

STATE OF TEXAS
CITY OF FRIENDSWOOD
COUNTIES OF
GALVESTON/HARRIS
MARCH 2, 2020



AGENDA

NOTICE IS HEREBY GIVEN OF A FRIENDSWOOD CITY COUNCIL REGULAR MEETING TO BE HELD AT 5:00 PM ON MONDAY, MARCH 2, 2020, AT FRIENDSWOOD CITY HALL, COUNCIL CHAMBERS, 910 S. FRIENDSWOOD DRIVE, FRIENDSWOOD, TEXAS, REGARDING THE ITEMS OF BUSINESS ACCORDING TO THE AGENDA LISTED BELOW:

5 PM – REGULAR MEETING

1. Call to order
2. Invocation – Reverend Robert Flick, Good Shepherd Episcopal Church
3. Pledge of Allegiance to the United States and Texas Flags – Cub Scouts Jack Merkys and Nicholas Wheeler with Pack 452
(HONOR THE TEXAS FLAG; I PLEDGE ALLEGIANCE TO THEE, TEXAS, ONE STATE UNDER GOD, ONE AND INDIVISIBLE)
4. Communications from the Public
(To comply with provisions of the Open Meetings Act, the City Council may not deliberate on items discussed under this agenda item. The Council may refer this item to the City Manager or direct this item to be placed on the next regular Council agenda. Out of respect for those speaking during public comment, please refrain from any outbursts or interjections to include, but not limited to, applause and/or disparaging noises from the audience. Doing so discourages others from voicing their thoughts and opinions, and disrupts the meeting. Furthermore, any personnel complaints against a City employee aside from the City Manager, City Secretary, City Attorney or Municipal Judge cannot be discussed under this section. Please contact the City Manager's office for concerns involving a City employee.)
5. **WORK SESSION**
 - A. Special Event Permits
 - B. City Wide Traffic Study
6. Special Recognition and Acknowledgements

- A. Presentation of the 2019 Comprehensive Annual Financial Report (CAFR) from auditors Whitley Penn, presented by Engagement Partner Lupe Garcia, CPA

7. Public Hearing

To receive comments from the public, both oral and written, regarding:

- A. Proposed amendments to Appendix C, Zoning Ordinance Sections 10-12 regarding board of adjustment establishment and procedure, powers and duties, and appeals from the board of adjustment and Section 20, Definitions, to be consistent with state law, particularly Chapter 211 of the Local Government Code.
- B. Proposed amendments to Appendix C, Zoning Ordinance, Section 7. P. 6. Permitted Use Table regarding changes for NAICS Use #447 Gasoline Stations, #511 Publishing Industries, and #713940 Fitness and Recreational Sports Centers.

8. Communications from the Public

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9. City Manager's Report

- A. Youth Sports Day
- B. Hurricane Harvey Update

10. Communications from Committees and Special Reports

- A. Annual report from Planning and Zoning Commission Chair Joe Matranga

11. Discussion and Possible Action

- A. Discussion and possible action regarding the approval of changes to the event permitting process.

- B. Discussion and possible action regarding appointments to the following committees, boards and commissions:

4th of July Steering Committee – Appoint Nancy Sims to an unexpired term expiring November 2022 to replace Corey Kirkland who resigned; appoint Larry Sims to an unexpired term expiring November 2022 to replace Nicole Morgan who was not reappointed.

- C. Discussion and possible action regarding the acceptance of the Certification of Unopposed Candidates.

12. Resolutions

Consideration and possible action regarding the following:

- A. Resolution No. R2020-04: A resolution of City of Friendswood, Texas, declaring March 6, 2020, as Wedgewood Elementary School Day in the City of Friendswood, Texas.
- B. Resolution No. R2020-05: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, authorizing participation in North Central Texas Council of Governments' North Texas Share Program.
- C. Resolution No. R2020-06: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, approving Capital Equipment Leasing Financing terms for the purchase of a fire truck.
- D. Resolution No. R2020-07: A resolution approving and adopting updates/amendments to the "Design Criteria Manual" for the City of Friendswood, Texas; approving the standards contained therein for the design, construction and installation of public infrastructure and related facilities and improvements within the City; and repealing all prior design criteria manuals and repealing other resolutions or parts of resolutions inconsistent or in conflict herewith.
- E. Resolution No. R2020-08: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, approving capital equipment leasing financing terms for the purchase of an ambulance.

13. Ordinances

Consideration and possible action regarding the following:

- A. Ordinance No. T2020-08: Second and Final reading of an an ordinance granting to CenterPoint Energy Resources Corp., DBA CenterPoint Energy Texas Gas Operations, the right, privilege and franchise to construct, install, extend, remove, replace, abandon, operate and maintain its facilities within the public rights-of-way of the City of Friendswood, Texas, for the transportation, delivery, sale and distribution of natural gas; providing for a term of 30 years; containing other provisions relating to the foregoing subject; providing for severability and providing an effective date.
- B. Ordinance No. T2020-10: First reading of an ordinance amending the Code of Ordinances, Chapter 54, Offenses and Miscellaneous Provisions, Article III., Protection of Citizens, Employees, Municipal Property by amending Section 54-48 entitled "Interfering with City Officers and Employees"; providing a penalty of an amount not to exceed \$500.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.
- C. Ordinance No. T2020-11: First reading of an ordinance amending the Code of Ordinances, Chapter 14, Building and Building Regulations, Article VIII., Swimming Pools by amending Section 14-356 entitled "Barrier Requirements"; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.
- D. Ordinance No. T2020-12: First reading of an ordinance amending the Code of Ordinances, Chapter 82, Traffic and Vehicles, Article II., Fire Lanes by amending Sections 82-62 through 82-71 regarding Fire Lane Requirements, Enforcement and Penalties for violation of division; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.
- E. Ordinance No. T2020-13: First reading of an ordinance of the City of Friendswood, Texas, granting an electrical franchise to CenterPoint Energy pursuant to Texas Utilities Code §§ 33.008, 181.042, and 181.043; stating a purpose; providing for a term of 30 years; providing for the location of facilities; providing for repair of excavations and obstructions; providing for indemnity to the City of Friendswood providing for street rental; repealing the former franchise, which is Ordinance No. 84-16A of the City of Friendswood; providing a severability clause; providing an open meetings clause; providing for publication and an effective date.

- F. Ordinance No. T2020-14: First reading of an ordinance amending the Code of Ordinances, Chapter 14, Buildings and Building Regulations, Article II., Building Code by amending Sections 14-25 through 14-28 regarding trash on construction sites, site drainage, restoration of property to original condition and housekeeping practices on construction sites; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.
- G. Ordinance No. T2020-15: First and Final reading of an ordinance of the City of Friendswood, Texas, declaring the unopposed candidates for City Council Position 2, Sally Branson and City Council Position 5, John Scott, elected; cancelling the May 02, 2020, General Election, and a Runoff Election on June 13, 2020, for such positions; providing for severability; and repealing all ordinances or parts of ordinances inconsistent or in conflict herewith.
- H. Ordinance No. T2020-16: First reading of an ordinance amending Appendix C "Zoning Ordinance," "Section 10. Board of Adjustment-Establishment and Procedure," "Section 11. Same-Powers and Duties," "Section 12. Appeals from the Board of Adjustment," and "Section 20. Definitions-Variance"; providing a penalty for violation in an amount not to exceed \$2000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.
- I. Ordinance No. T2020-17: First reading of an ordinance amending Appendix C "Zoning Ordinance," Section 7. "Schedule of District Regulations," Subsection 7.P.6., "Permitted Use Table," amending the following NAICS Uses: #447 Gasoline Stations, #511 Publishing Industries, and #713940 Fitness and Recreational Sports Centers; providing a penalty for violation in an amount not to exceed \$2000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.
- J. Ordinance No. T2020-18: First and Final reading of an ordinance amending City of Friendswood, Texas, Ordinance No. 2019-38, passed and approved October 7, 2019, same being an ordinance approving and adopting the City's General Budget for Fiscal Year 2019-2020 by approving "Budget Amendment IV" to the "Original General Budget of the City of Friendswood, Texas, for the Fiscal Year 2019-2020"; providing for supplemental appropriation and/or transfer of certain funds; providing for severability; and providing other matters related to the subject.

14. Communications from the Mayor and Councilmembers

15. Consent Agenda

Consideration and possible action regarding the following:

- A. Approving a Business Associate Agreement between Gabriel, Roeder, Smith & Company and the City of Friendswood Retiree Health Care Plan and authorize the Mayor to execute said document.
- B. Approving the January 2020 Tax Report.
- C. Approving the disposal of a decommissioned police vehicle through Houston Auto Auction.
- D. Approving the minutes of the February 3 and February 8, 2020, Council Meetings.

16. Adjournment

This facility is wheelchair accessible and accessible parking spaces are available. Requests for accommodations or interpretive service must be made two (2) business days or more prior to this meeting. Please contact the City Secretary's Office at (281) 996-3270 for further information.

I, MELINDA WELSH, CITY SECRETARY OF THE CITY OF FRIENDSWOOD DO HEREBY CERTIFY THAT THE ABOVE NOTICE OF MEETING OF THE FRIENDSWOOD CITY COUNCIL WAS POSTED IN A PLACE CONVENIENT TO THE GENERAL PUBLIC IN COMPLIANCE WITH CHAPTER 551, TEXAS GOVERNMENT CODE, ON

DATE

AT TIME

**MELINDA WELSH, TRMC
CITY SECRETARY**

**All meetings of City Council are open to the public, except when there is a necessity to meet in an Executive Session (closed to the public) under the provisions of Section 551, Texas Government Code. The City Council reserves the right to convene into Executive Session to hear any of the above described agenda items that qualify for an executive session by publicly announcing the applicable section number of the Open Meetings Act.

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/7/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Special Event Permits

Originating Department: Parks and Recreation

Degree of importance: Significant

Through a PowerPoint Presentation staff will show the current fee structure, examples of area Municipalities fee structure, and proposed fee structure along with requiring rental groups to provide additional insurance (event insurance) riders to cover property and structural damages to facilities.

SUMMARY / ORIGINATING CAUSE

During the October meeting we held staff discussions with Mayor and Council regarding adjusting the fees and refundable deposits for large Special Events held at City Parks. As mentioned, the current fee structure is too low causing an influx in request to rent parks (Stevenson Park). Both commercial and nonprofit groups are currently renting the park at rates that are established for small family gatherings.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

1. Special Event Permit Application
2. Special Event Permit Discussion



City of Friendswood Parks & Recreation Department
910 S. Friendswood Dr., Friendswood, TX 77546
281-996-3220 / rec@friendswood.com / www.friendswood.com

PUBLIC EVENT/SPECIAL EVENT PERMIT APPLICATION

FIRST TIME EVENTS: It is recommended to schedule a meeting with the Parks & Rec Dept. to discuss the application in detail for first time applicants. Please call (281) 996-3220 to make arrangements.

Reservations can be made 12 months in advance for any public event, special event or company picnic.			
Set-Up Date:	_____	Start time:	_____ End Time: _____
Event Date(s):	_____	Start time:	_____ End Time: _____
Event Date(s):	_____	Start time:	_____ End Time: _____
(Two-day event) / add additional line for 3+ day event			
Break-down Date:	_____	Start time:	_____ End Time: _____
Park Requested:	_____		
Facility/Facilities Requested:	_____		

including but not limited to: pavilions, gazebos, sports fields, amphitheater, restrooms, etc.			
Type of event	_____ Fair/Festival	_____ Concert	_____ Tournament
Mark all that apply:	_____ Fundraiser	_____ Company Picnic	_____ Race/Fun Run
	_____ Other: _____		
Estimated # attending event:	_____ (include vendors, staff, volunteers and participants)		
Descriptive summary of the event (attach additional sheets if necessary):	_____		

Event Name:	_____		
Name of Applicant:	_____ (Photo ID req. / age 21+)		
Company Name (if applicable):	_____		
Individual/Tax-Exempt, For-Profit or Commercial:	_____		
(attach proof of current tax-exempt/non-profit status, including IRS form 990)			
Mailing address:	_____ City: _____		
State:	_____ Zip:	_____ Email address: _____	
Cell Phone ()	_____	Other Phone ()	_____
Day of Event Contact Name:	_____ Phone () _____		
Is the event being sponsored, co-sponsored or supported by another organization or group? If yes, attach a list of supporting organization(s).			
	_____ YES	_____ NO	
Will gate, admission or registration fees be charged?			
If yes, attach a list of proposed fees and their purpose	_____ YES	_____ NO	
How will the event be promoted?	_____ TV Ads	_____ Social Media	_____ Radio
	_____ Flyers/posters	_____ Billboards	_____ Internet
Separate permit needed for signs	_____ Signs	_____ Other	_____
Event website:	_____		

Event Location Layout - Please list the proposed event location and attach a map of the proposed logistical layout for your event.

Event Size: _____ # of Participants _____ Total Number of Attendees at one time
_____ # of Staff/Volunteers _____ **Total Number of Attendees**

Event History: Is this a first time event? _____ YES _____ NO

Is this an Annual Event? _____ YES _____ NO

How many years in existence? _____ YEARS Highest Number of Attendees _____

Previous Name(s) of Event: _____

If your previous year's application is on file, are there any changes from the previous year?

List: _____

Activities and Entertainment - Please attach a list of scheduled activities and entertainment with times (i.e. bands, contests, arts & crafts show, cook-off, performers, etc.).

Structures - Please check all structural elements that apply.

_____ Tent(s) _____ Booth(s) _____ Table(s) _____ Chair(s) _____ Stage(s)
_____ Fencing _____ Light Tower(s) _____ Generator(s) _____ RV(s) _____ Amusements
_____ Other(s), please list: _____

You will need to provide sizes of all structures and include means of fire apparatus access along with any flame resistance certifications. Depending on structure sizes, you may need to have a trained crowd manager present.

Event Parking - What parking arrangements have been made for your event? If you are using alternate parking lots, an approval letter from the property owner must accompany this application. An event parking map will need to be submitted with this application.

Event Participant Parking Area (vendors, staff, volunteers, media): _____

Event Attendees Parking Area _____

Grass Parking - If you are requesting to utilize a grass parking area, what will you do in the event of inclement weather?

Street/Lane Closures: Are you requesting any street/lane closures? ____ YES ____ NO

Please list any street/lane closures you are requesting and attach a map:

***Portable Toilets:** Indicate the number of portable toilets you will have at your event. The closure of free-standing park restrooms may be required depending on the # of participants expected. Any event exceeding 500 in attendance may require portable toilets.

_____ # of Regular _____ # of ADA

When will they be delivered? _____

*For multi-day events, servicing of port-a-lets is required!

Food/Beverages: Please indicate all food/beverage elements that apply:

_____ Sale of food/beverages _____ Distribution of food/beverages

A Health Permit is required for each vendor selling or distributing food/beverages.

_____ Distribution of Alcoholic beverages (The sale of alcohol is not permitted)

You must obtain a TABC Permit for the distribution of alcoholic beverages and will need permission from the City of Friendswood Parks & Recreation Department To obtain your permit, if required.

Please state your alcohol control plan, such as limits, enforcement, shuttle services, etc.

First Aid Plan: Will you have a first aid station on-site? _____ YES _____ NO

What are your plans for a minor/major emergency? _____

Does your event layout provide for emergency vehicle access? _____ YES _____ NO

Utilities

Will you need electricity? _____ YES _____ NO (see page 7, item #14)

Electricity for: _____

Will you need access to water? _____ YES _____ NO

Water for: _____

Inclement Weather Plan:

What are your plans in case of inclement weather? _____

Name and phone number of weather monitor: _____

Event Notification: The applicant understands that they may be required to serve notices to residents and/or businesses in the area where the event will be held and furnish proof to the Department. Notices should include event date, times, and details.

Security:

The applicant is responsible for adequate security for the permitted event, including crowd control, emergency response access and safeguarding the attendees and park property. The City of Friendswood Police Department will determine how many officers will be necessary for your event. The rate for security will be \$55 per officer per hour.

Insurance Requirements:

Public liability and property damage insurance is required for all athletic user groups, special event permit applicants, amusement vendors (i.e. moonwalks), special event organizers producing events that are open to the public, and for-profit commercial vendors, otherwise known as "vendor" in the amounts set forth below.....acts or omissions of the vendor. Insurance must be issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions insuring the public from any loss or damage that may arise to any person or property by reason of the acts or omissions of the vendor.

Vendor must at its own expense be required to carry the following minimum insurance coverage:

- For damages arising out of bodily injury to or death of one person in any one occurrence – one hundred thousand and no/100 dollars (\$100,000.00);
- For damages arising out of bodily injury to or death of two or more persons in any one occurrence – three hundred thousand and no/100 dollars (\$300,000.00);
- For damage to or destruction of property in any one occurrence – one hundred thousand and no/100 dollars (\$100,000.00);
- Alcohol - If alcoholic beverages are served, or allowed to be consumed during the event, the insurance certificate must state specifically that it also covers any losses resulting from the consumption of alcohol at the event.

Certificate Holder:

The Certificate Holder is: City of Friendswood, 910 S. Friendswood Dr., Friendswood, TX 77546

Additional Insured Required:

The City of Friendswood must be named as additional insured on policies listed in subparagraphs above and must be notified of any changes to the policy(ies).

General Requirements:

- Insurance is to be placed with insurers having a best rating of no less than A.
- The vendor must furnish the City with certificates of insurance and original endorsements affecting coverage required by these insurance clauses.
- The insurance certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf.
- Proof of insurance must be provided at least five (5) business days before the start of the event, athletic season, or first permitted date, or the permit/event will be cancelled.
- The City reserves the right to pursue other remedies permitted by law or in equity.
- In no event must the City be liable for any damage to or destruction of any property belonging to the event organizer/vendor unless specified in writing and agreed upon by both parties.

Indemnification

Vendor agrees to indemnify, defend and hold harmless CITY, its officers, officials, agents, and employees from any claim, loss, damage, causes of action, suits and liability of every kind, including all expenses of litigation, court costs, and attorney's fees, for injury to, or death of any person, or for damage to any personal or real property, arising out of, or in conjunction with the Vendor's event, or any act or omission of Vendor, its officers, employees, agents, or subcontractors during the conduct of Vendor's event.

Special Event Permit Fees:

Fees for these permits are based on the number of people projected to be attending the event and whether or not gate/admission or registration fees are charged. Depending on the site, parks may include outdoor picnic shelters, outdoor pavilions and other outdoor amenities. Special Event Applications must be submitted at least 90 calendar days in advance of the event date and are made on a first-come, first serve basis.

Attendance	Deposit	User Fees	
		Non-Profit/Tax-Exempt	Commercial/For Profit
Less than 250	\$600	\$150	\$250
250-500 persons	\$600	\$250	\$500
501-1,000 persons	\$1,000	\$350	\$700
1,001-3,000 persons	\$2,500	\$400	\$800
3,001 or more	\$2,500	\$500	\$1,000

Cleaning Attendants:

Any large event with 75 or more people must secure the services of at least two Cleaning Attendants to ensure the integrity of the reserved park is upheld.

- Cleaning Attendants must be scheduled at least two weeks prior to any large event.
- Changes, or event cancellations must be made 48 hours prior to scheduled event. Changes made within 48 hours will be subject to additional fees paid to the City of Friendswood.
- Any additional hours needed and not paid for prior will be taken out of the paid deposit
- Cleaning Attendants are only responsible for the duties assigned on this agreement.
- Cleaning Attendant fee is \$14.25 per hour and paid at time of reservation

Cleaning Attendants Responsibilities:

- Cleaning/pick up of trash on park grounds.
- Empty all garbage cans, dispose of bags in dumpsters and refill with new bags.
- Clean and restock all restrooms.
- For maintenance repairs to park facility, please call 281-996-3300 to dispatch a Parks & Recreation staff member.

Security Fees:

- City of Friendswood Police Officers will be present at all large events. All security fees are paid to the Parks & Recreation Department at a rate of \$55 per hour per officer. The number of officers needed for your event will be determined by the City of Friendswood Police Department.

SPECIAL EVENT CONTRACT RULES: The undersigned applies for a special event permit and agrees to the regulations listed below as established by the City of Friendswood Parks & Recreation Department.

1. Please have your Permit in possession during your use of the permitted facility.
2. The layout approved for this event denotes the permitted activities and must be followed in the staging and placement of parking, concession stands, booths, inflatables and amusements, trash receptacles, portable restrooms, performance staging and other support amenities. Any deviation from the approved layout, except in the instance of minor on-site adjustments must receive permission from the Parks & Recreation Director.
3. No motorized vehicles may be driven upon or parked on grass areas or sidewalks unless approved in the layout.
4. Cancellations: If applicant wishes to cancel the event, the notification must be given in writing at least 7-calendar days in advance. Failure to comply with these deadlines may result in the forfeiture of user fees. Cancellations may be charged a \$30 administrative fee.
5. Concession Stands, exhibit booths, tents, awnings, and/or similar support structures may not be attached to, set against, or situated so as to damage any wall, column, tree, post, light standard or any other park amenity.
6. The Permit Holder must leave all facilities in good or better condition that existed before the event. Following the conclusion of the event all or part of the deposit may be refunded, depending upon the condition in which the facility are left. If the facility is damaged or not thoroughly cleaned, the Permit holder agrees, as a condition of the issuance of the Permit to pay such additional charges as are assessed by the Department. Permit Holders are responsible for damage to any furniture, equipment, and building along with the surrounding grounds. Deposits must be made when the reservation is made and will be deposited. Following the event, a refund will be issued to the permit holder approximately 14-30 days after the conclusion of the event (if applicable).
7. No banners, flags, temporary signs, or similar visual effects may be attached to lights, sign posts, trees or secured by stapling, taping, nailing, or other means that may cause damage to park structures or amenities. Rice, birdseed, confetti, silly string, piñatas and glitter are not allowed.
8. No glass containers are allowed.
9. Please note that should the City need to utilize the park for emergency purposes, Applicant will be given notice at the earliest opportunity and User Fees will be refunded.
10. The completed "Public Event/Special Event Permit Application" must be submitted to the Parks & Rec Office a minimum of 30 calendar days in advance but not more than 12 months in advance. Deposit payments are due at the time the reservation is made. The Applicant will be required to pay 100% of all Special Event Permit Fees, thirty (15) calendar days prior to the event date. Gate fee applicants must pay required fees at the conclusion of their event.
11. Permit holder is responsible for obtaining any noise/sound or additional permits are required by the City that the event is held in.
12. Sites and Facilities are limited. For this reason, reservations should be made as far in advance as is reasonably possible. Special event reservations can be made up to 12 months in advance.
13. All electrical connections and hook-ups installed by the applicant must meet appropriate safety and city or county code requirements. Special event permits are issued for the use of existing electrical systems and outlets only. Total amperage required by the applicant may not exceed safe capacity of existing park service.

SPECIAL EVENT CONTRACT RULES - Continued

14. Existing faucets or hose bibs may be used for water connections, but no temporary connections or modifications to the park's water supply may be made without prior approval.
15. Adherence to the date and time allotments of this application/permit are mandatory, and is inclusive of set-up, strike and clean-up.
16. Failure to abide by any of these General Conditions will automatically revoke the Permit and cancel the Reservation. All policies and fees in this application are subject to change.
17. All Reservation Application Forms must include a valid telephone number, email address, cell phone number. Facility and/or User Reservation Fees are to be paid by Cash, Personal Check, Cashier's Check, Money Order, or by credit card (Visa, MasterCard, Discover) made payable to the City of Friendswood. A convenience fee of 2.5% will be assessed on all debit card and credit card transactions.
18. The Applicant must provide for the Event, at no additional charge to the public, an adequate number of portable toilets (one per 100 attendees), including a proper ratio of such toilets that meet the Americans with Disabilities Act specifications (ADA).
19. The Permittee must obtain a Fire Inspection (if necessary).
20. Depending on the size and nature of the event, the Permittee may be required to meet with the Development Review Committee (DRC). This informal meeting allows the Permittee and all involving departments within the City of Friendswood to discuss all logistics for the event. DRC meetings are held on Wednesday mornings at 9am, 10am, and 11am.
21. The Permittee may use, for the event, any electrical outlets that currently exist at the site. It is the Permittee's responsibility to contact the Department at least 72 hours before the Event to ensure that the electrical power is turned on. If the Event takes place at a Site where no electrical outlets are currently in place or if the Permittee has additional electrical requirements, it will be the Permittee's responsibility to safely provide for the Event's additional needs.
22. Any misrepresentation of the signed special event application or failure to meet the requirements set forth herein will result in retention of the deposit fee.
23. Following the conclusion of the Event, if the Facility, or Grounds is damaged, the Permittee agrees, as a condition of the issuance of the Permit to pay such charges as are assessed by the City. If a dispute arises out of or relates to the breach of this Agreement, and if the dispute cannot be resolved through negotiation, then the City and Permittee agree to submit the dispute to mediation. In the event that the City or Permittee desire to mediate any dispute, that party must notify the other party in writing of the dispute it desires to mediate. Within thirty (30) days after receipt of the written notice of the dispute and the request to mediate, the parties must attend a mediation conducted by a mutually agreeable mediator. If the parties do not achieve a resolution of the dispute by mediation, within ten (10) days after the mediator declares an impasse, either party may file a lawsuit in Galveston County, Texas.

Applicant's Name

Applicant's Signature

Date

Checklist / Notes:

For Office Staff Only:

Staff Initials: _____

Permit #: _____

Receipt Attached _____

Initial Meeting Date: _____

On-Site Meeting Date: _____

Routed to other Departments:

_____ Parks Dept. _____ Galveston County _____ Police Dept. _____ EMS _____ FMO _____ CDD

Rental Supervisor Checklist

- Event Layout: _____
- Event Parking Map: _____
- Copy of Event Flyer _____
- Handicap Parking _____
- Activity & Structures Listing: _____
- Insurance: _____
- TABC Permit: _____
- Sound Permit: _____
- Security Scheduled: _____
- Park Attendants Scheduled _____
- Street Closure Map: _____
- Written Emergency Action Plan (EAP): _____
- Fire Inspection: _____

Rental Supervisor Signature: _____

Date: _____

NOTES/SPECIAL REQUESTS:

CITY OF FRIENDSWOOD

Special Event Permit Application



Special Event Permit Application

- **New Special Event Permit Application creates uniformity for all public events with detailed information such as:**
 - ✓ Parking Plan & Street Closures
 - ✓ Event Layout
 - ✓ Inclement Weather Plan
 - ✓ Emergency Action Plan
 - ✓ Fire Inspection
 - ✓ How event will be promoted – social media, radio, TV ads, etc.
- **Allows for more department visibility**



Special Event Permit Application - Update

- **Only applies to public events held at City Parks/Facilities**
- **A DRC meeting will now be held for all necessary departments to review and discuss all logistics for the event.**
 - Involves PD, FMO, EMS, CDD, P&R, CMO, ASO, & Galveston County Health District
- **Cleaning Attendant (\$14.25 per hour) instead of Park Attendant (\$25 per hour), saves applicant \$10.75 per hour on fees**
- **Expectation of Friendswood Police to provide security for all public events held on City property at a rate of \$55 per hour/officer**



Neighbor Pricing

<u>Entity</u>	<u>Non-Profit Fee</u>	<u>Resident Fee</u>	<u>Non-Resident Fee</u>	<u>Deposit</u>
Alvin	\$480 -12hrs	\$480 -12hrs	\$480 -12hrs	\$500
Pearland	\$600	\$1,200	\$1,800	\$500
Galveston County	300-500 - \$345 501-2,000 - \$575 2,001-5000 - \$700 >5,001 - \$700	Same as Non-Profit	300-500 - \$700 501-2,000 - \$1,150 2,001-5000 - \$1,400 >5,001 - \$1,400	300-500 - \$200 501-2,000 - \$700 2,001-5000 - \$1,700 >5,001 - \$2,700
Harris County	\$430	\$430	\$430	\$280
Galveston	\$200	\$200	\$200	\$1,000



New Pricing

Attendance	Deposit	User Fees	User Fees
		Non-Profit/Tax-Exempt	Commercial/For Profit
Less than 250	\$600	\$150	\$250
250-500 persons	\$600	\$250	\$500
501-1,000 persons	\$1,000	\$350	\$700
1,001-3,000 persons	\$2,500	\$400	\$800
3,001 or more	\$2,500	\$500	\$1,000

- User fees cover administrative costs, park supplies, electricity, water, park repairs, emergency maintenance call outs
- Costs associated with park repairs in the last 5 years are estimated at \$25,000



Payment Option #1 (staff recommended)

- Pays full deposit when reservation is made
- Pays all user fees, security fees, and cleaning attendant fees 7 days prior to rental date



Payment Option #2

- Pays full deposit when reservation is made
- Pays 50% of user fees, security fees, and cleaning attendant fees 7 days prior to rental date. Pays the rest of 50% user fees by 7 days after the event.



Questions, Comments, or Recommendations?



FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/3/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: City Wide Traffic Study

Originating Department: Engineering

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

The City of Friendswood commissioned Brown & Gay Engineers, Inc. (BGE) to conduct a city-wide traffic study to analyze the mobility needs of the city. Existing congestion was evaluated along with potential transportation infrastructure improvements.

Three future years (2025, 2030, and 2040) were evaluated for short-, mid-, and long-term improvements.

A public meeting was held on August 14, 2019 at the Friendswood Public Library which allowed residents an opportunity to express their traffic concerns.

The Study's findings and recommendations are written into a report. BGE will present these findings and recommendations to the City Council.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

The improvements identified in the traffic study would help reduce the delays and long queues that drivers within the City of Friendswood currently experience and would experience in the future.

Supporting data will be used to coordinate improvements with public entities such as the Texas Department of Transportation and Harris County.

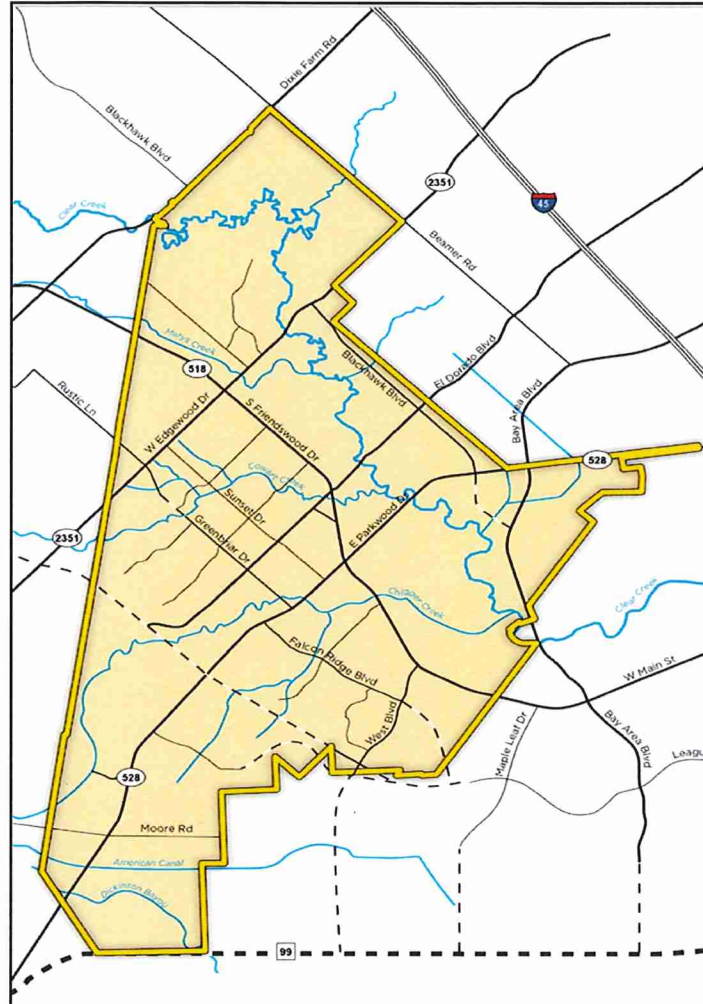
RECOMMENDATIONS

ATTACHMENTS

1. City of Friendswood City-Wide Traffic Study February 2020

CITYWIDE TRAFFIC STUDY

City of Friendswood, Texas



Prepared for:
The City of Friendswood

By: BGE, Inc



February 2020



BGE, Inc.
TBPE FIRM REGISTRATION NO. 1046

Executive Summary

The City of Friendswood is a growing community that is looking to prepare for the mobility needs of the city by analyzing the existing congestion and evaluating potential transportation infrastructure improvements. The improvements evaluated would help reduce the delays and long queues that travelers within the City of Friendswood would experience. The City of Friendswood requested to evaluate the City's needs over the next 20 years.

Three future years were evaluated for improvements: Year 2025, Year 2030, and Year 2040. It is anticipated that new neighborhoods would be built out, major roadway connections would be constructed, and these years would pose the most impact on the roadway network. These three analysis years outlined the following improvements:

- **Year 2025 Short-Term Improvements**– Improvements that could be implemented within the existing right-of-way
- **Year 2030 Mid-Term Improvements** – Improvements that require minimal right-of-way acquisition
- **Year 2040 Long-Term Improvements** – Any improvement needed to improve mobility and traffic operations.

As part of the study, a public meeting was held to provide the residents with an understanding of the improvements that were being evaluated within the city limits and give them an opportunity to express any traffic concerns experienced. The recommendations developed included feedback received from the residents.

Recommendations:

Year 2025 (Short-Term)

In the Year 2025, the improvements were determined based on feasibility of construction within a 5-year period. These recommendations could be implemented in a relatively quicker time frame. The improvements include improved optimized signal timings, lengthening critical turn lanes, modified lane assignments, providing key turn lanes at critical intersections, and minor widening to add capacity to congested roadways.

Year 2030 (Mid-Term)

When looking at Year 2030, additional time allows for projects that require additional ROW to be built. In the Year 2030, the improvements recommended included improved signal timings, modified lane assignments, providing turn lanes at several key intersections, and the extension of roadway facilities. The extension of roadway facilities is expected to provide an additional route and allow for reducing capacity on congested roadways.

Year 2040 (Long-Term)

Long-term improvements allow for the acquisition of extensive ROW, identifying funding, and extensive coordination. In the Year 2040, the improvements recommended included improved signal timings, lengthening critical turn lanes, providing key turn lanes at critical intersections, extension of improvements along roadways, major/minor roadway widening, roadway realignment, and an additional roadway connection. These improvements require public involvement and coordination between agencies.

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- Appendix A: Existing Traffic Counts
- Appendix B: “Existing 2019” Conditions Analysis
- Appendix C: “Year 2025 No-Build” Conditions Analysis
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- Appendix H: “Year 2040 Build” Conditions Analysis
- Appendix I: Local Street Conditions Analysis
- Appendix J: Public Meeting Comments—August 14, 2019
- Appendix K: “Year 2025” Benefit-Cost Analysis
- Appendix L: “Year 2030” Benefit-Cost Analysis
- Appendix M: “Year 2040” Benefit-Cost Analysis

1.0 Introduction

As the City of Friendswood continues to develop and grow in the coming years, it will be necessary to ensure ongoing mobility. To aid in the discussion about mobility, the City of Friendswood has requested a citywide traffic study be conducted. With this study, the City will be able to prioritize improvements to keep the City moving. The city's roadway network is anchored primarily by three major thoroughfares: FM 518, FM 528, and FM 2351, with numerous boulevards and collectors supplying the network. The city is expected to continue growing over the next few decades, which will require improvements to the roadway network in order to operate with optimal efficiency.

1.1 Study Purpose

The purpose of the study is to analyze the existing roadway network and identify areas which will need to be addressed to accommodate growing traffic volumes over the next 25 years. In order to improve mobility and traffic operations within the City of Friendswood, improvements were divided into three groups based on improvement type and associated timeline:

- **Year 2025 Short-Term Improvements**– Improvements that could be implemented quickly and within the existing right-of-way.
- **Year 2030 Mid-Term Improvements** – Improvements that might require minimal additional right-of-way acquisition and may take additional time for design and coordination.
- **Year 2040 Long-Term Improvements** – Long-term improvements needed to improve mobility and traffic operations that may require extensive right-of-way, long design and coordination time.

1.2 Study Area

The City of Friendswood falls within these counties: Galveston County and Harris County. The city is located west of League City, southeast of Pearland, and northeast of Alvin in the greater Houston area.

IH 45 to the east and SH 35 to the west provide connectivity for commuter traffic to/from Houston to the north. These transportation corridors are fed by three major thoroughfares: FM 518, FM 528 and FM 2351 with all three connecting to IH 45.

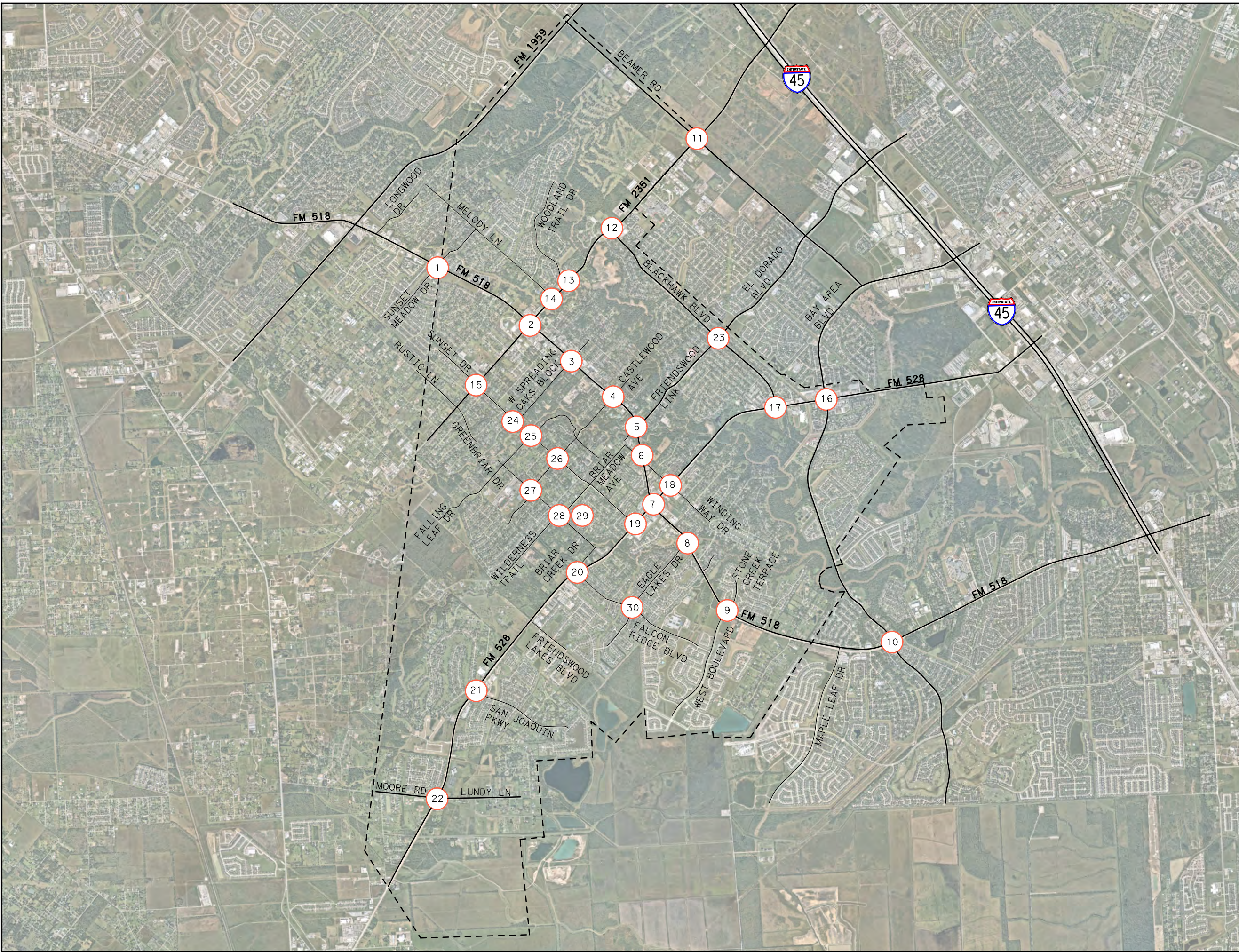
- FM 518 provides primary north-south connectivity, running parallel with IH 45 while connecting Friendswood with Pearland to the north and League City to the east.
- FM 528 provides east-west connectivity, running parallel with FM 2351 while connecting Friendswood with Webster to the east and Alvin to the west.
- FM 2351 provides east-west connectivity, running parallel with FM 528 while connecting Friendswood with Clear Lake to the east and SH 35 to the west.

The study includes analysis of 30 intersections which were deemed most critical to traffic operations within the city:

1. E. Broadway St./FM 518 at Sunset Meadow Dr/Winding Rd.
2. E. Edgewood Dr./FM 2351 at N. Friendswood Dr./FM 518
3. S. Friendswood Dr./FM 518 at E. Spreading Oaks Ave.
4. S. Friendswood Dr./FM 518 at E. Castlewood Ave.
5. S. Friendswood Dr./FM 518 at Whispering Pines Ave.
6. S. Friendswood Dr./FM 518 at Winding Way Dr.
7. S. Friendswood Dr./FM 518 at E. Parkwood Dr./FM 528
8. S. Friendswood Dr./FM 518 at Eagle Lakes Dr.
9. S. Friendswood Dr./FM 518 at Stone Creek Terrace/West Boulevard
10. W. Main Street/FM 518 at Bay Area Blvd.
11. FM 2351 at Beamer Rd.
12. E. Edgewood Ave./FM 2351 at Blackhawk Blvd.
13. E. Edgewood Dr./FM 2351 at Woodland Trail Dr./Royal Ct.
14. E. Edgewood Dr./FM 2351 at Melody Ln.
15. W. Edgewood Dr./FM 2351 at Sunset Dr.
16. FM 528 at Bay Area Blvd.
17. FM 528 at Blackhawk Blvd.
18. E. Parkwood Dr/FM 528 at Winding Way Dr.
19. W. Parkwood Dr/FM 528 at Sunset Dr.
20. W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd.
21. W. Parkwood Dr/FM 528 at Cypress Point Dr./San Joaquin Pkwy
22. W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln.
23. Blackhawk Blvd. at Friendswood Link Rd.
24. Sunset Dr at W Spreading Oaks Dr./Cowards Creek Dr.
25. Sunset Dr at Falling Leaf Dr.
26. Sunset Dr. at W. Castlewood Ave.
27. Greenbriar Dr. at W. Castlewood Ave.
28. Greenbriar Dr. at Wilderness Trail
29. Greenbriar Dr. at Briarmeadow Ave
30. Falcon Ridge Blvd. at Eagle Lakes Dr.

The study area and intersections are shown in **Figure 1**.

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LEGEND

XX INTERSECTION NUMBER

--- CITY LIMITS

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PROJECT LOCATION

CITY-WIDE TRAFFIC STUDY

CITY OF FRIENDSWOOD

DATE: DEC2019	FIGURE: 1	PAGE: 3
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2.0 Data Collection

The study consisted of an extensive traffic data collection effort, roadway and intersection analyses, field observations, and corridor travel time analyses. Data acquisition included 24-hour traffic counts and turning movement counts.

2.1 Existing Transportation Network

The roadway network in the area is served primarily by Interstate Highway 45 (IH 45), Farm-to-market (FM) roadways and numerous local streets. The existing primary roadway network within the study area is shown in **Figure 2**.

2.1.1 Interstate Highway 45

Interstate Highway 45 is the only interstate facility currently serving the City of Friendswood area. IH 45 runs north to south providing connectivity to Downtown Houston to the north and Galveston to the south. Access to IH 45 is provided by grade-separated interchanges along FM 2351, FM 528, FM 518 and El Dorado Boulevard.

2.1.2 Farm-To-Market Roads

The Farm-to-Market roads allow for access, connectivity and mobility within the City of Friendswood. There are three FM roadways located within the City of Friendswood limits. Each FM road also has a city street name designation:

2.1.2.1 FM 2351 / E. Edgewood Drive /W. Edgewood Drive

FM 2351/ E. Edgewood Drive is a four-lane divided roadway east of FM 518 to Beamer Road and becomes FM 2351/ W. Edgewood Drive, a two-lane roadway and a continuous left-turn lane from west of FM 518 to Rustic Lane. FM 2351 begins at IH 45 and continues west past the study area to SH 35.

FM 2351 has a posted speed limit of 50 mph east of Beamer Road to IH 45, 45 mph west of Beamer Road to FM 518 and 35 mph from FM 518 to Rustic Lane.

2.1.2.2 FM 518 / N. Friendswood Drive /S. Friendswood Drive

FM 518/ N. Friendswood Drive/ S. Friendswood Drive is a four-lane divided roadway north of FM 2351 to Winding Way Drive and becomes a four-lane roadway with a continuous left-turn lane from Winding Way Drive to IH 45. FM 518 begins at SH 146 and continues past the City of Friendswood to SH 35.

FM 518 has a posted speed limit of 45 mph north of FM 2351, 30 mph within the City of Friendswood from FM 2351 to Whispering Pines Avenue, 45 mph from Whispering Pines Avenue to IH 45.

2.1.2.3 FM 528/E. Parkwood Drive / W. Parkwood Drive

FM 528/ E. Edgewood Drive/ W. Parkwood Drive is a six-lane roadway with a continuous-left turn lane from IH-45 to Sunset Drive and becomes a four-lane roadway with a continuous left-turn lane from SH 35 to west of Sunset Drive. FM 528 begins at IH 45 and continues west past the study area to SH 35.

FM 518 has a posted speed limit of 55 mph from IH 45 to Plymouth Colony Drive, 45 mph west of Plymouth Colony Drive to Sun Meadow Boulevard and 55 mph west of Sun Meadow Boulevard to SH 35.

2.1.3 Local Streets

The local streets within the City of Friendswood carry lower traffic volumes at lower speeds. These streets primarily serve the neighborhoods within the study area.

2.1.3.1 Sunset Drive

Sunset Drive is a two-lane street with a continuous left-turn lane from FM 2351 to FM 518. There are five signalized intersection within Sunset Drive and several unsignalized intersections. The posted speed limit along Sunset Drive is 35 mph.

2.1.3.2 Greenbriar Drive

Greenbriar Drive is a two-lane street from Falling Leaf Drive to Briar Creek Drive. There are ten unsignalized intersections along Greenbriar Drive and several private driveways. Greenbriar Drive primarily serves the Friendswood High School which is located from W. Castle Avenue to Falling Leaf Drive. The posted speed limit along Greenbriar Drive is 20 mph.

2.1.3.3 Blackhawk Boulevard

Blackhawk Boulevard is a four-lane boulevard from FM 2351 to FM 528. There are three signalized intersection along Blackhawk Boulevard and several unsignalized intersections. The posted speed limit along Blackhawk Boulevard is 30 mph.

2.1.3.4 Falcon Ridge Boulevard

Falcon Ridge Boulevard is a two-lane roadway with raised medians from FM 528 to Middle Creek street. Falcon Ridge Boulevard becomes a two-lane roadway undivided from Middle Creek street to West Boulevard. Friendswood Jr High School is located along Falcon Ridge Boulevard. The posted speed limit along Falcon Ridge Boulevard is 20 mph.

2.1.3.5 Friendswood Lakes Boulevard

Friendswood Lakes Boulevard is a two-lane roadway with raised medians from FM 528 to Stoney Lakes Drive. Friendswood Lakes Boulevards becomes a two-lane rural road north of FM 528. The posted speed limit along Friendswood Lakes Boulevard is 30 mph.

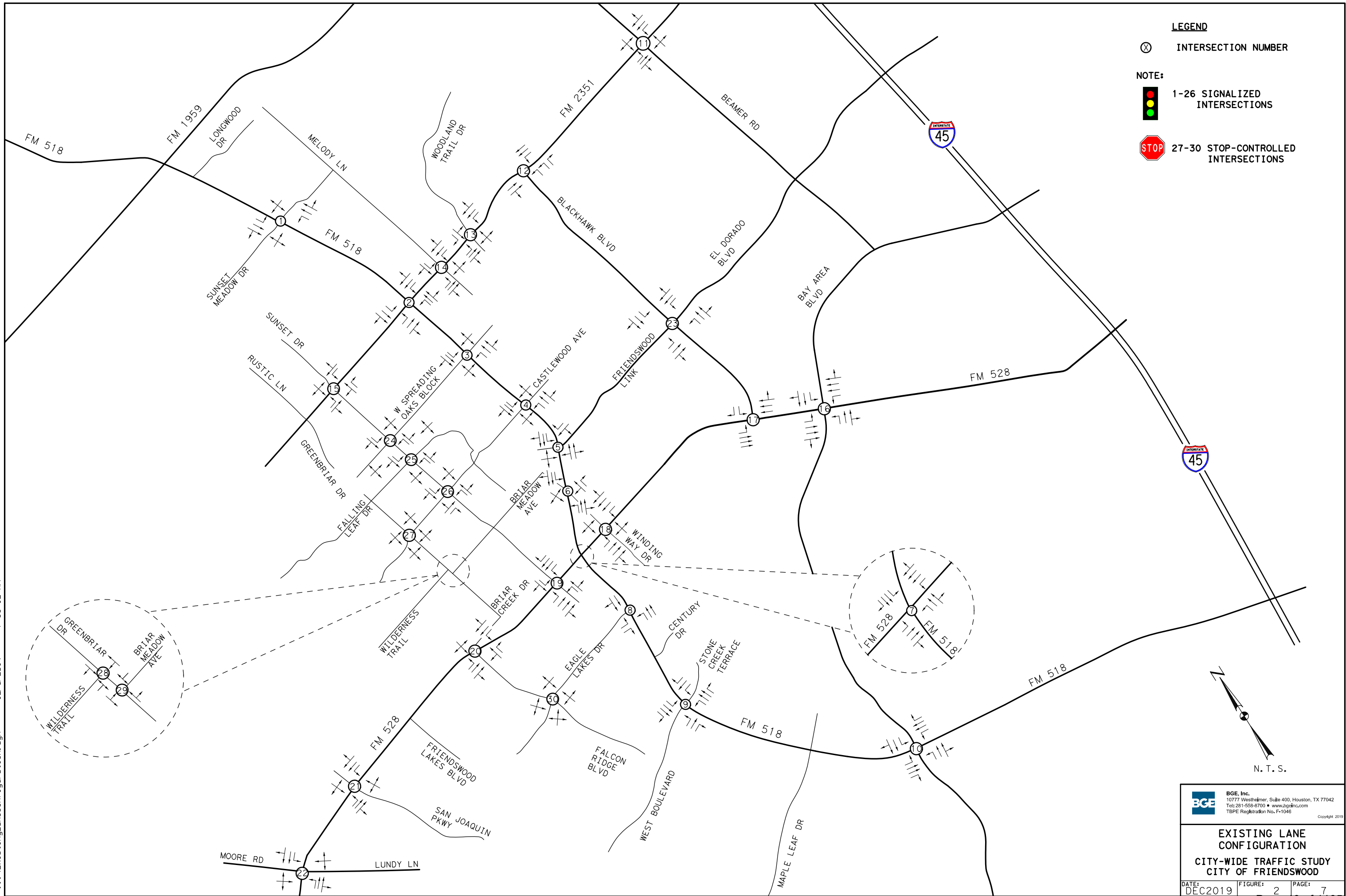
2.1.3.6 San Joaquin Parkway/ Cypress Point Drive

San Joaquin Parkway/Cypress Point Drive is a two-lane roadway with raised medians from FM 528 to Lakeway Drive. San Joaquin Parkway/Cypress Point Drive primarily serves residential developments within the city limits. The posted speed limit along San Joaquin Parkway/Cypress Point Drive is 30 mph.

2.1.3.7 Moore Road/Lundy Lane

Moore Road/Lundy Lane is a two-lane roadway from SH 35 to El Dorado Drive. The posted speed limit along Moore Road/Lundy Lane is 30 mph.

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2.2 Field Observations

Field observations were conducted along the FM roads and local streets on Wednesday, April 17, 2019 during the AM peak, midday and PM peak. The following subsections describe the field observations:

2.2.1 FM 528/W Parkwood Avenue/E Parkwood Avenue at FM 518/S Friendswood Drive

- The northbound through FM 518 traffic experiences long queues which also blocks the right-turn movements trying to turn right onto FM 528 during the AM period.
- The eastbound through FM 528 traffic experiences long queues that spillback to the next signalized intersection of Winding Way Drive at FM 528 during the PM peak period.
- The southbound and northbound FM 518 left-turn lanes experiences long queues during all peak periods.

2.2.2 FM 2351 at FM 528

- The southbound FM 518 through movements experiences long queues blocking commercial driveways during the AM and PM peak.
- The northbound, southbound and eastbound left-turn lanes experiences long queues which spillback blocking the through lanes at each approach during the AM and PM peak.

2.2.3 FM 2351 at Beamer Road

- The southbound approach at Beamer Road experiences long queues, the traffic dissipates after 3 signal cycles during the AM and PM peak.
- The eastbound and westbound FM 2351 approaches experiences long queues during the AM and PM peak periods.

2.2.4 Sunset Drive at FM 2351

- FM 2351 eastbound drivers coming from the adjacent Elementary School travel over the painted shoulder in order to turn right onto Sunset Drive.
- During the AM peak period, the long queues along FM 2351 dissipate after two signal cycles.

2.2.5 Sunset Drive at FM 528

- The southbound Sunset Drive left-turn movements experiences long queues which spillback blocking the shared-through and right-turn movements during the AM and PM peak periods.
- During the PM peak period, the eastbound and westbound FM 528 approaches experiences long queues that dissipate after three signal cycles.

2.2.6 Greenbriar Drive at W. Castlewood Avenue

- Greenbriar experiences long queues from Falling Leaf Drive to W Castle Avenue, due to the Friendswood High School traffic during the AM peak.

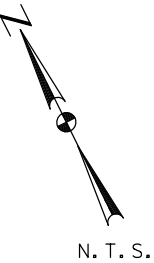
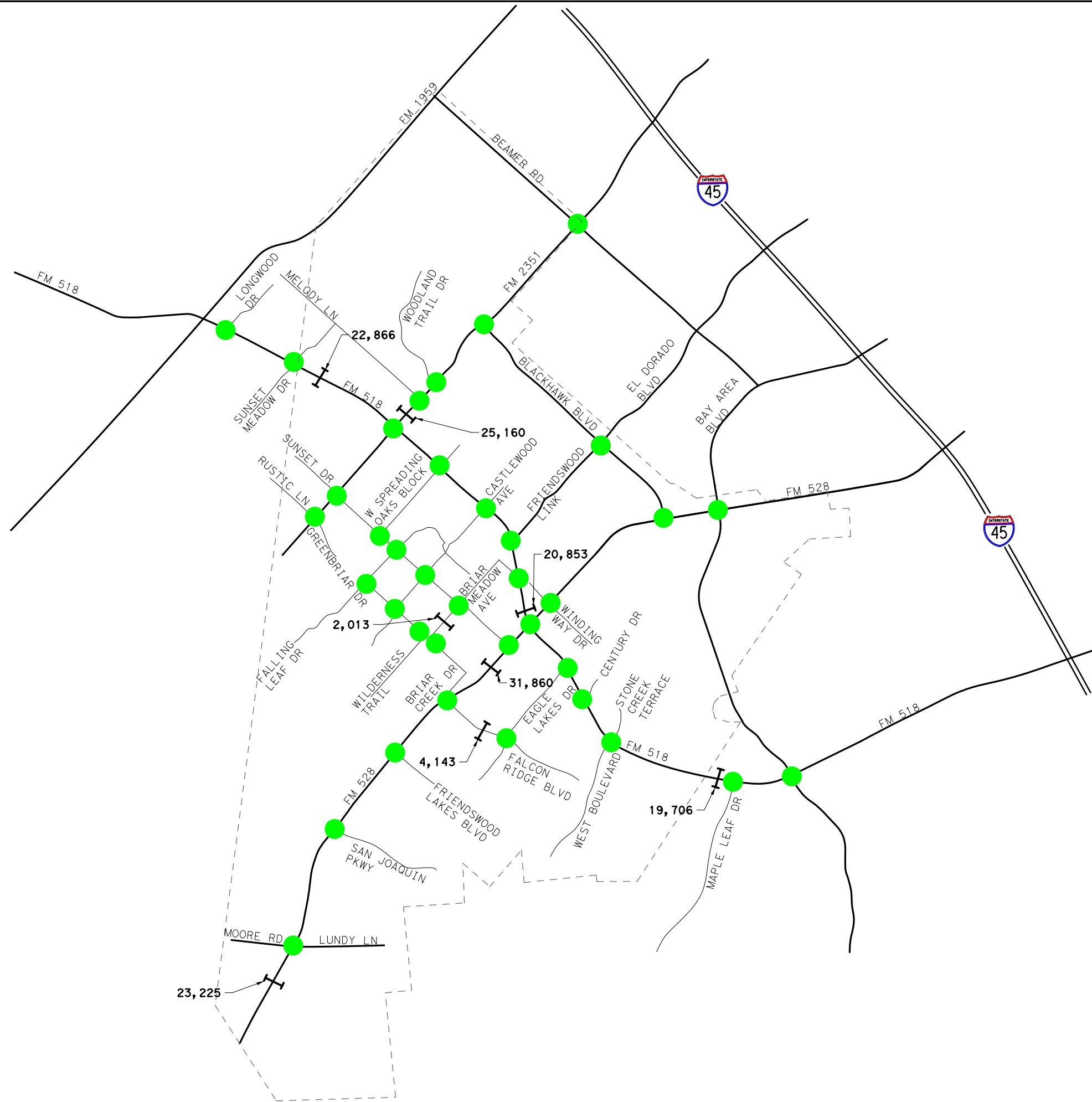
2.3 Traffic Counts

The initial tasks for the traffic study included evaluating 15 twenty-four-hour traffic counts (bi-directional) and 30 intersection peak-hour turning movement counts.

The 15 twenty-four-hour traffic counts (bi-directional) were collected on Tuesday, February 26, 2019 and Thursday, March 28, 2019. The turning movement counts for the 30 intersections were collected on Wednesday, February 7, 2019 from 6:30 AM to 7:30 AM and 4:30 PM to 6:30 PM. The traffic count data sheets are provided in **Appendix A**. **Figure 3** shows the 24-hour counts and existing traffic movement counts locations.

LEGEND

- I 24-HOUR COUNTS
- STUDY INTERSECTIONS



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EXISTING TRAFFIC COUNTS
LOCATION
CITY-WIDE TRAFFIC STUDY
CITY OF FRIENDSWOOD

2.4 Travel Times

Travel time studies for existing conditions were performed during the morning, midday, and afternoon peak periods on Tuesday, March 26, 2019 and Wednesday, March 27, 2019 using a GPS logging software. Information derived from the travel time studies includes total travel time, number of stops, average link speed, and delay.

Travel times were measured at the following roadways:

- FM 518 to/from: FM 2351 and Stone Creek Terrance
- FM 528 to/from: Winding Way Drive and Falcon Ridge Boulevard
- FM 2351 to/from: Woodland Trail Drive and FM 518
- Sunset Drive to/from: W. Spreading Oaks Block and Castlewood Avenue

For the travel time analysis three runs were performed in each direction. The AM peak run was performed between 7:00 a.m. and 8:45 a.m. The Off-peak run was performed between 12:00 p.m. and 1:30 p.m. The PM peak was performed between 4:45 p.m. and 6:00 p.m. **Table 1 - Table 4** summarizes the travel times.

Table 1 – Travel Time Summary FM 518

Travel Direction	Peak	Average Travel Time
		(min)
NB	AM	12
SB	AM	14
NB	Midday	10
SB	Midday	9
NB	PM	17
SB	PM	18

Table 2 – Travel Time Summary FM 528

Travel Direction	Peak	Average Travel Time
		(min)
EB	AM	4
WB	AM	6
EB	Midday	3
WB	Midday	4
EB	PM	7
WB	PM	12

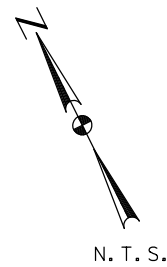
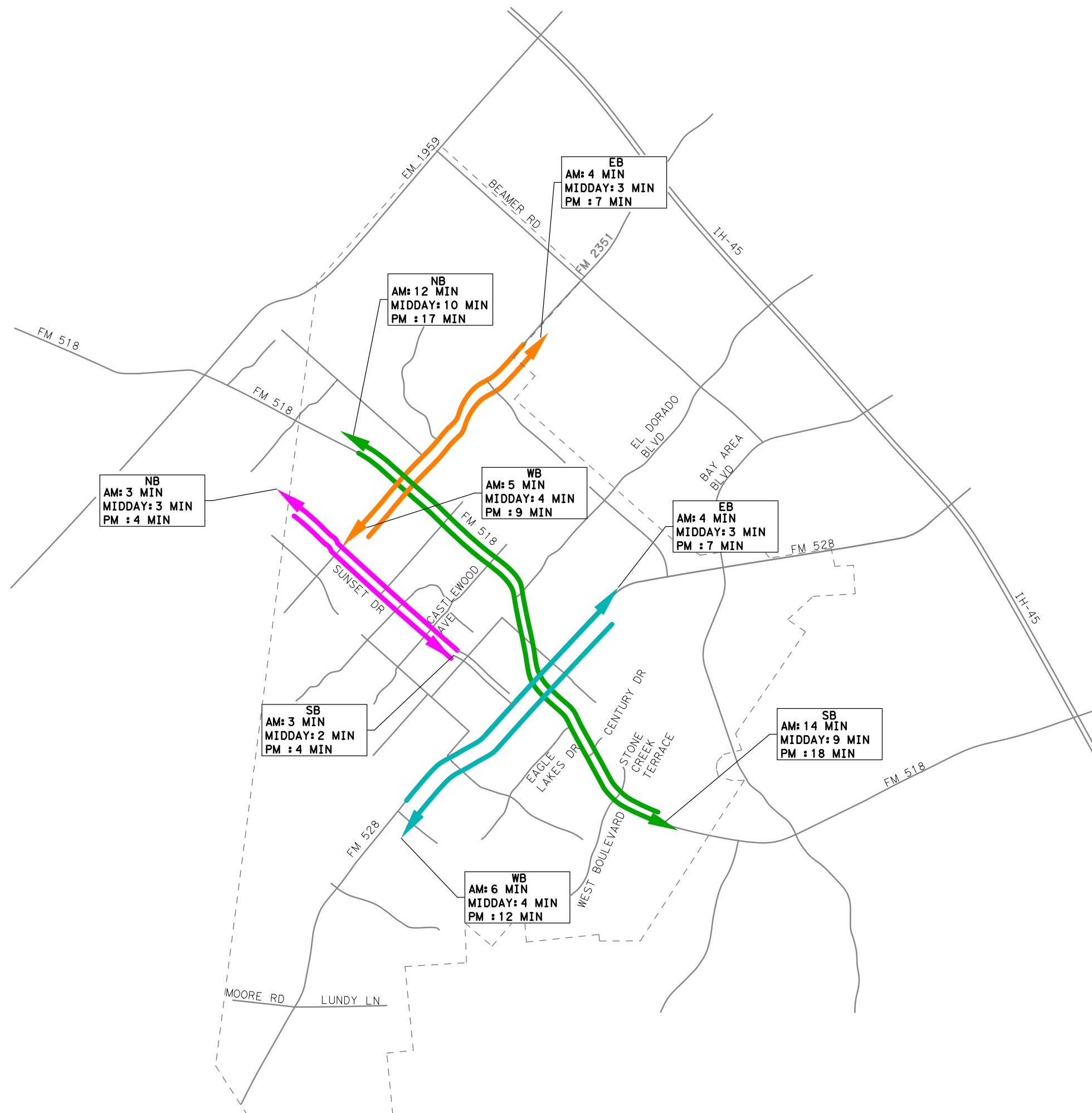
Table 3 – Travel Time Summary FM 2351

Travel Direction	Peak	Average Travel Time
		(min)
EB	AM	4
WB	AM	5
EB	Midday	3
WB	Midday	4
EB	PM	7
WB	PM	9

Table 4 – Travel Time Summary Sunset Drive

Travel Direction	Peak	Average Travel Time
		(min)
NB	AM	3
SB	AM	3
NB	Midday	3
SB	Midday	2
NB	PM	4
SB	PM	4

The combined travel times for the AM peak, Midday and PM peak along FM 2351, FM 518, FM 528 and Sunset drive are shown on **Figure 4**.



2.5 Projected Growth Rate

To understand future demands, traffic volumes are grown to the future years. The projected growth rate for the area was determined based on HGAC projected traffic volumes, future development within City of Friendswood, City of Friendswood Major Thoroughfare Plan and future roadway connections. The growth rate was determined for each of the major corridors (roadways that traverse through the city) and for the local streets based on connectivity and the traffic volumes. Based on development and travel patterns, three growth rate areas were determined. The HGAC projected traffic volumes were identified for Year 2025, Year 2030, and Year 2040 and were used in evaluating the growth rate along the major corridors within the city limits. The areas and the applied growth rates to the existing traffic volumes are shown in **Figure 5**.

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LEGEND

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24-HOUR COUNTS

STUDY INTERSECTIONS

AREA 1
% GROWTH
YEAR 2025 2%
YEAR 2030 1.6%
YEAR 2040 1%

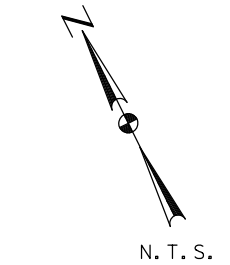
AREA 3
% GROWTH AT INTERSECTIONS

SUNSET DR: YEAR 2025 1%
YEAR 2030 1%
YEAR 2040 1%

CASTLEWOOD: YEAR 2025 2%
YEAR 2030 2%
YEAR 2040 1%

BLACKHAWK: YEAR 2025 2%
YEAR 2030 1.5%
YEAR 2040 1%

AREA 2
% GROWTH
YEAR 2025 2%
YEAR 2030 2%
YEAR 2040 1.6%



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GROWTH RATE
CITY-WIDE TRAFFIC STUDY
CITY OF FRIENDSWOOD

DATE: DEC2019FIGURE: 5PAGE: 15

As a result, growth rates were determined based on areas and applied to the roadways within that area. Higher growth is expected to occur over the first five years with new developments occurring in the area and will begin to reduce over the next ten to fifteen years as space for development is limited. This provides a lower growth rate for the later analysis years.

The growth rate was determined for the city using two predominant areas, Area 1 and Area 2. Area 1 includes the area north of Friendswood Link Drive and Area 2 includes the area south of Friendswood Link Drive.

The growth in Area 1 is expected to be 2% initially then reduce to 1% in the later analysis years. The growth in Area 2 is expected to be 2% initially then reduce to 1.6% in the later analysis years. The growth rate within the city limits is expected to be a maximum of 2%. The intersections along Sunset Drive, Castlewood Drive, and Blackhawk Boulevard were used to determine local street growth. The growth along the local streets are expected to range between 1% and 2%.

3.0 Analysis

Analyses were completed with the aid of *Synchro 10* as well as HCM guidelines. The *Synchro* analyses were calibrated with field observations. Levels of service for unsignalized and signalized intersections are based on average delay in seconds per vehicle. Acceptable levels of service include “LOS A” through “LOS D.” Unacceptable levels of service are typically “LOS E” and “LOS F,” which means that traffic delays are excessive at study intersections and mitigation measures may be required. **Table 5** shows the criteria for each level of service.

The corridor analysis was evaluated using the delay for the signalized and unsignalized intersections along the major corridors (FM 518, FM 2351, FM 528, Sunset Drive and Greenbriar Drive), speed limit and a reduction factor for the number of access points per mile.

Table 5: Level of Service Criteria

Level of Service	Unsignalized Intersection	Signalized Intersection
A	< 10 seconds	< 10 Seconds
B	10 - 15 seconds	10 - 20 Seconds
C	15 - 25 Seconds	20 - 35 Seconds
D	25 - 35 Seconds	35 - 55 Seconds
E	35 - 50 Seconds	55 - 85 Seconds
F	> 50 Seconds	> 85 Seconds

Seven analysis scenarios were conducted to evaluate the study intersections for each of the two peak hour periods, weekday AM and weekday PM. The analysis scenarios are:

1. “Existing” Condition
2. “Year 2025 No Build” Condition
3. “Year 2025 Build” Condition
4. “Year 2030 No Build” Condition
5. “Year 2030 Build” Condition
6. “Year 2040 No Build” Condition
7. “Year 2040 Build” Condition

The “Existing” condition scenario is based on traffic data collected for the study. The “No Build” conditions maintain existing signal and lane configurations at the study intersections with the existing traffic grown based on the associated growth rate for each year and area. The “Build” conditions include roadway improvements and traffic signal timings improvements at the study intersections. The Year 2025, Year 2030, and Year 2040 build conditions are considered short-term, mid-term, and long-term improvements, respectively.

The capacity analysis for each scenario are shown in **Appendix B** through **Appendix I**.

3.1 Existing Conditions

In order to establish baseline conditions, an “Existing” conditions analysis was completed using the existing count data. Traffic operations using the existing traffic volumes were quantified and are

summarized in this section in **Table 6** through **Table 9** . The existing traffic volumes are shown in **Figure 3**.

Table 6: FM 518 Corridor Existing Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Existing AM		Overall Existing PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	D	36.8	C	34.7
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	D	44.2	E	56.3
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	A	7.3	A	9.6
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	A	10.0	A	9.1
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	B	12.2	E	55.0
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	B	18.0	D	48.2
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	E	58.4	F	80.2
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	12.3	A	7.6
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	B	19.1	B	17.0
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	C	31.7	C	34.6
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 6 shows the level of service and delay recorded at each of the study intersections under “Existing” conditions.

- The intersection of E. Edgewood Drive/FM 2351 at N. Friendswood Drive/FM 518 operates at an unacceptable level of service during the PM peak period as a result of the high volume of left-turn vehicles on all the approaches.

Table 7: FM 2351 Corridor Existing Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Existing AM		Overall Existing PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	D	52.3	E	68.9
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	B	17.3	B	18.3
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	B	15.2	B	15.9
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	B	15.9	B	17.6
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	C	25.5	C	22.1
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		C	

Table 7 shows the level of service and delay recorded at each of the study intersections under “Existing” conditions.

- The intersection of FM 2351 at Beamer Road operates at an unacceptable level of service during both peak periods.

Table 8: FM 528 Corridor Existing Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Existing AM		Overall Existing PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	226.2	F	373.0
17	FM 528 at Blackhawk Blvd	Signalized Intersection	C	26.9	C	21.2
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	D	35.4	C	33.2
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	B	18.6	C	33.0
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	C	21.3	C	26.8
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	30.6	C	23.7
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	A	3.0	A	9.5
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			D		D	

Table 8 shows the level of service and delay recorded at each of the study intersections under “Existing” conditions.

- The intersection of FM 528 at Bay Area Boulevard operates at an unacceptable level of service during the both peak periods as a result of the high eastbound and westbound traffic volumes.

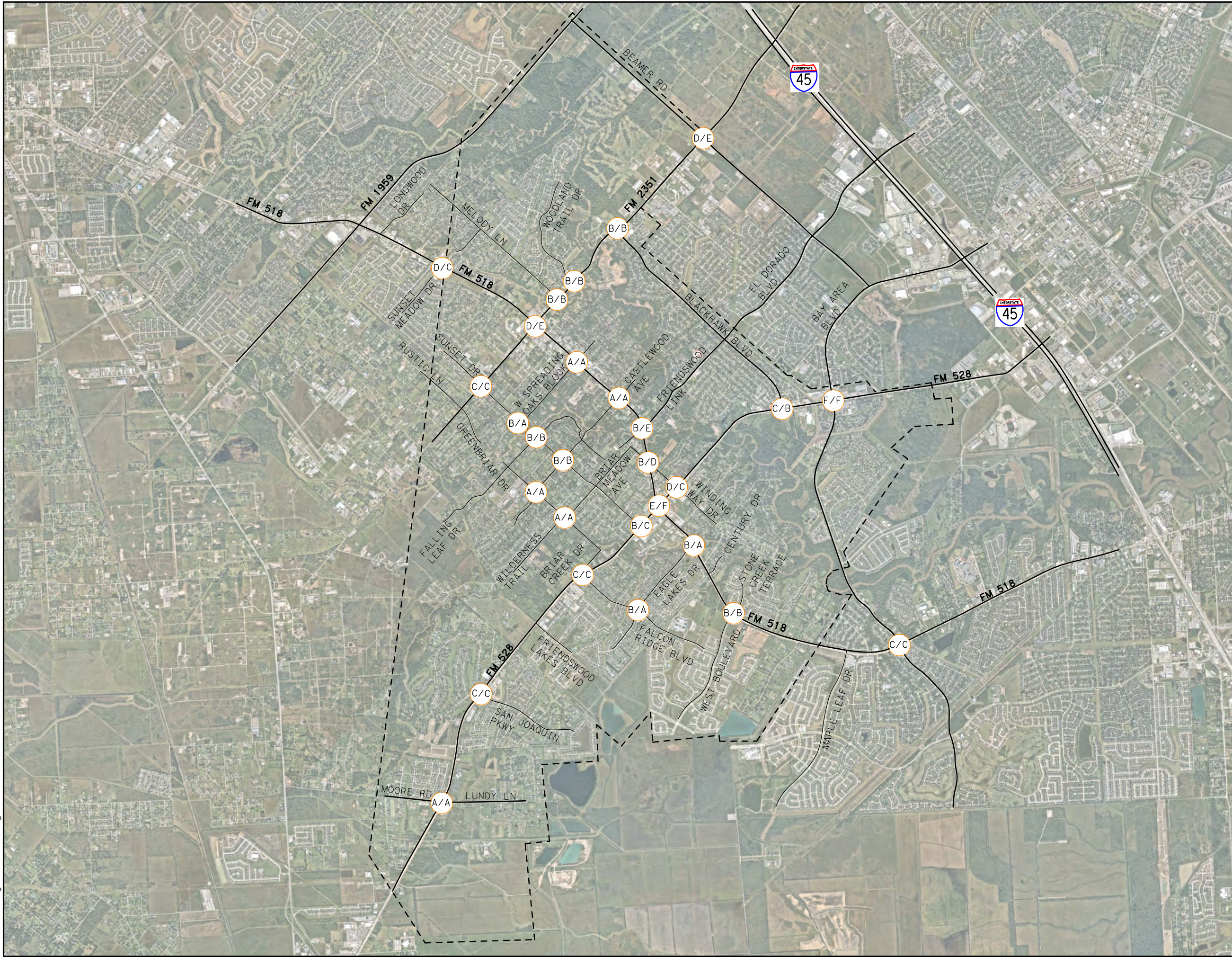
Table 9: Local Street Existing Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Existing AM		Overall Existing PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	C	21.0	B	17.8
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	10.9	A	10.0
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	16.0	B	14.3
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	B	15.1	B	16.5
Corridor Level of Service Sunset Dr			D		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	A	5.8	A	6.8
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	2.6	A	2.9
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.0	A	2.9
Corridor Level of Service Greenbriar Dr			B		C	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	B	12.6	A	9.2

Table 9 shows the level of service and delay recorded at each of the study intersections under “Existing” conditions.

- All intersections are expected to operate at a LOS C or better in both peak periods.
- The corridors are expected to operate at a LOS D or better.

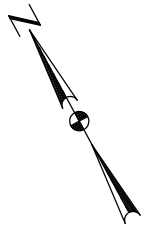
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LEGEND



AM/PM
LEVEL OF SERVICE



N. T. S.



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FIGURE:
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3.2 Year 2025 Analysis

The analyses for the “Year 2025” show improvements to the study intersections and roadway network that could be done within the existing right-of-way. A comparison tables per corridor for the “Year 2025 No-Build” and “Year 2025 Build” were created to better understand the benefits from a capacity standpoint. The comparison tables, **Table 10** through **Table 17**, are separated into weekday AM and PM peak hours.

The “Year 2025 Build” scenario proposes signal timing optimization at 26 signals, construction and extension of turn lanes at several key intersections, widening of Bay Area Boulevard up to 500 feet north and south of the intersection, accommodate left-turn lanes into Friendswood High School driveways along Greenbriar and include Harris County improvements at FM 2351 at Beamer Road.

Figure 7 shows AM and PM peak capacity level of service results for the “No-Build Year 2025” conditions. **Figure 8** shows AM and PM peak capacity level of service results for the “Build Year 2025” conditions.

Table 10: FM 518 Corridor Year 2025 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build AM		Overall Year 2025 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	34.0	B	19.9
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	D	52.1	D	49.2
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	A	7.7	A	7.7
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	11.4	A	9.1
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	B	13.6	B	13.4
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	B	18.9	B	13.6
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	E	77.1	D	50.1
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	13.7	B	10.1
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	20.8	B	19.0
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	C	33.7	C	24.0
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 10 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 AM” and “Build Year 2025 AM” conditions.

- The intersection of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518 is expected to operate at an unacceptable level of service, LOS D during both conditions. The delay improves minimally with lengthening the left-turn lanes. The improvement is expected to reduce queuing

with minimal changes in delay. For a significant improvement in the level of service, additional right-of-way is needed.

Table 11 : FM 2351 Corridor Year 2025 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build AM		Overall Year 2025 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	E	79.4	D	46.0
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	B	18.3	B	19.9
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	B	15.4	B	13.6
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	B	16.2	B	15.9
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	C	25.9	B	16.6
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 11 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 AM” and “Build Year 2025 AM” conditions.

- The intersection of FM 2351 at Beamer Road is expected to operate at a failing level of service, LOS E during the No-Build condition. By implementing the improvements, the intersection is expected to improve to acceptable levels of service and delay.

Table 12 : FM 528 Corridor Year 2025 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build AM		Overall Year 2025 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	278.7	D	43.3
17	FM 528 at Blackhawk Blvd	Signalized Intersection	C	23.9	B	14.8
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	D	37.1	C	23.6
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	C	22.2	C	21.6
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	C	26.9	C	22.0
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	29.6	C	21.9
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	A	3.2	A	3.9
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			D		D	

Table 12 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 AM” and “Build Year 2025 AM” conditions.

- The intersection of FM 528 at Bay Area Boulevard is expected to operate at a failing level of service, LOS F during the No-Build condition. By implementing the improvements, the intersection is expected to improve to a LOS D.

Table 13 : Local Streets Year 2025 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build AM		Overall Year 2025 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	C	21.3	A	9.3
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	11.6	B	12.0
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	17.6	B	18.6
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	B	15.9	B	11.8
Corridor Level of Service Sunset Dr			D		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	A	8.2	A	7.3
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	2.9	A	2.9
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.3	A	3.3
Corridor Level of Service Greenbriar Dr			B		B	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	C	15.1	C	15.1

Table 13 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 AM” and “Build Year 2025 AM” conditions.

- By implementing the improvements, all the intersection are expected to improve level of service and delay during the Build conditions.

Table 14 : FM 518 Corridor Year 2025 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build PM		Overall Year 2025 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	30.0	C	22.2
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	F	125.2	E	59.9
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	B	13.6	A	8.9
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	15.4	B	10.0
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	F	170.1	D	39.5
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	F	179.8	B	17.6
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	F	232.7	D	54.6
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	14.2	A	7.6
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	25.6	B	16.1
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	E	69.8	C	30.2
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 14 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 PM” and “Build Year 2025 PM” conditions.

- The intersection of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518 is expected to operate at a failing level of service during both conditions. The delay improves significantly with lengthening the left-turn lanes and is expected to reduce queuing. For a significant improvement in the level of service, additional right-of-way is needed.

Table 15 : FM 2351 Corridor Year 2025 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build PM		Overall Year 2025 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	F	139.4	D	50.5
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	C	20.3	B	19.0
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	C	20.9	B	19.8
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	C	25.5	C	20.9
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	D	52.2	B	19.3
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 15 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 PM” and “Build Year 2025 PM” conditions.

- The intersection of FM 2351 at Beamer Road is expected to operate at a failing level of service, LOS F during the No-Build condition. By implementing the improvements, the intersection is expected to improve to a LOS D.

Table 16 :FM 528 Corridor Year 2025 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build AM		Overall Year 2025 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	641.0	D	48.2
17	FM 528 at Blackhawk Blvd	Signalized Intersection	D	39.6	B	18.5
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	F	102.2	B	19.8
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	F	109.9	D	36.0
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	F	137.5	C	25.1
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	34.9	C	22.0
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	B	15.3	B	14.2
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			F		C	

Table 16 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 PM” and “Build Year 2025 PM” conditions.

- The intersection of FM 528 at Bay Area Boulevard is expected to operate at a failing level of service, LOS F during the No-Build condition. By implementing the improvements, the intersection is expected to improve to a LOS D.
- The corridor level of service for FM 528 is expected to improve from a LOS F to a LOS C.

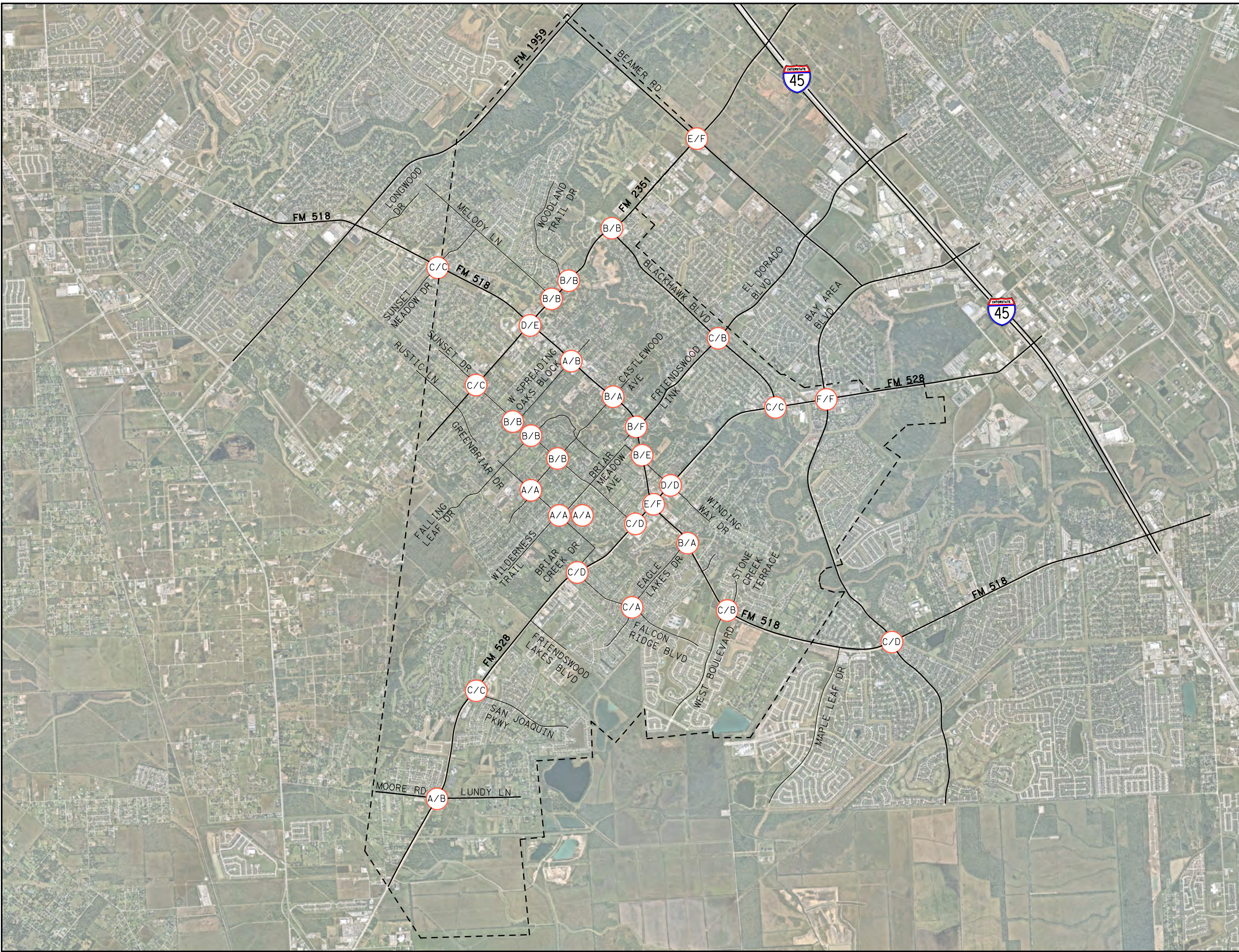
Table 17 : Local Streets Year 2025 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2025 No Build PM		Overall Year 2025 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	B	18.6	B	10.7
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	14.3	B	11.8
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	19.3	B	15.4
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	C	20.5	B	14.4
Corridor Level of Service Sunset Dr			D		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	B	13.4	A	7.3
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	3.4	A	3.1
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.3	A	3.0
Corridor Level of Service Greenbriar Dr			C		C	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	B	11.6	A	9.7

Table 17 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2025 PM” and “Build Year 2025 PM” conditions.

- By implementing the improvements, all the intersection are expected to improve level of service and delay during the Build conditions.

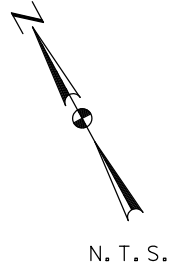
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LEGEND

 AM/PM
LEVEL OF SERVICE

----- CITY LIMITS





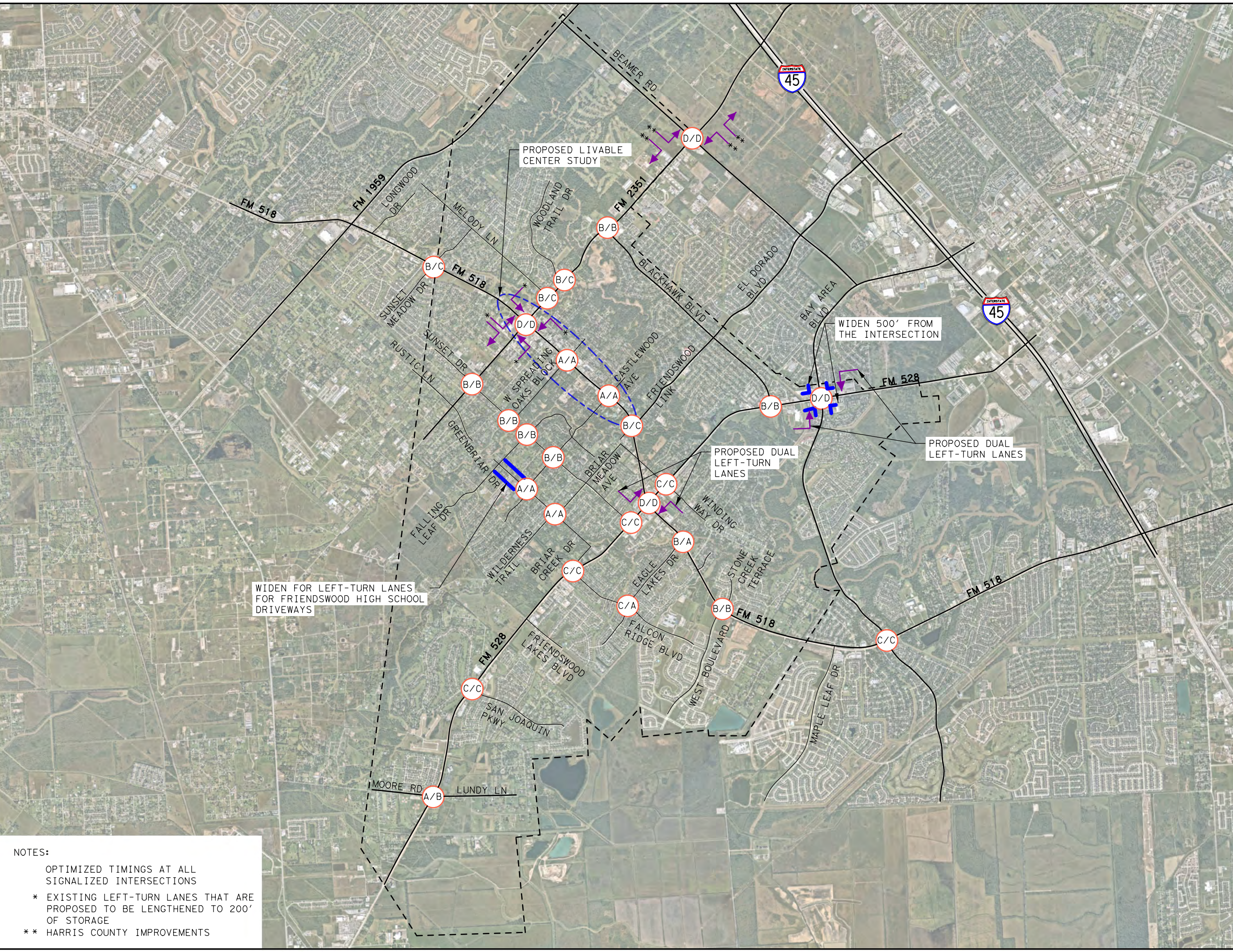
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**YEAR 2025
NO-BUILD CONDITIONS
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CITY OF FRIENDSWOOD**

DATE: DEC2019	FIGURE: 7	PAGE: 32
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NOTES:
OPTIMIZED TIMINGS AT ALL SIGNALIZED INTERSECTIONS
* EXISTING LEFT-TURN LANES THAT ARE PROPOSED TO BE LENGTHENED TO 200' OF STORAGE
** HARRIS COUNTY IMPROVEMENTS

LEGEND

- ROAD WIDENING
- RIGHT TURN LANE
LEFT TURN LANE
- AM/PM
LEVEL OF SERVICE
- CITY LIMITS
- LIVABLE CENTER STUDY AREA

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**YEAR 2025 CONDITIONS
WITH IMPROVEMENTS**

CITY-WIDE TRAFFIC STUDY

CITY OF FRIENDSWOOD

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3.3 Year 2030 Analysis

The analyses for the “Year 2030” show the expected results from mid-term improvements to the study intersections and roadway network. Comparison tables per corridor for the “Year 2030 No-Build” and “Year 2030 Build” were created to better understand the benefits from a capacity perspective. The comparison tables, **Table 18** through **Table 25**, are separated into weekday AM and PM peak hours.

The “Year 2030 Build” scenario proposes signal timing optimization at 26 signals, the construction of turn lanes and lane reconfiguration of approaches at several key intersections, and the extension of Blackhawk Blvd from FM 528 to Bay Area Blvd.

Table 18: FM 518 Corridor Year 2030 AM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build AM		Overall Year 2030 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	33.1	C	20.9
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	E	62.9	E	71.0
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	A	8.3	A	8.1
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	12.7	A	9.8
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	B	15.3	B	11.9
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	B	20.0	B	15.1
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	F	100.8	D	48.0
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	15.3	B	11.6
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	23.0	C	21.6
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	D	35.7	C	27.9
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 18 shows the level of service and delay recorded at each of the FM 518 corridor study intersections for the Year 2030 No-Build and Build AM scenarios. The corridor level of service includes unsignalized local street access points along the corridor.

- The intersection of S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528 is expected to improve to an acceptable LOS D as a result of implementing dual left-turn lanes in the eastbound and westbound directions.

Table 19: FM 2351 Corridor Year 2030 AM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build AM		Overall Year 2030 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	F	102.6	D	49.8
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	B	19.8	B	19.7
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	B	15.6	B	13.5
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	B	16.5	B	16.8
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	C	25.3	B	17.0
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 19 shows the level of service and delay recorded at each of the FM 2351 corridor study intersections for the Year 2030 No-Build and Build AM scenarios. The corridor level of service includes the intersection at N. Friendswood Dr/FM 518 and unsignalized local street access points along the corridor.

- The intersection of FM 2351 at Beamer Rd is expected to improve to an acceptable LOS D as a result of implementing right-turn lanes in the eastbound and westbound directions.

Table 20: FM 528 Corridor Year 2030 AM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build AM		Overall Year 2030 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	295.3	C	34.8
17	FM 528 at Blackhawk Blvd	Signalized Intersection	C	26.9	C	29.9
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	D	41.1	C	23.1
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	C	29.9	B	18.2
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	D	39.1	C	29.7
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	29.9	C	22.2
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	A	3.4	A	4.2
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			D		C	

Table 20 shows the level of service and delay recorded at each of the FM 528 corridor study intersections for the Year 2030 No-Build and Build AM scenarios. The corridor level of service includes the intersection at S. Friendswood Dr/FM 518 and unsignalized local street access points along the corridor.

- The intersection of FM 528 at Bay Area Blvd is expected to improve to an acceptable LOS C as a result of implementing an extension of Blackhawk Blvd from FM 528 to Bay Area Blvd to alleviate traffic congestion.

Table 21: Local Streets Year 2030 AM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build AM		Overall Year 2030 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	C	21.4	A	9.4
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	12.6	B	12.9
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	19.0	B	19.8
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	B	16.7	B	12.4
Corridor Level of Service Sunset Dr			D		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	B	12.2	B	10.4
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	3.2	A	3.2
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.6	A	3.6
Corridor Level of Service Greenbriar Dr			B		B	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	C	19.4	C	19.4

Table 21 shows the level of service and delay recorded at each of the local street study intersections for the Year 2030 No-Build and Build AM scenarios. The corridor level of service includes signalized intersections previously covered in this section which involve either Sunset Dr or Greenbriar Dr.

- All intersections are expected to remain at acceptable levels of service with many improving as a result of the optimization of signal timings.

Table 22: FM 518 Corridor Year 2030 PM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build PM		Overall Year 2030 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	29.9	C	23.9
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	F	94.4	E	70.0
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	B	11.7	B	11.4
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	12.5	B	11.9
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	F	112.7	D	36.4
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	F	108.0	C	25.8
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	F	155.0	D	49.1
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	10.1	A	9.2
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	21.1	B	17.9
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	D	45.2	D	36.3
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 22 shows the level of service and delay recorded at each of the FM 518 corridor study intersections for the Year 2030 No-Build and Build PM scenarios. The corridor level of service includes unsignalized local street access points along the corridor.

- The intersection of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518 is expected to improve from a LOS F to a LOS E as a result of implementing a westbound right-turn lane.

Although the intersection is expected to continue operating at an unacceptable LOS, further improvements are not feasible for the Year 2030 mid-term criteria.

- The intersection of S. Friendswood Dr/FM 518 at Whispering Pines Ave is expected to improve to an acceptable LOS D as a result of implementing a left-turn and right-turn in the northbound direction.
- The intersection of S. Friendswood Dr/FM 518 at Winding Way Dr is expected to improve to an acceptable LOS C as a result of adjacent improvements along the FM 518 corridor, and the optimization of the signal timings.
- The intersection of S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528 is expected to improve to an acceptable LOS D as a result of implementing dual left-turn lanes in the eastbound and westbound directions.

Table 23: FM 2351 Corridor Year 2030 PM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build PM		Overall Year 2030 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	F	107.7	D	52.8
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	B	19.4	C	24.7
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	B	18.2	B	18.8
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	C	21.3	C	22.6
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	C	29.8	C	25.0
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 23 shows the level of service and delay recorded at each of the FM 2351 corridor study intersections for the Year 2030 No-Build and Build PM scenarios. The corridor level of service includes the intersection at N. Friendswood Dr/FM 518 and unsignalized local street access points along the corridor.

- The intersection of FM 2351 at Beamer Rd is expected to improve to an acceptable LOS D as a result of implementing right-turn lanes in the eastbound and westbound directions

Table 24: FM 528 Corridor Year 2030 PM Peak Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build PM		Overall Year 2030 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	355.0	D	42.8
17	FM 528 at Blackhawk Blvd	Signalized Intersection	C	21.2	D	42.0
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	E	56.2	C	27.6
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	E	64.3	D	49.2
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	E	65.7	D	39.8
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	24.3	C	23.1
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	B	11.8	B	14.7
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			F		C	

Table 24 shows the level of service and delay recorded at each of the FM 528 corridor study intersections for the Year 2030 No-Build and Build PM scenarios. The corridor level of service includes the intersection at S. Friendswood Dr/FM 518 and unsignalized local street access points along the corridor.

- The intersection of FM 528 at Bay Area Blvd is expected to improve to an acceptable LOS D as a result of implementing an extension of Blackhawk Blvd from FM 528 to Bay Area Blvd to alleviate traffic congestion.
- The intersection of E. Parkwood Dr/FM 528 at Winding Way Dr is expected to improve to an acceptable LOS C as a result of implementing a right-turn lane in the northbound direction.
- The intersection of E. Parkwood Dr/FM 528 at Sunset Dr is expected to improve to an acceptable LOS D as a result of implementing a dual left-turn approach and lane re-configuration in the southbound direction.
- The intersection of W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd is expected to improve to an acceptable LOS D as a result of optimizing the signal timings.

Table 25: Local Streets Year 2030 PM Peak Traffic Operations Summary

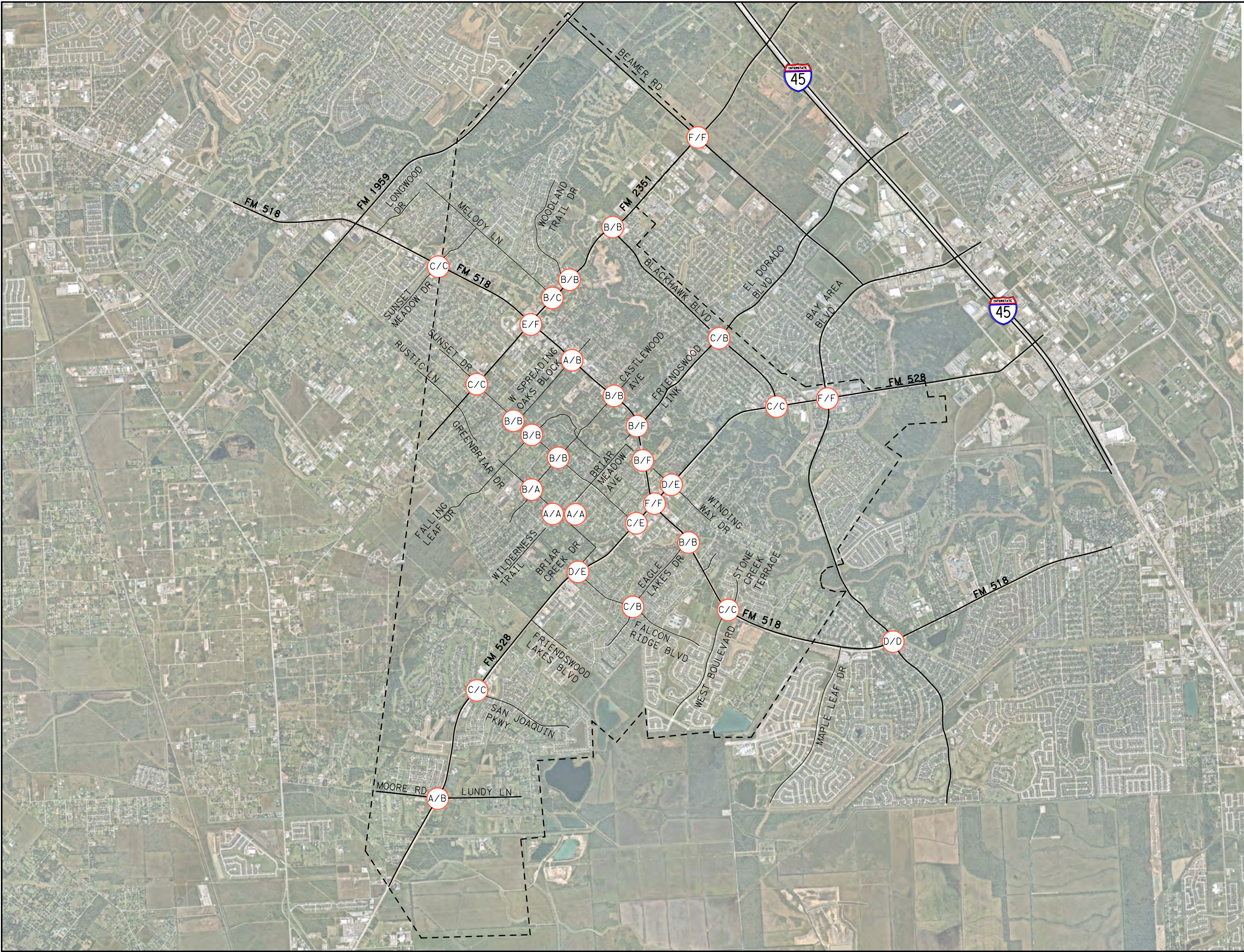
Traffic Count Number	Intersection	Control Type	Overall Year 2030 No Build AM		Overall Year 2030 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	B	18.2	B	11.1
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	12.4	B	12.4
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	17.4	B	15.7
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	B	19.0	B	16.0
Corridor Level of Service Sunset Dr			F		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	A	9.7	A	8.4
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	3.2	A	3.2
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.1	A	3.1
Corridor Level of Service Greenbriar Dr			B		C	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	B	10.3	B	10.3

Table 25 shows the level of service and delay recorded at each of the local street study intersections for the Year 2030 No-Build and Build PM scenarios. The corridor level of service includes signalized intersections previously covered in this section which involve either Sunset Dr or Greenbriar Dr.

- All intersections are expected to remain at acceptable levels of service with many improving as a result of the optimization of signal timings.

Figure 9 shows AM and PM peak capacity level of service results for the “Year 2030 No-Build” conditions. **Figure 10** shows AM and PM peak capacity level of service results for the “Year 2030 Build” conditions.

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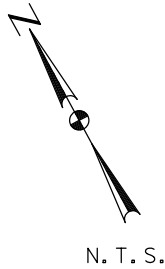
LEGEND



AM/PM
LEVEL OF SERVICE



CITY LIMITS



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**YEAR 2030
NO-BUILD CONDITIONS
CITY-WIDE TRAFFIC STUDY
CITY OF FRIENDSWOOD**

DATE: DEC2019 FIGURE: 9 PAGE: 44

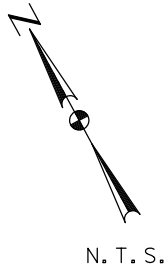
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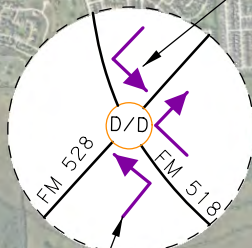
OPTIMIZED TIMINGS AT ALL
SIGNALIZED INTERSECTIONS

LEGEND

- ROAD EXTENSION
- RIGHT TURN LANE
LEFT TURN LANE
- AM/PM
LEVEL OF SERVICE
- CITY LIMITS
- LIVABLE CENTER
STUDY AREA



DETAIL A



PROPOSED DUAL
LEFT-TURN LANES

PROPOSED DUAL
LEFT-TURN LANES

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YEAR 2030 CONDITIONS
WITH IMPROVEMENTS
CITY-WIDE TRAFFIC STUDY
CITY OF FRIENDSWOOD

DATE: DEC2019 FIGURE: 10 PAGE: 45

3.4 Year 2040 Analysis

The analyses for the “Year 2040” show improvements to the study intersections and roadway network. A comparison tables per corridor for the “Year 2040 No-Build” and “Year 2040 Build” were created to better understand the benefits from a capacity standpoint. The comparison tables, **Table 26** through **Table 33**, are separated into weekday AM and PM peak hours.

The “Year 2040 Build” scenario proposes signal timing optimization at 26 signals, the widening of the F.M roads in the study area and local streets, construction and extension of turn lanes at several key intersections, the realignment of two local street and new roadway connections (by others).

Figure 11 shows AM and PM peak capacity level of service results for the “No-Build Year 2040” conditions. **Figure 12** shows AM and PM peak capacity level of service results for the “Build Year 2040” conditions.

Table 26: FM 518 Corridor Year 2040 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build AM		Overall Year 2040 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	30.9	B	16.8
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	F	84.3	D	31.2
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	A	9.2	A	5.2
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	14.2	A	6.0
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	B	20.0	B	10.3
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	C	21.9	B	13.0
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	F	156.6	C	21.9
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	19.3	C	34.3
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	28.1	D	52.5
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	D	44.7	D	36.7
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			D		D	

Table 26 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 AM” and “Build Year 2040 AM” conditions.

- The intersection of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518 and the intersection of S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528 are expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

Table 27: FM 2351 Corridor Year 2040 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build AM		Overall Year 2040 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	F	137.8	D	54.7
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	C	23.3	C	24.3
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	B	16.6	B	14.2
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	B	17.8	B	16.4
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	C	21.9	B	14.5
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 27 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 AM” and “Build Year 2040 AM” conditions.

- The intersection of FM 2351 at Beamer Road is expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

Table 28: FM 528 Corridor Year 2040 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build AM		Overall Year 2040 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	451.6	D	54.2
17	FM 528 at Blackhawk Blvd	Signalized Intersection	C	24.5	C	21.8
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	E	62.6	C	20.5
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	E	56.1	C	29.6
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	F	87.5	C	26.9
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	D	36.4	C	28.8
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	A	3.8	A	3.7
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			C		C	

Table 28 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 AM” and “Build Year 2040 AM” conditions.

- The intersections of FM 528 at Bay Area Boulevard, E. Parkwood Dr/FM 528 at Winding Way Drive, W. Parkwood Dr/FM 528 at Sunset Drive and W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd and W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy are expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

Table 29: Local Streets Year 2040 AM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build AM		Overall Year 2040 Build AM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	C	21.9	A	9.6
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	13.0	B	14.8
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	C	22.5	C	22.9
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	B	17.9	B	14.9
Corridor Level of Service Sunset Dr			F		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	C	24.6	B	13.2
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	3.8	B 10.3	
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	4.1		
Corridor Level of Service Greenbriar Dr			C		D	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	E	41.2	D	28.2

Table 29 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 AM” and “Build Year 2040 AM” conditions.

- The intersection of Falcon Ridge Boulevard at Eagle Lakes Drive is expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.
- The intersections of Greenbriar Drive at Wilderness Trail and Briarmeadow Avenue are expected to remain at an acceptable level of service, LOS B after the proposed realignment.
- The corridor analysis for Sunset Drive is expected to improve from a LOS F to a LOS D.

Table 30: FM 518 Corridor Year 2040 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build PM		Overall Year 2040 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
1	E. Broadway St/FM 518 at Sunset Meadows Dr/Winding Rd	Signalized Intersection	C	30.0	C	22.5
2	E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Signalized Intersection	F	125.2	C	33.2
3	S. Friendswood Dr/FM 518 at E. Spreading Oaks Ave	Signalized Intersection	B	13.6	A	6.0
4	S. Friendswood Dr/FM 518 at E. Castlewood Ave	Signalized Intersection	B	15.4	A	6.0
5	S. Friendswood Dr/FM 518 at Whispering Pines Ave	Signalized Intersection	F	170.1	C	24.4
6	S. Friendswood Dr/FM 518 at Winding Way Dr	Signalized Intersection	F	179.8	B	14.8
7	S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Signalized Intersection	F	232.7	C	31.1
8	S. Friendswood Dr/FM 518 at Eagle Lakes Dr	Signalized Intersection	B	14.2	B	12.0
9	S. Friendswood Dr/FM 518 at Stone Creek Terrace/West Boulevard	Signalized Intersection	C	25.6	C	30.2
10	W. Main Street/FM 518 at Bay Area Blvd	Signalized Intersection	E	69.8	D	48.2
Corridor Level of Service E. Broadway/S. Friendswood/ W. Main St./ FM 518			F		D	

Table 30 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 PM” and “Build Year 2040 PM” conditions.

- The intersections of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518, S. Friendswood Dr/FM 518 at Whispering Pines Avenue, S. Friendswood Dr/FM 518 at Winding Way Drive, S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528 and W. Main Street/FM 518 at Bay Area Boulevard are expected to operate at a failing level of service during the No-Build condition. By

implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

Table 31: FM 2351 Corridor Year 2040 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build PM		Overall Year 2040 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
11	FM 2351 at Beamer Rd	Signalized Intersection	F	139.4	D	44.8
12	E. Edgewood Ave/FM 2351 at Blackhawk Blvd	Signalized Intersection	C	20.3	C	26.0
13	E. Edgewood Dr/FM 2351 at Woodland Trail Dr/Royal Ct	Signalized Intersection	C	20.9	C	24.6
14	E. Edgewood Dr/FM 2351 at Melody Ln	Signalized Intersection	C	25.5	C	27.7
15	W. Edgewood Dr/FM 2351 at Sunset Dr	Signalized Intersection	D	52.2	C	31.3
Corridor Level of Service E. Edgewood Ave/ W. Edgewood Dr/ FM 2351			D		D	

Table 31 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 PM” and “Build Year 2040 PM” conditions.

- The intersection of FM 2351 at Beamer Road is expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

Table 32: FM 528 Corridor Year 2040 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build PM		Overall Year 2040 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
16	FM 528 at Bay Area Blvd	Signalized Intersection	F	641.0	D	48.9
17	FM 528 at Blackhawk Blvd	Signalized Intersection	D	39.6	D	36.8
18	E. Parkwood Dr/FM 528 at Winding Way Dr	Signalized Intersection	F	102.2	B	18.3
19	W. Parkwood Dr/FM 528 at Sunset Dr	Signalized Intersection	F	109.9	D	36.9
20	W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd	Signalized Intersection	F	137.5	C	29.3
21	W. Parkwood Dr/FM 528 at Cypress Point Dr/San Joaquin Pkwy	Signalized Intersection	C	34.9	C	31.4
22	W. Parkwood Dr/FM 528 at Moore Rd/Lundy Ln	Signalized Intersection	B	15.3	B	18.7
Corridor Level of Service E. Parkwood Dr/ W. Parkwood Dr/ FM 528			F		C	

Table 32 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 PM” and “Build Year 2040 PM” conditions.

- The intersections of FM 528 at Bay Area Boulevard, E. Parkwood Dr/FM 528 at Winding Way Drive, W. Parkwood Dr/FM 528 at Sunset Drive and W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd are expected to operate at a failing level of service during the No-Build condition. By implementing the improvements, the intersections are expected to improve to acceptable levels of service and delay.

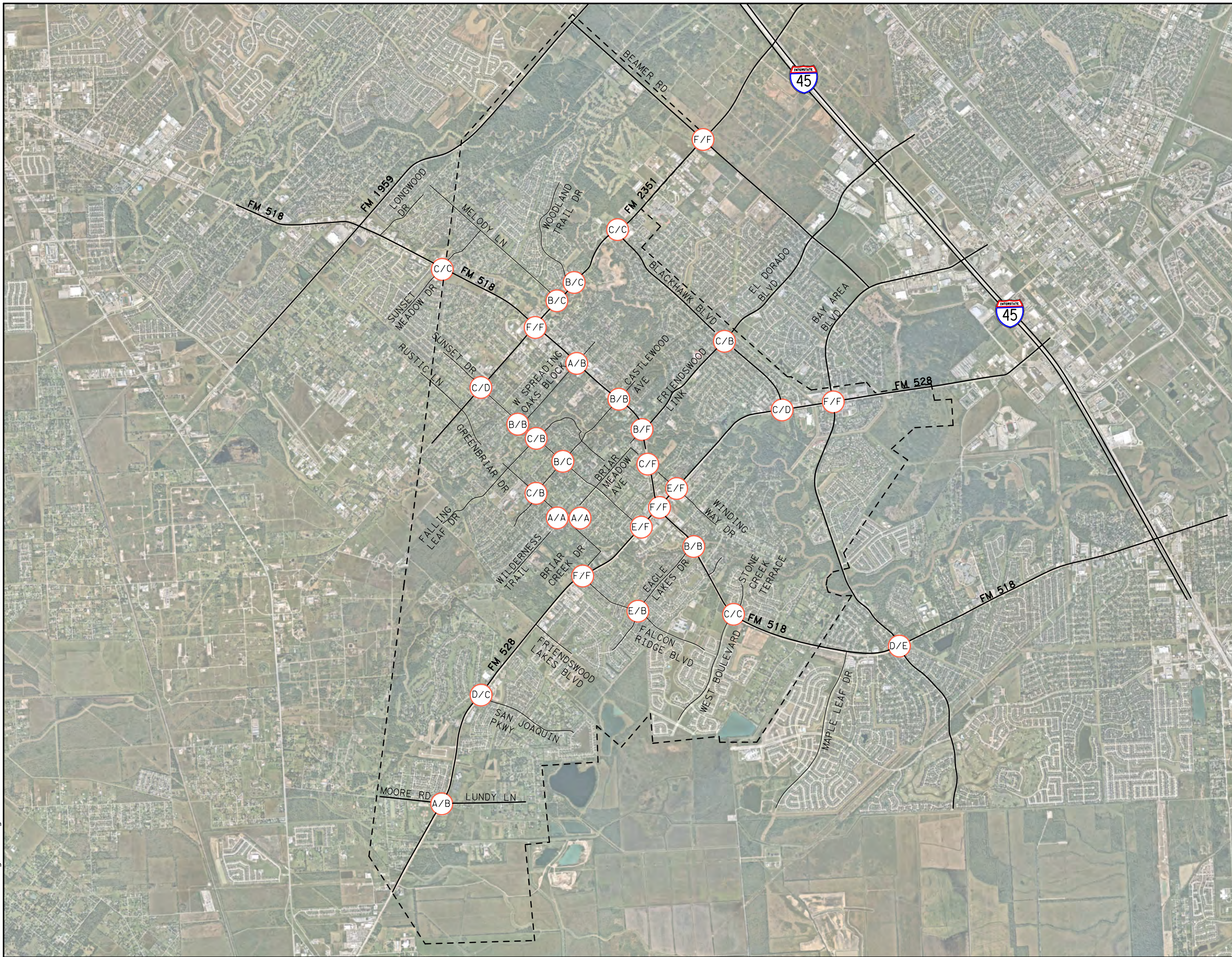
Table 33: Local Streets Year 2040 PM Traffic Operations Summary

Traffic Count Number	Intersection	Control Type	Overall Year 2040 No Build PM		Overall Year 2040 Build PM	
			Level of Service	Delay (sec/veh)	Level of Service	Delay (sec/veh)
23	Blackhawk Blvd at Friendswood Link Rd	Signalized Intersection	B	18.6	B	11.5
24	Sunset Dr at W Spreading Oaks Dr/Cowards Creek Dr	Signalized Intersection	B	14.3	B	15.9
25	Sunset Dr at Falling Leaf Dr	Signalized Intersection	B	19.3	B	17.9
26	Sunset Dr at W. Castlewood Ave	Signalized Intersection	C	20.5	B	18.1
Corridor Level of Service Sunset Dr			F		D	
27	Greenbriar Dr at W. Castlewood Ave	Unsignalized Intersection	B	13.4	A	9.7
28	Greenbriar Dr at Wilderness Trail	Unsignalized Intersection	A	3.4	A 6.8	
29	Greenbriar Dr at Briarmeadow Ave	Unsignalized Intersection	A	3.3		
Corridor Level of Service Greenbriar Dr			C		B	
30	Falcon Ridge Blvd at Eagle Lakes Dr	Unsignalized Intersection	B	11.6	B	12.2

Table 33 shows the level of service and delay recorded at each of the study intersections under “No Build Year 2040 PM” and “Build Year 2040 PM” conditions.

- All the intersections operate at acceptable level of service, however, during the “Build Year 2040” scenario all intersection improved in delay as well as the corridor level of service.
- The intersections of Greenbriar Drive at Wilderness Trail and Briarmeadow Avenue are expected to remain at an acceptable level of service, LOS A after the proposed realignment.
- The corridor analysis for Sunset Drive is expected to improve from a LOS F to a LOS D.

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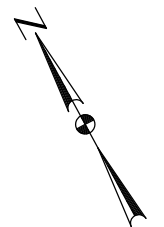
LEGEND



AM/PM
LEVEL OF SERVICE



CITY LIMITS



N. T. S.



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YEAR 2040
NO-BUILD CONDITIONS
CITY-WIDE TRAFFIC STUDY
CITY OF FRIENDSWOOD

DATE:
DEC2019

FIGURE:
11

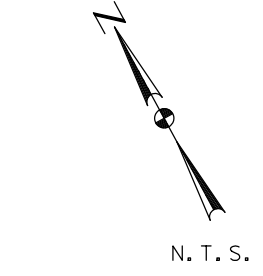
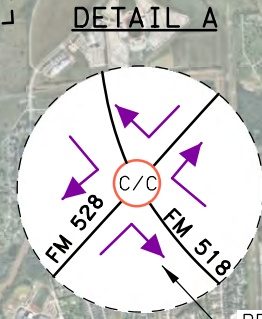
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NOTES:
OPTIMIZED TIMINGS AT ALL SIGNALIZED INTERSECTION
* STORAGE LENGHT FOR LEFT-TURN AND RIGHT-TURN LANES ARE PROPOSED TO BE LENGTHENED BY THE YEAR 2040
** FM 518 (FROM FM 2351 TO FM 528) TURNING MOVEMENTS REROUTED TO ACCOUNT FOR FRIENDSWOOD LAKES BOULEVARD CONNECTION

LEGEND

NEW CONNECTION

ROAD WIDENING

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YEAR 2040 CONDITIONS
WITH IMPROVEMENTS

CITY-WIDE TRAFFIC STUDY

CITY OF FRIENDSWOOD

DATE: DEC2019

FIGURE: 12

PAGE: 56

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4.0 Other Consideration for Improvements

4.1 Livable Center Study

The Houston-Galveston Area Council (HGAC) developed a program called “Livable Centers” that works with communities to evaluate the existing infrastructure, policy and programs to build a community that is multimodal. Several areas and cities have worked with HGAC to develop a study for a livable center in their area. The intent is to identify development that will provide multi-use space where residents can shop and work in the same area. For a development to function, certain infrastructure is needed and an implementation plan would need to be developed. Due to the existing local street grid-like system along FM 518 near FM 2351 this is an ideal location to evaluate the implementation of a livable center. The City of Friendswood should work in conjunction with HGAC to evaluate the City of Friendswood for a livable center. Improvements identified in a livable center study could be implemented over the next 15 years.

5.0 Public Involvement

5.1 Public Meeting

A public meeting was held on August 14, 2019 at the Friendswood Public Library by the City of Friendswood and BGE staff. The public meeting allowed BGE to present the residents with an understanding of the study being conducted for the City and allow the residents to express their traffic concerns. The residents were presented with four exhibits which highlighted the existing traffic operations, and proposed improvements for the three analysis years. BGE staff discussed each of the exhibits with the residents, and requested feedback. The residents shared their experiences which aligned with BGE observations and the findings from the traffic model.

5.2 Findings

The feedback received from the residents was marked up on the figures or a comment card was filled out. The comments received were all reviewed and evaluated to determine if additional mitigation measures were needed and could be implemented. The improvements determined by the residents were applicable for the Year 2025 and Year 2030 scenarios. Improvements for the “Year 2040” scenario accommodated the concerns expressed by the residents. The following improvements were determined during the public meeting and implemented for the respected design year:

- **Friendswood Lakes Boulevard at W. Parkwood Dr/FM 528** – Extend Friendswood Lakes Boulevard from W. Parkwood Dr/FM 528 to West Boulevard to accommodate the proposed development that is under construction. Plans are currently in design and planned to be in place by Year 2025.
- **W. Parkwood Dr/FM 528 at Sunset Dr** – Restripe the southbound Sunset Drive approach to have a dedicated left-turn lane and a shared left, through, and right-turn lane (Included in Year 2025 Improvement).
- **S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528** – Proposed northbound right-turn deceleration with 100 feet of storage and 100 foot of taper (Included in Year 2025 Improvement).
- **W. Parkwood Dr/FM 528 at Briar Creek Dr/Falcon Ridge Blvd** – Widen Briar Creek Drive to accommodate a dedicated left-turn lane and a dedicated right-turn lane on the southbound approach, which would require a box culvert relocation. Construct a right-turn deceleration lane on the eastbound W. Parkwood Dr/FM 528 approach onto Falcon Ridge Blvd (Included in Year 2030 Improvement).
- **E. Parkwood Dr/FM 528 at Winding Way Dr** – construct a right-turn deceleration lane on the northbound Winding Way Dr approach with 100 feet of storage and a 100-foot taper (Included in Year 2030 Improvement).

The comments received are shown in **Appendix J**.

6.0 Flooding Analysis and Evacuation Route Plan

The City of Friendswood lies in a geographical region that is prone to flooding due to proximity to the coast and low-lying topography. It is critical to analyze the proposed mobility improvements not only for efficiency, but to consider the effects of flooding on the overall system and to implement systems to mitigate flooding. As part of the study analyzing the mobility of the city's major roadways and residential streets, a flooding analysis was conducted to identify areas and corridors within the City of Friendswood which are most susceptible to a flooding event, and to recommend improvements to infrastructure and the evacuation route plan.

Data sources include historical flood maps and mitigation studies from previous flooding events, as well as county, H-GAC, and TxDOT-commissioned evacuation route maps. As the city continues to grow, it is critical to identify areas which experience problems during flooding events and recommend solutions to best mitigate these events.

6.1 Flood-Prone Areas

Historical data provided by the City of Friendswood indicates that certain low-lying corridors and neighborhoods are the most susceptible to over-the-curb street flooding.

- Blackhawk Blvd – Between Friendswood Link Road and FM 528. The 0.85-mile segment of Blackhawk Blvd serves as a collector for the Forest Bend residential neighborhood and part of longer link connecting traffic between FM 2351 and FM 528.
- Neighborhood west of intersection of N. Friendswood Dr/FM 518 at E. Edgewood Dr/FM 2351 – The primary access roads into the neighborhood which experience flooding issues are Chelsea Lane (from FM 518) and Brigadoon Lane (from FM 2351).

In larger flooding events, additional areas may become susceptible to flooding and should continue to be studied for future improvements.

6.2 Proposed Improvements

It is recommended that improvements to drainage infrastructure be made to Blackhawk Blvd and areas in proximity to Chelsea Lane and Brigadoon Lane. Storm sewer lines which collect rainwater from these roadways should be evaluated to determine the effectiveness of removing storm water.

In areas which experience a high flowrate within storm sewer systems, it may be necessary to consider up-gauging pipe size and widening drainage channels. For Blackhawk Blvd, a plan of solution should include improving drainage flow towards Clear Creek to the west. For the neighborhood to the west, an improved drainage system with up-sized storm sewer would help alleviate flooding issues as stormwater flows north to Marys Creek. Detailed flooding analysis should be conducted for recommended storm sewer sizing.

Mobility improvements outlined in this study such as road widening will provide opportunities to incorporate drainage elements such as curb/gutter, storm sewer enhancements, or ditch widening throughout the City.

6.3 Evacuation Route Plan

Current evacuation route maps from Harris County, H-GAC, and TxDOT indicate that IH 45 to the east and SH 6 to the south are designated evacuation routes, along with SH 288 and Beltway 8 further out. Within the City of Friendswood, the major thoroughfares (FM 518, FM 528, and FM 2351) provide the network to feed these evacuation routes.

Temporary “High Water” signs are installed along roadways impacted by flooding from a heavy rainfall event. In areas most susceptible to flooding, it is recommended to place detour signs directing traffic to the nearest major thoroughfare, provided it is passable.

6.3.1 Blackhawk Blvd

For the neighborhood of Forest Bend, served by Blackhawk Blvd, an alternate collection pattern will need to be considered in the event of Blackhawk Blvd flooding. It may be beneficial for traffic along Friendswood Link Road to use Hibiscus Lane or Oxnard Lane to south, or Townes Road to the west for traffic along FM 528. For through traffic using Blackhawk Blvd, alternate routes include Bay Area Blvd, Beamer Road, and FM 518. Temporary static or message board signs would be beneficial to informing drivers of a flooding conflict along Blackhawk Blvd and recommending a detour.

6.3.2 Neighborhood West of N. Friendswood/FM 518 at E. Edgewood Dr/FM 2351

For the neighborhood to the west served by Chelsea Lane and Brigadoon Lane, signs will need to be placed encouraging an alternate path to FM 518 or FM 2351. For traffic to/from FM 518, Sunset Meadows Drive, Brandywyne Drive, Stratmore Drive, and Mary Ann Drive could serve as alternate access points in the event of flooding along Chelsea Lane or any of the aforementioned streets. For traffic to/from FM 2351, Stadium Lane and Sunset Drive could serve as alternate access points in the event of flooding along Brigadoon Lane or any of the aforementioned streets. Temporary static or message board signs would be beneficial to informing drivers of a flooding conflict within the neighborhood and recommending a detour.

Similar measures should be considered for additional areas affected by flooding.

6.3.3 Maintaining Access to Evacuation Routes

Priority should be placed on maintaining mobility along major thoroughfare corridors within the City during flooding events. In conjunction with proposed improvements within this study, an evaluation should be conducted along FM 518, FM 2351, and FM 528 to ensure functionality and structural soundness during flooding events.

Friendswood Lakes Blvd and SH 99 (Grand Parkway) are two major roadway facilities which are planned to be constructed in the coming years. These roads are expected to provide additional mobility and an alternate route in the event of a flood.

7.0 Recommendations

The recommendations were developed based on reviewing the existing and future capacity analyses, findings through the public meeting, and construction feasibility. An analysis of the study roadway networks and intersections provide a better understanding of both current and future traffic conditions and indicate what is required to accommodate the existing and future system demands. As a result of the analysis, the following improvements are recommended for each of the analysis years:

Year 2025 (Short-Term)

- **Signal Timings-** Proposed to optimized signal timings at 26 signal locations.
- **E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518-** Proposed a southbound right turn lane with 100 feet of storage and 100-foot taper. Extend all left-turn lanes at the study intersection to 200 feet of storage and 100-foot taper.
- **S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528 -** Proposed dual left-turn lanes along FM 518.
- **FM 2351 at Beamer Rd-** Harris County's improvements include the construction of left-turn and right-turn lanes on the northbound and southbound Beamer Road approaches.
- **FM 528 at Bay Area Boulevard-** Widen Bay Area Boulevard into the median to add an additional through lane 500 feet north and 500 feet south of the study intersection to ultimately have a 6-lane section. Construct eastbound and westbound dual left-turn lanes for FM 528.
- **W. Parkwood Dr/FM 528 at Sunset Dr-** Restripe the southbound Sunset Drive approach to have a dedicated left-turn lane and a shared left, through, and right-turn lane.
- **Greenbriar (between Falling Leaf and W. Castlewood Ave)** is proposed to be widened to accommodate two northbound left-turn lanes into Friendswood High School driveways along Greenbriar.
- **Greenbriar Dr at W. Castlewood Ave-** A right-turn lane with 100 feet of storage and a 100-foot taper is recommended on the westbound W. Castlewood Ave approach.
- **Friendswood Livable Center-** A livable center study should be conducted for the City of Friendswood within the vicinity of E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518. The study would be conducted with HGAC to understand what infrastructure is needed to accommodate a multi-modal development.

Year 2030 (Mid-Term)

- **Signal Timings** – Proposed to optimize signal timings at 26 signal locations.
- **E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518** – Proposed right-turn lane with 100 feet of storage and a 100-foot taper on the westbound FM 2351 approach.
- **S. Friendswood Dr/FM 518 at Whispering Pines Ave** – Proposed left-turn lane and right-turn lane, each with 100 feet of storage and a 100-foot taper on the northbound FM 518 approach.
- **S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528** – Proposed dual left-turn lanes to match length of existing left-turn lanes on the eastbound and westbound FM 528 approaches.
- **FM 2351 at Beamer Rd** – Proposed right-turn lanes with 200 feet of storage and a 100-foot taper on the eastbound and westbound FM 2351 approaches.
- **FM 528 at Bay Area Blvd (Blackhawk Blvd Extension)** – Proposed extension of Blackhawk Blvd from FM 528 to Bay Area Blvd as a four-lane boulevard.
- **E. Parkwood Dr/FM 528 at Winding Way Dr** – Proposed right-turn lane with 100 feet of storage and a 100-foot taper on the northbound Winding Way Dr approach.
- **E. Parkwood Dr/FM 528 at Sunset Dr** – Proposed widening of Sunset Dr approach to include dual left-turn lanes on southbound Sunset Dr approach. Proposed lane configuration would consist of an exclusive left-turn lane, a shared left-turn/through lane, and an exclusive right-turn lane.

Year 2040 (Long-Term)

- **Signal Timings** – Proposed to optimized signal timings at 26 signal locations.
- **E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518** - Proposed extending left-turn lanes, 100 feet storage and a 100-foot taper at all approaches, except for the westbound FM 2351 approach. Proposed dedicated right-turn lane on the northbound FM 518 approach with 150 feet storage and a 100-foot taper.
- **S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528** - Proposed extending left-turn lanes, 100 feet storage and a 100-foot taper at all approaches, except for the southbound FM 518 approach. Proposed dedicated right-turn lanes on the eastbound and westbound FM 528 approaches with 200' storage and 150' storage with 100' taper, respectively. Extend the northbound FM 518 right-turn lane, 100 feet storage and a 100-foot taper
- **FM 2351 at Beamer Rd**- Extend the boulevard section from a 2-lane road to a 4-lane boulevard at Beamer Road.
- **FM 528 at Bay Area Boulevard**- Proposed dedicated southbound right-turn lane with 400 feet storage and a 100-foot taper on Bay Area Boulevard.

- **E. Parkwood Dr/FM 528 at Winding Way Dr** – Proposed widening of Winding Way Drive to two lanes in each direction and construct a dedicated westbound FM 528 right-turn lane with 300 feet storage and a 100-foot taper.
- **W. Parkwood Dr/FM 528 at Sunset Dr** – Proposed widening of Sunset Dr to two lanes in each direction from FM 528 to Regency Court with an exclusive southbound Sunset Drive right-turn lane with 150 feet storage and 25-foot taper and an eastbound FM 528 right-turn lane with 180 feet storage and 25-foot taper.
- **Greenbriar Dr at W. Castlewood Ave-** Proposed road widening from W. Castlewood Ave to FM 528.
- **Greenbriar Dr at Wilderness Trail Ave & Greenbriar Dr at Briarmeadow Ave-** Proposed realignment of Wilderness Trail to become the fourth leg of the Briarmeadow Ave intersection
- **Falcon Ridge Blvd at Eagle Lakes Dr** – Proposed right-turn lanes with 100 feet storage and 100-foot taper on all approaches except for the westbound approach.
- **FM 2351 Corridor-** Proposed additional through lane along FM 2351 between IH 45 to East of Rustic Lane.
- **FM 528 Corridor-** Proposed additional through lane along FM 528 between Friendswood Lakes Boulevard to Bay Area Boulevard.
- **Sunset Drive widening-** Proposed widening of Sunset Dr to two lanes in each direction from FM 528 to Regency Court
- **Winding Way Drive Widening-** Proposed widening of Winding Way Drive to two lanes in each direction.
- **FM 528 Connection to SH 99**– Proposed a roadway connection to future SH 99.

Figure 8, Figure 10 and Figure 12 show the implemented improvements for each analysis year.

8.0 Benefit/Cost Analysis

It is important to determine the expected benefit of an improvement prior to implementation to ensure that funding is allocated in a way to improve the City. Depending on a roadway's characteristic, the benefit for constructing a lane or widening a road may not provide enough benefit to warrant the construction. A benefit/cost (B/C) analysis is conducted to determine how beneficial the improvement would be for a project.

The associated cost and benefit were calculated for the recommended improvements that were analyzed for each scenario at a high level. The preliminary cost was determined based on the estimated construction cost and the anticipated engineering cost. The benefit was determined based on delay benefits, emissions benefit, and safety benefits.

8.1 Preliminary Cost Estimates

8.1.1 Year 2025 Improvements

The preliminary cost estimate was determined for extended left-turn lanes, additional turn lanes and through lanes, and optimizing the signal timings. The preliminary total cost for the Year 2025 improvements is approximately \$2.2 million as shown in **Table 34**.

Table 34: Year 2025 Improvements— Preliminary Cost Estimate

Location	Improvement	Construction (Approx.)	Engineering (Approx.)	Preliminary Total Cost
E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Left-turns extension on all approaches Southbound right-turn lane	\$262,500	\$30,000	\$292,500
FM 528 at Bay Area Blvd	Add a through that extends 500 feet north and south of the intersection Dual eastbound and westbound left-turn lanes	\$784,000	\$60,000	\$844,000
S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Dual northbound and southbound left-turn lanes Northbound right-turn lane	\$291,000	\$20,000	\$311,000

Table 34 (Continued): Year 2025 Improvements—Preliminary Cost Estimate

Location	Improvement	Construction (Approx.)	Engineering (Approx.)	Preliminary Total Cost
W. Parkwood Dr/FM 528 at Sunset Dr	Restripe southbound approach to shared left/through/right turn lane	\$32,000	\$10,000	\$42,000
Greenbriar Drive at W. Castlewood Ave	Westbound right-turn lane	\$117,000	\$20,000	\$137,000
Greenbriar Drive	Road widening approximately 1,000 feet from W. Castlewood Ave to Falling Leaf Dr. Two northbound left-turn lanes at High School Driveways	\$428,000	\$40,000	\$468,000
26 Signal Locations	Timings Optimization	\$30,000	\$100,000	\$135,000

8.1.2 Year 2030 Improvements

The preliminary cost estimate was determined for the additional turn lanes, optimized signal timings, and new roadway connections. The preliminary total cost for the Year 2030 improvements is approximately \$5.5 million as shown in **Table 35**.

Table 35: Year 2030 Improvements—Preliminary Cost Estimate

Location	Improvement	Construction (Approx.)	Engineering (Approx.)	Preliminary Total Cost
26 Signal Locations	Timings optimization	\$30,000	\$100,000	\$135,000
E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Westbound right-turn lane	\$120,000	\$20,000	\$140,000
S. Friendswood Dr/FM 518 at Whispering Pines Ave	Northbound right-turn lane Northbound left-turn lane	\$175,000	\$25,000	\$200,000
S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Dual eastbound and westbound left-turn lanes	\$265,000	\$25,000	\$290,000
FM 2351 at Beamer Rd	Northbound and southbound right-turn Lanes	\$235,000	\$25,000	\$260,000
FM 528 at Bay Area Blvd	Blackhawk Blvd extension from FM 528 to Bay Area Blvd	\$3,910,000	\$40,000	\$3,950,000
E. Parkwood Dr/FM 528 at Winding Way Dr	Northbound right-turn Lane	\$120,000	\$20,000	\$140,000
W. Parkwood Dr/FM 528 at Sunset Dr	Southbound dual left-turn lanes	\$135,000	\$20,000	\$155,000

8.1.3 Year 2040 Improvements

The preliminary cost estimate was determined for extended left-turn lanes, additional turn lanes and through lanes, optimizing the signal timings and new roadway connections. The preliminary total cost for the Year 2040 improvements is approximately \$26 million as shown in **Table 36**.

Table 36: Year 2040 Improvements—Preliminary Cost Estimate

Location	Improvement	Construction (Approx.)	Engineering (Approx.)	Preliminary Total Cost
E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Left-turn lanes extension on all approaches except for the westbound approach. Northbound right-turn lane.	\$369,000	\$40,000	\$409,000
FM 2351 at Beamer Rd	Widen Beamer Road from 2-lane road to 4-lane boulevard	\$3,597,000	\$20,000	\$3,617,000
FM 2351	Road widening from IH 45 to East of Rustic Lane	\$5,177,000	\$40,000	\$5,217,000
FM 528	Road widening from IH 45 to Friendswood Lakes Boulevard	\$8,960,600	\$40,000	\$9,000,600
FM 528 at Bay Area Blvd	Southbound right-turn lane	\$207,000	\$20,000	\$227,000
Winding Way	Widen Winding Way from FM 528 to FM 518	\$1,917,000	\$20,000	\$1,937,000
E. Parkwood Dr/FM 528 at Winding Way Dr	Westbound right-turn lane	\$177,000	\$20,000	\$197,000

Table 36 (Continued): Year 2040 Improvements—Preliminary Cost Estimate

Location	Improvement	Construction (Approx.)	Engineering (Approx.)	Preliminary Total Cost
S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Left-turn lanes extension on all approaches except for the southbound approach Eastbound right-turn lane Westbound right-turn lane Left-Turn lane extension on northbound approach	\$736,500	\$40,000	\$776,500
W. Parkwood Dr/FM 528 at Sunset Dr	Eastbound right-turn lane Southbound right-turn lane	\$136,000	\$20,000	\$156,000
Sunset Drive	Road widening from FM 528 to Regency Court	\$373,800	\$20,000	\$393,800
FM 528	Roadway Connection to SH 99	\$2,169,000	\$20,000	\$2,189,000
Falcon Ridge at Eagle Lakes	Right-turn lanes on all approaches except for westbound approach.	\$187,000	\$20,000	\$207,000
Greenbriar at Wilderness Trail/Briar Meadow	Roadway realignment at Wilderness Trail/ Briar Meadow	\$799,000	\$20,000	\$819,000
Greenbriar Drive at W. Castlewood Ave	Road Widening from W. Castlewood Ave to FM 528	\$1,274,200	\$20,000	\$1,294,200
26 Signal Locations	Timings Optimization	\$30,000	\$100,000	\$135,000

8.2 Benefit/Cost Ratio

For the B/C ratio, the benefit for improving a roadway facility is based on several factors in addition to improving traffic flow, such as safety and vehicle emissions. The benefits were calculated by choosing the applicable roadway improvement or signal operations management improvement. In some instances, multiple improvements may have been calculated to determine the benefit at the intersection. Using the preliminary costs determined in the previous section and the benefits, the B/C ratio can be calculated. The B/C was determined for each intersection/roadway to determine how beneficial the improvement would be for a project. Typically, a project with a benefit-cost ratio greater than 1 would be a good indicator for funding.

With the calculated ratio, the improvements can be ranked. The improvements identified should be implemented to accommodate the future traffic demand. However, not all improvements could be implemented at one time due to various considerations, such as financing. For each of the future years, the improvements were ranked for implementation. The local streets were ranked based on improving traffic flow for the residents in the neighborhoods. One improvement that ranked the highest for all three future years is the signal timings optimization.

Signal timings optimization ranks the highest due to optimizing the timings is a relatively low cost to the City and can provide a significant benefit. It is expected that the signal timings should be evaluated every few years, but considerations should be taken when significant development is constructed and fully occupied as well.

For the three TxDOT roadways, the ranking was based on the B/C ratio and the severity of the congestion at the intersection. The B/C ratio calculated correlates with the severity of congestion.

8.2.1 Year 2025 Improvements

For the Year 2025, the total benefit for the intersection along with the total preliminary cost (construction plus engineering) was used for the B/C ratio. **Table 37** shows the (B/C) for each intersection. The B/C analyses for Year 2025 is shown in **Appendix K**.

Table 37: Year 2025 Improvements—Benefit/Cost Ratio

Location	Improvement	B/C Ratio
E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Left-turn lanes extension, 200' storage, 100' taper for eastbound, northbound and southbound approaches Left-turn lane extension, 250' storage, 100' taper for westbound approach Southbound right-turn lane; 100' storage, 100' taper	3.58
FM 528 at Bay Area Blvd	Add through lane that extends 500 feet north and south of the intersection Dual eastbound and westbound left-turn lanes; 150' storage, 100' taper for each lane	6.14

Table 37: Year 2025 Improvements—Benefit/Cost Ratio (Continued)

Location	Improvement	B/C Ratio
S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Dual northbound left-turn lane; 180' storage, 100' taper Dual southbound left-turn lane; 200' storage, 100' taper Northbound right-turn lane; 100' storage, 100' taper	3.92
W. Parkwood Dr/FM 528 at Sunset Dr	Restripe southbound approach to shared left/through/right turn lane	1.28
Greenbriar Drive at W. Castlewood Ave	Westbound right-turn lane; 100' storage, 100' taper	1.97
Greenbriar Drive	Road widening approximately 1,000 feet from W. Castlewood Ave to Falling Leaf Dr. Two northbound left-turn lanes at High School Driveways	0.45
26 Signal Locations	Timings Optimization	591.00

Overall, the B/C ratio shows that there are significant benefits with the Year 2025 improvements. Greenbriar Drive is expected to have a lower benefit which is deceiving, as it is a lower volume street. Although the B/C ratio does not exceed 1.00, the Greenbriar Drive improvements provide high benefits to the local and high school traffic and would improve throughput for the neighborhood traffic.

8.2.1.1 Ranking of Year 2025 Improvements

The projects recommended for the Year 2025 were ranked based on the type of street serving the City of Friendswood, the B/C analysis, and the expressed needs by the residents. The ranking for the Year 2025 projects is the following:

1. Signal timings Optimization
2. Greenbriar Drive at W. Castlewood Avenue
3. W. Parkwood Dr/FM 528 at Sunset Dr
4. Greenbriar Drive
5. FM 528 at Bay Area Boulevard
6. S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528
7. N. Friendswood Dr./FM 518 at E. Edgewood Dr/FM 2351

The B/C ratio for local streets may reflect a lower value due to the lower traffic volumes, but these projects are important to the local community. Greenbriar Drive provides access to the high school and

can improve the existing queuing issues. Sunset Drive at FM 528 provides access to the local supermarket store for the residential area.

8.2.2 Year 2030 Improvements

The B/C ratio was calculated for each intersection/roadway. The benefits were determined by choosing the applicable roadway improvement, corridor improvement or signal operations management improvement. The total benefit for the intersection/roadway corridor along with the total cost (construction plus engineering) was used for the B/C ratio. **Table 38** shows the B/C for each intersection. The B/C analyses for Year 2030 is shown in **Appendix L**.

Table 38: Year 2030 Improvements—Benefit/Cost Ratio

Location	Improvement	B/C Ratio
26 Signal Locations	Timings optimization	112.30
E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518	Westbound right-turn lane	1.29
S. Friendswood Dr/FM 518 at Whispering Pines Ave	Northbound right-turn lane Northbound left-turn lane	1.49
S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528	Dual eastbound and westbound left-turn lanes	2.66
FM 2351 at Beamer Rd	Northbound and southbound right-turn Lanes	1.94
FM 528 at Bay Area Blvd	Blackhawk Blvd extension from FM 528 to Bay Area Blvd	1.70
E. Parkwood Dr/FM 528 at Winding Way Dr	Northbound right-turn Lane	2.91
W. Parkwood Dr/FM 528 at Sunset Dr	Southbound dual left-turn lanes	3.28

Overall, the B/C ratio shows that there are significant benefits with the Year 2030 improvements. The addition of turn lanes to high-volume corridors and the extension of Blackhawk Blvd is expected to provide large enough benefits to offset the cost.

8.2.2.1 Ranking of Year 2030 Improvements

The projects recommended for the Year 2030 were ranked based on the type of street serving the City of Friendswood, the B/C analysis, and the expressed needs by the residents. The ranking for the projects is the following:

1. Signal Timings Optimization
2. W. Parkwood Dr/FM 528 at Sunset Dr

3. E. Parkwood Dr/FM 528 at Winding Way Dr
4. S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528
5. FM 2351 at Beamer Rd
6. FM 528 at Bay Area Blvd (Blackhawk Blvd Extension)
7. S. Friendswood Dr/FM 518 at Whispering Pines Ave
8. N. Friendswood Dr./FM 518 at E. Edgewood Dr/FM 2351

8.2.3 Year 2040 Improvements

For the Year 2040, the total benefit for the intersection along with the total preliminary cost (construction plus engineering) was used for the B/C ratio. **Table 39** shows the benefit cost for each intersection. The B/C analyses for Year 2040 is shown in **Appendix M**.

Table 39: Year 2040 Improvements—Benefit/Cost Ratio

Location	Improvement	B/C Ratio
E. Edgewood Dr/ FM 2351 at N. Friendswood Dr/FM 518	Left-turn lanes extension, 100' storage, 100' taper on all approaches except for the westbound approach. Northbound right-turn lane. 150' storage, 100' taper	1.38
FM 2351 at Beamer Rd	Widen Beamer Road from 2- lane road to 4-lane boulevard	3.08
FM 2351	Road widening from IH 45 to East of Rustic Lane	1.78
FM 528	Road widening from IH 45 to Friendswood Lakes Boulevard	2.43
FM 528 at Bay Area Blvd	Southbound right-turn lane, 400' storage, 100' taper	1.30
Winding Way	Widen Winding Way from FM 528 to FM 518	2.35
E. Parkwood Dr/FM 528 at Winding Way Dr	Westbound right-turn lane, 300' storage, 100' taper	1.30
S. Friendswood Dr/ FM 518 at E. Parkwood Dr/FM 528	Left-turn lanes extension, 100' storage and 100' taper on all approaches except for the southbound approach Eastbound right-turn lane, 200' storage, 100' taper Westbound right-turn lane, 150' storage, 100' taper Left-Turn lane extension, 100' storage, 100' taper for northbound approach	2.29
W. Parkwood Dr/FM 528 at Sunset Dr	Eastbound right-turn lane, 180' storage, 25' taper Southbound right-turn lane, 150' storage, 25' taper	1.55

Table 39: (Continued): Year 2040 Improvements—Benefit/Cost Ratio

Location	Improvement	B/C Ratio
Sunset Drive	Road widening from FM 528 to Regency Court	1.97
FM 528	Roadway Connection to SH 99	1.30
Falcon Ridge at Eagle Lakes	Right-turn lanes, 100' storage, 100' taper on all approaches except for westbound approach.	0.30
Greenbriar at Wilderness Trail/Briar Meadow	Roadway realignment at Wilderness Trail/ Briar Meadow	0.34
Greenbriar Drive at W. Castlewood Ave	Road Widening from W. Castlewood Ave to FM 528	0.16
26 Signal Locations	Timings Optimization	252.64

Overall, the B/C ratio shows that there are significant benefits with the Year 2040 improvements. Greenbriar Drive and Falcon Ridge are expected to have the lowest B/C due to the low traffic volumes. Although the B/C ratio does not exceed 1.00, the Greenbriar Drive and Falcon Ridge improvements provide key benefits to the neighborhood and should be constructed.

8.2.3.1 Ranking of Year 2040 Improvements

For the Year 2040, the total benefit for the intersection along with the total preliminary cost (construction plus engineering) was used for the B/C ratio. The ranking for the projects is the following:

1. Signal timings Optimization
2. Sunset Drive widening
3. Greenbriar Dr at Wilderness Trail Ave & Greenbriar Dr at Briarmeadow Ave
4. Falcon Ridge Blvd at Eagle Lakes Dr
5. Greenbriar Dr at W. Castlewood Ave
6. FM 2351 at Beamer Rd
7. FM 528 Corridor

8. FM 2351 Corridor
9. W. Parkwood Dr/FM 528 at Sunset Dr
10. E. Edgewood Dr/FM 2351 at N. Friendswood Dr/FM 518
11. Winding Way widening
12. S. Friendswood Dr/FM 518 at E. Parkwood Dr/FM 528
13. E. Parkwood Dr/FM 528 at Winding Way Dr
14. FM 528 at Bay Area Boulevard
15. FM 528 Connection to SH 99

The B/C ratio for local streets is not as high as a result of the traffic along these corridors serve primarily low volume traffic. These projects are important to the local community since Greenbriar Drive provides access to the high school and several neighborhoods. The realignment of Wilderness Trail/Briar Meadow would reduce conflicting turning movements and reduced queueing at the intersections. Sunset Drive at FM 528 provides access to the local supermarket store for the residential area.

The B/C ratio calculated correlates with the severity of congestion. The ranking for the FM 528 connection to SH 99 would require coordination with TxDOT to study the alignment of the proposed interchange.

9.0 Agency Coordination

There are four agencies that are involved with the improvements within the city limits: City of Friendswood, Texas Department of Transportation (TxDOT), Harris County, and Galveston County. Coordination has taken place between the City of Friendswood and TxDOT. City of Friendswood staff, TxDOT staff, and BGE staff met to discuss the project and provide an understanding of the preliminary improvements to improve traffic operations. TxDOT was involved in the project early on since many of the major roadways to travel through the city and feed local streets are TxDOT roadways. There has been limited coordination with Harris County except for research that has been done to determine improvements expected within the city limits. Based on the information gathered, there are expected improvements along Beamer Road in the vicinity of FM 2351.

When implementation of the improvements is determined, coordination between the agencies will take place to ensure the financial and construction needs are agreed upon.

10.0 Conclusions

It is expected that the growth in the City of Friendswood, will provide economic benefits to the area with the unfortunate impact of increased traffic. Fortunately, growth will occur over time providing opportunities for the City of Friendswood to improve to the roadway network. This study provides the necessary mitigation options that could alleviate these major traffic concerns for the next 25 years. These options were determined through extensive analyses of the intersections along with the resident's input from the public meeting. Some of the recommendations have a relatively quick timeline for implementation, such as optimizing the traffic signals along the corridors, and others that require additional planning, such as major corridor widening. The City of Friendswood can use these recommendations as part of a future planning effort to identify funding solutions and ensure mobility needs are being met.

Appendix A

Existing Traffic Counts

1. FM 2351 at Beamer Rd - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627316, Location: 29.557151, -95.180078



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 2351 Eastbound							FM 2351 Westbound							Beamer Rd Northbound							Beamer Rd Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*	Int	
2019-02-27																													
6:30AM	19	279	9	0	307	0		8	127	18	0	153	0		7	14	15	0	36	0		1	8	27	0	36	0		532
6:45AM	38	280	5	0	323	0		5	211	18	0	234	0		7	42	16	0	65	0		3	14	58	0	75	0		697
Hourly Total	57	559	14	0	630	0		13	338	36	0	387	0		14	56	31	0	101	0		4	22	85	0	111	0		1229
7:00AM	40	280	11	0	331	0		11	231	7	0	249	0		6	22	36	0	64	0		5	19	70	0	94	0		738
7:15AM	32	308	13	0	353	0		13	147	12	0	172	0		9	31	34	0	74	0		2	36	19	0	57	0		656
7:30AM	25	309	11	0	345	0		9	146	22	0	177	0		5	69	11	1	86	0		5	39	11	0	55	0		663
7:45AM	22	315	9	0	346	0		20	192	36	0	248	0		6	66	15	0	87	0		9	41	21	0	71	0		752
Hourly Total	119	1212	44	0	1375	0		53	716	77	0	846	0		26	188	96	1	311	0		21	135	121	0	277	0		2809
8:00AM	28	392	10	0	430	0		11	162	16	0	189	0		11	48	9	0	68	0		7	37	23	0	67	0		754
8:15AM	35	280	8	0	323	0		12	134	10	1	157	0		4	66	16	0	86	0		3	43	19	0	65	0		631
Hourly Total	63	672	18	0	753	0		23	296	26	1	346	0		15	114	25	0	154	0		10	80	42	0	132	0		1385
4:30PM	20	183	5	0	208	0		47	286	13	0	346	0		16	37	8	0	61	0		5	53	12	0	70	0		685
4:45PM	24	226	22	1	273	0		38	277	22	0	337	0		17	28	14	0	59	0		8	59	27	0	94	0		763
Hourly Total	44	409	27	1	481	0		85	563	35	0	683	0		33	65	22	0	120	0		13	112	39	0	164	0		1448
5:00PM	24	200	21	1	246	0		31	262	14	0	307	0		28	56	11	0	95	0		13	44	27	0	84	0		732
5:15PM	23	196	17	3	239	0		34	299	15	0	348	0		18	38	8	0	64	0		6	49	22	0	77	0		728
5:30PM	21	199	23	1	244	0		33	323	26	1	383	0		15	33	5	0	53	0		4	41	19	0	64	0		744
5:45PM	35	183	17	0	235	0		28	311	15	0	354	0		25	48	9	0	82	0		5	39	22	0	66	0		737
Hourly Total	103	778	78	5	964	0		126	1195	70	1	1392	0		86	175	33	0	294	0		28	173	90	0	291	0		2941
6:00PM	25	188	15	2	230	0		27	280	12	0	319	0		18	46	18	0	82	0		10	45	19	0	74	0		705
6:15PM	20	160	11	0	191	0		40	268	12	0	320	0		31	40	6	0	77	0		7	35	18	0	60	0		648
Hourly Total	45	348	26	2	421	0		67	548	24	0	639	0		49	86	24	0	159	0		17	80	37	0	134	0		1353
Total	431	3978	207	8	4624	0		367	3656	268	2	4293	0		223	684	231	1	1139	0		93	602	414	0	1109	0		11165
% Approach	9.3%	86.0%	4.5%	0.2%	-	-		8.5%	85.2%	6.2%	0%	-	-		19.6%	60.1%	20.3%	0.1%	-	-		8.4%	54.3%	37.3%	0%	-	-		-
% Total	3.9%	35.6%	1.9%	0.1%	41.4%	-		3.3%	32.7%	2.4%	0%	38.5%	-		2.0%	6.1%	2.1%	0%	10.2%	-		0.8%	5.4%	3.7%	0%	9.9%	-		-
Lights	421	3914	207	8	4550	-		362	3613	266	2	4243	-		218	679	224	1	1122	-		89	595	399	0	1083	-		10998
% Lights	97.7%	98.4%	100%	100%	98.4%	-		98.6%	98.8%	99.3%	100%	98.8%	-		97.8%	99.3%	97.0%	100%	98.5%	-		95.7%	98.8%	96.4%	0%	97.7%	-		98.5%
Articulated Trucks	1	9	0	0	10	-		1	7	0	0	8	-		2	0	2	0	4	-		0	0	0	0	0	-		22
% Articulate d Trucks	0.2%	0.2%	0%	0%	0.2%	-		0.3%	0.2%	0%	0%	0.2%	-		0.9%	0%	0.9%	0%	0.4%	-		0%	0%	0% 0%	0%	0%	-		0.2%
Buses and Single-Unit Trucks	9	55	0	0	64	-		4	36	2	0	42	-		3	5	5	0	13	-		4	7	15	0	26	-		145
% Buses and Single-Unit Trucks	2.1%	1.4%	0%	0%	1.4%	-		1.1%	1.0%	0.7%	0%	1.0%	-		1.3%	0.7%	2.2%	0%	1.1%	-		4.3%	1.2%	3.6%	0%	2.3%	-		1.3%
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

2. FM 2351 at Blackhawk Blvd - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627317, Location: 29.545548, -95.193344



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	FM 2351 Eastbound					FM 2351 Westbound					Blackhawk Blvd Northbound					
Time	T	R	U	App	Ped*	L	T	U	App	Ped*	L	R	U	App	Ped*	Int
2019-02-27 6:30AM	210	3	0	213	0	11	82	1	94	0	13	40	1	54	0	361
6:45AM	254	6	0	260	0	16	106	2	124	0	15	62	0	77	0	461
Hourly Total	464	9	0	473	0	27	188	3	218	0	28	102	1	131	0	822
7:00AM	254	7	0	261	0	17	117	0	134	0	18	95	0	113	0	508
7:15AM	252	9	1	262	0	18	162	2	182	0	10	38	0	48	0	492
7:30AM	269	8	0	277	0	9	143	0	152	0	27	31	0	58	0	487
7:45AM	314	12	0	326	0	22	196	3	221	0	14	32	0	46	0	593
Hourly Total	1089	36	1	1126	0	66	618	5	689	0	69	196	0	265	0	2080
8:00AM	278	6	0	284	0	20	179	3	202	0	24	41	1	66	0	552
8:15AM	276	6	0	282	0	19	136	2	157	0	24	23	1	48	0	487
Hourly Total	554	12	0	566	0	39	315	5	359	0	48	64	2	114	0	1039
4:30PM	220	13	0	233	0	16	290	5	311	0	21	12	0	33	0	577
4:45PM	220	16	0	236	0	17	308	3	328	0	18	22	0	40	0	604
Hourly Total	440	29	0	469	0	33	598	8	639	0	39	34	0	73	0	1181
5:00PM	210	21	0	231	0	15	345	0	360	0	32	17	0	49	0	640
5:15PM	185	21	0	206	0	19	295	4	318	0	24	16	0	40	0	564
5:30PM	224	19	0	243	0	15	334	0	349	0	24	17	0	41	0	633
5:45PM	227	18	0	245	0	22	311	0	333	0	24	23	0	47	0	625
Hourly Total	846	79	0	925	0	71	1285	4	1360	0	104	73	0	177	0	2462
6:00PM	213	14	0	227	0	14	311	0	325	0	32	14	0	46	1	598
6:15PM	190	12	0	202	0	23	291	0	314	0	19	16	0	35	1	551
Hourly Total	403	26	0	429	0	37	602	0	639	0	51	30	0	81	2	1149
Total	3796	191	1	3988	0	273	3606	25	3904	0	339	499	3	841	2	8733
% Approach	95.2%	4.8%	0%	-	-	7.0%	92.4%	0.6%	-	-	40.3%	59.3%	0.4%	-	-	-
% Total	43.5%	2.2%	0%	45.7%	-	3.1%	41.3%	0.3%	44.7%	-	3.9%	5.7%	0%	9.6%	-	-
Lights	3753	189	1	3943	-	268	3576	25	3869	-	337	487	3	827	-	8639
% Lights	98.9%	99.0%	100%	98.9%	-	98.2%	99.2%	100%	99.1%	-	99.4%	97.6%	100%	98.3%	-	98.9%
Articulated Trucks	4	0	0	4	-	2	6	0	8	-	0	2	0	2	-	14
% Articulated Trucks	0.1%	0%	0%	0.1%	-	0.7%	0.2%	0%	0.2%	-	0%	0.4%	0%	0.2%	-	0.2%
Buses and Single-Unit Trucks	39	2	0	41	-	3	24	0	27	-	2	10	0	12	-	80
% Buses and Single-Unit Trucks	1.0%	1.0%	0%	1.0%	-	1.1%	0.7%	0%	0.7%	-	0.6%	2.0%	0%	1.4%	-	0.9%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

3. E. Edgewood Dr. at Woodland Trail Dr - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627319, Location: 29.538546, -95.200443



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	E. Edgewood Ave Eastbound							E. Edgewood Ave Westbound							Royal Ct Northbound							Woodland Trail Dr Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*	Int	
2019-02-27 6:30AM	2	183	0	0	185	0		0	94	4	0	98	0		0	0	0	0	0	0		24	0	3	0	27	0	310	
6:45AM	1	251	0	0	252	0		0	110	6	0	116	0		0	0	0	0	0	0		18	0	4	0	22	0	390	
Hourly Total	3	434	0	0	437	0		0	204	10	0	214	0		0	0	0	0	0	0		42	0	7	0	49	0	700	
7:00AM	8	232	0	0	240	0		0	112	4	0	116	0		0	0	0	0	0	0		28	0	8	0	36	0	392	
7:15AM	2	229	0	0	231	0		0	173	6	0	179	0		0	0	0	0	0	0		27	0	30	0	57	0	467	
7:30AM	9	248	0	0	257	0		0	166	8	0	174	0		0	0	0	0	0	0		31	0	30	0	61	0	492	
7:45AM	10	268	0	0	278	0		0	216	7	0	223	0		0	0	1	0	1	0		42	0	34	0	76	0	578	
Hourly Total	29	977	0	0	1006	0		0	667	25	0	692	0		0	0	1	0	1	0		128	0	102	0	230	0	1929	
8:00AM	19	274	0	0	293	0		0	205	16	0	221	0		0	0	0	0	0	0		22	0	16	0	38	0	552	
8:15AM	8	245	0	0	253	0		0	144	13	0	157	0		0	0	0	0	0	0		34	0	29	0	63	0	473	
Hourly Total	27	519	0	0	546	0		0	349	29	0	378	0		0	0	0	0	0	0		56	0	45	0	101	0	1025	
4:30PM	24	196	0	0	220	0		0	290	17	0	307	0		0	0	0	0	0	0	1		15	0	23	0	38	0	565
4:45PM	14	234	0	0	248	0		0	301	26	0	327	0		0	1	0	0	1	0		16	0	17	0	33	1	609	
Hourly Total	38	430	0	0	468	0		0	591	43	0	634	0		0	1	0	0	1	1		31	0	40	0	71	1	1174	
5:00PM	22	210	0	0	232	0		0	290	29	1	320	0		0	0	0	0	0	0	1		12	0	19	0	31	0	583
5:15PM	22	201	0	0	223	0		0	310	41	0	351	1		1	0	0	0	1	0		8	0	12	0	20	1	595	
5:30PM	19	201	0	0	220	0		0	302	30	0	332	0		0	0	0	0	0	0	1		21	0	11	0	32	0	584
5:45PM	18	243	0	0	261	0		0	323	25	0	348	0		0	0	0	0	0	0		13	0	21	0	34	0	643	
Hourly Total	81	855	0	0	936	0		0	1225	125	1	1351	1		1	0	0	0	1	2		54	0	63	0	117	1	2405	
6:00PM	20	186	0	0	206	0		0	289	27	0	316	0		0	0	0	0	0	0		10	0	20	0	30	0	552	
6:15PM	10	206	0	0	216	0		0	304	22	0	326	0		0	0	0	0	0	0		11	0	9	0	20	0	562	
Hourly Total	30	392	0	0	422	0		0	593	49	0	642	0		0	0	0	0	0	0		21	0	29	0	50	0	1114	
Total	208	3607	0	0	3815	0		0	3629	281	1	3911	1		1	1	1	0	3	3		332	0	286	0	618	2	8347	
% Approach	5.5%	94.5%	0%	0%	-	-		0%	92.8%	7.2%	0%	-	-		33.3%	33.3%	33.3%	0%	-	-		53.7%	0%	46.3%	0%	-	-	-	
% Total	2.5%	43.2%	0%	0%	45.7%	-		0%	43.5%	3.4%	0%	46.9%	-		0%	0%	0%	0%	0%	0%	-		4.0%	0%	3.4%	0%	7.4%	-	-
Lights	206	3568	0	0	3774	-		0	3601	277	1	3879	-		0	1	0	0	1	-		330	0	284	0	614	-	8268	
% Lights	99.0%	98.9%	0%	0%	98.9%	-		0%	99.2%	98.6%	100%	99.2%	-		0%	100%	0%	0%	33.3%	-		99.4%	0%	99.3%	0%	99.4%	-	99.1%	
Articulated Trucks	0	4	0	0	4	-		0	4	0	0	4	-		0	0	0	0	0	-		0	0	0	0	0	-	8	
% Articulated Trucks	0%	0.1%	0%	0%	0.1%	-		0%	0.1%	0%	0%	0.1%	-		0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-	0.1%	
Buses and Single-Unit Trucks	2	35	0	0	37	-		0	24	4	0	28	-		1	0	1	0	2	-		2	0	2	0	4	-	71	
% Buses and Single-Unit Trucks	1.0%	1.0%	0%	0%	1.0%	-		0%	0.7%	1.4%	0%	0.7%	-		100%	0%	100%	0%	66.7%	-		0.6%	0%	0.7%	0%	0.6%	-	0.9%	
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	1		-	-	-	-	-	3		-	-	-	-	-	2		
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	100%		

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

4. E. Edgewood Dr at Melody Ln - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627320, Location: 29.536735, -95.202443



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	E. Edgewood Dr Eastbound						E. Edgewood Dr Westbound						Unnamed Drwy Northbound						Melody Ln Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	2	168	0	0	170	0	0	89	6	0	95	0	0	0	0	0	0	0	13	0	13	0	26	0	291
6:45AM	6	226	0	1	233	0	0	117	1	0	118	0	0	0	0	0	0	0	24	0	14	0	38	0	389
Hourly Total	8	394	0	1	403	0	0	206	7	0	213	0	0	0	0	0	0	0	37	0	27	0	64	0	680
7:00AM	13	207	0	0	220	0	1	113	11	0	125	0	0	0	0	0	0	0	41	0	15	0	56	0	401
7:15AM	6	210	0	1	217	0	1	188	11	0	200	0	0	0	1	0	1	0	20	0	27	0	47	0	465
7:30AM	10	239	0	0	249	0	2	194	5	0	201	0	0	0	0	0	0	0	25	0	52	0	77	0	527
7:45AM	20	244	1	2	267	0	4	229	7	0	240	0	0	0	0	0	0	0	41	1	60	0	102	0	609
Hourly Total	49	900	1	3	953	0	8	724	34	0	766	0	0	0	1	0	1	0	127	1	154	0	282	0	2002
8:00AM	24	279	0	0	303	0	4	201	9	0	214	0	1	0	0	0	1	0	15	0	51	0	66	0	584
8:15AM	21	233	1	0	255	0	2	164	7	0	173	0	1	1	1	0	3	0	20	3	51	0	74	0	505
Hourly Total	45	512	1	0	558	0	6	365	16	0	387	0	2	1	1	0	4	0	35	3	102	0	140	0	1089
4:30PM	24	221	0	1	246	1	1	300	23	0	324	0	0	0	0	0	0	1	22	0	23	0	45	0	615
4:45PM	33	216	1	0	250	0	2	298	27	3	330	0	4	1	1	0	6	0	12	0	40	0	52	0	638
Hourly Total	57	437	1	1	496	1	3	598	50	3	654	0	4	1	1	0	6	1	34	0	63	0	97	0	1253
5:00PM	41	217	0	1	259	0	1	316	22	0	339	0	3	1	0	0	4	0	25	0	32	0	57	1	659
5:15PM	20	212	0	0	232	0	2	290	29	0	321	0	1	3	1	0	5	0	19	0	39	0	58	0	616
5:30PM	32	205	0	0	237	0	0	302	29	3	334	0	0	2	0	0	2	1	27	0	40	0	67	0	640
5:45PM	26	246	1	0	273	0	1	319	25	4	349	0	3	1	0	0	4	0	17	0	32	0	49	0	675
Hourly Total	119	880	1	1	1001	0	4	1227	105	7	1343	0	7	7	1	0	15	1	88	0	143	0	231	1	2590
6:00PM	27	185	0	0	212	0	0	296	30	0	326	0	4	1	0	0	5	0	22	0	29	0	51	0	594
6:15PM	23	197	0	0	220	0	1	267	29	0	297	0	2	1	2	0	5	0	20	0	24	0	44	1	566
Hourly Total	50	382	0	0	432	0	1	563	59	0	623	0	6	2	2	0	10	0	42	0	53	0	95	1	1160
Total	328	3505	4	6	3843	1	22	3683	271	10	3986	0	19	11	6	0	36	2	363	4	542	0	909	2	8774
% Approach	8.5%	91.2%	0.1%	0.2%	-	-	0.6%	92.4%	6.8%	0.3%	-	-	52.8%	30.6%	16.7%	0%	-	-	39.9%	0.4%	59.6%	0%	-	-	-
% Total	3.7%	39.9%	0%	0.1%	43.8%	-	0.3%	42.0%	3.1%	0.1%	45.4%	-	0.2%	0.1%	0.1%	0%	0.4%	-	4.1%	0%	6.2%	0%	10.4%	-	-
Lights	327	3467	4	6	3804	-	22	3648	270	10	3950	-	19	11	6	0	36	-	359	4	532	0	895	-	8685
% Lights	99.7%	98.9%	100%	100%	99.0%	-	100%	99.0%	99.6%	100%	99.1%	-	100%	100%	100%	0%	100%	-	98.9%	100%	98.2%	0%	98.5%	-	99.0%
Articulated Trucks	0	3	0	0	3	-	0	9	0	0	9	-	0	0	0	0	0	-	1	0	0	0	1	-	13
% Articulated Trucks	0%	0.1%	0%	0%	0.1%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0.3%	0%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	1	35	0	0	36	-	0	26	1	0	27	-	0	0	0	0	0	-	3	0	10	0	13	-	76
% Buses and Single-Unit Trucks	0.3%	1.0%	0%	0%	0.9%	-	0%	0.7%	0.4%	0%	0.7%	-	0%	0%	0%	0%	0%	-	0.8%	0%	1.8%	0%	1.4%	-	0.9%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	2	-
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

5. E. Edgewood Dr. at N. Friendswood Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627321, Location: 29.533563, -95.205999



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	E. Edgewood Dr. Eastbound							E. Edgewood Dr. Westbound							N. Friendswood Dr. Northbound							N. Friendswood Dr. Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*	Int	
2019-02-27 6:30AM	35	99	5	0	139	0		23	44	26	0	93	0		8	85	25	0	118	0		34	39	11	0	84	0	434	
6:45AM	36	108	4	0	148	0		24	61	32	0	117	0		9	90	23	0	122	0		68	64	14	0	146	0	533	
Hourly Total	71	207	9	0	287	0		47	105	58	0	210	0		17	175	48	0	240	0		102	103	25	0	230	0	967	
7:00AM	49	110	8	0	167	0		22	56	40	0	118	0		15	102	23	0	140	0		51	72	12	0	135	0	560	
7:15AM	26	96	10	0	132	0		41	97	45	0	183	0		36	134	30	1	201	0		58	95	27	0	180	0	696	
7:30AM	36	109	29	0	174	0		43	120	59	0	222	0		50	139	37	0	226	0		76	129	29	2	236	1	858	
7:45AM	38	121	22	0	181	0		69	117	55	0	241	0		28	131	48	0	207	3		53	162	18	0	233	0	862	
Hourly Total	149	436	69	0	654	0		175	390	199	0	764	0		129	506	138	1	774	3		238	458	86	2	784	1	2976	
8:00AM	42	141	14	0	197	0		59	82	58	0	199	0		12	123	43	0	178	5		63	139	13	0	215	0	789	
8:15AM	24	123	19	0	166	6		55	100	54	0	209	0		21	100	45	0	166	0		48	121	21	0	190	0	731	
Hourly Total	66	264	33	0	363	6		114	182	112	0	408	0		33	223	88	0	344	5		111	260	34	0	405	0	1520	
4:30PM	54	82	24	0	160	0		58	151	51	0	260	0		13	145	21	0	179	0		74	135	28	0	237	0	836	
4:45PM	43	102	23	0	168	0		47	158	52	0	257	0		20	164	39	0	223	0		52	153	31	0	236	0	884	
Hourly Total	97	184	47	0	328	0		105	309	103	0	517	0		33	309	60	0	402	0		126	288	59	0	473	0	1720	
5:00PM	62	96	23	0	181	0		50	183	70	1	304	0		12	157	31	0	200	0		47	136	28	0	211	0	896	
5:15PM	59	87	19	0	165	0		41	147	51	0	239	0		24	178	26	0	228	0		52	164	31	0	247	0	879	
5:30PM	63	108	23	0	194	0		53	185	89	1	328	0		14	153	22	0	189	0		46	155	36	0	237	0	948	
5:45PM	52	115	26	0	193	0		48	138	77	0	263	0		15	170	29	0	214	0		57	169	38	0	264	0	934	
Hourly Total	236	406	91	0	733	0		192	653	287	2	1134	0		65	658	108	0	831	0		202	624	133	0	959	0	3657	
6:00PM	57	83	17	0	157	0		49	176	73	0	298	0		24	149	19	0	192	0		47	121	24	0	192	1	839	
6:15PM	57	87	10	0	154	0		37	134	73	0	244	0		22	149	28	0	199	0		62	139	28	0	229	0	826	
Hourly Total	114	170	27	0	311	0		86	310	146	0	542	0		46	298	47	0	391	0		109	260	52	0	421	1	1665	
Total	733	1667	276	0	2676	6		719	1949	905	2	3575	0		323	2169	489	1	2982	8		888	1993	389	2	3272	2	12505	
% Approach	27.4%	62.3%	10.3%	0%	-	-		20.1%	54.5%	25.3%	0.1%	-	-		10.8%	72.7%	16.4%	0%	-	-		27.1%	60.9%	11.9%	0.1%	-	-	-	
% Total	5.9%	13.3%	2.2%	0%	21.4%	-		5.7%	15.6%	7.2%	0%	28.6%	-		2.6%	17.3%	3.9%	0%	23.8%	-		7.1%	15.9%	3.1%	0%	26.2%	-	-	
Lights	727	1634	270	0	2631	-		709	1921	899	2	3531	-		321	2147	484	1	2953	-		882	1974	383	2	3241	-	12356	
% Lights	99.2%	98.0%	97.8%	0%	98.3%	-		98.6%	98.6%	99.3%	100%	98.8%	-		99.4%	99.0%	99.0%	100%	99.0%	-		99.3%	99.0%	98.5%	100%	99.1%	-	98.8%	
Articulated Trucks	0	2	1	0	3	-		2	4	1	0	7	-		0	2	1	0	3	-		0	5	1	0	6	-	19	
% Articulated Trucks	0%	0.1%	0.4%	0%	0.1%	-		0.3%	0.2%	0.1%	0%	0.2%	-		0%	0.1%	0.2%	0%	0.1%	-		0%	0.3%	0.3%	0%	0.2%	-	0.2%	
Buses and Single-Unit Trucks	6	31	5	0	42	-		8	24	5	0	37	-		2	20	4	0	26	-		6	14	5	0	25	-	130	
% Buses and Single-Unit Trucks	0.8%	1.9%	1.8%	0%	1.6%	-		1.1%	1.2%	0.6%	0%	1.0%	-		0.6%	0.9%	0.8%	0%	0.9%	-		0.7%	0.7%	1.3%	0%	0.8%	-	1.0%	
Pedestrians	-	-	-	-	-	6		-	-	-	-	-	0		-	-	-	-	-	8		-	-	-	-	-	2		
% Pedestrians	-	-	-	-	-	100%		-	-	-	-	-	-		-	-	-	-	-	100%		-	-	-	-	-	100%		

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

6. W. Edgewood Dr. at Sunset Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627322, Location: 29.525558, -95.214615



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	W. Edgewood Dr. Eastbound						W. Edgewood Dr. Westbound						Sunset Dr. Northbound						Sunset Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	64	8	0	72	0	13	35	2	0	50	0	9	1	69	0	79	0	6	1	6	0	13	0	214
6:45AM	1	79	16	0	96	0	23	57	2	0	82	0	12	0	69	0	81	0	6	5	2	0	13	0	272
Hourly Total	1	143	24	0	168	0	36	92	4	0	132	0	21	1	138	0	160	0	12	6	8	0	26	0	486
7:00AM	1	76	8	0	85	0	13	47	1	0	61	0	11	0	74	0	85	0	4	3	6	0	13	0	244
7:15AM	0	89	19	0	108	0	26	64	1	0	91	0	13	1	113	0	127	0	9	9	8	0	26	0	352
7:30AM	3	83	11	0	97	0	56	71	2	0	129	0	22	0	97	0	119	0	13	4	25	0	42	0	387
7:45AM	13	88	26	0	127	0	95	59	8	0	162	0	14	1	56	0	71	0	1	8	20	0	29	0	389
Hourly Total	17	336	64	0	417	0	190	241	12	0	443	0	60	2	340	0	402	0	27	24	59	0	110	0	1372
8:00AM	3	95	31	0	129	0	67	60	5	0	132	0	21	3	51	0	75	0	7	11	3	0	21	0	357
8:15AM	1	68	20	0	89	0	62	47	3	0	112	0	25	2	74	0	101	0	5	5	1	0	11	0	313
Hourly Total	4	163	51	0	218	0	129	107	8	0	244	0	46	5	125	0	176	0	12	16	4	0	32	0	670
4:30PM	0	65	28	0	93	0	78	106	7	0	191	0	29	10	97	0	136	0	6	8	3	0	17	0	437
4:45PM	3	77	33	0	113	0	91	113	15	0	219	0	24	10	82	0	116	0	4	3	1	0	8	0	456
Hourly Total	3	142	61	0	206	0	169	219	22	0	410	0	53	20	179	0	252	0	10	11	4	0	25	0	893
5:00PM	5	70	36	0	111	0	90	114	10	0	214	0	41	13	78	0	132	0	6	5	2	0	13	0	470
5:15PM	4	95	44	0	143	0	87	104	6	0	197	0	41	5	127	0	173	0	7	6	5	0	18	0	531
5:30PM	4	67	25	0	96	0	115	113	13	0	241	1	39	5	80	0	124	0	6	6	3	0	15	0	476
5:45PM	6	121	21	0	148	0	80	116	12	0	208	1	32	7	78	0	117	0	6	4	5	0	15	0	488
Hourly Total	19	353	126	0	498	0	372	447	41	0	860	2	153	30	363	0	546	0	25	21	15	0	61	0	1965
6:00PM	7	61	23	0	91	0	100	103	10	0	213	0	46	7	65	0	118	0	7	4	5	0	16	0	438
6:15PM	3	82	32	0	117	0	64	112	16	0	192	0	36	8	61	0	105	0	7	5	4	0	16	0	430
Hourly Total	10	143	55	0	208	0	164	215	26	0	405	0	82	15	126	0	223	0	14	9	9	0	32	0	868
Total	54	1280	381	0	1715	0	1060	1321	113	0	2494	2	415	73	1271	0	1759	0	100	87	99	0	286	0	6254
% Approach	3.1%	74.6%	22.2%	0%	-	-	42.5%	53.0%	4.5%	0%	-	-	23.6%	4.2%	72.3%	0%	-	-	35.0%	30.4%	34.6%	0%	-	-	-
% Total	0.9%	20.5%	6.1%	0%	27.4%	-	16.9%	21.1%	1.8%	0%	39.9%	-	6.6%	1.2%	20.3%	0%	28.1%	-	1.6%	1.4%	1.6%	0%	4.6%	-	-
Lights	53	1258	375	0	1686	-	1045	1303	110	0	2458	-	412	73	1252	0	1737	-	99	87	94	0	280	-	6161
% Lights	98.1%	98.3%	98.4%	0%	98.3%	-	98.6%	98.6%	97.3%	0%	98.6%	-	99.3%	100%	98.5%	0%	98.7%	-	99.0%	100%	94.9%	0%	97.9%	-	98.5%
Articulated Trucks	0	3	1	0	4	-	0	5	0	0	5	-	1	0	0	0	1	-	0	0	0	0	0	-	10
% Articulated Trucks	0%	0.2%	0.3%	0%	0.2%	-	0%	0.4%	0%	0%	0.2%	-	0.2%	0%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	1	19	5	0	25	-	15	13	3	0	31	-	2	0	19	0	21	-	1	0	5	0	6	-	83
% Buses and Single-Unit Trucks	1.9%	1.5%	1.3%	0%	1.5%	-	1.4%	1.0%	2.7%	0%	1.2%	-	0.5%	0%	1.5%	0%	1.2%	-	1.0%	0%	5.1%	0%	2.1%	-	1.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

7. W. Edgewood Dr. at Rustic Ln. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627323, Location: 29.522968, -95.217462



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	W. Edgewood Dr. Eastbound						W. Edgewood Dr. Westbound						Greenbriar Dr Northbound						Rustic Ln. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	65	1	0	66	0	0	43	4	0	47	0	0	1	1	0	2	0	4	0	1	0	5	0	120
6:45AM	0	86	0	0	86	0	0	61	7	0	68	0	1	0	2	0	3	0	7	2	0	0	9	0	166
Hourly Total	0	151	1	0	152	0	0	104	11	0	115	0	1	1	3	0	5	0	11	2	1	0	14	0	286
7:00AM	2	72	1	0	75	0	0	58	10	0	68	0	1	1	4	0	6	0	8	2	0	0	10	0	159
7:15AM	3	98	2	0	103	0	0	71	12	0	83	0	2	1	5	0	8	0	6	3	1	0	10	0	204
7:30AM	0	97	10	0	107	0	2	84	38	0	124	0	1	2	6	0	9	0	17	4	2	0	23	0	263
7:45AM	2	84	19	0	105	0	8	60	23	0	91	0	4	1	1	0	6	0	18	5	0	0	23	0	225
Hourly Total	7	351	32	0	390	0	10	273	83	0	366	0	8	5	16	0	29	0	49	14	3	0	66	0	851
8:00AM	2	101	2	0	105	0	5	71	10	0	86	0	2	0	6	0	8	0	11	1	0	0	12	0	211
8:15AM	3	72	2	0	77	0	1	61	10	0	72	0	1	1	5	0	7	0	16	5	0	0	21	0	177
Hourly Total	5	173	4	0	182	0	6	132	20	0	158	0	3	1	11	0	15	0	27	6	0	0	33	0	388
4:30PM	2	88	2	0	92	0	4	110	15	0	129	0	2	0	1	0	3	0	11	4	0	0	15	0	239
4:45PM	4	96	1	0	101	0	4	117	15	0	136	0	1	0	1	0	2	0	7	3	1	0	11	0	250
Hourly Total	6	184	3	0	193	0	8	227	30	0	265	0	3	0	2	0	5	0	18	7	1	0	26	0	489
5:00PM	1	91	2	0	94	0	2	128	20	0	150	0	2	1	3	0	6	0	12	3	4	0	19	0	269
5:15PM	0	114	1	0	115	0	2	136	18	0	156	0	5	0	2	0	7	0	19	4	4	0	27	0	305
5:30PM	2	113	3	0	118	0	1	128	19	0	148	0	1	1	0	0	2	0	11	4	0	0	15	0	283
5:45PM	1	107	1	0	109	0	3	138	12	0	153	0	0	5	3	0	8	0	16	0	1	0	17	0	287
Hourly Total	4	425	7	0	436	0	8	530	69	0	607	0	8	7	8	0	23	0	58	11	9	0	78	0	1144
6:00PM	2	82	1	0	85	0	4	119	27	0	150	0	0	0	1	0	1	0	10	4	0	0	14	0	250
6:15PM	0	104	1	0	105	0	4	144	11	0	159	0	1	1	3	0	5	0	13	2	0	0	15	0	284
Hourly Total	2	186	2	0	190	0	8	263	38	0	309	0	1	1	4	0	6	0	23	6	0	0	29	0	534
Total	24	1470	49	0	1543	0	40	1529	251	0	1820	0	24	15	44	0	83	0	186	46	14	0	246	0	3692
% Approach	1.6%	95.3%	3.2%	0%	-	-	2.2%	84.0%	13.8%	0%	-	-	28.9%	18.1%	53.0%	0%	-	-	75.6%	18.7%	5.7%	0%	-	-	-
% Total	0.7%	39.8%	1.3%	0%	41.8%	-	1.1%	41.4%	6.8%	0%	49.3%	-	0.7%	0.4%	1.2%	0%	2.2%	-	5.0%	1.2%	0.4%	0%	6.7%	-	-
Lights	20	1444	48	0	1512	-	40	1509	247	0	1796	-	24	14	43	0	81	-	186	46	13	0	245	-	3634
% Lights	83.3%	98.2%	98.0%	0%	98.0%	-	100%	98.7%	98.4%	0%	98.7%	-	100%	93.3%	97.7%	0%	97.6%	-	100%	100%	92.9%	0%	99.6%	-	98.4%
Articulated Trucks	0	4	0	0	4	-	0	3	0	0	3	-	0	0	0	0	0	-	0	0	0	0	0	-	7
% Articulated Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	4	22	1	0	27	-	0	17	4	0	21	-	0	1	1	0	2	-	0	0	1	0	1	-	51
% Buses and Single-Unit Trucks	16.7%	1.5%	2.0%	0%	1.7%	-	0%	1.1%	1.6%	0%	1.2%	-	0%	6.7%	2.3%	0%	2.4%	-	0%	0%	7.1%	0%	0.4%	-	1.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

8. E. Broadway St at Longwood Dr - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627324, Location: 29.545922, -95.228786



Provided by: C. J. Hensch & Associates Inc.

5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	Longwood Dr Westbound					Broadway St Northbound					Broadway St Southbound					
Time	L	R	U	App	Ped*	T	R	U	App	Ped*	L	T	U	App	Ped*	Int
2019-02-27 6:30AM	2	24	0	26	0	255	0	0	255	0	2	92	0	94	0	375
6:45AM	1	23	0	24	0	306	2	0	308	0	2	126	0	128	0	460
Hourly Total	3	47	0	50	0	561	2	0	563	0	4	218	0	222	0	835
7:00AM	0	16	0	16	0	319	1	0	320	0	8	164	0	172	0	508
7:15AM	2	11	0	13	0	359	0	0	359	0	11	191	0	202	0	574
7:30AM	1	18	0	19	0	368	4	0	372	0	15	232	0	247	0	638
7:45AM	1	32	0	33	0	330	7	0	337	0	27	242	0	269	0	639
Hourly Total	4	77	0	81	0	1376	12	0	1388	0	61	829	0	890	0	2359
8:00AM	1	29	0	30	0	300	5	0	305	0	14	196	0	210	0	545
8:15AM	0	25	0	25	0	253	1	0	254	0	15	205	0	220	0	499
Hourly Total	1	54	0	55	0	553	6	0	559	0	29	401	0	430	0	1044
4:30PM	3	22	0	25	0	287	6	0	293	0	31	304	1	336	0	654
4:45PM	5	20	0	25	0	303	2	0	305	0	21	356	0	377	0	707
Hourly Total	8	42	0	50	0	590	8	0	598	0	52	660	1	713	0	1361
5:00PM	2	19	0	21	0	322	4	0	326	0	23	315	0	338	0	685
5:15PM	1	29	0	30	0	296	2	0	298	0	33	350	0	383	0	711
5:30PM	5	21	0	26	0	313	5	0	318	0	16	346	0	362	0	706
5:45PM	4	18	0	22	0	326	6	0	332	0	24	331	0	355	0	709
Hourly Total	12	87	0	99	0	1257	17	0	1274	0	96	1342	0	1438	0	2811
6:00PM	6	20	0	26	0	313	8	0	321	0	26	296	0	322	0	669
6:15PM	6	17	0	23	0	282	2	0	284	0	17	300	0	317	0	624
Hourly Total	12	37	0	49	0	595	10	0	605	0	43	596	0	639	0	1293
Total	40	344	0	384	0	4932	55	0	4987	0	285	4046	1	4332	0	9703
% Approach	10.4%	89.6%	0%	-	-	98.9%	1.1%	0%	-	-	6.6%	93.4%	0%	-	-	-
% Total	0.4%	3.5%	0%	4.0%	-	50.8%	0.6%	0%	51.4%	-	2.9%	41.7%	0%	44.6%	-	-
Lights	40	341	0	381	-	4888	53	0	4941	-	279	4002	1	4282	-	9604
% Lights	100%	99.1%	0%	99.2%	-	99.1%	96.4%	0%	99.1%	-	97.9%	98.9%	100%	98.8%	-	99.0%
Articulated Trucks	0	1	0	1	-	4	0	0	4	-	2	6	0	8	-	13
% Articulated Trucks	0%	0.3%	0%	0.3%	-	0.1%	0%	0%	0.1%	-	0.7%	0.1%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	0	2	0	2	-	40	2	0	42	-	4	38	0	42	-	86
% Buses and Single-Unit Trucks	0%	0.6%	0%	0.5%	-	0.8%	3.6%	0%	0.8%	-	1.4%	0.9%	0%	1.0%	-	0.9%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

9. S. Friendswood Dr. at E. Spreading Oaks A... - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627325, Location: 29.528522, -95.199983



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Spreading Oaks Ave. Eastbound						Spreading Oaks Ave. Westbound						Friendswood Dr Northbound						Friendswood Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	1	0	4	0	5	0	0	1	1	0	2	0	0	108	0	0	108	0	0	54	0	0	54	1	169
6:45AM	1	0	9	0	10	0	1	0	1	0	2	1	2	122	1	0	125	0	0	71	1	0	72	0	209
Hourly Total	2	0	13	0	15	0	1	1	2	0	4	1	2	230	1	0	233	0	0	125	1	0	126	1	378
7:00AM	4	0	9	0	13	0	4	1	1	0	6	0	1	164	1	0	166	0	0	96	1	0	97	0	282
7:15AM	9	0	4	0	13	0	2	2	0	0	4	0	7	197	2	0	206	0	0	118	3	0	121	0	344
7:30AM	8	0	2	0	10	0	2	2	0	0	4	0	5	238	1	0	244	0	0	176	12	0	188	0	446
7:45AM	14	2	25	0	41	0	1	10	0	0	11	0	6	199	2	0	207	0	1	206	10	0	217	0	476
Hourly Total	35	2	40	0	77	0	9	15	1	0	25	0	19	798	6	0	823	0	1	596	26	0	623	0	1548
8:00AM	14	0	9	0	23	0	6	0	2	0	8	0	4	191	2	0	197	0	0	183	9	0	192	0	420
8:15AM	7	1	11	0	19	0	2	2	2	0	6	0	16	206	3	0	225	0	3	176	5	0	184	0	434
Hourly Total	21	1	20	0	42	0	8	2	4	0	14	0	20	397	5	0	422	0	3	359	14	0	376	0	854
4:30PM	13	3	26	0	42	0	12	2	2	0	16	0	12	228	0	0	240	0	0	232	10	0	242	0	540
4:45PM	7	1	18	0	26	1	17	6	2	0	25	0	18	240	2	0	260	0	2	233	4	1	240	0	551
Hourly Total	20	4	44	0	68	1	29	8	4	0	41	0	30	468	2	0	500	0	2	465	14	1	482	0	1091
5:00PM	6	5	21	0	32	0	7	3	0	0	10	0	12	231	2	1	246	0	1	248	8	0	257	0	545
5:15PM	15	7	13	0	35	0	9	8	2	0	19	0	19	256	8	0	283	0	1	203	10	0	214	0	551
5:30PM	15	2	16	0	33	0	3	5	2	0	10	0	18	227	8	0	253	0	0	239	5	0	244	0	540
5:45PM	10	3	9	0	22	0	10	5	1	0	16	0	23	246	1	0	270	0	0	229	8	0	237	0	545
Hourly Total	46	17	59	0	122	0	29	21	5	0	55	0	72	960	19	1	1052	0	2	919	31	0	952	0	2181
6:00PM	12	1	22	0	35	0	5	3	1	0	9	0	14	198	1	0	213	0	0	202	10	0	212	0	469
6:15PM	1	5	10	0	16	0	9	5	0	0	14	0	17	203	2	0	222	0	0	187	8	0	195	0	447
Hourly Total	13	6	32	0	51	0	14	8	1	0	23	0	31	401	3	0	435	0	0	389	18	0	407	0	916
Total	137	30	208	0	375	1	90	55	17	0	162	1	174	3254	36	1	3465	0	8	2853	104	1	2966	1	6968
% Approach	36.5%	8.0%	55.5%	0%	-	-	55.6%	34.0%	10.5%	0%	-	-	5.0%	93.9%	1.0%	0%	-	-	0.3%	96.2%	3.5%	0%	-	-	-
% Total	2.0%	0.4%	3.0%	0%	5.4%	-	1.3%	0.8%	0.2%	0%	2.3%	-	2.5%	46.7%	0.5%	0%	49.7%	-	0.1%	40.9%	1.5%	0%	42.6%	-	-
Lights	136	30	192	0	358	-	88	54	16	0	158	-	161	3217	36	1	3415	-	7	2823	104	1	2935	-	6866
% Lights	99.3%	100%	92.3%	0%	95.5%	-	97.8%	98.2%	94.1%	0%	97.5%	-	92.5%	98.9%	100%	100%	98.6%	-	87.5%	98.9%	100%	100%	99.0%	-	98.5%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	3	0	0	3	-	0	6	0	0	6	-	9
% Articulate d Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%	0.2%	0%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	1	0	16	0	17	-	2	1	1	0	4	-	13	34	0	0	47	-	1	24	0	0	25	-	93
% Buses and Single-Unit Trucks	0.7%	0%	7.7%	0%	4.5%	-	2.2%	1.8%	5.9%	0%	2.5%	-	7.5%	1.0%	0%	0%	1.4%	-	12.5%	0.8%	0%	0%	0.8%	-	1.3%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	100%	

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

10. S Friendswood Dr. at E. Castlewood Ave. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627327, Location: 29.523566, -95.193978



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Castlewood Ave. Eastbound						Castlewood Ave. Westbound						S Friendswood Dr. Northbound						S Friendswood Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27 6:30AM	7	0	4	0	11	0	0	0	3	0	3	0	5	107	1	0	113	0	0	61	3	1	65	0	192
6:45AM	2	0	9	0	11	0	0	1	2	0	3	0	3	119	1	0	123	0	1	78	2	0	81	0	218
Hourly Total	9	0	13	0	22	0	0	1	5	0	6	0	8	226	2	0	236	0	1	139	5	1	146	0	410
7:00AM	8	0	14	0	22	0	4	0	4	0	8	0	10	137	2	0	149	0	2	120	4	0	126	0	305
7:15AM	16	0	14	0	30	0	5	3	6	0	14	0	6	200	2	0	208	0	1	130	3	0	134	0	386
7:30AM	16	1	22	0	39	0	2	0	8	0	10	0	14	187	4	0	205	0	4	170	7	0	181	0	435
7:45AM	13	2	15	0	30	0	4	0	5	0	9	0	15	192	3	0	210	0	8	225	6	0	239	0	488
Hourly Total	53	3	65	0	121	0	15	3	23	0	41	0	45	716	11	0	772	0	15	645	20	0	680	0	1614
8:00AM	10	1	21	0	32	0	6	1	4	0	11	0	25	210	7	0	242	0	5	207	11	0	223	0	508
8:15AM	21	0	15	0	36	0	6	4	1	0	11	0	24	203	4	0	231	0	1	145	18	0	164	0	442
Hourly Total	31	1	36	0	68	0	12	5	5	0	22	0	49	413	11	0	473	0	6	352	29	0	387	0	950
4:30PM	16	3	21	0	40	0	3	2	1	0	6	0	18	232	4	0	254	0	3	240	16	0	259	0	559
4:45PM	17	1	13	0	31	0	6	1	4	0	11	0	25	245	7	0	277	0	5	258	11	0	274	0	593
Hourly Total	33	4	34	0	71	0	9	3	5	0	17	0	43	477	11	0	531	0	8	498	27	0	533	0	1152
5:00PM	13	4	17	0	34	0	2	2	2	0	6	0	25	248	4	0	277	0	1	260	11	0	272	0	589
5:15PM	12	2	32	0	46	0	4	1	2	0	7	0	30	305	2	0	337	0	2	238	17	0	257	0	647
5:30PM	14	0	15	0	29	0	3	1	1	0	5	0	31	244	4	0	279	0	3	244	17	0	264	0	577
5:45PM	5	1	23	0	29	0	2	3	1	0	6	0	34	288	1	0	323	0	2	257	16	0	275	0	633
Hourly Total	44	7	87	0	138	0	11	7	6	0	24	0	120	1085	11	0	1216	0	8	999	61	0	1068	0	2446
6:00PM	18	0	25	0	43	0	3	1	2	0	6	0	20	216	4	0	240	0	2	210	20	0	232	0	521
6:15PM	7	0	16	0	23	0	3	0	0	0	3	0	32	228	2	0	262	0	5	216	4	0	225	0	513
Hourly Total	25	0	41	0	66	0	6	1	2	0	9	0	52	444	6	0	502	0	7	426	24	0	457	0	1034
Total	195	15	276	0	486	0	53	20	46	0	119	0	317	3361	52	0	3730	0	45	3059	166	1	3271	0	7606
% Approach	40.1%	3.1%	56.8%	0%	-	-	44.5%	16.8%	38.7%	0%	-	-	8.5%	90.1%	1.4%	0%	-	-	1.4%	93.5%	5.1%	0%	-	-	-
% Total	2.6%	0.2%	3.6%	0%	6.4%	-	0.7%	0.3%	0.6%	0%	1.6%	-	4.2%	44.2%	0.7%	0%	49.0%	-	0.6%	40.2%	2.2%	0%	43.0%	-	-
Lights	193	15	276	0	484	-	51	20	44	0	115	-	315	3311	52	0	3678	-	42	3012	165	1	3220	-	7497
% Lights	99.0%	100%	100%	0%	99.6%	-	96.2%	100%	95.7%	0%	96.6%	-	99.4%	98.5%	100%	0%	98.6%	-	93.3%	98.5%	99.4%	100%	98.4%	-	98.6%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	4	0	0	4	-	0	7	0	0	7	-	11
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%	0.2%	0%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	2	0	0	0	2	-	2	0	2	0	4	-	2	46	0	0	48	-	3	40	1	0	44	-	98
% Buses and Single-Unit Trucks	1.0%	0%	0%	0%	0.4%	-	3.8%	0%	4.3%	0%	3.4%	-	0.6%	1.4%	0%	0%	1.3%	-	6.7%	1.3%	0.6%	0%	1.3%	-	1.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

11. S. Friendswood Dr. at Whispering Pines - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627328, Location: 29.519494, -95.19057



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Unnamed Drwy Eastbound						Whispering Pines Westbound						S. Friendswood Dr. Northbound						S. Friendswood Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	0	0	0	0	0	22	0	17	0	39	0	0	89	27	0	116	0	6	47	0	0	53	0	208
6:45AM	0	0	0	0	0	0	24	0	17	0	41	0	0	104	26	0	130	0	11	81	0	0	92	0	263
Hourly Total	0	0	0	0	0	0	46	0	34	0	80	0	0	193	53	0	246	0	17	128	0	0	145	0	471
7:00AM	0	0	0	0	0	0	38	0	27	0	65	0	0	129	26	0	155	0	20	117	0	0	137	0	357
7:15AM	0	0	0	0	0	0	40	0	26	0	66	0	0	193	30	0	223	0	16	105	0	0	121	0	410
7:30AM	0	2	0	0	2	0	32	0	25	0	57	0	1	201	48	0	250	0	29	168	1	0	198	0	507
7:45AM	0	1	0	0	1	0	38	0	33	0	71	0	3	195	19	0	217	0	24	204	4	0	232	0	521
Hourly Total	0	3	0	0	3	0	148	0	111	0	259	0	4	718	123	0	845	0	89	594	5	0	688	0	1795
8:00AM	0	1	0	0	1	0	36	0	41	0	77	0	4	216	36	0	256	0	19	187	1	0	207	0	541
8:15AM	0	1	2	0	3	0	28	1	40	0	69	0	6	225	30	0	261	0	22	148	0	0	170	0	503
Hourly Total	0	2	2	0	4	0	64	1	81	0	146	0	10	441	66	0	517	0	41	335	1	0	377	0	1044
4:30PM	4	1	6	0	11	0	64	0	62	0	126	0	0	211	55	0	266	0	48	204	1	0	253	0	656
4:45PM	1	0	6	0	7	0	85	1	50	0	136	0	0	202	58	0	260	0	47	232	0	0	279	0	682
Hourly Total	5	1	12	0	18	0	149	1	112	0	262	0	0	413	113	0	526	0	95	436	1	0	532	0	1338
5:00PM	4	4	10	0	18	0	75	2	42	0	119	0	0	227	71	0	298	0	56	236	0	0	292	0	727
5:15PM	1	4	8	0	13	0	104	1	59	0	164	0	0	269	51	0	320	0	47	243	2	0	292	0	789
5:30PM	3	1	2	0	6	0	84	2	57	0	143	0	1	220	58	0	279	0	50	223	0	0	273	0	701
5:45PM	0	1	1	0	2	0	80	0	64	0	144	0	0	248	53	0	301	0	56	229	0	0	285	0	732
Hourly Total	8	10	21	0	39	0	343	5	222	0	570	0	1	964	233	0	1198	0	209	931	2	0	1142	0	2949
6:00PM	0	2	1	0	3	0	88	0	47	0	135	0	0	216	66	0	282	0	47	191	0	0	238	0	658
6:15PM	2	1	5	0	8	0	57	0	49	0	106	0	0	185	60	0	245	0	63	199	0	0	262	0	621
Hourly Total	2	3	6	0	11	0	145	0	96	0	241	0	0	401	126	0	527	0	110	390	0	0	500	0	1279
Total	15	19	41	0	75	0	895	7	656	0	1558	0	15	3130	714	0	3859	0	561	2814	9	0	3384	0	8876
% Approach	20.0%	25.3%	54.7%	0%	-	-	57.4%	0.4%	42.1%	0%	-	-	0.4%	81.1%	18.5%	0%	-	-	16.6%	83.2%	0.3%	0%	-	-	-
% Total	0.2%	0.2%	0.5%	0%	0.8%	-	10.1%	0.1%	7.4%	0%	17.6%	-	0.2%	35.3%	8.0%	0%	43.5%	-	6.3%	31.7%	0.1%	0%	38.1%	-	-
Lights	15	18	41	0	74	-	887	7	651	0	1545	-	15	3085	707	0	3807	-	553	2773	9	0	3335	-	8761
% Lights	100%	94.7%	100%	0%	98.7%	-	99.1%	100%	99.2%	0%	99.2%	-	100%	98.6%	99.0%	0%	98.7%	-	98.6%	98.5%	100%	0%	98.6%	-	98.7%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	2	0	0	2	-	1	5	0	0	6	-	8
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0.2%	0.2%	0%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	0	1	0	0	1	-	8	0	5	0	13	-	0	43	7	0	50	-	7	36	0	0	43	-	107
% Buses and Single-Unit Trucks	0%	5.3%	0%	0%	1.3%	-	0.9%	0%	0.8%	0%	0.8%	-	0%	1.4%	1.0%	0%	1.3%	-	1.2%	1.3%	0%	0%	1.3%	-	1.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

12. S. Friendswood Dr. at Winding Way Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627329, Location: 29.515165, -95.189875



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Winding Way Dr. Eastbound						Winding Way Dr. Westbound						S. Friendswood Dr. Northbound						S. Friendswood Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	5	0	1	0	6	0	0	0	17	0	17	0	0	122	0	0	122	0	10	54	0	0	64	0	209
6:45AM	5	2	3	0	10	0	0	2	24	0	26	0	3	116	3	0	122	0	18	86	1	0	105	0	263
Hourly Total	10	2	4	0	16	0	0	2	41	0	43	0	3	238	3	0	244	0	28	140	1	0	169	0	472
7:00AM	7	6	6	0	19	0	0	6	26	0	32	0	7	185	1	0	193	0	31	105	3	0	139	0	383
7:15AM	10	13	16	0	39	0	1	19	53	0	73	0	36	238	5	0	279	0	41	98	2	0	141	0	532
7:30AM	16	17	16	0	49	0	3	9	43	0	55	0	15	178	4	0	197	0	51	148	4	0	203	0	504
7:45AM	3	8	4	0	15	0	1	6	44	0	51	0	6	191	2	0	199	0	44	174	4	0	222	0	487
Hourly Total	36	44	42	0	122	0	5	40	166	0	211	0	64	792	12	0	868	0	167	525	13	0	705	0	1906
8:00AM	1	10	3	0	14	0	2	3	46	0	51	0	7	201	2	0	210	0	50	174	7	0	231	0	506
8:15AM	4	2	4	0	10	0	2	6	50	0	58	0	14	196	6	0	216	0	37	150	5	0	192	0	476
Hourly Total	5	12	7	0	24	0	4	9	96	0	109	0	21	397	8	0	426	0	87	324	12	0	423	0	982
4:30PM	10	4	7	0	21	1	2	8	75	0	85	0	2	164	9	0	175	0	38	247	7	0	292	0	573
4:45PM	11	7	6	0	24	0	5	3	68	0	76	0	3	193	8	0	204	0	46	246	5	0	297	0	601
Hourly Total	21	11	13	0	45	1	7	11	143	0	161	0	5	357	17	0	379	0	84	493	12	0	589	0	1174
5:00PM	8	7	5	0	20	0	7	13	77	0	97	0	6	209	4	0	219	0	54	278	9	1	342	0	678
5:15PM	8	7	1	0	16	0	2	13	85	0	100	0	9	234	3	0	246	0	56	272	11	0	339	0	701
5:30PM	1	9	5	0	15	0	8	12	58	0	78	0	8	200	8	0	216	0	52	250	5	0	307	0	616
5:45PM	7	6	6	0	19	0	6	10	64	0	80	0	4	237	6	0	247	0	46	244	10	0	300	0	646
Hourly Total	24	29	17	0	70	0	23	48	284	0	355	0	27	880	21	0	928	0	208	1044	35	1	1288	0	2641
6:00PM	12	3	2	0	17	0	2	6	61	0	69	0	4	179	6	0	189	0	57	217	12	0	286	0	561
6:15PM	6	2	2	0	10	0	5	7	47	0	59	0	6	215	3	0	224	0	29	214	4	0	247	0	540
Hourly Total	18	5	4	0	27	0	7	13	108	0	128	0	10	394	9	0	413	0	86	431	16	0	533	0	1101
Total	114	103	87	0	304	1	46	123	838	0	1007	0	130	3058	70	0	3258	0	660	2957	89	1	3707	0	8276
% Approach	37.5%	33.9%	28.6%	0%	-	-	4.6%	12.2%	83.2%	0%	-	-	4.0%	93.9%	2.1%	0%	-	-	17.8%	79.8%	2.4%	0%	-	-	-
% Total	1.4%	1.2%	1.1%	0%	3.7%	-	0.6%	1.5%	10.1%	0%	12.2%	-	1.6%	37.0%	0.8%	0%	39.4%	-	8.0%	35.7%	1.1%	0%	44.8%	-	-
Lights	113	102	86	0	301	-	46	123	831	0	1000	-	130	3011	70	0	3211	-	651	2918	89	1	3659	-	8171
% Lights	99.1%	99.0%	98.9%	0%	99.0%	-	100%	100%	99.2%	0%	99.3%	-	100%	98.5%	100%	0%	98.6%	-	98.6%	98.7%	100%	100%	98.7%	-	98.7%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	1	-	0	7	0	0	7	-	8
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.2%	0%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	1	1	1	0	3	-	0	0	7	0	7	-	0	46	0	0	46	-	9	32	0	0	41	-	97
% Buses and Single-Unit Trucks	0.9%	1.0%	1.1%	0%	1.0%	-	0%	0%	0.8%	0%	0.7%	-	0%	1.5%	0%	0%	1.4%	-	1.4%	1.1%	0%	0%	1.1%	-	1.2%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

13. S. Friendswood at E. Parkwood Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627331, Location: 29.509244, -95.188459



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Parkwood Dr. Eastbound							Parkwood Dr. Westbound							Friendswood Northbound							Friendswood Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		Int
2019-02-27																													
6:30AM	21	210	48	0	279	0		9	68	8	0	85	0		58	82	56	0	196	0		19	33	20	0	72	0		632
6:45AM	25	230	44	0	299	0		7	101	1	0	109	0		56	77	53	0	186	0		21	39	29	0	89	0		683
Hourly Total	46	440	92	0	578	0		16	169	9	0	194	0		114	159	109	0	382	0		40	72	49	0	161	0		1315
7:00AM	32	270	40	0	342	0		17	143	10	0	170	0		72	132	56	1	261	0		24	60	29	0	113	0		886
7:15AM	73	269	47	0	389	0		22	107	7	0	136	0		84	215	69	0	368	0		40	81	50	0	171	0		1064
7:30AM	63	339	74	0	476	0		31	149	15	0	195	0		87	118	80	0	285	1		42	109	80	0	231	0		1187
7:45AM	54	325	74	0	453	0		38	161	15	0	214	0		103	143	82	0	328	0		34	96	58	0	188	0		1183
Hourly Total	222	1203	235	0	1660	0		108	560	47	0	715	0		346	608	287	1	1242	1		140	346	217	0	703	0		4320
8:00AM	59	235	77	0	371	0		44	124	11	0	179	0		113	185	58	0	356	0		30	115	56	0	201	0		1107
8:15AM	54	281	80	0	415	0		41	158	12	0	211	0		98	136	69	0	303	0		28	84	45	0	157	0		1086
Hourly Total	113	516	157	0	786	0		85	282	23	0	390	0		211	321	127	0	659	0		58	199	101	0	358	0		2193
4:30PM	64	226	86	0	376	0		73	306	15	0	394	0		76	108	32	0	216	0		32	152	93	0	277	0		1263
4:45PM	51	195	93	0	339	0		63	319	19	0	401	0		92	128	36	0	256	0		34	149	91	0	274	0		1270
Hourly Total	115	421	179	0	715	0		136	625	34	0	795	0		168	236	68	0	472	0		66	301	184	0	551	0		2533
5:00PM	62	248	101	0	411	0		72	362	25	0	459	0		76	129	47	1	253	0		24	162	88	0	274	0		1397
5:15PM	53	240	91	0	384	0		69	355	23	0	447	0		93	151	38	0	282	0		26	172	96	0	294	0		1407
5:30PM	72	282	89	0	443	0		76	341	15	0	432	0		81	130	46	0	257	0		27	160	67	0	254	0		1386
5:45PM	54	215	94	0	363	0		68	293	20	0	381	0		96	164	40	0	300	0		25	178	81	0	284	0		1328
Hourly Total	241	985	375	0	1601	0		285	1351	83	0	1719	0		346	574	171	1	1092	0		102	672	332	0	1106	0		5518
6:00PM	63	245	96	0	404	0		69	307	12	0	388	0		77	125	45	0	247	0		25	131	76	0	232	1		1271
6:15PM	63	189	74	0	326	0		69	280	16	0	365	0		82	132	47	1	262	0		23	139	70	1	233	0		1186
Hourly Total	126	434	170	0	730	0		138	587	28	0	753	0		159	257	92	1	509	0		48	270	146	1	465	1		2457
Total	863	3999	1208	0	6070	0		768	3574	224	0	4566	0		1344	2155	854	3	4356	1		454	1860	1029	1	3344	1		18336
% Approach	14.2%	65.9%	19.9%	0%	-	-		16.8%	78.3%	4.9%	0%	-	-		30.9%	49.5%	19.6%	0.1%	-	-		13.6%	55.6%	30.8%	0%	-	-		-
% Total	4.7%	21.8%	6.6%	0%	33.1%	-		4.2%	19.5%	1.2%	0%	24.9%	-		7.3%	11.8%	4.7%	0%	23.8%	-		2.5%	10.1%	5.6%	0%	18.2%	-		-
Lights	856	3958	1185	0	5999	-		763	3551	223	0	4537	-		1329	2126	853	3	4311	-		451	1830	1020	1	3302	-		18149
% Lights	99.2%	99.0%	98.1%	0%	98.8%	-		99.3%	99.4%	99.6%	0%	99.4%	-		98.9%	98.7%	99.9%	100%	99.0%	-		99.3%	98.4%	99.1%	100%	98.7%	-		99.0%
Articulated Trucks	0	16	4	0	20	-		1	8	1	0	10	-		1	0	1	0	2	-		2	2	1	0	5	-		37
% Articulate d Trucks	0%	0.4%	0.3%	0%	0.3%	-		0.1%	0.2%	0.4%	0%	0.2%	-		0.1%	0%	0.1%	0%	0%	-		0.4%	0.1%	0.1%	0%	0.1%	-		0.2%
Buses and Single-Unit Trucks	7	25	19	0	51	-		4	15	0	0	19	-		14	29	0	0	43	-		1	28	8	0	37	-		150
% Buses and Single-Unit Trucks	0.8%	0.6%	1.6%	0%	0.8%	-		0.5%	0.4%	0%	0%	0.4%	-		1.0%	1.3%	0%	0%	1.0%	-		0.2%	1.5%	0.8%	0%	1.1%	-		0.8%
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	1		-	-	-	-	-	-		1
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	100%		-	-	-	-	-	-		100%

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

14. S. Friendswood Dr. at Eagle Lakes Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627332, Location: 29.503867, -95.183507



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	Eagle Lakes Dr. Eastbound					S. Friendswood Dr. Northbound					S. Friendswood Dr. Southbound					
Time	L	R	U	App	Ped*	L	T	U	App	Ped*	T	R	U	App	Ped*	Int
2019-02-27 6:30AM	17	4	0	21	0	2	158	0	160	0	95	1	0	96	0	277
6:45AM	22	5	0	27	0	2	186	0	188	0	79	1	0	80	0	295
Hourly Total	39	9	0	48	0	4	344	0	348	0	174	2	0	176	0	572
7:00AM	31	3	0	34	0	2	227	0	229	0	118	9	0	127	0	390
7:15AM	52	7	0	59	0	3	360	0	363	0	141	7	0	148	0	570
7:30AM	41	5	0	46	0	5	320	0	325	0	178	17	0	195	0	566
7:45AM	45	12	0	57	0	2	299	0	301	0	196	18	0	214	0	572
Hourly Total	169	27	0	196	0	12	1206	0	1218	0	633	51	0	684	0	2098
8:00AM	44	12	0	56	0	4	338	0	342	0	236	15	0	251	0	649
8:15AM	53	10	0	63	1	8	363	0	371	1	181	11	0	192	0	626
Hourly Total	97	22	0	119	1	12	701	0	713	1	417	26	0	443	0	1275
4:30PM	26	3	0	29	0	7	243	0	250	0	303	39	1	343	0	622
4:45PM	16	6	0	22	0	7	239	0	246	0	290	28	0	318	0	586
Hourly Total	42	9	0	51	0	14	482	0	496	0	593	67	1	661	0	1208
5:00PM	25	2	0	27	1	5	261	0	266	1	315	32	0	347	0	640
5:15PM	16	6	0	22	0	12	270	0	282	0	333	39	0	372	0	676
5:30PM	23	5	0	28	0	8	289	0	297	0	312	31	0	343	0	668
5:45PM	17	2	0	19	0	9	253	0	262	0	313	49	0	362	0	643
Hourly Total	81	15	0	96	1	34	1073	0	1107	1	1273	151	0	1424	0	2627
6:00PM	21	2	0	23	0	12	262	0	274	0	286	30	0	316	0	613
6:15PM	36	9	0	45	0	4	237	0	241	0	282	35	1	318	0	604
Hourly Total	57	11	0	68	0	16	499	0	515	0	568	65	1	634	0	1217
Total	485	93	0	578	2	92	4305	0	4397	2	3658	362	2	4022	0	8997
% Approach	83.9%	16.1%	0%	-	-	2.1%	97.9%	0%	-	-	90.9%	9.0%	0%	-	-	-
% Total	5.4%	1.0%	0%	6.4%	-	1.0%	47.8%	0%	48.9%	-	40.7%	4.0%	0%	44.7%	-	-
Lights	484	91	0	575	-	90	4261	0	4351	-	3612	358	2	3972	-	8898
% Lights	99.8%	97.8%	0%	99.5%	-	97.8%	99.0%	0%	99.0%	-	98.7%	98.9%	100%	98.8%	-	98.9%
Articulated Trucks	0	0	0	0	-	0	1	0	1	-	5	0	0	5	-	6
% Articulated Trucks	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.1%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	1	2	0	3	-	2	43	0	45	-	41	4	0	45	-	93
% Buses and Single-Unit Trucks	0.2%	2.2%	0%	0.5%	-	2.2%	1.0%	0%	1.0%	-	1.1%	1.1%	0%	1.1%	-	1.0%
Pedestrians	-	-	-	-	2	-	-	-	-	2	-	-	-	-	0	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

15. E. Friendswood Dr. at Century Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627333, Location: 29.500236, -95.181314



Provided by: C. J. Hensch & Associates Inc.

5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	Century Dr. Westbound					Friendswood Dr. Northbound					Friendswood Dr. Southbound					
Time	L	R	U	App	Ped*	T	R	U	App	Ped*	L	T	U	App	Ped*	Int
2019-02-27 6:30AM	0	0	0	0	0	155	0	0	155	0	0	97	0	97	0	252
6:45AM	0	0	0	0	0	183	0	0	183	0	0	92	0	92	0	275
Hourly Total	0	0	0	0	0	338	0	0	338	0	0	189	0	189	0	527
7:00AM	0	1	0	1	0	234	0	0	234	0	1	127	0	128	0	363
7:15AM	0	0	0	0	0	325	0	0	325	0	0	146	0	146	0	471
7:30AM	0	0	0	0	0	291	0	0	291	0	1	184	0	185	0	476
7:45AM	0	2	0	2	0	292	0	0	292	0	2	211	0	213	0	507
Hourly Total	0	3	0	3	0	1142	0	0	1142	0	4	668	0	672	0	1817
8:00AM	0	0	0	0	0	329	0	0	329	0	6	227	0	233	0	562
8:15AM	0	2	0	2	0	350	1	0	351	0	2	208	0	210	0	563
Hourly Total	0	2	0	2	0	679	1	0	680	0	8	435	0	443	0	1125
4:30PM	0	5	0	5	0	255	0	0	255	0	2	295	1	298	0	558
4:45PM	2	5	0	7	0	233	1	0	234	0	0	282	0	282	0	523
Hourly Total	2	10	0	12	0	488	1	0	489	0	2	577	1	580	0	1081
5:00PM	0	2	0	2	0	264	0	0	264	0	3	315	0	318	0	584
5:15PM	0	4	0	4	0	268	0	0	268	0	2	321	0	323	0	595
5:30PM	0	0	0	0	0	299	0	0	299	0	1	330	0	331	0	630
5:45PM	0	0	0	0	0	245	0	0	245	0	0	317	0	317	0	562
Hourly Total	0	6	0	6	0	1076	0	0	1076	0	6	1283	0	1289	0	2371
6:00PM	1	1	0	2	0	271	0	0	271	0	3	291	0	294	0	567
6:15PM	0	3	0	3	0	234	0	0	234	0	1	276	0	277	0	514
Hourly Total	1	4	0	5	0	505	0	0	505	0	4	567	0	571	0	1081
Total	3	25	0	28	0	4228	2	0	4230	0	24	3719	1	3744	0	8002
% Approach	10.7%	89.3%	0%	-	-	100.0%	0%	0%	-	-	0.6%	99.3%	0%	-	-	-
% Total	0%	0.3%	0%	0.3%	-	52.8%	0%	0%	52.9%	-	0.3%	46.5%	0%	46.8%	-	-
Lights	3	24	0	27	-	4186	2	0	4188	-	24	3663	1	3688	-	7903
% Lights	100%	96.0%	0%	96.4%	-	99.0%	100%	0%	99.0%	-	100%	98.5%	100%	98.5%	-	98.8%
Articulated Trucks	0	0	0	0	-	2	0	0	2	-	0	6	0	6	-	8
% Articulated Trucks	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0.2%	0%	0.2%	-	0.1%
Buses and Single-Unit Trucks	0	1	0	1	-	40	0	0	40	-	0	50	0	50	-	91
% Buses and Single-Unit Trucks	0%	4.0%	0%	3.6%	-	0.9%	0%	0%	0.9%	-	0%	1.3%	0%	1.3%	-	1.1%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

16. S. Friendswood Dr. at Stone Creek Terrace - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627334, Location: 29.494966, -95.177869



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	West Blvd Eastbound						Stone Creek Terrace Westbound						Friendswood Dr. Northbound						Friendswood Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	31	2	15	0	48	0	1	0	19	0	20	0	2	104	0	0	106	0	4	77	5	0	86	0	260
6:45AM	34	0	30	0	64	0	1	0	23	0	24	0	5	126	1	0	132	0	4	79	7	0	90	0	310
Hourly Total	65	2	45	0	112	0	2	0	42	0	44	0	7	230	1	0	238	0	8	156	12	0	176	0	570
7:00AM	48	1	23	0	72	0	2	1	26	0	29	0	7	149	0	0	156	0	6	97	13	0	116	0	373
7:15AM	79	6	30	0	115	0	5	0	44	0	49	0	14	195	1	0	210	0	5	108	25	0	138	0	512
7:30AM	42	1	27	0	70	0	2	0	42	0	44	0	8	190	2	0	200	0	8	138	20	0	166	0	480
7:45AM	39	1	25	0	65	0	3	1	41	0	45	0	14	195	1	0	210	0	8	110	28	0	146	0	466
Hourly Total	208	9	105	0	322	0	12	2	153	0	167	0	43	729	4	0	776	0	27	453	86	0	566	0	1831
8:00AM	63	5	18	0	86	0	2	7	35	0	44	0	25	188	4	0	217	0	11	100	32	0	143	0	490
8:15AM	58	7	28	0	93	0	2	8	32	0	42	0	20	186	2	0	208	0	13	113	28	0	154	0	497
Hourly Total	121	12	46	0	179	0	4	15	67	0	86	0	45	374	6	0	425	0	24	213	60	0	297	0	987
4:30PM	39	2	17	0	58	0	1	0	16	0	17	0	44	187	1	0	232	0	27	206	46	0	279	0	586
4:45PM	35	2	21	0	58	0	1	2	21	0	24	0	29	174	8	0	211	0	25	197	43	0	265	0	558
Hourly Total	74	4	38	0	116	0	2	2	37	0	41	0	73	361	9	0	443	0	52	403	89	0	544	0	1144
5:00PM	27	1	22	0	50	0	2	2	15	0	19	0	28	199	3	0	230	0	24	231	40	0	295	0	594
5:15PM	41	7	23	0	71	0	0	3	17	0	20	0	21	217	3	0	241	0	23	244	34	0	301	0	633
5:30PM	27	2	26	0	55	0	1	3	21	0	25	0	28	230	2	0	260	0	31	218	49	0	298	0	638
5:45PM	21	3	24	0	48	0	3	4	16	0	23	0	27	218	6	0	251	0	19	222	46	0	287	0	609
Hourly Total	116	13	95	0	224	0	6	12	69	0	87	0	104	864	14	0	982	0	97	915	169	0	1181	0	2474
6:00PM	22	0	11	0	33	0	2	1	21	0	24	0	38	191	6	0	235	0	24	203	48	0	275	0	567
6:15PM	28	1	17	0	46	0	0	1	18	0	19	0	26	192	1	0	219	0	24	193	46	0	263	0	547
Hourly Total	50	1	28	0	79	0	2	2	39	0	43	0	64	383	7	0	454	0	48	396	94	0	538	0	1114
Total	634	41	357	0	1032	0	28	33	407	0	468	0	336	2941	41	0	3318	0	256	2536	510	0	3302	0	8120
% Approach	61.4%	4.0%	34.6%	0%	-	-	6.0%	7.1%	87.0%	0%	-	-	10.1%	88.6%	1.2%	0%	-	-	7.8%	76.8%	15.4%	0%	-	-	-
% Total	7.8%	0.5%	4.4%	0%	12.7%	-	0.3%	0.4%	5.0%	0%	5.8%	-	4.1%	36.2%	0.5%	0%	40.9%	-	3.2%	31.2%	6.3%	0%	40.7%	-	-
Lights	617	41	352	0	1010	-	27	32	404	0	463	-	333	2924	40	0	3297	-	254	2505	492	0	3251	-	8021
% Lights	97.3%	100%	98.6%	0%	97.9%	-	96.4%	97.0%	99.3%	0%	98.9%	-	99.1%	99.4%	97.6%	0%	99.4%	-	99.2%	98.8%	96.5%	0%	98.5%	-	98.8%
Articulated Trucks	0	0	2	0	2	-	0	0	0	0	0	-	0	1	0	0	1	-	0	4	0	0	4	-	7
% Articulated Trucks	0%	0%	0.6%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.2%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	17	0	3	0	20	-	1	1	3	0	5	-	3	16	1	0	20	-	2	27	18	0	47	-	92
% Buses and Single-Unit Trucks	2.7%	0%	0.8%	0%	1.9%	-	3.6%	3.0%	0.7%	0%	1.1%	-	0.9%	0.5%	2.4%	0%	0.6%	-	0.8%	1.1%	3.5%	0%	1.4%	-	1.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

17. S. Friendswood Dr./W. Main St. at Maple... - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627335, Location: 29.489492, -95.161169



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Friendswood Dr. Eastbound						Friendswood Dr. Westbound						Maple Leaf Dr. Northbound						Maple Leaf Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	91	6	0	97	0	23	82	0	0	105	0	15	0	61	0	76	0	4	0	1	0	5	0	283
6:45AM	0	121	7	0	128	0	35	101	0	0	136	0	23	0	72	0	95	0	3	1	2	0	6	0	365
Hourly Total	0	212	13	0	225	0	58	183	0	0	241	0	38	0	133	0	171	0	7	1	3	0	11	0	648
7:00AM	0	101	9	0	110	0	29	106	0	0	135	0	34	1	58	0	93	0	2	0	0	0	2	0	340
7:15AM	0	146	8	0	154	0	33	162	1	0	196	0	42	0	62	0	104	0	4	0	1	0	5	1	459
7:30AM	0	166	15	0	181	0	9	140	0	0	149	0	38	2	65	0	105	0	5	0	0	0	5	0	440
7:45AM	0	135	11	0	146	0	28	162	1	0	191	0	36	2	72	0	110	0	2	0	1	0	3	0	450
Hourly Total	0	548	43	0	591	0	99	570	2	0	671	0	150	5	257	0	412	0	13	0	2	0	15	1	1689
8:00AM	1	122	9	0	132	0	28	185	2	1	216	0	30	1	51	1	83	0	1	0	0	0	1	0	432
8:15AM	0	120	14	0	134	0	17	152	0	0	169	0	36	0	40	0	76	0	2	1	1	0	4	0	383
Hourly Total	1	242	23	0	266	0	45	337	2	1	385	0	66	1	91	1	159	0	3	1	1	0	5	0	815
4:30PM	2	168	26	0	196	0	50	185	3	0	238	0	40	0	28	1	69	0	0	0	2	0	2	0	505
4:45PM	2	182	38	0	222	0	56	185	3	0	244	0	40	0	36	0	76	0	2	0	1	0	3	0	545
Hourly Total	4	350	64	0	418	0	106	370	6	0	482	0	80	0	64	1	145	0	2	0	3	0	5	0	1050
5:00PM	0	189	50	0	239	0	55	195	2	0	252	0	28	1	37	1	67	0	0	0	0	0	0	0	558
5:15PM	1	226	38	0	265	0	44	211	1	0	256	0	34	1	43	1	79	0	0	0	0	0	0	0	600
5:30PM	1	206	33	0	240	0	49	218	1	0	268	0	52	0	29	0	81	0	1	1	0	0	2	0	591
5:45PM	1	212	34	0	247	0	66	212	3	0	281	0	36	0	23	0	59	0	0	3	0	0	3	0	590
Hourly Total	3	833	155	0	991	0	214	836	7	0	1057	0	150	2	132	2	286	0	1	4	0	0	5	0	2339
6:00PM	3	173	38	0	214	0	53	183	1	0	237	0	42	0	32	0	74	0	0	0	0	0	0	0	525
6:15PM	0	177	35	0	212	0	44	189	4	0	237	0	46	0	34	0	80	0	3	0	1	0	4	0	533
Hourly Total	3	350	73	0	426	0	97	372	5	0	474	0	88	0	66	0	154	0	3	0	1	0	4	0	1058
Total	11	2535	371	0	2917	0	619	2668	22	1	3310	0	572	8	743	4	1327	0	29	6	10	0	45	1	7599
% Approach	0.4%	86.9%	12.7%	0%	-	-	18.7%	80.6%	0.7%	0%	-	-	43.1%	0.6%	56.0%	0.3%	-	-	64.4%	13.3%	22.2%	0%	-	-	-
% Total	0.1%	33.4%	4.9%	0%	38.4%	-	8.1%	35.1%	0.3%	0%	43.6%	-	7.5%	0.1%	9.8%	0.1%	17.5%	-	0.4%	0.1%	0.1%	0%	0.6%	-	-
Lights	11	2505	366	0	2882	-	610	2646	22	1	3279	-	569	8	728	4	1309	-	28	6	10	0	44	-	7514
% Lights	100%	98.8%	98.7%	0%	98.8%	-	98.5%	99.2%	100%	100%	99.1%	-	99.5%	100%	98.0%	100%	98.6%	-	96.6%	100%	100%	0%	97.8%	-	98.9%
Articulated Trucks	0	5	1	0	6	-	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	7
% Articulated Trucks	0%	0.2%	0.3%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Buses and Single-Unit Trucks	0	25	4	0	29	-	9	21	0	0	30	-	3	0	15	0	18	-	1	0	0	0	1	-	78
% Buses and Single-Unit Trucks	0%	1.0%	1.1%	0%	1.0%	-	1.5%	0.8%	0%	0%	0.9%	-	0.5%	0%	2.0%	0%	1.4%	-	3.4%	0%	0%	0%	2.2%	-	1.0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

18. Blackhawk Blvd. at Friendswood Link Rd. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627336, Location: 29.530883, -95.177898



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Friendswood Link Rd. Eastbound							El Dorado Blvd Westbound							Blackhawk Blvd. Northbound							Blackhawk Blvd. Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		Int
2019-02-27																													
6:30AM	5	62	4	0	71	0		2	29	8	0	39	0		1	13	8	0	22	0		9	6	3	0	18	0		150
6:45AM	9	59	3	0	71	0		4	41	13	0	58	0		3	19	7	0	29	0		16	12	8	0	36	0		194
Hourly Total	14	121	7	0	142	0		6	70	21	0	97	0		4	32	15	0	51	0		25	18	11	0	54	0		344
7:00AM	5	53	4	0	62	0		3	43	31	0	77	0		6	37	8	0	51	0		13	17	5	0	35	0		225
7:15AM	4	52	4	0	60	0		7	65	14	0	86	0		3	13	11	0	27	0		13	15	10	0	38	0		211
7:30AM	6	81	10	0	97	1		2	55	12	0	69	0		12	20	10	0	42	0		27	21	9	0	57	0		265
7:45AM	16	85	21	0	122	0		2	87	6	0	95	0		25	15	8	0	48	0		26	17	20	1	64	0		329
Hourly Total	31	271	39	0	341	1		14	250	63	0	327	0		46	85	37	0	168	0		79	70	44	1	194	0		1030
8:00AM	21	87	24	0	132	0		10	81	14	0	105	3		16	14	7	0	37	0		6	19	17	1	43	2		317
8:15AM	7	58	8	0	73	0		8	47	8	0	63	0		11	11	5	0	27	0		11	22	6	0	39	0		202
Hourly Total	28	145	32	0	205	0		18	128	22	0	168	3		27	25	12	0	64	0		17	41	23	1	82	2		519
4:30PM	8	90	8	0	106	1		14	117	23	0	154	0		14	12	8	0	34	3		10	16	11	0	37	0		331
4:45PM	6	90	14	0	110	0		14	133	25	0	172	3		12	19	9	0	40	0		10	11	11	1	33	2		355
Hourly Total	14	180	22	0	216	1		28	250	48	0	326	3		26	31	17	0	74	3		20	27	22	1	70	2		686
5:00PM	13	85	10	0	108	0		6	114	19	0	139	0		6	24	10	0	40	0		14	27	22	0	63	0		350
5:15PM	11	103	13	0	127	0		14	160	28	2	204	0		8	22	13	0	43	0		11	19	5	0	35	0		409
5:30PM	5	81	6	0	92	1		13	133	19	0	165	0		7	25	9	0	41	0		9	15	12	0	36	0		334
5:45PM	10	97	12	0	119	0		6	143	32	0	181	0		7	32	14	0	53	0		11	10	8	0	29	0		382
Hourly Total	39	366	41	0	446	1		39	550	98	2	689	0		28	103	46	0	177	0		45	71	47	0	163	0		1475
6:00PM	8	89	6	0	103	0		11	130	20	0	161	0		6	21	10	0	37	2		14	13	5	0	32	0		333
6:15PM	9	104	14	0	127	0		12	106	20	0	138	0		2	17	6	0	25	0		10	16	5	0	31	0		321
Hourly Total	17	193	20	0	230	0		23	236	40	0	299	0		8	38	16	0	62	2		24	29	10	0	63	0		654
Total	143	1276	161	0	1580	3		128	1484	292	2	1906	6		139	314	143	0	596	5		210	256	157	3	626	4		4708
% Approach	9.1%	80.8%	10.2%	0%	-	-		6.7%	77.9%	15.3%	0.1%	-	-		23.3%	52.7%	24.0%	0%	-	-		33.5%	40.9%	25.1%	0.5%	-	-		-
% Total	3.0%	27.1%	3.4%	0%	33.6%	-		2.7%	31.5%	6.2%	0%	40.5%	-		3.0%	6.7%	3.0%	0%	12.7%	-		4.5%	5.4%	3.3%	0.1%	13.3%	-		-
Lights	138	1265	160	0	1563	-		127	1476	291	2	1896	-		137	305	142	0	584	-		207	253	154	3	617	-		4660
% Lights	96.5%	99.1%	99.4%	0%	98.9%	-		99.2%	99.5%	99.7%	100%	99.5%	-		98.6%	97.1%	99.3%	0%	98.0%	-		98.6%	98.8%	98.1%	100%	98.6%	-		99.0%
Articulate d Trucks	0	2	0	0	2	-		0	0	0	0	0	-		0	1	1	0	2	-		1	0	0	0	1	-		5
% Articulate d Trucks	0%	0.2%	0%	0%	0.1%	-		0%	0%	0%	0%	0%	-		0%	0.3%	0.7%	0%	0.3%	-		0.5%	0%	0%	0%	0.2%	-		0.1%
Buses and Single-Unit Trucks	5	9	1	0	15	-		1	8	1	0	10	-		2	8	0	0	10	-		2	3	3	0	8	-		43
% Buses and Single-Unit Trucks	3.5%	0.7%	0.6%	0%	0.9%	-		0.8%	0.5%	0.3%	0%	0.5%	-		1.4%	2.5%	0%	0%	1.7%	-		1.0%	1.2%	1.9%	0%	1.3%	-		0.9%
Pedestrians	-	-	-	-	-	3		-	-	-	-	-	6		-	-	-	-	-	5		-	-	-	-	-	4		
% Pedestrians	-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	-		-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

19. FM 528 at W. Bay Area Blvd. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627337, Location: 29.522308, -95.161849



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound						FM 528 Westbound						Bay Area Blvd. Northbound						Bay Area Blvd. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	25	281	13	0	319	0	18	65	6	0	89	1	19	52	77	0	148	0	16	22	20	1	59	0	615
6:45AM	33	314	21	0	368	3	15	87	11	0	113	0	23	65	77	0	165	0	21	36	24	0	81	0	727
Hourly Total	58	595	34	0	687	3	33	152	17	0	202	1	42	117	154	0	313	0	37	58	44	1	140	0	1342
7:00AM	29	345	27	0	401	0	22	121	12	0	155	0	43	85	93	0	221	0	17	21	37	0	75	0	852
7:15AM	51	360	9	0	420	0	23	131	11	0	165	0	29	113	99	0	241	0	19	17	41	0	77	0	903
7:30AM	83	465	20	0	568	1	23	150	22	0	195	0	37	124	79	0	240	0	27	25	43	0	95	0	1098
7:45AM	79	376	20	0	475	1	27	201	18	0	246	1	46	146	82	0	274	0	23	47	42	0	112	0	1107
Hourly Total	242	1546	76	0	1864	2	95	603	63	0	761	1	155	468	353	0	976	0	86	110	163	0	359	0	3960
8:00AM	87	315	28	0	430	1	21	150	12	0	183	0	63	125	82	0	270	0	28	45	58	0	131	0	1014
8:15AM	66	388	15	0	469	10	26	162	14	0	202	0	45	80	57	0	182	0	25	24	38	1	88	1	941
Hourly Total	153	703	43	0	899	11	47	312	26	0	385	0	108	205	139	0	452	0	53	69	96	1	219	1	1955
4:30PM	61	185	20	0	266	0	86	327	13	0	426	0	51	89	48	0	188	3	44	87	78	0	209	0	1089
4:45PM	68	227	34	0	329	2	82	338	19	0	439	3	44	91	44	0	179	2	47	89	58	0	194	0	1141
Hourly Total	129	412	54	0	595	2	168	665	32	0	865	3	95	180	92	0	367	5	91	176	136	0	403	0	2230
5:00PM	74	267	36	0	377	2	79	310	20	0	409	0	53	100	36	0	189	0	24	116	84	2	226	0	1201
5:15PM	64	243	26	0	333	0	99	328	27	0	454	0	54	101	41	0	196	0	38	104	99	1	242	0	1225
5:30PM	79	274	40	0	393	1	98	257	27	0	382	0	56	93	43	0	192	0	33	97	74	1	205	1	1172
5:45PM	74	252	22	0	348	1	85	274	23	0	382	1	52	94	53	0	199	0	41	108	80	0	229	0	1158
Hourly Total	291	1036	124	0	1451	4	361	1169	97	0	1627	1	215	388	173	0	776	0	136	425	337	4	902	1	4756
6:00PM	62	210	29	0	301	0	92	259	30	0	381	2	46	101	43	0	190	0	41	86	72	0	199	0	1071
6:15PM	78	229	32	0	339	0	80	253	25	0	358	1	50	94	30	0	174	0	34	107	63	0	204	0	1075
Hourly Total	140	439	61	0	640	0	172	512	55	0	739	3	96	195	73	0	364	0	75	193	135	0	403	0	2146
Total	1013	4731	392	0	6136	22	876	3413	290	0	4579	9	711	1553	984	0	3248	5	478	1031	911	6	2426	2	16389
% Approach	16.5%	77.1%	6.4%	0%	-	-	19.1%	74.5%	6.3%	0%	-	-	21.9%	47.8%	30.3%	0%	-	-	19.7%	42.5%	37.6%	0.2%	-	-	-
% Total	6.2%	28.9%	2.4%	0%	37.4%	-	5.3%	20.8%	1.8%	0%	27.9%	-	4.3%	9.5%	6.0%	0%	19.8%	-	2.9%	6.3%	5.6%	0%	14.8%	-	-
Lights	1005	4685	386	0	6076	-	874	3357	283	0	4514	-	707	1538	976	0	3221	-	461	1023	906	6	2396	-	16207
% Lights	99.2%	99.0%	98.5%	0%	99.0%	-	99.8%	98.4%	97.6%	0%	98.6%	-	99.4%	99.0%	99.2%	0%	99.2%	-	96.4%	99.2%	99.5%	100%	98.8%	-	98.9%
Articulated Trucks	3	13	1	0	17	-	0	12	0	0	12	-	0	0	1	0	1	-	0	1	2	0	3	-	33
% Articulated Trucks	0.3%	0.3%	0.3%	0%	0.3%	-	0%	0.4%	0%	0%	0.3%	-	0%	0%	0.1%	0%	0%	-	0%	0.1%	0.2%	0%	0.1%	-	0.2%
Buses and Single-Unit Trucks	5	33	5	0	43	-	2	44	7	0	53	-	4	15	7	0	26	-	17	7	3	0	27	-	149
% Buses and Single-Unit Trucks	0.5%	0.7%	1.3%	0%	0.7%	-	0.2%	1.3%	2.4%	0%	1.2%	-	0.6%	1.0%	0.7%	0%	0.8%	-	3.6%	0.7%	0.3%	0%	1.1%	-	0.9%
Pedestrians	-	-	-	-	-	22	-	-	-	-	-	9	-	-	-	-	-	5	-	-	-	-	-	2	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	100%

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

20. FM 528 at Blackhawk Blvd. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627338, Location: 29.521493, -95.169562



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound					FM 528 Westbound					Blackhawk Blvd. Southbound					
Time	L	T	U	App	Ped*	T	R	U	App	Ped*	L	R	U	App	Ped*	Int
2019-02-27 6:30AM	5	274	0	279	0	70	10	0	80	0	45	10	0	55	0	414
6:45AM	7	306	0	313	0	125	16	0	141	0	31	14	0	45	0	499
Hourly Total	12	580	0	592	0	195	26	0	221	0	76	24	0	100	0	913
7:00AM	7	336	0	343	0	143	32	0	175	0	43	14	0	57	0	575
7:15AM	12	417	0	429	0	156	18	0	174	0	39	24	0	63	0	666
7:30AM	10	469	0	479	0	200	36	0	236	0	55	17	0	72	0	787
7:45AM	15	458	0	473	0	226	35	0	261	0	51	21	0	72	0	806
Hourly Total	44	1680	0	1724	0	725	121	0	846	0	188	76	0	264	0	2834
8:00AM	14	389	0	403	0	240	32	0	272	1	65	22	0	87	0	762
8:15AM	10	373	0	383	0	188	34	0	222	6	55	21	0	76	0	681
Hourly Total	24	762	0	786	0	428	66	0	494	7	120	43	0	163	0	1443
4:30PM	25	256	0	281	0	445	50	0	495	0	38	18	2	58	0	834
4:45PM	21	259	0	280	0	416	49	0	465	0	51	19	1	71	0	816
Hourly Total	46	515	0	561	0	861	99	0	960	0	89	37	3	129	0	1650
5:00PM	24	320	0	344	0	459	50	0	509	0	48	17	0	65	0	918
5:15PM	26	318	0	344	0	475	58	0	533	1	45	23	1	69	0	946
5:30PM	23	325	0	348	0	422	59	0	481	0	36	21	1	58	0	887
5:45PM	25	287	0	312	0	386	63	0	449	0	36	19	1	56	0	817
Hourly Total	98	1250	0	1348	0	1742	230	0	1972	1	165	80	3	248	0	3568
6:00PM	29	299	0	328	0	406	44	0	450	0	29	18	0	47	0	825
6:15PM	25	299	0	324	0	360	62	0	422	0	37	17	0	54	0	800
Hourly Total	54	598	0	652	0	766	106	0	872	0	66	35	0	101	0	1625
Total	278	5385	0	5663	0	4717	648	0	5365	8	704	295	6	1005	0	12033
% Approach	4.9%	95.1%	0%	-	-	87.9%	12.1%	0%	-	-	70.0%	29.4%	0.6%	-	-	-
% Total	2.3%	44.8%	0%	47.1%	-	39.2%	5.4%	0%	44.6%	-	5.9%	2.5%	0%	8.4%	-	-
Lights	273	5339	0	5612	-	4672	639	0	5311	-	700	293	6	999	-	11922
% Lights	98.2%	99.1%	0%	99.1%	-	99.0%	98.6%	0%	99.0%	-	99.4%	99.3%	100%	99.4%	-	99.1%
Articulated Trucks	2	19	0	21	-	11	1	0	12	-	0	2	0	2	-	35
% Articulated Trucks	0.7%	0.4%	0%	0.4%	-	0.2%	0.2%	0%	0.2%	-	0%	0.7%	0%	0.2%	-	0.3%
Buses and Single-Unit Trucks	3	27	0	30	-	34	8	0	42	-	4	0	0	4	-	76
% Buses and Single-Unit Trucks	1.1%	0.5%	0%	0.5%	-	0.7%	1.2%	0%	0.8%	-	0.6%	0%	0%	0.4%	-	0.6%
Pedestrians	-	-	-	-	0	-	-	-	-	8	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

21. FM 528 at Winding Way Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627340, Location: 29.511684, -95.185726



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound							FM 528 Westbound							Winding Way Dr. Northbound							Winding Way Dr. Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*	Int	
2019-02-27																													
6:30AM	1	255	2	0	258	0		2	75	12	0	89	0		1	4	13	0	18	0		14	0	1	0	15	0		380
6:45AM	10	304	1	0	315	0		2	93	25	0	120	0		2	6	14	0	22	0		18	2	0	0	20	0		477
Hourly Total	11	559	3	0	573	0		4	168	37	0	209	0		3	10	27	0	40	0		32	2	1	0	35	0		857
7:00AM	5	308	2	0	315	0		7	132	29	0	168	0		3	8	19	0	30	0		32	1	0	0	33	0		546
7:15AM	7	356	0	0	363	0		8	113	45	0	166	0		3	19	31	0	53	0		59	6	3	0	68	0		650
7:30AM	14	421	6	0	441	0		6	166	41	0	213	0		5	16	28	0	49	0		63	1	1	0	65	0		768
7:45AM	18	376	5	0	399	0		12	183	42	0	237	0		6	11	36	0	53	0		52	8	8	0	68	0		757
Hourly Total	44	1461	13	0	1518	0		33	594	157	0	784	0		17	54	114	0	185	0		206	16	12	0	234	0		2721
8:00AM	6	310	12	0	328	0		11	168	30	0	209	0		9	13	35	0	57	0		43	9	16	0	68	0		662
8:15AM	15	340	5	1	361	0		15	166	28	0	209	0		10	18	41	0	69	0		38	4	12	0	54	0		693
Hourly Total	21	650	17	1	689	0		26	334	58	0	418	0		19	31	76	0	126	0		81	13	28	0	122	0		1355
4:30PM	22	239	11	0	272	0		30	328	62	0	420	0		5	15	12	0	32	0		36	14	16	0	66	0		790
4:45PM	15	212	23	0	250	0		31	349	39	0	419	0		11	13	18	0	42	0		46	15	18	0	79	0		790
Hourly Total	37	451	34	0	522	0		61	677	101	0	839	0		16	28	30	0	74	0		82	29	34	0	145	0		1580
5:00PM	19	292	14	1	326	0		30	374	67	0	471	0		5	16	23	0	44	0		52	9	13	0	74	0		915
5:15PM	21	260	10	0	291	0		34	382	61	0	477	0		10	15	19	0	44	0		50	11	15	0	76	0		888
5:30PM	20	327	11	0	358	0		38	373	53	0	464	0		8	8	23	0	39	0		47	14	16	0	77	0		938
5:45PM	22	243	13	0	278	0		23	356	50	0	429	0		5	12	21	0	38	0		51	10	14	0	75	0		820
Hourly Total	82	1122	48	1	1253	0		125	1485	231	0	1841	0		28	51	86	0	165	0		200	44	58	0	302	0		3561
6:00PM	18	272	10	0	300	0		27	330	57	0	414	0		7	7	11	0	25	0		47	11	16	0	74	1		813
6:15PM	15	246	12	2	275	0		19	311	33	0	363	0		6	6	10	0	22	0		34	8	6	0	48	0		708
Hourly Total	33	518	22	2	575	0		46	641	90	0	777	0		13	13	21	0	47	0		81	19	22	0	122	1		1521
Total	228	4761	137	4	5130	0		295	3899	674	0	4868	0		96	187	354	0	637	0		682	123	155	0	960	1		11595
% Approach	4.4%	92.8%	2.7%	0.1%	-	-		6.1%	80.1%	13.8%	0%	-	-		15.1%	29.4%	55.6%	0%	-	-		71.0%	12.8%	16.1%	0%	-	-		-
% Total	2.0%	41.1%	1.2%	0%	44.2%	-		2.5%	33.6%	5.8%	0%	42.0%	-		0.8%	1.6%	3.1%	0%	5.5%	-		5.9%	1.1%	1.3%	0%	8.3%	-		-
Lights	227	4715	134	4	5080	-		294	3866	670	0	4830	-		94	185	352	0	631	-		677	119	153	0	949	-		11490
% Lights	99.6%	99.0%	97.8%	100%	99.0%	-		99.7%	99.2%	99.4%	0%	99.2%	-		97.9%	98.9%	99.4%	0%	99.1%	-		99.3%	96.7%	98.7%	0%	98.9%	-		99.1%
Articulated Trucks	0	19	0	0	19	-		0	10	1	0	11	-		1	0	0	0	1	-		0	0	0	0	0	-		31
% Articulated Trucks	0%	0.4%	0%	0%	0.4%	-		0%	0.3%	0.1%	0%	0.2%	-		1.0%	0%	0%	0%	0.2%	-		0%	0%	0%	0%	0%	-		0.3%
Buses and Single-Unit Trucks	1	27	3	0	31	-		1	23	3	0	27	-		1	2	2	0	5	-		5	4	2	0	11	-		74
% Buses and Single-Unit Trucks	0.4%	0.6%	2.2%	0%	0.6%	-		0.3%	0.6%	0.4%	0%	0.6%	-		1.0%	1.1%	0.6%	0%	0.8%	-		0.7%	3.3%	1.3%	0%	1.1%	-		0.6%
Pedestrians	-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	0		-	-	-	-	-	1		
% Pedestrians	-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-	-	-	-	-	-		-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

22. FM 528 Rd. at Sunset Ln. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627341, Location: 29.506689, -95.191182



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound						FM 528 Westbound						Drwy Northbound						Sunset Ln. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	15	207	3	0	225	0	1	94	26	0	121	0	1	3	1	0	5	0	52	1	13	0	66	0	417
6:45AM	23	246	2	0	271	0	2	148	21	0	171	0	4	1	3	0	8	0	44	4	10	0	58	0	508
Hourly Total	38	453	5	0	496	0	3	242	47	0	292	0	5	4	4	0	13	0	96	5	23	0	124	0	925
7:00AM	27	306	6	0	339	0	0	158	45	0	203	0	4	5	1	0	10	0	58	4	11	0	73	0	625
7:15AM	62	316	4	0	382	0	2	165	44	0	211	0	5	8	5	0	18	0	63	3	28	0	94	0	705
7:30AM	29	395	8	0	432	0	3	250	54	0	307	0	8	5	1	0	14	0	75	5	29	0	109	1	862
7:45AM	23	348	10	0	381	0	3	222	66	0	291	0	3	7	5	0	15	0	85	12	26	0	123	0	810
Hourly Total	141	1365	28	0	1534	0	8	795	209	0	1012	0	20	25	12	0	57	0	281	24	94	0	399	1	3002
8:00AM	40	302	4	0	346	0	5	175	58	0	238	0	7	8	4	0	19	0	115	21	24	0	160	0	763
8:15AM	39	311	6	0	356	0	3	195	79	0	277	0	3	8	5	0	16	0	85	8	10	0	103	0	752
Hourly Total	79	613	10	0	702	0	8	370	137	0	515	0	10	16	9	0	35	0	200	29	34	0	263	0	1515
4:30PM	29	280	13	0	322	0	13	341	82	0	436	2	29	17	8	0	54	0	59	20	37	0	116	0	928
4:45PM	24	254	16	0	294	0	14	306	62	0	382	0	28	25	6	0	59	0	80	12	41	0	133	0	868
Hourly Total	53	534	29	0	616	0	27	647	144	0	818	2	57	42	14	0	113	0	139	32	78	0	249	0	1796
5:00PM	39	312	20	0	371	0	6	370	66	0	442	0	32	19	10	0	61	0	72	22	51	0	145	0	1019
5:15PM	37	331	19	0	387	0	12	350	73	0	435	0	33	25	10	0	68	0	76	25	39	0	140	0	1030
5:30PM	32	281	24	0	337	0	10	391	84	0	485	0	22	25	9	0	56	0	61	23	53	0	137	0	1015
5:45PM	38	296	19	0	353	0	7	335	84	0	426	0	42	22	6	0	70	0	86	21	34	0	141	0	990
Hourly Total	146	1220	82	0	1448	0	35	1446	307	0	1788	0	129	91	35	0	255	0	295	91	177	0	563	0	4054
6:00PM	37	284	12	0	333	0	10	369	76	0	455	0	37	15	7	0	59	0	49	9	46	0	104	0	951
6:15PM	41	267	9	0	317	0	8	333	62	0	403	0	28	27	7	0	62	0	68	17	53	0	138	0	920
Hourly Total	78	551	21	0	650	0	18	702	138	0	858	0	65	42	14	0	121	0	117	26	99	0	242	0	1871
Total	535	4736	175	0	5446	0	99	4202	982	0	5283	2	286	220	88	0	594	0	1128	207	505	0	1840	1	13163
% Approach	9.8%	87.0%	3.2%	0%	-	-	1.9%	79.5%	18.6%	0%	-	-	48.1%	37.0%	14.8%	0%	-	-	61.3%	11.3%	27.4%	0%	-	-	-
% Total	4.1%	36.0%	1.3%	0%	41.4%	-	0.8%	31.9%	7.5%	0%	40.1%	-	2.2%	1.7%	0.7%	0%	4.5%	-	8.6%	1.6%	3.8%	0%	14.0%	-	-
Lights	512	4671	175	0	5358	-	99	4160	969	0	5228	-	286	220	87	0	593	-	1114	207	473	0	1794	-	12973
% Lights	95.7%	98.6%	100%	0%	98.4%	-	100%	99.0%	98.7%	0%	99.0%	-	100%	100%	98.9%	0%	99.8%	-	98.8%	100%	93.7%	0%	97.5%	-	98.6%
Articulated Trucks	0	18	0	0	18	-	0	10	0	0	10	-	0	0	0	0	0	-	1	0	0	0	1	-	29
% Articulated Trucks	0%	0.4%	0%	0%	0.3%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0.1%	0%	0%	0%	0.1%	-	0.2%
Buses and Single-Unit Trucks	23	47	0	0	70	-	0	32	13	0	45	-	0	0	1	0	1	-	13	0	32	0	45	-	161
% Buses and Single-Unit Trucks	4.3%	1.0%	0%	0%	1.3%	-	0%	0.8%	1.3%	0%	0.9%	-	0%	0%	1.1%	0%	0.2%	-	1.2%	0%	6.3%	0%	2.4%	-	1.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	100%	

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

23. FM 528 Rd. at Falcon Ridge Blvd. - TMC

Thu Mar 21, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627342, Location: 29.500594, -95.200172



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound						FM 528 Westbound						Falcon Ridge Blvd. Northbound						Falcon Ridge Blvd. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-03-21 6:30AM	4	218	1	0	223	0	3	118	0	0	121	0	12	0	19	0	31	0	0	1	7	0	8	0	383
6:45AM	12	225	4	0	241	0	5	136	1	0	142	0	11	3	16	0	30	0	1	2	8	0	11	0	424
Hourly Total	16	443	5	0	464	0	8	254	1	0	263	0	23	3	35	0	61	0	1	3	15	0	19	0	807
7:00AM	21	325	2	0	348	0	4	182	2	0	188	0	19	3	29	0	51	0	0	4	10	0	14	0	601
7:15AM	43	375	17	0	435	0	4	222	1	0	227	0	19	22	39	0	80	0	1	4	23	0	28	0	770
7:30AM	26	403	12	0	441	0	10	275	1	0	286	0	26	11	29	0	66	0	3	6	29	0	38	0	831
7:45AM	51	367	42	0	460	0	16	229	3	0	248	0	26	25	26	0	77	0	3	13	31	0	47	0	832
Hourly Total	141	1470	73	0	1684	0	34	908	7	0	949	0	90	61	123	0	274	0	7	27	93	0	127	0	3034
8:00AM	63	333	41	0	437	0	25	188	6	0	219	0	18	26	64	0	108	0	1	28	20	0	49	0	813
8:15AM	72	295	24	0	391	0	15	153	4	0	172	1	16	53	80	0	149	0	7	22	22	0	51	0	763
Hourly Total	135	628	65	0	828	0	40	341	10	0	391	1	34	79	144	0	257	0	8	50	42	0	100	0	1576
4:30PM	27	316	20	0	363	0	23	368	4	0	395	0	21	9	15	0	45	0	6	17	37	0	60	0	863
4:45PM	26	316	16	0	358	0	20	390	3	0	413	0	14	12	23	0	49	0	4	17	30	0	51	0	871
Hourly Total	53	632	36	0	721	0	43	758	7	0	808	0	35	21	38	0	94	0	10	34	67	0	111	0	1734
5:00PM	36	329	17	0	382	0	25	391	3	0	419	0	16	13	21	0	50	0	2	21	35	0	58	0	909
5:15PM	36	351	26	0	413	0	32	405	5	0	442	0	19	20	22	0	61	0	3	24	42	0	69	0	985
5:30PM	29	318	39	0	386	0	22	416	2	0	440	0	20	15	28	0	63	0	11	26	40	0	77	0	966
5:45PM	36	353	38	0	427	0	23	398	1	0	422	0	20	8	30	0	58	2	3	16	30	1	50	0	957
Hourly Total	137	1351	120	0	1608	0	102	1610	11	0	1723	0	75	56	101	0	232	2	19	87	147	1	254	0	3817
6:00PM	25	319	24	0	368	0	25	412	0	0	437	0	10	13	28	0	51	0	4	9	29	0	42	0	898
6:15PM	19	332	19	0	370	0	13	384	2	0	399	0	22	13	32	0	67	0	3	12	27	0	42	0	878
Hourly Total	44	651	43	0	738	0	38	796	2	0	836	0	32	26	60	0	118	0	7	21	56	0	84	0	1776
Total	526	5175	342	0	6043	0	265	4667	38	0	4970	1	289	246	501	0	1036	2	52	222	420	1	695	0	12744
% Approach	8.7%	85.6%	5.7%	0%	-	-	5.3%	93.9%	0.8%	0%	-	-	27.9%	23.7%	48.4%	0%	-	-	7.5%	31.9%	60.4%	0.1%	-	-	-
% Total	4.1%	40.6%	2.7%	0%	47.4%	-	2.1%	36.6%	0.3%	0%	39.0%	-	2.3%	1.9%	3.9%	0%	8.1%	-	0.4%	1.7%	3.3%	0%	5.5%	-	-
Lights	519	5073	333	0	5925	-	260	4582	37	0	4879	-	286	239	489	0	1014	-	52	220	418	1	691	-	12509
% Lights	98.7%	98.0%	97.4%	0%	98.0%	-	98.1%	98.2%	97.4%	0%	98.2%	-	99.0%	97.2%	97.6%	0%	97.9%	-	100%	99.1%	99.5%	100%	99.4%	-	98.2%
Articulated Trucks	0	14	1	0	15	-	0	16	0	0	16	-	0	1	0	0	1	-	0	0	0	0	0	-	32
% Articulated Trucks	0%	0.3%	0.3%	0%	0.2%	-	0%	0.3%	0%	0%	0.3%	-	0%	0.4%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.3%
Buses and Single-Unit Trucks	7	88	8	0	103	-	5	69	1	0	75	-	3	6	12	0	21	-	0	2	2	0	4	-	203
% Buses and Single-Unit Trucks	1.3%	1.7%	2.3%	0%	1.7%	-	1.9%	1.5%	2.6%	0%	1.5%	-	1.0%	2.4%	2.4%	0%	2.0%	-	0%	0.9%	0.5%	0%	0.6%	-	1.6%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-100%	-	-	-	-	-100%	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

24. FM 528 at Friendswood Lakes Blvd. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627344, Location: 29.4945, -95.207481



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound						FM 528 Westbound						Friendswood Lakes Blvd Northbound						Unnamed Rd Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	229	1	0	230	0	8	128	0	0	136	0	7	0	20	0	27	0	0	0	0	0	0	0	393
6:45AM	0	245	11	0	256	0	8	156	0	0	164	0	6	0	15	0	21	0	0	0	0	0	0	0	441
Hourly Total	0	474	12	0	486	0	16	284	0	0	300	0	13	0	35	0	48	0	0	0	0	0	0	0	834
7:00AM	0	322	10	0	332	0	10	181	0	0	191	0	9	0	27	0	36	0	0	0	0	0	0	0	559
7:15AM	0	375	4	0	379	0	11	202	0	0	213	0	10	0	33	0	43	0	0	0	0	0	0	0	635
7:30AM	0	454	8	0	462	0	6	305	0	0	311	0	24	0	39	0	63	0	0	0	0	0	0	0	836
7:45AM	0	436	36	0	472	0	17	260	1	0	278	0	40	0	43	0	83	0	0	0	0	0	0	0	833
Hourly Total	0	1587	58	0	1645	0	44	948	1	0	993	0	83	0	142	0	225	0	0	0	0	0	0	0	2863
8:00AM	0	362	42	0	404	0	14	203	0	0	217	0	36	0	31	0	67	0	1	0	0	0	1	1	689
8:15AM	0	299	17	0	316	0	23	214	0	0	237	0	10	0	35	0	45	0	0	0	0	0	0	0	598
Hourly Total	0	661	59	0	720	0	37	417	0	0	454	0	46	0	66	0	112	0	1	0	0	0	1	1	1287
4:30PM	0	309	14	0	323	0	32	360	0	0	392	0	11	0	24	0	35	0	0	0	0	0	0	0	750
4:45PM	0	267	7	1	275	0	37	339	0	0	376	0	18	0	26	0	44	0	0	0	0	0	0	0	695
Hourly Total	0	576	21	1	598	0	69	699	0	0	768	0	29	0	50	0	79	0	0	0	0	0	0	0	1445
5:00PM	0	338	19	0	357	0	52	402	0	0	454	0	15	0	43	0	58	0	0	0	0	0	0	0	869
5:15PM	0	341	16	0	357	0	34	416	0	0	450	0	25	0	40	0	65	0	0	0	0	0	0	0	872
5:30PM	0	351	15	0	366	0	48	399	0	0	447	0	15	0	33	0	48	0	0	0	0	0	0	0	861
5:45PM	0	356	15	0	371	0	29	384	0	0	413	0	20	0	30	0	50	0	0	0	0	0	0	0	834
Hourly Total	0	1386	65	0	1451	0	163	1601	0	0	1764	0	75	0	146	0	221	0	0	0	0	0	0	0	3436
6:00PM	0	311	16	0	327	0	38	386	0	0	424	0	13	0	22	0	35	0	0	0	0	0	0	0	786
6:15PM	0	272	10	0	282	0	39	383	1	0	423	0	19	0	38	0	57	0	0	0	1	0	1	0	763
Hourly Total	0	583	26	0	609	0	77	769	1	0	847	0	32	0	60	0	92	0	0	0	1	0	1	0	1549
Total	0	5267	241	1	5509	0	406	4718	2	0	5126	0	278	0	499	0	777	0	1	0	1	0	2	1	11414
% Approach	0%	95.6%	4.4%	0%	-	-	7.9%	92.0%	0%	0%	-	-	35.8%	0%	64.2%	0%	-	-	50.0%	0%	50.0%	0%	-	-	-
% Total	0%	46.1%	2.1%	0%	48.3%	-	3.6%	41.3%	0%	0%	44.9%	-	2.4%	0%	4.4%	0%	6.8%	-	0%	0%	0%	0%	0%	-	-
Lights	0	5188	236	1	5425	-	402	4644	2	0	5048	-	276	0	494	0	770	-	1	0	1	0	2	-	11245
% Lights	0%	98.5%	97.9%	100%	98.5%	-	99.0%	98.4%	100%	0%	98.5%	-	99.3%	0%	99.0%	0%	99.1%	-	100%	0%	100%	0%	100%	-	98.5%
Articulated Trucks	0	16	0	0	16	-	0	5	0	0	5	-	0	0	0	0	0	-	0	0	0	0	0	-	21
% Articulated Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.2%
Buses and Single-Unit Trucks	0	63	5	0	68	-	4	69	0	0	73	-	2	0	5	0	7	-	0	0	0	0	0	-	148
% Buses and Single-Unit Trucks	0%	1.2%	2.1%	0%	1.2%	-	1.0%	1.5%	0%	0%	1.4%	-	0.7%	0%	1.0%	0%	0.9%	-	0%	0%	0%	0%	0%	-	1.3%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

25. FM 528 at San Joaquin Pkwy - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627345, Location: 29.485504, -95.216078



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	FM 528 Eastbound						FM 528 Westbound						San Joaquin Pkwy Northbound						Cypress Point Dr Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	0	189	0	0	189	0	5	122	7	0	134	0	5	0	15	0	20	0	8	0	2	0	10	0	353
6:45AM	1	207	2	0	210	0	3	149	3	0	155	0	10	0	24	0	34	0	20	0	1	0	21	0	420
Hourly Total	1	396	2	0	399	0	8	271	10	0	289	0	15	0	39	0	54	0	28	0	3	0	31	0	773
7:00AM	0	245	1	0	246	0	3	148	2	0	153	0	8	0	37	0	45	0	24	0	2	0	26	0	470
7:15AM	1	307	0	0	308	0	8	206	3	0	217	0	11	0	40	0	51	0	28	0	1	0	29	0	605
7:30AM	1	340	0	0	341	0	8	214	14	0	236	0	16	1	46	0	63	0	26	0	4	0	30	0	670
7:45AM	1	312	3	0	316	0	22	205	9	0	236	0	13	0	41	0	54	0	31	0	1	0	32	0	638
Hourly Total	3	1204	4	0	1211	0	41	773	28	0	842	0	48	1	164	0	213	0	109	0	8	0	117	0	2383
8:00AM	0	234	4	0	238	0	18	175	11	0	204	0	9	0	42	0	51	0	27	2	4	0	33	0	526
8:15AM	0	234	5	0	239	1	8	183	10	0	201	0	7	0	33	0	40	0	24	1	2	0	27	1	507
Hourly Total	0	468	9	0	477	1	26	358	21	0	405	0	16	0	75	0	91	0	51	3	6	0	60	1	1033
4:30PM	1	253	13	0	267	0	30	319	22	0	371	0	4	2	18	0	24	0	7	0	6	0	13	0	675
4:45PM	0	236	3	0	239	0	28	290	14	0	332	0	7	1	15	0	23	0	16	0	0	0	16	0	610
Hourly Total	1	489	16	0	506	0	58	609	36	0	703	0	11	3	33	0	47	0	23	0	6	0	29	0	1285
5:00PM	4	276	10	0	290	0	27	310	26	0	363	0	14	3	30	0	47	0	18	0	1	0	19	0	719
5:15PM	0	325	7	0	332	0	33	363	33	0	429	0	6	2	20	0	28	0	11	0	1	0	12	0	801
5:30PM	4	273	8	0	285	0	39	327	25	0	391	0	5	1	21	0	27	0	9	1	2	0	12	0	715
5:45PM	2	316	11	0	329	0	42	315	24	0	381	0	4	3	17	0	24	0	15	0	1	0	16	0	750
Hourly Total	10	1190	36	0	1236	0	141	1315	108	0	1564	0	29	9	88	0	126	0	53	1	5	0	59	0	2985
6:00PM	4	263	12	0	279	0	23	306	26	0	355	0	10	2	21	0	33	0	17	1	4	0	22	0	689
6:15PM	0	251	7	0	258	0	30	314	24	0	368	0	9	1	8	0	18	0	13	0	2	0	15	0	659
Hourly Total	4	514	19	0	537	0	53	620	50	0	723	0	19	3	29	0	51	0	30	1	6	0	37	0	1348
Total	19	4261	86	0	4366	1	327	3946	253	0	4526	0	138	16	428	0	582	0	294	5	34	0	333	1	9807
% Approach	0.4%	97.6%	2.0%	0%	-	-	7.2%	87.2%	5.6%	0%	-	-	23.7%	2.7%	73.5%	0%	-	-	88.3%	1.5%	10.2%	0%	-	-	-
% Total	0.2%	43.4%	0.9%	0%	44.5%	-	3.3%	40.2%	2.6%	0%	46.2%	-	1.4%	0.2%	4.4%	0%	5.9%	-	3.0%	0.1%	0.3%	0%	3.4%	-	-
Lights	18	4190	82	0	4290	-	321	3893	248	0	4462	-	135	16	419	0	570	-	294	4	34	0	332	-	9654
% Lights	94.7%	98.3%	95.3%	0%	98.3%	-	98.2%	98.7%	98.0%	0%	98.6%	-	97.8%	100%	97.9%	0%	97.9%	-	100%	80.0%	100%	0%	99.7%	-	98.4%
Articulated Trucks	0	21	1	0	22	-	0	7	0	0	7	-	0	0	0	0	0	-	0	0	0	0	0	-	29
% Articulated Trucks	0%	0.5%	1.2%	0%	0.5%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.3%
Buses and Single-Unit Trucks	1	50	3	0	54	-	6	46	5	0	57	-	3	0	9	0	12	-	0	1	0	0	1	-	124
% Buses and Single-Unit Trucks	5.3%	1.2%	3.5%	0%	1.2%	-	1.8%	1.2%	2.0%	0%	1.3%	-	2.2%	0%	2.1%	0%	2.1%	-	0%	20.0%	0%	0%	0.3%	-	1.3%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

26. FM 528 at Lundy Ln. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627346, Location: 29.471394, -95.222355



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Moore Rd Eastbound						Lundy Ln. Westbound						FM 528 Northbound						FM 528 Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	16	0	3	0	19	0	0	0	1	0	1	0	0	136	0	0	136	0	0	110	11	0	121	0	277
6:45AM	16	0	2	0	18	0	0	1	1	0	2	0	0	169	0	0	169	0	0	146	17	0	163	0	352
Hourly Total	32	0	5	0	37	0	0	1	2	0	3	0	0	305	0	0	305	0	0	256	28	0	284	0	629
7:00AM	24	2	4	0	30	0	1	1	3	0	5	0	0	193	0	0	193	0	1	167	17	0	185	0	413
7:15AM	33	0	6	0	39	0	3	3	5	0	11	0	0	216	0	0	216	0	2	175	27	0	204	0	470
7:30AM	44	0	7	0	51	0	0	0	4	0	4	0	1	255	1	0	257	0	3	197	27	0	227	0	539
7:45AM	38	0	2	0	40	0	1	1	6	0	8	0	0	210	0	0	210	0	1	199	27	0	227	0	485
Hourly Total	139	2	19	0	160	0	5	5	18	0	28	0	1	874	1	0	876	0	7	738	98	0	843	0	1907
8:00AM	23	0	5	0	28	0	0	0	10	0	10	0	2	171	2	0	175	0	4	136	14	0	154	0	367
8:15AM	9	0	2	0	11	0	1	0	4	0	5	0	1	188	1	0	190	0	2	161	23	0	186	0	392
Hourly Total	32	0	7	0	39	0	1	0	14	0	15	0	3	359	3	0	365	0	6	297	37	0	340	0	759
4:30PM	30	0	5	0	35	0	2	1	5	0	8	0	2	212	2	0	216	0	5	267	21	0	293	0	552
4:45PM	29	0	7	0	36	0	1	2	1	0	4	0	0	213	1	0	214	0	1	221	36	0	258	0	512
Hourly Total	59	0	12	0	71	0	3	3	6	0	12	0	2	425	3	0	430	0	6	488	57	0	551	0	1064
5:00PM	38	3	5	0	46	0	0	0	4	0	4	0	0	259	2	0	261	0	9	272	45	0	326	0	637
5:15PM	33	1	3	0	37	0	1	0	2	0	3	0	3	314	4	0	321	0	3	277	38	0	318	0	679
5:30PM	25	1	1	0	27	0	1	2	0	0	3	0	0	268	1	0	269	0	5	279	40	0	324	0	623
5:45PM	32	4	6	0	42	0	0	0	6	0	6	0	1	293	6	0	300	0	3	215	29	0	247	0	595
Hourly Total	128	9	15	0	152	0	2	2	12	0	16	0	4	1134	13	0	1151	0	20	1043	152	0	1215	0	2534
6:00PM	35	3	3	0	41	0	1	0	5	0	6	0	2	251	6	0	259	0	3	243	29	0	275	0	581
6:15PM	23	1	5	0	29	0	1	0	4	0	5	0	5	237	3	0	245	0	4	231	27	0	262	0	541
Hourly Total	58	4	8	0	70	0	2	0	9	0	11	0	7	488	9	0	504	0	7	474	56	0	537	0	1122
Total	448	15	66	0	529	0	13	11	61	0	85	0	17	3585	29	0	3631	0	46	3296	428	0	3770	0	8015
% Approach	84.7%	2.8%	12.5%	0%	-	-	15.3%	12.9%	71.8%	0%	-	-	0.5%	98.7%	0.8%	0%	-	-	1.2%	87.4%	11.4%	0%	-	-	-
% Total	5.6%	0.2%	0.8%	0%	6.6%	-	0.2%	0.1%	0.8%	0%	1.1%	-	0.2%	44.7%	0.4%	0%	45.3%	-	0.6%	41.1%	5.3%	0%	47.0%	-	-
Lights	442	14	66	0	522	-	12	11	56	0	79	-	17	3534	28	0	3579	-	42	3251	419	0	3712	-	7892
% Lights	98.7%	93.3%	100%	0%	98.7%	-	92.3%	100%	91.8%	0%	92.9%	-	100%	98.6%	96.6%	0%	98.6%	-	91.3%	98.6%	97.9%	0%	98.5%	-	98.5%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	16	0	0	16	-	0	8	0	0	8	-	24
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.4%	0%	0%	0.4%	-	0%	0.2%	0%	0%	0.2%	-	0.3%
Buses and Single-Unit Trucks	6	1	0	0	7	-	1	0	5	0	6	-	0	35	1	0	36	-	4	37	9	0	50	-	99
% Buses and Single-Unit Trucks	1.3%	6.7%	0%	0%	1.3%	-	7.7%	0%	8.2%	0%	7.1%	-	0%	1.0%	3.4%	0%	1.0%	-	8.7%	1.1%	2.1%	0%	1.3%	-	1.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

27. Cowards Creek Dr. at Sunset Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627347, Location: 29.520546, -95.208711



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Cowards Creek Dr. Eastbound						Spreading Oaks Block Westbound						Sunset Dr. Northbound						Sunset Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	1	0	1	0	2	0	9	1	0	0	10	0	0	73	2	1	76	0	0	22	2	0	24	0	112
6:45AM	1	0	0	0	1	0	8	0	1	0	9	0	0	73	4	0	77	0	2	41	2	0	45	0	132
Hourly Total	2	0	1	0	3	0	17	1	1	0	19	0	0	146	6	1	153	0	2	63	4	0	69	0	244
7:00AM	1	1	2	0	4	0	3	1	1	0	5	0	0	95	2	0	97	0	2	40	1	0	43	0	149
7:15AM	0	2	0	0	2	0	13	2	2	0	17	0	0	137	15	0	152	0	3	61	1	0	65	0	236
7:30AM	4	4	2	0	10	0	22	1	3	0	26	0	0	132	18	0	150	0	3	83	3	0	89	0	275
7:45AM	1	3	1	0	5	0	40	0	0	0	40	0	1	77	23	0	101	0	11	151	4	0	166	0	312
Hourly Total	6	10	5	0	21	0	78	4	6	0	88	0	1	441	58	0	500	0	19	335	9	0	363	0	972
8:00AM	0	1	1	0	2	0	23	1	3	0	27	0	3	76	19	0	98	0	4	138	2	0	144	0	271
8:15AM	0	1	2	0	3	0	20	1	2	0	23	0	2	113	17	0	132	0	3	97	2	0	102	0	260
Hourly Total	0	2	3	0	5	0	43	2	5	0	50	0	5	189	36	0	230	0	7	235	4	0	246	0	531
4:30PM	8	2	4	0	14	0	23	1	5	0	29	0	5	124	17	0	146	0	6	107	0	0	113	0	302
4:45PM	3	0	0	0	3	0	17	2	8	0	27	0	5	109	12	0	126	0	4	136	2	0	142	0	298
Hourly Total	11	2	4	0	17	0	40	3	13	0	56	0	10	233	29	0	272	0	10	243	2	0	255	0	600
5:00PM	1	0	2	0	3	1	15	1	14	0	30	0	0	135	16	0	151	0	5	139	1	0	145	1	329
5:15PM	4	2	1	0	7	0	23	2	5	0	30	1	1	139	15	0	155	1	9	139	1	0	149	0	341
5:30PM	0	0	2	0	2	0	22	1	12	0	35	0	3	120	13	0	136	0	3	143	1	0	147	0	320
5:45PM	2	1	1	0	4	0	17	1	8	0	26	0	2	115	10	0	127	0	1	122	3	0	126	0	283
Hourly Total	7	3	6	0	16	1	77	5	39	0	121	1	6	509	54	0	569	1	18	543	6	0	567	1	1273
6:00PM	4	0	2	0	6	0	8	1	1	0	10	0	0	115	13	0	128	0	4	129	5	0	138	0	282
6:15PM	3	0	5	0	8	0	19	1	10	0	30	0	1	108	13	0	122	0	5	117	0	0	122	0	282
Hourly Total	7	0	7	0	14	0	27	2	11	0	40	0	1	223	26	0	250	0	9	246	5	0	260	0	564
Total	33	17	26	0	76	1	282	17	75	0	374	1	23	1741	209	1	1974	1	65	1665	30	0	1760	1	4184
% Approach	43.4%	22.4%	34.2%	0%	-	-	75.4%	4.5%	20.1%	0%	-	-	1.2%	88.2%	10.6%	0.1%	-	-	3.7%	94.6%	1.7%	0%	-	-	-
% Total	0.8%	0.4%	0.6%	0%	1.8%	-	6.7%	0.4%	1.8%	0%	8.9%	-	0.5%	41.6%	5.0%	0%	47.2%	-	1.6%	39.8%	0.7%	0%	42.1%	-	-
Lights	32	16	26	0	74	-	268	16	74	0	358	-	22	1691	209	1	1923	-	65	1644	28	0	1737	-	4092
% Lights	97.0%	94.1%	100%	0%	97.4%	-	95.0%	94.1%	98.7%	0%	95.7%	-	95.7%	97.1%	100%	100%	97.4%	-	100%	98.7%	93.3%	0%	98.7%	-	97.8%
Articulated Trucks	1	0	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Articulate d Trucks	3.0%	0%	0%	0%	1.3%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	0	1	0	0	1	-	14	1	1	0	16	-	1	50	0	0	51	-	0	21	2	0	23	-	91
% Buses and Single-Unit Trucks	0%	5.9%	0%	0%	1.3%	-	5.0%	5.9%	1.3%	0%	4.3%	-	4.3%	2.9%	0%	0%	2.6%	-	0%	1.3%	6.7%	0%	1.3%	-	2.2%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

28. Falling Leaf Dr. at Sunset Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627348, Location: 29.518793, -95.206446



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Falling Leaf Dr. Eastbound						Falling Leaf Dr. Westbound						Sunset Dr. Northbound						Sunset Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	14	0	7	0	21	0	0	1	0	0	1	0	1	62	1	0	64	0	0	26	10	0	36	0	122
6:45AM	24	0	8	0	32	0	0	0	1	0	1	0	2	53	0	0	55	0	0	31	17	0	48	0	136
Hourly Total	38	0	15	0	53	0	0	1	1	0	2	0	3	115	1	0	119	0	0	57	27	0	84	0	258
7:00AM	22	1	6	0	29	0	0	0	1	0	1	0	3	76	0	0	79	0	0	37	9	0	46	0	155
7:15AM	34	1	9	0	44	0	1	2	5	0	8	0	6	107	0	0	113	0	1	55	17	0	73	0	238
7:30AM	42	0	3	0	45	0	0	0	5	0	5	0	9	104	0	0	113	0	1	54	45	0	100	0	263
7:45AM	33	1	7	0	41	0	0	5	0	0	5	0	14	71	0	0	85	0	3	106	86	0	195	0	326
Hourly Total	131	3	25	0	159	0	1	7	11	0	19	0	32	358	0	0	390	0	5	252	157	0	414	0	982
8:00AM	43	2	10	0	55	0	0	2	1	0	3	0	28	55	0	0	83	0	2	71	88	0	161	0	302
8:15AM	41	3	13	0	57	0	1	2	1	0	4	0	33	88	0	0	121	0	2	55	61	0	118	0	300
Hourly Total	84	5	23	0	112	0	1	4	2	0	7	0	61	143	0	0	204	0	4	126	149	0	279	0	602
4:30PM	36	2	9	0	47	0	0	0	1	0	1	0	6	105	0	0	111	0	1	106	24	0	131	0	290
4:45PM	49	1	6	0	56	0	0	1	1	0	2	0	13	78	1	0	92	0	2	115	35	0	152	0	302
Hourly Total	85	3	15	0	103	0	0	1	2	0	3	0	19	183	1	0	203	0	3	221	59	0	283	0	592
5:00PM	39	2	13	0	54	0	2	1	0	0	3	0	8	109	0	0	117	0	1	126	36	0	163	0	337
5:15PM	28	1	8	0	37	0	0	0	2	0	2	0	4	124	0	0	128	0	2	125	36	0	163	0	330
5:30PM	27	0	4	0	31	0	0	1	2	0	3	0	6	106	2	0	114	0	3	125	40	0	168	0	316
5:45PM	24	2	4	0	30	1	2	1	0	0	3	0	8	105	2	0	115	0	2	97	33	0	132	0	280
Hourly Total	118	5	29	0	152	1	4	3	4	0	11	0	26	444	4	0	474	0	8	473	145	0	626	0	1263
6:00PM	24	1	4	0	29	0	0	0	2	0	2	0	10	99	0	0	109	0	1	120	24	0	145	0	285
6:15PM	26	0	3	0	29	0	1	0	2	0	3	0	8	96	1	0	105	0	1	105	27	0	133	0	270
Hourly Total	50	1	7	0	58	0	1	0	4	0	5	0	18	195	1	0	214	0	2	225	51	0	278	0	555
Total	506	17	114	0	637	1	7	16	24	0	47	0	159	1438	7	0	1604	0	22	1354	588	0	1964	0	4252
% Approach	79.4%	2.7%	17.9%	0%	-	-	14.9%	34.0%	51.1%	0%	-	-	9.9%	89.7%	0.4%	0%	-	-	1.1%	68.9%	29.9%	0%	-	-	-
% Total	11.9%	0.4%	2.7%	0%	15.0%	-	0.2%	0.4%	0.6%	0%	1.1%	-	3.7%	33.8%	0.2%	0%	37.7%	-	0.5%	31.8%	13.8%	0%	46.2%	-	-
Lights	488	17	114	0	619	-	7	16	24	0	47	-	156	1409	7	0	1572	-	22	1325	581	0	1928	-	4166
% Lights	96.4%	100%	100%	0%	97.2%	-	100%	100%	100%	0%	100%	-	98.1%	98.0%	100%	0%	98.0%	-	100%	97.9%	98.8%	0%	98.2%	-	98.0%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	2	0	0	2	-	2
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%
Buses and Single-Unit Trucks	18	0	0	0	18	-	0	0	0	0	0	-	3	29	0	0	32	-	0	27	7	0	34	-	84
% Buses and Single-Unit Trucks	3.6%	0%	0%	0%	2.8%	-	0%	0%	0%	0%	0%	-	1.9%	2.0%	0%	0%	2.0%	-	0%	2.0%	1.2%	0%	1.7%	-	2.0%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

29. Sunset Dr. at W. Castlewood Ave. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627349, Location: 29.515697, -95.202539



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	W. Castlewood Ave. Eastbound						W. Castlewood Ave. Westbound						Sunset Dr. Northbound						Sunset Dr. Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	14	1	4	0	19	0	1	2	0	0	3	0	6	45	2	0	53	0	0	29	3	0	32	0	107
6:45AM	13	3	8	0	24	0	1	4	1	0	6	0	1	39	3	0	43	0	6	34	1	0	41	0	114
Hourly Total	27	4	12	0	43	0	2	6	1	0	9	0	7	84	5	0	96	0	6	63	4	0	73	0	221
7:00AM	17	6	12	0	35	0	2	10	2	0	14	0	4	55	6	0	65	0	1	36	5	0	42	0	156
7:15AM	31	5	7	0	43	0	3	9	7	0	19	0	3	66	6	0	75	0	5	52	7	0	64	1	201
7:30AM	24	11	6	0	41	0	2	11	8	0	21	0	7	71	6	0	84	0	4	40	6	0	50	0	196
7:45AM	18	13	9	0	40	0	5	11	7	0	23	0	13	57	5	0	75	0	5	101	3	0	109	0	247
Hourly Total	90	35	34	0	159	0	12	41	24	0	77	0	27	249	23	0	299	0	15	229	21	0	265	1	800
8:00AM	10	20	15	0	45	0	3	18	10	0	31	0	7	73	12	0	92	0	3	76	5	0	84	0	252
8:15AM	17	18	20	0	55	0	4	25	12	0	41	1	12	78	9	0	99	0	5	54	7	0	66	0	261
Hourly Total	27	38	35	0	100	0	7	43	22	0	72	1	19	151	21	0	191	0	8	130	12	0	150	0	513
4:30PM	14	10	9	0	33	0	15	25	5	0	45	0	8	93	8	0	109	0	5	96	17	0	118	0	305
4:45PM	11	15	15	0	41	0	14	14	7	0	35	0	12	77	7	0	96	0	4	105	9	0	118	0	290
Hourly Total	25	25	24	0	74	0	29	39	12	0	80	0	20	170	15	0	205	0	9	201	26	0	236	0	595
5:00PM	14	15	11	0	40	0	12	18	6	0	36	0	6	89	11	0	106	0	3	119	14	0	136	0	318
5:15PM	15	13	15	0	43	0	15	24	4	0	43	0	9	114	12	0	135	0	6	105	15	0	126	0	347
5:30PM	11	11	10	0	32	0	15	21	8	0	44	0	11	92	10	0	113	0	3	102	20	0	125	0	314
5:45PM	11	16	12	0	39	0	12	30	6	0	48	0	12	96	9	0	117	0	7	83	12	0	102	0	306
Hourly Total	51	55	48	0	154	0	54	93	24	0	171	0	38	391	42	0	471	0	19	409	61	0	489	0	1285
6:00PM	8	18	6	0	32	0	10	7	7	0	24	0	11	90	10	0	111	0	5	109	12	0	126	0	293
6:15PM	10	9	11	0	30	0	7	17	8	0	32	0	9	85	10	0	104	0	3	87	13	0	103	0	269
Hourly Total	18	27	17	0	62	0	17	24	15	0	56	0	20	175	20	0	215	0	8	196	25	0	229	0	562
Total	238	184	170	0	592	0	121	246	98	0	465	1	131	1220	126	0	1477	0	65	1228	149	0	1442	1	3976
% Approach	40.2%	31.1%	28.7%	0%	-	-	26.0%	52.9%	21.1%	0%	-	-	8.9%	82.6%	8.5%	0%	-	-	4.5%	85.2%	10.3%	0%	-	-	-
% Total	6.0%	4.6%	4.3%	0%	14.9%	-	3.0%	6.2%	2.5%	0%	11.7%	-	3.3%	30.7%	3.2%	0%	37.1%	-	1.6%	30.9%	3.7%	0%	36.3%	-	-
Lights	231	183	167	0	581	-	121	243	96	0	460	-	131	1197	125	0	1453	-	65	1206	145	0	1416	-	3910
% Lights	97.1%	99.5%	98.2%	0%	98.1%	-	100%	98.8%	98.0%	0%	98.9%	-	100%	98.1%	99.2%	0%	98.4%	-	100%	98.2%	97.3%	0%	98.2%	-	98.3%
Articulated Trucks	0	1	0	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1	1	0	2	-	3
% Articulated Trucks	0%	0.5%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0.7%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	7	0	3	0	10	-	0	3	2	0	5	-	0	23	1	0	24	-	0	21	3	0	24	-	63
% Buses and Single-Unit Trucks	2.9%	0%	1.8%	0%	1.7%	-	0%	1.2%	2.0%	0%	1.1%	-	0%	1.9%	0.8%	0%	1.6%	-	0%	1.7%	2.0%	0%	1.7%	-	1.6%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	100%

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

30. Briar Meadow Ave. at Sunset - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627350, Location: 29.512118, -95.197801



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Briar Meadow Ave Eastbound						Briar Meadow Ave Westbound						Sunset Dr Northbound						Sunset Dr Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	9	2	7	0	18	0	0	1	0	0	1	0	4	41	1	0	46	0	0	46	2	0	48	0	113
6:45AM	5	3	12	0	20	0	1	2	1	0	4	0	5	39	3	0	47	0	8	44	0	0	52	0	123
Hourly Total	14	5	19	0	38	0	1	3	1	0	5	0	9	80	4	0	93	0	8	90	2	0	100	0	236
7:00AM	4	3	12	0	19	0	1	1	1	0	3	0	5	68	6	0	79	0	1	50	1	0	52	0	153
7:15AM	11	4	12	0	27	0	13	1	1	0	15	0	11	103	14	0	128	0	0	59	4	0	63	0	233
7:30AM	10	1	22	0	33	0	11	5	1	0	17	2	7	76	8	0	91	0	1	68	3	0	72	0	213
7:45AM	3	3	17	0	23	0	1	2	3	0	6	0	22	73	4	0	99	0	2	96	13	0	111	0	239
Hourly Total	28	11	63	0	102	0	26	9	6	0	41	2	45	320	32	0	397	0	4	273	21	0	298	0	838
8:00AM	8	10	29	0	47	0	1	4	2	0	7	0	18	85	3	0	106	0	2	100	4	0	106	0	266
8:15AM	2	9	27	0	38	0	0	7	2	0	9	0	14	106	3	0	123	0	7	80	6	0	93	0	263
Hourly Total	10	19	56	0	85	0	1	11	4	0	16	0	32	191	6	0	229	0	9	180	10	0	199	0	529
4:30PM	3	2	11	0	16	0	1	10	2	0	13	0	18	94	3	0	115	0	4	104	14	0	122	0	266
4:45PM	8	10	13	0	31	0	4	8	3	0	15	0	14	85	4	0	103	0	6	108	10	0	124	0	273
Hourly Total	11	12	24	0	47	0	5	18	5	0	28	0	32	179	7	0	218	0	10	212	24	0	246	0	539
5:00PM	6	7	9	0	22	0	4	13	10	0	27	0	15	100	6	0	121	0	7	118	10	0	135	0	305
5:15PM	7	8	13	0	28	0	3	7	11	0	21	0	15	93	8	0	116	0	1	115	6	0	122	0	287
5:30PM	6	5	16	0	27	0	4	6	6	0	16	0	20	110	1	0	131	0	10	111	5	0	126	0	300
5:45PM	5	3	26	0	34	0	2	13	5	0	20	0	17	122	3	0	142	0	6	94	10	0	110	0	306
Hourly Total	24	23	64	0	111	0	13	39	32	0	84	0	67	425	18	0	510	0	24	438	31	0	493	0	1198
6:00PM	6	11	12	0	29	0	2	13	5	0	20	0	13	102	4	0	119	0	2	108	8	0	118	0	286
6:15PM	5	2	13	0	20	0	5	11	5	0	21	0	15	98	8	0	121	0	7	103	10	0	120	0	282
Hourly Total	11	13	25	0	49	0	7	24	10	0	41	0	28	200	12	0	240	0	9	211	18	0	238	0	568
Total	98	83	251	0	432	0	53	104	58	0	215	2	213	1395	79	0	1687	0	64	1404	106	0	1574	0	3908
% Approach	22.7%	19.2%	58.1%	0%	-	-	24.7%	48.4%	27.0%	0%	-	-	12.6%	82.7%	4.7%	0%	-	-	4.1%	89.2%	6.7%	0%	-	-	-
% Total	2.5%	2.1%	6.4%	0%	11.1%	-	1.4%	2.7%	1.5%	0%	5.5%	-	5.5%	35.7%	2.0%	0%	43.2%	-	1.6%	35.9%	2.7%	0%	40.3%	-	-
Lights	98	78	248	0	424	-	35	103	57	0	195	-	213	1369	64	0	1646	-	64	1380	104	0	1548	-	3813
% Lights	100%	94.0%	98.8%	0%	98.1%	-	66.0%	99.0%	98.3%	0%	90.7%	-	100%	98.1%	81.0%	0%	97.6%	-	100%	98.3%	98.1%	0%	98.3%	-	97.6%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	1	-	0	1	0	0	1	-	2
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%	0.1%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	0	5	3	0	8	-	18	1	1	0	20	-	0	25	15	0	40	-	0	23	2	0	25	-	93
% Buses and Single-Unit Trucks	0%	6.0%	1.2%	0%	1.9%	-	34.0%	1.0%	1.7%	0%	9.3%	-	0%	1.8%	19.0%	0%	2.4%	-	0%	1.6%	1.9%	0%	1.6%	-	2.4%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

31. Greenbriar Dr. at Falling Leaf Dr. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627351, Location: 29.51503, -95.210832



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Falling Leaf Dr. Eastbound						Falling Leaf Dr. Westbound						Greenbriar Dr Northbound						Greenbriar Dr Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27 6:30AM	0	16	2	0	18	0	10	3	0	0	13	0	1	0	6	0	7	0	0	2	0	0	2	0	40
6:45AM	0	20	3	0	23	0	13	3	0	0	16	0	5	1	10	0	16	0	0	1	0	0	1	0	56
Hourly Total	0	36	5	0	41	0	23	6	0	0	29	0	6	1	16	0	23	0	0	3	0	0	3	0	96
7:00AM	0	15	4	0	19	0	6	7	1	0	14	0	5	0	13	0	18	0	0	0	0	0	0	0	51
7:15AM	0	17	3	0	20	0	16	6	0	0	22	0	2	0	24	0	26	0	0	1	0	0	1	0	69
7:30AM	0	13	2	0	15	0	38	14	1	0	53	0	3	0	36	0	39	0	3	0	0	0	3	0	110
7:45AM	0	14	12	0	26	0	80	23	0	0	103	0	4	1	22	0	27	0	0	1	0	0	1	0	157
Hourly Total	0	59	21	0	80	0	140	50	2	0	192	0	14	1	95	0	110	0	3	2	0	0	5	0	387
8:00AM	0	17	5	0	22	0	81	27	1	0	109	0	7	1	33	0	41	0	2	0	0	0	2	0	174
8:15AM	0	21	4	0	25	0	57	38	0	0	95	0	5	0	37	0	42	0	1	1	0	0	2	0	164
Hourly Total	0	38	9	0	47	0	138	65	1	0	204	0	12	1	70	0	83	0	3	1	0	0	4	0	338
4:30PM	0	17	3	0	20	0	16	15	1	0	32	0	4	1	29	0	34	0	2	1	0	0	3	0	89
4:45PM	0	14	7	0	21	1	21	19	2	0	42	0	4	0	40	0	44	0	0	1	0	0	1	0	108
Hourly Total	0	31	10	0	41	1	37	34	3	0	74	0	8	1	69	0	78	0	2	2	0	0	4	0	197
5:00PM	3	23	8	0	34	0	24	22	0	0	46	0	4	2	27	0	33	1	1	0	2	0	3	0	116
5:15PM	0	16	10	0	26	0	21	15	0	0	36	0	8	1	20	0	29	0	3	0	0	0	3	0	94
5:30PM	0	8	4	0	12	0	19	28	1	0	48	0	7	0	20	0	27	0	0	0	0	0	0	0	87
5:45PM	0	12	9	0	21	0	19	18	2	0	39	0	8	4	12	0	24	0	0	1	0	0	1	0	85
Hourly Total	3	59	31	0	93	0	83	83	3	0	169	0	27	7	79	0	113	1	4	1	2	0	7	0	382
6:00PM	0	10	5	0	15	0	13	15	2	0	30	0	6	3	18	0	27	0	0	1	0	0	1	0	73
6:15PM	0	11	3	0	14	0	10	22	2	0	34	0	5	0	16	0	21	0	0	0	0	0	0	0	69
Hourly Total	0	21	8	0	29	0	23	37	4	0	64	0	11	3	34	0	48	0	0	1	0	0	1	0	142
Total	3	244	84	0	331	1	444	275	13	0	732	0	78	14	363	0	455	1	12	10	2	0	24	0	1542
% Approach	0.9%	73.7%	25.4%	0%	-	-	60.7%	37.6%	1.8%	0%	-	-	17.1%	3.1%	79.8%	0%	-	-	50.0%	41.7%	8.3%	0%	-	-	-
% Total	0.2%	15.8%	5.4%	0%	21.5%	-	28.8%	17.8%	0.8%	0%	47.5%	-	5.1%	0.9%	23.5%	0%	29.5%	-	0.8%	0.6%	0.1%	0%	1.6%	-	-
Lights	3	242	83	0	328	-	436	273	13	0	722	-	77	14	346	0	437	-	12	10	2	0	24	-	1511
% Lights	100%	99.2%	98.8%	0%	99.1%	-	98.2%	99.3%	100%	0%	98.6%	-	98.7%	100%	95.3%	0%	96.0%	-	100%	100%	100%	0%	100%	-	98.0%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	0	2	1	0	3	-	8	2	0	0	10	-	1	0	17	0	18	-	0	0	0	0	0	-	31
% Buses and Single-Unit Trucks	0%	0.8%	1.2%	0%	0.9%	-	1.8%	0.7%	0%	0%	1.4%	-	1.3%	0%	4.7%	0%	4.0%	-	0%	0%	0%	0%	0%	-	2.0%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

32. Greenbriar Dr. at W. Castlewood Ave. - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627352, Location: 29.511662, -95.206819



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	W. Castlewood Ave. Eastbound						W. Castlewood Ave. Westbound						Greenbriar Dr Northbound						Greenbriar Dr Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	2	10	2	0	14	0	2	2	6	0	10	0	2	18	1	0	21	0	4	16	4	0	24	0	69
6:45AM	0	17	2	0	19	0	1	0	4	0	5	0	2	41	4	0	47	0	2	14	0	0	16	0	87
Hourly Total	2	27	4	0	33	0	3	2	10	0	15	0	4	59	5	0	68	0	6	30	4	0	40	0	156
7:00AM	1	18	1	0	20	0	5	4	8	0	17	1	2	27	7	0	36	1	6	14	0	0	20	0	93
7:15AM	1	26	3	0	30	0	5	5	9	0	19	1	1	36	12	0	49	1	3	13	0	0	16	0	114
7:30AM	4	25	6	0	35	0	5	5	12	0	22	0	2	69	9	0	80	0	4	17	1	0	22	1	159
7:45AM	3	17	5	0	25	0	0	3	24	0	27	0	1	136	8	0	145	0	20	54	7	0	81	0	278
Hourly Total	9	86	15	0	110	0	15	17	53	0	85	2	6	268	36	0	310	2	33	98	8	0	139	1	644
8:00AM	1	6	5	0	12	1	0	2	22	0	24	0	4	155	8	0	167	0	24	79	2	0	105	0	308
8:15AM	3	12	7	0	22	1	0	11	36	0	47	1	2	136	7	0	145	0	33	74	2	0	109	1	323
Hourly Total	4	18	12	0	34	2	0	13	58	0	71	1	6	291	15	0	312	0	57	153	4	0	214	1	631
4:30PM	0	15	5	0	20	0	12	16	13	0	41	0	5	38	4	0	47	0	12	55	0	0	67	0	175
4:45PM	1	13	1	0	15	0	10	14	13	0	37	0	6	33	7	0	46	0	19	54	2	0	75	0	173
Hourly Total	1	28	6	0	35	0	22	30	26	0	78	0	11	71	11	0	93	0	31	109	2	0	142	0	348
5:00PM	2	14	2	0	18	1	11	16	5	0	32	0	5	36	9	0	50	0	18	73	5	0	96	0	196
5:15PM	3	10	4	0	17	0	15	24	7	0	46	0	8	29	15	0	52	0	6	39	8	0	53	0	168
5:30PM	0	13	2	0	15	0	12	20	12	0	44	0	6	32	11	0	49	0	5	31	2	0	38	0	146
5:45PM	1	12	4	0	17	0	11	18	23	0	52	0	8	41	13	0	62	0	13	39	2	0	54	0	185
Hourly Total	6	49	12	0	67	1	49	78	47	0	174	0	27	138	48	0	213	0	42	182	17	0	241	0	695
6:00PM	0	12	4	0	16	0	4	13	9	0	26	0	9	40	8	0	57	0	10	36	3	0	49	0	148
6:15PM	1	14	3	0	18	0	9	12	13	0	34	0	7	30	4	0	41	0	10	27	0	0	37	0	130
Hourly Total	1	26	7	0	34	0	13	25	22	0	60	0	16	70	12	0	98	0	20	63	3	0	86	0	278
Total	23	234	56	0	313	3	102	165	216	0	483	3	70	897	127	0	1094	2	189	635	38	0	862	2	2752
% Approach	7.3%	74.8%	17.9%	0%	-	-	21.1%	34.2%	44.7%	0%	-	-	6.4%	82.0%	11.6%	0%	-	-	21.9%	73.7%	4.4%	0%	-	-	-
% Total	0.8%	8.5%	2.0%	0%	11.4%	-	3.7%	6.0%	7.8%	0%	17.6%	-	2.5%	32.6%	4.6%	0%	39.8%	-	6.9%	23.1%	1.4%	0%	31.3%	-	-
Lights	23	232	55	0	310	-	100	162	214	0	476	-	68	885	120	0	1073	-	189	630	38	0	857	-	2716
% Lights	100%	99.1%	98.2%	0%	99.0%	-	98.0%	98.2%	99.1%	0%	98.6%	-	97.1%	98.7%	94.5%	0%	98.1%	-	100%	99.2%	100%	0%	99.4%	-	98.7%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	0	2	1	0	3	-	2	3	2	0	7	-	2	12	7	0	21	-	0	5	0	0	5	-	36
% Buses and Single-Unit Trucks	0%	0.9%	1.8%	0%	1.0%	-	2.0%	1.8%	0.9%	0%	1.4%	-	2.9%	1.3%	5.5%	0%	1.9%	-	0%	0.8%	0%	0%	0.6%	-	1.3%
Pedestrians	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-	2	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

33. Greenbriar Dr at Wilderness Trail - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627353, Location: 29.508328, -95.20281



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg Direction	Wilderness Trail Eastbound					Greenbriar Dr Northbound					Greenbriar Dr Southbound					
Time	L	R	U	App	Ped*	L	T	U	App	Ped*	T	R	U	App	Ped*	Int
2019-02-27 6:30AM	3	6	0	9	0	1	17	0	18	0	17	0	0	17	0	44
6:45AM	5	16	0	21	0	0	33	0	33	0	14	0	0	14	0	68
Hourly Total	8	22	0	30	0	1	50	0	51	0	31	0	0	31	0	112
7:00AM	8	13	0	21	0	6	31	0	37	0	14	2	0	16	0	74
7:15AM	6	17	0	23	0	5	60	0	65	0	27	2	0	29	0	117
7:30AM	9	23	0	32	0	7	62	0	69	0	35	2	0	37	0	138
7:45AM	6	20	0	26	0	10	134	0	144	0	61	6	0	67	0	237
Hourly Total	29	73	0	102	0	28	287	0	315	0	137	12	0	149	0	566
8:00AM	12	21	0	33	0	15	148	0	163	0	68	4	0	72	0	268
8:15AM	9	22	0	31	0	16	116	0	132	0	70	4	0	74	0	237
Hourly Total	21	43	0	64	0	31	264	0	295	0	138	8	0	146	0	505
4:30PM	4	9	0	13	0	15	45	0	60	0	56	6	0	62	0	135
4:45PM	5	13	0	18	0	17	45	0	62	0	60	6	0	66	0	146
Hourly Total	9	22	0	31	0	32	90	0	122	0	116	12	0	128	0	281
5:00PM	5	17	0	22	0	17	45	0	62	0	76	6	0	82	0	166
5:15PM	5	9	1	15	0	21	40	0	61	0	52	9	0	61	0	137
5:30PM	8	17	0	25	0	26	34	0	60	0	44	3	0	47	0	132
5:45PM	4	19	0	23	0	14	55	0	69	0	51	3	0	54	0	146
Hourly Total	22	62	1	85	0	78	174	0	252	0	223	21	0	244	0	581
6:00PM	7	16	0	23	0	17	42	0	59	0	40	5	0	45	0	127
6:15PM	5	11	0	16	0	19	29	0	48	0	25	5	0	30	0	94
Hourly Total	12	27	0	39	0	36	71	0	107	0	65	10	0	75	0	221
Total	101	249	1	351	0	206	936	0	1142	0	710	63	0	773	0	2266
% Approach	28.8%	70.9%	0.3%	-	-	18.0%	82.0%	0%	-	-	91.8%	8.2%	0%	-	-	-
% Total	4.5%	11.0%	0%	15.5%	-	9.1%	41.3%	0%	50.4%	-	31.3%	2.8%	0%	34.1%	-	-
Lights	99	246	1	346	-	204	920	0	1124	-	704	62	0	766	-	2236
% Lights	98.0%	98.8%	100%	98.6%	-	99.0%	98.3%	0%	98.4%	-	99.2%	98.4%	0%	99.1%	-	98.7%
Articulated Trucks	0	0	0	0	-	1	0	0	1	-	0	1	0	1	-	2
% Articulated Trucks	0%	0%	0%	0%	-	0.5%	0%	0%	0.1%	-	0%	1.6%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	2	3	0	5	-	1	16	0	17	-	6	0	0	6	-	28
% Buses and Single-Unit Trucks	2.0%	1.2%	0%	1.4%	-	0.5%	1.7%	0%	1.5%	-	0.8%	0%	0%	0.8%	-	1.2%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

34. Briarmeadow Ave at Greenbriar Dr - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627354, Location: 29.507941, -95.202331



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Unnamed Drwy Eastbound							Briarmeadow Ave Westbound							Greenbriar Ave Northbound							Greenbriar Ave Southbound							
Time	L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*		L	T	R	U	App	Ped*	Int	
2019-02-27 6:30AM	0	0	0	0	0	0		0	0	7	0	7	0		0	11	3	0	14	0		5	18	0	0	23	0		44
6:45AM	0	0	0	0	0	0		1	0	6	0	7	0		0	28	0	0	28	0		14	16	0	0	30	0		65
Hourly Total	0	0	0	0	0	0		1	0	13	0	14	0		0	39	3	0	42	0		19	34	0	0	53	0		109
7:00AM	0	0	0	0	0	0		0	0	6	0	6	0		0	30	2	0	32	0		13	14	0	0	27	0		65
7:15AM	0	1	0	0	1	0		1	0	11	0	12	0		1	55	10	0	66	0		15	26	0	0	41	0		120
7:30AM	0	0	1	0	1	3		7	0	10	0	17	0		0	61	3	0	64	0		18	39	0	0	57	0		139
7:45AM	0	0	0	0	0	0		4	0	34	0	38	0		0	110	2	0	112	0		19	60	0	0	79	0		229
Hourly Total	0	1	1	0	2	3		12	0	61	0	73	0		1	256	17	0	274	0		65	139	0	0	204	0		553
8:00AM	0	0	0	0	0	0		1	0	22	0	23	1		0	140	2	0	142	0		34	56	0	0	90	0		255
8:15AM	0	0	1	0	1	0		4	0	20	0	24	0		0	109	2	0	111	0		33	59	0	0	92	0		228
Hourly Total	0	0	1	0	1	0		5	0	42	0	47	1		0	249	4	0	253	0		67	115	0	0	182	0		483
4:30PM	0	0	0	0	0	0		5	0	21	0	26	0		0	39	3	0	42	0		13	52	0	0	65	0		133
4:45PM	0	0	0	0	0	0		5	0	17	0	22	0		0	45	2	0	47	0		17	56	0	0	73	0		142
Hourly Total	0	0	0	0	0	0		10	0	38	0	48	0		0	84	5	0	89	0		30	108	0	0	138	0		275
5:00PM	0	0	0	0	0	0		5	0	18	0	23	0		0	43	3	0	46	0		14	78	0	0	92	0		161
5:15PM	0	0	0	0	0	0		4	0	20	0	24	0		0	41	4	0	45	0		12	49	0	0	61	0		130
5:30PM	0	0	0	0	0	0		2	0	22	0	24	0		0	38	4	0	42	0		19	42	0	0	61	0		127
5:45PM	0	0	0	0	0	0		5	0	15	0	20	0		0	53	4	0	57	0		25	45	0	0	70	0		147
Hourly Total	0	0	0	0	0	0		16	0	75	0	91	0		0	175	15	0	190	0		70	214	0	0	284	0		565
6:00PM	0	0	0	0	0	0		6	0	21	0	27	0		0	39	1	0	40	0		18	37	0	0	55	0		122
6:15PM	0	0	0	0	0	0		7	0	19	0	26	0		0	28	5	0	33	0		9	28	0	0	37	0		96
Hourly Total	0	0	0	0	0	0		13	0	40	0	53	0		0	67	6	0	73	0		27	65	0	0	92	0		218
Total	0	1	2	0	3	3		57	0	269	0	326	1		1	870	50	0	921	0		278	675	0	0	953	0		2203
% Approach	0%	33.3%	66.7%	0%	-	-		17.5%	0%	82.5%	0%	-	-		0.1%	94.5%	5.4%	0%	-	-		29.2%	70.8%	0%	0%	-	-		-
% Total	0%	0%	0.1%	0%	0.1%	-		2.6%	0%	12.2%	0%	14.8%	-		0%	39.5%	2.3%	0%	41.8%	-		12.6%	30.6%	0%	0%	43.3%	-		-
Lights	0	1	2	0	3	-		55	0	269	0	324	-		1	852	43	0	896	-		275	669	0	0	944	-		2167
% Lights	0%	100%	100%	0%	100%	-		96.5%	0%	100%	0%	99.4%	-		100%	97.9%	86.0%	0%	97.3%	-		98.9%	99.1%	0%	0%	99.1%	-		98.4%
Articulated Trucks	0	0	0	0	0	-		0	0	0	0	0	-		0	0	0	0	0	-		0	0	0	0	0	-		0
% Articulated Trucks	0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%	0%	0%	0%	0%	-		0%
Buses and Single-Unit Trucks	0	0	0	0	0	-		2	0	0	0	2	-		0	18	7	0	25	-		3	6	0	0	9	-		36
% Buses and Single-Unit Trucks	0%	0%	0%	0%	0%	-		3.5%	0%	0%	0%	0.6%	-		0%	2.1%	14.0%	0%	2.7%	-		1.1%	0.9%	0%	0%	0.9%	-		1.6%
Pedestrians	-	-	-	-	-	3		-	-	-	-	-	1		-	-	-	-	-	0		-	-	-	-	-	0		-
% Pedestrians	-	-	-	-	-	100%		-	-	-	-	-	100%		-	-	-	-	-	-		-	-	-	-	-	-		-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

35. Falcon Ridge at Eagle Lakes Dr - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627355, Location: 29.495683, -95.192091



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Eagle Lakes Dr Eastbound						Eagle Lakes Dr Westbound						Falcon Ridge Northbound						Falcon Ridge Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	2	19	4	0	25	1	2	2	1	0	5	0	0	1	4	0	5	0	8	5	0	0	13	0	48
6:45AM	1	15	4	0	20	0	2	11	1	0	14	1	0	3	2	0	5	0	5	7	3	0	15	1	54
Hourly Total	3	34	8	0	45	1	4	13	2	0	19	1	0	4	6	0	10	0	13	12	3	0	28	1	102
7:00AM	0	29	1	0	30	0	2	8	0	0	10	0	2	3	7	0	12	0	9	14	4	0	27	0	79
7:15AM	0	33	8	0	41	2	1	14	3	0	18	0	2	3	2	0	7	0	12	16	2	0	30	0	96
7:30AM	4	34	9	0	47	0	4	12	3	0	19	0	4	11	10	0	25	0	11	16	4	0	31	0	122
7:45AM	8	60	12	0	80	0	5	61	3	0	69	0	10	9	14	0	33	0	8	12	18	0	38	0	220
Hourly Total	12	156	30	0	198	2	12	95	9	0	116	0	18	26	33	0	77	0	40	58	28	0	126	0	517
8:00AM	15	74	19	0	108	0	8	84	3	0	95	0	5	9	13	0	27	0	16	25	28	0	69	2	299
8:15AM	12	91	13	0	116	0	4	45	5	0	54	0	4	5	8	0	17	0	15	9	25	0	49	0	236
Hourly Total	27	165	32	0	224	0	12	129	8	0	149	0	9	14	21	0	44	0	31	34	53	0	118	2	535
4:30PM	7	40	1	0	48	0	5	29	6	0	40	2	6	20	8	0	34	0	5	10	4	0	19	0	141
4:45PM	5	32	5	0	42	0	8	39	8	0	55	0	1	14	8	0	23	1	10	8	4	0	22	0	142
Hourly Total	12	72	6	0	90	0	13	68	14	0	95	2	7	34	16	0	57	1	15	18	8	0	41	0	283
5:00PM	8	32	3	0	43	0	4	39	7	0	50	0	2	12	3	0	17	1	8	9	6	0	23	1	133
5:15PM	4	38	1	0	43	0	6	49	10	0	65	0	5	18	1	0	24	0	4	9	6	0	19	0	151
5:30PM	3	36	1	0	40	0	6	42	10	0	58	0	2	15	10	0	27	0	6	6	3	0	15	0	140
5:45PM	4	22	1	0	27	0	3	32	5	0	40	0	3	19	9	0	31	1	8	5	7	0	20	0	118
Hourly Total	19	128	6	0	153	0	19	162	32	0	213	0	12	64	23	0	99	2	26	29	22	0	77	1	542
6:00PM	8	27	3	0	38	1	3	33	10	0	46	3	5	19	5	0	29	0	2	7	5	0	14	0	127
6:15PM	3	18	2	0	23	0	3	19	8	0	30	0	4	8	3	0	15	0	3	12	3	1	19	0	87
Hourly Total	11	45	5	0	61	1	6	52	18	0	76	3	9	27	8	0	44	0	5	19	8	1	33	0	214
Total	84	600	87	0	771	4	66	519	83	0	668	6	55	169	107	0	331	3	130	170	122	1	423	4	2193
% Approach	10.9%	77.8%	11.3%	0%	-	-	9.9%	77.7%	12.4%	0%	-	-	16.6%	51.1%	32.3%	0%	-	-	30.7%	40.2%	28.8%	0.2%	-	-	-
% Total	3.8%	27.4%	4.0%	0%	35.2%	-	3.0%	23.7%	3.8%	0%	30.5%	-	2.5%	7.7%	4.9%	0%	15.1%	-	5.9%	7.8%	5.6%	0%	19.3%	-	-
Lights	81	581	87	0	749	-	64	508	81	0	653	-	53	167	103	0	323	-	128	165	118	1	412	-	2137
% Lights	96.4%	96.8%	100%	0%	97.1%	-	97.0%	97.9%	97.6%	0%	97.8%	-	96.4%	98.8%	96.3%	0%	97.6%	-	98.5%	97.1%	96.7%	100%	97.4%	-	97.4%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Buses and Single-Unit Trucks	3	19	0	0	22	-	2	11	2	0	15	-	2	2	4	0	8	-	2	5	4	0	11	-	56
% Buses and Single-Unit Trucks	3.6%	3.2%	0%	0%	2.9%	-	3.0%	2.1%	2.4%	0%	2.2%	-	3.6%	1.2%	3.7%	0%	2.4%	-	1.5%	2.9%	3.3%	0%	2.6%	-	2.6%
Pedestrians	-	-	-	-	-	4	-	-	-	-	-	6	-	-	-	-	-	3	-	-	-	-	-	4	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	-	100%

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

36. W. Main St at Bay Area Blvd - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627356, Location: 29.490076, -95.153161



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	W Main St Eastbound						W Main St Westbound						Bay Area Blvd Northbound						Bay Area Blvd Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	53	165	14	0	232	0	13	88	42	0	143	0	18	39	40	0	97	0	58	11	12	0	81	0	553
6:45AM	59	189	13	0	261	0	20	92	57	0	169	0	30	58	56	0	144	0	65	29	21	0	115	0	689
Hourly Total	112	354	27	0	493	0	33	180	99	0	312	0	48	97	96	0	241	0	123	40	33	0	196	0	1242
7:00AM	71	187	16	0	274	0	23	99	73	0	195	0	25	50	65	0	140	0	63	26	23	0	112	0	721
7:15AM	60	165	13	0	238	0	31	144	88	0	263	0	50	88	21	1	160	0	37	12	15	0	64	0	725
7:30AM	102	183	16	0	301	0	11	116	64	1	192	0	29	74	45	0	148	0	29	14	22	0	65	0	706
7:45AM	64	138	12	0	214	0	27	130	97	0	254	0	35	89	54	0	178	0	52	23	28	0	103	0	749
Hourly Total	297	673	57	0	1027	0	92	489	322	1	904	0	139	301	185	1	626	0	181	75	88	0	344	0	2901
8:00AM	59	155	19	0	233	0	25	147	83	0	255	0	38	73	54	0	165	0	41	14	34	0	89	0	742
8:15AM	60	134	19	0	213	0	12	142	47	0	201	0	34	68	27	0	129	0	30	20	21	0	71	0	614
Hourly Total	119	289	38	0	446	0	37	289	130	0	456	0	72	141	81	0	294	0	71	34	55	0	160	0	1356
4:30PM	38	115	37	0	190	0	49	221	70	0	340	0	44	54	30	0	128	0	55	69	79	0	203	0	861
4:45PM	52	167	34	0	253	0	25	196	83	0	304	2	34	53	26	0	113	0	50	50	81	0	181	0	851
Hourly Total	90	282	71	0	443	0	74	417	153	0	644	2	78	107	56	0	241	0	105	119	160	0	384	0	1712
5:00PM	53	162	52	0	267	0	39	218	58	0	315	0	36	42	23	0	101	0	50	75	92	0	217	0	900
5:15PM	51	146	47	0	244	0	44	223	65	0	332	0	50	59	22	0	131	0	55	80	99	0	234	0	941
5:30PM	57	172	29	0	258	0	22	222	53	0	297	1	57	68	13	0	138	0	42	50	91	0	183	0	876
5:45PM	46	165	50	0	261	0	35	213	58	0	306	0	43	53	17	0	113	0	43	67	82	0	192	0	872
Hourly Total	207	645	178	0	1030	0	140	876	234	0	1250	1	186	222	75	0	483	0	190	272	364	0	826	0	3589
6:00PM	42	123	32	0	197	0	33	196	49	0	278	0	39	53	16	0	108	0	26	67	89	0	182	0	765
6:15PM	47	143	37	0	227	0	27	193	39	0	259	0	40	40	34	0	114	0	47	59	61	0	167	0	767
Hourly Total	89	266	69	0	424	0	60	389	88	0	537	0	79	93	50	0	222	0	73	126	150	0	349	0	1532
Total	914	2509	440	0	3863	0	436	2640	1026	1	4103	3	602	961	543	1	2107	0	743	666	850	0	2259	0	12332
% Approach	23.7%	64.9%	11.4%	0%	-	-	10.6%	64.3%	25.0%	0%	-	-	28.6%	45.6%	25.8%	0%	-	-	32.9%	29.5%	37.6%	0%	-	-	-
% Total	7.4%	20.3%	3.6%	0%	31.3%	-	3.5%	21.4%	8.3%	0%	33.3%	-	4.9%	7.8%	4.4%	0%	17.1%	-	6.0%	5.4%	6.9%	0%	18.3%	-	-
Lights	903	2476	435	0	3814	-	431	2611	1004	1	4047	-	601	945	534	1	2081	-	729	658	842	0	2229	-	12171
% Lights	98.8%	98.7%	98.9%	0%	98.7%	-	98.9%	98.9%	97.9%	100%	98.6%	-	99.8%	98.3%	98.3%	100%	98.8%	-	98.1%	98.8%	99.1%	0%	98.7%	-	98.7%
Articulated Trucks	0	7	0	0	7	-	0	3	2	0	5	-	0	0	0	0	0	-	2	0	0	0	2	-	14
% Articulated Trucks	0%	0.3%	0%	0%	0.2%	-	0%	0.1%	0.2%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.3%	0%	0%	0%	0.1%	-	0.1%
Buses and Single-Unit Trucks	11	26	5	0	42	-	5	26	20	0	51	-	1	16	9	0	26	-	12	8	8	0	28	-	147
% Buses and Single-Unit Trucks	1.2%	1.0%	1.1%	0%	1.1%	-	1.1%	1.0%	1.9%	0%	1.2%	-	0.2%	1.7%	1.7%	0%	1.2%	-	1.6%	1.2%	0.9%	0%	1.2%	-	1.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

37. E. Broadway at Sunset Meadows Dr/Winding... - TMC

Wed Feb 27, 2019

Full Length (6:30 AM-8:30 AM, 4:30 PM-6:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians)

All Movements

ID: 627357, Location: 29.541533, -95.219712



Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave., Pasadena, TX, 77503, US

Leg Direction	Sunset Meadows Dr Eastbound						Winding Rd Westbound						E Broadway St Northbound						E Broadway St Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2019-02-27																									
6:30AM	42	0	5	0	47	0	1	0	8	0	9	0	1	146	0	0	147	0	1	72	2	0	75	0	278
6:45AM	47	1	10	0	58	0	1	0	7	0	8	0	3	188	1	0	192	0	3	120	8	0	131	0	389
Hourly Total	89	1	15	0	105	0	2	0	15	0	17	0	4	334	1	0	339	0	4	192	10	0	206	0	667
7:00AM	43	0	9	0	52	0	3	0	7	0	10	0	3	196	3	0	202	0	5	117	14	0	136	0	400
7:15AM	47	1	9	0	57	0	7	0	3	0	10	0	5	229	2	0	236	0	3	167	16	0	186	0	489
7:30AM	43	0	12	0	55	0	6	0	6	0	12	0	2	259	6	0	267	0	4	190	13	0	207	0	541
7:45AM	27	0	6	0	33	0	4	1	2	0	7	0	5	230	3	0	238	0	4	199	18	0	221	0	499
Hourly Total	160	1	36	0	197	0	20	1	18	0	39	0	15	914	14	0	943	0	16	673	61	0	750	0	1929
8:00AM	25	0	8	0	33	0	3	0	4	0	7	0	0	229	1	0	230	0	2	157	14	0	173	0	443
8:15AM	19	0	8	0	27	0	6	1	8	0	15	0	1	163	3	0	167	0	2	163	14	0	179	0	388
Hourly Total	44	0	16	0	60	0	9	1	12	0	22	0	1	392	4	0	397	0	4	320	28	0	352	0	831
4:30PM	14	1	5	0	20	0	4	1	5	0	10	0	11	244	4	0	259	0	5	257	23	0	285	0	574
4:45PM	24	1	8	0	33	0	5	1	9	0	15	0	12	248	6	0	266	0	5	222	31	0	258	0	572
Hourly Total	38	2	13	0	53	0	9	2	14	0	25	0	23	492	10	0	525	0	10	479	54	0	543	0	1146
5:00PM	22	0	5	0	27	0	7	3	6	0	16	0	14	282	4	0	300	0	7	247	30	0	284	0	627
5:15PM	17	0	9	0	26	0	5	5	13	0	23	0	10	277	4	0	291	0	10	289	40	0	339	0	679
5:30PM	27	1	12	0	40	0	3	3	11	0	17	0	14	280	4	0	298	0	12	275	36	0	323	0	678
5:45PM	27	1	9	0	37	0	3	6	9	0	18	0	13	283	5	0	301	0	5	238	39	0	282	0	638
Hourly Total	93	2	35	0	130	0	18	17	39	0	74	0	51	1122	17	0	1190	0	34	1049	145	0	1228	0	2622
6:00PM	28	0	7	0	35	0	4	4	14	0	22	0	11	268	1	0	280	0	3	236	36	0	275	0	612
6:15PM	23	1	11	0	35	0	3	1	7	0	11	0	6	253	7	0	266	0	5	219	22	0	246	0	558
Hourly Total	51	1	18	0	70	0	7	5	21	0	33	0	17	521	8	0	546	0	8	455	58	0	521	0	1170
Total	475	7	133	0	615	0	65	26	119	0	210	0	111	3775	54	0	3940	0	76	3168	356	0	3600	0	8365
% Approach	77.2%	1.1%	21.6%	0%	-	-	31.0%	12.4%	56.7%	0%	-	-	2.8%	95.8%	1.4%	0%	-	-	2.1%	88.0%	9.9%	0%	-	-	-
% Total	5.7%	0.1%	1.6%	0%	7.4%	-	0.8%	0.3%	1.4%	0%	2.5%	-	1.3%	45.1%	0.6%	0%	47.1%	-	0.9%	37.9%	4.3%	0%	43.0%	-	-
Lights	467	7	132	0	606	-	64	26	118	0	208	-	110	3746	50	0	3906	-	76	3143	344	0	3563	-	8283
% Lights	98.3%	100%	99.2%	0%	98.5%	-	98.5%	100%	99.2%	0%	99.0%	-	99.1%	99.2%	92.6%	0%	99.1%	-	100%	99.2%	96.6%	0%	99.0%	-	99.0%
Articulated Trucks	0	0	0	0	0	-	0	0	0	0	0	-	0	4	0	0	4	-	0	10	0	0	10	-	14
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.1%	0%	0%	0.1%	-	0%	0.3%	0%	0%	0.3%	-	0.2%
Buses and Single-Unit Trucks	8	0	1	0	9	-	1	0	1	0	2	-	1	25	4	0	30	-	0	15	12	0	27	-	68
% Buses and Single-Unit Trucks	1.7%	0%	0.8%	0%	1.5%	-	1.5%	0%	0.8%	0%	1.0%	-	0.9%	0.7%	7.4%	0%	0.8%	-	0%	0.5%	3.4%	0%	0.8%	-	0.8%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Appendix B

“Existing 2019” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	12	709	59	8	881	13	114	0	34	19	2	20
Future Volume (vph)	12	709	59	8	881	13	114	0	34	19	2	20
Satd. Flow (prot)	1770	3500	0	1770	3532	0	0	1738	0	0	1700	0
Flt Permitted	0.110			0.181				0.756			0.867	
Satd. Flow (perm)	205	3500	0	337	3532	0	0	1365	0	0	1508	0
Satd. Flow (RTOR)		10			2			85			22	
Adj. Flow (vph)	13	771	64	9	958	14	124	0	37	21	2	22
Lane Group Flow (vph)	13	835	0	9	972	0	0	161	0	0	45	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	78.0		12.0	78.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	53.5	49.7		51.1	48.0			74.0			74.0	
Actuated g/C Ratio	0.40	0.37		0.38	0.36			0.55			0.55	
v/c Ratio	0.09	0.65		0.05	0.77			0.20			0.05	
Control Delay	23.1	36.8		20.5	42.8			10.1			11.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	23.1	36.8		20.5	42.8			10.1			11.9	
LOS	C	D		C	D			B			B	
Approach Delay		36.6			42.6			10.1			11.9	
Approach LOS		D			D			B			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 36.8

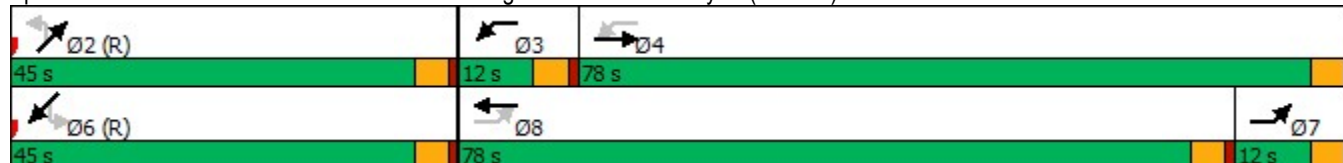
Intersection LOS: D

Intersection Capacity Utilization 45.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

Existing AM Peak 2019

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	240	551	81	111	493	173	140	494	84	226	419	226
Future Volume (vph)	240	551	81	111	493	173	140	494	84	226	419	226
Satd. Flow (prot)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Satd. Flow (RTOR)		16			44			16			94	
Adj. Flow (vph)	261	599	88	121	536	188	152	537	91	246	455	246
Lane Group Flow (vph)	261	687	0	121	724	0	152	628	0	246	701	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.8	35.7		19.2	30.1		17.2	26.5		23.6	32.9	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	32.3		11.7	25.8		11.7	20.6		17.2	26.1	
Actuated g/C Ratio	0.18	0.32		0.12	0.26		0.12	0.21		0.17	0.26	
v/c Ratio	0.81	0.61		0.58	0.79		0.73	0.86		0.81	0.74	
Control Delay	60.3	31.6		54.5	41.1		64.8	51.3		61.6	34.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	60.3	31.6		54.5	41.1		64.8	51.3		61.6	34.9	
LOS	E	C		D	D		E	D		E	C	
Approach Delay		39.5			43.0			53.9			41.8	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 99.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 44.2

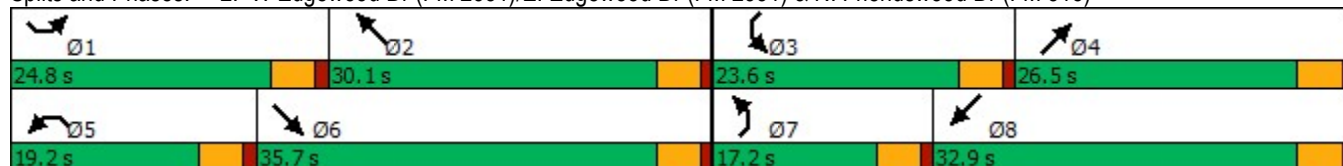
Intersection LOS: D

Intersection Capacity Utilization 76.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	4	741	36	31	834	8	43	3	47	11	14	4
Future Volume (vph)	4	741	36	31	834	8	43	3	47	11	14	4
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1696	0	0	1796	0
Flt Permitted	0.295			0.317				0.836			0.854	
Satd. Flow (perm)	550	3514	0	590	3536	0	0	1451	0	0	1564	0
Satd. Flow (RTOR)		6			1			35			4	
Adj. Flow (vph)	4	805	39	34	907	9	47	3	51	12	15	4
Lane Group Flow (vph)	4	844	0	34	916	0	0	101	0	0	31	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	14.0	84.0		15.0	85.0		36.0	36.0		36.0	36.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	90.7	85.2		88.8	89.6			10.4			10.4	
Actuated g/C Ratio	0.82	0.77		0.80	0.81			0.09			0.09	
v/c Ratio	0.01	0.31		0.06	0.32			0.60			0.21	
Control Delay	2.5	5.2		2.6	3.8			46.8			44.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	2.5	5.2		2.6	3.8			46.8			44.0	
LOS	A	A		A	A			D			D	
Approach Delay		5.1			3.8			46.8			44.0	
Approach LOS		A			A			D			D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 110.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 7.3

Intersection LOS: A

Intersection Capacity Utilization 40.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
14 s	85 s	36 s
		
Ø5	Ø6	Ø8
15 s	84 s	36 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	18	747	42	78	792	18	60	4	73	18	5	18
Future Volume (vph)	18	747	42	78	792	18	60	4	73	18	5	18
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1692	0	0	1712	0
Flt Permitted	0.300			0.303				0.867			0.788	
Satd. Flow (perm)	559	3511	0	564	3529	0	0	1499	0	0	1380	0
Satd. Flow (RTOR)		6			3			41			20	
Adj. Flow (vph)	20	812	46	85	861	20	65	4	79	20	5	20
Lane Group Flow (vph)	20	858	0	85	881	0	0	148	0	0	45	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	13.0	75.0		20.0	82.0		40.0	40.0		40.0	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	84.7	77.2		82.8	82.4			13.5			13.5	
Actuated g/C Ratio	0.78	0.71		0.76	0.76			0.12			0.12	
v/c Ratio	0.04	0.34		0.17	0.33			0.67			0.24	
Control Delay	3.4	7.5		3.9	5.8			47.4			30.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.4	7.5		3.9	5.8			47.4			30.3	
LOS	A	A		A	A			D			C	
Approach Delay		7.4			5.6			47.4			30.3	
Approach LOS		A			A			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 108.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 10.0

Intersection LOS: A

Intersection Capacity Utilization 48.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
13 s	82 s	40 s
		
Ø5	Ø6	Ø8
20 s	75 s	40 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	5	2	134	1	139	14	837	133	94	707	6
Future Volume (vph)	0	5	2	134	1	139	14	837	133	94	707	6
Satd. Flow (prot)	0	1790	0	0	1775	1583	0	3465	0	1770	3536	0
Flt Permitted					0.723			0.939		0.224		
Satd. Flow (perm)	0	1790	0	0	1347	1583	0	3257	0	417	3536	0
Satd. Flow (RTOR)		2				151		23			1	
Adj. Flow (vph)	0	5	2	146	1	151	15	910	145	102	768	7
Lane Group Flow (vph)	0	7	0	0	147	151	0	1070	0	102	775	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	38.0	38.0		38.0	38.0	38.0	84.0	84.0		13.0	97.0	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effct Green (s)		18.2			18.2	18.2		81.0		88.1	92.7	
Actuated g/C Ratio		0.15			0.15	0.15		0.68		0.73	0.77	
v/c Ratio		0.03			0.72	0.41		0.48		0.26	0.28	
Control Delay		36.3			67.9	10.2		10.8		5.8	4.7	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		36.3			67.9	10.2		10.8		5.8	4.7	
LOS		D			E	B		B		A	A	
Approach Delay		36.3			38.6			10.8			4.8	
Approach LOS		D			D			B			A	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 119.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 12.2

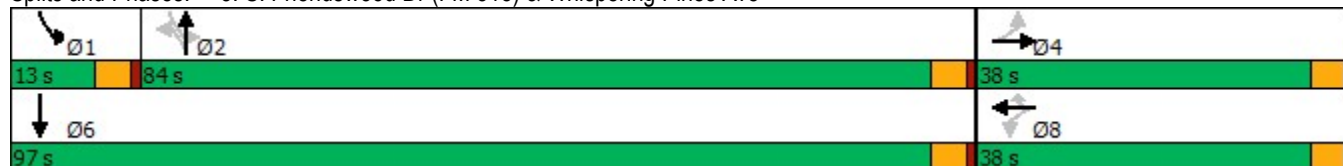
Intersection LOS: B

Intersection Capacity Utilization 72.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	42	594	14	182	644	20	24	37	27	8	24	183
Future Volume (vph)	42	594	14	182	644	20	24	37	27	8	24	183
Satd. Flow (prot)	1770	3529	0	1770	3522	0	0	1763	0	0	1839	1583
Flt Permitted	0.950			0.950				0.901			0.929	
Satd. Flow (perm)	1770	3529	0	1770	3522	0	0	1610	0	0	1730	1583
Satd. Flow (RTOR)		2			4			15				199
Adj. Flow (vph)	46	646	15	198	700	22	26	40	29	9	26	199
Lane Group Flow (vph)	46	661	0	198	722	0	0	95	0	0	35	199
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	19.0	57.0		42.0	80.0		36.0	36.0		36.0	36.0	36.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	8.2	64.8		17.0	76.0			10.6			10.6	10.6
Actuated g/C Ratio	0.08	0.61		0.16	0.72			0.10			0.10	0.10
v/c Ratio	0.34	0.31		0.70	0.29			0.55			0.20	0.59
Control Delay	55.0	11.3		56.0	6.6			51.3			47.8	14.2
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	55.0	11.3		56.0	6.6			51.3			47.8	14.2
LOS	D	B		E	A			D			D	B
Approach Delay		14.1			17.2			51.3			19.2	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 106

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 18.0

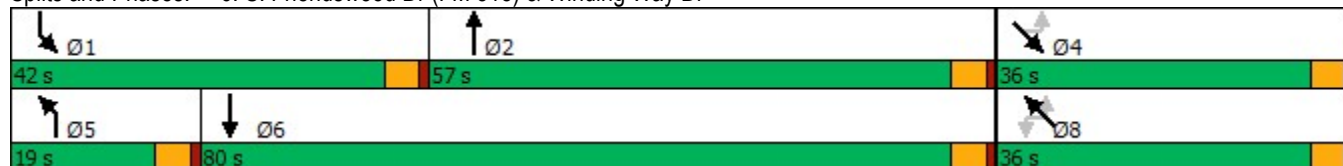
Intersection LOS: B

Intersection Capacity Utilization 49.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	401	582	289	134	404	239	230	1180	305	154	592	53
Future Volume (vph)	401	582	289	134	404	239	230	1180	305	154	592	53
Satd. Flow (prot)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Satd. Flow (RTOR)		69				260		50			10	
Adj. Flow (vph)	436	633	314	146	439	260	250	1283	332	167	643	58
Lane Group Flow (vph)	436	947	0	146	439	260	250	1615	0	167	701	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	41.0	50.7		17.3	27.0	27.0	34.2	48.0		19.0	32.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	35.3	46.3		12.7	23.7	23.7	23.8	43.7		14.3	34.2	
Actuated g/C Ratio	0.26	0.34		0.09	0.18	0.18	0.18	0.32		0.11	0.25	
v/c Ratio	0.94	0.79		0.88	0.71	0.53	0.80	0.99		0.89	0.55	
Control Delay	78.4	42.7		104.2	59.9	9.9	72.2	64.4		101.6	45.8	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	78.4	42.7		104.2	59.9	9.9	72.2	64.4		101.6	45.8	
LOS	E	D		F	E	A	E	E		F	D	
Approach Delay		53.9			52.2			65.5			56.5	
Approach LOS		D			D			E			E	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 58.4

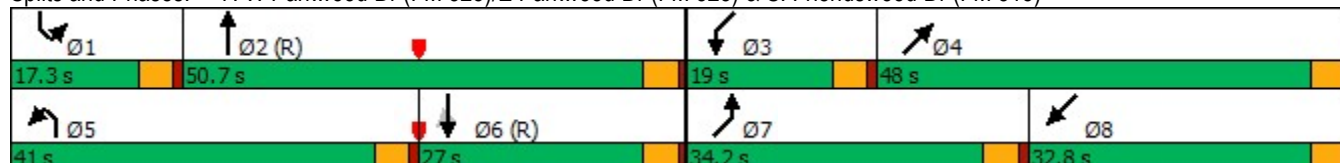
Intersection LOS: E

Intersection Capacity Utilization 86.5%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	19	1320	791	61	183	39
Future Volume (vph)	19	1320	791	61	183	39
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.279				0.950	
Satd. Flow (perm)	520	3539	3500	0	1688	1583
Satd. Flow (RTOR)			10			42
Adj. Flow (vph)	21	1435	860	66	199	42
Lane Group Flow (vph)	21	1435	926	0	199	42
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	11.0	100.0	89.0		40.0	40.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	107.2	109.9	103.5		21.1	21.1
Actuated g/C Ratio	0.77	0.78	0.74		0.15	0.15
v/c Ratio	0.05	0.52	0.36		0.75	0.15
Control Delay	4.5	6.7	7.9		73.6	14.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.5	6.7	7.9		73.6	14.3
LOS	A	A	A		E	B
Approach Delay		6.7	7.9		63.2	
Approach LOS		A	A		E	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 12.3

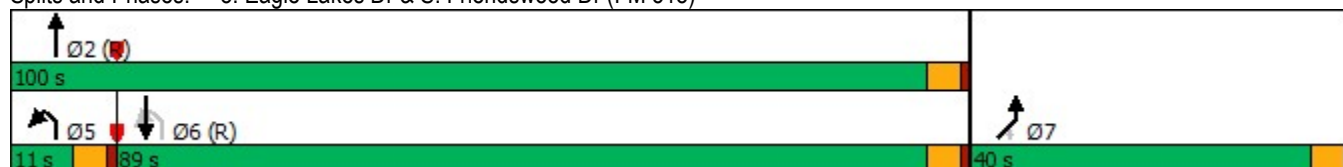
Intersection LOS: B

Intersection Capacity Utilization 54.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	40	461	108	67	759	9	202	14	98	9	16	150
Future Volume (vph)	40	461	108	67	759	9	202	14	98	9	16	150
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.265			0.426			0.950			0.950		
Satd. Flow (perm)	494	3539	1583	794	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			156			156			109			163
Adj. Flow (vph)	43	501	117	73	825	10	220	15	107	10	17	163
Lane Group Flow (vph)	43	501	117	73	825	10	220	15	107	10	17	163
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	10.0	44.0	44.0	10.0	44.0	44.0	28.0	41.0	41.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	63.1	56.0	56.0	62.2	58.8	58.8	18.0	28.2	28.2	5.5	7.7	7.7
Actuated g/C Ratio	0.60	0.53	0.53	0.59	0.56	0.56	0.17	0.27	0.27	0.05	0.07	0.07
v/c Ratio	0.11	0.27	0.13	0.14	0.42	0.01	0.73	0.03	0.21	0.11	0.12	0.61
Control Delay	10.3	15.9	1.7	10.2	16.5	0.0	54.7	26.6	6.3	50.2	45.8	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	15.9	1.7	10.2	16.5	0.0	54.7	26.6	6.3	50.2	45.8	17.4
LOS	B	B	A	B	B	A	D	C	A	D	D	B
Approach Delay		13.1			15.8			38.3			21.7	
Approach LOS		B			B			D			C	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 19.1

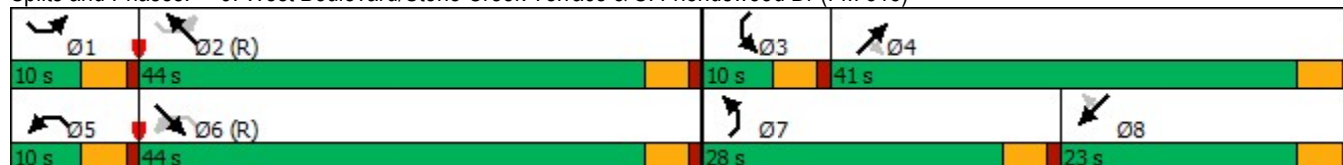
Intersection LOS: B

Intersection Capacity Utilization 54.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	610	66	75	535	291	109	304	180	152	71	105
Future Volume (vph)	285	610	66	75	535	291	109	304	180	152	71	105
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3221	0
Flt Permitted	0.187			0.265			0.632			0.357		
Satd. Flow (perm)	348	3539	1583	494	3539	1583	1177	3341	0	665	3221	0
Satd. Flow (RTOR)			136			316		96			114	
Adj. Flow (vph)	310	663	72	82	582	316	118	330	196	165	77	114
Lane Group Flow (vph)	310	663	72	82	582	316	118	526	0	165	191	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	32.0	55.4	55.4	10.6	34.0	34.0	11.3	33.8		20.2	42.7	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	46.1	42.1	42.1	47.0	26.0	26.0	55.9	44.2		55.9	47.2	
Actuated g/C Ratio	0.38	0.35	0.35	0.39	0.22	0.22	0.47	0.37		0.47	0.39	
v/c Ratio	0.83	0.53	0.11	0.32	0.76	0.54	0.20	0.41		0.39	0.14	
Control Delay	60.3	32.3	0.3	22.2	50.8	7.6	19.4	26.2		21.6	11.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	60.3	32.3	0.3	22.2	50.8	7.6	19.4	26.2		21.6	11.8	
LOS	E	C	A	C	D	A	B	C		C	B	
Approach Delay		38.4			34.5			25.0			16.3	
Approach LOS		D			C			C			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 31.7

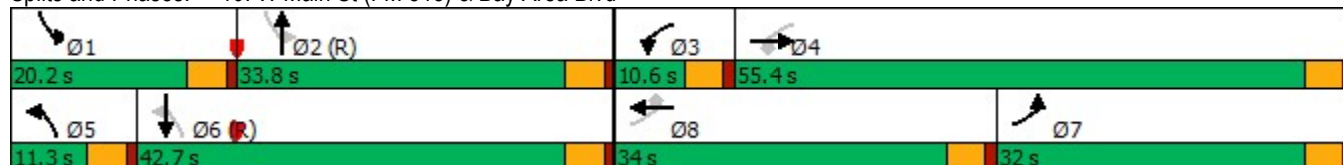
Intersection LOS: C

Intersection Capacity Utilization 68.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	24	160	74	26	249	51	110	1296	38	52	634	84
Future Volume (vph)	24	160	74	26	249	51	110	1296	38	52	634	84
Satd. Flow (prot)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Flt Permitted		0.995			0.996		0.950			0.950		
Satd. Flow (perm)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Satd. Flow (RTOR)		14			7			3			13	
Adj. Flow (vph)	26	174	80	28	271	55	120	1409	41	57	689	91
Lane Group Flow (vph)	0	280	0	0	354	0	120	1450	0	57	780	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.0	24.0		31.6	31.6		20.4	54.4		10.0	44.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		19.2			27.2		12.7	50.0		5.5	40.6	
Actuated g/C Ratio		0.16			0.23		0.11	0.42		0.05	0.34	
v/c Ratio		0.93			0.83		0.63	0.97		0.69	0.65	
Control Delay		83.5			61.0		65.2	50.6		95.2	35.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		83.5			61.0		65.2	50.6		95.2	35.3	
LOS		F			E		E	D		F	D	
Approach Delay		83.5			61.0			51.7			39.4	
Approach LOS		F			E			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 117.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 52.3

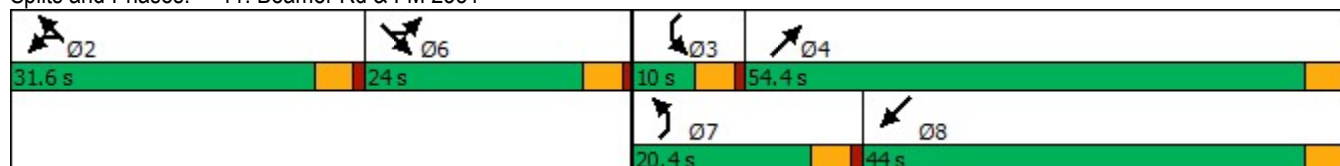
Intersection LOS: D

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1137	32	70	654	89	127
Future Volume (vph)	1137	32	70	654	89	127
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	4					138
Adj. Flow (vph)	1236	35	76	711	97	138
Lane Group Flow (vph)	1271	0	76	711	97	138
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	50.0		14.4	64.4	25.6	25.6
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	34.8		8.3	44.7	22.0	22.0
Actuated g/C Ratio	0.46		0.11	0.59	0.29	0.29
v/c Ratio	0.79		0.40	0.34	0.10	0.25
Control Delay	21.7		41.9	7.8	25.1	6.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.7		41.9	7.8	25.1	6.7
LOS	C		D	A	C	A
Approach Delay	21.7			11.1	14.3	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 76.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 17.3

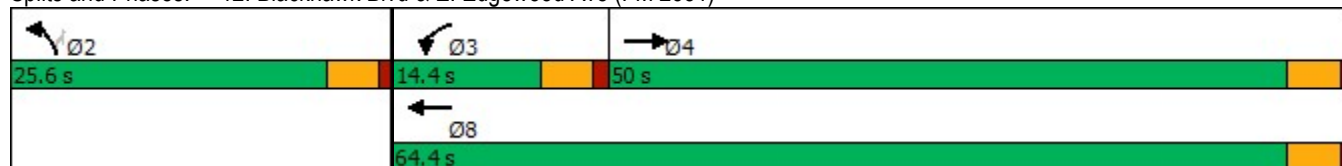
Intersection LOS: B

Intersection Capacity Utilization 52.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & E. Edgewood Ave (FM 2351)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	129	0	109	0	0	0	46	1035	0	0	731	44
Future Volume (vph)	129	0	109	0	0	0	46	1035	0	0	731	44
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.210					
Satd. Flow (perm)	0	1410	1583	0	1863	0	391	3539	0	1863	3507	0
Satd. Flow (RTOR)			136								9	
Adj. Flow (vph)	140	0	118	0	0	0	50	1125	0	0	795	48
Lane Group Flow (vph)	0	140	118	0	0	0	50	1125	0	0	843	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.9	61.3				26.8	29.3			23.1	
Actuated g/C Ratio		0.37	1.00				0.44	0.48			0.38	
v/c Ratio		0.27	0.07				0.16	0.67			0.64	
Control Delay		17.9	0.1				9.0	14.0			18.8	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		17.9	0.1				9.0	14.0			18.8	
LOS		B	A				A	B			B	
Approach Delay		9.7						13.7			18.8	
Approach LOS		A						B			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 61.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 15.2

Intersection LOS: B

Intersection Capacity Utilization 51.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 13: FM 2351 & Royal Ct/Woodland Trail Dr

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	101	4	214	2	1	1	75	995	2	12	788	28
Future Volume (vph)	101	4	214	2	1	1	75	995	2	12	788	28
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.917		0.199			0.156		
Satd. Flow (perm)	1406	1589	0	0	1650	0	371	3539	0	291	3522	0
Satd. Flow (RTOR)		233			1						5	
Adj. Flow (vph)	110	4	233	2	1	1	82	1082	2	13	857	30
Lane Group Flow (vph)	110	237	0	0	4	0	82	1084	0	13	887	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	23.0	23.0			23.0		29.7	31.5		32.4	24.2	
Actuated g/C Ratio	0.35	0.35			0.35		0.45	0.48		0.50	0.37	
v/c Ratio	0.22	0.33			0.01		0.26	0.64		0.05	0.68	
Control Delay	20.0	4.9			17.0		9.6	14.7		7.2	20.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	20.0	4.9			17.0		9.6	14.7		7.2	20.5	
LOS	B	A			B		A	B		A	C	
Approach Delay		9.7			17.0			14.3			20.3	
Approach LOS		A			B			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 65.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 15.9

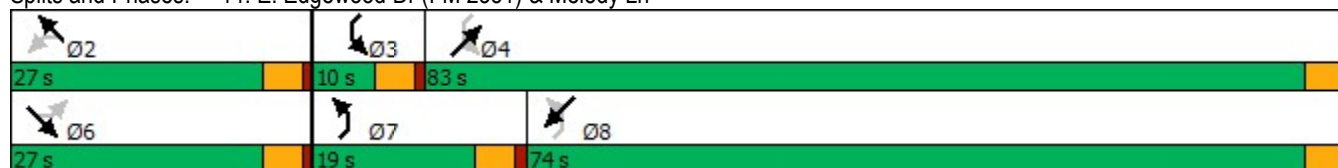
Intersection LOS: B

Intersection Capacity Utilization 56.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	26	28	49	82	6	278	20	334	88	280	237	18
Future Volume (vph)	26	28	49	82	6	278	20	334	88	280	237	18
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1842	0
Flt Permitted		0.931			0.714		0.542			0.357		
Satd. Flow (perm)	0	1623	0	0	1330	1583	1010	1805	0	665	1842	0
Satd. Flow (RTOR)		36				302		26			8	
Adj. Flow (vph)	28	30	53	89	7	302	22	363	96	304	258	20
Lane Group Flow (vph)	0	111	0	0	96	302	22	459	0	304	278	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		28.2			28.2	66.4	29.0	29.0		29.0	29.0	
Actuated g/C Ratio		0.42			0.42	1.00	0.44	0.44		0.44	0.44	
v/c Ratio		0.16			0.17	0.19	0.05	0.57		1.05	0.34	
Control Delay		12.3			16.9	0.3	9.4	15.3		86.8	12.3	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		12.3			16.9	0.3	9.4	15.3		86.8	12.3	
LOS		B			B	A	A	B		F	B	
Approach Delay		12.3			4.3			15.1			51.2	
Approach LOS		B			A			B			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 66.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 25.5

Intersection LOS: C

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	315	1544	83	97	663	66	191	475	300	103	141	181
Future Volume (vph)	315	1544	83	97	663	66	191	475	300	103	141	181
Satd. Flow (prot)	1770	5045	0	1770	5014	0	1770	3334	0	1770	3242	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5045	0	1770	5014	0	1770	3334	0	1770	3242	0
Satd. Flow (RTOR)		8			16			73			197	
Adj. Flow (vph)	342	1678	90	105	721	72	208	516	326	112	153	197
Lane Group Flow (vph)	342	1768	0	105	793	0	208	842	0	112	350	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	84.0		9.5	84.0		9.5	51.0		9.5	51.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	69.5		5.0	69.5		15.0	46.5		15.0	46.5	
Actuated g/C Ratio	0.03	0.45		0.03	0.45		0.10	0.30		0.10	0.30	
v/c Ratio	6.00	0.78		1.84	0.35		1.21	0.80		0.65	0.31	
Control Delay	2297.7	37.8		475.2	26.9		188.6	51.5		83.4	18.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2297.7	37.8		475.2	26.9		188.6	51.5		83.4	18.3	
LOS	F	D		F	C		F	D		F	B	
Approach Delay		404.1			79.3			78.7			34.1	
Approach LOS		F			E			E			C	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 6.00

Intersection Signal Delay: 226.2

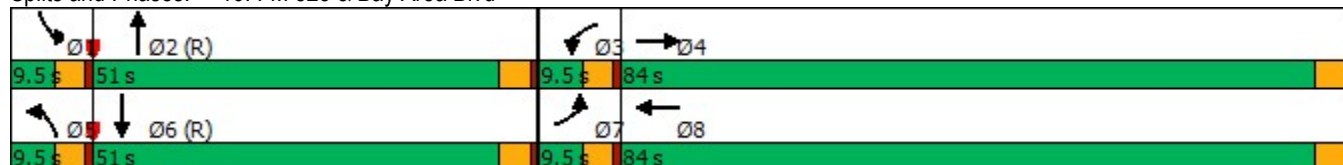
Intersection LOS: F

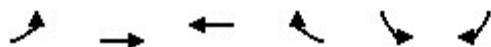
Intersection Capacity Utilization 80.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑		↰	↰
Traffic Volume (vph)	49	1689	854	137	225	81
Future Volume (vph)	49	1689	854	137	225	81
Satd. Flow (prot)	1770	5085	4979	0	1770	1583
Flt Permitted	0.178				0.950	
Satd. Flow (perm)	332	5085	4979	0	1770	1583
Satd. Flow (RTOR)			33			88
Adj. Flow (vph)	53	1836	928	149	245	88
Lane Group Flow (vph)	53	1836	1077	0	245	88
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	14.0	88.0	74.0		47.0	47.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	64.4	68.0	57.7		58.0	58.0
Actuated g/C Ratio	0.48	0.50	0.43		0.43	0.43
v/c Ratio	0.22	0.72	0.50		0.32	0.12
Control Delay	17.4	27.4	27.9		28.8	5.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	17.4	27.4	27.9		28.8	5.8
LOS	B	C	C		C	A
Approach Delay		27.1	27.9		22.7	
Approach LOS		C	C		C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 26.9

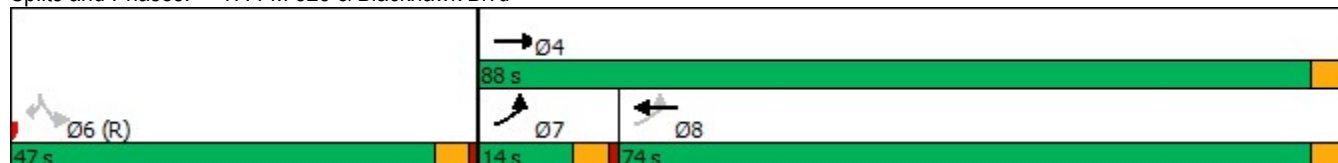
Intersection LOS: C

Intersection Capacity Utilization 52.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	195	22	37	30	58	140	53	1447	28	44	683	141
Future Volume (vph)	195	22	37	30	58	140	53	1447	28	44	683	141
Satd. Flow (prot)	0	1758	0	0	1696	0	1770	5070	0	1770	4953	0
Flt Permitted		0.581			0.930		0.225			0.074		
Satd. Flow (perm)	0	1061	0	0	1589	0	419	5070	0	138	4953	0
Satd. Flow (RTOR)		8			72			2			39	
Adj. Flow (vph)	212	24	40	33	63	152	58	1573	30	48	742	153
Lane Group Flow (vph)	0	276	0	0	248	0	58	1603	0	48	895	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	65.8	65.8		65.8	65.8		11.2	62.0		12.2	63.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		67.3			67.3		60.1	54.1		60.1	54.7	
Actuated g/C Ratio		0.48			0.48		0.43	0.39		0.43	0.39	
v/c Ratio		0.54			0.31		0.24	0.82		0.34	0.46	
Control Delay		31.4			17.9		21.9	42.3		25.7	30.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		31.4			17.9		21.9	42.3		25.7	30.6	
LOS		C			B		C	D		C	C	
Approach Delay		31.4			17.9			41.5			30.3	
Approach LOS		C			B			D			C	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 35.4

Intersection LOS: D

Intersection Capacity Utilization 75.3%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

 Ø2 (R)	 Ø3	 Ø4
65.8 s	12.2 s	62 s
 Ø6 (R)	 Ø7	 Ø8
65.8 s	11.2 s	63 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	360	46	89	21	28	15	131	1356	28	14	842	357
Future Volume (vph)	360	46	89	21	28	15	131	1356	28	14	842	357
Satd. Flow (prot)	1770	1678	0	1770	1766	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.727			0.663			0.181			0.159		
Satd. Flow (perm)	1354	1678	0	1235	1766	0	337	5070	0	296	3539	1583
Satd. Flow (RTOR)		97			16			5				388
Adj. Flow (vph)	391	50	97	23	30	16	142	1474	30	15	915	388
Lane Group Flow (vph)	391	147	0	23	46	0	142	1504	0	15	915	388
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	26.5	26.5		26.5	26.5		9.6	24.0		9.5	23.9	23.9
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	23.9	23.9		23.9	23.9		23.5	25.2		27.2	19.4	19.4
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.39	0.42		0.45	0.32	0.32
v/c Ratio	0.73	0.20		0.05	0.06		0.56	0.71		0.06	0.80	0.50
Control Delay	27.0	6.3		12.8	9.5		18.5	17.7		9.8	25.3	4.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	27.0	6.3		12.8	9.5		18.5	17.7		9.8	25.3	4.6
LOS	C	A		B	A		B	B		A	C	A
Approach Delay		21.3			10.6			17.8			19.0	
Approach LOS		C			B			B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 18.6

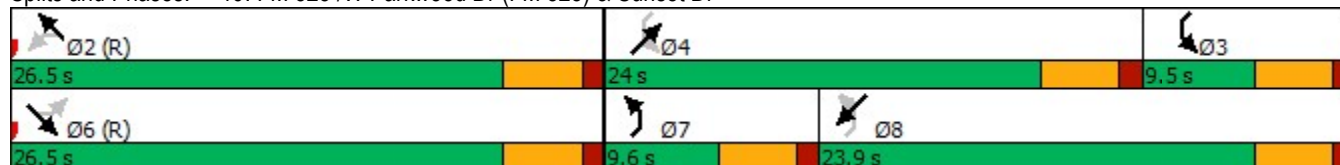
Intersection LOS: B

Intersection Capacity Utilization 68.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	212	1398	119	66	845	14	86	115	199	11	69	102
Future Volume (vph)	212	1398	119	66	845	14	86	115	199	11	69	102
Satd. Flow (prot)	1770	3497	0	1770	3532	0	0	1824	1583	0	1716	0
Flt Permitted	0.220			0.081				0.699			0.978	
Satd. Flow (perm)	410	3497	0	151	3532	0	0	1302	1583	0	1683	0
Satd. Flow (RTOR)		15			2				153		59	
Adj. Flow (vph)	230	1520	129	72	918	15	93	125	216	12	75	111
Lane Group Flow (vph)	230	1649	0	72	933	0	0	218	216	0	198	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	53.3	49.5		54.6	44.2			23.2	23.2		23.2	
Actuated g/C Ratio	0.59	0.55		0.60	0.49			0.26	0.26		0.26	
v/c Ratio	0.61	0.86		0.34	0.54			0.65	0.42		0.42	
Control Delay	13.6	23.0		10.3	16.5			44.8	13.7		25.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	13.6	23.0		10.3	16.5			44.8	13.7		25.5	
LOS	B	C		B	B			D	B		C	
Approach Delay		21.8			16.0			29.4			25.5	
Approach LOS		C			B			C			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 90.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 21.3

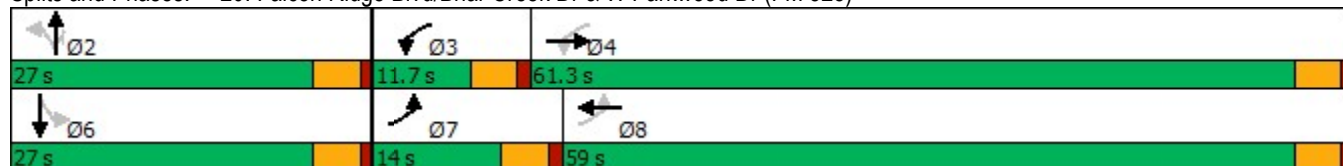
Intersection LOS: C

Intersection Capacity Utilization 82.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	108	3	11	45	1	162	2	1120	12	56	777	44
Future Volume (vph)	108	3	11	45	1	162	2	1120	12	56	777	44
Satd. Flow (prot)	0	1763	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.583			0.911		0.218			0.078		
Satd. Flow (perm)	0	1073	0	0	1519	0	406	3532	0	145	3511	0
Satd. Flow (RTOR)		4			137			1			7	
Adj. Flow (vph)	117	3	12	49	1	176	2	1217	13	61	845	48
Lane Group Flow (vph)	0	132	0	0	226	0	2	1230	0	61	893	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	47.0	47.0		47.0	47.0		10.0	75.0		13.0	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		59.5			59.5		65.6	58.4		64.0	64.5	
Actuated g/C Ratio		0.44			0.44		0.49	0.43		0.47	0.48	
v/c Ratio		0.28			0.30		0.01	0.81		0.45	0.53	
Control Delay		28.2			12.3		13.5	37.6		42.8	25.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		28.2			12.3		13.5	37.6		42.8	25.3	
LOS		C			B		B	D		D	C	
Approach Delay		28.2			12.3			37.5			26.4	
Approach LOS		C			B			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 30.6

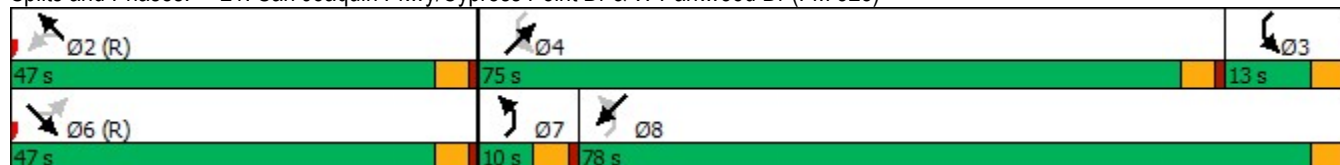
Intersection LOS: C

Intersection Capacity Utilization 68.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	0	16	2	1	24	4	824	4	10	693	91
Future Volume (vph)	26	0	16	2	1	24	4	824	4	10	693	91
Satd. Flow (prot)	0	1715	0	0	1632	0	1770	3536	0	1770	3479	0
Flt Permitted		0.883			0.981		0.326			0.305		
Satd. Flow (perm)	0	1561	0	0	1606	0	607	3536	0	568	3479	0
Satd. Flow (RTOR)		88			26			1			21	
Adj. Flow (vph)	28	0	17	2	1	26	4	896	4	11	753	99
Lane Group Flow (vph)	0	45	0	0	29	0	4	900	0	11	852	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	29.0	29.0		29.0	29.0		14.0	87.0		14.0	87.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		6.4			6.4		115.7	111.9		115.7	115.4	
Actuated g/C Ratio		0.05			0.05		0.89	0.86		0.89	0.89	
v/c Ratio		0.28			0.28		0.01	0.30		0.02	0.28	
Control Delay		4.8			29.7		1.2	3.1		1.2	1.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		4.8			29.7		1.2	3.1		1.2	1.9	
LOS		A			C		A	A		A	A	
Approach Delay		4.8			29.7			3.1			1.9	
Approach LOS		A			C			A			A	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.30

Intersection Signal Delay: 3.0

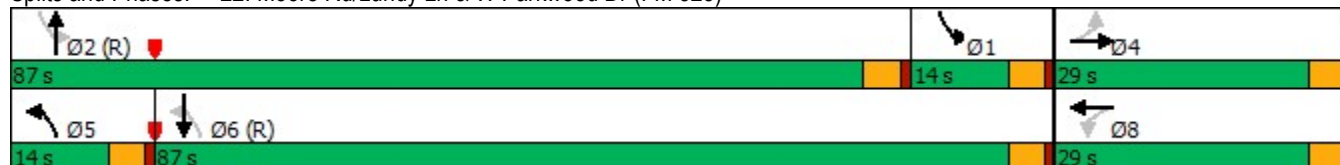
Intersection LOS: A

Intersection Capacity Utilization 39.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	70	79	52	64	60	30	50	311	63	22	270	40
Future Volume (vph)	70	79	52	64	60	30	50	311	63	22	270	40
Satd. Flow (prot)	1770	3327	0	1770	3359	0	1770	3451	0	1770	3472	0
Flt Permitted	0.690			0.661			0.467			0.377		
Satd. Flow (perm)	1285	3327	0	1231	3359	0	870	3451	0	702	3472	0
Satd. Flow (RTOR)		57			33			28			19	
Adj. Flow (vph)	76	86	57	70	65	33	54	338	68	24	293	43
Lane Group Flow (vph)	76	143	0	70	98	0	54	406	0	24	336	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	55.0	55.0		55.0	55.0		65.0	65.0		65.0	65.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	50.6	50.6		50.6	50.6		13.3	13.3		13.3	13.3	
Actuated g/C Ratio	0.69	0.69		0.69	0.69		0.18	0.18		0.18	0.18	
v/c Ratio	0.09	0.06		0.08	0.04		0.34	0.62		0.19	0.52	
Control Delay	4.5	2.7		4.5	3.0		32.1	29.9		28.6	28.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	4.5	2.7		4.5	3.0		32.1	29.9		28.6	28.2	
LOS	A	A		A	A		C	C		C	C	
Approach Delay		3.3			3.6			30.1			28.2	
Approach LOS		A			A			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 72.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 21.0

Intersection LOS: C

Intersection Capacity Utilization 38.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
55 s	65 s
 Ø6	 Ø8
55 s	65 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	21	469	11	6	398	77	5	9	6	105	3	8
Future Volume (vph)	21	469	11	6	398	77	5	9	6	105	3	8
Satd. Flow (prot)	1770	1857	0	1770	1818	0	0	1763	0	0	1765	0
Flt Permitted	0.395			0.423				0.929			0.730	
Satd. Flow (perm)	736	1857	0	788	1818	0	0	1656	0	0	1346	0
Satd. Flow (RTOR)		2			19			7			5	
Adj. Flow (vph)	23	510	12	7	433	84	5	10	7	114	3	9
Lane Group Flow (vph)	23	522	0	7	517	0	0	22	0	0	126	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	50.8	50.4		49.6	48.2			11.4			11.6	
Actuated g/C Ratio	0.73	0.72		0.71	0.69			0.16			0.17	
v/c Ratio	0.04	0.39		0.01	0.41			0.08			0.56	
Control Delay	4.3	7.8		5.2	8.3			18.5			34.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.3	7.8		5.2	8.3			18.5			34.3	
LOS	A	A		A	A			B			C	
Approach Delay		7.6			8.3			18.5			34.3	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 10.9

Intersection LOS: B

Intersection Capacity Utilization 46.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	286	280	84	318	0	159	6	33	1	9	7
Future Volume (vph)	8	286	280	84	318	0	159	6	33	1	9	7
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1749	0	0	1751	0
Flt Permitted	0.553			0.261				0.756			0.986	
Satd. Flow (perm)	1030	1725	0	486	1863	0	0	1376	0	0	1732	0
Satd. Flow (RTOR)		96						14			8	
Adj. Flow (vph)	9	311	304	91	346	0	173	7	36	1	10	8
Lane Group Flow (vph)	9	615	0	91	346	0	0	216	0	0	19	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	42.4	38.1		45.4	44.4			14.7			14.7	
Actuated g/C Ratio	0.61	0.54		0.65	0.63			0.21			0.21	
v/c Ratio	0.01	0.63		0.22	0.29			0.72			0.05	
Control Delay	7.2	13.3		7.4	9.6			37.6			15.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	13.3		7.4	9.6			37.6			15.5	
LOS	A	B		A	A			D			B	
Approach Delay		13.2			9.2			37.6			15.5	
Approach LOS		B			A			D			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 16.0

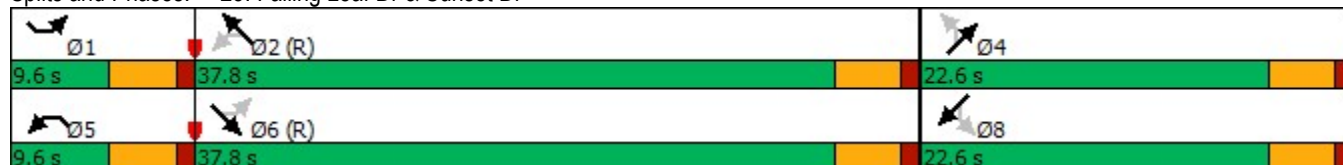
Intersection LOS: B

Intersection Capacity Utilization 65.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	17	271	21	39	279	32	69	62	50	14	65	37
Future Volume (vph)	17	271	21	39	279	32	69	62	50	14	65	37
Satd. Flow (prot)	1770	1842	0	1770	1833	0	0	1814	1583	0	1772	0
Flt Permitted	0.557			0.518				0.747			0.949	
Satd. Flow (perm)	1038	1842	0	965	1833	0	0	1391	1583	0	1692	0
Satd. Flow (RTOR)		8			11				94		33	
Adj. Flow (vph)	18	295	23	42	303	35	75	67	54	15	71	40
Lane Group Flow (vph)	18	318	0	42	338	0	0	142	54	0	126	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	48.5	45.9		50.7	50.2			11.8	11.8		11.5	
Actuated g/C Ratio	0.69	0.66		0.72	0.72			0.17	0.17		0.16	
v/c Ratio	0.02	0.26		0.05	0.26			0.61	0.16		0.41	
Control Delay	6.2	15.4		4.3	6.6			37.4	3.0		22.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.2	15.4		4.3	6.6			37.4	3.0		22.5	
LOS	A	B		A	A			D	A		C	
Approach Delay		14.9			6.3			27.9			22.5	
Approach LOS		B			A			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 15.1

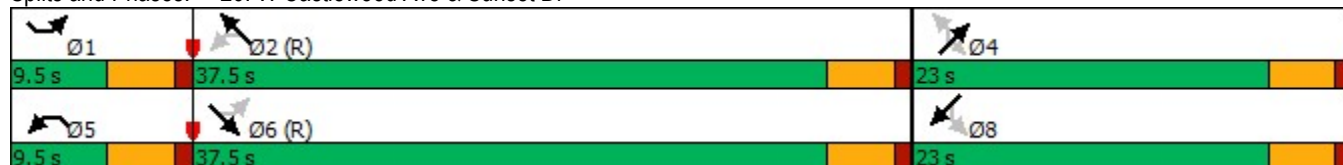
Intersection LOS: B

Intersection Capacity Utilization 45.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	81	224	12	9	496	32	11	60	23	5	21	94
Future Volume (Veh/h)	81	224	12	9	496	32	11	60	23	5	21	94
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	243	13	10	539	35	12	65	25	5	23	102
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	574			256			1116	1020	250	1060	1008	556
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	574			256			1116	1020	250	1060	1008	556
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	91			99			91	70	97	96	89	81
cM capacity (veh/h)	999			1309			128	214	789	139	217	530
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	344	584	102	130								
Volume Left	88	10	12	5								
Volume Right	13	35	25	102								
cSH	999	1309	238	389								
Volume to Capacity	0.09	0.01	0.43	0.33								
Queue Length 95th (ft)	7	1	50	36								
Control Delay (s)	3.0	0.2	31.1	18.8								
Lane LOS	A	A	D	C								
Approach Delay (s)	3.0	0.2	31.1	18.8								
Approach LOS			D	C								
Intersection Summary												
Average Delay			5.8									
Intersection Capacity Utilization			64.6%		ICU Level of Service				C			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	234	16	48	460	36	86
Future Volume (Veh/h)	234	16	48	460	36	86
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	254	17	52	500	39	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			271		866	262
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			271		866	262
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		87	88
cM capacity (veh/h)			1292		310	776
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	271	552	132			
Volume Left	0	52	39			
Volume Right	17	0	93			
cSH	1700	1292	538			
Volume to Capacity	0.16	0.04	0.25			
Queue Length 95th (ft)	0	3	24			
Control Delay (s)	0.0	1.2	13.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	1.2	13.9			
Approach LOS			B			
Intersection Summary						
Average Delay			2.6			
Intersection Capacity Utilization			57.4%	ICU Level of Service		B
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	104	214	420	9	16	86
Future Volume (Veh/h)	104	214	420	9	16	86
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	113	233	457	10	17	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	467				921	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				921	462
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				94	84
cM capacity (veh/h)	1094				269	600
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	346	467	110			
Volume Left	113	0	17			
Volume Right	0	10	93			
cSH	1094	1700	504			
Volume to Capacity	0.10	0.27	0.22			
Queue Length 95th (ft)	9	0	21			
Control Delay (s)	3.5	0.0	14.1			
Lane LOS	A		B			
Approach Delay (s)	3.5	0.0	14.1			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization		55.9%		ICU Level of Service		B
Analysis Period (min)		15				

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	50	62	75	23	34	45	39	259	53	21	202	14
Future Volume (vph)	50	62	75	23	34	45	39	259	53	21	202	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	54	67	82	25	37	49	42	282	58	23	220	15
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	203	111	382	258								
Volume Left (vph)	54	25	42	23								
Volume Right (vph)	82	49	58	15								
Hadj (s)	-0.16	-0.19	-0.04	0.02								
Departure Headway (s)	5.7	5.8	5.2	5.4								
Degree Utilization, x	0.32	0.18	0.55	0.39								
Capacity (veh/h)	568	516	652	616								
Control Delay (s)	11.3	10.1	14.5	11.9								
Approach Delay (s)	11.3	10.1	14.5	11.9								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay			12.6									
Level of Service			B									
Intersection Capacity Utilization			48.5%	ICU Level of Service					A			
Analysis Period (min)			15									

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	6	2	0	19	2	128	0	65	23	256	102	2
Future Volume (Veh/h)	6	2	0	19	2	128	0	65	23	256	102	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	2	0	21	2	139	0	71	25	278	111	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	141			2			187	199	2	190	130	72
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	141			2			187	199	2	190	130	72
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	90	98	59	85	100
cM capacity (veh/h)	1442			1620			675	684	1082	683	748	991
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	9	162	96	391								
Volume Left	7	21	0	278								
Volume Right	0	139	25	2								
cSH	1442	1620	757	702								
Volume to Capacity	0.00	0.01	0.13	0.56								
Queue Length 95th (ft)	0	1	11	87								
Control Delay (s)	5.8	1.0	10.4	16.4								
Lane LOS	A	A	B	C								
Approach Delay (s)	5.8	1.0	10.4	16.4								
Approach LOS			B	C								
Intersection Summary												
Average Delay			11.6									
Intersection Capacity Utilization			41.8%		ICU Level of Service				A			
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	34	1049	145	51	1122	17	93	2	35	18	17	39
Future Volume (vph)	34	1049	145	51	1122	17	93	2	35	18	17	39
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1733	0	0	1710	0
Flt Permitted	0.091			0.084				0.758			0.920	
Satd. Flow (perm)	170	3476	0	156	3532	0	0	1361	0	0	1592	0
Satd. Flow (RTOR)		18			2			12			36	
Adj. Flow (vph)	37	1140	158	55	1220	18	101	2	38	20	18	42
Lane Group Flow (vph)	37	1298	0	55	1238	0	0	141	0	0	80	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	93.0		13.0	94.0		44.0	44.0		44.0	44.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.2	71.6		78.2	69.1			59.2			59.2	
Actuated g/C Ratio	0.53	0.48		0.52	0.46			0.39			0.39	
v/c Ratio	0.19	0.78		0.34	0.76			0.26			0.12	
Control Delay	20.0	35.2		18.8	36.5			33.0			20.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	20.0	35.2		18.8	36.5			33.0			20.5	
LOS	C	D		B	D			C			C	
Approach Delay		34.8			35.7			33.0			20.5	
Approach LOS		C			D			C			C	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 34.7

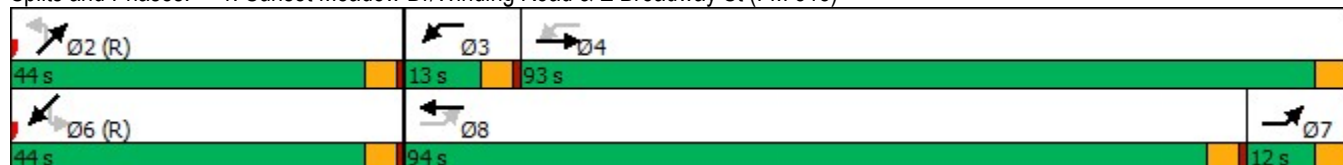
Intersection LOS: C

Intersection Capacity Utilization 63.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	202	624	133	65	658	108	236	406	91	192	653	287
Future Volume (vph)	202	624	133	65	658	108	236	406	91	192	653	287
Satd. Flow (prot)	1770	3447	0	1770	3465	0	1770	3440	0	1770	3376	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3447	0	1770	3465	0	1770	3440	0	1770	3376	0
Satd. Flow (RTOR)		23			15			22			59	
Adj. Flow (vph)	220	678	145	71	715	117	257	441	99	209	710	312
Lane Group Flow (vph)	220	823	0	71	832	0	257	540	0	209	1022	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	21.0	44.2		12.2	35.4		23.6	35.5		28.1	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.3	42.0		7.5	30.9		18.8	35.5		18.8	35.5	
Actuated g/C Ratio	0.14	0.35		0.06	0.26		0.16	0.30		0.16	0.30	
v/c Ratio	0.91	0.67		0.65	0.92		0.92	0.52		0.75	0.98	
Control Delay	90.5	36.0		81.3	58.4		87.8	36.4		64.9	62.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	90.5	36.0		81.3	58.4		87.8	36.4		64.9	62.9	
LOS	F	D		F	E		F	D		E	E	
Approach Delay		47.5			60.2			53.0			63.2	
Approach LOS		D			E			D			E	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 119.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 56.3

Intersection LOS: E

Intersection Capacity Utilization 88.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
21 s	35.4 s	28.1 s	35.5 s
			
Ø5	Ø6	Ø7	Ø8
12.2 s	44.2 s	23.6 s	40 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	919	31	72	960	19	49	17	59	29	21	5
Future Volume (vph)	2	919	31	72	960	19	49	17	59	29	21	5
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1710	0	0	1794	0
Flt Permitted	0.243			0.244				0.869			0.701	
Satd. Flow (perm)	453	3522	0	455	3529	0	0	1515	0	0	1291	0
Satd. Flow (RTOR)		5			3			35			4	
Adj. Flow (vph)	2	999	34	78	1043	21	53	18	64	32	23	5
Lane Group Flow (vph)	2	1033	0	78	1064	0	0	135	0	0	60	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	12.0	72.0		16.0	76.0		32.0	32.0		32.0	32.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.9	71.8		77.2	78.9			12.2			12.2	
Actuated g/C Ratio	0.78	0.70		0.76	0.77			0.12			0.12	
v/c Ratio	0.00	0.42		0.18	0.39			0.64			0.38	
Control Delay	3.0	8.0		4.0	5.1			44.8			45.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.0	8.0		4.0	5.1			44.8			45.1	
LOS	A	A		A	A			D			D	
Approach Delay		8.0			5.1			44.8			45.1	
Approach LOS		A			A			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 102

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 9.6

Intersection LOS: A

Intersection Capacity Utilization 50.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
12 s	76 s	32 s
		
Ø5	Ø6	Ø8
16 s	72 s	32 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	999	61	120	1085	11	44	7	87	11	7	6
Future Volume (vph)	8	999	61	120	1085	11	44	7	87	11	7	6
Satd. Flow (prot)	1770	3507	0	1770	3532	0	0	1677	0	0	1758	0
Flt Permitted	0.209			0.206				0.883			0.766	
Satd. Flow (perm)	389	3507	0	384	3532	0	0	1505	0	0	1377	0
Satd. Flow (RTOR)		8			2			64			7	
Adj. Flow (vph)	9	1086	66	130	1179	12	48	8	95	12	8	7
Lane Group Flow (vph)	9	1152	0	130	1191	0	0	151	0	0	27	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	11.0	71.0		20.0	80.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.4	68.5		75.7	78.4			11.3			11.3	
Actuated g/C Ratio	0.79	0.68		0.75	0.78			0.11			0.11	
v/c Ratio	0.02	0.48		0.33	0.43			0.67			0.17	
Control Delay	3.1	9.1		5.2	5.3			39.7			34.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.1	9.1		5.2	5.3			39.7			34.7	
LOS	A	A		A	A			D			C	
Approach Delay		9.0			5.3			39.7			34.7	
Approach LOS		A			A			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 100.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 9.1

Intersection LOS: A

Intersection Capacity Utilization 56.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
11 s	80 s	29 s
		
Ø5	Ø6	Ø8
20 s	71 s	29 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	10	21	343	5	222	1	964	233	209	931	2
Future Volume (vph)	8	10	21	343	5	222	1	964	233	209	931	2
Satd. Flow (prot)	0	1711	0	0	1775	1583	0	3437	0	1770	3539	0
Flt Permitted		0.917			0.697			0.954		0.222		
Satd. Flow (perm)	0	1585	0	0	1298	1583	0	3278	0	414	3539	0
Satd. Flow (RTOR)		23				241		58			1	
Adj. Flow (vph)	9	11	23	373	5	241	1	1048	253	227	1012	2
Lane Group Flow (vph)	0	43	0	0	378	241	0	1302	0	227	1014	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	22.5	22.5		9.5	22.5	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		18.0			18.0	18.0		18.0		23.0	27.5	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.42	0.50	
v/c Ratio		0.08			0.88	0.35		1.16		0.76	0.57	
Control Delay		8.6			43.7	4.0		108.1		29.0	10.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		8.6			43.7	4.0		108.1		29.0	10.9	
LOS		A			D	A		F		C	B	
Approach Delay		8.6			28.2			108.1			14.2	
Approach LOS		A			C			F			B	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 55.0

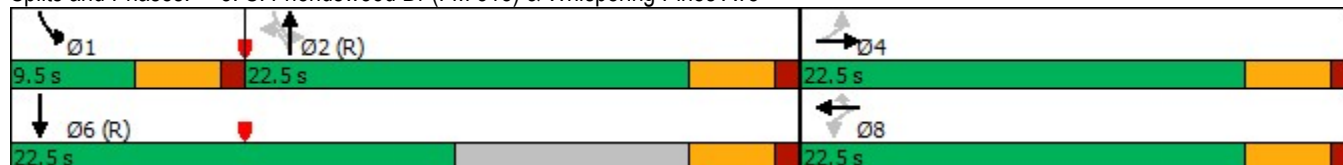
Intersection LOS: E

Intersection Capacity Utilization 97.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	27	880	21	208	1044	35	24	29	17	23	48	284
Future Volume (vph)	27	880	21	208	1044	35	24	29	17	23	48	284
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1772	0	0	1833	1583
Flt Permitted	0.950			0.950				0.909			0.914	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1639	0	0	1703	1583
Satd. Flow (RTOR)		5			6			18				254
Adj. Flow (vph)	29	957	23	226	1135	38	26	32	18	25	52	309
Lane Group Flow (vph)	29	980	0	226	1173	0	0	76	0	0	77	309
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	5.0	18.0		5.0	18.0			18.0			18.0	18.0
Actuated g/C Ratio	0.09	0.33		0.09	0.33			0.33			0.33	0.33
v/c Ratio	0.18	0.84		1.40	1.01			0.14			0.14	0.45
Control Delay	25.7	25.5		229.2	48.5			11.2			13.7	6.0
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	25.7	25.5		229.2	48.5			11.2			13.7	6.0
LOS	C	C		F	D			B			B	A
Approach Delay		25.5			77.7			11.2			7.5	
Approach LOS		C			E			B			A	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 45 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.40

Intersection Signal Delay: 48.2

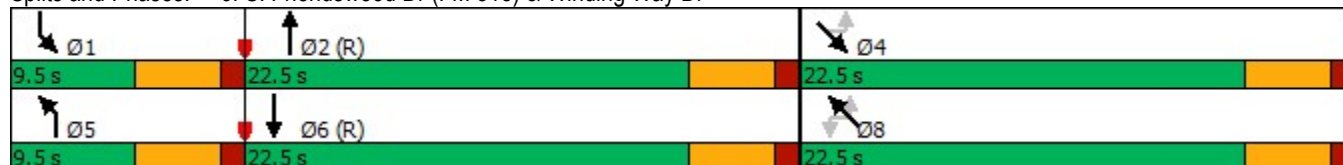
Intersection LOS: D

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	346	574	171	102	672	332	241	985	375	285	1351	83
Future Volume (vph)	346	574	171	102	672	332	241	985	375	285	1351	83
Satd. Flow (prot)	1770	3419	0	1770	3539	1583	1770	4877	0	1770	5040	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3419	0	1770	3539	1583	1770	4877	0	1770	5040	0
Satd. Flow (RTOR)		32				299		72			7	
Adj. Flow (vph)	376	624	186	111	730	361	262	1071	408	310	1468	90
Lane Group Flow (vph)	376	810	0	111	730	361	262	1479	0	310	1558	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	31.0	48.1		16.4	33.5	33.5	23.2	39.0		26.5	42.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	26.5	44.3		11.2	29.0	29.0	18.7	34.5		22.0	37.8	
Actuated g/C Ratio	0.20	0.34		0.09	0.22	0.22	0.14	0.27		0.17	0.29	
v/c Ratio	1.04	0.68		0.73	0.93	0.62	1.03	1.10		1.04	1.06	
Control Delay	109.3	39.0		84.0	67.9	14.0	118.8	98.2		114.1	85.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	109.3	39.0		84.0	67.9	14.0	118.8	98.2		114.1	85.1	
LOS	F	D		F	E	B	F	F		F	F	
Approach Delay		61.3			53.2			101.3			89.9	
Approach LOS		E			D			F			F	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 31 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 80.2

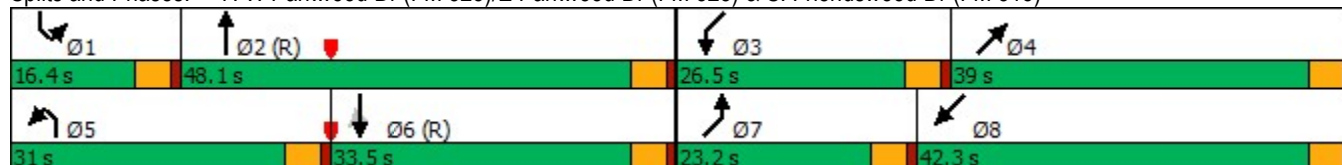
Intersection LOS: F

Intersection Capacity Utilization 95.9%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	34	1073	1273	151	81	15
Future Volume (vph)	34	1073	1273	151	81	15
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.131				0.950	
Satd. Flow (perm)	244	3539	3483	0	1770	1583
Satd. Flow (RTOR)			25			16
Adj. Flow (vph)	37	1166	1384	164	88	16
Lane Group Flow (vph)	37	1166	1548	0	88	16
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	12.0	100.0	88.0		20.0	20.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	97.0	99.7	93.3		11.3	11.3
Actuated g/C Ratio	0.81	0.83	0.78		0.09	0.09
v/c Ratio	0.14	0.40	0.57		0.53	0.10
Control Delay	4.1	3.7	7.3		62.8	21.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.1	3.7	7.3		62.8	21.5
LOS	A	A	A		E	C
Approach Delay		3.7	7.3		56.4	
Approach LOS		A	A		E	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 7.6

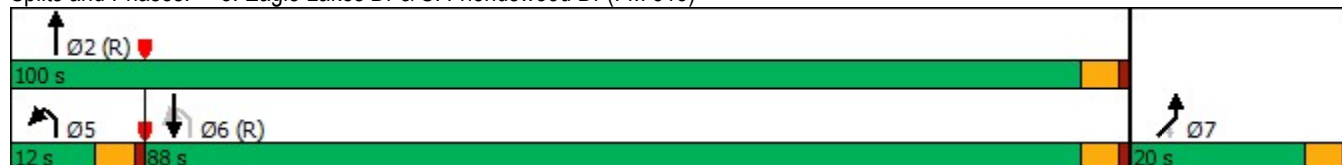
Intersection LOS: A

Intersection Capacity Utilization 52.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	97	915	169	104	864	14	116	13	95	6	12	69
Future Volume (vph)	97	915	169	104	864	14	116	13	95	6	12	69
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.248			0.228			0.950			0.950		
Satd. Flow (perm)	462	3539	1583	425	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			184			136			103			136
Adj. Flow (vph)	105	995	184	113	939	15	126	14	103	7	13	75
Lane Group Flow (vph)	105	995	184	113	939	15	126	14	103	7	13	75
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	15.0	58.0	58.0	16.0	59.0	59.0	23.0	36.0	36.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	83.9	76.0	76.0	83.9	76.2	76.2	13.7	20.6	20.6	5.5	6.4	6.4
Actuated g/C Ratio	0.70	0.63	0.63	0.70	0.64	0.64	0.11	0.17	0.17	0.05	0.05	0.05
v/c Ratio	0.26	0.44	0.17	0.29	0.42	0.01	0.63	0.04	0.29	0.09	0.13	0.35
Control Delay	12.0	23.7	9.6	6.6	7.6	0.0	63.8	39.8	10.0	57.3	56.5	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.0	23.7	9.6	6.6	7.6	0.0	63.8	39.8	10.0	57.3	56.5	4.5
LOS	B	C	A	A	A	A	E	D	B	E	E	A
Approach Delay		20.8			7.3			39.6			15.5	
Approach LOS		C			A			D			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 55.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	207	645	178	140	876	234	186	222	75	190	272	364
Future Volume (vph)	207	645	178	140	876	234	186	222	75	190	272	364
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.098			0.246			0.215			0.492		
Satd. Flow (perm)	183	3539	1583	458	3539	1583	400	3405	0	916	3235	0
Satd. Flow (RTOR)			193			254		35			248	
Adj. Flow (vph)	225	701	193	152	952	254	202	241	82	207	296	396
Lane Group Flow (vph)	225	701	193	152	952	254	202	323	0	207	692	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	23.0	56.0	56.0	15.0	48.0	48.0	22.0	38.9		20.1	37.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	56.9	46.8	46.8	56.9	40.9	40.9	55.1	41.4		55.1	40.7	
Actuated g/C Ratio	0.44	0.36	0.36	0.44	0.31	0.31	0.42	0.32		0.42	0.31	
v/c Ratio	0.82	0.55	0.28	0.50	0.85	0.38	0.63	0.29		0.43	0.58	
Control Delay	69.9	34.5	4.4	24.8	50.1	5.3	32.6	32.2		26.3	27.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	69.9	34.5	4.4	24.8	50.1	5.3	32.6	32.2		26.3	27.2	
LOS	E	C	A	C	D	A	C	C		C	C	
Approach Delay		36.4			38.9			32.4			27.0	
Approach LOS		D			D			C			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 34.6

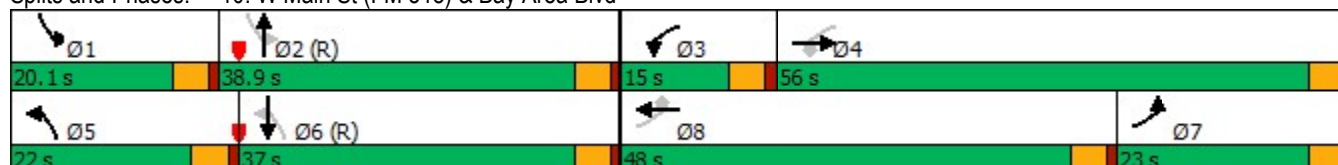
Intersection LOS: C

Intersection Capacity Utilization 80.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	28	173	90	86	175	33	103	778	78	126	1195	70
Future Volume (vph)	28	173	90	86	175	33	103	778	78	126	1195	70
Satd. Flow (prot)	0	1776	0	0	1809	0	1770	3490	0	1770	3511	0
Flt Permitted		0.995			0.986		0.950			0.950		
Satd. Flow (perm)	0	1776	0	0	1809	0	1770	3490	0	1770	3511	0
Satd. Flow (RTOR)		11			3		7				4	
Adj. Flow (vph)	30	188	98	93	190	36	112	846	85	137	1299	76
Lane Group Flow (vph)	0	316	0	0	319	0	112	931	0	137	1375	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	40.0	40.0		43.0	43.0		19.0	68.6		28.4	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		33.0			38.6		13.7	66.4		18.5	71.2	
Actuated g/C Ratio		0.19			0.22		0.08	0.38		0.11	0.41	
v/c Ratio		0.92			0.79		0.81	0.70		0.73	0.96	
Control Delay		98.3			79.8		117.1	49.5		98.6	66.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		98.3			79.8		117.1	49.5		98.6	66.0	
LOS		F			E		F	D		F	E	
Approach Delay		98.3			79.8			56.8			68.9	
Approach LOS		F			E			E			E	

Intersection Summary

Cycle Length: 180

Actuated Cycle Length: 174.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 68.9

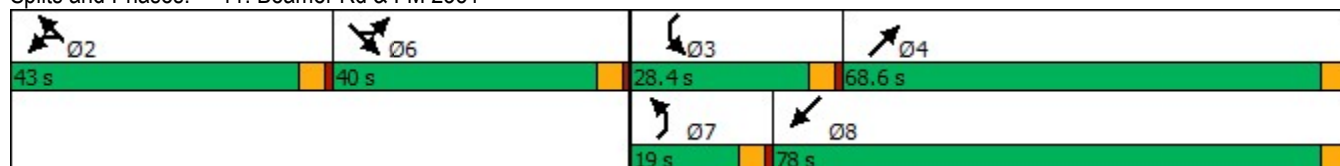
Intersection LOS: E

Intersection Capacity Utilization 87.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	846	79	71	1285	104	73
Future Volume (vph)	846	79	71	1285	104	73
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	13					79
Adj. Flow (vph)	920	86	77	1397	113	79
Lane Group Flow (vph)	1006	0	77	1397	113	79
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	69.0		22.0	91.0	29.0	29.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	30.5		8.8	41.3	25.0	25.0
Actuated g/C Ratio	0.40		0.12	0.55	0.33	0.33
v/c Ratio	0.71		0.37	0.72	0.10	0.14
Control Delay	22.3		38.7	14.7	21.1	6.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.3		38.7	14.7	21.1	6.8
LOS	C		D	B	C	A
Approach Delay	22.3			15.9	15.2	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 75.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 18.3

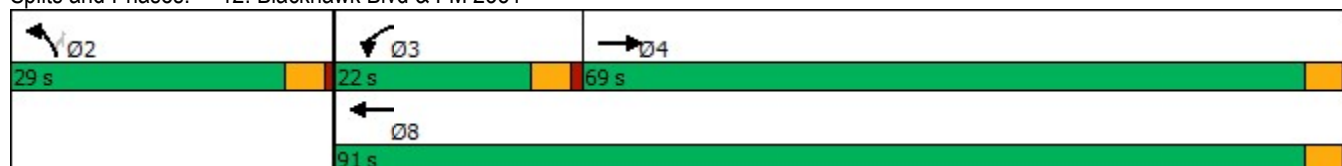
Intersection LOS: B

Intersection Capacity Utilization 47.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	54	0	63	1	0	0	81	855	0	0	1225	125
Future Volume (vph)	54	0	63	1	0	0	81	855	0	0	1225	125
Satd. Flow (prot)	0	1770	1583	0	1770	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757			0.719		0.089					
Satd. Flow (perm)	0	1410	1583	0	1339	0	166	3539	0	1863	3490	0
Satd. Flow (RTOR)			136								17	
Adj. Flow (vph)	59	0	68	1	0	0	88	929	0	0	1332	136
Lane Group Flow (vph)	0	59	68	0	1	0	88	929	0	0	1468	0
Turn Type	Perm	NA	Free	Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		23.4	86.6		23.4		50.5	53.8			44.9	
Actuated g/C Ratio		0.27	1.00		0.27		0.58	0.62			0.52	
v/c Ratio		0.15	0.04		0.00		0.38	0.42			0.81	
Control Delay		31.6	0.0		31.0		11.3	8.3			21.0	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		31.6	0.0		31.0		11.3	8.3			21.0	
LOS		C	A		C		B	A			C	
Approach Delay		14.7			31.0			8.6			21.0	
Approach LOS		B			C			A			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 86.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 57.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	88	0	143	7	7	1	119	880	1	4	1227	105
Future Volume (vph)	88	0	143	7	7	1	119	880	1	4	1227	105
Satd. Flow (prot)	1770	1583	0	0	1805	0	1770	3539	0	1770	3497	0
Flt Permitted	0.746				0.893		0.080			0.246		
Satd. Flow (perm)	1390	1583	0	0	1650	0	149	3539	0	458	3497	0
Satd. Flow (RTOR)		181			1						13	
Adj. Flow (vph)	96	0	155	8	8	1	129	957	1	4	1334	114
Lane Group Flow (vph)	96	155	0	0	17	0	129	958	0	4	1448	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	22.9	22.9			22.9		54.1	57.1		58.0	45.8	
Actuated g/C Ratio	0.25	0.25			0.25		0.60	0.63		0.64	0.50	
v/c Ratio	0.27	0.29			0.04		0.54	0.43		0.01	0.82	
Control Delay	34.2	5.1			30.8		22.0	9.3		5.0	22.9	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	34.2	5.1			30.8		22.0	9.3		5.0	22.9	
LOS	C	A			C		C	A		A	C	
Approach Delay		16.2			30.8			10.8			22.8	
Approach LOS		B			C			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 90.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 17.6

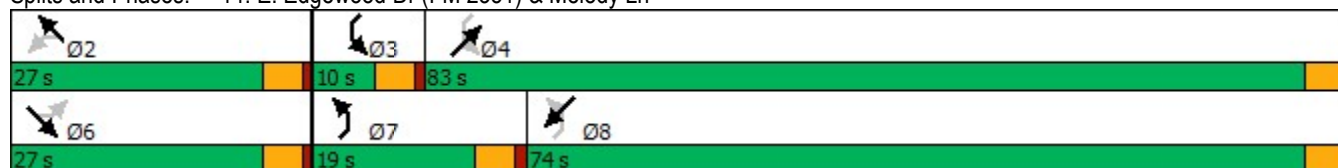
Intersection LOS: B

Intersection Capacity Utilization 64.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	25	21	15	153	30	363	19	353	126	372	447	41
Future Volume (vph)	25	21	15	153	30	363	19	353	126	372	447	41
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1790	0	1770	1839	0
Flt Permitted		0.857			0.742		0.366			0.373		
Satd. Flow (perm)	0	1544	0	0	1382	1583	682	1790	0	695	1839	0
Satd. Flow (RTOR)		12				395		35			9	
Adj. Flow (vph)	27	23	16	166	33	395	21	384	137	404	486	45
Lane Group Flow (vph)	0	66	0	0	199	395	21	521	0	404	531	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		28.9			28.9	91.1	52.8	52.8		52.8	52.8	
Actuated g/C Ratio		0.32			0.32	1.00	0.58	0.58		0.58	0.58	
v/c Ratio		0.13			0.45	0.25	0.05	0.50		1.00	0.50	
Control Delay		26.6			35.2	0.4	6.9	11.0		65.2	11.6	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		26.6			35.2	0.4	6.9	11.0		65.2	11.6	
LOS		C			D	A	A	B		E	B	
Approach Delay		26.6			12.0			10.8			34.8	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 91.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 22.1

Intersection LOS: C

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	1036	124	361	1169	97	215	388	173	136	425	337
Future Volume (vph)	291	1036	124	361	1169	97	215	388	173	136	425	337
Satd. Flow (prot)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Satd. Flow (RTOR)		19			12			50			92	
Adj. Flow (vph)	316	1126	135	392	1271	105	234	422	188	148	462	366
Lane Group Flow (vph)	316	1261	0	392	1376	0	234	610	0	148	828	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	79.0		9.5	79.0		9.5	56.0		9.5	56.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	54.1		5.0	54.1		25.4	51.5		25.4	51.5	
Actuated g/C Ratio	0.03	0.35		0.03	0.35		0.16	0.33		0.16	0.33	
v/c Ratio	5.54	0.71		6.88	0.78		0.80	0.52		0.51	0.71	
Control Delay	2093.9	44.6		2690.2	47.1		82.1	39.7		66.9	43.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2093.9	44.6		2690.2	47.1		82.1	39.7		66.9	43.4	
LOS	F	D		F	D		F	D		E	D	
Approach Delay		455.2			633.1			51.4			47.0	
Approach LOS		F			F			D			D	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 6.88

Intersection Signal Delay: 373.0

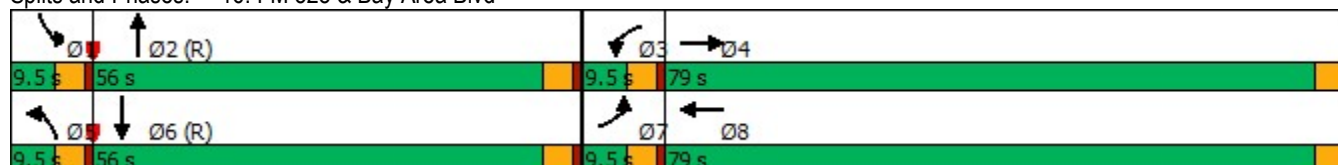
Intersection LOS: F

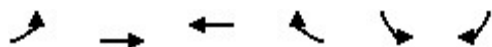
Intersection Capacity Utilization 92.2%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑↑↑	↑↑↑		←	←
Traffic Volume (vph)	98	1250	1742	230	165	80
Future Volume (vph)	98	1250	1742	230	165	80
Satd. Flow (prot)	1770	5085	4999	0	1770	1583
Flt Permitted	0.054				0.950	
Satd. Flow (perm)	101	5085	4999	0	1770	1583
Satd. Flow (RTOR)			29			87
Adj. Flow (vph)	107	1359	1893	250	179	87
Lane Group Flow (vph)	107	1359	2143	0	179	87
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	19.0	101.0	82.0		34.0	34.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	84.2	88.7	74.1		37.3	37.3
Actuated g/C Ratio	0.62	0.66	0.55		0.28	0.28
v/c Ratio	0.57	0.41	0.78		0.37	0.17
Control Delay	33.3	11.0	25.7		44.0	9.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	33.3	11.0	25.7		44.0	9.2
LOS	C	B	C		D	A
Approach Delay		12.6	25.7		32.6	
Approach LOS		B	C		C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.2

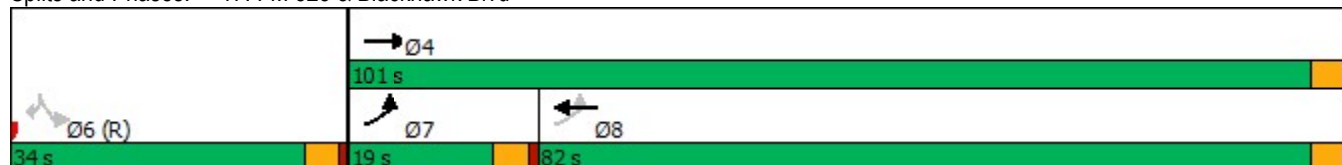
Intersection LOS: C

Intersection Capacity Utilization 64.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	200	44	58	28	51	86	82	1122	48	125	1485	231
Future Volume (vph)	200	44	58	28	51	86	82	1122	48	125	1485	231
Satd. Flow (prot)	0	1756	0	0	1717	0	1770	5055	0	1770	4984	0
Flt Permitted		0.665			0.909		0.078			0.118		
Satd. Flow (perm)	0	1207	0	0	1573	0	145	5055	0	220	4984	0
Satd. Flow (RTOR)		12			54			6			31	
Adj. Flow (vph)	217	48	63	30	55	93	89	1220	52	136	1614	251
Lane Group Flow (vph)	0	328	0	0	178	0	89	1272	0	136	1865	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	51.9	51.9		51.9	51.9		12.1	49.9		18.2	56.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		48.2			48.2		58.3	48.0		58.3	50.9	
Actuated g/C Ratio		0.40			0.40		0.49	0.40		0.49	0.42	
v/c Ratio		0.67			0.27		0.53	0.63		0.57	0.87	
Control Delay		36.5			18.0		28.0	30.6		25.6	36.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		36.5			18.0		28.0	30.6		25.6	36.6	
LOS		D			B		C	C		C	D	
Approach Delay		36.5			18.0			30.4			35.9	
Approach LOS		D			B			C			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 33.2

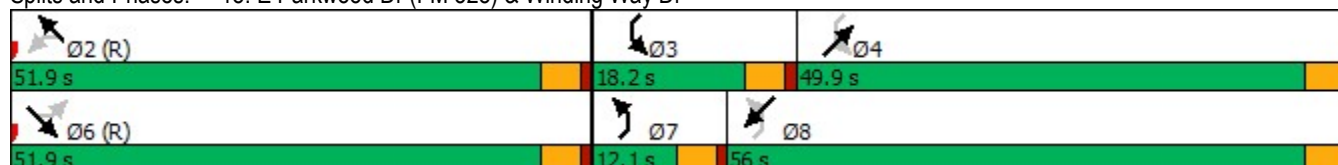
Intersection LOS: C

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	295	91	177	129	91	35	146	1220	82	35	1446	307
Future Volume (vph)	295	91	177	129	91	35	146	1220	82	35	1446	307
Satd. Flow (prot)	1770	1678	0	1770	1785	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.630			0.410			0.068			0.114		
Satd. Flow (perm)	1174	1678	0	764	1785	0	127	5040	0	212	3539	1583
Satd. Flow (RTOR)		87			17			13				256
Adj. Flow (vph)	321	99	192	140	99	38	159	1326	89	38	1572	334
Lane Group Flow (vph)	321	291	0	140	137	0	159	1415	0	38	1572	334
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	44.0	44.0		44.0	44.0		14.0	66.4		9.6	62.0	62.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)	40.0	40.0		40.0	40.0		66.5	57.8		68.3	57.2	57.2
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.55	0.48		0.57	0.48	0.48
v/c Ratio	0.82	0.47		0.55	0.23		0.81	0.58		0.13	0.93	0.38
Control Delay	55.5	24.8		42.7	26.6		54.9	24.8		14.9	40.9	6.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	55.5	24.8		42.7	26.6		54.9	24.8		14.9	40.9	6.1
LOS	E	C		D	C		D	C		B	D	A
Approach Delay		40.9			34.7			27.9			34.4	
Approach LOS		D			C			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 33.0

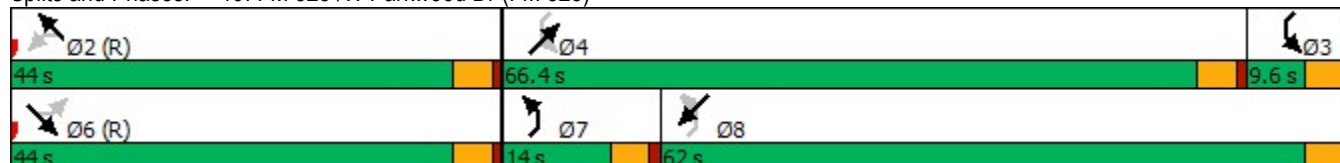
Intersection LOS: C

Intersection Capacity Utilization 86.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	137	1351	120	102	1610	11	75	56	101	19	87	147
Future Volume (vph)	137	1351	120	102	1610	11	75	56	101	19	87	147
Satd. Flow (prot)	1770	3497	0	1770	3536	0	0	1811	1583	0	1711	0
Flt Permitted	0.076			0.074				0.499			0.972	
Satd. Flow (perm)	142	3497	0	138	3536	0	0	930	1583	0	1669	0
Satd. Flow (RTOR)		15			1				110		64	
Adj. Flow (vph)	149	1468	130	111	1750	12	82	61	110	21	95	160
Lane Group Flow (vph)	149	1598	0	111	1762	0	0	143	110	0	276	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	61.1	54.2		61.1	52.6			22.6	22.6		22.6	
Actuated g/C Ratio	0.63	0.56		0.63	0.54			0.23	0.23		0.23	
v/c Ratio	0.65	0.82		0.55	0.92			0.66	0.24		0.63	
Control Delay	29.4	21.5		22.6	29.8			51.7	7.9		33.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	29.4	21.5		22.6	29.8			51.7	7.9		33.7	
LOS	C	C		C	C			D	A		C	
Approach Delay		22.2			29.4			32.7			33.7	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 97.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 26.8

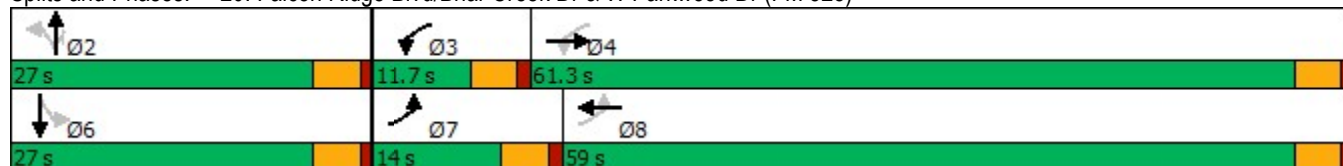
Intersection LOS: C

Intersection Capacity Utilization 89.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	53	1	5	29	9	88	10	1190	36	141	1315	108
Future Volume (vph)	53	1	5	29	9	88	10	1190	36	141	1315	108
Satd. Flow (prot)	0	1763	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.733			0.929		0.075			0.075		
Satd. Flow (perm)	0	1350	0	0	1568	0	140	3525	0	140	3500	0
Satd. Flow (RTOR)		3			85			4			14	
Adj. Flow (vph)	58	1	5	32	10	96	11	1293	39	153	1429	117
Lane Group Flow (vph)	0	64	0	0	138	0	11	1332	0	153	1546	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	28.0	28.0		28.0	28.0		10.0	70.0		22.0	82.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		40.1			40.1		70.0	56.7		66.4	68.9	
Actuated g/C Ratio		0.33			0.33		0.58	0.47		0.55	0.57	
v/c Ratio		0.14			0.24		0.07	0.80		0.73	0.77	
Control Delay		32.3			15.7		6.3	22.8		56.9	21.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		32.3			15.7		6.3	22.8		56.9	21.7	
LOS		C			B		A	C		E	C	
Approach Delay		32.3			15.7			22.6			24.9	
Approach LOS		C			B			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 23.7

Intersection LOS: C

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	9	15	2	2	12	4	1134	13	20	1043	152
Future Volume (vph)	128	9	15	2	2	12	4	1134	13	20	1043	152
Satd. Flow (prot)	0	1765	0	0	1661	0	1770	3532	0	1770	3472	0
Flt Permitted		0.748			0.974		0.172			0.176		
Satd. Flow (perm)	0	1375	0	0	1627	0	320	3532	0	328	3472	0
Satd. Flow (RTOR)		4			13			2			23	
Adj. Flow (vph)	139	10	16	2	2	13	4	1233	14	22	1134	165
Lane Group Flow (vph)	0	165	0	0	17	0	4	1247	0	22	1299	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	35.0	35.0		35.0	35.0		10.0	74.8		10.2	75.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		19.4			19.4		90.7	85.5		88.9	89.6	
Actuated g/C Ratio		0.16			0.16		0.76	0.71		0.74	0.75	
v/c Ratio		0.73			0.06		0.01	0.50		0.07	0.50	
Control Delay		64.6			21.2		5.0	10.0		0.7	2.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		64.6			21.2		5.0	10.0		0.7	2.1	
LOS		E			C		A	A		A	A	
Approach Delay		64.6			21.3			10.0			2.1	
Approach LOS		E			C			A			A	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 9.5

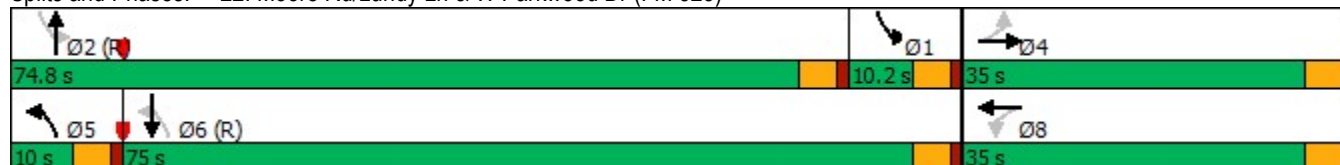
Intersection LOS: A

Intersection Capacity Utilization 56.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	71	47	28	103	46	39	366	41	39	550	98
Future Volume (vph)	45	71	47	28	103	46	39	366	41	39	550	98
Satd. Flow (prot)	1770	3327	0	1770	3376	0	1770	3486	0	1770	3458	0
Flt Permitted	0.649			0.671			0.232			0.434		
Satd. Flow (perm)	1209	3327	0	1250	3376	0	432	3486	0	808	3458	0
Satd. Flow (RTOR)		51			50			19			32	
Adj. Flow (vph)	49	77	51	30	112	50	42	398	45	42	598	107
Lane Group Flow (vph)	49	128	0	30	162	0	42	443	0	42	705	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	41.0	41.0		41.0	41.0		79.0	79.0		79.0	79.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.6	36.6		36.6	36.6		18.6	18.6		18.6	18.6	
Actuated g/C Ratio	0.57	0.57		0.57	0.57		0.29	0.29		0.29	0.29	
v/c Ratio	0.07	0.07		0.04	0.08		0.34	0.43		0.18	0.69	
Control Delay	7.7	4.8		7.6	5.2		25.9	18.8		18.7	23.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.7	4.8		7.6	5.2		25.9	18.8		18.7	23.0	
LOS	A	A		A	A		C	B		B	C	
Approach Delay		5.6			5.6			19.5			22.8	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 64.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 17.8

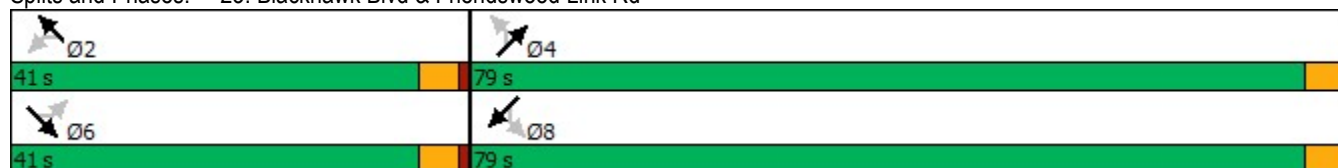
Intersection LOS: B

Intersection Capacity Utilization 46.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	18	543	6	6	509	54	7	3	6	77	5	39
Future Volume (vph)	18	543	6	6	509	54	7	3	6	77	5	39
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1725	0	0	1727	0
Flt Permitted	0.359			0.370				0.897			0.795	
Satd. Flow (perm)	669	1859	0	689	1837	0	0	1582	0	0	1417	0
Satd. Flow (RTOR)		1			10			7			33	
Adj. Flow (vph)	20	590	7	7	553	59	8	3	7	84	5	42
Lane Group Flow (vph)	20	597	0	7	612	0	0	18	0	0	131	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	51.9	51.6		51.8	51.5			10.2			10.2	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.15			0.15	
v/c Ratio	0.03	0.44		0.01	0.45			0.08			0.56	
Control Delay	3.8	7.6		5.5	8.2			19.1			29.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.8	7.6		5.5	8.2			19.1			29.2	
LOS	A	A		A	A			B			C	
Approach Delay		7.5			8.1			19.1			29.2	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 10.0

Intersection LOS: A

Intersection Capacity Utilization 48.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	473	145	26	444	4	118	5	29	4	3	4
Future Volume (vph)	8	473	145	26	444	4	118	5	29	4	3	4
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1740	0
Flt Permitted	0.435			0.280				0.767			0.903	
Satd. Flow (perm)	810	1798	0	522	1861	0	0	1392	0	0	1600	0
Satd. Flow (RTOR)		30			1			17			4	
Adj. Flow (vph)	9	514	158	28	483	4	128	5	32	4	3	4
Lane Group Flow (vph)	9	672	0	28	487	0	0	165	0	0	11	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	46.5	44.3		47.5	46.4			12.6			12.6	
Actuated g/C Ratio	0.66	0.63		0.68	0.66			0.18			0.18	
v/c Ratio	0.01	0.58		0.06	0.39			0.62			0.04	
Control Delay	7.1	12.2		6.7	11.3			33.3			17.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.1	12.2		6.7	11.3			33.3			17.7	
LOS	A	B		A	B			C			B	
Approach Delay		12.1			11.0			33.3			17.7	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 14.3

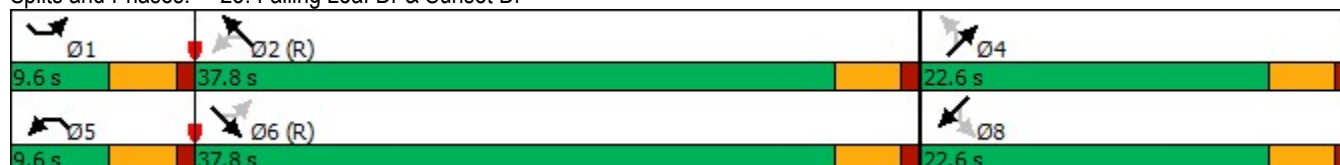
Intersection LOS: B

Intersection Capacity Utilization 56.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	409	63	38	391	42	51	55	48	54	93	24
Future Volume (vph)	19	409	63	38	391	42	51	55	48	54	93	24
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1798	0
Flt Permitted	0.458			0.365				0.736			0.857	
Satd. Flow (perm)	853	1825	0	680	1835	0	0	1371	1583	0	1566	0
Satd. Flow (RTOR)		15			11				94		11	
Adj. Flow (vph)	21	445	68	41	425	46	55	60	52	59	101	26
Lane Group Flow (vph)	21	513	0	41	471	0	0	115	52	0	186	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	45.2	41.8		47.2	46.1			12.9	12.9		12.9	
Actuated g/C Ratio	0.65	0.60		0.67	0.66			0.18	0.18		0.18	
v/c Ratio	0.03	0.47		0.07	0.39			0.46	0.14		0.63	
Control Delay	6.9	17.5		5.0	8.3			30.1	2.5		33.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.9	17.5		5.0	8.3			30.1	2.5		33.4	
LOS	A	B		A	A			C	A		C	
Approach Delay		17.1			8.0			21.5			33.4	
Approach LOS		B			A			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 16.5

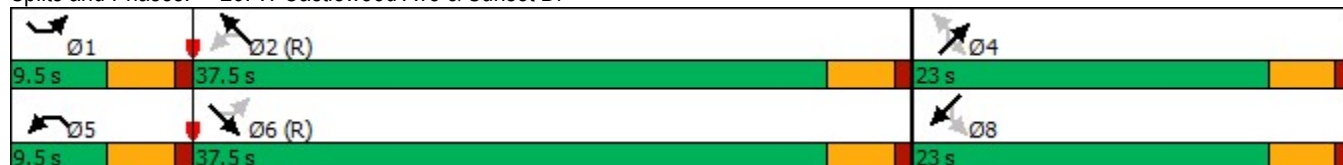
Intersection LOS: B

Intersection Capacity Utilization 55.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	42	182	17	27	138	48	6	49	12	49	78	47
Future Volume (Veh/h)	42	182	17	27	138	48	6	49	12	49	78	47
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	198	18	29	150	52	7	53	13	53	85	51
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	202			216			626	559	207	572	542	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	202			216			626	559	207	572	542	176
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			98			98	87	98	86	80	94
cM capacity (veh/h)	1370			1354			303	414	833	367	423	867
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	262	231	73	189								
Volume Left	46	29	7	53								
Volume Right	18	52	13	51								
cSH	1370	1354	438	468								
Volume to Capacity	0.03	0.02	0.17	0.40								
Queue Length 95th (ft)	3	2	15	48								
Control Delay (s)	1.6	1.1	14.9	17.8								
Lane LOS	A	A	B	C								
Approach Delay (s)	1.6	1.1	14.9	17.8								
Approach LOS			B	C								
Intersection Summary												
Average Delay			6.8									
Intersection Capacity Utilization			42.3%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	223	21	78	174	22	62
Future Volume (Veh/h)	223	21	78	174	22	62
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	242	23	85	189	24	67
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			265		612	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			265		612	254
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		94	91
cM capacity (veh/h)			1299		426	785
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	265	274	91			
Volume Left	0	85	24			
Volume Right	23	0	67			
cSH	1700	1299	643			
Volume to Capacity	0.16	0.07	0.14			
Queue Length 95th (ft)	0	5	12			
Control Delay (s)	0.0	2.9	11.5			
Lane LOS		A	B			
Approach Delay (s)	0.0	2.9	11.5			
Approach LOS			B			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			41.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	70	214	175	15	16	75
Future Volume (Veh/h)	70	214	175	15	16	75
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	233	190	16	17	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	206				583	198
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206				583	198
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				96	90
cM capacity (veh/h)	1365				448	843
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	309	206	99			
Volume Left	76	0	17			
Volume Right	0	16	82			
cSH	1365	1700	732			
Volume to Capacity	0.06	0.12	0.14			
Queue Length 95th (ft)	4	0	12			
Control Delay (s)	2.3	0.0	10.7			
Lane LOS	A		B			
Approach Delay (s)	2.3	0.0	10.7			
Approach LOS			B			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			40.8%	ICU Level of Service		A
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	27	36	20	14	64	20	24	142	10	23	156	21
Future Volume (vph)	27	36	20	14	64	20	24	142	10	23	156	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	29	39	22	15	70	22	26	154	11	25	170	23
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	90	107	191	218								
Volume Left (vph)	29	15	26	25								
Volume Right (vph)	22	22	11	23								
Hadj (s)	-0.05	-0.06	0.03	-0.01								
Departure Headway (s)	5.0	5.0	4.7	4.6								
Degree Utilization, x	0.12	0.15	0.25	0.28								
Capacity (veh/h)	653	660	726	734								
Control Delay (s)	8.7	8.8	9.3	9.4								
Approach Delay (s)	8.7	8.8	9.3	9.4								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			9.2									
Level of Service			A									
Intersection Capacity Utilization			29.3%		ICU Level of Service				A			
Analysis Period (min)			15									

Appendix C

“Year 2025 No-Build” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	14	798	66	9	992	15	128	0	38	21	2	23
Future Volume (vph)	14	798	66	9	992	15	128	0	38	21	2	23
Satd. Flow (prot)	1770	3497	0	1770	3532	0	0	1738	0	0	1698	0
Flt Permitted	0.096			0.164				0.747			0.857	
Satd. Flow (perm)	179	3497	0	305	3532	0	0	1348	0	0	1488	0
Satd. Flow (RTOR)		10			2			85			25	
Adj. Flow (vph)	15	867	72	10	1078	16	139	0	41	23	2	25
Lane Group Flow (vph)	15	939	0	10	1094	0	0	180	0	0	50	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	78.0		12.0	78.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	59.2	55.4		56.8	53.6			68.3			68.3	
Actuated g/C Ratio	0.44	0.41		0.42	0.40			0.51			0.51	
v/c Ratio	0.10	0.65		0.05	0.78			0.25			0.07	
Control Delay	20.6	33.4		17.4	39.2			13.0			13.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	20.6	33.4		17.4	39.2			13.0			13.6	
LOS	C	C		B	D			B			B	
Approach Delay		33.2			39.0			13.0			13.6	
Approach LOS		C			D			B			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 34.0

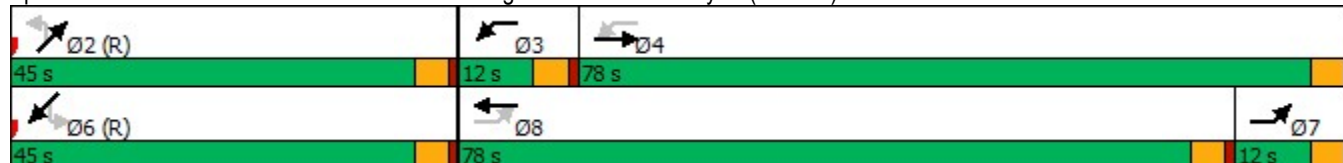
Intersection LOS: C

Intersection Capacity Utilization 50.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

No Build AM Peak 2025

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	270	621	91	125	555	195	158	556	95	255	472	255
Future Volume (vph)	270	621	91	125	555	195	158	556	95	255	472	255
Satd. Flow (prot)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Satd. Flow (RTOR)		16			44			17			94	
Adj. Flow (vph)	293	675	99	136	603	212	172	604	103	277	513	277
Lane Group Flow (vph)	293	774	0	136	815	0	172	707	0	277	790	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.8	35.7		19.2	30.1		17.2	26.5		23.6	32.9	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	19.4	32.7		12.3	25.6		12.2	22.0		18.3	28.0	
Actuated g/C Ratio	0.19	0.32		0.12	0.25		0.12	0.21		0.18	0.27	
v/c Ratio	0.88	0.70		0.65	0.93		0.82	0.94		0.88	0.81	
Control Delay	69.0	34.9		58.0	54.5		74.8	62.0		71.3	38.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	69.0	34.9		58.0	54.5		74.8	62.0		71.3	38.6	
LOS	E	C		E	D		E	E		E	D	
Approach Delay		44.3			55.0			64.5			47.1	
Approach LOS		D			D			E			D	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 103.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 52.1

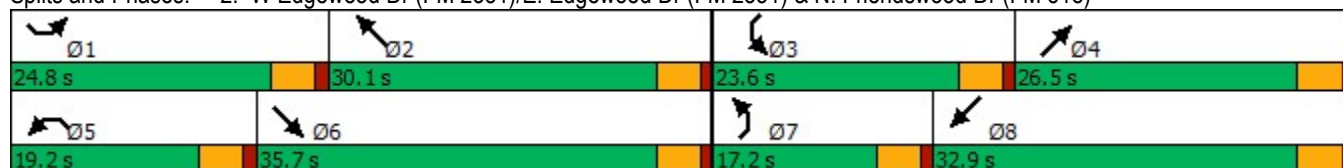
Intersection LOS: D

Intersection Capacity Utilization 84.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	834	41	35	939	9	48	3	53	12	16	5
Future Volume (vph)	5	834	41	35	939	9	48	3	53	12	16	5
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1696	0	0	1794	0
Flt Permitted	0.257			0.278				0.857			0.849	
Satd. Flow (perm)	479	3514	0	518	3536	0	0	1486	0	0	1551	0
Satd. Flow (RTOR)		6			1			37			5	
Adj. Flow (vph)	5	907	45	38	1021	10	52	3	58	13	17	5
Lane Group Flow (vph)	5	952	0	38	1031	0	0	113	0	0	35	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	14.0	84.0		15.0	85.0		36.0	36.0		36.0	36.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	90.2	84.7		88.4	89.1			11.2			11.2	
Actuated g/C Ratio	0.81	0.76		0.79	0.80			0.10			0.10	
v/c Ratio	0.01	0.36		0.08	0.36			0.62			0.22	
Control Delay	2.6	5.8		2.9	4.3			46.7			43.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	2.6	5.8		2.9	4.3			46.7			43.1	
LOS	A	A		A	A			D			D	
Approach Delay		5.7			4.3			46.7			43.1	
Approach LOS		A			A			D			D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 111.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 7.7

Intersection LOS: A

Intersection Capacity Utilization 45.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
14 s	85 s	36 s
		
Ø5	Ø6	Ø8
15 s	84 s	36 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	841	47	88	892	20	68	5	82	20	6	20
Future Volume (vph)	20	841	47	88	892	20	68	5	82	20	6	20
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1691	0	0	1718	0
Flt Permitted	0.260			0.260				0.860			0.790	
Satd. Flow (perm)	484	3511	0	484	3529	0	0	1487	0	0	1386	0
Satd. Flow (RTOR)		6			3			41			22	
Adj. Flow (vph)	22	914	51	96	970	22	74	5	89	22	7	22
Lane Group Flow (vph)	22	965	0	96	992	0	0	168	0	0	51	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	13.0	75.0		20.0	82.0		40.0	40.0		40.0	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	82.8	73.0		80.0	80.5			15.1			15.1	
Actuated g/C Ratio	0.76	0.67		0.74	0.74			0.14			0.14	
v/c Ratio	0.05	0.41		0.22	0.38			0.70			0.24	
Control Delay	4.0	9.3		4.8	6.8			49.2			29.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.0	9.3		4.8	6.8			49.2			29.8	
LOS	A	A		A	A			D			C	
Approach Delay		9.2			6.7			49.2			29.8	
Approach LOS		A			A			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 108.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 11.4

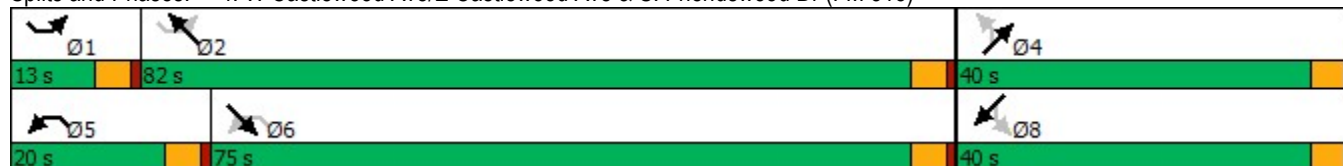
Intersection LOS: B

Intersection Capacity Utilization 52.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	6	2	151	1	157	16	943	150	106	796	7
Future Volume (vph)	0	6	2	151	1	157	16	943	150	106	796	7
Satd. Flow (prot)	0	1807	0	0	1775	1583	0	3465	0	1770	3536	0
Flt Permitted					0.721			0.935		0.182		
Satd. Flow (perm)	0	1807	0	0	1343	1583	0	3243	0	339	3536	0
Satd. Flow (RTOR)		2				171		22			2	
Adj. Flow (vph)	0	7	2	164	1	171	17	1025	163	115	865	8
Lane Group Flow (vph)	0	9	0	0	165	171	0	1205	0	115	873	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	38.0	38.0		38.0	38.0	38.0	84.0	84.0		13.0	97.0	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		20.0			20.0	20.0		80.8		88.2	92.7	
Actuated g/C Ratio		0.16			0.16	0.16		0.66		0.72	0.76	
v/c Ratio		0.03			0.75	0.42		0.56		0.35	0.32	
Control Delay		36.6			68.8	9.5		12.9		7.5	5.5	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		36.6			68.8	9.5		12.9		7.5	5.5	
LOS		D			E	A		B		A	A	
Approach Delay		36.6			38.6			12.9			5.7	
Approach LOS		D			D			B			A	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 121.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 13.6

Intersection LOS: B

Intersection Capacity Utilization 79.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

		
Ø1	Ø2	Ø4
13 s	84 s	38 s
		
Ø6		Ø8
97 s		38 s

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	47	669	16	205	725	23	27	42	30	9	27	206
Future Volume (vph)	47	669	16	205	725	23	27	42	30	9	27	206
Satd. Flow (prot)	1770	3529	0	1770	3522	0	0	1763	0	0	1839	1583
Flt Permitted	0.950			0.950				0.902			0.918	
Satd. Flow (perm)	1770	3529	0	1770	3522	0	0	1611	0	0	1710	1583
Satd. Flow (RTOR)		2			4			15				224
Adj. Flow (vph)	51	727	17	223	788	25	29	46	33	10	29	224
Lane Group Flow (vph)	51	744	0	223	813	0	0	108	0	0	39	224
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	19.0	57.0		42.0	80.0		36.0	36.0		36.0	36.0	36.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	8.5	63.5		18.6	76.0			11.5			11.5	11.5
Actuated g/C Ratio	0.08	0.59		0.17	0.71			0.11			0.11	0.11
v/c Ratio	0.36	0.36		0.73	0.33			0.58			0.21	0.61
Control Delay	56.2	13.0		56.4	7.4			53.0			47.6	13.5
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	56.2	13.0		56.4	7.4			53.0			47.6	13.5
LOS	E	B		E	A			D			D	B
Approach Delay		15.8			17.9			53.0			18.6	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 107.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 18.9

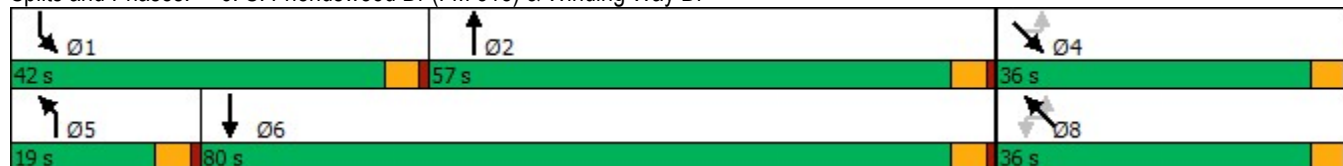
Intersection LOS: B

Intersection Capacity Utilization 53.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	452	655	325	151	455	269	259	1329	343	173	667	60
Future Volume (vph)	452	655	325	151	455	269	259	1329	343	173	667	60
Satd. Flow (prot)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Satd. Flow (RTOR)		69				292		50			10	
Adj. Flow (vph)	491	712	353	164	495	292	282	1445	373	188	725	65
Lane Group Flow (vph)	491	1065	0	164	495	292	282	1818	0	188	790	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	41.0	50.7		17.3	27.0	27.0	34.2	48.0		19.0	32.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	36.5	46.2		12.8	22.5	22.5	25.6	43.5		14.5	32.4	
Actuated g/C Ratio	0.27	0.34		0.09	0.17	0.17	0.19	0.32		0.11	0.24	
v/c Ratio	1.03	0.89		0.98	0.84	0.58	0.84	1.12		0.99	0.65	
Control Delay	96.3	49.7		125.4	68.3	10.2	74.3	104.5		122.2	49.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	96.3	49.7		125.4	68.3	10.2	74.3	104.5		122.2	49.3	
LOS	F	D		F	E	B	E	F		F	D	
Approach Delay		64.4			60.3			100.4			63.3	
Approach LOS		E			E			F			E	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 77.1

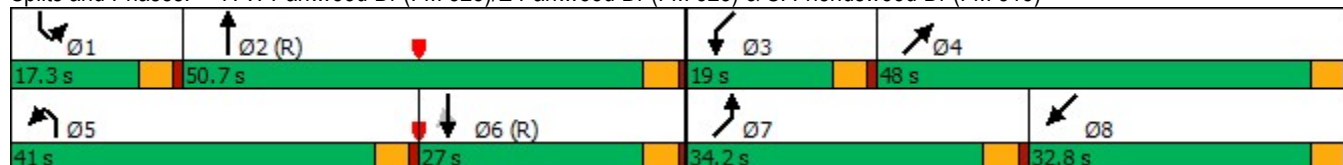
Intersection LOS: E

Intersection Capacity Utilization 95.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	21	1487	891	69	206	44
Future Volume (vph)	21	1487	891	69	206	44
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.238				0.950	
Satd. Flow (perm)	443	3539	3500	0	1688	1583
Satd. Flow (RTOR)			10			48
Adj. Flow (vph)	23	1616	968	75	224	48
Lane Group Flow (vph)	23	1616	1043	0	224	48
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	11.0	100.0	89.0		40.0	40.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	105.3	108.0	101.5		23.0	23.0
Actuated g/C Ratio	0.75	0.77	0.72		0.16	0.16
v/c Ratio	0.06	0.59	0.41		0.77	0.16
Control Delay	5.1	8.4	9.3		73.0	12.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	5.1	8.4	9.3		73.0	12.9
LOS	A	A	A		E	B
Approach Delay		8.4	9.3		62.4	
Approach LOS		A	A		E	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 13.7

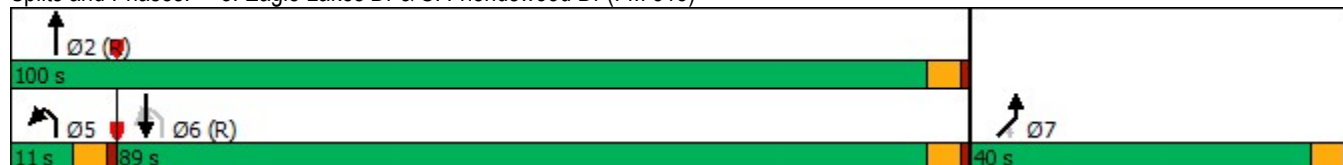
Intersection LOS: B

Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	519	122	75	855	10	227	16	110	10	18	169
Future Volume (vph)	45	519	122	75	855	10	227	16	110	10	18	169
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.212			0.384			0.950			0.950		
Satd. Flow (perm)	395	3539	1583	715	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			156			156			120			184
Adj. Flow (vph)	49	564	133	82	929	11	247	17	120	11	20	184
Lane Group Flow (vph)	49	564	133	82	929	11	247	17	120	11	20	184
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	10.0	44.0	44.0	10.0	44.0	44.0	28.0	41.0	41.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	60.9	54.4	54.4	60.9	55.2	55.2	19.1	29.5	29.5	5.5	7.8	7.8
Actuated g/C Ratio	0.58	0.52	0.52	0.58	0.53	0.53	0.18	0.28	0.28	0.05	0.07	0.07
v/c Ratio	0.15	0.31	0.15	0.17	0.50	0.01	0.77	0.03	0.23	0.12	0.14	0.64
Control Delay	11.3	17.3	2.6	10.9	19.3	0.0	56.3	25.9	6.1	50.5	46.0	17.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	17.3	2.6	10.9	19.3	0.0	56.3	25.9	6.1	50.5	46.0	17.3
LOS	B	B	A	B	B	A	E	C	A	D	D	B
Approach Delay		14.3			18.4			39.2			21.7	
Approach LOS		B			B			D			C	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 20.8

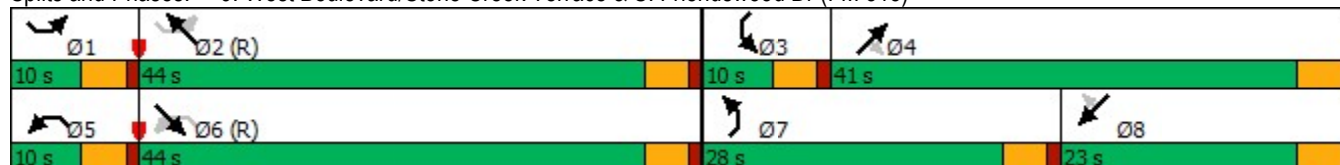
Intersection LOS: C

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	321	687	74	84	602	328	123	342	203	171	80	118
Future Volume (vph)	321	687	74	84	602	328	123	342	203	171	80	118
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3224	0
Flt Permitted	0.147			0.229			0.608			0.291		
Satd. Flow (perm)	274	3539	1583	427	3539	1583	1133	3341	0	542	3224	0
Satd. Flow (RTOR)			136			322		96			128	
Adj. Flow (vph)	349	747	80	91	654	357	134	372	221	186	87	128
Lane Group Flow (vph)	349	747	80	91	654	357	134	593	0	186	215	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	32.0	55.4	55.4	10.6	34.0	34.0	11.3	33.8		20.2	42.7	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	50.3	44.2	44.2	50.3	27.4	27.4	51.7	38.9		51.7	43.4	
Actuated g/C Ratio	0.42	0.37	0.37	0.42	0.23	0.23	0.43	0.32		0.43	0.36	
v/c Ratio	0.87	0.57	0.12	0.37	0.81	0.59	0.25	0.52		0.51	0.17	
Control Delay	63.7	31.5	0.7	21.4	52.3	10.3	22.1	31.2		26.2	12.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	63.7	31.5	0.7	21.4	52.3	10.3	22.1	31.2		26.2	12.3	
LOS	E	C	A	C	D	B	C	C		C	B	
Approach Delay		39.0			36.1			29.5			18.8	
Approach LOS		D			D			C			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 33.7

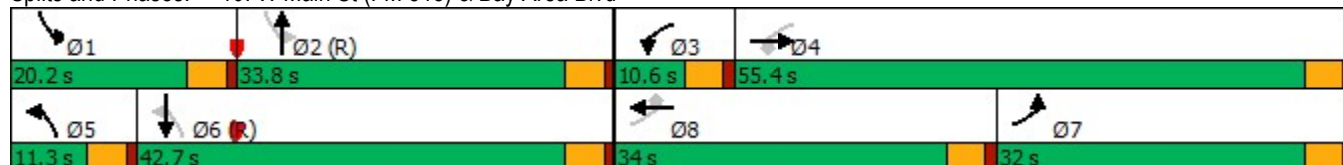
Intersection LOS: C

Intersection Capacity Utilization 74.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	27	180	83	29	280	57	124	1460	43	59	714	95
Future Volume (vph)	27	180	83	29	280	57	124	1460	43	59	714	95
Satd. Flow (prot)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Flt Permitted		0.995			0.996		0.950			0.950		
Satd. Flow (perm)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Satd. Flow (RTOR)		14			7			3			13	
Adj. Flow (vph)	29	196	90	32	304	62	135	1587	47	64	776	103
Lane Group Flow (vph)	0	315	0	0	398	0	135	1634	0	64	879	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.0	24.0		31.6	31.6		20.4	54.4		10.0	44.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		19.5			27.1		13.5	49.9		5.5	41.9	
Actuated g/C Ratio		0.16			0.23		0.11	0.42		0.05	0.35	
v/c Ratio		1.05			0.96		0.68	1.11		0.79	0.72	
Control Delay		111.1			80.6		68.2	95.0		110.7	37.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		111.1			80.6		68.2	95.0		110.7	37.9	
LOS		F			F		E	F		F	D	
Approach Delay		111.1			80.6			92.9			42.8	
Approach LOS		F			F			F			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 79.4

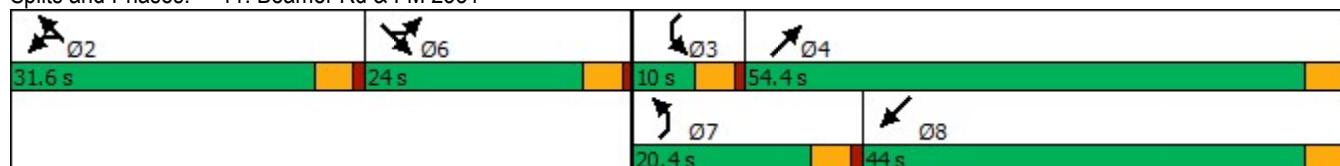
Intersection LOS: E

Intersection Capacity Utilization 82.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1280	36	79	737	100	143
Future Volume (vph)	1280	36	79	737	100	143
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	4					155
Adj. Flow (vph)	1391	39	86	801	109	155
Lane Group Flow (vph)	1430	0	86	801	109	155
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	50.0		14.4	64.4	25.6	25.6
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	39.3		8.6	49.5	21.9	21.9
Actuated g/C Ratio	0.49		0.11	0.61	0.27	0.27
v/c Ratio	0.83		0.46	0.37	0.12	0.29
Control Delay	23.3		45.6	7.7	27.0	6.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.3		45.6	7.7	27.0	6.7
LOS	C		D	A	C	A
Approach Delay	23.3			11.4	15.1	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 80.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 18.3

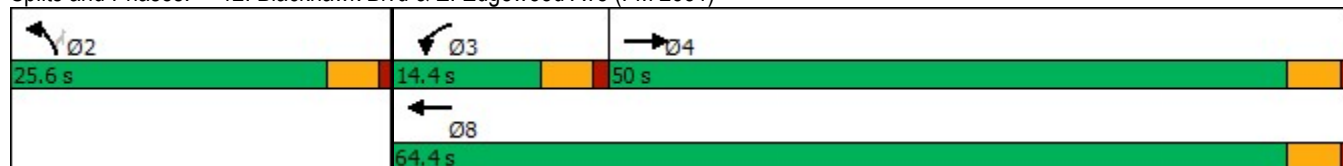
Intersection LOS: B

Intersection Capacity Utilization 56.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & E. Edgewood Ave (FM 2351)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	145	0	123	0	0	0	52	1166	0	0	823	50
Future Volume (vph)	145	0	123	0	0	0	52	1166	0	0	823	50
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.178					
Satd. Flow (perm)	0	1410	1583	0	1863	0	332	3539	0	1863	3507	0
Satd. Flow (RTOR)			136								9	
Adj. Flow (vph)	158	0	134	0	0	0	57	1267	0	0	895	54
Lane Group Flow (vph)	0	158	134	0	0	0	57	1267	0	0	949	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.9	65.0				30.5	33.0			26.7	
Actuated g/C Ratio		0.35	1.00				0.47	0.51			0.41	
v/c Ratio		0.32	0.08				0.19	0.71			0.66	
Control Delay		20.3	0.1				9.0	14.3			18.6	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		20.3	0.1				9.0	14.3			18.6	
LOS		C	A				A	B			B	
Approach Delay		11.0						14.1			18.6	
Approach LOS		B						B			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 15.4

Intersection LOS: B

Intersection Capacity Utilization 55.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351 & Royal Ct/Woodland Trail Dr

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	114	5	241	2	1	1	84	1121	2	14	887	32
Future Volume (vph)	114	5	241	2	1	1	84	1121	2	14	887	32
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.912		0.166			0.124		
Satd. Flow (perm)	1406	1589	0	0	1641	0	309	3539	0	231	3522	0
Satd. Flow (RTOR)		243			1						5	
Adj. Flow (vph)	124	5	262	2	1	1	91	1218	2	15	964	35
Lane Group Flow (vph)	124	267	0	0	4	0	91	1220	0	15	999	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	23.1	23.1			23.1		33.7	35.5		36.4	28.0	
Actuated g/C Ratio	0.33	0.33			0.33		0.49	0.51		0.52	0.40	
v/c Ratio	0.27	0.39			0.01		0.30	0.67		0.06	0.70	
Control Delay	22.8	6.4			19.2		9.8	14.8		7.0	20.4	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	22.8	6.4			19.2		9.8	14.8		7.0	20.4	
LOS	C	A			B		A	B		A	C	
Approach Delay		11.6			19.3			14.5			20.2	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 69.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 16.2

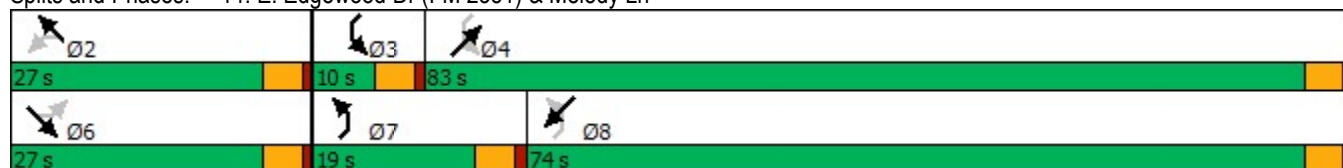
Intersection LOS: B

Intersection Capacity Utilization 61.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	29	32	55	92	7	313	23	376	99	315	267	20
Future Volume (vph)	29	32	55	92	7	313	23	376	99	315	267	20
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1842	0
Flt Permitted		0.922			0.686		0.520			0.342		
Satd. Flow (perm)	0	1608	0	0	1278	1583	969	1805	0	637	1842	0
Satd. Flow (RTOR)		35				340		26			7	
Adj. Flow (vph)	32	35	60	100	8	340	25	409	108	342	290	22
Lane Group Flow (vph)	0	127	0	0	108	340	25	517	0	342	312	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		28.8			28.8	77.1	38.9	38.9		38.9	38.9	
Actuated g/C Ratio		0.37			0.37	1.00	0.50	0.50		0.50	0.50	
v/c Ratio		0.20			0.23	0.21	0.05	0.56		1.07	0.33	
Control Delay		18.1			24.5	0.3	8.0	13.7		88.5	10.8	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		18.1			24.5	0.3	8.0	13.7		88.5	10.8	
LOS		B			C	A	A	B		F	B	
Approach Delay		18.1			6.1			13.4			51.4	
Approach LOS		B			A			B			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 77.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 25.9

Intersection LOS: C

Intersection Capacity Utilization 67.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	355	1739	93	109	747	74	215	535	338	116	159	204
Future Volume (vph)	355	1739	93	109	747	74	215	535	338	116	159	204
Satd. Flow (prot)	1770	5045	0	1770	5019	0	1770	3334	0	1770	3242	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5045	0	1770	5019	0	1770	3334	0	1770	3242	0
Satd. Flow (RTOR)		8			16			67			183	
Adj. Flow (vph)	386	1890	101	118	812	80	234	582	367	126	173	222
Lane Group Flow (vph)	386	1991	0	118	892	0	234	949	0	126	395	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	84.0		9.5	84.0		9.5	51.0		9.5	51.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	5.0	75.4		5.0	75.4		9.1	46.5		9.1	46.5	
Actuated g/C Ratio	0.03	0.49		0.03	0.49		0.06	0.30		0.06	0.30	
v/c Ratio	6.77	0.80		2.07	0.36		2.25	0.90		1.21	0.36	
Control Delay	2643.1	35.7		568.7	24.0		624.6	60.1		212.2	22.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2643.1	35.7		568.7	24.0		624.6	60.1		212.2	22.8	
LOS	F	D		F	C		F	E		F	C	
Approach Delay		459.1			87.7			171.8			68.6	
Approach LOS		F			F			F			E	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 6.77

Intersection Signal Delay: 278.7

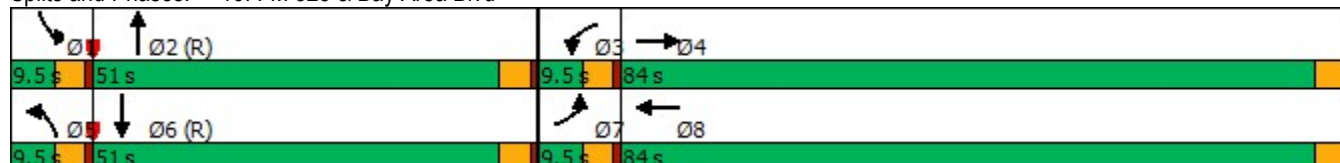
Intersection LOS: F

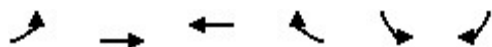
Intersection Capacity Utilization 88.8%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑		↰	↰
Traffic Volume (vph)	55	1902	962	154	253	91
Future Volume (vph)	55	1902	962	154	253	91
Satd. Flow (prot)	1770	5085	4979	0	1770	1583
Flt Permitted	0.158				0.950	
Satd. Flow (perm)	294	5085	4979	0	1770	1583
Satd. Flow (RTOR)			33			99
Adj. Flow (vph)	60	2067	1046	167	275	99
Lane Group Flow (vph)	60	2067	1213	0	275	99
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	14.0	88.0	74.0		47.0	47.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	71.8	75.4	65.2		50.6	50.6
Actuated g/C Ratio	0.53	0.56	0.48		0.37	0.37
v/c Ratio	0.25	0.73	0.50		0.41	0.15
Control Delay	14.8	23.6	23.8		35.2	6.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	14.8	23.6	23.8		35.2	6.5
LOS	B	C	C		D	A
Approach Delay		23.3	23.8		27.6	
Approach LOS		C	C		C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 23.9

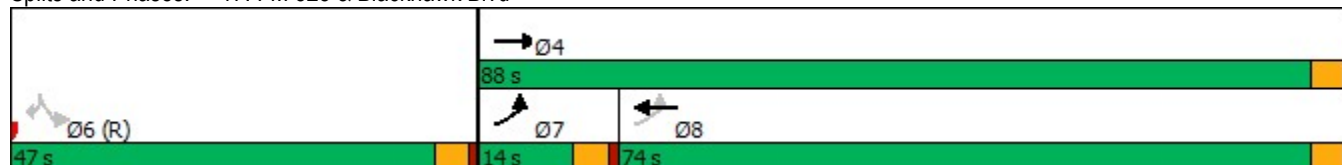
Intersection LOS: C

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	220	25	42	34	65	158	60	1630	32	50	769	159
Future Volume (vph)	220	25	42	34	65	158	60	1630	32	50	769	159
Satd. Flow (prot)	0	1758	0	0	1696	0	1770	5070	0	1770	4953	0
Flt Permitted		0.550			0.922		0.192			0.071		
Satd. Flow (perm)	0	1004	0	0	1575	0	358	5070	0	132	4953	0
Satd. Flow (RTOR)		8			73			2			39	
Adj. Flow (vph)	239	27	46	37	71	172	65	1772	35	54	836	173
Lane Group Flow (vph)	0	312	0	0	280	0	65	1807	0	54	1009	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	65.8	65.8		65.8	65.8		11.2	62.0		12.2	63.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		64.7			64.7		62.7	56.7		62.7	57.3	
Actuated g/C Ratio		0.46			0.46		0.45	0.40		0.45	0.41	
v/c Ratio		0.67			0.37		0.29	0.88		0.38	0.49	
Control Delay		38.4			20.1		22.2	44.4		26.4	30.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		38.4			20.1		22.2	44.4		26.4	30.1	
LOS		D			C		C	D		C	C	
Approach Delay		38.4			20.1			43.6			29.9	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 37.1

Intersection LOS: D

Intersection Capacity Utilization 82.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

 Ø2 (R)	 Ø3	 Ø4
65.8 s	12.2 s	62 s
 Ø6 (R)	 Ø7	 Ø8
65.8 s	11.2 s	63 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	405	52	100	24	32	17	148	1527	32	16	948	402
Future Volume (vph)	405	52	100	24	32	17	148	1527	32	16	948	402
Satd. Flow (prot)	1770	1680	0	1770	1768	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.722			0.652			0.179			0.157		
Satd. Flow (perm)	1345	1680	0	1215	1768	0	333	5070	0	292	3539	1583
Satd. Flow (RTOR)		109			18			5				437
Adj. Flow (vph)	440	57	109	26	35	18	161	1660	35	17	1030	437
Lane Group Flow (vph)	440	166	0	26	53	0	161	1695	0	17	1030	437
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	26.5	26.5		26.5	26.5		9.6	24.0		9.5	23.9	23.9
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	23.7	23.7		23.7	23.7		23.7	25.4		27.4	19.6	19.6
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.42		0.46	0.33	0.33
v/c Ratio	0.83	0.23		0.05	0.07		0.64	0.79		0.07	0.89	0.54
Control Delay	34.6	6.4		12.8	9.6		23.2	20.0		10.0	31.3	4.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	34.6	6.4		12.8	9.6		23.2	20.0		10.0	31.3	4.7
LOS	C	A		B	A		C	C		A	C	A
Approach Delay		26.9			10.7			20.3			23.3	
Approach LOS		C			B			C			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.2

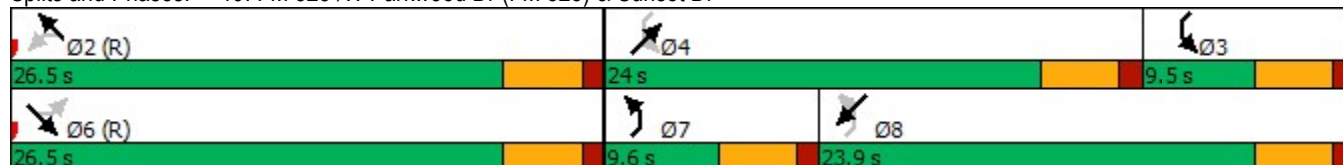
Intersection LOS: C

Intersection Capacity Utilization 74.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	239	1574	134	74	952	16	97	130	224	12	78	115
Future Volume (vph)	239	1574	134	74	952	16	97	130	224	12	78	115
Satd. Flow (prot)	1770	3497	0	1770	3532	0	0	1824	1583	0	1716	0
Flt Permitted	0.186			0.074				0.608			0.976	
Satd. Flow (perm)	346	3497	0	138	3532	0	0	1133	1583	0	1680	0
Satd. Flow (RTOR)		15			3				143		59	
Adj. Flow (vph)	260	1711	146	80	1035	17	105	141	243	13	85	125
Lane Group Flow (vph)	260	1857	0	80	1052	0	0	246	243	0	223	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	58.1	54.0		59.3	48.8			22.8	22.8		22.8	
Actuated g/C Ratio	0.61	0.57		0.63	0.52			0.24	0.24		0.24	
v/c Ratio	0.74	0.93		0.40	0.58			0.90	0.50		0.50	
Control Delay	22.1	28.5		13.9	16.8			73.6	18.2		28.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	22.1	28.5		13.9	16.8			73.6	18.2		28.6	
LOS	C	C		B	B			E	B		C	
Approach Delay		27.7			16.6			46.1			28.6	
Approach LOS		C			B			D			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 94.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 26.9

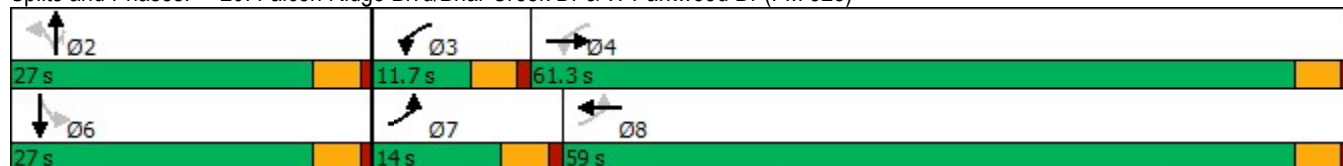
Intersection LOS: C

Intersection Capacity Utilization 91.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	122	3	12	51	1	182	2	1261	14	63	875	50
Future Volume (vph)	122	3	12	51	1	182	2	1261	14	63	875	50
Satd. Flow (prot)	0	1761	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.519			0.903		0.194			0.063		
Satd. Flow (perm)	0	955	0	0	1505	0	361	3532	0	117	3511	0
Satd. Flow (RTOR)		4			138			1			7	
Adj. Flow (vph)	133	3	13	55	1	198	2	1371	15	68	951	54
Lane Group Flow (vph)	0	149	0	0	254	0	2	1386	0	68	1005	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	47.0	47.0		47.0	47.0		10.0	75.0		13.0	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		53.7			53.7		71.4	63.6		69.8	70.3	
Actuated g/C Ratio		0.40			0.40		0.53	0.47		0.52	0.52	
v/c Ratio		0.39			0.37		0.01	0.83		0.50	0.55	
Control Delay		35.2			16.3		11.0	35.8		47.6	22.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		35.2			16.3		11.0	35.8		47.6	22.4	
LOS		D			B		B	D		D	C	
Approach Delay		35.2			16.3			35.7			24.0	
Approach LOS		D			B			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 29.6

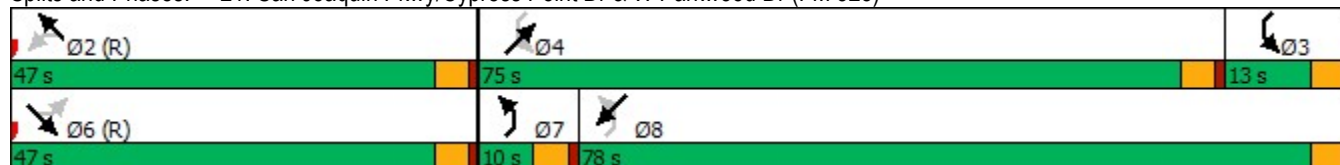
Intersection LOS: C

Intersection Capacity Utilization 75.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	18	2	1	27	5	928	5	11	780	102
Future Volume (vph)	29	0	18	2	1	27	5	928	5	11	780	102
Satd. Flow (prot)	0	1713	0	0	1631	0	1770	3536	0	1770	3479	0
Flt Permitted		0.908			0.980		0.290			0.268		
Satd. Flow (perm)	0	1603	0	0	1603	0	540	3536	0	499	3479	0
Satd. Flow (RTOR)		88			29			1			21	
Adj. Flow (vph)	32	0	20	2	1	29	5	1009	5	12	848	111
Lane Group Flow (vph)	0	52	0	0	32	0	5	1014	0	12	959	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	29.0	29.0		29.0	29.0		14.0	87.0		14.0	87.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		6.5			6.5		115.6	111.8		115.6	115.4	
Actuated g/C Ratio		0.05			0.05		0.89	0.86		0.89	0.89	
v/c Ratio		0.32			0.30		0.01	0.33		0.02	0.31	
Control Delay		7.9			29.2		1.2	3.2		1.3	2.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		7.9			29.2		1.2	3.2		1.3	2.0	
LOS		A			C		A	A		A	A	
Approach Delay		7.9			29.2			3.2			2.0	
Approach LOS		A			C			A			A	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.33

Intersection Signal Delay: 3.2

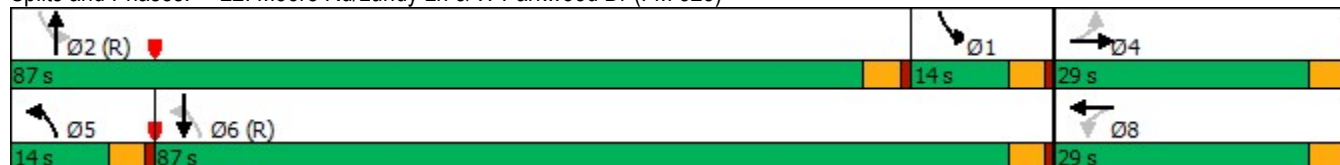
Intersection LOS: A

Intersection Capacity Utilization 42.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	79	89	59	72	68	34	56	350	71	25	304	45
Future Volume (vph)	79	89	59	72	68	34	56	350	71	25	304	45
Satd. Flow (prot)	1770	3327	0	1770	3362	0	1770	3451	0	1770	3472	0
Flt Permitted	0.682			0.650			0.422			0.333		
Satd. Flow (perm)	1270	3327	0	1211	3362	0	786	3451	0	620	3472	0
Satd. Flow (RTOR)		64			37			28			20	
Adj. Flow (vph)	86	97	64	78	74	37	61	380	77	27	330	49
Lane Group Flow (vph)	86	161	0	78	111	0	61	457	0	27	379	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	55.0	55.0		55.0	55.0		65.0	65.0		65.0	65.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	50.6	50.6		50.6	50.6		14.7	14.7		14.7	14.7	
Actuated g/C Ratio	0.68	0.68		0.68	0.68		0.20	0.20		0.20	0.20	
v/c Ratio	0.10	0.07		0.09	0.05		0.39	0.65		0.22	0.54	
Control Delay	5.1	2.9		5.1	3.3		33.6	30.2		29.4	28.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.1	2.9		5.1	3.3		33.6	30.2		29.4	28.1	
LOS	A	A		A	A		C	C		C	C	
Approach Delay		3.7			4.0			30.6			28.2	
Approach LOS		A			A			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 74.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 39.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
55 s	65 s
 Ø6	 Ø8
55 s	65 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	498	12	6	422	82	6	10	7	118	3	9
Future Volume (vph)	22	498	12	6	422	82	6	10	7	118	3	9
Satd. Flow (prot)	1770	1855	0	1770	1818	0	0	1761	0	0	1765	0
Flt Permitted	0.372			0.397				0.923			0.727	
Satd. Flow (perm)	693	1855	0	740	1818	0	0	1647	0	0	1341	0
Satd. Flow (RTOR)		2			19			8			5	
Adj. Flow (vph)	24	541	13	7	459	89	7	11	8	128	3	10
Lane Group Flow (vph)	24	554	0	7	548	0	0	26	0	0	141	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	50.0	49.8		49.1	47.7			12.1			12.3	
Actuated g/C Ratio	0.71	0.71		0.70	0.68			0.17			0.18	
v/c Ratio	0.04	0.42		0.01	0.44			0.09			0.59	
Control Delay	4.7	8.4		5.5	8.9			17.7			34.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.7	8.4		5.5	8.9			17.7			34.7	
LOS	A	A		A	A			B			C	
Approach Delay		8.3			8.8			17.7			34.7	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 11.6

Intersection LOS: B

Intersection Capacity Utilization 48.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	304	297	89	338	0	179	7	37	1	10	8
Future Volume (vph)	8	304	297	89	338	0	179	7	37	1	10	8
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1751	0	0	1751	0
Flt Permitted	0.543			0.228				0.754			0.987	
Satd. Flow (perm)	1011	1725	0	425	1863	0	0	1374	0	0	1732	0
Satd. Flow (RTOR)		96						14			9	
Adj. Flow (vph)	9	330	323	97	367	0	195	8	40	1	11	9
Lane Group Flow (vph)	9	653	0	97	367	0	0	243	0	0	21	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	41.6	37.4		44.6	43.6			15.5			15.5	
Actuated g/C Ratio	0.59	0.53		0.64	0.62			0.22			0.22	
v/c Ratio	0.01	0.68		0.26	0.32			0.77			0.05	
Control Delay	7.4	15.0		7.7	9.7			41.0			15.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.4	15.0		7.7	9.7			41.0			15.2	
LOS	A	B		A	A			D			B	
Approach Delay		14.9			9.3			41.0			15.2	
Approach LOS		B			A			D			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 17.6

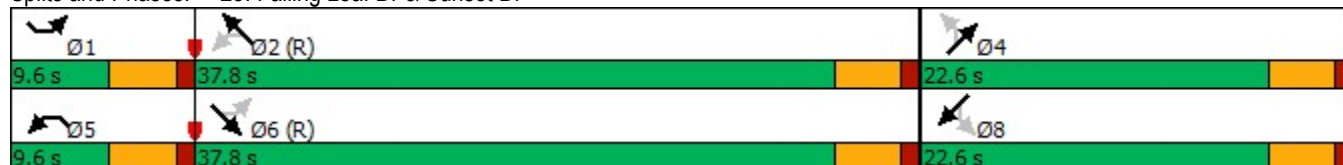
Intersection LOS: B

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	18	288	22	41	296	34	78	70	56	16	73	42
Future Volume (vph)	18	288	22	41	296	34	78	70	56	16	73	42
Satd. Flow (prot)	1770	1842	0	1770	1835	0	0	1814	1583	0	1770	0
Flt Permitted	0.547			0.494				0.729			0.951	
Satd. Flow (perm)	1019	1842	0	920	1835	0	0	1358	1583	0	1694	0
Satd. Flow (RTOR)		7			11				94		33	
Adj. Flow (vph)	20	313	24	45	322	37	85	76	61	17	79	46
Lane Group Flow (vph)	20	337	0	45	359	0	0	161	61	0	142	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	45.4	42.0		47.4	46.3			12.7	12.7		12.7	
Actuated g/C Ratio	0.65	0.60		0.68	0.66			0.18	0.18		0.18	
v/c Ratio	0.03	0.30		0.06	0.30			0.65	0.17		0.42	
Control Delay	6.6	15.8		4.8	7.4			38.4	3.4		22.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.6	15.8		4.8	7.4			38.4	3.4		22.1	
LOS	A	B		A	A			D	A		C	
Approach Delay		15.3			7.1			28.8			22.1	
Approach LOS		B			A			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.9

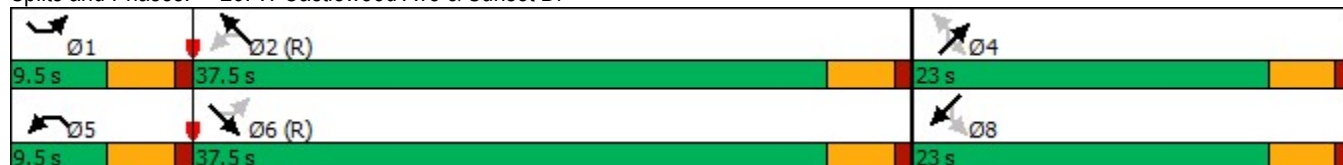
Intersection LOS: B

Intersection Capacity Utilization 47.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	91	252	14	10	559	36	12	68	26	6	24	106
Future Volume (Veh/h)	91	252	14	10	559	36	12	68	26	6	24	106
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	274	15	11	608	39	13	74	28	7	26	115
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	647			289			1257	1148	282	1194	1136	628
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	647			289			1257	1148	282	1194	1136	628
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			99			86	58	96	93	85	76
cM capacity (veh/h)	939			1273			92	176	757	97	179	483
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	388	658	115	148								
Volume Left	99	11	13	7								
Volume Right	15	39	28	115								
cSH	939	1273	192	325								
Volume to Capacity	0.11	0.01	0.60	0.46								
Queue Length 95th (ft)	9	1	83	57								
Control Delay (s)	3.2	0.2	48.4	25.0								
Lane LOS	A	A	E	C								
Approach Delay (s)	3.2	0.2	48.4	25.0								
Approach LOS			E	C								
Intersection Summary												
Average Delay			8.2									
Intersection Capacity Utilization			71.2%	ICU Level of Service				C				
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	264	18	54	518	41	97
Future Volume (Veh/h)	264	18	54	518	41	97
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	287	20	59	563	45	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			307		978	297
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			307		978	297
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		83	86
cM capacity (veh/h)			1254		265	742
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	307	622	150			
Volume Left	0	59	45			
Volume Right	20	0	105			
cSH	1700	1254	482			
Volume to Capacity	0.18	0.05	0.31			
Queue Length 95th (ft)	0	4	33			
Control Delay (s)	0.0	1.3	15.8			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.3	15.8			
Approach LOS			C			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			63.5%	ICU Level of Service		B
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	117	241	473	10	18	97
Future Volume (Veh/h)	117	241	473	10	18	97
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	127	262	514	11	20	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525				1036	520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525				1036	520
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				91	81
cM capacity (veh/h)	1042				225	556
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	389	525	125			
Volume Left	127	0	20			
Volume Right	0	11	105			
cSH	1042	1700	451			
Volume to Capacity	0.12	0.31	0.28			
Queue Length 95th (ft)	10	0	28			
Control Delay (s)	3.8	0.0	16.0			
Lane LOS	A		C			
Approach Delay (s)	3.8	0.0	16.0			
Approach LOS			C			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization		61.6%		ICU Level of Service		B
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	56	70	84	26	38	51	44	292	60	24	227	16
Future Volume (vph)	56	70	84	26	38	51	44	292	60	24	227	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	76	91	28	41	55	48	317	65	26	247	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	228	124	430	290								
Volume Left (vph)	61	28	48	26								
Volume Right (vph)	91	55	65	17								
Hadj (s)	-0.15	-0.19	-0.03	0.02								
Departure Headway (s)	6.1	6.3	5.5	5.8								
Degree Utilization, x	0.38	0.22	0.66	0.47								
Capacity (veh/h)	522	476	624	570								
Control Delay (s)	12.8	11.0	18.5	13.8								
Approach Delay (s)	12.8	11.0	18.5	13.8								
Approach LOS	B	B	C	B								
Intersection Summary												
Delay			15.1									
Level of Service			C									
Intersection Capacity Utilization			53.7%	ICU Level of Service					A			
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	38	1181	163	57	1264	19	105	0	39	20	19	44
Future Volume (vph)	38	1181	163	57	1264	19	105	0	39	20	19	44
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1733	0	0	1710	0
Flt Permitted	0.078			0.070				0.727			0.916	
Satd. Flow (perm)	145	3476	0	130	3532	0	0	1305	0	0	1585	0
Satd. Flow (RTOR)		18			2			76			36	
Adj. Flow (vph)	41	1284	177	62	1374	21	114	0	42	22	21	48
Lane Group Flow (vph)	41	1461	0	62	1395	0	0	156	0	0	91	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	93.0		13.0	94.0		44.0	44.0		44.0	44.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effct Green (s)	86.4	79.0		85.6	76.8			51.8			51.8	
Actuated g/C Ratio	0.58	0.53		0.57	0.51			0.35			0.35	
v/c Ratio	0.22	0.79		0.39	0.77			0.31			0.16	
Control Delay	19.2	31.8		17.9	32.3			22.7			24.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	19.2	31.8		17.9	32.3			22.7			24.9	
LOS	B	C		B	C			C			C	
Approach Delay		31.4			31.7			22.7			24.9	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 31.0

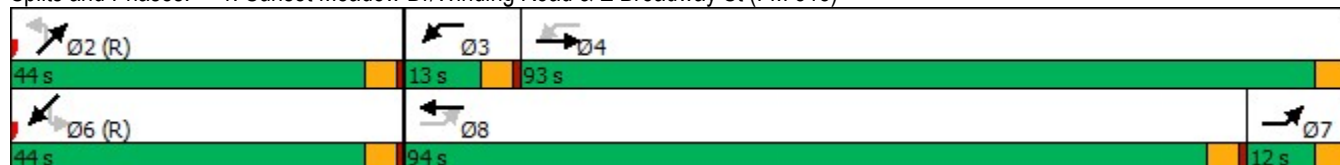
Intersection LOS: C

Intersection Capacity Utilization 68.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	227	703	150	73	741	122	266	457	102	216	735	323
Future Volume (vph)	227	703	150	73	741	122	266	457	102	216	735	323
Satd. Flow (prot)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Satd. Flow (RTOR)		22			15			21			59	
Adj. Flow (vph)	247	764	163	79	805	133	289	497	111	235	799	351
Lane Group Flow (vph)	247	927	0	79	938	0	289	608	0	235	1150	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	21.0	44.2		12.2	35.4		23.6	35.5		28.1	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.5	39.8		7.6	30.9		19.1	34.5		20.1	35.5	
Actuated g/C Ratio	0.14	0.33		0.06	0.26		0.16	0.29		0.17	0.30	
v/c Ratio	1.02	0.80		0.71	1.04		1.03	0.60		0.79	1.11	
Control Delay	113.4	41.8		87.8	83.4		110.9	39.3		67.0	99.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	113.4	41.8		87.8	83.4		110.9	39.3		67.0	99.4	
LOS	F	D		F	F		F	D		E	F	
Approach Delay		56.9			83.7			62.3			93.9	
Approach LOS		E			F			E			F	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 75.5

Intersection LOS: E

Intersection Capacity Utilization 97.3%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
21 s	35.4 s	28.1 s	35.5 s
			
Ø5	Ø6	Ø7	Ø8
12.2 s	44.2 s	23.6 s	40 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	1035	35	81	1081	21	55	19	66	33	24	6
Future Volume (vph)	2	1035	35	81	1081	21	55	19	66	33	24	6
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1710	0	0	1791	0
Flt Permitted	0.203			0.203				0.856			0.691	
Satd. Flow (perm)	378	3522	0	378	3529	0	0	1492	0	0	1269	0
Satd. Flow (RTOR)		5			3			35			4	
Adj. Flow (vph)	2	1125	38	88	1175	23	60	21	72	36	26	7
Lane Group Flow (vph)	2	1163	0	88	1198	0	0	153	0	0	69	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	12.0	72.0		16.0	76.0		32.0	32.0		32.0	32.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.8	71.4		77.0	78.7			13.6			13.6	
Actuated g/C Ratio	0.77	0.69		0.75	0.76			0.13			0.13	
v/c Ratio	0.01	0.48		0.24	0.45			0.68			0.41	
Control Delay	3.5	9.3		4.9	6.1			47.5			45.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.5	9.3		4.9	6.1			47.5			45.1	
LOS	A	A		A	A			D			D	
Approach Delay		9.3			6.0			47.5			45.1	
Approach LOS		A			A			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 103.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 10.8

Intersection LOS: B

Intersection Capacity Utilization 55.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
12 s	76 s	32 s
		
Ø5	Ø6	Ø8
16 s	72 s	32 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	1125	69	135	1222	12	50	8	98	12	8	7
Future Volume (vph)	9	1125	69	135	1222	12	50	8	98	12	8	7
Satd. Flow (prot)	1770	3507	0	1770	3536	0	0	1677	0	0	1758	0
Flt Permitted	0.169			0.164				0.882			0.768	
Satd. Flow (perm)	315	3507	0	305	3536	0	0	1503	0	0	1379	0
Satd. Flow (RTOR)		8			2			64			8	
Adj. Flow (vph)	10	1223	75	147	1328	13	54	9	107	13	9	8
Lane Group Flow (vph)	10	1298	0	147	1341	0	0	170	0	0	30	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	11.0	71.0		20.0	80.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.2	67.5		75.4	78.1			12.7			12.7	
Actuated g/C Ratio	0.78	0.66		0.74	0.77			0.12			0.12	
v/c Ratio	0.03	0.56		0.43	0.49			0.70			0.17	
Control Delay	3.6	11.1		7.4	6.3			41.9			33.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.6	11.1		7.4	6.3			41.9			33.7	
LOS	A	B		A	A			D			C	
Approach Delay		11.0			6.4			41.9			33.7	
Approach LOS		B			A			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 101.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 10.7

Intersection LOS: B

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
11 s	80 s	29 s
		
Ø5	Ø6	Ø8
20 s	71 s	29 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	11	24	386	6	250	1	1086	262	235	1048	2
Future Volume (vph)	9	11	24	386	6	250	1	1086	262	235	1048	2
Satd. Flow (prot)	0	1709	0	0	1775	1583	0	3437	0	1770	3539	0
Flt Permitted		0.908			0.694			0.954		0.222		
Satd. Flow (perm)	0	1568	0	0	1293	1583	0	3278	0	414	3539	0
Satd. Flow (RTOR)		26				243		58				
Adj. Flow (vph)	10	12	26	420	7	272	1	1180	285	255	1139	2
Lane Group Flow (vph)	0	48	0	0	427	272	0	1466	0	255	1141	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	22.5	22.5		9.5	22.5	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		18.0			18.0	18.0		18.0		23.0	27.5	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.42	0.50	
v/c Ratio		0.09			1.00	0.40		1.31		0.85	0.64	
Control Delay		8.5			67.1	5.1		169.3		39.9	11.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		8.5			67.1	5.1		169.3		39.9	11.9	
LOS		A			E	A		F		D	B	
Approach Delay		8.5			42.9			169.3			17.0	
Approach LOS		A			D			F			B	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 83.8

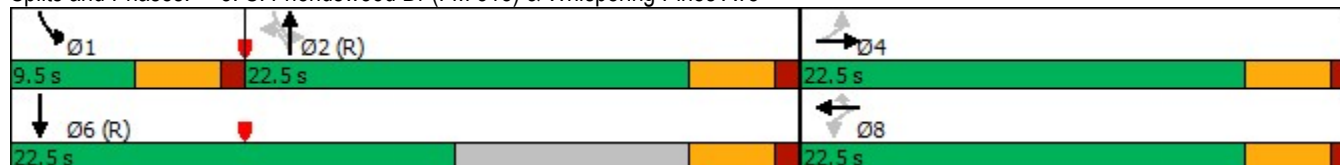
Intersection LOS: F

Intersection Capacity Utilization 107.1%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	30	991	24	234	1176	39	27	33	19	26	54	320
Future Volume (vph)	30	991	24	234	1176	39	27	33	19	26	54	320
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1771	0	0	1833	1583
Flt Permitted	0.950			0.950				0.905			0.910	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1630	0	0	1695	1583
Satd. Flow (RTOR)		5			6			21				247
Adj. Flow (vph)	33	1077	26	254	1278	42	29	36	21	28	59	348
Lane Group Flow (vph)	33	1103	0	254	1320	0	0	86	0	0	87	348
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	5.0	18.0		5.0	18.0			18.0			18.0	18.0
Actuated g/C Ratio	0.09	0.33		0.09	0.33			0.33			0.33	0.33
v/c Ratio	0.20	0.95		1.57	1.13			0.16			0.16	0.51
Control Delay	26.2	36.2		298.4	90.7			11.3			13.9	7.7
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	26.2	36.2		298.4	90.7			11.3			13.9	7.7
LOS	C	D		F	F			B			B	A
Approach Delay		36.0			124.2			11.3			8.9	
Approach LOS		D			F			B			A	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 45 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 74.7

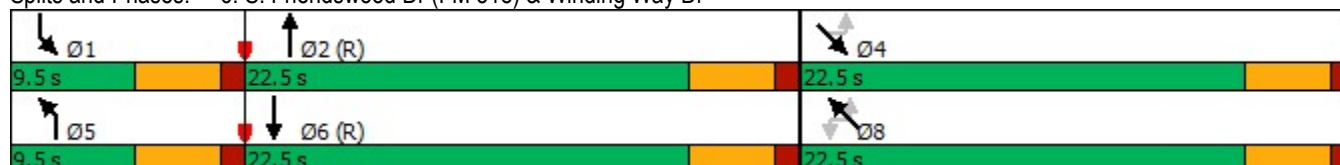
Intersection LOS: E

Intersection Capacity Utilization 63.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	390	646	193	115	757	374	271	1109	422	321	1521	93
Future Volume (vph)	390	646	193	115	757	374	271	1109	422	321	1521	93
Satd. Flow (prot)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Satd. Flow (RTOR)		32				291		72			7	
Adj. Flow (vph)	424	702	210	125	823	407	295	1205	459	349	1653	101
Lane Group Flow (vph)	424	912	0	125	823	407	295	1664	0	349	1754	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	31.0	48.1		16.4	33.5	33.5	23.2	39.0		26.5	42.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	26.5	44.0		11.5	29.0	29.0	18.7	34.5		22.0	37.8	
Actuated g/C Ratio	0.20	0.34		0.09	0.22	0.22	0.14	0.27		0.17	0.29	
v/c Ratio	1.18	0.77		0.80	1.04	0.70	1.16	1.24		1.17	1.19	
Control Delay	150.1	42.6		91.9	92.5	20.5	155.5	151.4		152.2	134.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	150.1	42.6		91.9	92.5	20.5	155.5	151.4		152.2	134.3	
LOS	F	D		F	F	C	F	F		F	F	
Approach Delay		76.7			70.8			152.0			137.3	
Approach LOS		E			E			F			F	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 31 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 116.2

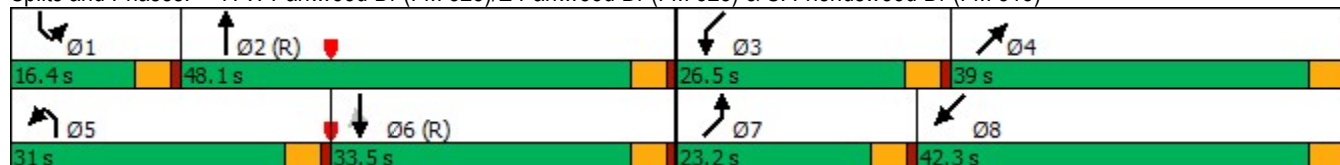
Intersection LOS: F

Intersection Capacity Utilization 106.2%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	38	1208	1434	170	91	17
Future Volume (vph)	38	1208	1434	170	91	17
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.095				0.950	
Satd. Flow (perm)	177	3539	3483	0	1770	1583
Satd. Flow (RTOR)			25			18
Adj. Flow (vph)	41	1313	1559	185	99	18
Lane Group Flow (vph)	41	1313	1744	0	99	18
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	12.0	100.0	88.0		20.0	20.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	95.6	99.2	90.7		11.8	11.8
Actuated g/C Ratio	0.80	0.83	0.76		0.10	0.10
v/c Ratio	0.19	0.45	0.66		0.57	0.11
Control Delay	4.7	3.8	9.5		64.0	20.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.7	3.8	9.5		64.0	20.4
LOS	A	A	A		E	C
Approach Delay		3.9	9.5		57.3	
Approach LOS		A	A		E	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 8.9

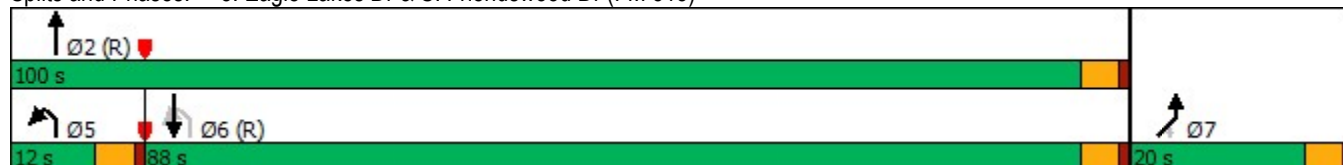
Intersection LOS: A

Intersection Capacity Utilization 57.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	109	1030	190	117	973	16	131	15	107	7	14	78
Future Volume (vph)	109	1030	190	117	973	16	131	15	107	7	14	78
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.205			0.184			0.950			0.950		
Satd. Flow (perm)	382	3539	1583	343	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			207			136			116			136
Adj. Flow (vph)	118	1120	207	127	1058	17	142	16	116	8	15	85
Lane Group Flow (vph)	118	1120	207	127	1058	17	142	16	116	8	15	85
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	15.0	58.0	58.0	16.0	59.0	59.0	23.0	36.0	36.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	83.0	74.4	74.4	83.0	74.9	74.9	14.5	21.5	21.5	5.5	6.6	6.6
Actuated g/C Ratio	0.69	0.62	0.62	0.69	0.62	0.62	0.12	0.18	0.18	0.05	0.06	0.06
v/c Ratio	0.33	0.51	0.20	0.38	0.48	0.02	0.67	0.05	0.31	0.10	0.15	0.40
Control Delay	12.7	27.6	9.8	11.1	8.6	0.0	65.2	39.1	9.6	57.7	56.7	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	27.6	9.8	11.1	8.6	0.0	65.2	39.1	9.6	57.7	56.7	7.1
LOS	B	C	A	B	A	A	E	D	A	E	E	A
Approach Delay		23.9			8.7			40.2			17.8	
Approach LOS		C			A			D			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 19.1

Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	233	726	200	158	987	264	209	250	84	214	306	410
Future Volume (vph)	233	726	200	158	987	264	209	250	84	214	306	410
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.093			0.215			0.128			0.443		
Satd. Flow (perm)	173	3539	1583	400	3539	1583	238	3405	0	825	3235	0
Satd. Flow (RTOR)			217			287		34			250	
Adj. Flow (vph)	253	789	217	172	1073	287	227	272	91	233	333	446
Lane Group Flow (vph)	253	789	217	172	1073	287	227	363	0	233	779	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	23.0	56.0	56.0	15.0	48.0	48.0	22.0	38.9		20.1	37.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	59.9	49.7	49.7	59.9	42.8	42.8	52.1	37.7		52.1	36.3	
Actuated g/C Ratio	0.46	0.38	0.38	0.46	0.33	0.33	0.40	0.29		0.40	0.28	
v/c Ratio	0.87	0.58	0.29	0.59	0.92	0.40	0.81	0.36		0.54	0.72	
Control Delay	76.0	33.7	4.3	26.7	55.4	5.2	52.2	35.2		29.9	33.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	76.0	33.7	4.3	26.7	55.4	5.2	52.2	35.2		29.9	33.3	
LOS	E	C	A	C	E	A	D	D		C	C	
Approach Delay		37.1			42.8			41.7			32.6	
Approach LOS		D			D			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 38.7

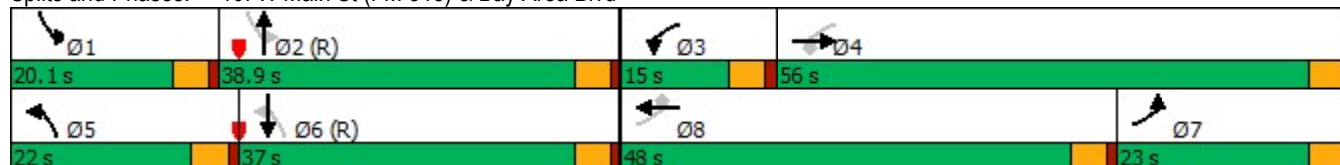
Intersection LOS: D

Intersection Capacity Utilization 88.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	32	195	101	97	197	37	116	876	88	142	1346	79
Future Volume (vph)	32	195	101	97	197	37	116	876	88	142	1346	79
Satd. Flow (prot)	0	1776	0	0	1809	0	1770	3490	0	1770	3511	0
Flt Permitted		0.995			0.986		0.950			0.950		
Satd. Flow (perm)	0	1776	0	0	1809	0	1770	3490	0	1770	3511	0
Satd. Flow (RTOR)		11			3		7			4		
Adj. Flow (vph)	35	212	110	105	214	40	126	952	96	154	1463	86
Lane Group Flow (vph)	0	357	0	0	359	0	126	1048	0	154	1549	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	40.0	40.0		43.0	43.0		19.0	68.6		28.4	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		35.5			38.5		14.4	67.8		20.1	73.5	
Actuated g/C Ratio		0.20			0.21		0.08	0.38		0.11	0.41	
v/c Ratio		0.99			0.92		0.89	0.79		0.78	1.08	
Control Delay		113.8			97.5		131.7	55.5		103.2	97.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		113.8			97.5		131.7	55.5		103.2	97.1	
LOS		F			F		F	E		F	F	
Approach Delay		113.8			97.5			63.7			97.6	
Approach LOS		F			F			E			F	

Intersection Summary

Cycle Length: 180

Actuated Cycle Length: 179.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 88.1

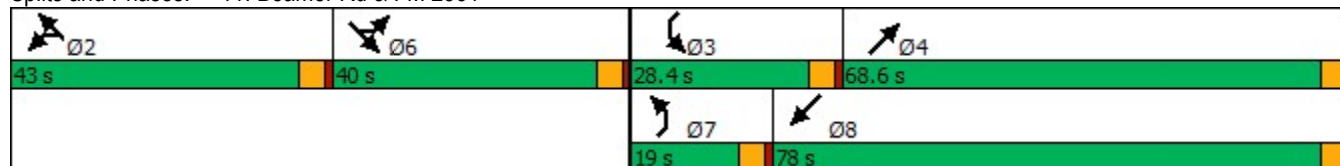
Intersection LOS: F

Intersection Capacity Utilization 96.7%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	953	89	80	1447	117	82
Future Volume (vph)	953	89	80	1447	117	82
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	13					89
Adj. Flow (vph)	1036	97	87	1573	127	89
Lane Group Flow (vph)	1133	0	87	1573	127	89
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	69.0		22.0	91.0	29.0	29.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	36.0		9.5	47.4	25.0	25.0
Actuated g/C Ratio	0.44		0.12	0.58	0.31	0.31
v/c Ratio	0.73		0.42	0.77	0.12	0.16
Control Delay	22.5		42.6	15.2	24.3	7.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.5		42.6	15.2	24.3	7.4
LOS	C		D	B	C	A
Approach Delay	22.5			16.6	17.4	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 81.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 18.9

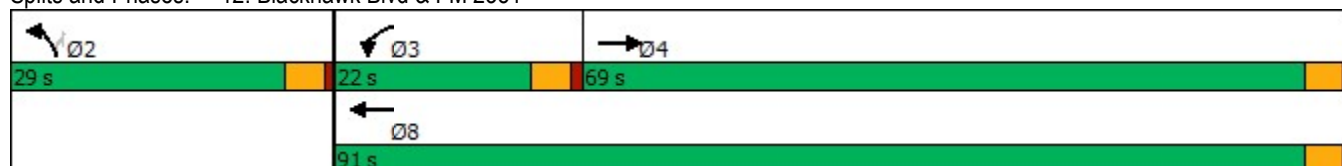
Intersection LOS: B

Intersection Capacity Utilization 51.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	61	0	71	1	0	0	91	963	0	0	1380	141
Future Volume (vph)	61	0	71	1	0	0	91	963	0	0	1380	141
Satd. Flow (prot)	0	1770	1583	0	1770	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757			0.714		0.071					
Satd. Flow (perm)	0	1410	1583	0	1330	0	132	3539	0	1863	3490	0
Satd. Flow (RTOR)			136								17	
Adj. Flow (vph)	66	0	77	1	0	0	99	1047	0	0	1500	153
Lane Group Flow (vph)	0	66	77	0	1	0	99	1047	0	0	1653	0
Turn Type	Perm	NA	Free	Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		23.2	98.3		23.2		62.4	65.8			56.3	
Actuated g/C Ratio		0.24	1.00		0.24		0.63	0.67			0.57	
v/c Ratio		0.20	0.05		0.00		0.46	0.44			0.82	
Control Delay		38.3	0.1		37.0		18.1	7.7			21.2	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		38.3	0.1		37.0		18.1	7.7			21.2	
LOS		D	A		D		B	A			C	
Approach Delay		17.7			37.0			8.6			21.2	
Approach LOS		B			D			A			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 98.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 16.1

Intersection LOS: B

Intersection Capacity Utilization 63.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	99	0	161	8	8	1	134	991	1	5	1382	118
Future Volume (vph)	99	0	161	8	8	1	134	991	1	5	1382	118
Satd. Flow (prot)	1770	1583	0	0	1807	0	1770	3539	0	1770	3497	0
Flt Permitted	0.745				0.880		0.067			0.216		
Satd. Flow (perm)	1388	1583	0	0	1628	0	125	3539	0	402	3497	0
Satd. Flow (RTOR)		166			1						12	
Adj. Flow (vph)	108	0	175	9	9	1	146	1077	1	5	1502	128
Lane Group Flow (vph)	108	175	0	0	19	0	146	1078	0	5	1630	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	23.0	23.0			23.0		66.0	68.8		69.8	55.8	
Actuated g/C Ratio	0.22	0.22			0.22		0.64	0.67		0.68	0.54	
v/c Ratio	0.35	0.36			0.05		0.60	0.45		0.01	0.86	
Control Delay	41.8	9.7			36.8		29.7	8.7		4.4	25.0	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	41.8	9.7			36.8		29.7	8.7		4.4	25.0	
LOS	D	A			D		C	A		A	C	
Approach Delay		22.0			36.8			11.2			24.9	
Approach LOS		C			D			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 102.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 19.4

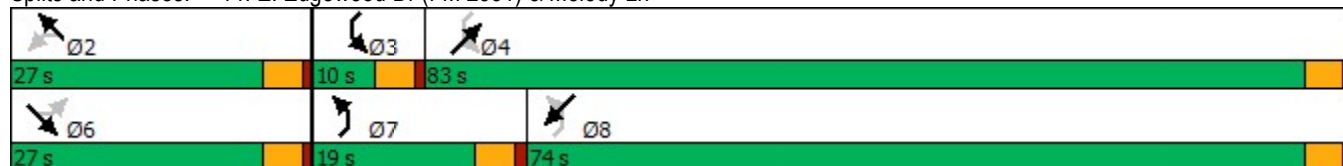
Intersection LOS: B

Intersection Capacity Utilization 70.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	28	24	17	172	34	409	21	398	142	419	503	46
Future Volume (vph)	28	24	17	172	34	409	21	398	142	419	503	46
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1790	0	1770	1839	0
Flt Permitted		0.825			0.724		0.361			0.367		
Satd. Flow (perm)	0	1486	0	0	1349	1583	672	1790	0	684	1839	0
Satd. Flow (RTOR)		13				445		35			9	
Adj. Flow (vph)	30	26	18	187	37	445	23	433	154	455	547	50
Lane Group Flow (vph)	0	74	0	0	224	445	23	587	0	455	597	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		27.8			27.8	114.6	77.7	77.7		77.7	77.7	
Actuated g/C Ratio		0.24			0.24	1.00	0.68	0.68		0.68	0.68	
v/c Ratio		0.20			0.69	0.28	0.05	0.48		0.98	0.48	
Control Delay		33.2			53.6	0.4	6.1	9.4		57.1	9.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		33.2			53.6	0.4	6.1	9.4		57.1	9.9	
LOS		C			D	A	A	A		E	A	
Approach Delay		33.2			18.2			9.3			30.3	
Approach LOS		C			B			A			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 114.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 21.7

Intersection LOS: C

Intersection Capacity Utilization 82.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	328	1167	140	407	1316	109	242	437	195	153	479	380
Future Volume (vph)	328	1167	140	407	1316	109	242	437	195	153	479	380
Satd. Flow (prot)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Satd. Flow (RTOR)		19			12			50			82	
Adj. Flow (vph)	357	1268	152	442	1430	118	263	475	212	166	521	413
Lane Group Flow (vph)	357	1420	0	442	1548	0	263	687	0	166	934	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	79.0		9.5	79.0		9.5	56.0		9.5	56.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	60.6		5.0	60.6		18.9	51.5		18.9	51.5	
Actuated g/C Ratio	0.03	0.39		0.03	0.39		0.12	0.33		0.12	0.33	
v/c Ratio	6.26	0.72		7.75	0.78		1.21	0.59		0.76	0.81	
Control Delay	2415.4	40.8		3083.3	43.2		183.7	41.7		86.7	48.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2415.4	40.8		3083.3	43.2		183.7	41.7		86.7	48.8	
LOS	F	D		F	D		F	D		F	D	
Approach Delay		517.8			718.5			81.0			54.5	
Approach LOS		F			F			F			D	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 7.75

Intersection Signal Delay: 427.5

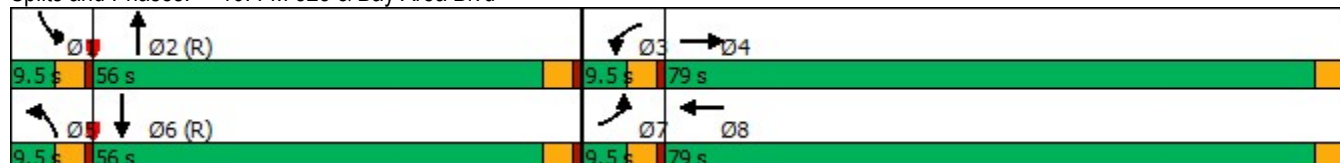
Intersection LOS: F

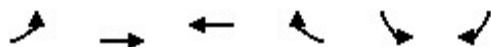
Intersection Capacity Utilization 102.1%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	1408	1962	259	186	90
Future Volume (vph)	110	1408	1962	259	186	90
Satd. Flow (prot)	1770	5085	4994	0	1770	1583
Flt Permitted	0.051				0.950	
Satd. Flow (perm)	95	5085	4994	0	1770	1583
Satd. Flow (RTOR)			29			98
Adj. Flow (vph)	120	1530	2133	282	202	98
Lane Group Flow (vph)	120	1530	2415	0	202	98
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	19.0	101.0	82.0		34.0	34.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	88.6	93.1	78.3		32.9	32.9
Actuated g/C Ratio	0.66	0.69	0.58		0.24	0.24
v/c Ratio	0.63	0.44	0.83		0.47	0.21
Control Delay	39.5	9.6	25.8		49.1	9.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	39.5	9.6	25.8		49.1	9.2
LOS	D	A	C		D	A
Approach Delay		11.7	25.8		36.1	
Approach LOS		B	C		D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 21.2

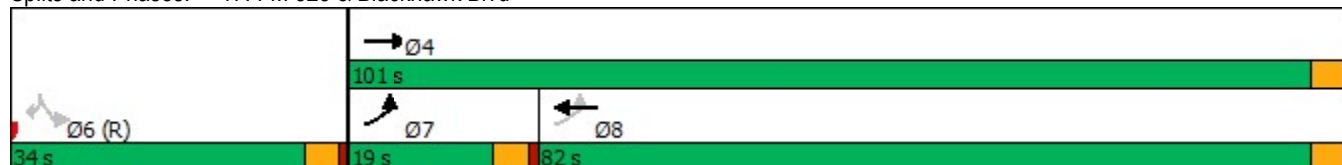
Intersection LOS: C

Intersection Capacity Utilization 71.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	225	50	65	32	57	97	92	1264	54	141	1672	260
Future Volume (vph)	225	50	65	32	57	97	92	1264	54	141	1672	260
Satd. Flow (prot)	0	1756	0	0	1717	0	1770	5055	0	1770	4984	0
Flt Permitted		0.640			0.899		0.077			0.083		
Satd. Flow (perm)	0	1161	0	0	1557	0	143	5055	0	155	4984	0
Satd. Flow (RTOR)		12			54			6			31	
Adj. Flow (vph)	245	54	71	35	62	105	100	1374	59	153	1817	283
Lane Group Flow (vph)	0	370	0	0	202	0	100	1433	0	153	2100	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	51.9	51.9		51.9	51.9		12.1	49.9		18.2	56.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		47.4			47.4		59.1	48.0		59.1	51.7	
Actuated g/C Ratio		0.40			0.40		0.49	0.40		0.49	0.43	
v/c Ratio		0.80			0.31		0.59	0.71		0.68	0.97	
Control Delay		45.3			19.6		32.2	32.7		38.5	46.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		45.3			19.6		32.2	32.7		38.5	46.6	
LOS		D			B		C	C		D	D	
Approach Delay		45.3			19.6			32.7			46.0	
Approach LOS		D			B			C			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 40.0

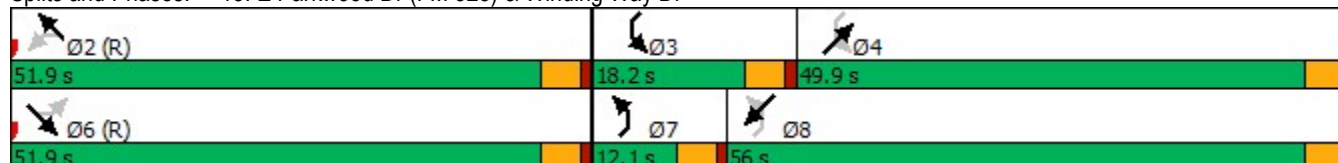
Intersection LOS: D

Intersection Capacity Utilization 88.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	332	102	199	145	102	39	164	1374	92	39	1628	346
Future Volume (vph)	332	102	199	145	102	39	164	1374	92	39	1628	346
Satd. Flow (prot)	1770	1678	0	1770	1786	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.605			0.357			0.067			0.091		
Satd. Flow (perm)	1127	1678	0	665	1786	0	125	5040	0	170	3539	1583
Satd. Flow (RTOR)		87			17			13				256
Adj. Flow (vph)	361	111	216	158	111	42	178	1493	100	42	1770	376
Lane Group Flow (vph)	361	327	0	158	153	0	178	1593	0	42	1770	376
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	44.0	44.0		44.0	44.0		14.0	66.4		9.6	62.0	62.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	39.5	39.5		39.5	39.5		67.0	61.6		68.8	57.5	57.5
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.56	0.51		0.57	0.48	0.48
v/c Ratio	0.98	0.54		0.72	0.26		0.89	0.61		0.19	1.04	0.42
Control Delay	81.7	27.3		56.3	27.5		69.3	22.9		18.4	65.6	7.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	81.7	27.3		56.3	27.5		69.3	22.9		18.4	65.6	7.7
LOS	F	C		E	C		E	C		B	E	A
Approach Delay		55.9			42.1			27.6			54.8	
Approach LOS		E			D			C			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 44.4

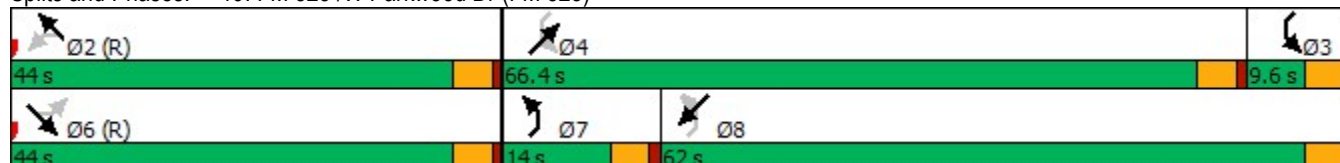
Intersection LOS: D

Intersection Capacity Utilization 95.2%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	1521	135	115	1813	12	84	63	114	21	98	166
Future Volume (vph)	154	1521	135	115	1813	12	84	63	114	21	98	166
Satd. Flow (prot)	1770	3497	0	1770	3536	0	0	1811	1583	0	1711	0
Flt Permitted	0.073			0.071				0.412			0.970	
Satd. Flow (perm)	136	3497	0	132	3536	0	0	767	1583	0	1666	0
Satd. Flow (RTOR)		15			1				124		64	
Adj. Flow (vph)	167	1653	147	125	1971	13	91	68	124	23	107	180
Lane Group Flow (vph)	167	1800	0	125	1984	0	0	159	124	0	310	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	63.5	56.5		63.5	54.7			22.5	22.5		22.5	
Actuated g/C Ratio	0.64	0.57		0.64	0.55			0.23	0.23		0.23	
v/c Ratio	0.72	0.90		0.63	1.02			0.92	0.27		0.73	
Control Delay	37.2	27.0		29.0	49.2			90.6	7.7		39.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	37.2	27.0		29.0	49.2			90.6	7.7		39.4	
LOS	D	C		C	D			F	A		D	
Approach Delay		27.8			48.0			54.3			39.4	
Approach LOS		C			D			D			D	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 99.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 39.3

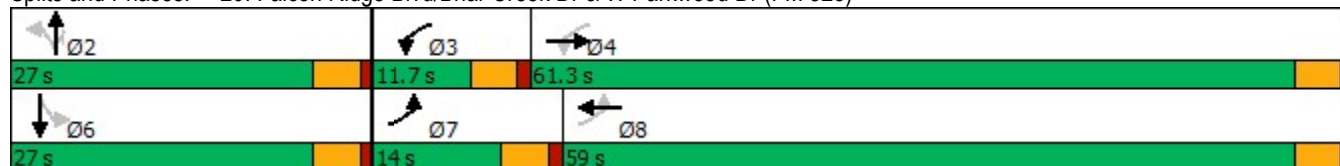
Intersection LOS: D

Intersection Capacity Utilization 98.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	60	1	6	33	10	99	11	1340	41	159	1481	122
Future Volume (vph)	60	1	6	33	10	99	11	1340	41	159	1481	122
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.652			0.922		0.057			0.065		
Satd. Flow (perm)	0	1199	0	0	1556	0	106	3525	0	121	3500	0
Satd. Flow (RTOR)		4			86			4			14	
Adj. Flow (vph)	65	1	7	36	11	108	12	1457	45	173	1610	133
Lane Group Flow (vph)	0	73	0	0	155	0	12	1502	0	173	1743	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	28.0	28.0		28.0	28.0		10.0	70.0		22.0	82.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		32.8			32.8		76.4	61.1		73.7	74.2	
Actuated g/C Ratio		0.27			0.27		0.64	0.51		0.61	0.62	
v/c Ratio		0.22			0.32		0.08	0.84		0.70	0.80	
Control Delay		38.0			20.2		4.7	22.5		52.1	20.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		38.0			20.2		4.7	22.5		52.1	20.4	
LOS		D			C		A	C		D	C	
Approach Delay		38.0			20.2			22.4			23.3	
Approach LOS		D			C			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 23.1

Intersection LOS: C

Intersection Capacity Utilization 70.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	144	10	17	2	2	14	5	1277	15	23	1175	171
Future Volume (vph)	144	10	17	2	2	14	5	1277	15	23	1175	171
Satd. Flow (prot)	0	1765	0	0	1655	0	1770	3532	0	1770	3472	0
Flt Permitted		0.746			0.976		0.132			0.136		
Satd. Flow (perm)	0	1372	0	0	1624	0	246	3532	0	253	3472	0
Satd. Flow (RTOR)		4			15			2			23	
Adj. Flow (vph)	157	11	18	2	2	15	5	1388	16	25	1277	186
Lane Group Flow (vph)	0	186	0	0	19	0	5	1404	0	25	1463	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	35.0	35.0		35.0	35.0		10.0	74.8		10.2	75.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		21.2			21.2		88.9	83.7		87.1	87.7	
Actuated g/C Ratio		0.18			0.18		0.74	0.70		0.73	0.73	
v/c Ratio		0.76			0.06		0.02	0.57		0.10	0.58	
Control Delay		64.5			19.5		5.6	12.0		0.9	2.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		64.5			19.5		5.6	12.0		0.9	2.5	
LOS		E			B		A	B		A	A	
Approach Delay		64.5			19.5			11.9			2.5	
Approach LOS		E			B			B			A	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 10.6

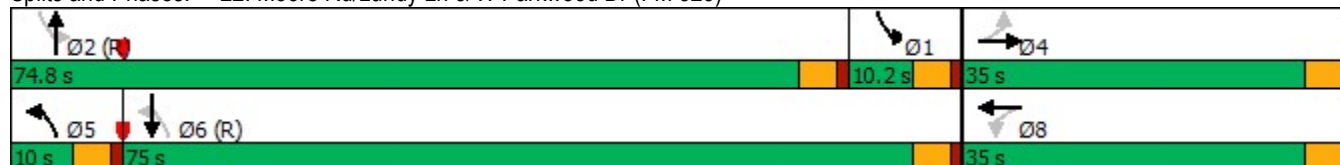
Intersection LOS: B

Intersection Capacity Utilization 61.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	51	80	53	32	116	52	44	412	46	44	619	110
Future Volume (vph)	51	80	53	32	116	52	44	412	46	44	619	110
Satd. Flow (prot)	1770	3327	0	1770	3373	0	1770	3486	0	1770	3458	0
Flt Permitted	0.636			0.660			0.199			0.397		
Satd. Flow (perm)	1185	3327	0	1229	3373	0	371	3486	0	740	3458	0
Satd. Flow (RTOR)		58			57			19			32	
Adj. Flow (vph)	55	87	58	35	126	57	48	448	50	48	673	120
Lane Group Flow (vph)	55	145	0	35	183	0	48	498	0	48	793	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	41.0	41.0		41.0	41.0		79.0	79.0		79.0	79.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.6	36.6		36.6	36.6		21.3	21.3		21.3	21.3	
Actuated g/C Ratio	0.55	0.55		0.55	0.55		0.32	0.32		0.32	0.32	
v/c Ratio	0.09	0.08		0.05	0.10		0.41	0.44		0.20	0.71	
Control Delay	9.1	5.5		8.8	6.0		29.1	18.4		18.5	22.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.1	5.5		8.8	6.0		29.1	18.4		18.5	22.9	
LOS	A	A		A	A		C	B		B	C	
Approach Delay		6.5			6.4			19.4			22.6	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 67

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 17.9

Intersection LOS: B

Intersection Capacity Utilization 48.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
41 s	79 s
 Ø6	 Ø8
41 s	79 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	576	6	6	540	57	8	3	7	87	6	44
Future Volume (vph)	19	576	6	6	540	57	8	3	7	87	6	44
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1723	0	0	1727	0
Flt Permitted	0.330			0.342				0.892			0.796	
Satd. Flow (perm)	615	1859	0	637	1837	0	0	1572	0	0	1419	0
Satd. Flow (RTOR)		1			10			8			33	
Adj. Flow (vph)	21	626	7	7	587	62	9	3	8	95	7	48
Lane Group Flow (vph)	21	633	0	7	649	0	0	20	0	0	150	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	51.1	50.7		50.9	50.6			11.1			11.1	
Actuated g/C Ratio	0.73	0.72		0.73	0.72			0.16			0.16	
v/c Ratio	0.04	0.47		0.01	0.49			0.08			0.60	
Control Delay	4.3	8.6		5.7	8.4			17.9			30.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.3	8.6		5.7	8.4			17.9			30.1	
LOS	A	A		A	A			B			C	
Approach Delay		8.5			8.4			17.9			30.1	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 10.8

Intersection LOS: B

Intersection Capacity Utilization 51.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	502	154	28	471	4	133	6	33	5	3	5
Future Volume (vph)	8	502	154	28	471	4	133	6	33	5	3	5
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1732	0
Flt Permitted	0.410			0.244				0.767			0.894	
Satd. Flow (perm)	764	1798	0	455	1861	0	0	1392	0	0	1579	0
Satd. Flow (RTOR)		30			1			16			5	
Adj. Flow (vph)	9	546	167	30	512	4	145	7	36	5	3	5
Lane Group Flow (vph)	9	713	0	30	516	0	0	188	0	0	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	45.6	43.4		46.6	45.6			13.5			13.5	
Actuated g/C Ratio	0.65	0.62		0.67	0.65			0.19			0.19	
v/c Ratio	0.02	0.63		0.07	0.43			0.67			0.04	
Control Delay	7.5	14.0		8.1	13.7			35.1			17.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.5	14.0		8.1	13.7			35.1			17.1	
LOS	A	B		A	B			D			B	
Approach Delay		13.9			13.4			35.1			17.1	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 16.5

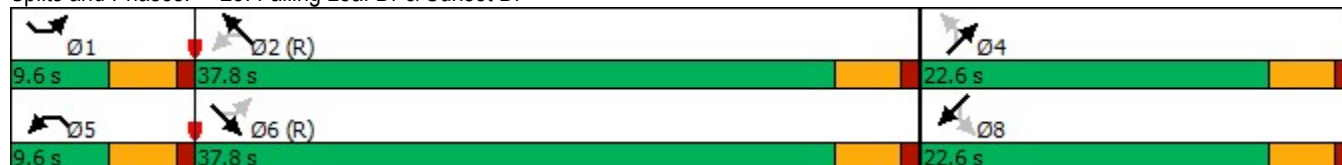
Intersection LOS: B

Intersection Capacity Utilization 59.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	434	67	40	415	45	57	62	54	61	105	27
Future Volume (vph)	20	434	67	40	415	45	57	62	54	61	105	27
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1798	0
Flt Permitted	0.413			0.346				0.708			0.852	
Satd. Flow (perm)	769	1825	0	645	1835	0	0	1319	1583	0	1557	0
Satd. Flow (RTOR)		15			11				94		11	
Adj. Flow (vph)	22	472	73	43	451	49	62	67	59	66	114	29
Lane Group Flow (vph)	22	545	0	43	500	0	0	129	59	0	209	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	44.4	41.1		45.6	43.3			13.7	13.7		13.7	
Actuated g/C Ratio	0.63	0.59		0.65	0.62			0.20	0.20		0.20	
v/c Ratio	0.04	0.51		0.08	0.44			0.50	0.15		0.67	
Control Delay	7.1	18.4		5.3	10.6			30.9	3.1		34.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	7.1	18.4		5.3	10.6			30.9	3.1		34.5	
LOS	A	B		A	B			C	A		C	
Approach Delay		18.0			10.2			22.1			34.5	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 18.0

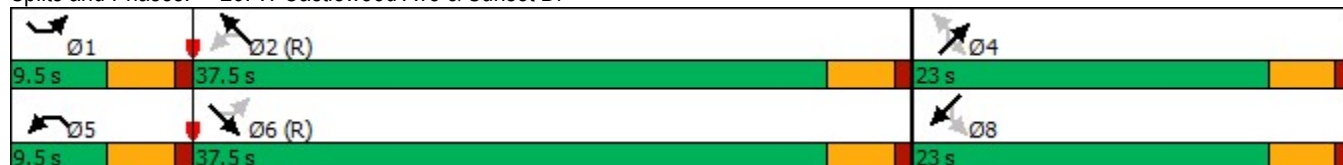
Intersection LOS: B

Intersection Capacity Utilization 57.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	47	205	19	30	155	54	7	55	14	55	88	53
Future Volume (Veh/h)	47	205	19	30	155	54	7	55	14	55	88	53
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	223	21	33	168	59	8	60	15	60	96	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	227			244			705	628	234	644	610	198
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	227			244			705	628	234	644	610	198
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			97	84	98	81	75	93
cM capacity (veh/h)	1341			1322			252	375	806	317	384	844
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	295	260	83	214								
Volume Left	51	33	8	60								
Volume Right	21	59	15	58								
cSH	1341	1322	394	421								
Volume to Capacity	0.04	0.02	0.21	0.51								
Queue Length 95th (ft)	3	2	20	70								
Control Delay (s)	1.6	1.2	16.6	22.1								
Lane LOS	A	A	C	C								
Approach Delay (s)	1.6	1.2	16.6	22.1								
Approach LOS			C	C								
Intersection Summary												
Average Delay			8.1									
Intersection Capacity Utilization			45.9%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	251	24	88	196	25	70
Future Volume (Veh/h)	251	24	88	196	25	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	273	26	96	213	27	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			299		691	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			299		691	286
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		93	90
cM capacity (veh/h)			1262		379	753
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	299	309	103			
Volume Left	0	96	27			
Volume Right	26	0	76			
cSH	1700	1262	598			
Volume to Capacity	0.18	0.08	0.17			
Queue Length 95th (ft)	0	6	15			
Control Delay (s)	0.0	3.0	12.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.0	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			45.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	79	241	197	17	18	84
Future Volume (Veh/h)	79	241	197	17	18	84
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	86	262	214	18	20	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	232				657	223
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232				657	223
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				95	89
cM capacity (veh/h)	1336				402	817
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	348	232	111			
Volume Left	86	0	20			
Volume Right	0	18	91			
cSH	1336	1700	689			
Volume to Capacity	0.06	0.14	0.16			
Queue Length 95th (ft)	5	0	14			
Control Delay (s)	2.4	0.0	11.2			
Lane LOS	A		B			
Approach Delay (s)	2.4	0.0	11.2			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization		44.6%		ICU Level of Service		A
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	30	41	23	16	72	23	27	160	11	26	176	24
Future Volume (vph)	30	41	23	16	72	23	27	160	11	26	176	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	45	25	17	78	25	29	174	12	28	191	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	120	215	245								
Volume Left (vph)	33	17	29	28								
Volume Right (vph)	25	25	12	26								
Hadj (s)	-0.05	-0.06	0.03	-0.01								
Departure Headway (s)	5.2	5.1	4.8	4.8								
Degree Utilization, x	0.15	0.17	0.29	0.32								
Capacity (veh/h)	626	634	704	713								
Control Delay (s)	9.1	9.2	9.8	10.0								
Approach Delay (s)	9.1	9.2	9.8	10.0								
Approach LOS	A	A	A	B								
Intersection Summary												
Delay	9.7											
Level of Service	A											
Intersection Capacity Utilization	32.1%			ICU Level of Service			A					
Analysis Period (min)	15											

Appendix D

“Year 2025 Build” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	14	798	66	9	992	15	128	0	38	21	2	23
Future Volume (vph)	14	798	66	9	992	15	128	0	38	21	2	23
Satd. Flow (prot)	1770	3497	0	1770	3532	0	0	1738	0	0	1698	0
Flt Permitted	0.179			0.179				0.752			0.867	
Satd. Flow (perm)	333	3497	0	333	3532	0	0	1357	0	0	1505	0
Satd. Flow (RTOR)		16			3			191			25	
Adj. Flow (vph)	15	867	72	10	1078	16	139	0	41	23	2	25
Lane Group Flow (vph)	15	939	0	10	1094	0	0	180	0	0	50	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	27.0		9.6	27.0		23.4	23.4		23.4	23.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	27.6	22.4		23.4	22.4			26.7			26.7	
Actuated g/C Ratio	0.46	0.37		0.39	0.37			0.44			0.44	
v/c Ratio	0.05	0.71		0.04	0.83			0.25			0.07	
Control Delay	7.9	19.3		9.0	23.9			3.5			8.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.9	19.3		9.0	23.9			3.5			8.2	
LOS	A	B		A	C			A			A	
Approach Delay		19.1			23.7			3.5			8.2	
Approach LOS		B			C			A			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 19.9

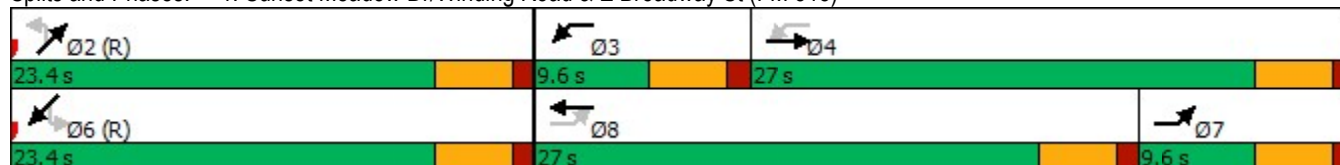
Intersection LOS: B

Intersection Capacity Utilization 50.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	270	621	91	125	555	195	158	556	95	255	472	255
Future Volume (vph)	270	621	91	125	555	195	158	556	95	255	472	255
Satd. Flow (prot)	1770	3539	1583	1770	3401	0	1770	3461	0	1770	3352	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3401	0	1770	3461	0	1770	3352	0
Satd. Flow (RTOR)			143		57			22			123	
Adj. Flow (vph)	293	675	99	136	603	212	172	604	103	277	513	277
Lane Group Flow (vph)	293	675	99	136	815	0	172	707	0	277	790	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									
Total Split (s)	17.4	26.8	26.8	13.7	23.1		13.4	22.5		17.0	26.1	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	12.9	22.7	22.7	8.8	18.6		8.9	17.7		12.5	21.3	
Actuated g/C Ratio	0.16	0.28	0.28	0.11	0.23		0.11	0.22		0.16	0.27	
v/c Ratio	1.02	0.67	0.18	0.69	0.97		0.87	0.90		1.00	0.80	
Control Delay	95.9	29.4	2.5	54.2	55.4		76.1	45.7		91.1	30.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	95.9	29.4	2.5	54.2	55.4		76.1	45.7		91.1	30.2	
LOS	F	C	A	D	E		E	D		F	C	
Approach Delay		45.1			55.2			51.6			46.0	
Approach LOS		D			E			D			D	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 79.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 49.2

Intersection LOS: D

Intersection Capacity Utilization 84.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
17.4 s	23.1 s	17 s	22.5 s
			
Ø5	Ø6	Ø7	Ø8
13.7 s	26.8 s	13.4 s	26.1 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	834	41	35	939	9	48	3	53	12	16	5
Future Volume (vph)	5	834	41	35	939	9	48	3	53	12	16	5
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1696	0	0	1794	0
Flt Permitted	0.239			0.263				0.836			0.893	
Satd. Flow (perm)	445	3514	0	490	3536	0	0	1450	0	0	1632	0
Satd. Flow (RTOR)		10			2			58			5	
Adj. Flow (vph)	5	907	45	38	1021	10	52	3	58	13	17	5
Lane Group Flow (vph)	5	952	0	38	1031	0	0	113	0	0	35	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	32.5	30.8		31.7	32.6			7.6			7.6	
Actuated g/C Ratio	0.68	0.64		0.66	0.68			0.16			0.16	
v/c Ratio	0.01	0.42		0.08	0.43			0.41			0.13	
Control Delay	3.8	7.8		4.1	6.6			15.0			16.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.8	7.8		4.1	6.6			15.0			16.6	
LOS	A	A		A	A			B			B	
Approach Delay		7.8			6.5			15.0			16.6	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 47.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 7.7

Intersection LOS: A

Intersection Capacity Utilization 45.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6	Ø8
9.6 s	27.8 s	22.6 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	841	47	88	892	20	68	5	82	20	6	20
Future Volume (vph)	20	841	47	88	892	20	68	5	82	20	6	20
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1691	0	0	1718	0
Flt Permitted	0.248			0.247				0.834			0.813	
Satd. Flow (perm)	462	3511	0	460	3529	0	0	1442	0	0	1427	0
Satd. Flow (RTOR)		11			4			89			22	
Adj. Flow (vph)	22	914	51	96	970	22	74	5	89	22	7	22
Lane Group Flow (vph)	22	965	0	96	992	0	0	168	0	0	51	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.4		10.0	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	31.8	28.1		30.1	32.0			8.5			8.5	
Actuated g/C Ratio	0.66	0.59		0.63	0.67			0.18			0.18	
v/c Ratio	0.05	0.47		0.22	0.42			0.51			0.19	
Control Delay	4.4	10.1		5.5	7.1			15.8			13.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.4	10.1		5.5	7.1			15.8			13.8	
LOS	A	B		A	A			B			B	
Approach Delay		10.0			7.0			15.8			13.8	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 48

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 9.1

Intersection LOS: A

Intersection Capacity Utilization 52.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6	Ø8
10 s	27.4 s	22.6 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	6	2	151	1	157	16	943	150	106	796	7
Future Volume (vph)	0	6	2	151	1	157	16	943	150	106	796	7
Satd. Flow (prot)	0	1807	0	0	1775	1583	0	3465	0	1770	3536	0
Flt Permitted					0.721			0.939		0.143		
Satd. Flow (perm)	0	1807	0	0	1343	1583	0	3257	0	266	3536	0
Satd. Flow (RTOR)		2				171		34			2	
Adj. Flow (vph)	0	7	2	164	1	171	17	1025	163	115	865	8
Lane Group Flow (vph)	0	9	0	0	165	171	0	1205	0	115	873	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	28.0	28.0		9.5	37.5	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		12.1			12.1	12.1		28.0		32.2	35.9	
Actuated g/C Ratio		0.21			0.21	0.21		0.49		0.56	0.63	
v/c Ratio		0.02			0.58	0.36		0.75		0.41	0.39	
Control Delay		14.2			27.5	5.7		17.8		10.3	6.5	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		14.2			27.5	5.7		17.8		10.3	6.5	
LOS		B			C	A		B		B	A	
Approach Delay		14.3			16.4			17.8			7.0	
Approach LOS		B			B			B			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 57.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 13.4

Intersection LOS: B

Intersection Capacity Utilization 79.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

 Ø1	 Ø2	 Ø4
9.5 s	28 s	22.5 s
 Ø6		 Ø8
37.5 s		22.5 s

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	47	669	16	205	725	23	27	42	30	9	27	206
Future Volume (vph)	47	669	16	205	725	23	27	42	30	9	27	206
Satd. Flow (prot)	1770	3529	0	1770	3522	0	0	1763	0	0	1839	1583
Flt Permitted	0.950			0.950				0.899			0.902	
Satd. Flow (perm)	1770	3529	0	1770	3522	0	0	1606	0	0	1680	1583
Satd. Flow (RTOR)		4			6			33				224
Adj. Flow (vph)	51	727	17	223	788	25	29	46	33	10	29	224
Lane Group Flow (vph)	51	744	0	223	813	0	0	108	0	0	39	224
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	10.5	22.5		15.0	27.0		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effct Green (s)	5.9	18.1		9.8	28.4			7.8			7.8	7.8
Actuated g/C Ratio	0.12	0.37		0.20	0.58			0.16			0.16	0.16
v/c Ratio	0.24	0.57		0.63	0.40			0.38			0.15	0.51
Control Delay	23.8	15.1		28.4	8.1			18.1			19.1	8.0
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	23.8	15.1		28.4	8.1			18.1			19.1	8.0
LOS	C	B		C	A			B			B	A
Approach Delay		15.7			12.5			18.1			9.6	
Approach LOS		B			B			B			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 49.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 13.6

Intersection LOS: B

Intersection Capacity Utilization 53.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr

		
Ø1	Ø2	Ø4
15 s	22.5 s	22.5 s
		
Ø5	Ø6	Ø8
10.5 s	27 s	22.5 s

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	452	655	325	151	455	269	259	1329	343	173	667	60
Future Volume (vph)	452	655	325	151	455	269	259	1329	343	173	667	60
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	4928	0	1770	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	1770	4928	0	1770	5024	0
Satd. Flow (RTOR)			225			292		64			13	
Adj. Flow (vph)	491	712	353	164	495	292	282	1445	373	188	725	65
Lane Group Flow (vph)	491	712	353	164	495	292	282	1818	0	188	790	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6						
Total Split (s)	24.0	39.2	39.2	10.8	26.0	26.0	27.0	43.0		17.0	33.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.7	34.7	34.7	6.3	22.3	22.3	20.7	38.5		12.5	30.3	
Actuated g/C Ratio	0.17	0.32	0.32	0.06	0.20	0.20	0.19	0.35		0.11	0.28	
v/c Ratio	0.84	0.64	0.54	0.84	0.69	0.53	0.85	1.03		0.94	0.57	
Control Delay	58.2	35.4	14.3	84.7	46.7	8.2	65.9	63.8		98.0	35.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	58.2	35.4	14.3	84.7	46.7	8.2	65.9	63.8		98.0	35.9	
LOS	E	D	B	F	D	A	E	E		F	D	
Approach Delay		37.8			41.4			64.1			47.9	
Approach LOS		D			D			E			D	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 50.1

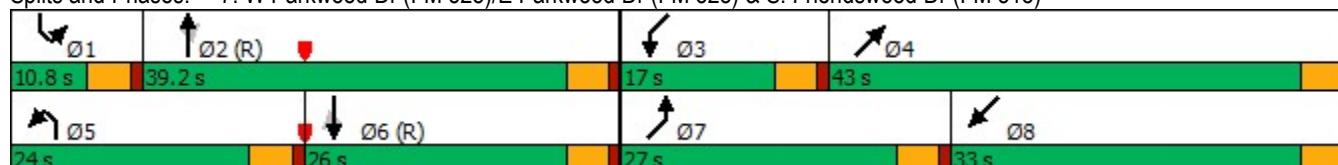
Intersection LOS: D

Intersection Capacity Utilization 83.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		 	 			
Traffic Volume (vph)	21	1487	891	69	206	44
Future Volume (vph)	21	1487	891	69	206	44
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.207				0.950	
Satd. Flow (perm)	386	3539	3500	0	1660	1583
Satd. Flow (RTOR)			21			48
Adj. Flow (vph)	23	1616	968	75	224	48
Lane Group Flow (vph)	23	1616	1043	0	224	48
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.5	32.0	22.5		13.0	13.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	26.9	27.8	25.9		8.2	8.2
Actuated g/C Ratio	0.60	0.62	0.58		0.18	0.18
v/c Ratio	0.06	0.74	0.52		0.69	0.15
Control Delay	4.0	8.8	7.8		31.4	7.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.0	8.8	7.8		31.4	7.3
LOS	A	A	A		C	A
Approach Delay		8.8	7.8		27.2	
Approach LOS		A	A		C	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 45

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 10.1

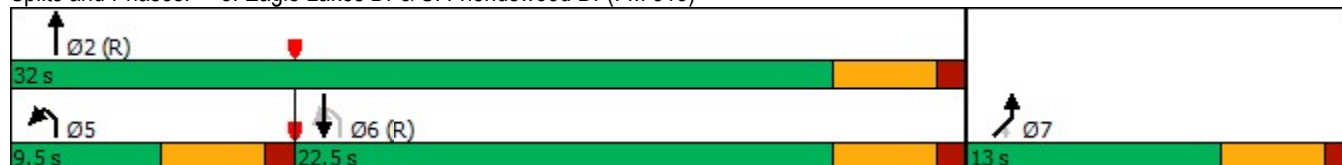
Intersection LOS: B

Intersection Capacity Utilization 60.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	519	122	75	855	10	227	16	110	10	18	169
Future Volume (vph)	45	519	122	75	855	10	227	16	110	10	18	169
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.188			0.369			0.950			0.950		
Satd. Flow (perm)	350	3539	1583	687	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			205			205			143			205
Adj. Flow (vph)	49	564	133	82	929	11	247	17	120	11	20	184
Lane Group Flow (vph)	49	564	133	82	929	11	247	17	120	11	20	184
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	9.5	28.1	28.1	10.4	29.0	29.0	19.0	32.0	32.0	9.5	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	42.9	35.9	35.9	42.0	38.7	38.7	13.8	23.5	23.5	5.0	7.1	7.1
Actuated g/C Ratio	0.54	0.45	0.45	0.52	0.48	0.48	0.17	0.29	0.29	0.06	0.09	0.09
v/c Ratio	0.16	0.36	0.16	0.18	0.54	0.01	0.81	0.03	0.21	0.10	0.12	0.56
Control Delay	10.0	17.0	1.1	9.8	18.0	0.0	53.6	20.9	4.1	37.6	34.0	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	17.0	1.1	9.8	18.0	0.0	53.6	20.9	4.1	37.6	34.0	11.2
LOS	A	B	A	A	B	A	D	C	A	D	C	B
Approach Delay		13.7			17.1			36.7			14.7	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)

			
Ø1	Ø2 (R)	Ø3	Ø4
9.5 s	29 s	9.5 s	32 s
			
Ø5	Ø6 (R)	Ø7	Ø8
10.4 s	28.1 s	19 s	22.5 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	321	687	74	84	602	328	123	342	203	171	80	118
Future Volume (vph)	321	687	74	84	602	328	123	342	203	171	80	118
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3224	0
Flt Permitted	0.233			0.242			0.617			0.269		
Satd. Flow (perm)	434	3539	1583	451	3539	1583	1149	3341	0	501	3224	0
Satd. Flow (RTOR)			164			291		169			128	
Adj. Flow (vph)	349	747	80	91	654	357	134	372	221	186	87	128
Lane Group Flow (vph)	349	747	80	91	654	357	134	593	0	186	215	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	15.1	27.1	27.1	10.5	22.5	22.5	9.5	22.8		9.6	22.9	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	28.1	24.2	24.2	29.0	17.2	17.2	24.8	18.3		23.9	20.8	
Actuated g/C Ratio	0.40	0.35	0.35	0.41	0.25	0.25	0.35	0.26		0.34	0.30	
v/c Ratio	0.91	0.61	0.12	0.31	0.75	0.59	0.30	0.59		0.69	0.21	
Control Delay	55.2	22.2	0.4	13.3	30.5	9.7	16.1	18.7		31.5	9.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	55.2	22.2	0.4	13.3	30.5	9.7	16.1	18.7		31.5	9.4	
LOS	E	C	A	B	C	A	B	B		C	A	
Approach Delay		30.5			22.3			18.2			19.7	
Approach LOS		C			C			B			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 24.0

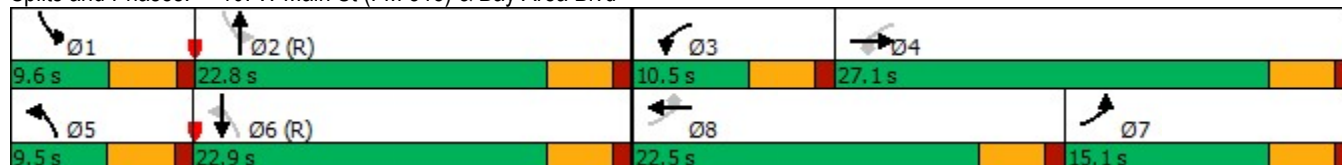
Intersection LOS: C

Intersection Capacity Utilization 74.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	27	180	83	29	280	57	124	1460	43	59	714	95
Future Volume (vph)	27	180	83	29	280	57	124	1460	43	59	714	95
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3525	0	1770	3476	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3525	0	1770	3476	0
Satd. Flow (RTOR)			149			149		3			14	
Adj. Flow (vph)	29	196	90	32	304	62	135	1587	47	64	776	103
Lane Group Flow (vph)	29	196	90	32	304	62	135	1634	0	64	879	0
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2						
Total Split (s)	22.6	22.6	22.6	24.2	24.2	24.2	20.4	53.4		9.8	42.8	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	15.2	15.2	15.2	19.8	19.8	19.8	12.8	49.1		5.3	39.5	
Actuated g/C Ratio	0.14	0.14	0.14	0.19	0.19	0.19	0.12	0.47		0.05	0.38	
v/c Ratio	0.11	0.73	0.25	0.10	0.87	0.15	0.63	0.99		0.72	0.67	
Control Delay	40.6	59.9	2.7	38.4	68.0	0.8	58.2	49.9		92.0	30.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	40.6	59.9	2.7	38.4	68.0	0.8	58.2	49.9		92.0	30.9	
LOS	D	E	A	D	E	A	E	D		F	C	
Approach Delay		41.8			55.1			50.6			35.1	
Approach LOS		D			E			D			D	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 105.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 46.0

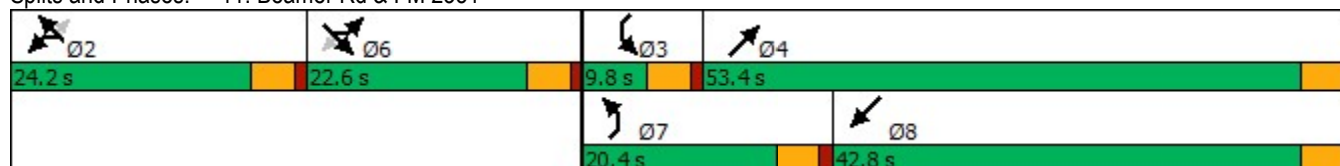
Intersection LOS: D

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1280	36	79	737	100	143
Future Volume (vph)	1280	36	79	737	100	143
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	5					155
Adj. Flow (vph)	1391	39	86	801	109	155
Lane Group Flow (vph)	1430	0	86	801	109	155
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	36.0		10.2	46.2	23.8	23.8
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	30.2		5.8	37.9	19.5	19.5
Actuated g/C Ratio	0.45		0.09	0.57	0.29	0.29
v/c Ratio	0.89		0.56	0.40	0.11	0.27
Control Delay	26.3		47.4	8.4	19.4	5.3
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	26.3		47.4	8.4	19.4	5.3
LOS	C		D	A	B	A
Approach Delay	26.3			12.2	11.1	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 66.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 19.9

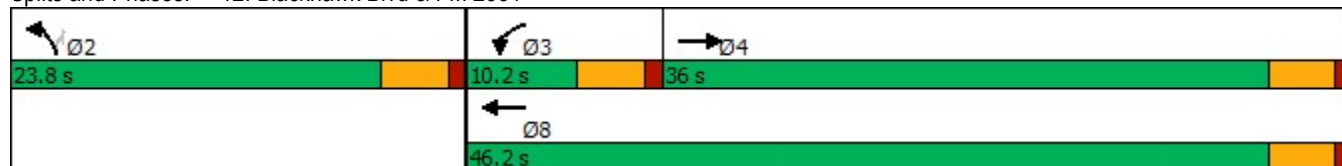
Intersection LOS: B

Intersection Capacity Utilization 56.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	145	0	123	0	0	0	52	1166	0	0	823	50
Future Volume (vph)	145	0	123	0	0	0	52	1166	0	0	823	50
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.186					
Satd. Flow (perm)	0	1410	1583	0	1863	0	346	3539	0	1863	3507	0
Satd. Flow (RTOR)			191								12	
Adj. Flow (vph)	158	0	134	0	0	0	57	1267	0	0	895	54
Lane Group Flow (vph)	0	158	134	0	0	0	57	1267	0	0	949	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	22.5	22.5		22.5	22.5		9.5	28.0		9.5	28.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		18.2	55.5				25.7	28.2			22.9	
Actuated g/C Ratio		0.33	1.00				0.46	0.51			0.41	
v/c Ratio		0.34	0.08				0.20	0.70			0.65	
Control Delay		18.5	0.1				8.2	12.7			16.3	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		18.5	0.1				8.2	12.7			16.3	
LOS		B	A				A	B			B	
Approach Delay		10.0						12.5			16.3	
Approach LOS		B						B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 55.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 13.6

Intersection LOS: B

Intersection Capacity Utilization 55.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
22.5 s	9.5 s	28 s
 Ø6	 Ø7	 Ø8
22.5 s	9.5 s	28 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	114	5	241	2	1	1	84	1121	2	14	887	32
Future Volume (vph)	114	5	241	2	1	1	84	1121	2	14	887	32
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.900		0.167			0.147		
Satd. Flow (perm)	1406	1589	0	0	1619	0	311	3539	0	274	3522	0
Satd. Flow (RTOR)		224			1						7	
Adj. Flow (vph)	124	5	262	2	1	1	91	1218	2	15	964	35
Lane Group Flow (vph)	124	267	0	0	4	0	91	1220	0	15	999	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	22.5	22.5		22.5	22.5		9.6	28.0		9.5	27.9	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.2	18.2			18.2		25.7	27.3		28.2	21.8	
Actuated g/C Ratio	0.32	0.32			0.32		0.46	0.48		0.50	0.39	
v/c Ratio	0.27	0.40			0.01		0.33	0.71		0.06	0.73	
Control Delay	18.1	6.3			13.8		10.2	15.7		6.7	19.0	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	18.1	6.3			13.8		10.2	15.7		6.7	19.0	
LOS	B	A			B		B	B		A	B	
Approach Delay		10.1			13.8			15.3			18.8	
Approach LOS		B			B			B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 56.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 61.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln

 Ø2	 Ø3	 Ø4
22.5 s	9.5 s	28 s
 Ø6	 Ø7	 Ø8
22.5 s	9.6 s	27.9 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	29	32	55	92	7	313	23	376	99	315	267	20
Future Volume (vph)	29	32	55	92	7	313	23	376	99	315	267	20
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1863	1583
Flt Permitted		0.919			0.678		0.566			0.370		
Satd. Flow (perm)	0	1602	0	0	1263	1583	1054	1805	0	689	1863	1583
Satd. Flow (RTOR)		60				340		35				25
Adj. Flow (vph)	32	35	60	100	8	340	25	409	108	342	290	22
Lane Group Flow (vph)	0	127	0	0	108	340	25	517	0	342	290	22
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	23.0	23.0		23.0	23.0		42.0	42.0		42.0	42.0	42.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)		18.9			18.9	59.2	31.1	31.1		31.1	31.1	31.1
Actuated g/C Ratio		0.32			0.32	1.00	0.53	0.53		0.53	0.53	0.53
v/c Ratio		0.23			0.27	0.21	0.05	0.54		0.94	0.30	0.03
Control Delay		11.9			20.0	0.3	6.3	10.4		51.6	8.2	2.6
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		11.9			20.0	0.3	6.3	10.4		51.6	8.2	2.6
LOS		B			C	A	A	B		D	A	A
Approach Delay		11.9			5.1			10.2			30.7	
Approach LOS		B			A			B			C	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 59.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 16.6

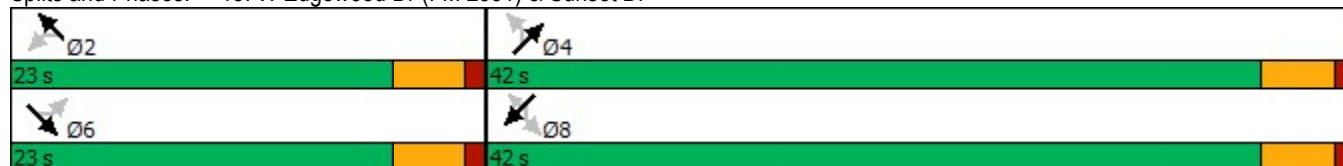
Intersection LOS: B

Intersection Capacity Utilization 67.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  		 	  		 	  	
Traffic Volume (vph)	355	1739	93	109	747	74	215	535	338	116	159	204
Future Volume (vph)	355	1739	93	109	747	74	215	535	338	116	159	204
Satd. Flow (prot)	3433	5045	0	3433	5019	0	1770	4790	0	1770	4658	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5045	0	3433	5019	0	1770	4790	0	1770	4658	0
Satd. Flow (RTOR)		10			17			169			222	
Adj. Flow (vph)	386	1890	101	118	812	80	234	582	367	126	173	222
Lane Group Flow (vph)	386	1991	0	118	892	0	234	949	0	126	395	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	21.0	39.0		9.6	27.6		17.2	27.2		14.2	24.2	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	14.6	34.5		5.1	25.0		12.7	23.1		9.3	19.7	
Actuated g/C Ratio	0.16	0.38		0.06	0.28		0.14	0.26		0.10	0.22	
v/c Ratio	0.69	1.03		0.61	0.63		0.94	0.70		0.70	0.33	
Control Delay	42.3	55.9		55.5	30.8		84.0	28.0		59.8	13.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	42.3	55.9		55.5	30.8		84.0	28.0		59.8	13.5	
LOS	D	E		E	C		F	C		E	B	
Approach Delay		53.7			33.7			39.1			24.7	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 43.3

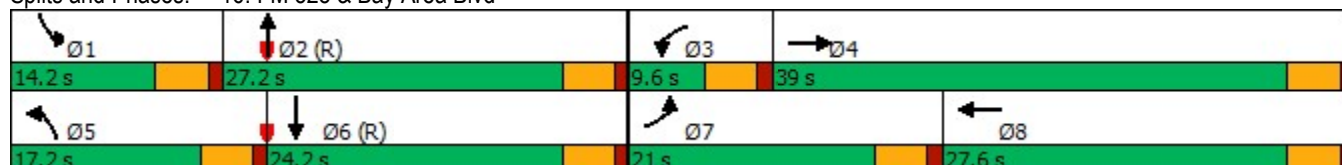
Intersection LOS: D

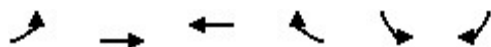
Intersection Capacity Utilization 79.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	55	1902	962	154	253	91
Future Volume (vph)	55	1902	962	154	253	91
Satd. Flow (prot)	1770	5085	4979	0	1770	1583
Flt Permitted	0.183				0.950	
Satd. Flow (perm)	341	5085	4979	0	1770	1583
Satd. Flow (RTOR)			59			99
Adj. Flow (vph)	60	2067	1046	167	275	99
Lane Group Flow (vph)	60	2067	1213	0	275	99
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	9.5	32.0	22.5		23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	24.8	27.5	21.8		18.5	18.5
Actuated g/C Ratio	0.45	0.50	0.40		0.34	0.34
v/c Ratio	0.21	0.81	0.60		0.46	0.17
Control Delay	9.2	14.9	15.1		17.5	4.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	9.2	14.9	15.1		17.5	4.3
LOS	A	B	B		B	A
Approach Delay		14.7	15.1		14.0	
Approach LOS		B	B		B	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 14.8

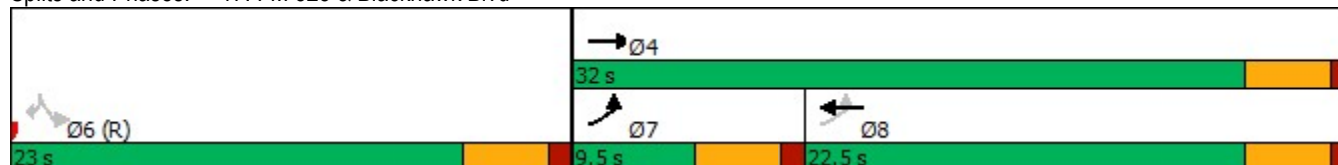
Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	220	25	42	34	65	158	60	1630	32	50	769	159
Future Volume (vph)	220	25	42	34	65	158	60	1630	32	50	769	159
Satd. Flow (prot)	0	1758	0	0	1696	0	1770	5070	0	1770	4953	0
Flt Permitted		0.552			0.927		0.204			0.130		
Satd. Flow (perm)	0	1008	0	0	1583	0	380	5070	0	242	4953	0
Satd. Flow (RTOR)		13			121			4			67	
Adj. Flow (vph)	239	27	46	37	71	172	65	1772	35	54	836	173
Lane Group Flow (vph)	0	312	0	0	280	0	65	1807	0	54	1009	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	32.2	32.2		32.2	32.2		10.4	33.0		9.8	32.4	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		29.4			29.4		33.0	30.7		33.9	28.3	
Actuated g/C Ratio		0.39			0.39		0.44	0.41		0.45	0.38	
v/c Ratio		0.77			0.40		0.24	0.87		0.25	0.53	
Control Delay		36.0			11.7		11.8	27.0		12.4	18.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		36.0			11.7		11.8	27.0		12.4	18.2	
LOS		D			B		B	C		B	B	
Approach Delay		36.0			11.7			26.4			18.0	
Approach LOS		D			B			C			B	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 23.6

Intersection LOS: C

Intersection Capacity Utilization 82.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

 Ø2 (R)	 Ø3	 Ø4
32.2 s	9.8 s	33 s
 Ø6 (R)	 Ø7	 Ø8
32.2 s	10.4 s	32.4 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	405	52	100	24	32	17	148	1527	32	16	948	402
Future Volume (vph)	405	52	100	24	32	17	148	1527	32	16	948	402
Satd. Flow (prot)	1681	1637	0	1770	1768	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.722	0.833		0.434			0.138			0.115		
Satd. Flow (perm)	1278	1394	0	808	1768	0	257	5070	0	214	3539	1583
Satd. Flow (RTOR)		44			18			5				437
Adj. Flow (vph)	440	57	109	26	35	18	161	1660	35	17	1030	437
Lane Group Flow (vph)	304	302	0	26	53	0	161	1695	0	17	1030	437
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	33.5	33.5		33.5	33.5		11.2	32.0		9.5	30.3	30.3
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	29.4	29.4		29.4	29.4		32.1	34.7		36.1	25.4	25.4
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.43	0.46		0.48	0.34	0.34
v/c Ratio	0.61	0.53		0.08	0.08		0.66	0.72		0.08	0.86	0.53
Control Delay	24.7	19.0		15.6	11.1		27.0	19.5		12.8	32.1	4.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	24.7	19.0		15.6	11.1		27.0	19.5		12.8	32.1	4.7
LOS	C	B		B	B		C	B		B	C	A
Approach Delay		21.8			12.6			20.2			23.8	
Approach LOS		C			B			C			C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 21.6

Intersection LOS: C

Intersection Capacity Utilization 68.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Drive

 Ø2 (R)	 Ø4	 Ø3
33.5 s	32 s	9.5 s
 Ø6 (R)	 Ø7	 Ø8
33.5 s	11.2 s	30.3 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	239	1574	134	74	952	16	97	130	224	12	78	115
Future Volume (vph)	239	1574	134	74	952	16	97	130	224	12	78	115
Satd. Flow (prot)	1770	3539	1583	1770	3532	0	0	1824	1583	1770	1863	1583
Flt Permitted	0.152			0.098				0.823		0.455		
Satd. Flow (perm)	283	3539	1583	183	3532	0	0	1533	1583	848	1863	1583
Satd. Flow (RTOR)			109		2				143			143
Adj. Flow (vph)	260	1711	146	80	1035	17	105	141	243	13	85	125
Lane Group Flow (vph)	260	1711	146	80	1052	0	0	246	243	13	85	125
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8		4	4			2		2	6		6
Total Split (s)	18.5	47.2	47.2	9.6	38.3		23.2	23.2	23.2	23.2	23.2	23.2
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	43.5	40.8	40.8	44.7	32.5			18.9	18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.57	0.54	0.54	0.59	0.43			0.25	0.25	0.25	0.25	0.25
v/c Ratio	0.69	0.90	0.16	0.37	0.70			0.65	0.49	0.06	0.18	0.25
Control Delay	21.2	24.7	3.8	10.5	20.8			36.7	15.3	25.0	26.0	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	21.2	24.7	3.8	10.5	20.8			36.7	15.3	25.0	26.0	5.2
LOS	C	C	A	B	C			D	B	C	C	A
Approach Delay		22.8			20.1			26.1			14.3	
Approach LOS		C			C			C			B	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 76.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 22.0

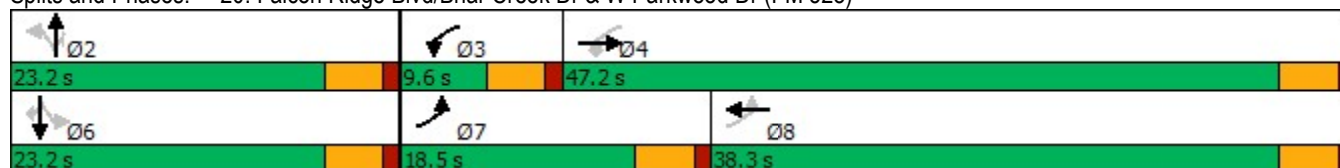
Intersection LOS: C

Intersection Capacity Utilization 77.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	122	3	12	51	1	182	2	1261	14	63	875	50
Future Volume (vph)	122	3	12	51	1	182	2	1261	14	63	875	50
Satd. Flow (prot)	0	1761	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.533			0.905		0.198			0.145		
Satd. Flow (perm)	0	981	0	0	1509	0	369	3532	0	270	3511	0
Satd. Flow (RTOR)		7			198			2			11	
Adj. Flow (vph)	133	3	13	55	1	198	2	1371	15	68	951	54
Lane Group Flow (vph)	0	149	0	0	254	0	2	1386	0	68	1005	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	32.0		9.6	32.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.8			22.8		32.3	27.5		32.6	31.3	
Actuated g/C Ratio		0.35			0.35		0.50	0.42		0.50	0.48	
v/c Ratio		0.43			0.39		0.01	0.93		0.27	0.59	
Control Delay		22.1			7.3		6.0	30.7		13.3	13.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		22.1			7.3		6.0	30.7		13.3	13.9	
LOS		C			A		A	C		B	B	
Approach Delay		22.1			7.3			30.7			13.9	
Approach LOS		C			A			C			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 21.9

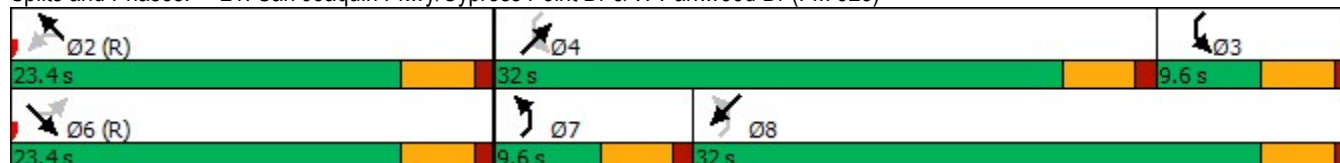
Intersection LOS: C

Intersection Capacity Utilization 75.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	18	2	1	27	5	928	5	11	780	102
Future Volume (vph)	29	0	18	2	1	27	5	928	5	11	780	102
Satd. Flow (prot)	0	1713	0	0	1631	0	1770	3536	0	1770	3479	0
Flt Permitted		0.828			0.972		0.279			0.261		
Satd. Flow (perm)	0	1462	0	0	1590	0	520	3536	0	486	3479	0
Satd. Flow (RTOR)		191			29			1			28	
Adj. Flow (vph)	32	0	20	2	1	29	5	1009	5	12	848	111
Lane Group Flow (vph)	0	52	0	0	32	0	5	1014	0	12	959	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	22.6	22.6		22.6	22.6		9.6	27.8		9.6	27.8	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		6.1			6.1		48.0	48.8		48.0	48.6	
Actuated g/C Ratio		0.10			0.10		0.80	0.81		0.80	0.81	
v/c Ratio		0.16			0.17		0.01	0.35		0.02	0.34	
Control Delay		1.1			13.4		2.4	3.9		2.5	3.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		1.1			13.4		2.4	3.9		2.5	3.8	
LOS		A			B		A	A		A	A	
Approach Delay		1.1			13.4			3.9			3.8	
Approach LOS		A			B			A			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.35

Intersection Signal Delay: 3.9

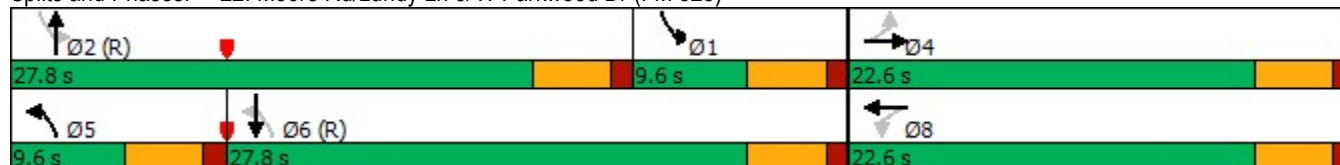
Intersection LOS: A

Intersection Capacity Utilization 42.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	79	89	59	72	68	34	56	350	71	25	304	45
Future Volume (vph)	79	89	59	72	68	34	56	350	71	25	304	45
Satd. Flow (prot)	1770	3327	0	1770	3362	0	1770	3451	0	1770	3472	0
Flt Permitted	0.682			0.650			0.527			0.489		
Satd. Flow (perm)	1270	3327	0	1211	3362	0	982	3451	0	911	3472	0
Satd. Flow (RTOR)		64			37			63			44	
Adj. Flow (vph)	86	97	64	78	74	37	61	380	77	27	330	49
Lane Group Flow (vph)	86	161	0	78	111	0	61	457	0	27	379	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.27	0.27		0.27	0.27	
v/c Ratio	0.14	0.10		0.13	0.07		0.23	0.47		0.11	0.39	
Control Delay	6.9	4.2		6.9	4.5		12.6	11.2		10.9	10.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.9	4.2		6.9	4.5		12.6	11.2		10.9	10.8	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		5.2			5.5			11.4			10.8	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 37

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 9.3

Intersection LOS: A

Intersection Capacity Utilization 39.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
22.5 s	22.5 s
 Ø6	 Ø8
22.5 s	22.5 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	498	12	6	422	82	6	10	7	118	3	9
Future Volume (vph)	22	498	12	6	422	82	6	10	7	118	3	9
Satd. Flow (prot)	1770	1855	0	1770	1818	0	0	1761	0	0	1765	0
Flt Permitted	0.375			0.374				0.910			0.727	
Satd. Flow (perm)	699	1855	0	697	1818	0	0	1624	0	0	1341	0
Satd. Flow (RTOR)		2			19			8			7	
Adj. Flow (vph)	24	541	13	7	459	89	7	11	8	128	3	10
Lane Group Flow (vph)	24	554	0	7	548	0	0	26	0	0	141	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	41.1	40.7		40.9	40.6			11.1			11.2	
Actuated g/C Ratio	0.68	0.68		0.68	0.68			0.18			0.19	
v/c Ratio	0.04	0.44		0.01	0.44			0.08			0.55	
Control Delay	4.9	9.8		6.8	10.4			14.9			28.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.9	9.8		6.8	10.4			14.9			28.2	
LOS	A	A		A	B			B			C	
Approach Delay		9.6			10.3			14.9			28.2	
Approach LOS		A			B			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 12.0

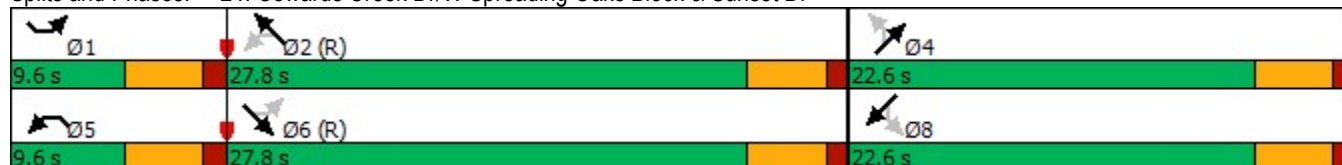
Intersection LOS: B

Intersection Capacity Utilization 48.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	304	297	89	338	0	179	7	37	1	10	8
Future Volume (vph)	8	304	297	89	338	0	179	7	37	1	10	8
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1751	0	0	1751	0
Flt Permitted	0.543			0.180				0.754			0.987	
Satd. Flow (perm)	1011	1725	0	335	1863	0	0	1374	0	0	1732	0
Satd. Flow (RTOR)		96						17			9	
Adj. Flow (vph)	9	330	323	97	367	0	195	8	40	1	11	9
Lane Group Flow (vph)	9	653	0	97	367	0	0	243	0	0	21	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.5	27.8		9.6	27.9		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	32.6	28.3		35.8	34.8			14.3			14.3	
Actuated g/C Ratio	0.54	0.47		0.60	0.58			0.24			0.24	
v/c Ratio	0.01	0.76		0.29	0.34			0.71			0.05	
Control Delay	8.9	21.0		8.3	9.8			30.9			12.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	8.9	21.0		8.3	9.8			30.9			12.2	
LOS	A	C		A	A			C			B	
Approach Delay		20.8			9.5			30.9			12.2	
Approach LOS		C			A			C			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 18.6

Intersection LOS: B

Intersection Capacity Utilization 69.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr

		
Ø1	Ø2 (R)	Ø4
9.5 s	27.9 s	22.6 s
		
Ø5	Ø6 (R)	Ø8
9.6 s	27.8 s	22.6 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	18	288	22	41	296	34	78	70	56	16	73	42
Future Volume (vph)	18	288	22	41	296	34	78	70	56	16	73	42
Satd. Flow (prot)	1770	1842	0	1770	1835	0	0	1814	1583	0	1770	0
Flt Permitted	0.541			0.504				0.785			0.947	
Satd. Flow (perm)	1008	1842	0	939	1835	0	0	1462	1583	0	1686	0
Satd. Flow (RTOR)		8			11				119		46	
Adj. Flow (vph)	20	313	24	45	322	37	85	76	61	17	79	46
Lane Group Flow (vph)	20	337	0	45	359	0	0	161	61	0	142	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	23.0		9.5	23.0		22.5	22.5	22.5	22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	34.9	33.4		36.2	35.7			11.3	11.3		11.1	
Actuated g/C Ratio	0.63	0.61		0.66	0.65			0.21	0.21		0.20	
v/c Ratio	0.03	0.30		0.06	0.30			0.54	0.15		0.38	
Control Delay	5.4	10.4		5.3	8.5			25.5	1.7		15.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.4	10.4		5.3	8.5			25.5	1.7		15.2	
LOS	A	B		A	A			C	A		B	
Approach Delay		10.1			8.2			19.0			15.2	
Approach LOS		B			A			B			B	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 11.8

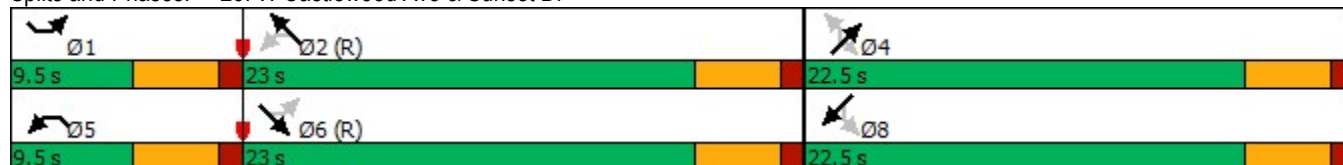
Intersection LOS: B

Intersection Capacity Utilization 47.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	91	252	14	10	559	36	12	68	26	6	24	106
Future Volume (Veh/h)	91	252	14	10	559	36	12	68	26	6	24	106
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	99	274	15	11	608	39	13	74	28	7	26	115
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												4
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	647			289			1200	1148	282	1194	1136	628
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	647			289			1200	1148	282	1194	1136	628
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			99			87	58	96	93	85	76
cM capacity (veh/h)	939			1273			100	176	757	97	179	483
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	388	658	115	148								
Volume Left	99	11	13	7								
Volume Right	15	39	28	115								
cSH	939	1273	196	622								
Volume to Capacity	0.11	0.01	0.59	0.24								
Queue Length 95th (ft)	9	1	81	23								
Control Delay (s)	3.2	0.2	46.5	18.8								
Lane LOS	A	A	E	C								
Approach Delay (s)	3.2	0.2	46.5	18.8								
Approach LOS			E	C								
Intersection Summary												
Average Delay			7.3									
Intersection Capacity Utilization			73.8%		ICU Level of Service				D			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	264	18	54	518	41	97
Future Volume (Veh/h)	264	18	54	518	41	97
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	287	20	59	563	45	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			307		978	297
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			307		978	297
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		83	86
cM capacity (veh/h)			1254		265	742
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	307	622	150			
Volume Left	0	59	45			
Volume Right	20	0	105			
cSH	1700	1254	482			
Volume to Capacity	0.18	0.05	0.31			
Queue Length 95th (ft)	0	4	33			
Control Delay (s)	0.0	1.3	15.8			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.3	15.8			
Approach LOS			C			
Intersection Summary						
Average Delay			2.9			
Intersection Capacity Utilization			63.5%	ICU Level of Service		B
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	117	241	473	10	18	97
Future Volume (Veh/h)	117	241	473	10	18	97
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	127	262	514	11	20	105
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525				1036	520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525				1036	520
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				91	81
cM capacity (veh/h)	1042				225	556
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	389	525	125			
Volume Left	127	0	20			
Volume Right	0	11	105			
cSH	1042	1700	451			
Volume to Capacity	0.12	0.31	0.28			
Queue Length 95th (ft)	10	0	28			
Control Delay (s)	3.8	0.0	16.0			
Lane LOS	A		C			
Approach Delay (s)	3.8	0.0	16.0			
Approach LOS			C			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization		61.6%		ICU Level of Service		B
Analysis Period (min)		15				

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	56	70	84	26	38	51	44	292	60	24	227	16
Future Volume (vph)	56	70	84	26	38	51	44	292	60	24	227	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	76	91	28	41	55	48	317	65	26	247	17
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	228	124	430	290								
Volume Left (vph)	61	28	48	26								
Volume Right (vph)	91	55	65	17								
Hadj (s)	-0.15	-0.19	-0.03	0.02								
Departure Headway (s)	6.1	6.3	5.5	5.8								
Degree Utilization, x	0.38	0.22	0.66	0.47								
Capacity (veh/h)	522	476	624	570								
Control Delay (s)	12.8	11.0	18.5	13.8								
Approach Delay (s)	12.8	11.0	18.5	13.8								
Approach LOS	B	B	C	B								
Intersection Summary												
Delay			15.1									
Level of Service			C									
Intersection Capacity Utilization			53.7%	ICU Level of Service					A			
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	38	1181	163	57	1264	19	105	0	39	20	19	44
Future Volume (vph)	38	1181	163	57	1264	19	105	0	39	20	19	44
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1733	0	0	1710	0
Flt Permitted	0.126			0.131				0.768			0.917	
Satd. Flow (perm)	235	3476	0	244	3532	0	0	1379	0	0	1587	0
Satd. Flow (RTOR)		29			3			176			48	
Adj. Flow (vph)	41	1284	177	62	1374	21	114	0	42	22	21	48
Lane Group Flow (vph)	41	1461	0	62	1395	0	0	156	0	0	91	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	32.4		9.6	32.4		23.0	23.0		23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	35.3	29.8		32.8	31.7			20.5			20.5	
Actuated g/C Ratio	0.54	0.46		0.50	0.49			0.32			0.32	
v/c Ratio	0.16	0.91		0.26	0.81			0.28			0.17	
Control Delay	10.3	27.6		9.1	20.3			4.2			11.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	10.3	27.6		9.1	20.3			4.2			11.0	
LOS	B	C		A	C			A			B	
Approach Delay		27.1			19.8			4.2			11.0	
Approach LOS		C			B			A			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 22.2

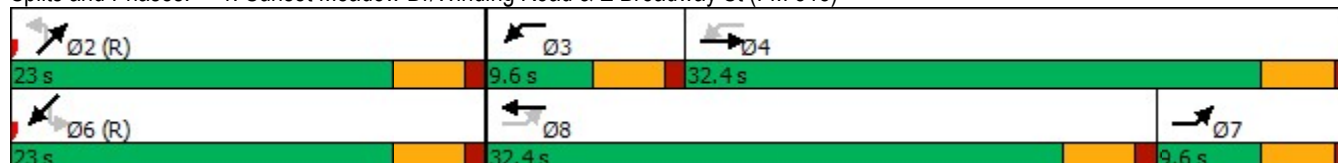
Intersection LOS: C

Intersection Capacity Utilization 68.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	227	703	150	73	741	122	266	457	102	216	735	323
Future Volume (vph)	227	703	150	73	741	122	266	457	102	216	735	323
Satd. Flow (prot)	3433	3539	1583	3433	3465	0	1770	3444	0	1770	3376	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3465	0	1770	3444	0	1770	3376	0
Satd. Flow (RTOR)			182		20			28			78	
Adj. Flow (vph)	247	764	163	79	805	133	289	497	111	235	799	351
Lane Group Flow (vph)	247	764	163	79	938	0	289	608	0	235	1150	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									
Total Split (s)	11.6	30.5	30.5	9.5	28.4		19.0	26.7		23.3	31.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	7.1	27.9	27.9	5.0	23.9		14.5	25.0		16.0	26.5	
Actuated g/C Ratio	0.08	0.31	0.31	0.06	0.27		0.16	0.28		0.18	0.29	
v/c Ratio	0.91	0.70	0.26	0.42	1.00		1.01	0.62		0.75	1.10	
Control Delay	79.6	32.0	4.2	48.0	64.1		96.7	31.1		49.6	87.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	79.6	32.0	4.2	48.0	64.1		96.7	31.1		49.6	87.7	
LOS	E	C	A	D	E		F	C		D	F	
Approach Delay		38.2			62.9			52.2			81.2	
Approach LOS		D			E			D			F	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 59.9

Intersection LOS: E

Intersection Capacity Utilization 91.2%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
11.6 s	28.4 s	23.3 s	26.7 s
			
Ø5	Ø6	Ø8	Ø7
9.5 s	30.5 s	31 s	19 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	1035	35	81	1081	21	55	19	66	33	24	6
Future Volume (vph)	2	1035	35	81	1081	21	55	19	66	33	24	6
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1710	0	0	1791	0
Flt Permitted	0.187			0.175				0.861			0.751	
Satd. Flow (perm)	348	3522	0	326	3529	0	0	1501	0	0	1379	0
Satd. Flow (RTOR)		6			4			72			7	
Adj. Flow (vph)	2	1125	38	88	1175	23	60	21	72	36	26	7
Lane Group Flow (vph)	2	1163	0	88	1198	0	0	153	0	0	69	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	43.1	35.8		40.4	42.8			9.0			9.0	
Actuated g/C Ratio	0.72	0.60		0.67	0.71			0.15			0.15	
v/c Ratio	0.01	0.55		0.23	0.48			0.53			0.32	
Control Delay	2.0	8.5		5.4	7.2			19.8			23.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	2.0	8.5		5.4	7.2			19.8			23.8	
LOS	A	A		A	A			B			C	
Approach Delay		8.5			7.1			19.8			23.8	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 9.6 (16%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 8.9

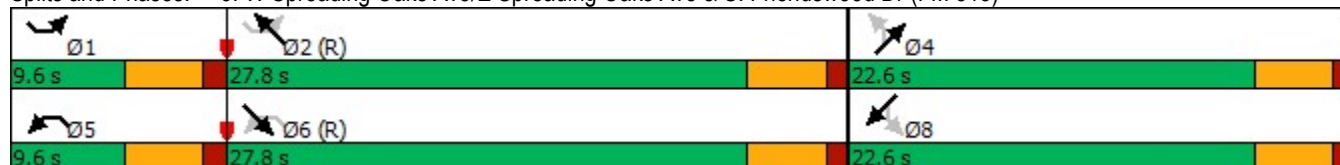
Intersection LOS: A

Intersection Capacity Utilization 55.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	1125	69	135	1222	12	50	8	98	12	8	7
Future Volume (vph)	9	1125	69	135	1222	12	50	8	98	12	8	7
Satd. Flow (prot)	1770	3507	0	1770	3536	0	0	1677	0	0	1758	0
Flt Permitted	0.153			0.147				0.882			0.777	
Satd. Flow (perm)	285	3507	0	274	3536	0	0	1503	0	0	1395	0
Satd. Flow (RTOR)		12			2			107			8	
Adj. Flow (vph)	10	1223	75	147	1328	13	54	9	107	13	9	8
Lane Group Flow (vph)	10	1298	0	147	1341	0	0	170	0	0	30	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	32.6		9.8	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	38.5	32.7		35.8	38.6			8.2			8.2	
Actuated g/C Ratio	0.71	0.60		0.66	0.71			0.15			0.15	
v/c Ratio	0.03	0.61		0.45	0.53			0.54			0.14	
Control Delay	3.9	11.6		9.7	7.6			16.1			17.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.9	11.6		9.7	7.6			16.1			17.7	
LOS	A	B		A	A			B			B	
Approach Delay		11.6			7.8			16.1			17.7	
Approach LOS		B			A			B			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 54.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 10.0

Intersection LOS: B

Intersection Capacity Utilization 62.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
9.6 s	32.8 s	22.6 s
		
Ø5	Ø6	Ø8
9.8 s	32.6 s	22.6 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	11	24	386	6	250	1	1086	262	235	1048	2
Future Volume (vph)	9	11	24	386	6	250	1	1086	262	235	1048	2
Satd. Flow (prot)	0	1709	0	0	1775	1583	0	3437	0	1770	3539	0
Flt Permitted		0.907			0.694			0.955		0.099		
Satd. Flow (perm)	0	1566	0	0	1293	1583	0	3282	0	184	3539	0
Satd. Flow (RTOR)		26				212		43				
Adj. Flow (vph)	10	12	26	420	7	272	1	1180	285	255	1139	2
Lane Group Flow (vph)	0	48	0	0	427	272	0	1466	0	255	1141	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	32.1	32.1		32.1	32.1	32.1	45.1	45.1		12.8	57.9	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		27.6			27.6	27.6		40.6		48.9	53.4	
Actuated g/C Ratio		0.31			0.31	0.31		0.45		0.54	0.59	
v/c Ratio		0.10			1.08	0.43		0.97		1.04	0.54	
Control Delay		13.5			92.6	10.5		42.5		91.1	12.2	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		13.5			92.6	10.5		42.5		91.1	12.2	
LOS		B			F	B		D		F	B	
Approach Delay		13.5			60.7			42.5			26.6	
Approach LOS		B			E			D			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 12.8 (14%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 39.5

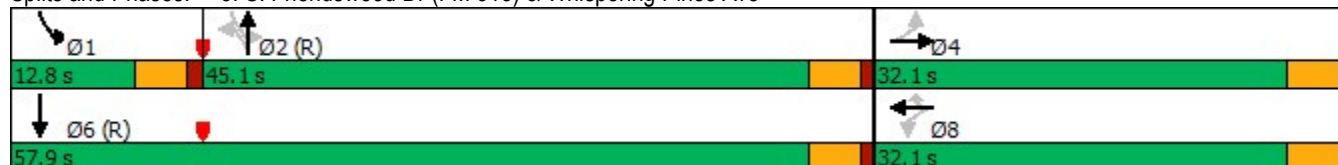
Intersection LOS: D

Intersection Capacity Utilization 107.1%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	30	991	24	234	1176	39	27	33	19	26	54	320
Future Volume (vph)	30	991	24	234	1176	39	27	33	19	26	54	320
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1771	0	0	1833	1583
Flt Permitted	0.950			0.950				0.872			0.888	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1571	0	0	1654	1583
Satd. Flow (RTOR)		4			6			21				273
Adj. Flow (vph)	33	1077	26	254	1278	42	29	36	21	28	59	348
Lane Group Flow (vph)	33	1103	0	254	1320	0	0	86	0	0	87	348
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.6	30.4		17.0	37.8		22.6	22.6		22.6	22.6	22.6
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effct Green (s)	6.1	31.7		14.1	46.0			10.7			10.7	10.7
Actuated g/C Ratio	0.09	0.45		0.20	0.66			0.15			0.15	0.15
v/c Ratio	0.21	0.69		0.71	0.57			0.33			0.35	0.74
Control Delay	33.3	19.9		39.4	10.2			22.8			28.4	16.7
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	33.3	19.9		39.4	10.2			22.8			28.4	16.7
LOS	C	B		D	B			C			C	B
Approach Delay		20.3			14.9			22.8			19.0	
Approach LOS		C			B			C			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 17.6

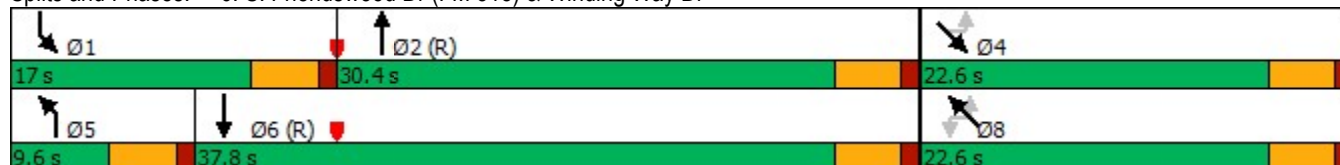
Intersection LOS: B

Intersection Capacity Utilization 63.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	390	646	193	115	757	374	271	1109	422	321	1521	93
Future Volume (vph)	390	646	193	115	757	374	271	1109	422	321	1521	93
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	4877	0	1770	5040	0
Flt Permitted	0.181			0.196			0.131			0.142		
Satd. Flow (perm)	654	3539	1583	708	3539	1583	244	4877	0	265	5040	0
Satd. Flow (RTOR)			182			279		111			11	
Adj. Flow (vph)	424	702	210	125	823	407	295	1205	459	349	1653	101
Lane Group Flow (vph)	424	702	210	125	823	407	295	1664	0	349	1754	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	6		2	2		6	8			4		
Total Split (s)	12.4	29.5	29.5	9.5	26.6	26.6	16.0	32.6		18.4	35.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	30.0	25.0	25.0	30.0	22.1	22.1	42.0	28.1		42.0	30.5	
Actuated g/C Ratio	0.33	0.28	0.28	0.33	0.25	0.25	0.47	0.31		0.47	0.34	
v/c Ratio	0.92	0.71	0.37	0.32	0.95	0.68	0.96	1.04		0.98	1.02	
Control Delay	49.3	34.1	7.9	24.4	54.6	16.3	69.9	71.0		77.1	58.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	49.3	34.1	7.9	24.4	54.6	16.3	69.9	71.0		77.1	58.0	
LOS	D	C	A	C	D	B	E	E		E	E	
Approach Delay		34.8			40.3			70.9			61.2	
Approach LOS		C			D			E			E	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 54.6

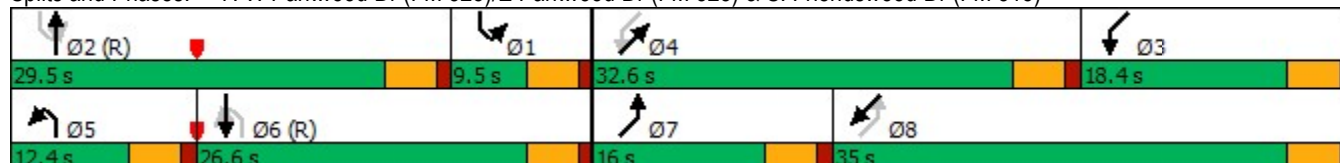
Intersection LOS: D

Intersection Capacity Utilization 95.7%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		 	  			
Traffic Volume (vph)	38	1208	1434	170	91	17
Future Volume (vph)	38	1208	1434	170	91	17
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.102				0.950	
Satd. Flow (perm)	190	3539	3483	0	1770	1583
Satd. Flow (RTOR)			36			18
Adj. Flow (vph)	41	1313	1559	185	99	18
Lane Group Flow (vph)	41	1313	1744	0	99	18
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.6	49.0	39.4		11.0	11.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	44.9	47.6	43.8		6.3	6.3
Actuated g/C Ratio	0.75	0.79	0.73		0.10	0.10
v/c Ratio	0.15	0.47	0.68		0.54	0.10
Control Delay	3.4	3.4	9.1		37.0	13.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	3.4	3.4	9.1		37.0	13.7
LOS	A	A	A		D	B
Approach Delay		3.4	9.1		33.4	
Approach LOS		A	A		C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 7.6

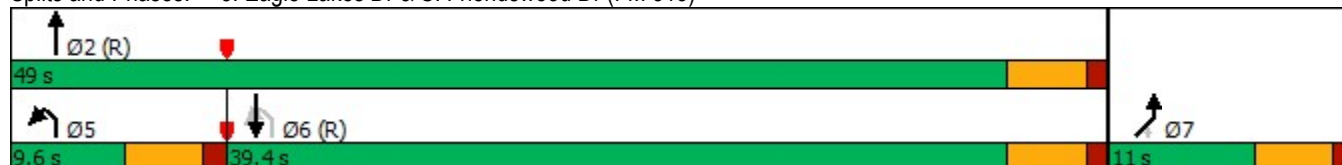
Intersection LOS: A

Intersection Capacity Utilization 57.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	109	1030	190	117	973	16	131	15	107	7	14	78
Future Volume (vph)	109	1030	190	117	973	16	131	15	107	7	14	78
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.175			0.146			0.950			0.950		
Satd. Flow (perm)	326	3539	1583	272	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			207			143			143			143
Adj. Flow (vph)	118	1120	207	127	1058	17	142	16	116	8	15	85
Lane Group Flow (vph)	118	1120	207	127	1058	17	142	16	116	8	15	85
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	9.6	34.9	34.9	9.6	34.9	34.9	13.0	26.0	26.0	9.5	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	50.3	41.3	41.3	49.4	43.7	43.7	8.4	15.2	15.2	5.0	6.2	6.2
Actuated g/C Ratio	0.63	0.52	0.52	0.62	0.55	0.55	0.10	0.19	0.19	0.06	0.08	0.08
v/c Ratio	0.34	0.61	0.23	0.40	0.55	0.02	0.76	0.05	0.28	0.07	0.10	0.33
Control Delay	8.4	16.8	2.8	9.6	15.1	0.1	62.3	27.3	5.6	36.9	35.4	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.4	16.8	2.8	9.6	15.1	0.1	62.3	27.3	5.6	36.9	35.4	5.1
LOS	A	B	A	A	B	A	E	C	A	D	D	A
Approach Delay		14.1			14.3			36.3			11.7	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 16.1

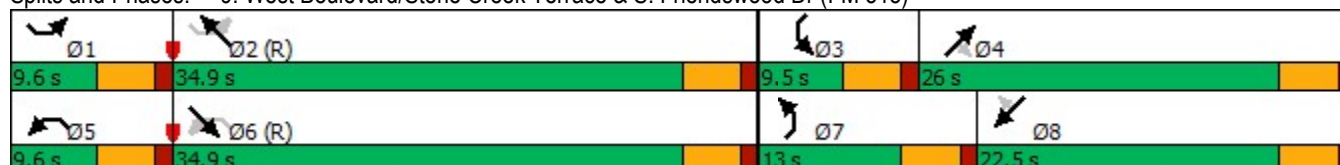
Intersection LOS: B

Intersection Capacity Utilization 60.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	233	726	200	158	987	264	209	250	84	214	306	410
Future Volume (vph)	233	726	200	158	987	264	209	250	84	214	306	410
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.169			0.202			0.214			0.475		
Satd. Flow (perm)	315	3539	1583	376	3539	1583	399	3405	0	885	3235	0
Satd. Flow (RTOR)			217			287		59			286	
Adj. Flow (vph)	253	789	217	172	1073	287	227	272	91	233	333	446
Lane Group Flow (vph)	253	789	217	172	1073	287	227	363	0	233	779	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	12.2	29.2	29.2	11.2	28.2	28.2	11.4	23.6		11.0	23.2	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	31.4	24.7	24.7	31.4	23.7	23.7	25.6	19.1		25.6	18.7	
Actuated g/C Ratio	0.42	0.33	0.33	0.42	0.32	0.32	0.34	0.25		0.34	0.25	
v/c Ratio	0.90	0.68	0.33	0.61	0.96	0.41	0.87	0.40		0.62	0.76	
Control Delay	61.7	25.2	4.4	22.2	45.7	4.7	50.7	20.8		24.8	21.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	61.7	25.2	4.4	22.2	45.7	4.7	50.7	20.8		24.8	21.9	
LOS	E	C	A	C	D	A	D	C		C	C	
Approach Delay		29.0			35.4			32.3			22.6	
Approach LOS		C			D			C			C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 30.2

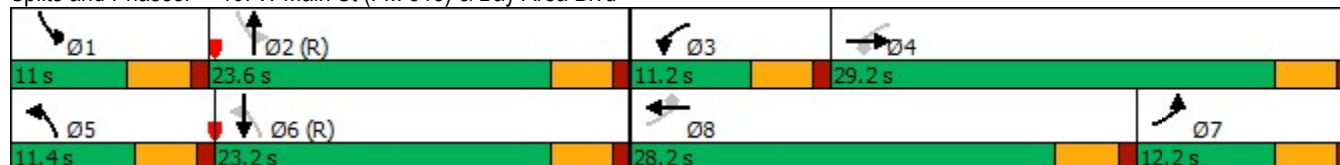
Intersection LOS: C

Intersection Capacity Utilization 88.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	32	195	101	97	197	37	116	876	88	142	1346	79
Future Volume (vph)	32	195	101	97	197	37	116	876	88	142	1346	79
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3490	0	1770	3511	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3490	0	1770	3511	0
Satd. Flow (RTOR)			149			149		11			7	
Adj. Flow (vph)	35	212	110	105	214	40	126	952	96	154	1463	86
Lane Group Flow (vph)	35	212	110	105	214	40	126	1048	0	154	1549	0
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2						
Total Split (s)	22.6	22.6	22.6	23.2	23.2	23.2	13.4	46.2		18.0	50.8	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.2	16.2	16.2	18.7	18.7	18.7	9.8	44.4		12.7	47.3	
Actuated g/C Ratio	0.15	0.15	0.15	0.17	0.17	0.17	0.09	0.40		0.12	0.43	
v/c Ratio	0.13	0.77	0.31	0.35	0.68	0.10	0.80	0.74		0.75	1.02	
Control Delay	41.0	64.1	4.9	44.1	54.6	0.5	84.6	32.2		70.0	60.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	41.0	64.1	4.9	44.1	54.6	0.5	84.6	32.2		70.0	60.9	
LOS	D	E	A	D	D	A	F	C		E	E	
Approach Delay		43.6			45.5			37.8			61.8	
Approach LOS		D			D			D			E	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 50.5

Intersection LOS: D

Intersection Capacity Utilization 76.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351

 Ø2 (R)	 Ø6	 Ø3	 Ø4
23.2 s	22.6 s	18 s	46.2 s
		 Ø7	 Ø8
		13.4 s	50.8 s

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↘	↗
Traffic Volume (vph)	953	89	80	1447	117	82
Future Volume (vph)	953	89	80	1447	117	82
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	19					89
Adj. Flow (vph)	1036	97	87	1573	127	89
Lane Group Flow (vph)	1133	0	87	1573	127	89
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	27.4		9.8	37.2	22.8	22.8
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	23.4		5.3	31.0	18.4	18.4
Actuated g/C Ratio	0.40		0.09	0.53	0.32	0.32
v/c Ratio	0.80		0.54	0.84	0.12	0.16
Control Delay	21.9		41.0	16.7	15.5	5.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	21.9		41.0	16.7	15.5	5.1
LOS	C		D	B	B	A
Approach Delay	21.9			17.9	11.2	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 58.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 19.0

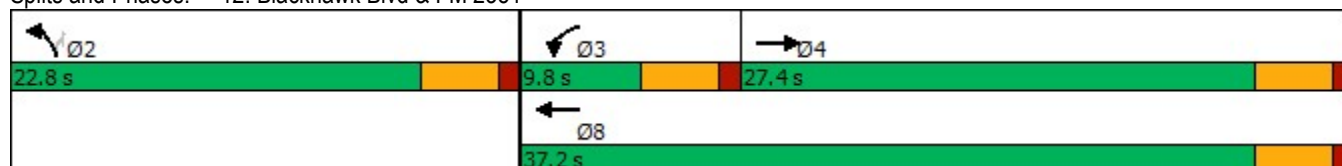
Intersection LOS: B

Intersection Capacity Utilization 51.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	61	0	71	1	0	0	91	963	0	0	1380	141
Future Volume (vph)	61	0	71	1	0	0	91	963	0	0	1380	141
Satd. Flow (prot)	0	1770	1583	0	1770	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757			0.714		0.109					
Satd. Flow (perm)	0	1410	1583	0	1330	0	203	3539	0	1863	3490	0
Satd. Flow (RTOR)			153								20	
Adj. Flow (vph)	66	0	77	1	0	0	99	1047	0	0	1500	153
Lane Group Flow (vph)	0	66	77	0	1	0	99	1047	0	0	1653	0
Turn Type	Perm	NA	Free	Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	42.1		9.5	42.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		19.0	72.1		19.0		40.5	44.0			36.6	
Actuated g/C Ratio		0.26	1.00		0.26		0.56	0.61			0.51	
v/c Ratio		0.18	0.05		0.00		0.44	0.49			0.93	
Control Delay		23.6	0.1		21.0		12.8	8.5			28.1	
Queue Delay		0.0	0.0		0.0		0.0	0.0			0.0	
Total Delay		23.6	0.1		21.0		12.8	8.5			28.1	
LOS		C	A		C		B	A			C	
Approach Delay		10.9			21.0			8.9			28.1	
Approach LOS		B			C			A			C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 72.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 63.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
23.4 s	9.5 s	42.1 s
 Ø6	 Ø7	 Ø8
23.4 s	9.6 s	42 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	99	0	161	8	8	1	134	991	1	5	1382	118
Future Volume (vph)	99	0	161	8	8	1	134	991	1	5	1382	118
Satd. Flow (prot)	1770	1583	0	0	1807	0	1770	3539	0	1770	3497	0
Flt Permitted	0.745				0.881		0.092			0.205		
Satd. Flow (perm)	1388	1583	0	0	1630	0	171	3539	0	382	3497	0
Satd. Flow (RTOR)		139			1						16	
Adj. Flow (vph)	108	0	175	9	9	1	146	1077	1	5	1502	128
Lane Group Flow (vph)	108	175	0	0	19	0	146	1078	0	5	1630	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	24.0	24.0		24.0	24.0		11.0	46.4		9.6	45.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	19.5	19.5			19.5		46.4	49.0		50.0	39.9	
Actuated g/C Ratio	0.25	0.25			0.25		0.58	0.62		0.63	0.50	
v/c Ratio	0.32	0.35			0.05		0.63	0.49		0.02	0.92	
Control Delay	27.9	9.7			22.8		25.4	9.9		5.2	28.6	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	27.9	9.7			22.8		25.4	9.9		5.2	28.6	
LOS	C	A			C		C	A		A	C	
Approach Delay		16.6			22.8			11.8			28.5	
Approach LOS		B			C			B			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 79.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 20.9

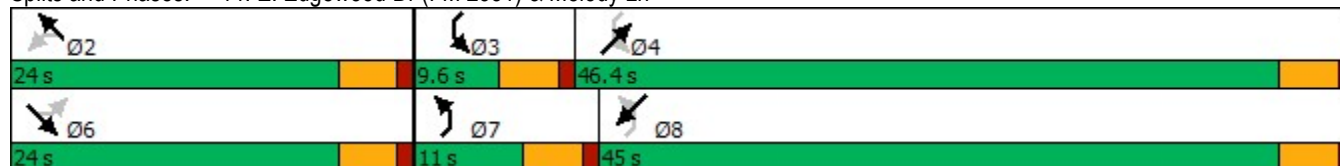
Intersection LOS: C

Intersection Capacity Utilization 70.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	28	24	17	172	34	409	21	398	142	419	503	46
Future Volume (vph)	28	24	17	172	34	409	21	398	142	419	503	46
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1790	0	1770	1863	1583
Flt Permitted		0.831			0.747		0.396			0.371		
Satd. Flow (perm)	0	1497	0	0	1391	1583	738	1790	0	691	1863	1583
Satd. Flow (RTOR)		16				445		45				50
Adj. Flow (vph)	30	26	18	187	37	445	23	433	154	455	547	50
Lane Group Flow (vph)	0	74	0	0	224	445	23	587	0	455	547	50
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	24.0	24.0		24.0	24.0		66.0	66.0		66.0	66.0	66.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		20.5			20.5	90.0	60.5	60.5		60.5	60.5	60.5
Actuated g/C Ratio		0.23			0.23	1.00	0.67	0.67		0.67	0.67	0.67
v/c Ratio		0.21			0.71	0.28	0.05	0.48		0.98	0.44	0.05
Control Delay		25.4			46.7	0.4	5.0	7.9		54.2	8.0	1.5
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		25.4			46.7	0.4	5.0	7.9		54.2	8.0	1.5
LOS		C			D	A	A	A		D	A	A
Approach Delay		25.4			15.9			7.8			27.7	
Approach LOS		C			B			A			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 19.3

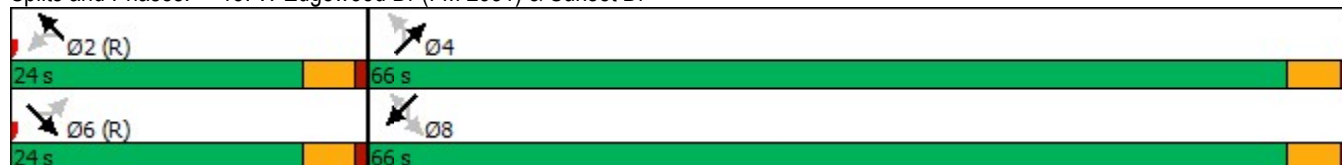
Intersection LOS: B

Intersection Capacity Utilization 82.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	  		 	  		 	  		 	  	
Traffic Volume (vph)	328	1167	140	407	1316	109	242	437	195	153	479	380
Future Volume (vph)	328	1167	140	407	1316	109	242	437	195	153	479	380
Satd. Flow (prot)	3433	5004	0	3433	5029	0	1770	4851	0	1770	4750	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5004	0	3433	5029	0	1770	4851	0	1770	4750	0
Satd. Flow (RTOR)		23			15			117			201	
Adj. Flow (vph)	357	1268	152	442	1430	118	263	475	212	166	521	413
Lane Group Flow (vph)	357	1420	0	442	1548	0	263	687	0	166	934	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	15.0	30.3		17.2	32.5		19.2	25.9		16.6	23.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	10.5	25.8		12.7	28.0		14.7	22.1		11.4	18.8	
Actuated g/C Ratio	0.12	0.29		0.14	0.31		0.16	0.25		0.13	0.21	
v/c Ratio	0.89	0.98		0.91	0.98		0.91	0.54		0.74	0.81	
Control Delay	65.3	51.5		63.6	50.5		73.2	26.2		58.5	33.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	65.3	51.5		63.6	50.5		73.2	26.2		58.5	33.0	
LOS	E	D		E	D		E	C		E	C	
Approach Delay		54.3			53.4			39.2			36.8	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 48.2

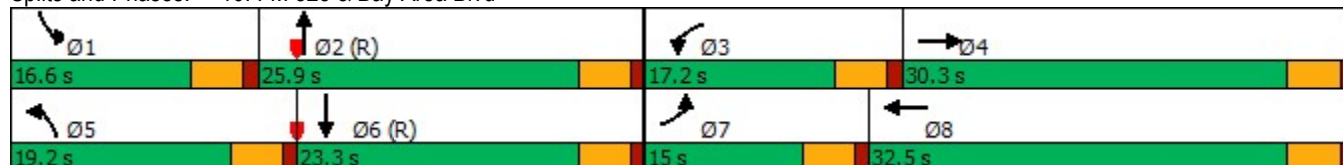
Intersection LOS: D

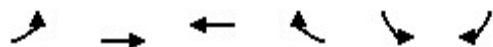
Intersection Capacity Utilization 83.5%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑↑↑	↑↑↑		←	←
Traffic Volume (vph)	110	1408	1962	259	186	90
Future Volume (vph)	110	1408	1962	259	186	90
Satd. Flow (prot)	1770	5085	4994	0	1770	1583
Flt Permitted	0.103				0.950	
Satd. Flow (perm)	192	5085	4994	0	1770	1583
Satd. Flow (RTOR)			45			98
Adj. Flow (vph)	120	1530	2133	282	202	98
Lane Group Flow (vph)	120	1530	2415	0	202	98
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	9.8	51.8	42.0		23.2	23.2
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	43.2	46.8	38.9		19.2	19.2
Actuated g/C Ratio	0.58	0.62	0.52		0.26	0.26
v/c Ratio	0.54	0.48	0.92		0.44	0.20
Control Delay	17.8	8.2	24.9		27.5	6.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	17.8	8.2	24.9		27.5	6.6
LOS	B	A	C		C	A
Approach Delay		8.9	24.9		20.6	
Approach LOS		A	C		C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 18.5

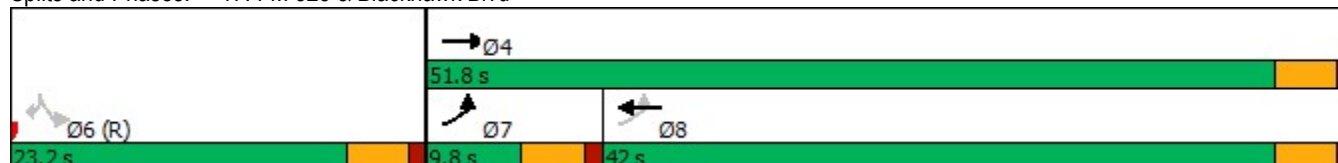
Intersection LOS: B

Intersection Capacity Utilization 71.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations									  		   	
Traffic Volume (vph)	225	50	65	32	57	97	92	1264	54	141	1672	260
Future Volume (vph)	225	50	65	32	57	97	92	1264	54	141	1672	260
Satd. Flow (prot)	0	1756	0	0	1717	0	1770	5055	0	1770	5085	1583
Flt Permitted		0.655			0.911		0.123			0.135		
Satd. Flow (perm)	0	1188	0	0	1578	0	229	5055	0	251	5085	1583
Satd. Flow (RTOR)		17			77			10				177
Adj. Flow (vph)	245	54	71	35	62	105	100	1374	59	153	1817	283
Lane Group Flow (vph)	0	370	0	0	202	0	100	1433	0	153	1817	283
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	28.8	28.8		28.8	28.8		9.8	34.4		11.8	36.4	36.4
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		25.5			25.5		36.9	28.8		36.0	32.6	32.6
Actuated g/C Ratio		0.34			0.34		0.49	0.38		0.48	0.43	0.43
v/c Ratio		0.89			0.34		0.45	0.73		0.58	0.82	0.36
Control Delay		50.1			13.7		15.0	7.4		24.2	25.1	12.8
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		50.1			13.7		15.0	7.4		24.2	25.1	12.8
LOS		D			B		B	A		C	C	B
Approach Delay		50.1			13.7			7.9			23.5	
Approach LOS		D			B			A			C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 19.8

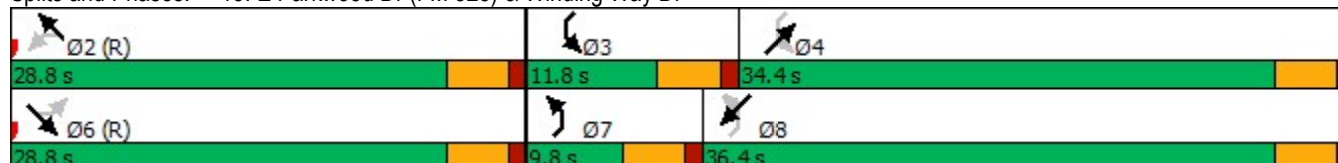
Intersection LOS: B

Intersection Capacity Utilization 82.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	332	102	199	145	102	39	164	1374	92	39	1628	346
Future Volume (vph)	332	102	199	145	102	39	164	1374	92	39	1628	346
Satd. Flow (prot)	1681	1604	0	1770	1786	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.620	0.958		0.262			0.088			0.096		
Satd. Flow (perm)	1097	1544	0	488	1786	0	164	5040	0	179	3539	1583
Satd. Flow (RTOR)		84			22			16				345
Adj. Flow (vph)	361	111	216	158	111	42	178	1493	100	42	1770	376
Lane Group Flow (vph)	325	363	0	158	153	0	178	1593	0	42	1770	376
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	31.6	31.6		31.6	31.6		10.2	48.6		9.8	48.2	48.2
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	27.1	27.1		27.1	27.1		49.4	46.9		51.2	43.7	43.7
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.55	0.52		0.57	0.49	0.49
v/c Ratio	0.98	0.69		1.08	0.28		0.93	0.60		0.20	1.03	0.40
Control Delay	79.7	29.2		132.4	22.0		60.9	22.9		12.1	39.0	2.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	79.7	29.2		132.4	22.0		60.9	22.9		12.1	39.0	2.8
LOS	E	C		F	C		E	C		B	D	A
Approach Delay		53.1			78.1			26.7			32.3	
Approach LOS		D			E			C			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 36.0

Intersection LOS: D

Intersection Capacity Utilization 95.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Drive

 Ø2 (R)	 Ø4	 Ø3
31.6 s	48.6 s	9.8 s
 Ø6 (R)	 Ø7	 Ø8
31.6 s	10.2 s	48.2 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	1521	135	115	1813	12	84	63	114	21	98	166
Future Volume (vph)	154	1521	135	115	1813	12	84	63	114	21	98	166
Satd. Flow (prot)	1770	3539	1583	1770	3536	0	0	1811	1583	1770	1863	1583
Flt Permitted	0.078			0.078				0.763		0.570		
Satd. Flow (perm)	145	3539	1583	145	3536	0	0	1421	1583	1062	1863	1583
Satd. Flow (RTOR)			110		1				124			131
Adj. Flow (vph)	167	1653	147	125	1971	13	91	68	124	23	107	180
Lane Group Flow (vph)	167	1653	147	125	1984	0	0	159	124	23	107	180
Turn Type	D.P+P	NA	Perm	D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8		4	4			2		2	6		6
Total Split (s)	11.0	55.8	55.8	11.2	56.0		23.0	23.0	23.0	23.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5			4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	58.0	51.4	51.4	58.0	51.5			18.5	18.5	18.5	18.5	18.5
Actuated g/C Ratio	0.64	0.57	0.57	0.64	0.57			0.21	0.21	0.21	0.21	0.21
v/c Ratio	0.80	0.82	0.15	0.59	0.98			0.54	0.29	0.11	0.28	0.42
Control Delay	43.9	19.8	3.4	15.8	30.5			40.0	7.9	30.6	32.5	13.5
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	19.8	3.4	15.8	30.5			40.0	7.9	30.6	32.5	13.5
LOS	D	B	A	B	C			D	A	C	C	B
Approach Delay		20.6			29.6			25.9			21.3	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 25.1

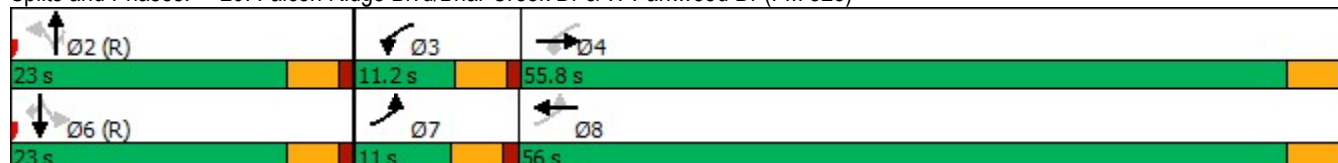
Intersection LOS: C

Intersection Capacity Utilization 84.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	60	1	6	33	10	99	11	1340	41	159	1481	122
Future Volume (vph)	60	1	6	33	10	99	11	1340	41	159	1481	122
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.656			0.920		0.082			0.105		
Satd. Flow (perm)	0	1206	0	0	1553	0	153	3525	0	196	3500	0
Satd. Flow (RTOR)		6			108			5			16	
Adj. Flow (vph)	65	1	7	36	11	108	12	1457	45	173	1610	133
Lane Group Flow (vph)	0	73	0	0	155	0	12	1502	0	173	1743	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	43.4		13.2	47.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		20.6			20.6		49.5	38.2		45.9	48.5	
Actuated g/C Ratio		0.26			0.26		0.62	0.48		0.57	0.61	
v/c Ratio		0.23			0.32		0.06	0.89		0.66	0.82	
Control Delay		25.4			11.4		5.6	27.1		33.5	17.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		25.4			11.4		5.6	27.1		33.5	17.2	
LOS		C			B		A	C		C	B	
Approach Delay		25.4			11.4			27.0			18.7	
Approach LOS		C			B			C			B	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.0

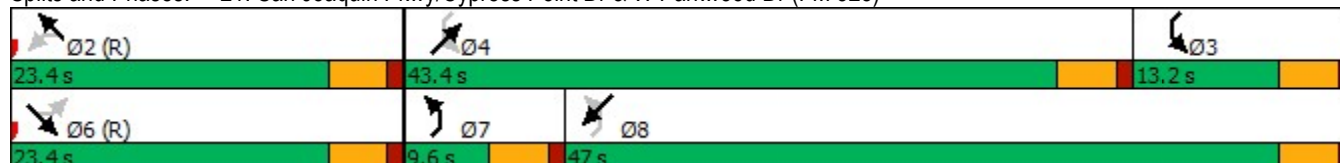
Intersection LOS: C

Intersection Capacity Utilization 70.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	144	10	17	2	2	14	5	1277	15	23	1175	171
Future Volume (vph)	144	10	17	2	2	14	5	1277	15	23	1175	171
Satd. Flow (prot)	0	1765	0	0	1655	0	1770	3532	0	1770	3472	0
Flt Permitted		0.746			0.971		0.108			0.114		
Satd. Flow (perm)	0	1372	0	0	1615	0	201	3532	0	212	3472	0
Satd. Flow (RTOR)		8			15			2			31	
Adj. Flow (vph)	157	11	18	2	2	15	5	1388	16	25	1277	186
Lane Group Flow (vph)	0	186	0	0	19	0	5	1404	0	25	1463	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	22.6	22.6		22.6	22.6		9.6	32.8		9.6	32.8	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		13.3			13.3		41.8	38.8		40.9	40.8	
Actuated g/C Ratio		0.20			0.20		0.64	0.60		0.63	0.63	
v/c Ratio		0.65			0.06		0.02	0.67		0.10	0.67	
Control Delay		32.7			11.1		5.6	13.8		7.9	12.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		32.7			11.1		5.6	13.8		7.9	12.4	
LOS		C			B		A	B		A	B	
Approach Delay		32.7			11.1			13.8			12.3	
Approach LOS		C			B			B			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 14.2

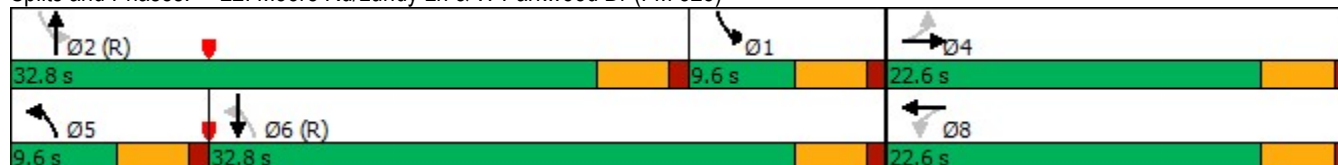
Intersection LOS: B

Intersection Capacity Utilization 61.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	51	80	53	32	116	52	44	412	46	44	619	110
Future Volume (vph)	51	80	53	32	116	52	44	412	46	44	619	110
Satd. Flow (prot)	1770	3327	0	1770	3373	0	1770	3486	0	1770	3458	0
Flt Permitted	0.636			0.660			0.272			0.466		
Satd. Flow (perm)	1185	3327	0	1229	3373	0	507	3486	0	868	3458	0
Satd. Flow (RTOR)		58			57			31			54	
Adj. Flow (vph)	55	87	58	35	126	57	48	448	50	48	673	120
Lane Group Flow (vph)	55	145	0	35	183	0	48	498	0	48	793	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		14.6	14.6		14.6	14.6	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.35	0.35		0.35	0.35	
v/c Ratio	0.11	0.10		0.07	0.12		0.27	0.40		0.16	0.64	
Control Delay	9.0	5.7		8.6	6.1		13.9	10.4		10.3	12.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.0	5.7		8.6	6.1		13.9	10.4		10.3	12.9	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		6.6			6.5			10.7			12.8	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 41.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 10.7

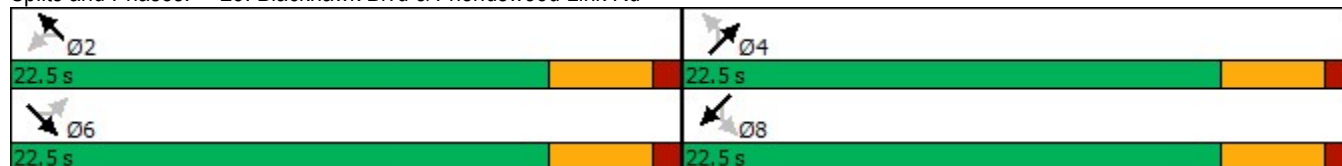
Intersection LOS: B

Intersection Capacity Utilization 48.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	576	6	6	540	57	8	3	7	87	6	44
Future Volume (vph)	19	576	6	6	540	57	8	3	7	87	6	44
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1723	0	0	1727	0
Flt Permitted	0.314			0.328				0.892			0.796	
Satd. Flow (perm)	585	1859	0	611	1837	0	0	1572	0	0	1419	0
Satd. Flow (RTOR)		1			10			8			40	
Adj. Flow (vph)	21	626	7	7	587	62	9	3	8	95	7	48
Lane Group Flow (vph)	21	633	0	7	649	0	0	20	0	0	150	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	42.1	41.7		41.9	41.6			10.1			10.1	
Actuated g/C Ratio	0.70	0.70		0.70	0.69			0.17			0.17	
v/c Ratio	0.04	0.49		0.01	0.51			0.07			0.55	
Control Delay	4.5	10.2		4.5	10.8			15.2			24.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.5	10.2		4.5	10.8			15.2			24.0	
LOS	A	B		A	B			B			C	
Approach Delay		10.0			10.7			15.2			24.0	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 11.8

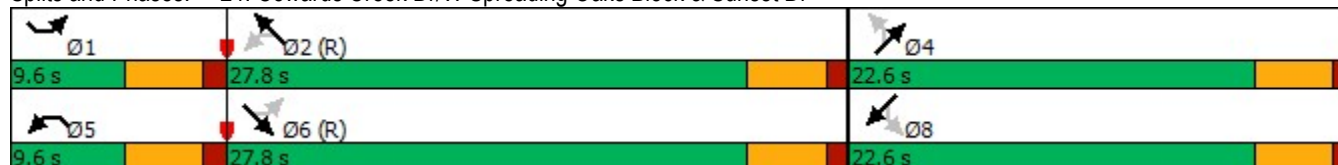
Intersection LOS: B

Intersection Capacity Utilization 51.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	502	154	28	471	4	133	6	33	5	3	5
Future Volume (vph)	8	502	154	28	471	4	133	6	33	5	3	5
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1732	0
Flt Permitted	0.404			0.229				0.767			0.893	
Satd. Flow (perm)	753	1798	0	427	1861	0	0	1392	0	0	1577	0
Satd. Flow (RTOR)		30			1			18			5	
Adj. Flow (vph)	9	546	167	30	512	4	145	7	36	5	3	5
Lane Group Flow (vph)	9	713	0	30	516	0	0	188	0	0	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	32.8		9.6	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	41.1	38.9		42.1	41.1			13.0			13.0	
Actuated g/C Ratio	0.63	0.60		0.65	0.63			0.20			0.20	
v/c Ratio	0.02	0.65		0.08	0.44			0.64			0.04	
Control Delay	5.4	15.9		5.5	9.6			31.1			15.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.4	15.9		5.5	9.6			31.1			15.3	
LOS	A	B		A	A			C			B	
Approach Delay		15.8			9.4			31.1			15.3	
Approach LOS		B			A			C			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 15.4

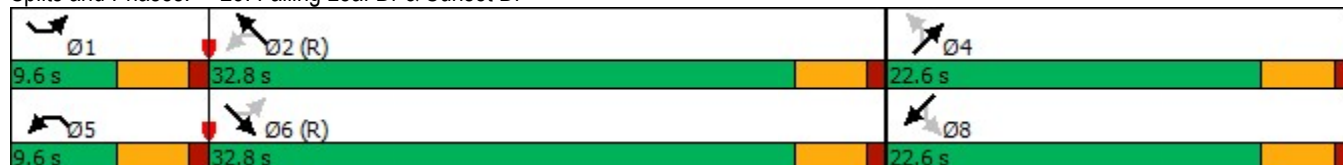
Intersection LOS: B

Intersection Capacity Utilization 59.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	434	67	40	415	45	57	62	54	61	105	27
Future Volume (vph)	20	434	67	40	415	45	57	62	54	61	105	27
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1798	0
Flt Permitted	0.409			0.332				0.744			0.853	
Satd. Flow (perm)	762	1825	0	618	1835	0	0	1386	1583	0	1559	0
Satd. Flow (RTOR)		15			11				109		14	
Adj. Flow (vph)	22	472	73	43	451	49	62	67	59	66	114	29
Lane Group Flow (vph)	22	545	0	43	500	0	0	129	59	0	209	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6	22.6	22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	36.5	34.2		37.5	36.4			12.6	12.6		12.6	
Actuated g/C Ratio	0.61	0.57		0.62	0.61			0.21	0.21		0.21	
v/c Ratio	0.04	0.52		0.09	0.45			0.44	0.14		0.62	
Control Delay	5.7	13.4		5.7	10.1			24.4	2.0		27.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.7	13.4		5.7	10.1			24.4	2.0		27.4	
LOS	A	B		A	B			C	A		C	
Approach Delay		13.1			9.8			17.3			27.4	
Approach LOS		B			A			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 14.4

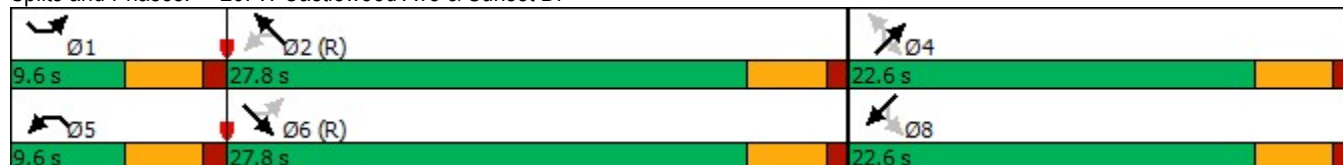
Intersection LOS: B

Intersection Capacity Utilization 57.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	47	205	19	30	155	54	7	55	14	55	88	53
Future Volume (Veh/h)	47	205	19	30	155	54	7	55	14	55	88	53
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	223	21	33	168	59	8	60	15	60	96	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												4
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	227			244			676	628	234	644	610	198
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	227			244			676	628	234	644	610	198
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			97	84	98	81	75	93
cM capacity (veh/h)	1341			1322			264	375	806	317	384	844
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	295	260	83	214								
Volume Left	51	33	8	60								
Volume Right	21	59	15	58								
cSH	1341	1322	397	491								
Volume to Capacity	0.04	0.02	0.21	0.44								
Queue Length 95th (ft)	3	2	19	54								
Control Delay (s)	1.6	1.2	16.5	19.1								
Lane LOS	A	A	C	C								
Approach Delay (s)	1.6	1.2	16.5	19.1								
Approach LOS			C	C								
Intersection Summary												
Average Delay			7.3									
Intersection Capacity Utilization			42.7%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	251	24	88	196	25	70
Future Volume (Veh/h)	251	24	88	196	25	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	273	26	96	213	27	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			299		691	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			299		691	286
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		93	90
cM capacity (veh/h)			1262		379	753
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	299	309	103			
Volume Left	0	96	27			
Volume Right	26	0	76			
cSH	1700	1262	598			
Volume to Capacity	0.18	0.08	0.17			
Queue Length 95th (ft)	0	6	15			
Control Delay (s)	0.0	3.0	12.3			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.0	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			45.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	79	241	197	17	18	84
Future Volume (Veh/h)	79	241	197	17	18	84
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	86	262	214	18	20	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	232				657	223
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	232				657	223
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				95	89
cM capacity (veh/h)	1336				402	817
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	348	232	111			
Volume Left	86	0	20			
Volume Right	0	18	91			
cSH	1336	1700	689			
Volume to Capacity	0.06	0.14	0.16			
Queue Length 95th (ft)	5	0	14			
Control Delay (s)	2.4	0.0	11.2			
Lane LOS	A		B			
Approach Delay (s)	2.4	0.0	11.2			
Approach LOS			B			
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization		44.6%		ICU Level of Service		A
Analysis Period (min)		15				

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	30	41	23	16	72	23	27	160	11	26	176	24
Future Volume (vph)	30	41	23	16	72	23	27	160	11	26	176	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	33	45	25	17	78	25	29	174	12	28	191	26
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	103	120	215	245								
Volume Left (vph)	33	17	29	28								
Volume Right (vph)	25	25	12	26								
Hadj (s)	-0.05	-0.06	0.03	-0.01								
Departure Headway (s)	5.2	5.1	4.8	4.8								
Degree Utilization, x	0.15	0.17	0.29	0.32								
Capacity (veh/h)	626	634	704	713								
Control Delay (s)	9.1	9.2	9.8	10.0								
Approach Delay (s)	9.1	9.2	9.8	10.0								
Approach LOS	A	A	A	B								
Intersection Summary												
Delay	9.7											
Level of Service	A											
Intersection Capacity Utilization	32.1%			ICU Level of Service					A			
Analysis Period (min)	15											

Appendix E

“Year 2030 No-Build” Conditions Analysis

Friendswood TX Traffic Study

No Build AM Peak 2030

1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	864	71	10	1074	16	139	0	41	23	2	25
Future Volume (vph)	15	864	71	10	1074	16	139	0	41	23	2	25
Satd. Flow (prot)	1770	3500	0	1770	3532	0	0	1738	0	0	1696	0
Flt Permitted	0.087			0.142				0.741			0.846	
Satd. Flow (perm)	162	3500	0	265	3532	0	0	1338	0	0	1469	0
Satd. Flow (RTOR)		10			2			85			27	
Adj. Flow (vph)	16	939	77	11	1167	17	151	0	45	25	2	27
Lane Group Flow (vph)	16	1016	0	11	1184	0	0	196	0	0	54	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	78.0		12.0	78.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	63.1	57.2		59.8	57.6			64.4			64.4	
Actuated g/C Ratio	0.47	0.42		0.44	0.43			0.48			0.48	
v/c Ratio	0.11	0.68		0.06	0.79			0.29			0.08	
Control Delay	19.1	33.3		15.9	37.0			15.5			14.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	19.1	33.3		15.9	37.0			15.5			14.8	
LOS	B	C		B	D			B			B	
Approach Delay		33.1			36.8			15.5			14.8	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)	7	369		6	463			51			12	
Queue Length 95th (ft)	17	394		13	479			137			45	
Internal Link Dist (ft)		932			2990			285			455	
Turn Bay Length (ft)	50			100								
Base Capacity (vph)	167	1910		201	1923			682			714	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.10	0.53		0.05	0.62			0.29			0.08	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 33.1

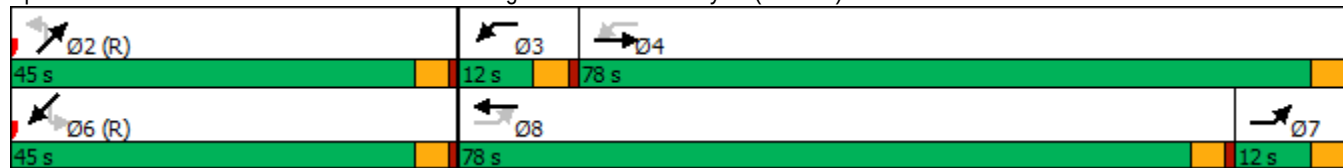
Intersection LOS: C

Intersection Capacity Utilization 54.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



BGE

Synchro 10 Report

Friendswood TX Traffic Study

No Build AM Peak 2030

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	292	672	99	135	601	211	171	602	103	276	511	276
Future Volume (vph)	292	672	99	135	601	211	171	602	103	276	511	276
Satd. Flow (prot)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Satd. Flow (RTOR)		16			44			17			94	
Adj. Flow (vph)	317	730	108	147	653	229	186	654	112	300	555	300
Lane Group Flow (vph)	317	838	0	147	882	0	186	766	0	300	855	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.8	35.7		19.2	30.1		17.2	26.5		23.6	32.9	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	20.1	33.0		12.7	25.6		12.6	22.0		19.0	28.5	
Actuated g/C Ratio	0.19	0.32		0.12	0.24		0.12	0.21		0.18	0.27	
v/c Ratio	0.94	0.76		0.68	1.02		0.88	1.04		0.93	0.87	
Control Delay	77.6	37.5		60.3	73.8		83.0	82.7		79.8	43.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	77.6	37.5		60.3	73.8		83.0	82.7		79.8	43.6	
LOS	E	D		E	E		F	F		E	D	
Approach Delay		48.5			71.9			82.8			53.0	
Approach LOS		D			E			F			D	
Queue Length 50th (ft)	211	264		95	~320		125	~288		201	261	
Queue Length 95th (ft)	#376	344		161	#447		#250	#411		#364	#370	
Internal Link Dist (ft)		496			1080			295			1563	
Turn Bay Length (ft)	80			100			120			130		
Base Capacity (vph)	343	1103		248	864		215	740		322	979	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.92	0.76		0.59	1.02		0.87	1.04		0.93	0.87	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 104.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 62.9

Intersection LOS: E

Intersection Capacity Utilization 89.7%

ICU Level of Service E

Analysis Period (min) 15

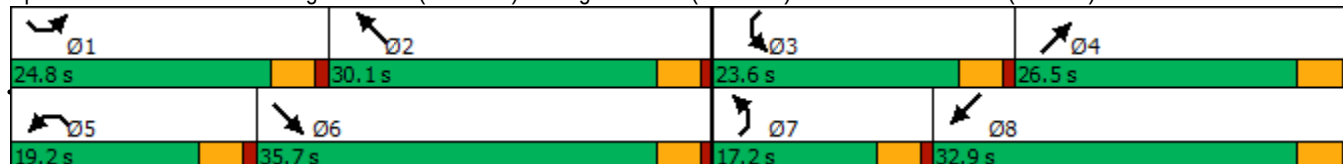
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	903	44	38	1017	10	52	3	57	13	17	5
Future Volume (vph)	5	903	44	38	1017	10	52	3	57	13	17	5
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1694	0	0	1794	0
Flt Permitted	0.231			0.252				0.860			0.844	
Satd. Flow (perm)	430	3514	0	469	3536	0	0	1491	0	0	1544	0
Satd. Flow (RTOR)		6			1			36			5	
Adj. Flow (vph)	5	982	48	41	1105	11	57	3	62	14	18	5
Lane Group Flow (vph)	5	1030	0	41	1116	0	0	122	0	0	37	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	14.0	84.0		15.0	85.0		36.0	36.0		36.0	36.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	89.8	84.3		88.0	88.7			12.0			12.0	
Actuated g/C Ratio	0.80	0.75		0.79	0.79			0.11			0.11	
v/c Ratio	0.01	0.39		0.09	0.40			0.64			0.22	
Control Delay	2.8	6.3		3.2	4.8			48.1			42.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	2.8	6.3		3.2	4.8			48.1			42.8	
LOS	A	A		A	A			D			D	
Approach Delay		6.3			4.7			48.1			42.8	
Approach LOS		A			A			D			D	
Queue Length 50th (ft)	1	134		4	88			59			21	
Queue Length 95th (ft)	3	213		14	230			122			54	
Internal Link Dist (ft)		1418			1651			1271			991	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	462	2653		502	2809			447			439	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.39		0.08	0.40			0.27			0.08	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 111.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 8.3

Intersection LOS: A

Intersection Capacity Utilization 48.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
14 s	85 s	36 s
		
Ø5	Ø6	Ø8
15 s	84 s	36 s

Friendswood TX Traffic Study

No Build AM Peak 2030

4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	910	51	95	966	22	74	5	89	22	6	22
Future Volume (vph)	22	910	51	95	966	22	74	5	89	22	6	22
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1691	0	0	1716	0
Flt Permitted	0.230			0.232				0.854			0.780	
Satd. Flow (perm)	428	3511	0	432	3529	0	0	1476	0	0	1367	0
Satd. Flow (RTOR)		6			3			41			24	
Adj. Flow (vph)	24	989	55	103	1050	24	80	5	97	24	7	24
Lane Group Flow (vph)	24	1044	0	103	1074	0	0	182	0	0	55	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	13.0	75.0		20.0	82.0		40.0	40.0		40.0	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	83.1	73.9		81.1	79.6			16.3			16.3	
Actuated g/C Ratio	0.75	0.67		0.73	0.72			0.15			0.15	
v/c Ratio	0.06	0.45		0.26	0.42			0.73			0.25	
Control Delay	4.4	10.3		5.5	8.4			51.6			29.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.4	10.3		5.5	8.4			51.6			29.6	
LOS	A	B		A	A			D			C	
Approach Delay		10.1			8.2			51.6			29.6	
Approach LOS		B			A			D			C	
Queue Length 50th (ft)	3	167		15	167			100			20	
Queue Length 95th (ft)	12	275		38	268			178			58	
Internal Link Dist (ft)		828			966			420			507	
Turn Bay Length (ft)	100			150								
Base Capacity (vph)	428	2339		521	2531			502			456	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.06	0.45		0.20	0.42			0.36			0.12	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 111

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 12.7

Intersection LOS: B

Intersection Capacity Utilization 55.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
13 s	82 s	40 s
		
Ø5	Ø6	Ø8
20 s	75 s	40 s

Friendswood TX Traffic Study

No Build AM Peak 2030

5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	7	2	167	1	173	18	1041	166	117	879	8
Future Volume (vph)	0	7	2	167	1	173	18	1041	166	117	879	8
Satd. Flow (prot)	0	1812	0	0	1775	1583	0	3465	0	1770	3536	0
Flt Permitted					0.721			0.929		0.147		
Satd. Flow (perm)	0	1812	0	0	1343	1583	0	3222	0	274	3536	0
Satd. Flow (RTOR)		2				182		22			2	
Adj. Flow (vph)	0	8	2	182	1	188	20	1132	180	127	955	9
Lane Group Flow (vph)	0	10	0	0	183	188	0	1332	0	127	964	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	38.0	38.0		38.0	38.0	38.0	84.0	84.0		13.0	97.0	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		22.1			22.1	22.1		80.7		88.3	92.8	
Actuated g/C Ratio		0.18			0.18	0.18		0.65		0.71	0.75	
v/c Ratio		0.03			0.77	0.44		0.63		0.44	0.36	
Control Delay		35.6			68.7	9.7		15.4		10.3	6.5	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		35.6			68.7	9.7		15.4		10.3	6.5	
LOS		D			E	A		B		B	A	
Approach Delay		35.6			38.8			15.4			6.9	
Approach LOS		D			D			B			A	
Queue Length 50th (ft)		5			141	4		303		24	120	
Queue Length 95th (ft)		21			222	66		481		57	211	
Internal Link Dist (ft)		91			1708			813			746	
Turn Bay Length (ft)										100		
Base Capacity (vph)		492			364	561		2106		300	2648	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.02			0.50	0.34		0.63		0.42	0.36	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 123.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 15.3

Intersection LOS: B

Intersection Capacity Utilization 86.4%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

		
Ø1	Ø2	Ø4
13 s	84 s	38 s
		
Ø6		Ø8
97 s		38 s

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	52	739	18	226	800	25	30	46	33	10	30	227
Future Volume (vph)	52	739	18	226	800	25	30	46	33	10	30	227
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1761	0	0	1840	1583
Flt Permitted	0.950			0.950				0.897			0.910	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1602	0	0	1695	1583
Satd. Flow (RTOR)		2			4			15				247
Adj. Flow (vph)	57	803	20	246	870	27	33	50	36	11	33	247
Lane Group Flow (vph)	57	823	0	246	897	0	0	119	0	0	44	247
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	19.0	57.0		42.0	80.0		36.0	36.0		36.0	36.0	36.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	8.9	62.5		20.1	76.1			12.3			12.3	12.3
Actuated g/C Ratio	0.08	0.58		0.19	0.70			0.11			0.11	0.11
v/c Ratio	0.40	0.41		0.75	0.36			0.61			0.23	0.62
Control Delay	57.5	14.8		57.1	8.1			54.6			47.8	13.0
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	57.5	14.8		57.1	8.1			54.6			47.8	13.0
LOS	E	B		E	A			D			D	B
Approach Delay		17.5			18.7			54.6			18.3	
Approach LOS		B			B			D			B	
Queue Length 50th (ft)	39	157		167	126			71			29	0
Queue Length 95th (ft)	85	265		257	208			135			66	74
Internal Link Dist (ft)		2078			699			1594			1683	
Turn Bay Length (ft)	110			170								
Base Capacity (vph)	238	2031		616	2471			479			496	638
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.24	0.41		0.40	0.36			0.25			0.09	0.39

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 108.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 20.0

Intersection LOS: B

Intersection Capacity Utilization 57.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr

		
Ø1	Ø2	Ø4
42 s	57 s	36 s
		
Ø5	Ø6	Ø8
19 s	80 s	36 s

Friendswood TX Traffic Study

No Build AM Peak 2030

7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	499	723	359	167	502	297	286	1467	379	191	736	66
Future Volume (vph)	499	723	359	167	502	297	286	1467	379	191	736	66
Satd. Flow (prot)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Satd. Flow (RTOR)		69				323		50			10	
Adj. Flow (vph)	542	786	390	182	546	323	311	1595	412	208	800	72
Lane Group Flow (vph)	542	1176	0	182	546	323	311	2007	0	208	872	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	41.0	50.7		17.3	27.0	27.0	34.2	48.0		19.0	32.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.5	46.2		12.8	22.5	22.5	27.1	43.5		14.5	30.9	
Actuated g/C Ratio	0.27	0.34		0.09	0.17	0.17	0.20	0.32		0.11	0.23	
v/c Ratio	1.13	0.98		1.09	0.93	0.61	0.88	1.24		1.09	0.75	
Control Delay	127.7	63.9		151.1	78.3	10.3	77.0	150.9		147.5	53.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	127.7	63.9		151.1	78.3	10.3	77.0	150.9		147.5	53.3	
LOS	F	E		F	E	B	E	F		F	D	
Approach Delay		84.0			70.0			141.0			71.4	
Approach LOS		F			E			F			E	
Queue Length 50th (ft)	~551	513		~179	251	0	261	~789		~206	266	
Queue Length 95th (ft)	#777	#671		#333	#359	88	#401	#885		#369	320	
Internal Link Dist (ft)		2375			2078			1141			1176	
Turn Bay Length (ft)	180			200		200	250			140		
Base Capacity (vph)	478	1195		167	589	533	389	1621		190	1157	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	1.13	0.98		1.09	0.93	0.61	0.80	1.24		1.09	0.75	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 100.8

Intersection LOS: F

Intersection Capacity Utilization 103.9%

ICU Level of Service G

Analysis Period (min) 15

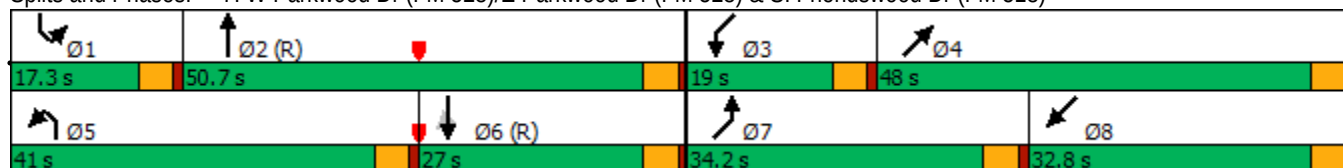
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	23	1642	984	76	227	49
Future Volume (vph)	23	1642	984	76	227	49
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.204				0.950	
Satd. Flow (perm)	380	3539	3500	0	1688	1583
Satd. Flow (RTOR)			10			53
Adj. Flow (vph)	25	1785	1070	83	247	53
Lane Group Flow (vph)	25	1785	1153	0	247	53
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	11.0	100.0	89.0		40.0	40.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	103.5	106.2	99.7		24.8	24.8
Actuated g/C Ratio	0.74	0.76	0.71		0.18	0.18
v/c Ratio	0.07	0.67	0.46		0.79	0.16
Control Delay	5.8	10.5	10.7		72.3	11.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	5.8	10.5	10.7		72.3	11.9
LOS	A	B	B		E	B
Approach Delay		10.5	10.7		61.6	
Approach LOS		B	B		E	
Queue Length 50th (ft)	5	367	238		217	0
Queue Length 95th (ft)	15	550	349		296	36
Internal Link Dist (ft)		550	2375		438	
Turn Bay Length (ft)	150					
Base Capacity (vph)	346	2684	2494		448	440
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.07	0.67	0.46		0.55	0.12

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 15.3

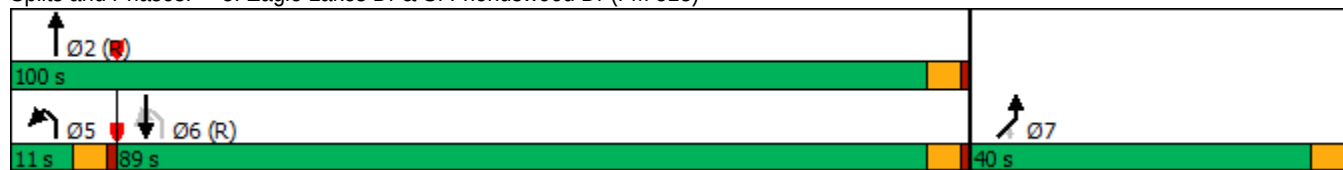
Intersection LOS: B

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	50	573	135	83	944	11	251	18	121	11	20	187
Future Volume (vph)	50	573	135	83	944	11	251	18	121	11	20	187
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.165			0.344			0.950			0.950		
Satd. Flow (perm)	307	3539	1583	641	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			156			156			132			176
Adj. Flow (vph)	54	623	147	90	1026	12	273	20	132	12	22	203
Lane Group Flow (vph)	54	623	147	90	1026	12	273	20	132	12	22	203
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	10.0	44.0	44.0	10.0	44.0	44.0	28.0	41.0	41.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	58.8	52.4	52.4	58.8	53.0	53.0	20.2	31.6	31.6	5.5	8.9	8.9
Actuated g/C Ratio	0.56	0.50	0.50	0.56	0.50	0.50	0.19	0.30	0.30	0.05	0.08	0.08
v/c Ratio	0.20	0.35	0.17	0.20	0.58	0.01	0.80	0.04	0.23	0.13	0.14	0.69
Control Delay	13.1	19.0	3.5	12.3	22.2	0.0	58.3	24.3	5.5	50.8	44.1	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.1	19.0	3.5	12.3	22.2	0.0	58.3	24.3	5.5	50.8	44.1	22.3
LOS	B	B	A	B	C	A	E	C	A	D	D	C
Approach Delay		15.9			21.2			40.3			25.8	
Approach LOS		B			C			D			C	
Queue Length 50th (ft)	14	133	0	24	251	0	174	9	0	8	14	18
Queue Length 95th (ft)	39	216	36	58	396	0	261	27	42	27	36	85
Internal Link Dist (ft)		956			2431			1290			159	
Turn Bay Length (ft)	100		890	100		420	120			100		100
Base Capacity (vph)	268	1765	867	440	1784	875	396	654	642	92	328	423
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.35	0.17	0.20	0.58	0.01	0.69	0.03	0.21	0.13	0.07	0.48

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 23.0

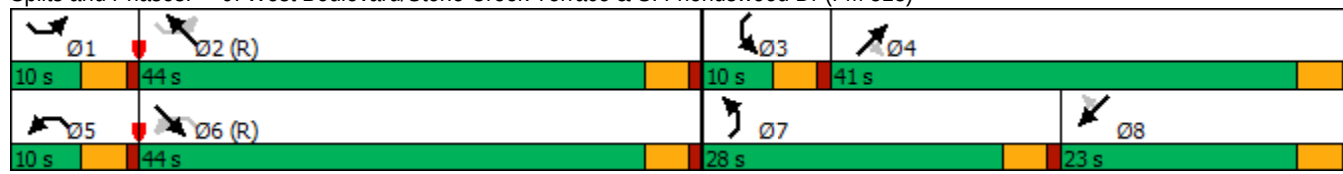
Intersection LOS: C

Intersection Capacity Utilization 62.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	354	759	82	93	665	362	136	378	224	189	88	130
Future Volume (vph)	354	759	82	93	665	362	136	378	224	189	88	130
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3224	0
Flt Permitted	0.139			0.209			0.583			0.220		
Satd. Flow (perm)	259	3539	1583	389	3539	1583	1086	3341	0	410	3224	0
Satd. Flow (RTOR)			136			296		95			141	
Adj. Flow (vph)	385	825	89	101	723	393	148	411	243	205	96	141
Lane Group Flow (vph)	385	825	89	101	723	393	148	654	0	205	237	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	32.0	55.4	55.4	10.6	34.0	34.0	11.3	33.8		20.2	42.7	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	53.9	47.8	47.8	53.9	28.7	28.7	48.1	34.6		48.1	40.5	
Actuated g/C Ratio	0.45	0.40	0.40	0.45	0.24	0.24	0.40	0.29		0.40	0.34	
v/c Ratio	0.89	0.59	0.13	0.41	0.86	0.65	0.31	0.63		0.65	0.20	
Control Delay	63.9	29.9	1.2	21.3	54.7	16.0	24.4	36.1		32.8	12.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	63.9	29.9	1.2	21.3	54.7	16.0	24.4	36.1		32.8	12.5	
LOS	E	C	A	C	D	B	C	D		C	B	
Approach Delay		38.0			39.4			33.9			21.9	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	228	248	0	39	281	61	72	210		104	27	
Queue Length 95th (ft)	#385	311	9	70	355	172	120	282		163	58	
Internal Link Dist (ft)		2502			2504			568			528	
Turn Bay Length (ft)	200		290	220		1000	80			80		
Base Capacity (vph)	467	1501	749	244	870	612	479	1031		348	1182	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.82	0.55	0.12	0.41	0.83	0.64	0.31	0.63		0.59	0.20	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 35.7

Intersection LOS: D

Intersection Capacity Utilization 81.1%

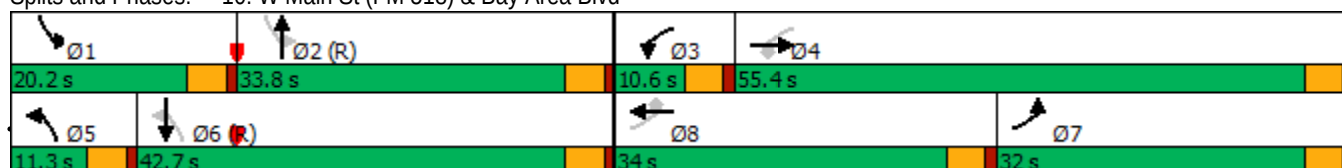
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	29	195	90	31	303	62	134	1581	47	64	773	103
Future Volume (vph)	29	195	90	31	303	62	134	1581	47	64	773	103
Satd. Flow (prot)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Flt Permitted		0.995			0.996		0.950			0.950		
Satd. Flow (perm)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Satd. Flow (RTOR)		14			7			3			13	
Adj. Flow (vph)	32	212	98	34	329	67	146	1718	51	70	840	112
Lane Group Flow (vph)	0	342	0	0	430	0	146	1769	0	70	952	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.0	24.0		31.6	31.6		20.4	54.4		10.0	44.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		19.5			27.1		13.8	49.9		5.5	41.6	
Actuated g/C Ratio		0.16			0.23		0.12	0.42		0.05	0.35	
v/c Ratio		1.14			1.04		0.72	1.21		0.86	0.79	
Control Delay		137.4			98.7		70.5	131.9		124.7	40.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		137.4			98.7		70.5	131.9		124.7	40.7	
LOS		F			F		E	F		F	D	
Approach Delay		137.4			98.7			127.2			46.5	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)		~300			~354		109	~881		55	348	
Queue Length 95th (ft)		#490			#559		180	#1023		#146	436	
Internal Link Dist (ft)		1651			3732			5386			1771	
Turn Bay Length (ft)							360			260		
Base Capacity (vph)		301			415		234	1467		81	1212	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		1.14			1.04		0.62	1.21		0.86	0.79	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 102.6

Intersection LOS: F

Intersection Capacity Utilization 87.7%

ICU Level of Service E

Analysis Period (min) 15

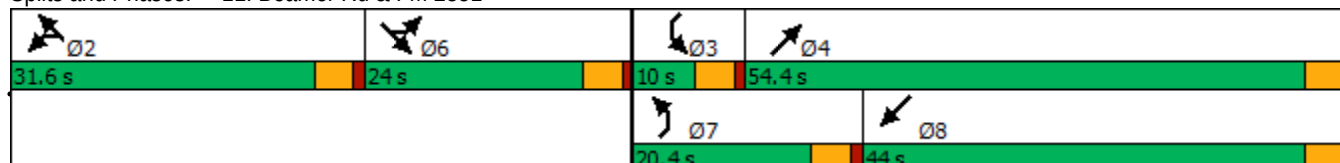
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1386	39	86	798	108	155
Future Volume (vph)	1386	39	86	798	108	155
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	4					168
Adj. Flow (vph)	1507	42	93	867	117	168
Lane Group Flow (vph)	1549	0	93	867	117	168
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	50.0		14.4	64.4	25.6	25.6
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	41.7		8.8	52.2	21.7	21.7
Actuated g/C Ratio	0.50		0.11	0.63	0.26	0.26
v/c Ratio	0.87		0.50	0.39	0.13	0.31
Control Delay	25.7		47.6	7.7	27.5	6.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	25.7		47.6	7.7	27.5	6.6
LOS	C		D	A	C	A
Approach Delay	25.7			11.6	15.2	
Approach LOS	C			B	B	
Queue Length 50th (ft)	387		51	101	27	0
Queue Length 95th (ft)	494		99	133	49	49
Internal Link Dist (ft)	687			427	507	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1985		216	2609	895	537
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.78		0.43	0.33	0.13	0.31

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 59.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & E. Edgewood Ave (FM 2351)

↖ Ø2	↘ Ø3	→ Ø4
25.6 s	14.4 s	50 s
	← Ø8	
	64.4 s	

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	157	0	133	0	0	0	56	1262	0	0	891	54
Future Volume (vph)	157	0	133	0	0	0	56	1262	0	0	891	54
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.159					
Satd. Flow (perm)	0	1410	1583	0	1863	0	296	3539	0	1863	3507	0
Satd. Flow (RTOR)			145								9	
Adj. Flow (vph)	171	0	145	0	0	0	61	1372	0	0	968	59
Lane Group Flow (vph)	0	171	145	0	0	0	61	1372	0	0	1027	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.8	68.0				33.5	36.0			29.6	
Actuated g/C Ratio		0.34	1.00				0.49	0.53			0.44	
v/c Ratio		0.36	0.09				0.21	0.73			0.67	
Control Delay		22.6	0.1				8.9	14.5			18.4	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		22.6	0.1				8.9	14.5			18.4	
LOS		C	A				A	B			B	
Approach Delay		12.3						14.3			18.4	
Approach LOS		B						B			B	
Queue Length 50th (ft)		56	0				11	209			192	
Queue Length 95th (ft)		126	0				25	274			263	
Internal Link Dist (ft)		212			271			289			1965	
Turn Bay Length (ft)							120					
Base Capacity (vph)		473	1583				385	3534			3452	
Starvation Cap Reductn		0	0				0	0			0	
Spillback Cap Reductn		0	0				0	0			0	
Storage Cap Reductn		0	0				0	0			0	
Reduced v/c Ratio		0.36	0.09				0.16	0.39			0.30	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 68

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 15.6

Intersection LOS: B

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351 & Royal Ct/Woodland Trail Dr

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	123	5	261	2	1	1	91	1214	2	15	960	35
Future Volume (vph)	123	5	261	2	1	1	91	1214	2	15	960	35
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.908		0.148			0.106		
Satd. Flow (perm)	1406	1589	0	0	1634	0	276	3539	0	197	3522	0
Satd. Flow (RTOR)		225			1						5	
Adj. Flow (vph)	134	5	284	2	1	1	99	1320	2	16	1043	38
Lane Group Flow (vph)	134	289	0	0	4	0	99	1322	0	16	1081	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	23.1	23.1			23.1		37.2	39.1		39.9	31.4	
Actuated g/C Ratio	0.32	0.32			0.32		0.51	0.54		0.55	0.43	
v/c Ratio	0.30	0.44			0.01		0.34	0.70		0.07	0.71	
Control Delay	25.2	9.2			21.2		10.2	14.8		6.8	20.2	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	25.2	9.2			21.2		10.2	14.8		6.8	20.2	
LOS	C	A			C		B	B		A	C	
Approach Delay		14.3			21.3			14.5			20.0	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	46	21			1		19	196		3	211	
Queue Length 95th (ft)	119	102			10		36	349		9	283	
Internal Link Dist (ft)		1749			166			1563			466	
Turn Bay Length (ft)	120						180			100		
Base Capacity (vph)	444	656			517		458	3440		229	3257	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.30	0.44			0.01		0.22	0.38		0.07	0.33	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 73

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 16.5

Intersection LOS: B

Intersection Capacity Utilization 65.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln

 Ø2	 Ø3	 Ø4
27 s	10 s	83 s
 Ø6	 Ø7	 Ø8
27 s	19 s	74 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	31	35	60	100	8	339	25	407	107	341	289	22
Future Volume (vph)	31	35	60	100	8	339	25	407	107	341	289	22
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1842	0
Flt Permitted		0.916			0.690		0.508			0.337		
Satd. Flow (perm)	0	1597	0	0	1285	1583	946	1805	0	628	1842	0
Satd. Flow (RTOR)		35				368		26			8	
Adj. Flow (vph)	34	38	65	109	9	368	27	442	116	371	314	24
Lane Group Flow (vph)	0	137	0	0	118	368	27	558	0	371	338	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		29.1			29.1	87.4	48.8	48.8		48.8	48.8	
Actuated g/C Ratio		0.33			0.33	1.00	0.56	0.56		0.56	0.56	
v/c Ratio		0.25			0.28	0.23	0.05	0.55		1.06	0.33	
Control Delay		23.2			31.2	0.3	7.1	12.4		84.1	9.7	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		23.2			31.2	0.3	7.1	12.4		84.1	9.7	
LOS		C			C	A	A	B		F	A	
Approach Delay		23.2			7.8			12.2			48.6	
Approach LOS		C			A			B			D	
Queue Length 50th (ft)		38			45	0	6	161		~215	85	
Queue Length 95th (ft)		126			137	0	15	228		#439	125	
Internal Link Dist (ft)		99			1232			1295			2821	
Turn Bay Length (ft)							100			135		
Base Capacity (vph)		554			427	1583	857	1638		569	1670	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.25			0.28	0.23	0.03	0.34		0.65	0.20	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 87.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 25.3

Intersection LOS: C

Intersection Capacity Utilization 72.0%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			  			  	
Traffic Volume (vph)	392	1920	31	90	855	82	119	591	373	128	176	225
Future Volume (vph)	392	1920	31	90	855	82	119	591	373	128	176	225
Satd. Flow (prot)	1770	5075	0	1770	5019	0	1770	3334	0	1770	3242	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5075	0	1770	5019	0	1770	3334	0	1770	3242	0
Satd. Flow (RTOR)		2			15			65			150	
Adj. Flow (vph)	426	2087	34	98	929	89	129	642	405	139	191	245
Lane Group Flow (vph)	426	2121	0	98	1018	0	129	1047	0	139	436	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	84.0		9.5	84.0		9.5	51.0		9.5	51.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	77.5		5.0	77.5		7.0	46.5		7.0	46.5	
Actuated g/C Ratio	0.03	0.50		0.03	0.50		0.05	0.30		0.05	0.30	
v/c Ratio	7.47	0.83		1.72	0.40		1.61	1.00		1.74	0.40	
Control Delay	2957.5	36.0		426.2	23.8		363.5	76.3		412.6	28.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2957.5	36.0		426.2	23.8		363.5	76.3		412.6	28.5	
LOS	F	D		F	C		F	E		F	C	
Approach Delay		524.6			59.2			107.8			121.4	
Approach LOS		F			E			F			F	
Queue Length 50th (ft)	~828	634		~144	219		~209	528		~230	118	
Queue Length 95th (ft)	#1047	697		#272	254		#351	#686		#378	170	
Internal Link Dist (ft)		2394			1837			501			792	
Turn Bay Length (ft)	150			150			100			100		
Base Capacity (vph)	57	2620		57	2598		80	1052		80	1083	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	7.47	0.81		1.72	0.39		1.61	1.00		1.74	0.40	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 7.47

Intersection Signal Delay: 295.3

Intersection LOS: F

Intersection Capacity Utilization 93.2%

ICU Level of Service F

Analysis Period (min) 15

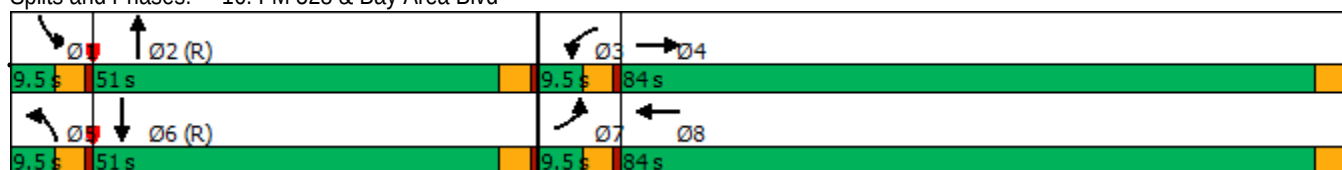
~ Volume exceeds capacity, queue is theoretically infinite.

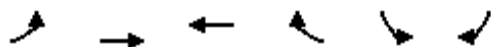
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	←	↑↑↑	↑↑↑		←	↑
Traffic Volume (vph)	49	1689	854	137	225	81
Future Volume (vph)	49	1689	854	137	225	81
Satd. Flow (prot)	1770	5085	4979	0	1770	1583
Flt Permitted	0.178				0.950	
Satd. Flow (perm)	332	5085	4979	0	1770	1583
Satd. Flow (RTOR)			33			88
Adj. Flow (vph)	53	1836	928	149	245	88
Lane Group Flow (vph)	53	1836	1077	0	245	88
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	14.0	88.0	74.0		47.0	47.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	64.4	68.0	57.7		58.0	58.0
Actuated g/C Ratio	0.48	0.50	0.43		0.43	0.43
v/c Ratio	0.22	0.72	0.50		0.32	0.12
Control Delay	17.4	27.4	27.9		28.8	5.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	17.4	27.4	27.9		28.8	5.8
LOS	B	C	C		C	A
Approach Delay		27.1	27.9		22.7	
Approach LOS		C	C		C	
Queue Length 50th (ft)	23	442	247		141	0
Queue Length 95th (ft)	39	424	261		236	37
Internal Link Dist (ft)		453	2394		620	
Turn Bay Length (ft)	150					
Base Capacity (vph)	261	3145	2579		759	729
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.20	0.58	0.42		0.32	0.12

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 26.9

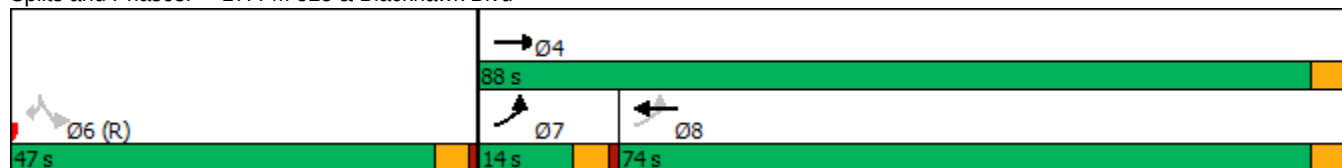
Intersection LOS: C

Intersection Capacity Utilization 52.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	243	28	46	38	72	174	66	1800	35	55	849	176
Future Volume (vph)	243	28	46	38	72	174	66	1800	35	55	849	176
Satd. Flow (prot)	0	1758	0	0	1696	0	1770	5070	0	1770	4953	0
Flt Permitted		0.524			0.914		0.164			0.069		
Satd. Flow (perm)	0	957	0	0	1561	0	305	5070	0	129	4953	0
Satd. Flow (RTOR)		8			73			2			39	
Adj. Flow (vph)	264	30	50	41	78	189	72	1957	38	60	923	191
Lane Group Flow (vph)	0	344	0	0	308	0	72	1995	0	60	1114	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	65.8	65.8		65.8	65.8		11.2	62.0		12.2	63.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		63.2			63.2		64.2	58.2		64.2	58.8	
Actuated g/C Ratio		0.45			0.45		0.46	0.42		0.46	0.42	
v/c Ratio		0.79			0.41		0.34	0.95		0.42	0.53	
Control Delay		47.5			21.8		23.4	50.1		27.7	30.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		47.5			21.8		23.4	50.1		27.7	30.3	
LOS		D			C		C	D		C	C	
Approach Delay		47.5			21.8			49.2			30.1	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)		265			144		34	639		28	265	
Queue Length 95th (ft)		#445			226		62	#753		54	311	
Internal Link Dist (ft)		1683			1296			1176			3206	
Turn Bay Length (ft)							240			140		
Base Capacity (vph)		436			744		210	2107		149	2103	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.79			0.41		0.34	0.95		0.40	0.53	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 41.1

Intersection LOS: D

Intersection Capacity Utilization 89.0%

ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

 Ø2 (R)	 Ø3	 Ø4
65.8 s	12.2 s	62 s
 Ø6 (R)	 Ø7	 Ø8
65.8 s	11.2 s	63 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	447	57	110	26	35	19	163	1686	35	18	1047	444
Future Volume (vph)	447	57	110	26	35	19	163	1686	35	18	1047	444
Satd. Flow (prot)	1770	1678	0	1770	1764	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.719			0.636			0.174			0.148		
Satd. Flow (perm)	1339	1678	0	1185	1764	0	324	5070	0	276	3539	1583
Satd. Flow (RTOR)		120			21			5				483
Adj. Flow (vph)	486	62	120	28	38	21	177	1833	38	20	1138	483
Lane Group Flow (vph)	486	182	0	28	59	0	177	1871	0	20	1138	483
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	26.5	26.5		26.5	26.5		9.6	24.0		9.5	23.9	23.9
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	22.0	22.0		22.0	22.0		24.5	27.1		28.1	19.4	19.4
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.41	0.45		0.47	0.32	0.32
v/c Ratio	0.99	0.26		0.06	0.09		0.69	0.82		0.08	0.99	0.58
Control Delay	62.0	6.5		12.9	9.5		27.2	20.4		10.4	48.3	5.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	62.0	6.5		12.9	9.5		27.2	20.4		10.4	48.3	5.0
LOS	E	A		B	A		C	C		B	D	A
Approach Delay		46.9			10.6			21.0			35.1	
Approach LOS		D			B			C			D	
Queue Length 50th (ft)	170	14		6	9		34	187		4	212	0
Queue Length 95th (ft)	#346	50		21	29		#98	#391		13	#343	56
Internal Link Dist (ft)		1366			368			1378			1141	
Turn Bay Length (ft)	50						180			160		
Base Capacity (vph)	490	691		434	660		255	2293		253	1144	838
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.99	0.26		0.06	0.09		0.69	0.82		0.08	0.99	0.58

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 29.9

Intersection LOS: C

Intersection Capacity Utilization 80.7%

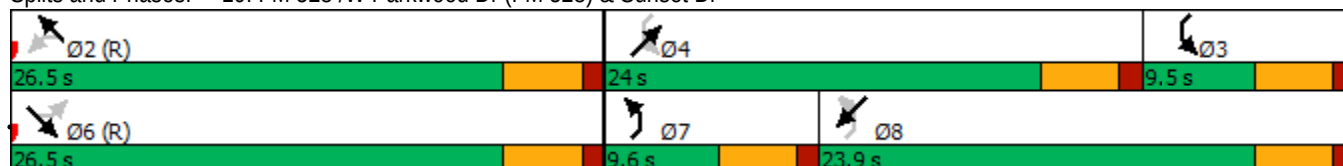
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



Friendswood TX Traffic Study

No Build AM Peak 2030

20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	1738	148	82	1051	18	107	144	247	13	86	127
Future Volume (vph)	264	1738	148	82	1051	18	107	144	247	13	86	127
Satd. Flow (prot)	1770	3497	0	1770	3529	0	0	1824	1583	0	1716	0
Flt Permitted	0.156			0.070				0.557			0.974	
Satd. Flow (perm)	291	3497	0	130	3529	0	0	1038	1583	0	1676	0
Satd. Flow (RTOR)		15			3				137		60	
Adj. Flow (vph)	287	1889	161	89	1142	20	116	157	268	14	93	138
Lane Group Flow (vph)	287	2050	0	89	1162	0	0	273	268	0	245	0
Turn Type	D,P+P	NA		D,P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	61.4	56.9		62.4	51.9			22.6	22.6		22.6	
Actuated g/C Ratio	0.63	0.58		0.64	0.53			0.23	0.23		0.23	
v/c Ratio	0.88	1.00		0.45	0.62			1.14	0.57		0.57	
Control Delay	41.2	42.0		17.4	17.5			137.9	21.8		31.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	41.2	42.0		17.4	17.5			137.9	21.8		31.2	
LOS	D	D		B	B			F	C		C	
Approach Delay		41.9			17.5			80.4			31.2	
Approach LOS		D			B			F			C	
Queue Length 50th (ft)	68	~736		17	249			~208	71		105	
Queue Length 95th (ft)	#220	#879		52	314			#367	157		186	
Internal Link Dist (ft)		1769			1275			1023			92	
Turn Bay Length (ft)	180			180					100			
Base Capacity (vph)	327	2048		204	1978			240	471		433	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.88	1.00		0.44	0.59			1.14	0.57		0.57	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 97.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.14

Intersection Signal Delay: 39.1

Intersection LOS: D

Intersection Capacity Utilization 98.8%

ICU Level of Service F

Analysis Period (min) 15

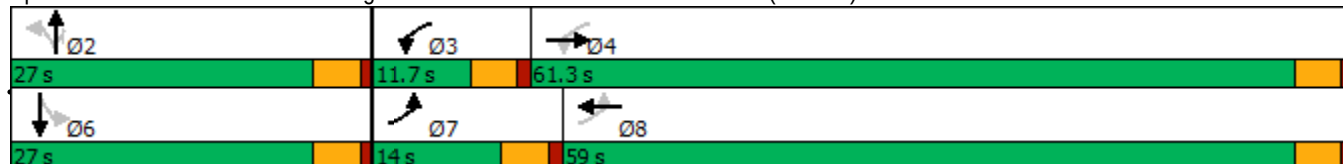
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	135	3	13	56	1	201	2	1392	15	70	966	55
Future Volume (vph)	135	3	13	56	1	201	2	1392	15	70	966	55
Satd. Flow (prot)	0	1761	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.478			0.900		0.173			0.060		
Satd. Flow (perm)	0	880	0	0	1500	0	322	3532	0	112	3511	0
Satd. Flow (RTOR)		4			137			1			7	
Adj. Flow (vph)	147	3	14	61	1	218	2	1513	16	76	1050	60
Lane Group Flow (vph)	0	164	0	0	280	0	2	1529	0	76	1110	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	47.0	47.0		47.0	47.0		10.0	75.0		13.0	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		49.3			49.3		75.8	67.2		74.2	74.7	
Actuated g/C Ratio		0.37			0.37		0.56	0.50		0.55	0.55	
v/c Ratio		0.51			0.44		0.01	0.87		0.52	0.57	
Control Delay		42.0			20.0		10.0	36.2		47.7	20.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		42.0			20.0		10.0	36.2		47.7	20.7	
LOS		D			C		A	D		D	C	
Approach Delay		42.0			20.0			36.1			22.4	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)		114			95		1	593		27	287	
Queue Length 95th (ft)		202			188		4	681		63	393	
Internal Link Dist (ft)		275			319			544			5578	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		323			634		239	1844		167	2015	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.51			0.44		0.01	0.83		0.46	0.55	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 29.9

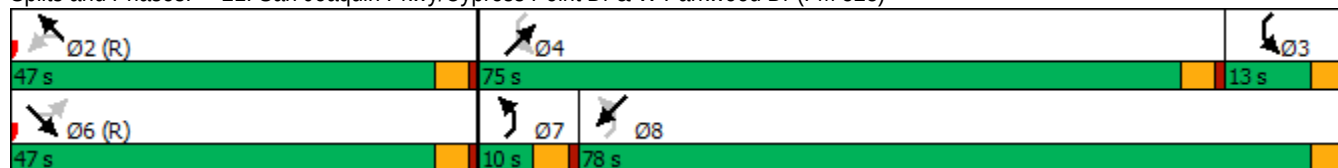
Intersection LOS: C

Intersection Capacity Utilization 81.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



Friendswood TX Traffic Study

No Build AM Peak 2030

22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	0	20	2	1	30	6	1025	6	12	861	113
Future Volume (vph)	32	0	20	2	1	30	6	1025	6	12	861	113
Satd. Flow (prot)	0	1713	0	0	1627	0	1770	3536	0	1770	3479	0
Flt Permitted		0.907			0.980		0.259			0.237		
Satd. Flow (perm)	0	1602	0	0	1599	0	482	3536	0	441	3479	0
Satd. Flow (RTOR)		88			33			1			21	
Adj. Flow (vph)	35	0	22	2	1	33	7	1114	7	13	936	123
Lane Group Flow (vph)	0	57	0	0	36	0	7	1121	0	13	1059	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	29.0	29.0		29.0	29.0		14.0	87.0		14.0	87.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		6.5			6.5		115.6	111.8		115.6	115.3	
Actuated g/C Ratio		0.05			0.05		0.89	0.86		0.89	0.89	
v/c Ratio		0.35			0.32		0.01	0.37		0.03	0.34	
Control Delay		9.8			28.5		1.2	3.5		1.3	2.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		9.8			28.5		1.2	3.5		1.3	2.2	
LOS		A			C		A	A		A	A	
Approach Delay		9.8			28.5			3.4			2.2	
Approach LOS		A			C			A			A	
Queue Length 50th (ft)		0			2		1	52		1	47	
Queue Length 95th (ft)		18			38		2	187		3	145	
Internal Link Dist (ft)		523			1267			1499			1231	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		373			328		525	3040		486	3088	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.15			0.11		0.01	0.37		0.03	0.34	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 3.4

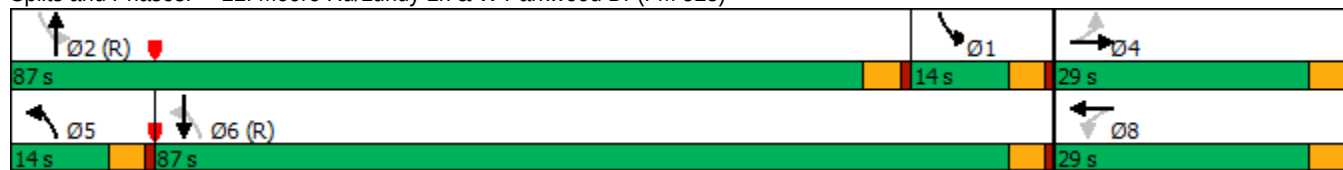
Intersection LOS: A

Intersection Capacity Utilization 45.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	85	96	64	78	73	37	61	379	77	27	329	49
Future Volume (vph)	85	96	64	78	73	37	61	379	77	27	329	49
Satd. Flow (prot)	1770	3327	0	1770	3362	0	1770	3451	0	1770	3472	0
Flt Permitted	0.677			0.642			0.395			0.306		
Satd. Flow (perm)	1261	3327	0	1196	3362	0	736	3451	0	570	3472	0
Satd. Flow (RTOR)		70			40			29			20	
Adj. Flow (vph)	92	104	70	85	79	40	66	412	84	29	358	53
Lane Group Flow (vph)	92	174	0	85	119	0	66	496	0	29	411	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	55.0	55.0		55.0	55.0		65.0	65.0		65.0	65.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	50.6	50.6		50.6	50.6		16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.67	0.67		0.67	0.67		0.21	0.21		0.21	0.21	
v/c Ratio	0.11	0.08		0.11	0.05		0.43	0.66		0.24	0.55	
Control Delay	5.6	3.2		5.6	3.6		34.6	30.1		29.7	28.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.6	3.2		5.6	3.6		34.6	30.1		29.7	28.0	
LOS	A	A		A	A		C	C		C	C	
Approach Delay		4.0			4.4			30.6			28.1	
Approach LOS		A			A			C			C	
Queue Length 50th (ft)	13	7		12	5		27	105		11	86	
Queue Length 95th (ft)	35	20		33	16		64	154		34	128	
Internal Link Dist (ft)		325			462			2964			1178	
Turn Bay Length (ft)	100			50			100			100		
Base Capacity (vph)	843	2249		800	2263		590	2772		457	2787	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.11	0.08		0.11	0.05		0.11	0.18		0.06	0.15	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 75.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 21.4

Intersection LOS: C

Intersection Capacity Utilization 41.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
55 s	65 s
 Ø6	 Ø8
55 s	65 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	23	523	13	6	444	86	6	11	8	128	3	10
Future Volume (vph)	23	523	13	6	444	86	6	11	8	128	3	10
Satd. Flow (prot)	1770	1855	0	1770	1818	0	0	1761	0	0	1765	0
Flt Permitted	0.342			0.366				0.924			0.725	
Satd. Flow (perm)	637	1855	0	682	1818	0	0	1647	0	0	1337	0
Satd. Flow (RTOR)		2			19			9			5	
Adj. Flow (vph)	25	568	14	7	483	93	7	12	9	139	3	11
Lane Group Flow (vph)	25	582	0	7	576	0	0	28	0	0	153	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	47.3	46.2		46.3	44.1			12.8			12.8	
Actuated g/C Ratio	0.68	0.66		0.66	0.63			0.18			0.18	
v/c Ratio	0.05	0.47		0.01	0.50			0.09			0.61	
Control Delay	4.9	9.4		5.7	9.9			17.1			35.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.9	9.4		5.7	9.9			17.1			35.3	
LOS	A	A		A	A			B			D	
Approach Delay		9.2			9.9			17.1			35.3	
Approach LOS		A			A			B			D	
Queue Length 50th (ft)	3	94		1	74			7			59	
Queue Length 95th (ft)	12	286		m3	122			24			105	
Internal Link Dist (ft)		593			928			273			821	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	520	1226		535	1152			432			349	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.05	0.47		0.01	0.50			0.06			0.44	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 12.6

Intersection LOS: B

Intersection Capacity Utilization 50.6%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	320	312	94	355	0	194	8	40	1	11	9
Future Volume (vph)	8	320	312	94	355	0	194	8	40	1	11	9
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1751	0	0	1749	0
Flt Permitted	0.525			0.202				0.753			0.988	
Satd. Flow (perm)	978	1725	0	376	1863	0	0	1372	0	0	1732	0
Satd. Flow (RTOR)		96						14			10	
Adj. Flow (vph)	9	348	339	102	386	0	211	9	43	1	12	10
Lane Group Flow (vph)	9	687	0	102	386	0	0	263	0	0	23	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	41.1	36.9		44.0	42.9			16.1			16.1	
Actuated g/C Ratio	0.59	0.53		0.63	0.61			0.23			0.23	
v/c Ratio	0.01	0.72		0.30	0.34			0.80			0.06	
Control Delay	7.4	16.5		8.4	9.9			43.7			14.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.4	16.5		8.4	9.9			43.7			14.9	
LOS	A	B		A	A			D			B	
Approach Delay		16.4			9.6			43.7			14.9	
Approach LOS		B			A			D			B	
Queue Length 50th (ft)	1	130		11	49			98			4	
Queue Length 95th (ft)	m5	#311		56	226			#204			21	
Internal Link Dist (ft)		928			1588			1375			462	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	633	954		344	1142			365			455	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.72		0.30	0.34			0.72			0.05	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	303	23	43	311	36	86	77	62	18	81	46
Future Volume (vph)	19	303	23	43	311	36	86	77	62	18	81	46
Satd. Flow (prot)	1770	1842	0	1770	1833	0	0	1814	1583	0	1772	0
Flt Permitted	0.532			0.477				0.706			0.945	
Satd. Flow (perm)	991	1842	0	889	1833	0	0	1315	1583	0	1685	0
Satd. Flow (RTOR)		7			11				94		32	
Adj. Flow (vph)	21	329	25	47	338	39	93	84	67	20	88	50
Lane Group Flow (vph)	21	354	0	47	377	0	0	177	67	0	158	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	44.6	41.2		46.5	45.5			13.6	13.6		13.6	
Actuated g/C Ratio	0.64	0.59		0.66	0.65			0.19	0.19		0.19	
v/c Ratio	0.03	0.33		0.07	0.32			0.70	0.18		0.45	
Control Delay	6.8	16.3		5.1	7.8			40.2	4.0		22.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.8	16.3		5.1	7.8			40.2	4.0		22.8	
LOS	A	B		A	A			D	A		C	
Approach Delay		15.7			7.5			30.3			22.8	
Approach LOS		B			A			C			C	
Queue Length 50th (ft)	4	142		6	54			71	0		47	
Queue Length 95th (ft)	m6	m211		18	163			123	18		90	
Internal Link Dist (ft)		1588			1447			1640			405	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	692	1087		663	1196			347	487		468	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.03	0.33		0.07	0.32			0.51	0.14		0.34	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 16.7

Intersection LOS: B

Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



BGE

Synchro 10 Report

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	99	273	15	11	605	39	13	75	29	7	26	117
Future Volume (Veh/h)	99	273	15	11	605	39	13	75	29	7	26	117
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	297	16	12	658	42	14	82	32	8	28	127
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	700			313			1365	1245	305	1297	1232	679
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	700			313			1365	1245	305	1297	1232	679
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			99			80	46	96	88	82	72
cM capacity (veh/h)	897			1247			70	152	735	69	154	452
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	421	712	128	163								
Volume Left	108	12	14	8								
Volume Right	16	42	32	127								
cSH	897	1247	163	282								
Volume to Capacity	0.12	0.01	0.79	0.58								
Queue Length 95th (ft)	10	1	127	84								
Control Delay (s)	3.5	0.3	79.6	33.9								
Lane LOS	A	A	F	D								
Approach Delay (s)	3.5	0.3	79.6	33.9								
Approach LOS			F	D								
Intersection Summary												
Average Delay			12.2									
Intersection Capacity Utilization			76.3%		ICU Level of Service				D			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	286	19	58	561	44	105
Future Volume (Veh/h)	286	19	58	561	44	105
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	311	21	63	610	48	114
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			332		1058	322
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			332		1058	322
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		80	84
cM capacity (veh/h)			1227		236	719
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	332	673	162			
Volume Left	0	63	48			
Volume Right	21	0	114			
cSH	1700	1227	448			
Volume to Capacity	0.20	0.05	0.36			
Queue Length 95th (ft)	0	4	41			
Control Delay (s)	0.0	1.3	17.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.3	17.5			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			67.8%	ICU Level of Service		C
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	127	261	512	11	19	105
Future Volume (Veh/h)	127	261	512	11	19	105
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	138	284	557	12	21	114
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	569				1123	563
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	569				1123	563
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	86				89	78
cM capacity (veh/h)	1003				196	526
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	422	569	135			
Volume Left	138	0	21			
Volume Right	0	12	114			
cSH	1003	1700	417			
Volume to Capacity	0.14	0.33	0.32			
Queue Length 95th (ft)	12	0	35			
Control Delay (s)	4.0	0.0	17.7			
Lane LOS	A		C			
Approach Delay (s)	4.0	0.0	17.7			
Approach LOS			C			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		65.9%		ICU Level of Service		C
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	62	77	93	29	42	56	49	322	66	26	251	18
Future Volume (vph)	62	77	93	29	42	56	49	322	66	26	251	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	67	84	101	32	46	61	53	350	72	28	273	20
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	252	139	475	321								
Volume Left (vph)	67	32	53	28								
Volume Right (vph)	101	61	72	20								
Hadj (s)	-0.15	-0.18	-0.03	0.01								
Departure Headway (s)	6.5	6.8	5.9	6.2								
Degree Utilization, x	0.45	0.26	0.77	0.55								
Capacity (veh/h)	489	452	594	537								
Control Delay (s)	14.8	12.2	25.9	16.5								
Approach Delay (s)	14.8	12.2	25.9	16.5								
Approach LOS	B	B	D	C								
Intersection Summary												
Delay			19.4									
Level of Service			C									
Intersection Capacity Utilization			58.7%	ICU Level of Service					B			
Analysis Period (min)			15									

Friendswood TX Traffic Study

No Build PM Peak 2030

1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	41	1279	176	62	1368	21	114	0	42	22	21	48
Future Volume (vph)	41	1279	176	62	1368	21	114	0	42	22	21	48
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1731	0	0	1710	0
Flt Permitted	0.068			0.058				0.702			0.909	
Satd. Flow (perm)	127	3476	0	108	3532	0	0	1259	0	0	1573	0
Satd. Flow (RTOR)		17			2			76			36	
Adj. Flow (vph)	45	1390	191	67	1487	23	124	0	46	24	23	52
Lane Group Flow (vph)	45	1581	0	67	1510	0	0	170	0	0	99	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	93.0		13.0	94.0		44.0	44.0		44.0	44.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	90.3	83.1		89.6	81.7			47.8			47.8	
Actuated g/C Ratio	0.60	0.55		0.60	0.54			0.32			0.32	
v/c Ratio	0.26	0.82		0.44	0.78			0.38			0.19	
Control Delay	22.4	30.8		22.1	30.1			26.5			27.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	22.4	30.8		22.1	30.1			26.5			27.3	
LOS	C	C		C	C			C			C	
Approach Delay		30.5			29.8			26.5			27.3	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	15	621		23	596			72			46	
Queue Length 95th (ft)	28	676		50	611			152			99	
Internal Link Dist (ft)		932			2990			285			455	
Turn Bay Length (ft)	50			100								
Base Capacity (vph)	179	2057		159	2108			452			525	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.25	0.77		0.42	0.72			0.38			0.19	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 29.9

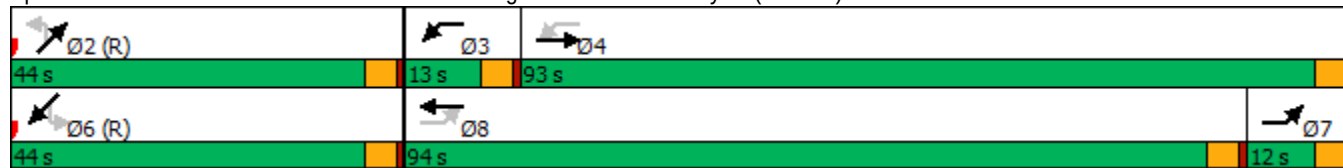
Intersection LOS: C

Intersection Capacity Utilization 71.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

No Build PM Peak 2030

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	246	761	162	79	802	132	288	495	110	234	796	350
Future Volume (vph)	246	761	162	79	802	132	288	495	110	234	796	350
Satd. Flow (prot)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Satd. Flow (RTOR)		22			15			21			59	
Adj. Flow (vph)	267	827	176	86	872	143	313	538	120	254	865	380
Lane Group Flow (vph)	267	1003	0	86	1015	0	313	658	0	254	1245	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	21.0	44.2		12.2	35.4		23.6	35.5		28.1	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.5	39.7		7.7	30.9		19.1	33.7		20.9	35.5	
Actuated g/C Ratio	0.14	0.33		0.06	0.26		0.16	0.28		0.17	0.30	
v/c Ratio	1.10	0.87		0.76	1.12		1.11	0.67		0.82	1.20	
Control Delay	134.7	46.2		93.5	110.8		134.1	41.6		69.1	134.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	134.7	46.2		93.5	110.8		134.1	41.6		69.1	134.2	
LOS	F	D		F	F		F	D		E	F	
Approach Delay		64.8			109.4			71.4			123.2	
Approach LOS		E			F			E			F	
Queue Length 50th (ft)	~234	375		67	~474		~278	235		188	~599	
Queue Length 95th (ft)	#405	#467		#155	#610		#458	307		#297	#739	
Internal Link Dist (ft)		496			1080			295			1563	
Turn Bay Length (ft)	80			100			120			130		
Base Capacity (vph)	243	1155		113	903		281	981		348	1040	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	1.10	0.87		0.76	1.12		1.11	0.67		0.73	1.20	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 94.4

Intersection LOS: F

Intersection Capacity Utilization 104.2%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
21 s	35.4 s	28.1 s	35.5 s
			
Ø5	Ø6	Ø7	Ø8
12.2 s	44.2 s	23.6 s	40 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	1120	38	88	1170	23	60	21	71	36	26	6
Future Volume (vph)	2	1120	38	88	1170	23	60	21	71	36	26	6
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1712	0	0	1791	0
Flt Permitted	0.177			0.176				0.849			0.680	
Satd. Flow (perm)	330	3522	0	328	3529	0	0	1482	0	0	1250	0
Satd. Flow (RTOR)		5			3			34			4	
Adj. Flow (vph)	2	1217	41	96	1272	25	65	23	77	39	28	7
Lane Group Flow (vph)	2	1258	0	96	1297	0	0	165	0	0	74	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	12.0	72.0		16.0	76.0		32.0	32.0		32.0	32.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.2	70.7		76.5	78.2			14.4			14.4	
Actuated g/C Ratio	0.77	0.68		0.74	0.76			0.14			0.14	
v/c Ratio	0.01	0.52		0.28	0.49			0.70			0.42	
Control Delay	4.0	10.4		5.8	6.8			49.4			45.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.0	10.4		5.8	6.8			49.4			45.2	
LOS	A	B		A	A			D			D	
Approach Delay		10.4			6.7			49.4			45.2	
Approach LOS		B			A			D			D	
Queue Length 50th (ft)	0	203		12	129			82			42	
Queue Length 95th (ft)	2	334		32	322			156			89	
Internal Link Dist (ft)		1418			1651			1271			991	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	358	2408		413	2666			419			335	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.52		0.23	0.49			0.39			0.22	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 103.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 11.7

Intersection LOS: B

Intersection Capacity Utilization 58.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
12 s	76 s	32 s
		
Ø5	Ø6	Ø8
16 s	72 s	32 s

Friendswood TX Traffic Study

No Build PM Peak 2030

4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	1218	75	146	1323	13	54	9	106	13	9	8
Future Volume (vph)	10	1218	75	146	1323	13	54	9	106	13	9	8
Satd. Flow (prot)	1770	3507	0	1770	3536	0	0	1679	0	0	1756	0
Flt Permitted	0.144			0.134				0.880			0.771	
Satd. Flow (perm)	268	3507	0	250	3536	0	0	1502	0	0	1383	0
Satd. Flow (RTOR)		8			2			63			9	
Adj. Flow (vph)	11	1324	82	159	1438	14	59	10	115	14	10	9
Lane Group Flow (vph)	11	1406	0	159	1452	0	0	184	0	0	33	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	11.0	71.0		20.0	80.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	79.7	67.0		76.0	78.7			13.9			13.9	
Actuated g/C Ratio	0.77	0.65		0.73	0.76			0.13			0.13	
v/c Ratio	0.04	0.62		0.50	0.54			0.72			0.17	
Control Delay	4.0	13.5		10.5	7.3			44.0			33.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.0	13.5		10.5	7.3			44.0			33.2	
LOS	A	B		B	A			D			C	
Approach Delay		13.4			7.6			44.0			33.2	
Approach LOS		B			A			D			C	
Queue Length 50th (ft)	1	246		20	150			75			14	
Queue Length 95th (ft)	7	463		57	394			158			44	
Internal Link Dist (ft)		828			966			420			507	
Turn Bay Length (ft)	100			150								
Base Capacity (vph)	301	2273		422	2687			405			336	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.04	0.62		0.38	0.54			0.45			0.10	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 103.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 12.5

Intersection LOS: B

Intersection Capacity Utilization 67.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
11 s	80 s	29 s
		
Ø5	Ø6	Ø8
20 s	71 s	29 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	12	26	426	7	276	1	1199	289	259	1157	2
Future Volume (vph)	0	12	26	426	7	276	1	1199	289	259	1157	2
Satd. Flow (prot)	0	1691	0	0	1775	1583	0	3437	0	1770	3539	0
Flt Permitted					0.700			0.954		0.222		
Satd. Flow (perm)	0	1691	0	0	1304	1583	0	3278	0	414	3539	0
Satd. Flow (RTOR)		28				241		58				
Adj. Flow (vph)	0	13	28	463	8	300	1	1303	314	282	1258	2
Lane Group Flow (vph)	0	41	0	0	471	300	0	1618	0	282	1260	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	22.5	22.5		9.5	22.5	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		18.0			18.0	18.0		18.0		23.0	27.5	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.42	0.50	
v/c Ratio		0.07			1.10	0.44		1.44		0.94	0.71	
Control Delay		7.5			95.0	6.1		227.7		55.9	13.1	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		7.5			95.0	6.1		227.7		55.9	13.1	
LOS		A			F	A		F		E	B	
Approach Delay		7.5			60.4			227.7			21.0	
Approach LOS		A			E			F			C	
Queue Length 50th (ft)		3			~180	13		~381		49	150	
Queue Length 95th (ft)		19			#330	59		m#396		#168	214	
Internal Link Dist (ft)		91			1708			813			746	
Turn Bay Length (ft)										100		
Base Capacity (vph)		577			430	684		1121		299	1785	
Starvation Cap Reductn		0			0	0		0		0	0	
Spillback Cap Reductn		0			0	0		0		0	0	
Storage Cap Reductn		0			0	0		0		0	0	
Reduced v/c Ratio		0.07			1.10	0.44		1.44		0.94	0.71	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.44

Intersection Signal Delay: 112.7

Intersection LOS: F

Intersection Capacity Utilization 116.3%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

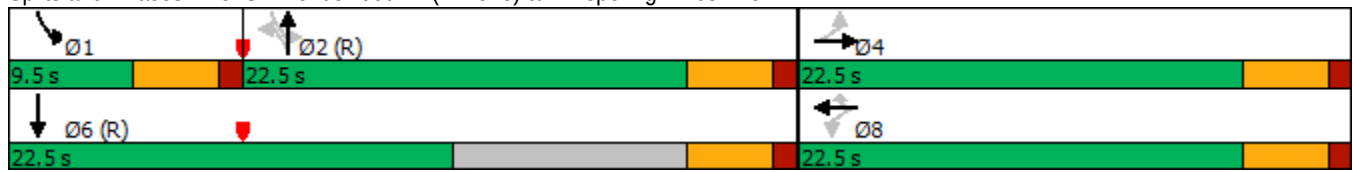
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	33	1094	26	258	1298	43	30	36	21	29	60	353
Future Volume (vph)	33	1094	26	258	1298	43	30	36	21	29	60	353
Satd. Flow (prot)	1770	3529	0	1770	3522	0	0	1771	0	0	1833	1583
Flt Permitted	0.950			0.950				0.896			0.902	
Satd. Flow (perm)	1770	3529	0	1770	3522	0	0	1614	0	0	1680	1583
Satd. Flow (RTOR)		5			6			23				243
Adj. Flow (vph)	36	1189	28	280	1411	47	33	39	23	32	65	384
Lane Group Flow (vph)	36	1217	0	280	1458	0	0	95	0	0	97	384
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	5.0	18.0		5.0	18.0			18.0			18.0	18.0
Actuated g/C Ratio	0.09	0.33		0.09	0.33			0.33			0.33	0.33
v/c Ratio	0.22	1.04		1.73	1.25			0.17			0.18	0.56
Control Delay	26.6	59.3		364.6	139.9			11.4			14.1	9.4
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	26.6	59.3		364.6	139.9			11.4			14.1	9.4
LOS	C	E		F	F			B			B	A
Approach Delay		58.3			176.1			11.4			10.3	
Approach LOS		E			F			B			B	
Queue Length 50th (ft)	11	~233		~145	~330			16			22	33
Queue Length 95th (ft)	33	#348		m#200	m#407			43			50	98
Internal Link Dist (ft)		2078			699			1594			1683	
Turn Bay Length (ft)	110			170								
Base Capacity (vph)	162	1168		162	1167			548			554	685
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.22	1.04		1.73	1.25			0.17			0.18	0.56

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 45 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.73

Intersection Signal Delay: 108.0

Intersection LOS: F

Intersection Capacity Utilization 69.0%

ICU Level of Service C

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



Friendswood TX Traffic Study

No Build PM Peak 2030

7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	431	713	213	127	836	413	299	1224	466	354	1679	103
Future Volume (vph)	431	713	213	127	836	413	299	1224	466	354	1679	103
Satd. Flow (prot)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Satd. Flow (RTOR)		32				286		72			7	
Adj. Flow (vph)	468	775	232	138	909	449	325	1330	507	385	1825	112
Lane Group Flow (vph)	468	1007	0	138	909	449	325	1837	0	385	1937	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	31.0	48.1		16.4	33.5	33.5	23.2	39.0		26.5	42.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	26.5	43.7		11.8	29.0	29.0	18.7	34.5		22.0	37.8	
Actuated g/C Ratio	0.20	0.34		0.09	0.22	0.22	0.14	0.27		0.17	0.29	
v/c Ratio	1.30	0.86		0.86	1.15	0.78	1.28	1.36		1.29	1.32	
Control Delay	195.2	47.8		100.4	127.6	27.3	196.7	204.6		195.2	185.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	195.2	47.8		100.4	127.6	27.3	196.7	204.6		195.2	185.3	
LOS	F	D		F	F	C	F	F		F	F	
Approach Delay		94.6			95.0			203.4			186.9	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~504	405		116	~473	134	~346	~733		~412	~773	
Queue Length 95th (ft)	#717	497		#236	#606	273	#535	#831		#613	#870	
Internal Link Dist (ft)		2375			2078			1141			1176	
Turn Bay Length (ft)	180			200		200	250			140		
Base Capacity (vph)	360	1170		162	789	575	254	1347		299	1470	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	1.30	0.86		0.85	1.15	0.78	1.28	1.36		1.29	1.32	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 31 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.36

Intersection Signal Delay: 155.0

Intersection LOS: F

Intersection Capacity Utilization 115.7%

ICU Level of Service H

Analysis Period (min) 15

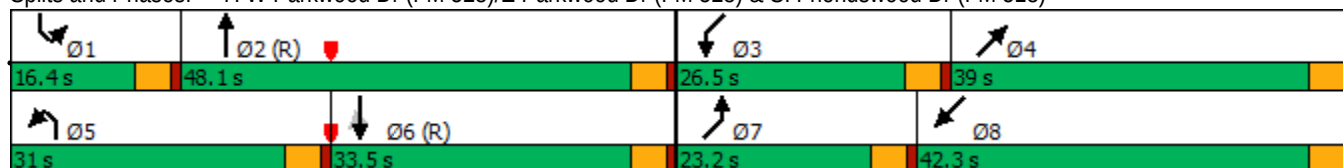
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	42	1334	1583	188	100	19
Future Volume (vph)	42	1334	1583	188	100	19
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.068				0.950	
Satd. Flow (perm)	127	3539	3483	0	1770	1583
Satd. Flow (RTOR)			25			21
Adj. Flow (vph)	46	1450	1721	204	109	21
Lane Group Flow (vph)	46	1450	1925	0	109	21
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	12.0	100.0	88.0		20.0	20.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	95.1	98.7	90.1		12.3	12.3
Actuated g/C Ratio	0.79	0.82	0.75		0.10	0.10
v/c Ratio	0.25	0.50	0.73		0.61	0.12
Control Delay	7.5	4.1	11.5		65.2	19.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.5	4.1	11.5		65.2	19.3
LOS	A	A	B		E	B
Approach Delay		4.2	11.5		57.7	
Approach LOS		A	B		E	
Queue Length 50th (ft)	4	105	406		82	0
Queue Length 95th (ft)	m22	255	562		140	24
Internal Link Dist (ft)		550	2375		438	
Turn Bay Length (ft)	150					
Base Capacity (vph)	204	2912	2622		228	222
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.23	0.50	0.73		0.48	0.09

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 10.1

Intersection LOS: B

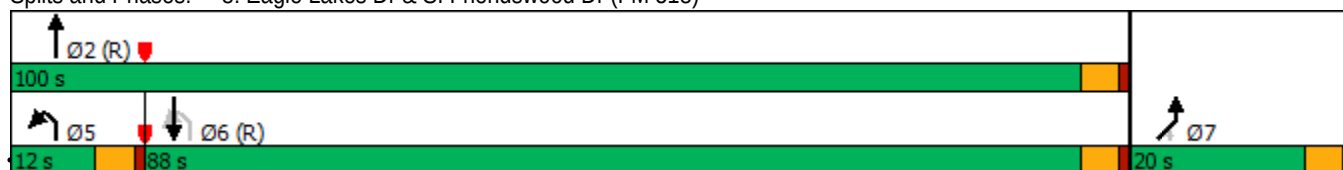
Intersection Capacity Utilization 62.8%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	120	1137	210	129	1074	18	145	17	118	8	15	86
Future Volume (vph)	120	1137	210	129	1074	18	145	17	118	8	15	86
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.161			0.138			0.950			0.950		
Satd. Flow (perm)	300	3539	1583	257	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			228			136			128			136
Adj. Flow (vph)	130	1236	228	140	1167	20	158	18	128	9	16	93
Lane Group Flow (vph)	130	1236	228	140	1167	20	158	18	128	9	16	93
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	15.0	58.0	58.0	16.0	59.0	59.0	23.0	36.0	36.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	80.1	69.9	69.9	80.1	71.2	71.2	15.3	24.4	24.4	5.5	6.6	6.6
Actuated g/C Ratio	0.67	0.58	0.58	0.67	0.59	0.59	0.13	0.20	0.20	0.05	0.06	0.06
v/c Ratio	0.42	0.60	0.22	0.47	0.56	0.02	0.71	0.05	0.30	0.11	0.16	0.43
Control Delay	13.5	30.5	8.9	18.9	10.3	0.1	66.7	38.7	8.9	58.1	56.9	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.5	30.5	8.9	18.9	10.3	0.1	66.7	38.7	8.9	58.1	56.9	9.1
LOS	B	C	A	B	B	A	E	D	A	E	E	A
Approach Delay		26.0			11.0			40.7			19.3	
Approach LOS		C			B			D			B	
Queue Length 50th (ft)	52	495	40	23	130	0	118	11	0	7	12	0
Queue Length 95th (ft)	m69	598	m104	97	206	m0	188	33	54	25	35	19
Internal Link Dist (ft)		956			2431			1290			159	
Turn Bay Length (ft)	100		890	100		420	120			100		100
Base Capacity (vph)	340	2060	1017	331	2099	994	272	489	509	81	287	359
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.60	0.22	0.42	0.56	0.02	0.58	0.04	0.25	0.11	0.06	0.26

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 21.1

Intersection LOS: C

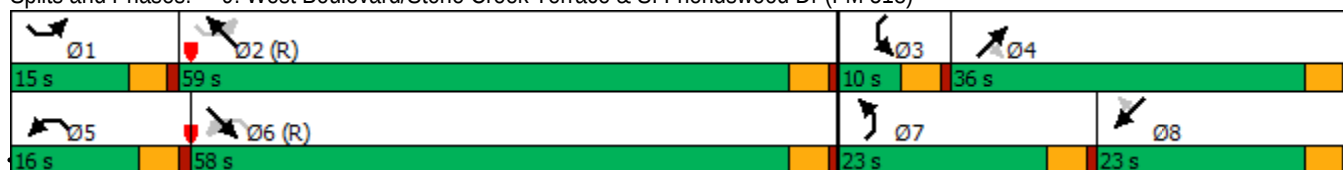
Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



BGE

Synchro 10 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	802	221	174	1090	291	231	276	93	236	338	453
Future Volume (vph)	257	802	221	174	1090	291	231	276	93	236	338	453
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.092			0.183			0.118			0.399		
Satd. Flow (perm)	171	3539	1583	341	3539	1583	220	3405	0	743	3235	0
Satd. Flow (RTOR)			240			316		35			249	
Adj. Flow (vph)	279	872	240	189	1185	316	251	300	101	257	367	492
Lane Group Flow (vph)	279	872	240	189	1185	316	251	401	0	257	859	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	23.0	56.0	56.0	15.0	48.0	48.0	22.0	38.9		20.1	37.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	61.4	51.2	51.2	61.4	43.5	43.5	50.6	35.7		50.6	33.8	
Actuated g/C Ratio	0.47	0.39	0.39	0.47	0.33	0.33	0.39	0.27		0.39	0.26	
v/c Ratio	0.93	0.63	0.31	0.69	1.00	0.43	0.88	0.42		0.63	0.84	
Control Delay	84.2	34.1	4.2	32.2	69.5	5.1	64.5	37.1		33.8	40.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	84.2	34.1	4.2	32.2	69.5	5.1	64.5	37.1		33.8	40.6	
LOS	F	C	A	C	E	A	E	D		C	D	
Approach Delay		39.0			53.3			47.6			39.0	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	181	306	0	84	~525	0	158	135		145	270	
Queue Length 95th (ft)	#349	377	52	131	#684	64	#306	185		215	#361	
Internal Link Dist (ft)		2502			2504			568			528	
Turn Bay Length (ft)	200		290	220		1000	80			80		
Base Capacity (vph)	309	1401	772	277	1184	739	295	959		416	1026	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.90	0.62	0.31	0.68	1.00	0.43	0.85	0.42		0.62	0.84	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 45.2

Intersection LOS: D

Intersection Capacity Utilization 96.1%

ICU Level of Service F

Analysis Period (min) 15

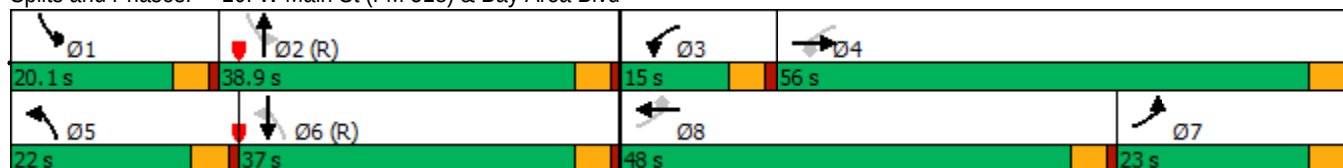
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	35	211	109	105	213	40	126	948	95	154	1457	86
Future Volume (vph)	35	211	109	105	213	40	126	948	95	154	1457	86
Satd. Flow (prot)	0	1777	0	0	1809	0	1770	3490	0	1770	3511	0
Flt Permitted		0.995			0.986		0.950			0.950		
Satd. Flow (perm)	0	1777	0	0	1809	0	1770	3490	0	1770	3511	0
Satd. Flow (RTOR)		11			3			6			4	
Adj. Flow (vph)	38	229	118	114	232	43	137	1030	103	167	1584	93
Lane Group Flow (vph)	0	385	0	0	389	0	137	1133	0	167	1677	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	40.0	40.0		43.0	43.0		19.0	68.6		28.4	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		35.5			38.5		14.5	67.1		20.9	73.5	
Actuated g/C Ratio		0.20			0.21		0.08	0.37		0.12	0.41	
v/c Ratio		1.07			1.00		0.96	0.87		0.81	1.17	
Control Delay		131.4			113.8		145.9	60.6		106.1	129.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		131.4			113.8		145.9	60.6		106.1	129.7	
LOS		F			F		F	E		F	F	
Approach Delay		131.4			113.8			69.8			127.6	
Approach LOS		F			F			E			F	
Queue Length 50th (ft)		~492			463		164	660		194	~1236	
Queue Length 95th (ft)		#717			#700		#317	772		#285	#1370	
Internal Link Dist (ft)		1651			3732			5386			1771	
Turn Bay Length (ft)							360			260		
Base Capacity (vph)		359			389		142	1305		235	1436	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		1.07			1.00		0.96	0.87		0.71	1.17	

Intersection Summary

Cycle Length: 180

Actuated Cycle Length: 180

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 107.7

Intersection LOS: F

Intersection Capacity Utilization 103.5%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 11: Beamer Rd & FM 2351

 Ø2	 Ø6	 Ø3	 Ø4
43 s	40 s	28.4 s	68.6 s
		 Ø7	 Ø8
		19 s	78 s

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1032	96	87	1567	127	89
Future Volume (vph)	1032	96	87	1567	127	89
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	12					97
Adj. Flow (vph)	1122	104	95	1703	138	97
Lane Group Flow (vph)	1226	0	95	1703	138	97
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	69.0		22.0	91.0	29.0	29.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	41.0		10.3	53.0	25.0	25.0
Actuated g/C Ratio	0.47		0.12	0.61	0.29	0.29
v/c Ratio	0.74		0.46	0.79	0.14	0.19
Control Delay	22.7		45.9	15.6	27.2	7.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	22.7		45.9	15.6	27.2	7.8
LOS	C		D	B	C	A
Approach Delay	22.7			17.2	19.2	
Approach LOS	C			B	B	
Queue Length 50th (ft)	287		49	330	28	0
Queue Length 95th (ft)	401		111	407	65	42
Internal Link Dist (ft)	687			427	507	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	2639		362	3349	983	522
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.46		0.26	0.51	0.14	0.19

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 87.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 19.4

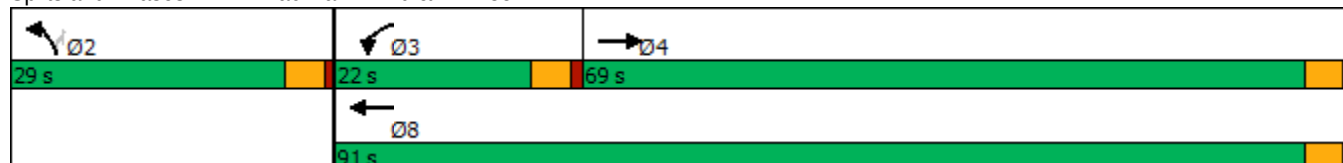
Intersection LOS: B

Intersection Capacity Utilization 55.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	66	0	77	0	0	0	99	1043	0	0	1494	153
Future Volume (vph)	66	0	77	0	0	0	99	1043	0	0	1494	153
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757					0.064					
Satd. Flow (perm)	0	1410	1583	0	1863	0	119	3539	0	1863	3490	0
Satd. Flow (RTOR)			136								17	
Adj. Flow (vph)	72	0	84	0	0	0	108	1134	0	0	1624	166
Lane Group Flow (vph)	0	72	84	0	0	0	108	1134	0	0	1790	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.8	107.7				71.2	75.8			62.9	
Actuated g/C Ratio		0.21	1.00				0.66	0.70			0.58	
v/c Ratio		0.24	0.05				0.52	0.46			0.88	
Control Delay		42.0	0.1				23.7	7.4			24.6	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		42.0	0.1				23.7	7.4			24.6	
LOS		D	A				C	A			C	
Approach Delay		19.4						8.8			24.6	
Approach LOS		B						A			C	
Queue Length 50th (ft)		43	0				20	155			507	
Queue Length 95th (ft)		93	0				78	190			651	
Internal Link Dist (ft)		212			271			289			1965	
Turn Bay Length (ft)							120					
Base Capacity (vph)		298	1583				244	2743			2420	
Starvation Cap Reductn		0	0				0	0			0	
Spillback Cap Reductn		0	0				0	0			0	
Storage Cap Reductn		0	0				0	0			0	
Reduced v/c Ratio		0.24	0.05				0.44	0.41			0.74	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 107.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 67.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351) & Woodland Trail Dr

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	107	0	174	9	9	1	145	1073	1	5	1496	128
Future Volume (vph)	107	0	174	9	9	1	145	1073	1	5	1496	128
Satd. Flow (prot)	1770	1583	0	0	1809	0	1770	3539	0	1770	3497	0
Flt Permitted	0.744				0.869		0.061			0.195		
Satd. Flow (perm)	1386	1583	0	0	1609	0	114	3539	0	363	3497	0
Satd. Flow (RTOR)		158			1						13	
Adj. Flow (vph)	116	0	189	10	10	1	158	1166	1	5	1626	139
Lane Group Flow (vph)	116	189	0	0	21	0	158	1167	0	5	1765	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	22.8	22.8			22.8		72.7	75.4		76.4	61.8	
Actuated g/C Ratio	0.21	0.21			0.21		0.67	0.69		0.70	0.57	
v/c Ratio	0.40	0.42			0.06		0.66	0.48		0.02	0.89	
Control Delay	45.7	13.3			38.6		36.3	8.7		4.4	27.4	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	45.7	13.3			38.6		36.3	8.7		4.4	27.4	
LOS	D	B			D		D	A		A	C	
Approach Delay		25.6			38.6			12.0			27.3	
Approach LOS		C			D			B			C	
Queue Length 50th (ft)	77	19			12		59	162		1	534	
Queue Length 95th (ft)	142	88			36		132	275		4	695	
Internal Link Dist (ft)		1749			166			1563			466	
Turn Bay Length (ft)	120						180			100		
Base Capacity (vph)	289	455			336		301	2672		326	2262	
Starvation Cap Reductn	0	0			0		0	0		0	12	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.40	0.42			0.06		0.52	0.44		0.02	0.78	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 109.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 21.3

Intersection LOS: C

Intersection Capacity Utilization 75.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln

 Ø2	 Ø3	 Ø4
27 s	10 s	83 s
 Ø6	 Ø7	 Ø8
27 s	19 s	74 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	30	26	18	186	37	443	23	431	154	454	545	50
Future Volume (vph)	30	26	18	186	37	443	23	431	154	454	545	50
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1790	0	1770	1839	0
Flt Permitted		0.725			0.707		0.339			0.346		
Satd. Flow (perm)	0	1306	0	0	1317	1583	631	1790	0	645	1839	0
Satd. Flow (RTOR)		13				482		35			9	
Adj. Flow (vph)	33	28	20	202	40	482	25	468	167	493	592	54
Lane Group Flow (vph)	0	81	0	0	242	482	25	635	0	493	646	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		27.5			27.5	120.0	83.5	83.5		83.5	83.5	
Actuated g/C Ratio		0.23			0.23	1.00	0.70	0.70		0.70	0.70	
v/c Ratio		0.26			0.80	0.30	0.06	0.51		1.10	0.50	
Control Delay		34.4			64.7	0.5	6.2	9.7		93.5	10.1	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		34.4			64.7	0.5	6.2	9.7		93.5	10.1	
LOS		C			E	A	A	A		F	B	
Approach Delay		34.4			22.0			9.5			46.2	
Approach LOS		C			C			A			D	
Queue Length 50th (ft)		43			178	0	6	195		~433	207	
Queue Length 95th (ft)		89			#311	0	15	275		#644	288	
Internal Link Dist (ft)		99			1232			1295			2821	
Turn Bay Length (ft)							100			135		
Base Capacity (vph)		309			301	1583	439	1256		448	1282	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.26			0.80	0.30	0.06	0.51		1.10	0.50	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.10

Intersection Signal Delay: 29.8

Intersection LOS: C

Intersection Capacity Utilization 87.4%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	362	1288	46	319	1453	120	133	482	215	169	529	420
Future Volume (vph)	362	1288	46	319	1453	120	133	482	215	169	529	420
Satd. Flow (prot)	1770	5060	0	1770	5029	0	1770	3376	0	1770	3306	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5060	0	1770	5029	0	1770	3376	0	1770	3306	0
Satd. Flow (RTOR)		5			12			50			76	
Adj. Flow (vph)	393	1400	50	347	1579	130	145	524	234	184	575	457
Lane Group Flow (vph)	393	1450	0	347	1709	0	145	758	0	184	1032	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	79.0		9.5	79.0		9.5	56.0		9.5	56.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	66.1		5.0	66.1		13.4	51.5		13.4	51.5	
Actuated g/C Ratio	0.03	0.43		0.03	0.43		0.09	0.33		0.09	0.33	
v/c Ratio	6.89	0.67		6.09	0.79		0.94	0.65		1.19	0.89	
Control Delay	2698.1	36.3		2336.9	40.4		124.3	43.7		189.0	55.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	2698.1	36.3		2336.9	40.4		124.3	43.7		189.0	55.7	
LOS	F	D		F	D		F	D		F	E	
Approach Delay		603.9			428.0			56.6			75.9	
Approach LOS		F			F			E			E	
Queue Length 50th (ft)	~759	419		~663	531		148	321		~229	487	
Queue Length 95th (ft)	#974	428		#870	538		#389	394		#485	#588	
Internal Link Dist (ft)		2394			1837			501			792	
Turn Bay Length (ft)	150			150			100			100		
Base Capacity (vph)	57	2450		57	2439		154	1162		154	1156	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	6.89	0.59		6.09	0.70		0.94	0.65		1.19	0.89	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 6.89

Intersection Signal Delay: 355.0

Intersection LOS: F

Intersection Capacity Utilization 101.3%

ICU Level of Service G

Analysis Period (min) 15

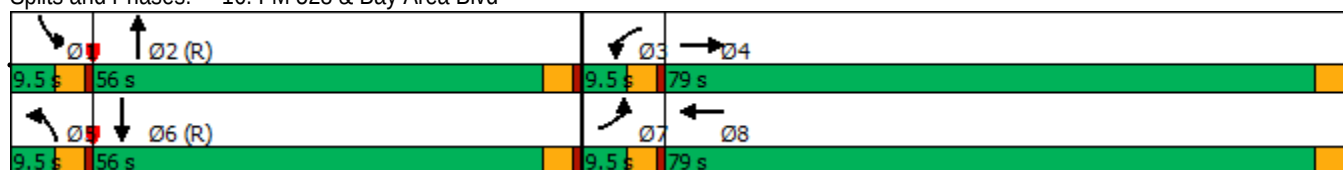
~ Volume exceeds capacity, queue is theoretically infinite.

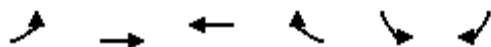
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑↰		↰	↰
Traffic Volume (vph)	98	1250	1742	230	165	80
Future Volume (vph)	98	1250	1742	230	165	80
Satd. Flow (prot)	1770	5085	4999	0	1770	1583
Flt Permitted	0.054				0.950	
Satd. Flow (perm)	101	5085	4999	0	1770	1583
Satd. Flow (RTOR)			29			87
Adj. Flow (vph)	107	1359	1893	250	179	87
Lane Group Flow (vph)	107	1359	2143	0	179	87
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	19.0	101.0	82.0		34.0	34.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	84.2	88.7	74.1		37.3	37.3
Actuated g/C Ratio	0.62	0.66	0.55		0.28	0.28
v/c Ratio	0.57	0.41	0.78		0.37	0.17
Control Delay	33.3	11.0	25.7		44.0	9.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	33.3	11.0	25.7		44.0	9.2
LOS	C	B	C		D	A
Approach Delay		12.6	25.7		32.6	
Approach LOS		B	C		C	
Queue Length 50th (ft)	38	185	503		128	0
Queue Length 95th (ft)	95	176	539		214	45
Internal Link Dist (ft)		453	2394		620	
Turn Bay Length (ft)	150					
Base Capacity (vph)	244	3634	2886		489	500
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.44	0.37	0.74		0.37	0.17

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.2

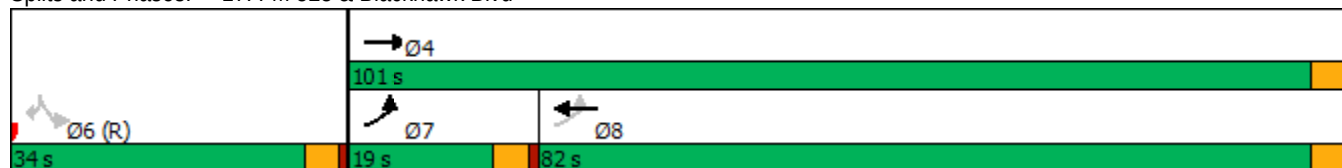
Intersection LOS: C

Intersection Capacity Utilization 64.6%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	248	55	72	35	63	107	102	1396	60	156	1846	287
Future Volume (vph)	248	55	72	35	63	107	102	1396	60	156	1846	287
Satd. Flow (prot)	0	1756	0	0	1717	0	1770	5055	0	1770	4984	0
Flt Permitted		0.621			0.894		0.077			0.084		
Satd. Flow (perm)	0	1127	0	0	1547	0	143	5055	0	156	4984	0
Satd. Flow (RTOR)		12			54			6			31	
Adj. Flow (vph)	270	60	78	38	68	116	111	1517	65	170	2007	312
Lane Group Flow (vph)	0	408	0	0	222	0	111	1582	0	170	2319	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	51.9	51.9		51.9	51.9		12.1	49.9		18.2	56.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		47.4			47.4		59.1	47.5		59.1	51.7	
Actuated g/C Ratio		0.40			0.40		0.49	0.40		0.49	0.43	
v/c Ratio		0.90			0.35		0.65	0.79		0.73	1.07	
Control Delay		58.2			20.7		37.4	35.6		43.4	75.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		58.2			20.7		37.4	35.6		43.4	75.2	
LOS		E			C		D	D		D	E	
Approach Delay		58.2			20.7			35.7			73.0	
Approach LOS		E			C			D			E	
Queue Length 50th (ft)		286			88		41	392		77	~728	
Queue Length 95th (ft)		#487			152		#108	464		153	#824	
Internal Link Dist (ft)		1683			1296			1176			3206	
Turn Bay Length (ft)							240			140		
Base Capacity (vph)		452			643		173	2005		263	2163	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.90			0.35		0.64	0.79		0.65	1.07	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 56.2

Intersection LOS: E

Intersection Capacity Utilization 95.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

			
Ø2 (R)		Ø3	Ø4
51.9 s		18.2 s	49.9 s
			
Ø6 (R)		Ø7	Ø8
51.9 s		12.1 s	56 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	367	113	220	160	113	43	181	1517	102	43	1797	382
Future Volume (vph)	367	113	220	160	113	43	181	1517	102	43	1797	382
Satd. Flow (prot)	1770	1678	0	1770	1786	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.583			0.319			0.068			0.066		
Satd. Flow (perm)	1086	1678	0	594	1786	0	127	5040	0	123	3539	1583
Satd. Flow (RTOR)		87			17			13				256
Adj. Flow (vph)	399	123	239	174	123	47	197	1649	111	47	1953	415
Lane Group Flow (vph)	399	362	0	174	170	0	197	1760	0	47	1953	415
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	44.0	44.0		44.0	44.0		14.0	66.4		9.6	62.0	62.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	39.5	39.5		39.5	39.5		67.0	60.3		67.9	57.5	57.5
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.56	0.50		0.57	0.48	0.48
v/c Ratio	1.12	0.59		0.89	0.28		0.98	0.69		0.25	1.15	0.47
Control Delay	121.5	29.7		81.5	28.2		90.9	24.8		26.7	106.2	9.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	121.5	29.7		81.5	28.2		90.9	24.8		26.7	106.2	9.2
LOS	F	C		F	C		F	C		C	F	A
Approach Delay		77.8			55.2			31.5			88.0	
Approach LOS		E			E			C			F	
Queue Length 50th (ft)	~355	177		127	87		104	394		14	~937	70
Queue Length 95th (ft)	#552	280		#268	145		#259	409		31	#1075	152
Internal Link Dist (ft)		1366			368			1378			1141	
Turn Bay Length (ft)	50						180			160		
Base Capacity (vph)	357	610		195	599		200	2686		188	1695	891
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	1.12	0.59		0.89	0.28		0.98	0.66		0.25	1.15	0.47

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.15

Intersection Signal Delay: 64.3

Intersection LOS: E

Intersection Capacity Utilization 103.6%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr

				
Ø2 (R)		Ø4		Ø3
44 s		66.4 s		9.6 s
				
Ø6 (R)		Ø7	Ø8	
44 s		14 s	62 s	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	1679	149	127	2002	13	93	70	126	23	108	183
Future Volume (vph)	170	1679	149	127	2002	13	93	70	126	23	108	183
Satd. Flow (prot)	1770	3497	0	1770	3536	0	0	1811	1583	0	1709	0
Flt Permitted	0.073			0.070				0.355			0.968	
Satd. Flow (perm)	136	3497	0	130	3536	0	0	661	1583	0	1661	0
Satd. Flow (RTOR)		15			1				137		65	
Adj. Flow (vph)	185	1825	162	138	2176	14	101	76	137	25	117	199
Lane Group Flow (vph)	185	1987	0	138	2190	0	0	177	137	0	341	0
Turn Type	D,P+P	NA		D,P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	63.9	56.8		63.9	54.8			22.5	22.5		22.5	
Actuated g/C Ratio	0.64	0.57		0.64	0.55			0.23	0.23		0.23	
v/c Ratio	0.78	1.00		0.69	1.13			1.20	0.30		0.80	
Control Delay	44.2	41.5		35.4	89.6			172.2	7.5		45.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	44.2	41.5		35.4	89.6			172.2	7.5		45.4	
LOS	D	D		D	F			F	A		D	
Approach Delay		41.7			86.4			100.3			45.4	
Approach LOS		D			F			F			D	
Queue Length 50th (ft)	64	621		35	~864			~137	0		169	
Queue Length 95th (ft)	#171	#834		#121	#1005			#270	48		#312	
Internal Link Dist (ft)		1769			1275			1023			92	
Turn Bay Length (ft)	180			180					100			
Base Capacity (vph)	243	1994		201	1938			148	462		424	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.76	1.00		0.69	1.13			1.20	0.30		0.80	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 99.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.20

Intersection Signal Delay: 65.7

Intersection LOS: E

Intersection Capacity Utilization 107.2%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

		
Ø2	Ø3	Ø4
27 s	11.7 s	61.3 s
		
Ø6	Ø7	Ø8
27 s	14 s	59 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	66	1	7	36	11	109	12	1479	45	176	1635	135
Future Volume (vph)	66	1	7	36	11	109	12	1479	45	176	1635	135
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.575			0.917		0.051			0.063		
Satd. Flow (perm)	0	1057	0	0	1548	0	95	3525	0	117	3500	0
Satd. Flow (RTOR)		4			86			4			14	
Adj. Flow (vph)	72	1	8	39	12	118	13	1608	49	191	1777	147
Lane Group Flow (vph)	0	81	0	0	169	0	13	1657	0	191	1924	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	28.0	28.0		28.0	28.0		10.0	70.0		22.0	82.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		29.1			29.1		80.1	63.7		77.4	77.9	
Actuated g/C Ratio		0.24			0.24		0.67	0.53		0.64	0.65	
v/c Ratio		0.31			0.38		0.09	0.88		0.73	0.85	
Control Delay		42.1			23.1		4.4	24.4		53.2	20.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		42.1			23.1		4.4	24.4		53.2	20.8	
LOS		D			C		A	C		D	C	
Approach Delay		42.1			23.1			24.3			23.7	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)		50			53		2	278		89	468	
Queue Length 95th (ft)		103			125		m2	425		163	685	
Internal Link Dist (ft)		275			319			544			5578	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		259			441		140	1925		320	2313	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.31			0.38		0.09	0.86		0.60	0.83	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 24.3

Intersection LOS: C

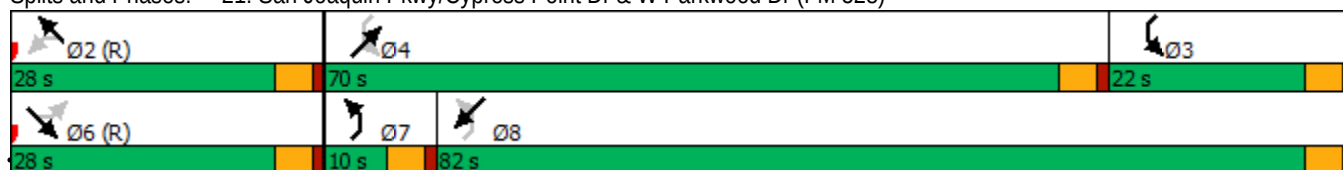
Intersection Capacity Utilization 75.7%

ICU Level of Service D

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



BGE

Synchro 10 Report

Friendswood TX Traffic Study

No Build PM Peak 2030

22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	11	19	2	2	15	6	1410	17	25	1297	189
Future Volume (vph)	159	11	19	2	2	15	6	1410	17	25	1297	189
Satd. Flow (prot)	0	1763	0	0	1653	0	1770	3532	0	1770	3472	0
Flt Permitted		0.746			0.977		0.100			0.102		
Satd. Flow (perm)	0	1370	0	0	1623	0	186	3532	0	190	3472	0
Satd. Flow (RTOR)		5			16			2			23	
Adj. Flow (vph)	173	12	21	2	2	16	7	1533	18	27	1410	205
Lane Group Flow (vph)	0	206	0	0	20	0	7	1551	0	27	1615	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	35.0	35.0		35.0	35.0		10.0	74.8		10.2	75.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.7			22.7		87.4	82.2		85.6	86.3	
Actuated g/C Ratio		0.19			0.19		0.73	0.68		0.71	0.72	
v/c Ratio		0.79			0.06		0.03	0.64		0.13	0.64	
Control Delay		65.0			18.2		6.2	14.1		1.2	3.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		65.0			18.2		6.2	14.1		1.2	3.0	
LOS		E			B		A	B		A	A	
Approach Delay		65.0			18.2			14.0			2.9	
Approach LOS		E			B			B			A	
Queue Length 50th (ft)		149			3		1	365		0	3	
Queue Length 95th (ft)		221			23		7	532		m1	370	
Internal Link Dist (ft)		523			1267			1499			1231	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		351			424		209	2420		210	2504	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.59			0.05		0.03	0.64		0.13	0.64	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 11.8

Intersection LOS: B

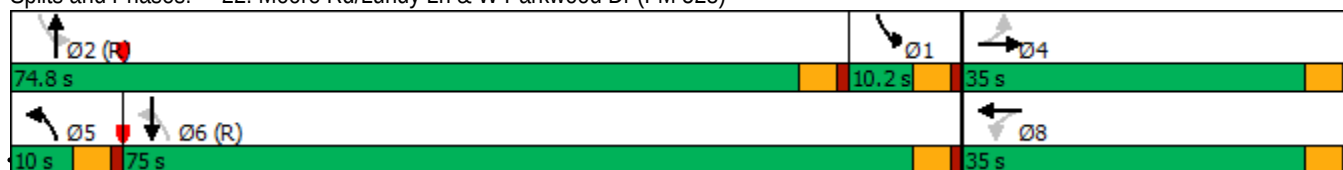
Intersection Capacity Utilization 66.6%

ICU Level of Service C

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	55	86	57	34	125	56	48	446	50	48	670	119
Future Volume (vph)	55	86	57	34	125	56	48	446	50	48	670	119
Satd. Flow (prot)	1770	3327	0	1770	3376	0	1770	3486	0	1770	3458	0
Flt Permitted	0.628			0.654			0.176			0.372		
Satd. Flow (perm)	1170	3327	0	1218	3376	0	328	3486	0	693	3458	0
Satd. Flow (RTOR)		62			61			19			32	
Adj. Flow (vph)	60	93	62	37	136	61	52	485	54	52	728	129
Lane Group Flow (vph)	60	155	0	37	197	0	52	539	0	52	857	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	41.0	41.0		41.0	41.0		79.0	79.0		79.0	79.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.7	36.7		36.7	36.7		23.1	23.1		23.1	23.1	
Actuated g/C Ratio	0.53	0.53		0.53	0.53		0.34	0.34		0.34	0.34	
v/c Ratio	0.10	0.09		0.06	0.11		0.47	0.46		0.22	0.73	
Control Delay	9.9	5.9		9.6	6.4		33.6	18.3		18.6	23.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.9	5.9		9.6	6.4		33.6	18.3		18.6	23.1	
LOS	A	A		A	A		C	B		B	C	
Approach Delay		7.0			6.9			19.6			22.8	
Approach LOS		A			A			B			C	
Queue Length 50th (ft)	11	8		7	13		17	88		15	157	
Queue Length 95th (ft)	35	26		24	34		53	127		40	215	
Internal Link Dist (ft)		325			462			2964			1178	
Turn Bay Length (ft)	100			50			100			100		
Base Capacity (vph)	623	1802		649	1828		327	3476		691	3448	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.10	0.09		0.06	0.11		0.16	0.16		0.08	0.25	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 68.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 50.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
41 s	79 s
 Ø6	 Ø8
41 s	79 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	605	6	6	568	60	9	3	8	94	6	48
Future Volume (vph)	20	605	6	6	568	60	9	3	8	94	6	48
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1722	0	0	1726	0
Flt Permitted	0.280			0.317				0.893			0.795	
Satd. Flow (perm)	522	1859	0	590	1837	0	0	1572	0	0	1416	0
Satd. Flow (RTOR)		1			10			9			33	
Adj. Flow (vph)	22	658	7	7	617	65	10	3	9	102	7	52
Lane Group Flow (vph)	22	665	0	7	682	0	0	22	0	0	161	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	48.4	47.3		47.5	45.2			11.7			11.7	
Actuated g/C Ratio	0.69	0.68		0.68	0.65			0.17			0.17	
v/c Ratio	0.05	0.53		0.01	0.57			0.08			0.61	
Control Delay	4.6	10.1		6.2	10.5			17.2			30.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.6	10.1		6.2	10.5			17.2			30.6	
LOS	A	B		A	B			B			C	
Approach Delay		9.9			10.5			17.2			30.6	
Approach LOS		A			B			B			C	
Queue Length 50th (ft)	2	106		1	109			5			51	
Queue Length 95th (ft)	10	350		m3	#313			20			98	
Internal Link Dist (ft)		593			928			273			821	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	463	1255		494	1188			413			390	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.05	0.53		0.01	0.57			0.05			0.41	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 12.4

Intersection LOS: B

Intersection Capacity Utilization 53.6%

ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	528	162	29	495	4	144	6	36	5	3	5
Future Volume (vph)	8	528	162	29	495	4	144	6	36	5	3	5
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1732	0
Flt Permitted	0.386			0.215				0.766			0.894	
Satd. Flow (perm)	719	1798	0	400	1861	0	0	1390	0	0	1579	0
Satd. Flow (RTOR)		30			1			16			5	
Adj. Flow (vph)	9	574	176	32	538	4	157	7	39	5	3	5
Lane Group Flow (vph)	9	750	0	32	542	0	0	203	0	0	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	45.1	42.9		46.0	45.0			14.1			14.1	
Actuated g/C Ratio	0.64	0.61		0.66	0.64			0.20			0.20	
v/c Ratio	0.02	0.67		0.09	0.45			0.70			0.04	
Control Delay	7.5	15.3		7.9	14.0			36.2			16.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.5	15.3		7.9	14.0			36.2			16.8	
LOS	A	B		A	B			D			B	
Approach Delay		15.2			13.7			36.2			16.8	
Approach LOS		B			B			D			B	
Queue Length 50th (ft)	1	102		4	82			74			3	
Queue Length 95th (ft)	m5	#384		m18	354			133			15	
Internal Link Dist (ft)		928			1588			1375			462	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	545	1114		372	1197			371			411	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.02	0.67		0.09	0.45			0.55			0.03	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 17.4

Intersection LOS: B

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	21	456	70	42	436	47	63	68	60	67	116	30
Future Volume (vph)	21	456	70	42	436	47	63	68	60	67	116	30
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1800	0
Flt Permitted	0.387			0.321				0.688			0.847	
Satd. Flow (perm)	721	1825	0	598	1835	0	0	1282	1583	0	1548	0
Satd. Flow (RTOR)		15			10				94		12	
Adj. Flow (vph)	23	496	76	46	474	51	68	74	65	73	126	33
Lane Group Flow (vph)	23	572	0	46	525	0	0	142	65	0	232	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	43.8	40.4		44.7	42.5			14.5	14.5		14.5	
Actuated g/C Ratio	0.63	0.58		0.64	0.61			0.21	0.21		0.21	
v/c Ratio	0.04	0.54		0.10	0.47			0.54	0.16		0.71	
Control Delay	7.2	19.3		5.6	11.4			31.6	3.5		35.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	7.2	19.3		5.6	11.4			31.6	3.5		35.8	
LOS	A	B		A	B			C	A		D	
Approach Delay		18.9			10.9			22.8			35.8	
Approach LOS		B			B			C			D	
Queue Length 50th (ft)	4	184		6	90			54	0		88	
Queue Length 95th (ft)	m8	367		18	249			101	16		149	
Internal Link Dist (ft)		1588			1447			1640			405	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	534	1059		477	1118			338	487		417	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.04	0.54		0.10	0.47			0.42	0.13		0.56	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 19.0

Intersection LOS: B

Intersection Capacity Utilization 60.7%

ICU Level of Service B

Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



BGE

Synchro 10 Report

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	51	222	21	32	168	58	8	61	15	61	97	59
Future Volume (Veh/h)	51	222	21	32	168	58	8	61	15	61	97	59
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	241	23	35	183	63	9	66	16	66	105	64
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	246			264			764	678	252	696	658	214
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	246			264			764	678	252	696	658	214
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			97			96	81	98	77	71	92
cM capacity (veh/h)	1320			1300			218	349	786	283	358	825
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	319	281	91	235								
Volume Left	55	35	9	66								
Volume Right	23	63	16	64								
cSH	1320	1300	363	389								
Volume to Capacity	0.04	0.03	0.25	0.60								
Queue Length 95th (ft)	3	2	24	95								
Control Delay (s)	1.7	1.2	18.2	27.4								
Lane LOS	A	A	C	D								
Approach Delay (s)	1.7	1.2	18.2	27.4								
Approach LOS			C	D								
Intersection Summary												
Average Delay			9.7									
Intersection Capacity Utilization			49.0%	ICU Level of Service	A							
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	272	26	95	212	27	76
Future Volume (Veh/h)	272	26	95	212	27	76
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	296	28	103	230	29	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			324		746	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			324		746	310
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		92	89
cM capacity (veh/h)			1236		349	730
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	324	333	112			
Volume Left	0	103	29			
Volume Right	28	0	83			
cSH	1700	1236	569			
Volume to Capacity	0.19	0.08	0.20			
Queue Length 95th (ft)	0	7	18			
Control Delay (s)	0.0	3.1	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.1	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			48.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	86	261	213	18	19	91
Future Volume (Veh/h)	86	261	213	18	19	91
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	93	284	232	20	21	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	252				712	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252				712	242
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				94	88
cM capacity (veh/h)	1313				371	797
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	377	252	120			
Volume Left	93	0	21			
Volume Right	0	20	99			
cSH	1313	1700	663			
Volume to Capacity	0.07	0.15	0.18			
Queue Length 95th (ft)	6	0	16			
Control Delay (s)	2.5	0.0	11.6			
Lane LOS	A		B			
Approach Delay (s)	2.5	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			47.5%	ICU Level of Service		A
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	33	45	25	18	79	25	30	177	12	29	194	26
Future Volume (vph)	33	45	25	18	79	25	30	177	12	29	194	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	49	27	20	86	27	33	192	13	32	211	28
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	112	133	238	271								
Volume Left (vph)	36	20	33	32								
Volume Right (vph)	27	27	13	28								
Hadj (s)	-0.05	-0.06	0.03	0.00								
Departure Headway (s)	5.4	5.3	5.0	4.9								
Degree Utilization, x	0.17	0.20	0.33	0.37								
Capacity (veh/h)	600	609	682	694								
Control Delay (s)	9.4	9.6	10.4	10.8								
Approach Delay (s)	9.4	9.6	10.4	10.8								
Approach LOS	A	A	B	B								
Intersection Summary												
Delay				10.3								
Level of Service				B								
Intersection Capacity Utilization				34.6%	ICU Level of Service	A						
Analysis Period (min)				15								

Appendix F

“Year 2030 Build” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	864	71	10	1074	16	139	0	41	23	2	25
Future Volume (vph)	15	864	71	10	1074	16	139	0	41	23	2	25
Satd. Flow (prot)	1770	3500	0	1770	3532	0	0	1738	0	0	1696	0
Flt Permitted	0.172			0.172				0.743			0.856	
Satd. Flow (perm)	320	3500	0	320	3532	0	0	1341	0	0	1486	0
Satd. Flow (RTOR)		16			3			191			27	
Adj. Flow (vph)	16	939	77	11	1167	17	151	0	45	25	2	27
Lane Group Flow (vph)	16	1016	0	11	1184	0	0	196	0	0	54	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	27.0		9.6	27.0		23.4	23.4		23.4	23.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	28.4	23.2		24.3	23.2			25.8			25.8	
Actuated g/C Ratio	0.47	0.39		0.40	0.39			0.43			0.43	
v/c Ratio	0.06	0.74		0.04	0.86			0.29			0.08	
Control Delay	8.0	19.6		8.7	25.6			4.1			8.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	8.0	19.6		8.7	25.6			4.1			8.4	
LOS	A	B		A	C			A			A	
Approach Delay		19.4			25.5			4.1			8.4	
Approach LOS		B			C			A			A	
Queue Length 50th (ft)	2	155		2	196			1			5	
Queue Length 95th (ft)	10	228		8	#327			40			28	
Internal Link Dist (ft)		932			2990			285			455	
Turn Bay Length (ft)	50			100								
Base Capacity (vph)	276	1374		252	1379			686			655	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.06	0.74		0.04	0.86			0.29			0.08	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 54.3%

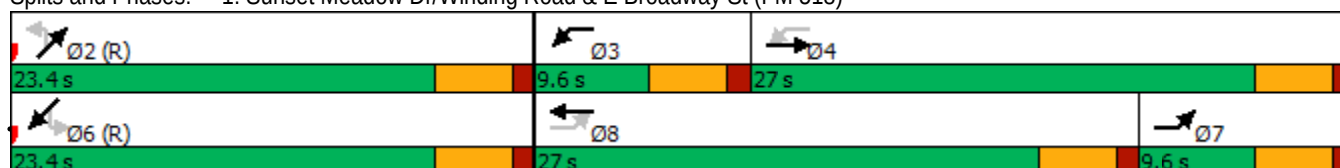
ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

2030 AM Peak

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	292	672	99	135	601	211	171	602	103	276	511	276
Future Volume (vph)	292	672	99	135	601	211	171	602	103	276	511	276
Satd. Flow (prot)	1770	3539	1583	1770	3401	0	1770	3461	0	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3401	0	1770	3461	0	1770	3539	1583
Satd. Flow (RTOR)			143		60			22				241
Adj. Flow (vph)	317	730	108	147	653	229	186	654	112	300	555	300
Lane Group Flow (vph)	317	730	108	147	882	0	186	766	0	300	555	300
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									8
Total Split (s)	12.6	28.7	28.7	10.0	26.1		16.3	22.6		18.7	25.0	25.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	8.1	24.2	24.2	5.5	21.6		11.2	18.1		14.2	21.1	21.1
Actuated g/C Ratio	0.10	0.30	0.30	0.07	0.27		0.14	0.23		0.18	0.26	0.26
v/c Ratio	1.77	0.68	0.19	1.21	0.92		0.75	0.96		0.96	0.60	0.51
Control Delay	395.0	28.4	2.8	186.9	42.4		53.0	54.4		76.1	29.1	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	395.0	28.4	2.8	186.9	42.4		53.0	54.4		76.1	29.1	9.5
LOS	F	C	A	F	D		D	D		E	C	A
Approach Delay		126.6			63.1			54.1			36.2	
Approach LOS		F			E			D			D	
Queue Length 50th (ft)	~240	167	0	~91	210		90	194		150	128	23
Queue Length 95th (ft)	#393	227	21	#203	#326		#181	#311		#301	181	90
Internal Link Dist (ft)		496			1080			295			1563	
Turn Bay Length (ft)	200		150	100			200			250		250
Base Capacity (vph)	179	1070	578	121	962		261	800		314	932	594
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	1.77	0.68	0.19	1.21	0.92		0.71	0.96		0.96	0.60	0.51

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.77

Intersection Signal Delay: 71.0

Intersection LOS: E

Intersection Capacity Utilization 89.7%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
12.6 s	26.1 s	18.7 s	22.6 s
			
Ø5	Ø6	Ø7	Ø8
10 s	28.7 s	16.3 s	25 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	903	44	38	1017	10	52	3	57	13	17	5
Future Volume (vph)	5	903	44	38	1017	10	52	3	57	13	17	5
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1694	0	0	1794	0
Flt Permitted	0.209			0.232				0.832			0.887	
Satd. Flow (perm)	389	3514	0	432	3536	0	0	1443	0	0	1623	0
Satd. Flow (RTOR)		10			2			62			5	
Adj. Flow (vph)	5	982	48	41	1105	11	57	3	62	14	18	5
Lane Group Flow (vph)	5	1030	0	41	1116	0	0	122	0	0	37	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	31.9	30.2		31.1	32.0			7.7			7.7	
Actuated g/C Ratio	0.67	0.64		0.66	0.68			0.16			0.16	
v/c Ratio	0.01	0.46		0.10	0.47			0.43			0.14	
Control Delay	3.8	8.3		4.3	7.1			15.2			16.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.8	8.3		4.3	7.1			15.2			16.5	
LOS	A	A		A	A			B			B	
Approach Delay		8.3			7.0			15.2			16.5	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	52		3	59			12			6	
Queue Length 95th (ft)	3	183		12	205			52			27	
Internal Link Dist (ft)		1418			1651			1271			991	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	413	2246		429	2391			597			632	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.46		0.10	0.47			0.20			0.06	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 47.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.47

Intersection Signal Delay: 8.1

Intersection LOS: A

Intersection Capacity Utilization 48.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6	Ø8
9.6 s	27.8 s	22.6 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	910	51	95	966	22	74	5	89	22	6	22
Future Volume (vph)	22	910	51	95	966	22	74	5	89	22	6	22
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1691	0	0	1716	0
Flt Permitted	0.221			0.214				0.832			0.787	
Satd. Flow (perm)	412	3511	0	399	3529	0	0	1438	0	0	1379	0
Satd. Flow (RTOR)		11			4			97			24	
Adj. Flow (vph)	24	989	55	103	1050	24	80	5	97	24	7	24
Lane Group Flow (vph)	24	1044	0	103	1074	0	0	182	0	0	55	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	33.6	28.0		30.9	33.7			8.8			8.8	
Actuated g/C Ratio	0.67	0.56		0.62	0.68			0.18			0.18	
v/c Ratio	0.06	0.53		0.27	0.45			0.55			0.21	
Control Delay	4.5	11.4		6.2	7.5			16.5			13.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.5	11.4		6.2	7.5			16.5			13.7	
LOS	A	B		A	A			B			B	
Approach Delay		11.3			7.4			16.5			13.7	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	2	112		9	64			23			8	
Queue Length 95th (ft)	10	204		29	213			68			31	
Internal Link Dist (ft)		828			966			420			507	
Turn Bay Length (ft)	100			150								
Base Capacity (vph)	417	1976		388	2387			587			519	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.06	0.53		0.27	0.45			0.31			0.11	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 49.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 9.8

Intersection LOS: A

Intersection Capacity Utilization 55.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6	Ø8
9.6 s	27.8 s	22.6 s

Friendswood TX Traffic Study

2030 AM Peak

5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	0	7	2	167	1	173	18	1041	166	117	879	8
Future Volume (vph)	0	7	2	167	1	173	18	1041	166	117	879	8
Satd. Flow (prot)	0	1812	0	0	1775	1583	1770	3539	1583	1770	3536	0
Flt Permitted					0.721		0.297			0.155		
Satd. Flow (perm)	0	1812	0	0	1343	1583	553	3539	1583	289	3536	0
Satd. Flow (RTOR)		2				188			149		2	
Adj. Flow (vph)	0	8	2	182	1	188	20	1132	180	127	955	9
Lane Group Flow (vph)	0	10	0	0	183	188	20	1132	180	127	964	0
Turn Type		NA		Perm	NA	Perm	Perm	NA	Perm	D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	28.0	28.0	28.0	9.5	37.5	
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)		12.6			12.6	12.6	27.2	27.2	27.2	31.3	34.9	
Actuated g/C Ratio		0.22			0.22	0.22	0.48	0.48	0.48	0.55	0.62	
v/c Ratio		0.02			0.61	0.38	0.08	0.66	0.21	0.44	0.44	
Control Delay		14.2			28.2	5.5	11.9	15.7	4.2	10.9	7.1	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		14.2			28.2	5.5	11.9	15.7	4.2	10.9	7.1	
LOS		B			C	A	B	B	A	B	A	
Approach Delay		14.2			16.7			14.1			7.6	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)		2			53	0	4	152	5	15	75	
Queue Length 95th (ft)		11			105	38	17	#266	40	42	143	
Internal Link Dist (ft)		91			1708			813			746	
Turn Bay Length (ft)							100		100	100		
Base Capacity (vph)		579			428	633	266	1703	839	291	2185	
Starvation Cap Reductn		0			0	0	0	0	0	0	0	
Spillback Cap Reductn		0			0	0	0	0	0	0	0	
Storage Cap Reductn		0			0	0	0	0	0	0	0	
Reduced v/c Ratio		0.02			0.43	0.30	0.08	0.66	0.21	0.44	0.44	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 56.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 11.9

Intersection LOS: B

Intersection Capacity Utilization 62.5%

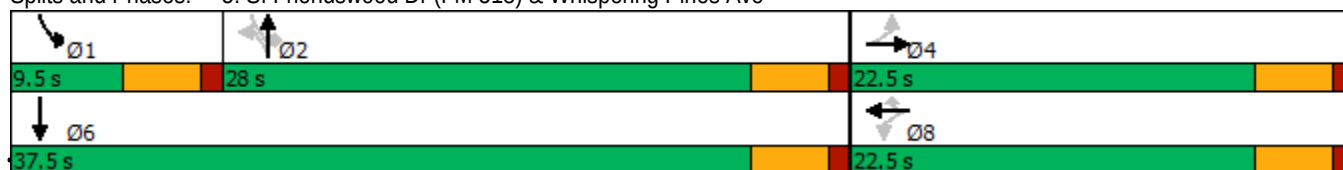
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



BGE

Synchro 10 Report

Friendswood TX Traffic Study

2030 AM Peak

6: S. Friendswood Dr (FM 518) & Winding Way Dr

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	52	739	18	226	800	25	30	46	33	10	30	227
Future Volume (vph)	52	739	18	226	800	25	30	46	33	10	30	227
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1761	0	0	1840	1583
Flt Permitted	0.950			0.950				0.893			0.907	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1595	0	0	1690	1583
Satd. Flow (RTOR)		4			6			36				247
Adj. Flow (vph)	57	803	20	246	870	27	33	50	36	11	33	247
Lane Group Flow (vph)	57	823	0	246	897	0	0	119	0	0	44	247
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	10.7	22.5		15.0	26.8		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	6.0	18.1		10.1	26.5			8.0			8.0	8.0
Actuated g/C Ratio	0.12	0.36		0.20	0.53			0.16			0.16	0.16
v/c Ratio	0.27	0.64		0.68	0.48			0.41			0.16	0.53
Control Delay	24.3	16.5		31.3	10.2			18.6			19.1	7.9
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	24.3	16.5		31.3	10.2			18.6			19.1	7.9
LOS	C	B		C	B			B			B	A
Approach Delay		17.0			14.7			18.6			9.6	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	15	101		66	94			22			11	0
Queue Length 95th (ft)	45	168		#163	160			58			33	46
Internal Link Dist (ft)		2078			699			1594			1683	
Turn Bay Length (ft)	110			170								
Base Capacity (vph)	221	1281		374	1877			601			612	731
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.26	0.64		0.66	0.48			0.20			0.07	0.34

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 49.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 15.1

Intersection LOS: B

Intersection Capacity Utilization 57.5%

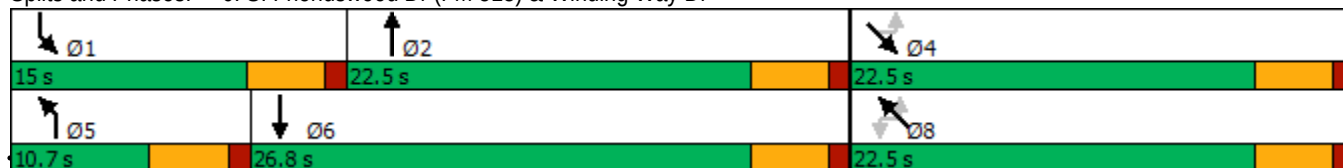
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



BGE

Synchro 10 Report

Friendswood TX Traffic Study

2030 AM Peak

7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	499	723	359	167	502	297	286	1467	379	191	736	66
Future Volume (vph)	499	723	359	167	502	297	286	1467	379	191	736	66
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	4928	0	3433	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	4928	0	3433	5024	0
Satd. Flow (RTOR)			168			239		75			15	
Adj. Flow (vph)	542	786	390	182	546	323	311	1595	412	208	800	72
Lane Group Flow (vph)	542	786	390	182	546	323	311	2007	0	208	872	0
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6						
Total Split (s)	21.0	33.0	33.0	12.4	24.4	24.4	19.6	43.0		11.6	35.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.5	28.5	28.5	7.9	19.9	19.9	13.5	38.5		7.1	32.1	
Actuated g/C Ratio	0.16	0.28	0.28	0.08	0.20	0.20	0.14	0.38		0.07	0.32	
v/c Ratio	0.96	0.78	0.68	0.67	0.78	0.64	0.67	1.03		0.86	0.54	
Control Delay	71.1	39.2	24.6	58.0	46.6	16.8	48.6	59.5		77.1	29.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	71.1	39.2	24.6	58.0	46.6	16.8	48.6	59.5		77.1	29.1	
LOS	E	D	C	E	D	B	D	E		E	C	
Approach Delay		45.9			39.4			58.0			38.4	
Approach LOS		D			D			E			D	
Queue Length 50th (ft)	178	242	125	59	174	46	97	~494		69	164	
Queue Length 95th (ft)	#282	314	234	#102	235	138	141	#593		#132	210	
Internal Link Dist (ft)		2375			2078			1141			1176	
Turn Bay Length (ft)	180		100	200		200	250			140		
Base Capacity (vph)	566	1009	571	271	704	506	518	1943		243	1622	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.96	0.78	0.68	0.67	0.78	0.64	0.60	1.03		0.86	0.54	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 48.0

Intersection LOS: D

Intersection Capacity Utilization 85.4%

ICU Level of Service E

Analysis Period (min) 15

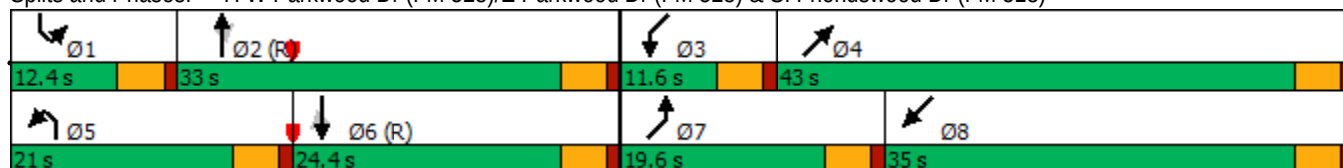
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	23	1642	984	76	227	49
Future Volume (vph)	23	1642	984	76	227	49
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.177				0.950	
Satd. Flow (perm)	330	3539	3500	0	1671	1583
Satd. Flow (RTOR)			19			53
Adj. Flow (vph)	25	1785	1070	83	247	53
Lane Group Flow (vph)	25	1785	1153	0	247	53
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.5	39.0	29.5		16.0	16.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	34.3	35.2	33.3		10.8	10.8
Actuated g/C Ratio	0.62	0.64	0.61		0.20	0.20
v/c Ratio	0.07	0.79	0.54		0.71	0.15
Control Delay	4.5	10.7	8.5		33.9	7.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	4.5	10.7	8.5		33.9	7.6
LOS	A	B	A		C	A
Approach Delay		10.6	8.5		29.2	
Approach LOS		B	A		C	
Queue Length 50th (ft)	3	191	89		75	0
Queue Length 95th (ft)	9	278	212		#160	23
Internal Link Dist (ft)		550	2375		438	
Turn Bay Length (ft)	150					
Base Capacity (vph)	341	2267	2129		370	372
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.07	0.79	0.54		0.67	0.14

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 11.6

Intersection LOS: B

Intersection Capacity Utilization 65.5%

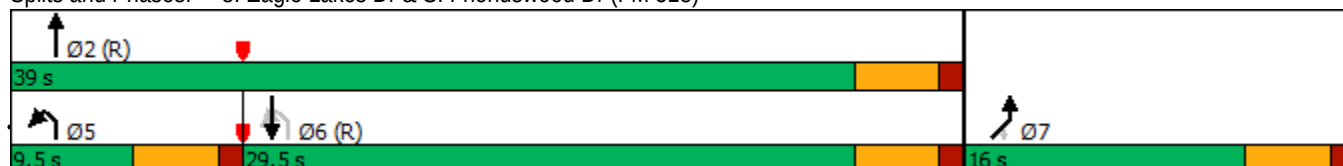
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	50	573	135	83	944	11	251	18	121	11	20	187
Future Volume (vph)	50	573	135	83	944	11	251	18	121	11	20	187
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.146			0.330			0.950			0.950		
Satd. Flow (perm)	272	3539	1583	615	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			205			205			143			205
Adj. Flow (vph)	54	623	147	90	1026	12	273	20	132	12	22	203
Lane Group Flow (vph)	54	623	147	90	1026	12	273	20	132	12	22	203
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	9.5	28.7	28.7	10.8	30.0	30.0	18.0	31.0	31.0	9.5	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	42.7	35.5	35.5	41.8	38.3	38.3	13.5	23.7	23.7	5.0	7.6	7.6
Actuated g/C Ratio	0.53	0.44	0.44	0.52	0.48	0.48	0.17	0.30	0.30	0.06	0.10	0.10
v/c Ratio	0.20	0.40	0.18	0.21	0.60	0.01	0.92	0.04	0.23	0.11	0.12	0.61
Control Delay	10.5	17.6	1.6	10.1	19.4	0.0	69.9	20.8	4.9	37.8	33.0	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.5	17.6	1.6	10.1	19.4	0.0	69.9	20.8	4.9	37.8	33.0	13.2
LOS	B	B	A	B	B	A	E	C	A	D	C	B
Approach Delay		14.3			18.4			47.4			16.3	
Approach LOS		B			B			D			B	
Queue Length 50th (ft)	11	107	0	18	203	0	136	7	0	6	10	0
Queue Length 95th (ft)	30	182	16	45	#322	0	#275	24	35	22	30	55
Internal Link Dist (ft)		956			2431			1290			159	
Turn Bay Length (ft)	100		890	100		420	120			100		100
Base Capacity (vph)	269	1570	816	430	1696	865	298	617	620	110	419	515
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.40	0.18	0.21	0.60	0.01	0.92	0.03	0.21	0.11	0.05	0.39

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 21.6

Intersection LOS: C

Intersection Capacity Utilization 62.8%

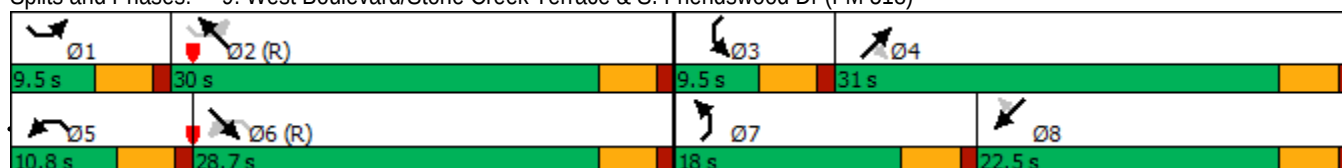
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	354	759	82	93	665	362	136	378	224	189	88	130
Future Volume (vph)	354	759	82	93	665	362	136	378	224	189	88	130
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3224	0
Flt Permitted	0.225			0.208			0.604			0.222		
Satd. Flow (perm)	419	3539	1583	387	3539	1583	1125	3341	0	414	3224	0
Satd. Flow (RTOR)			153			284		154			141	
Adj. Flow (vph)	385	825	89	101	723	393	148	411	243	205	96	141
Lane Group Flow (vph)	385	825	89	101	723	393	148	654	0	205	237	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	18.0	30.0	30.0	10.6	22.6	22.6	10.8	23.4		11.0	23.6	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	31.3	27.3	27.3	32.2	17.8	17.8	25.7	18.9		25.7	19.4	
Actuated g/C Ratio	0.42	0.36	0.36	0.43	0.24	0.24	0.34	0.25		0.34	0.26	
v/c Ratio	0.92	0.64	0.13	0.36	0.86	0.66	0.34	0.68		0.78	0.25	
Control Delay	56.3	23.2	1.1	14.9	39.4	13.8	17.6	23.4		39.4	10.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	56.3	23.2	1.1	14.9	39.4	13.8	17.6	23.4		39.4	10.3	
LOS	E	C	A	B	D	B	B	C		D	B	
Approach Delay		31.5			29.1			22.3			23.8	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	113	171	0	24	169	41	44	110		63	17	
Queue Length 95th (ft)	#285	233	7	50	#258	131	82	166		#144	45	
Internal Link Dist (ft)		2502			2504			568			528	
Turn Bay Length (ft)	200		290	220		1000	80			80		
Base Capacity (vph)	418	1289	674	278	854	597	440	957		264	937	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.92	0.64	0.13	0.36	0.85	0.66	0.34	0.68		0.78	0.25	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 27.9

Intersection LOS: C

Intersection Capacity Utilization 81.1%

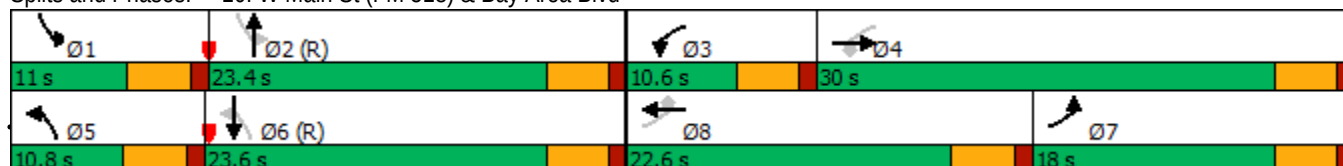
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	29	195	90	31	303	62	134	1581	47	64	773	103
Future Volume (vph)	29	195	90	31	303	62	134	1581	47	64	773	103
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			126			126			88			126
Adj. Flow (vph)	32	212	98	34	329	67	146	1718	51	70	840	112
Lane Group Flow (vph)	32	212	98	34	329	67	146	1718	51	70	840	112
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	22.5	22.5	22.5	29.1	29.1	29.1	23.3	68.0	68.0	10.4	55.1	55.1
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	17.2	17.2	17.2	24.6	24.6	24.6	15.3	63.5	63.5	5.9	54.1	54.1
Actuated g/C Ratio	0.13	0.13	0.13	0.19	0.19	0.19	0.12	0.49	0.49	0.05	0.42	0.42
v/c Ratio	0.14	0.86	0.31	0.10	0.93	0.17	0.70	0.99	0.06	0.88	0.57	0.15
Control Delay	50.9	84.9	6.4	44.6	84.6	0.9	72.2	51.7	0.9	130.2	31.2	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.9	84.9	6.4	44.6	84.6	0.9	72.2	51.7	0.9	130.2	31.2	3.7
LOS	D	F	A	D	F	A	E	D	A	F	C	A
Approach Delay		59.2			68.4			51.9			35.0	
Approach LOS		E			E			D			C	
Queue Length 50th (ft)	24	176	0	24	276	0	119	738	0	60	284	0
Queue Length 95th (ft)	56	#306	30	55	#457	0	189	#925	6	#154	364	31
Internal Link Dist (ft)		1651			3732			5386			1771	
Turn Bay Length (ft)	100		100	100		100	360		200	260		200
Base Capacity (vph)	246	259	328	336	354	403	257	1739	822	80	1482	736
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.82	0.30	0.10	0.93	0.17	0.57	0.99	0.06	0.88	0.57	0.15

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 129.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 49.8

Intersection LOS: D

Intersection Capacity Utilization 83.0%

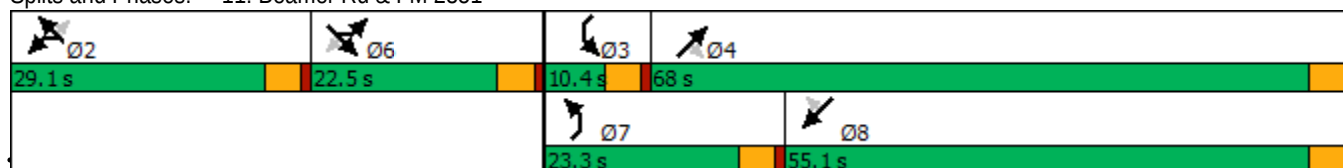
ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 11: Beamer Rd & FM 2351



BGE

Synchro 10 Report

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1386	39	86	798	108	155
Future Volume (vph)	1386	39	86	798	108	155
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	4					168
Adj. Flow (vph)	1507	42	93	867	117	168
Lane Group Flow (vph)	1549	0	93	867	117	168
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	50.0		14.4	64.4	25.6	25.6
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	41.9		8.8	52.4	21.7	21.7
Actuated g/C Ratio	0.50		0.11	0.63	0.26	0.26
v/c Ratio	0.87		0.50	0.39	0.13	0.31
Control Delay	25.6		47.7	7.7	27.5	6.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	25.6		47.7	7.7	27.5	6.6
LOS	C		D	A	C	A
Approach Delay	25.6			11.6	15.2	
Approach LOS	C			B	B	
Queue Length 50th (ft)	387		51	101	27	0
Queue Length 95th (ft)	494		99	133	49	49
Internal Link Dist (ft)	687			427	507	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1981		216	2603	893	536
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.78		0.43	0.33	0.13	0.31

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 83.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 19.7

Intersection LOS: B

Intersection Capacity Utilization 59.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351

↖ Ø2	↘ Ø3	→ Ø4
25.6 s	14.4 s	50 s
	← Ø8	
	64.4 s	

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	157	0	133	0	0	0	56	1262	0	0	891	54
Future Volume (vph)	157	0	133	0	0	0	56	1262	0	0	891	54
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.170					
Satd. Flow (perm)	0	1410	1583	0	1863	0	317	3539	0	1863	3507	0
Satd. Flow (RTOR)			176								12	
Adj. Flow (vph)	171	0	145	0	0	0	61	1372	0	0	968	59
Lane Group Flow (vph)	0	171	145	0	0	0	61	1372	0	0	1027	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	22.5	22.5		22.5	22.5		9.9	33.0		9.5	32.6	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		18.2	59.3				29.5	32.0			26.5	
Actuated g/C Ratio		0.31	1.00				0.50	0.54			0.45	
v/c Ratio		0.39	0.09				0.21	0.72			0.65	
Control Delay		21.6	0.1				7.9	12.5			15.8	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		21.6	0.1				7.9	12.5			15.8	
LOS		C	A				A	B			B	
Approach Delay		11.7						12.3			15.8	
Approach LOS		B						B			B	
Queue Length 50th (ft)		52	0				9	172			162	
Queue Length 95th (ft)		108	0				22	235			224	
Internal Link Dist (ft)		212			271			289			1965	
Turn Bay Length (ft)							120					
Base Capacity (vph)		433	1583				291	2007			1687	
Starvation Cap Reductn		0	0				0	0			0	
Spillback Cap Reductn		0	0				0	0			0	
Storage Cap Reductn		0	0				0	0			0	
Reduced v/c Ratio		0.39	0.09				0.21	0.68			0.61	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 59.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 13.5

Intersection LOS: B

Intersection Capacity Utilization 59.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351) & Woodland Trail Dr

 Ø2	 Ø3	 Ø4
22.5 s	9.5 s	33 s
 Ø6	 Ø7	 Ø8
22.5 s	9.9 s	32.6 s

Friendswood TX Traffic Study

2030 AM Peak
14: E. Edgewood Dr (FM 2351) & Melody Ln

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	123	5	261	2	1	1	91	1214	2	15	960	35
Future Volume (vph)	123	5	261	2	1	1	91	1214	2	15	960	35
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.896		0.154			0.138		
Satd. Flow (perm)	1406	1589	0	0	1612	0	287	3539	0	257	3522	0
Satd. Flow (RTOR)		216			1						7	
Adj. Flow (vph)	134	5	284	2	1	1	99	1320	2	16	1043	38
Lane Group Flow (vph)	134	289	0	0	4	0	99	1322	0	16	1081	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	22.5	22.5		22.5	22.5		9.6	28.0		9.5	27.9	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1			18.1		27.3	28.9		29.9	23.3	
Actuated g/C Ratio	0.31	0.31			0.31		0.47	0.50		0.52	0.40	
v/c Ratio	0.31	0.45			0.01		0.37	0.75		0.06	0.76	
Control Delay	18.6	7.7			13.8		11.0	16.8		6.7	19.8	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	18.6	7.7			13.8		11.0	16.8		6.7	19.8	
LOS	B	A			B		B	B		A	B	
Approach Delay		11.2			13.8			16.4			19.6	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	37	19			1		15	162		2	173	
Queue Length 95th (ft)	78	71			6		34	#374		9	243	
Internal Link Dist (ft)		1749			166			1563			466	
Turn Bay Length (ft)	120						180			100		
Base Capacity (vph)	439	644			504		266	1774		264	1434	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.31	0.45			0.01		0.37	0.75		0.06	0.75	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 57.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 16.8

Intersection LOS: B

Intersection Capacity Utilization 65.5%

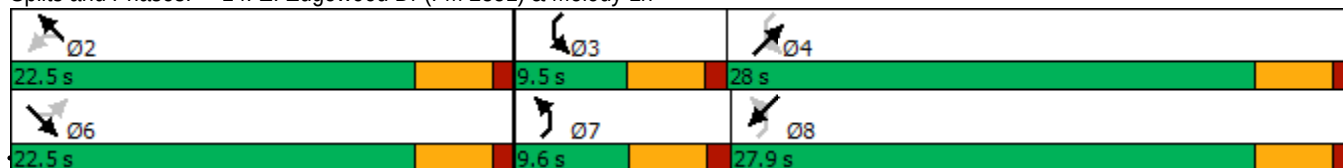
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



BGE

Synchro 10 Report

Friendswood TX Traffic Study

2030 AM Peak
15: W Edgewood Dr (FM 2351) & Sunset Dr

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	31	35	60	100	8	339	25	407	107	341	289	22
Future Volume (vph)	31	35	60	100	8	339	25	407	107	341	289	22
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1863	1583
Flt Permitted		0.913			0.692		0.549			0.360		
Satd. Flow (perm)	0	1592	0	0	1289	1583	1023	1805	0	671	1863	1583
Satd. Flow (RTOR)		58				368		34				24
Adj. Flow (vph)	34	38	65	109	9	368	27	442	116	371	314	24
Lane Group Flow (vph)	0	137	0	0	118	368	27	558	0	371	314	24
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	23.0	23.0		23.0	23.0		52.0	52.0		52.0	52.0	52.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		19.0			19.0	67.0	38.7	38.7		38.7	38.7	38.7
Actuated g/C Ratio		0.28			0.28	1.00	0.58	0.58		0.58	0.58	0.58
v/c Ratio		0.28			0.32	0.23	0.05	0.53		0.96	0.29	0.03
Control Delay		15.8			25.7	0.3	5.5	9.4		52.5	7.4	2.4
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		15.8			25.7	0.3	5.5	9.4		52.5	7.4	2.4
LOS		B			C	A	A	A		D	A	A
Approach Delay		15.8			6.5			9.3			30.8	
Approach LOS		B			A			A			C	
Queue Length 50th (ft)		29			45	0	4	111		124	56	0
Queue Length 95th (ft)		74			92	0	12	178		#315	92	7
Internal Link Dist (ft)		99			1232			1295			2821	
Turn Bay Length (ft)							100			135		135
Base Capacity (vph)		493			365	1583	746	1325		489	1358	1161
Starvation Cap Reductn		0			0	0	0	0		0	0	0
Spillback Cap Reductn		0			0	0	0	0		0	0	0
Storage Cap Reductn		0			0	0	0	0		0	0	0
Reduced v/c Ratio		0.28			0.32	0.23	0.04	0.42		0.76	0.23	0.02

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 67

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 72.0%

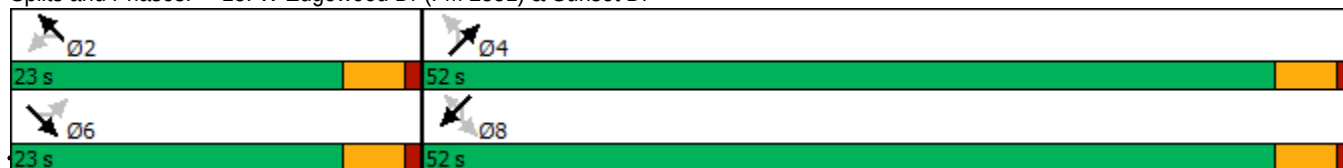
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr



BGE

Synchro 10 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	392	1920	31	90	855	82	119	591	373	128	176	225
Future Volume (vph)	392	1920	31	90	855	82	119	591	373	128	176	225
Satd. Flow (prot)	3433	5075	0	3433	5019	0	1770	4790	0	1770	4658	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5075	0	3433	5019	0	1770	4790	0	1770	4658	0
Satd. Flow (RTOR)		3			17			147			245	
Adj. Flow (vph)	426	2087	34	98	929	89	129	642	405	139	191	245
Lane Group Flow (vph)	426	2121	0	98	1018	0	129	1047	0	139	436	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	22.2	42.6		9.6	30.0		12.6	24.8		13.0	25.2	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	15.7	39.9		5.1	27.4		8.2	20.4		8.6	20.8	
Actuated g/C Ratio	0.17	0.44		0.06	0.30		0.09	0.23		0.10	0.23	
v/c Ratio	0.71	0.94		0.51	0.66		0.80	0.87		0.82	0.35	
Control Delay	45.5	31.9		50.7	29.6		75.7	38.3		77.1	13.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	45.5	31.9		50.7	29.6		75.7	38.3		77.1	13.2	
LOS	D	C		D	C		E	D		E	B	
Approach Delay		34.1			31.5			42.4			28.6	
Approach LOS		C			C			D			C	
Queue Length 50th (ft)	134	323		28	182		73	183		79	32	
Queue Length 95th (ft)	m148	m#530		54	235		#170	#258		#182	59	
Internal Link Dist (ft)		1475			1837			1748			792	
Turn Bay Length (ft)	150			150			100			100		
Base Capacity (vph)	675	2249		194	1539		161	1198		169	1263	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.63	0.94		0.51	0.66		0.80	0.87		0.82	0.35	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 34.8

Intersection LOS: C

Intersection Capacity Utilization 83.8%

ICU Level of Service E

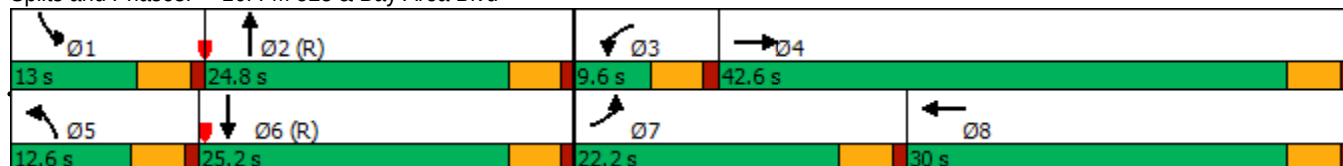
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 16: FM 528 & Bay Area Blvd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	2028	72	36	1062	170	47	71	10	251	28	100
Future Volume (vph)	61	2028	72	36	1062	170	47	71	10	251	28	100
Satd. Flow (prot)	1770	5060	0	1770	4979	0	1770	3472	0	1770	3122	0
Flt Permitted	0.950			0.950			0.664			0.579		
Satd. Flow (perm)	1770	5060	0	1770	4979	0	1237	3472	0	1079	3122	0
Satd. Flow (RTOR)		8			41			11			109	
Adj. Flow (vph)	66	2204	78	39	1154	185	51	77	11	273	30	109
Lane Group Flow (vph)	66	2282	0	39	1339	0	51	88	0	273	139	0
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	13.4	45.2		9.6	41.4		9.6	24.0		11.2	25.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	7.9	44.5		5.1	39.9		24.6	19.5		29.0	24.9	
Actuated g/C Ratio	0.09	0.49		0.06	0.44		0.27	0.22		0.32	0.28	
v/c Ratio	0.43	0.91		0.39	0.60		0.14	0.12		0.69	0.15	
Control Delay	47.2	28.9		41.5	32.1		21.4	25.3		35.3	9.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	47.2	28.9		41.5	32.1		21.4	25.3		35.3	9.1	
LOS	D	C		D	C		C	C		D	A	
Approach Delay		29.4			32.3			23.9			26.5	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	36	456		22	229		19	18		120	6	
Queue Length 95th (ft)	77	#594		m38	300		45	38		#204	30	
Internal Link Dist (ft)		1371			1475			2692			615	
Turn Bay Length (ft)	150			150			150			150		
Base Capacity (vph)	175	2508		100	2231		368	760		398	943	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.38	0.91		0.39	0.60		0.14	0.12		0.69	0.15	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 29.9

Intersection LOS: C

Intersection Capacity Utilization 78.0%

ICU Level of Service D

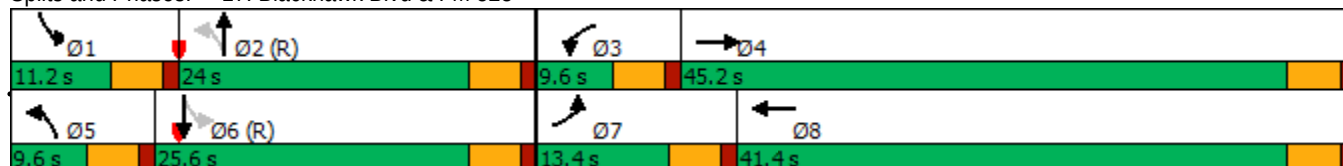
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: Blackhawk Blvd & FM 528



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	243	28	46	38	72	174	66	1800	35	55	849	176
Future Volume (vph)	243	28	46	38	72	174	66	1800	35	55	849	176
Satd. Flow (prot)	0	1758	0	0	1831	1583	1770	5070	0	1770	5085	1583
Flt Permitted		0.699			0.840		0.243			0.113		
Satd. Flow (perm)	0	1276	0	0	1565	1583	453	5070	0	210	5085	1583
Satd. Flow (RTOR)		12				161		4				191
Adj. Flow (vph)	264	30	50	41	78	189	72	1957	38	60	923	191
Lane Group Flow (vph)	0	344	0	0	119	189	72	1995	0	60	923	191
Turn Type	Perm	NA		Perm	NA	Perm	D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2		2	8			4		8
Total Split (s)	34.2	34.2		34.2	34.2	34.2	10.5	36.0		9.8	35.3	35.3
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)		29.7			29.7	29.7	37.7	35.4		38.6	32.9	32.9
Actuated g/C Ratio		0.37			0.37	0.37	0.47	0.44		0.48	0.41	0.41
v/c Ratio		0.72			0.20	0.27	0.23	0.89		0.29	0.44	0.25
Control Delay		30.8			18.3	5.5	11.9	28.3		13.7	18.4	3.6
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		30.8			18.3	5.5	11.9	28.3		13.7	18.4	3.6
LOS		C			B	A	B	C		B	B	A
Approach Delay		30.8			10.5			27.8			15.8	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)		139			40	9	17	354		14	124	0
Queue Length 95th (ft)		#264			77	50	37	#481		32	160	39
Internal Link Dist (ft)		1683			1296			1176			3206	
Turn Bay Length (ft)						100	240			140		100
Base Capacity (vph)		481			581	688	312	2246		204	2091	763
Starvation Cap Reductn		0			0	0	0	0		0	0	0
Spillback Cap Reductn		0			0	0	0	0		0	0	0
Storage Cap Reductn		0			0	0	0	0		0	0	0
Reduced v/c Ratio		0.72			0.20	0.27	0.23	0.89		0.29	0.44	0.25

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 23.1

Intersection LOS: C

Intersection Capacity Utilization 75.4%

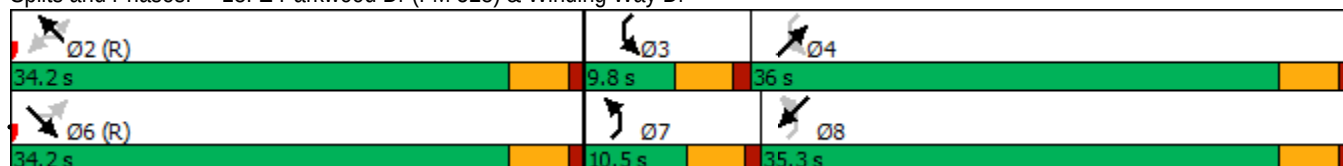
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	447	57	110	26	35	19	163	1686	35	18	1047	444
Future Volume (vph)	447	57	110	26	35	19	163	1686	35	18	1047	444
Satd. Flow (prot)	1681	1704	1583	1770	1764	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.719	0.735		0.421			0.152			0.131		
Satd. Flow (perm)	1272	1301	1583	784	1764	0	283	5070	0	244	3539	1583
Satd. Flow (RTOR)			191		21			6				483
Adj. Flow (vph)	486	62	120	28	38	21	177	1833	38	20	1138	483
Lane Group Flow (vph)	272	276	120	28	59	0	177	1871	0	20	1138	483
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		6	2			8			4		8
Total Split (s)	22.9	22.9	22.9	22.9	22.9		9.6	27.6		9.5	27.5	27.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	18.6	18.6	18.6	18.6	18.6		27.9	30.5		31.7	22.8	22.8
Actuated g/C Ratio	0.31	0.31	0.31	0.31	0.31		0.46	0.51		0.53	0.38	0.38
v/c Ratio	0.69	0.69	0.19	0.12	0.11		0.69	0.72		0.08	0.85	0.54
Control Delay	29.9	29.4	1.6	16.6	11.5		25.3	15.2		8.5	24.7	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	29.9	29.4	1.6	16.6	11.5		25.3	15.2		8.5	24.7	4.0
LOS	C	C	A	B	B		C	B		A	C	A
Approach Delay		24.6			13.1			16.1			18.4	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	90	91	0	7	10		29	160		3	190	0
Queue Length 95th (ft)	#195	#195	11	24	32		#98	#344		11	#300	51
Internal Link Dist (ft)		149			368			1378			1141	
Turn Bay Length (ft)	50						180			160		
Base Capacity (vph)	394	402	621	242	560		257	2581		255	1356	904
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.69	0.69	0.19	0.12	0.11		0.69	0.72		0.08	0.84	0.53

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 18.2

Intersection LOS: B

Intersection Capacity Utilization 69.8%

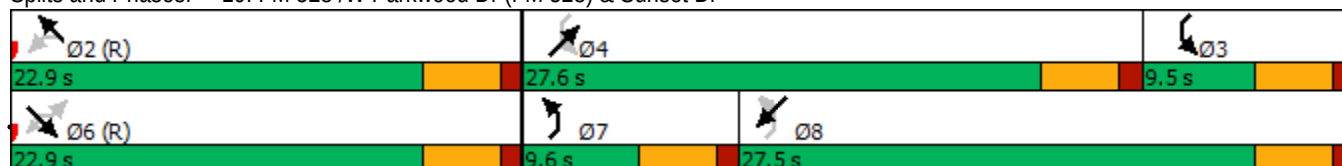
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



Friendswood TX Traffic Study

2030 AM Peak

20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	1738	148	82	1051	18	107	144	247	13	86	127
Future Volume (vph)	264	1738	148	82	1051	18	107	144	247	13	86	127
Satd. Flow (prot)	1770	3497	0	1770	3529	0	0	1824	1583	0	1852	1583
Flt Permitted	0.136			0.076				0.813			0.924	
Satd. Flow (perm)	253	3497	0	142	3529	0	0	1514	1583	0	1721	1583
Satd. Flow (RTOR)		17			2				127			138
Adj. Flow (vph)	287	1889	161	89	1142	20	116	157	268	14	93	138
Lane Group Flow (vph)	287	2050	0	89	1162	0	0	273	268	0	107	138
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	21.8	57.0		9.6	44.8		23.4	23.4	23.4	23.4	23.4	23.4
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	4.5
Act Effect Green (s)	55.6	52.6		56.6	42.1			18.9	18.9		18.9	18.9
Actuated g/C Ratio	0.63	0.60		0.64	0.48			0.21	0.21		0.21	0.21
v/c Ratio	0.73	0.98		0.48	0.69			0.84	0.61		0.29	0.31
Control Delay	25.5	34.0		16.9	21.1			58.1	23.3		32.4	7.6
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	25.5	34.0		16.9	21.1			58.1	23.3		32.4	7.6
LOS	C	C		B	C			E	C		C	A
Approach Delay		33.0			20.8			40.8			18.4	
Approach LOS		C			C			D			B	
Queue Length 50th (ft)	75	~568		14	257			151	70		52	0
Queue Length 95th (ft)	160	#784		45	355			#289	154		99	46
Internal Link Dist (ft)		1769			1275			1023			92	
Turn Bay Length (ft)	180			180					100			100
Base Capacity (vph)	465	2095		185	1691			325	439		370	448
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.62	0.98		0.48	0.69			0.84	0.61		0.29	0.31

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 88.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 29.7

Intersection LOS: C

Intersection Capacity Utilization 88.7%

ICU Level of Service E

Analysis Period (min) 15

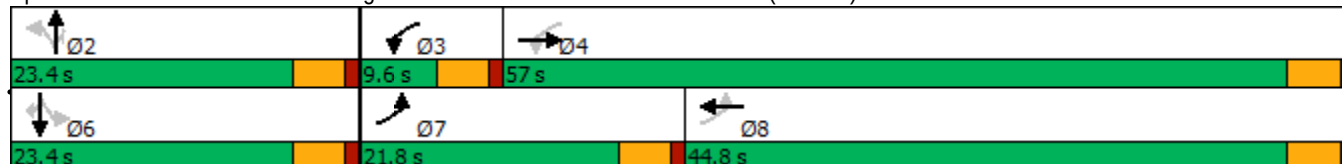
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	135	3	13	56	1	201	2	1392	15	70	966	55
Future Volume (vph)	135	3	13	56	1	201	2	1392	15	70	966	55
Satd. Flow (prot)	0	1761	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.460			0.908		0.184			0.123		
Satd. Flow (perm)	0	847	0	0	1514	0	343	3532	0	229	3511	0
Satd. Flow (RTOR)		7			179			2			11	
Adj. Flow (vph)	147	3	14	61	1	218	2	1513	16	76	1050	60
Lane Group Flow (vph)	0	164	0	0	280	0	2	1529	0	76	1110	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	37.0		9.6	37.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		20.9			20.9		39.2	32.5		37.6	38.2	
Actuated g/C Ratio		0.30			0.30		0.56	0.46		0.54	0.55	
v/c Ratio		0.64			0.49		0.01	0.93		0.32	0.58	
Control Delay		36.2			11.6		5.5	30.3		15.7	12.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		36.2			11.6		5.5	30.3		15.7	12.2	
LOS		D			B		A	C		B	B	
Approach Delay		36.2			11.6			30.3			12.4	
Approach LOS		D			B			C			B	
Queue Length 50th (ft)		61			34		0	310		12	128	
Queue Length 95th (ft)		#152			99		3	#470		27	251	
Internal Link Dist (ft)		275			319			544			5578	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		257			576		296	1640		236	1924	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.64			0.49		0.01	0.93		0.32	0.58	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 22.2

Intersection LOS: C

Intersection Capacity Utilization 81.5%

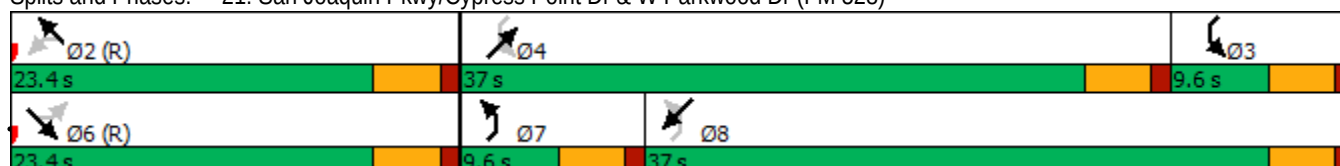
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	0	20	2	1	30	6	1025	6	12	861	113
Future Volume (vph)	32	0	20	2	1	30	6	1025	6	12	861	113
Satd. Flow (prot)	0	1713	0	0	1627	0	1770	3536	0	1770	3479	0
Flt Permitted		0.828			0.975		0.245			0.226		
Satd. Flow (perm)	0	1462	0	0	1591	0	456	3536	0	421	3479	0
Satd. Flow (RTOR)		191			33			1			28	
Adj. Flow (vph)	35	0	22	2	1	33	7	1114	7	13	936	123
Lane Group Flow (vph)	0	57	0	0	36	0	7	1121	0	13	1059	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	22.6	22.6		22.6	22.6		9.6	27.8		9.6	27.8	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		6.1			6.1		48.0	48.7		48.0	48.6	
Actuated g/C Ratio		0.10			0.10		0.80	0.81		0.80	0.81	
v/c Ratio		0.18			0.19		0.01	0.39		0.03	0.38	
Control Delay		1.2			13.1		2.3	4.1		2.6	4.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		1.2			13.1		2.3	4.1		2.6	4.1	
LOS		A			B		A	A		A	A	
Approach Delay		1.2			13.1			4.1			4.1	
Approach LOS		A			B			A			A	
Queue Length 50th (ft)		0			1		1	51		1	46	
Queue Length 95th (ft)		0			23		3	170		4	160	
Internal Link Dist (ft)		523			1267			1499			1231	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		574			502		486	2872		451	2823	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.10			0.07		0.01	0.39		0.03	0.38	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 4.2

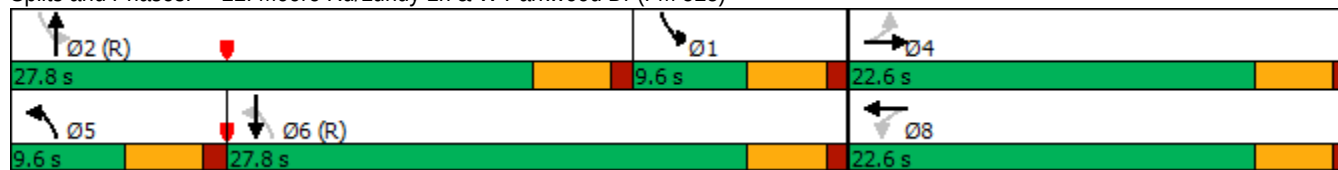
Intersection LOS: A

Intersection Capacity Utilization 45.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	85	96	64	78	73	37	61	379	77	27	329	49
Future Volume (vph)	85	96	64	78	73	37	61	379	77	27	329	49
Satd. Flow (prot)	1770	3327	0	1770	3362	0	1770	3451	0	1770	3472	0
Flt Permitted	0.677			0.642			0.511			0.466		
Satd. Flow (perm)	1261	3327	0	1196	3362	0	952	3451	0	868	3472	0
Satd. Flow (RTOR)		70			40			63			43	
Adj. Flow (vph)	92	104	70	85	79	40	66	412	84	29	358	53
Lane Group Flow (vph)	92	174	0	85	119	0	66	496	0	29	411	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		10.6	10.6		10.6	10.6	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.28	0.28		0.28	0.28	
v/c Ratio	0.15	0.11		0.15	0.07		0.25	0.49		0.12	0.41	
Control Delay	7.3	4.4		7.4	4.8		12.7	11.4		10.9	10.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.3	4.4		7.4	4.8		12.7	11.4		10.9	10.9	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		5.4			5.8			11.5			10.9	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	10	5		9	4		10	37		4	31	
Queue Length 95th (ft)	32	18		31	15		31	66		17	56	
Internal Link Dist (ft)		325			462			2964			1178	
Turn Bay Length (ft)	100			50			100			100		
Base Capacity (vph)	605	1633		574	1634		457	1689		416	1688	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.15	0.11		0.15	0.07		0.14	0.29		0.07	0.24	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 37.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 9.4

Intersection LOS: A

Intersection Capacity Utilization 41.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
22.5 s	22.5 s
 Ø6	 Ø8
22.5 s	22.5 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	23	523	13	6	444	86	6	11	8	128	3	10
Future Volume (vph)	23	523	13	6	444	86	6	11	8	128	3	10
Satd. Flow (prot)	1770	1855	0	1770	1818	0	0	1761	0	0	1765	0
Flt Permitted	0.353			0.349				0.916			0.725	
Satd. Flow (perm)	658	1855	0	650	1818	0	0	1633	0	0	1337	0
Satd. Flow (RTOR)		2			19			9			7	
Adj. Flow (vph)	25	568	14	7	483	93	7	12	9	139	3	11
Lane Group Flow (vph)	25	582	0	7	576	0	0	28	0	0	153	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	40.5	40.2		40.5	40.2			11.6			11.8	
Actuated g/C Ratio	0.68	0.67		0.68	0.67			0.19			0.20	
v/c Ratio	0.05	0.47		0.01	0.47			0.09			0.57	
Control Delay	5.3	11.1		5.3	11.0			14.3			28.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.3	11.1		5.3	11.0			14.3			28.4	
LOS	A	B		A	B			B			C	
Approach Delay		10.8			10.9			14.3			28.4	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	3	87		1	83			6			48	
Queue Length 95th (ft)	12	#341		5	#336			21			88	
Internal Link Dist (ft)		593			928			273			821	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	551	1244		543	1223			498			408	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.05	0.47		0.01	0.47			0.06			0.38	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.57

Intersection Signal Delay: 12.9

Intersection LOS: B

Intersection Capacity Utilization 50.6%

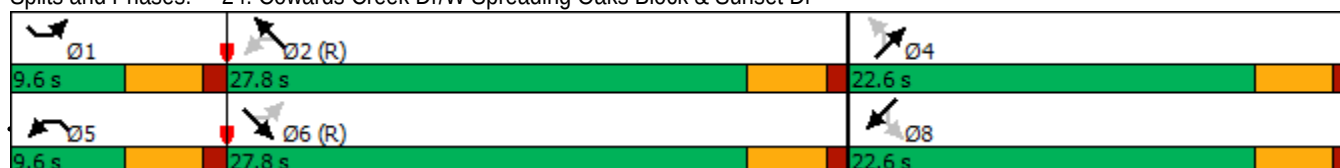
ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	320	312	94	355	0	194	8	40	1	11	9
Future Volume (vph)	8	320	312	94	355	0	194	8	40	1	11	9
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1751	0	0	1749	0
Flt Permitted	0.530			0.177				0.753			0.988	
Satd. Flow (perm)	987	1725	0	330	1863	0	0	1372	0	0	1732	0
Satd. Flow (RTOR)		96						15			10	
Adj. Flow (vph)	9	348	339	102	386	0	211	9	43	1	12	10
Lane Group Flow (vph)	9	687	0	102	386	0	0	263	0	0	23	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	32.8		9.6	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	36.6	32.3		39.6	38.5			15.5			15.5	
Actuated g/C Ratio	0.56	0.50		0.61	0.59			0.24			0.24	
v/c Ratio	0.01	0.76		0.31	0.35			0.78			0.05	
Control Delay	5.9	20.6		8.5	9.6			38.1			13.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.9	20.6		8.5	9.6			38.1			13.4	
LOS	A	C		A	A			D			B	
Approach Delay		20.4			9.3			38.1			13.4	
Approach LOS		C			A			D			B	
Queue Length 50th (ft)	1	203		15	68			89			4	
Queue Length 95th (ft)	6	#406		34	173			#182			19	
Internal Link Dist (ft)		928			1588			1375			462	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	620	906		325	1104			392			489	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.76		0.31	0.35			0.67			0.05	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 19.8

Intersection LOS: B

Intersection Capacity Utilization 72.7%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	19	303	23	43	311	36	86	77	62	18	81	46
Future Volume (vph)	19	303	23	43	311	36	86	77	62	18	81	46
Satd. Flow (prot)	1770	1842	0	1770	1833	0	0	1814	1583	0	1772	0
Flt Permitted	0.521			0.489				0.759			0.941	
Satd. Flow (perm)	970	1842	0	911	1833	0	0	1414	1583	0	1677	0
Satd. Flow (RTOR)		7			11				119		45	
Adj. Flow (vph)	21	329	25	47	338	39	93	84	67	20	88	50
Lane Group Flow (vph)	21	354	0	47	377	0	0	177	67	0	158	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	23.0		9.5	23.0		22.5	22.5	22.5	22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	34.6	33.0		35.6	35.2			11.8	11.8		11.5	
Actuated g/C Ratio	0.63	0.60		0.65	0.64			0.21	0.21		0.21	
v/c Ratio	0.03	0.32		0.07	0.32			0.58	0.15		0.41	
Control Delay	5.7	10.8		5.6	9.0			26.6	2.0		15.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.7	10.8		5.6	9.0			26.6	2.0		15.6	
LOS	A	B		A	A			C	A		B	
Approach Delay		10.5			8.6			19.8			15.6	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	2	44		5	47			52	0		31	
Queue Length 95th (ft)	11	161		18	172			92	9		65	
Internal Link Dist (ft)		1588			1447			1640			405	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	694	1108		682	1177			462	598		579	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.03	0.32		0.07	0.32			0.38	0.11		0.27	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 12.4

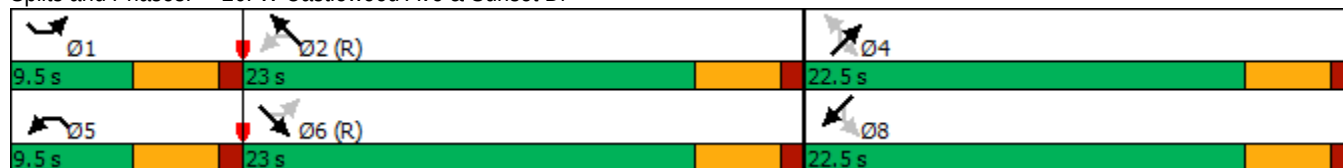
Intersection LOS: B

Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	99	273	15	11	605	39	13	75	29	7	26	117
Future Volume (Veh/h)	99	273	15	11	605	39	13	75	29	7	26	117
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	297	16	12	658	42	14	82	32	8	28	127
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												4
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	700			313			1302	1245	305	1297	1232	679
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	700			313			1302	1245	305	1297	1232	679
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	88			99			82	46	96	88	82	72
cM capacity (veh/h)	897			1247			77	152	735	69	154	452
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	421	712	128	163								
Volume Left	108	12	14	8								
Volume Right	16	42	32	127								
cSH	897	1247	167	580								
Volume to Capacity	0.12	0.01	0.77	0.28								
Queue Length 95th (ft)	10	1	123	29								
Control Delay (s)	3.5	0.3	75.0	21.6								
Lane LOS	A	A	F	C								
Approach Delay (s)	3.5	0.3	75.0	21.6								
Approach LOS			F	C								
Intersection Summary												
Average Delay			10.4									
Intersection Capacity Utilization			78.7%		ICU Level of Service				D			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	286	19	58	561	44	105
Future Volume (Veh/h)	286	19	58	561	44	105
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	311	21	63	610	48	114
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			332		1058	322
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			332		1058	322
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		80	84
cM capacity (veh/h)			1227		236	719
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	332	673	162			
Volume Left	0	63	48			
Volume Right	21	0	114			
cSH	1700	1227	448			
Volume to Capacity	0.20	0.05	0.36			
Queue Length 95th (ft)	0	4	41			
Control Delay (s)	0.0	1.3	17.5			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.3	17.5			
Approach LOS			C			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			67.8%	ICU Level of Service		C
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	127	261	512	11	19	105
Future Volume (Veh/h)	127	261	512	11	19	105
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	138	284	557	12	21	114
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	569				1123	563
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	569				1123	563
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	86				89	78
cM capacity (veh/h)	1003				196	526
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	422	569	135			
Volume Left	138	0	21			
Volume Right	0	12	114			
cSH	1003	1700	417			
Volume to Capacity	0.14	0.33	0.32			
Queue Length 95th (ft)	12	0	35			
Control Delay (s)	4.0	0.0	17.7			
Lane LOS	A		C			
Approach Delay (s)	4.0	0.0	17.7			
Approach LOS			C			
Intersection Summary						
Average Delay			3.6			
Intersection Capacity Utilization		65.9%		ICU Level of Service		C
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	62	77	93	29	42	56	49	322	66	26	251	18
Future Volume (vph)	62	77	93	29	42	56	49	322	66	26	251	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	67	84	101	32	46	61	53	350	72	28	273	20
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	252	139	475	321								
Volume Left (vph)	67	32	53	28								
Volume Right (vph)	101	61	72	20								
Hadj (s)	-0.15	-0.18	-0.03	0.01								
Departure Headway (s)	6.5	6.8	5.9	6.2								
Degree Utilization, x	0.45	0.26	0.77	0.55								
Capacity (veh/h)	489	452	594	537								
Control Delay (s)	14.8	12.2	25.9	16.5								
Approach Delay (s)	14.8	12.2	25.9	16.5								
Approach LOS	B	B	D	C								
Intersection Summary												
Delay			19.4									
Level of Service			C									
Intersection Capacity Utilization			58.7%	ICU Level of Service					B			
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	41	1279	176	62	1368	21	114	0	42	22	21	48
Future Volume (vph)	41	1279	176	62	1368	21	114	0	42	22	21	48
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1731	0	0	1710	0
Flt Permitted	0.116			0.116				0.761			0.912	
Satd. Flow (perm)	216	3476	0	216	3532	0	0	1365	0	0	1578	0
Satd. Flow (RTOR)		29			3			164			52	
Adj. Flow (vph)	45	1390	191	67	1487	23	124	0	46	24	23	52
Lane Group Flow (vph)	45	1581	0	67	1510	0	0	170	0	0	99	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	37.0		9.6	37.0		23.4	23.4		23.4	23.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	38.8	34.4		37.4	34.4			20.9			20.9	
Actuated g/C Ratio	0.55	0.49		0.53	0.49			0.30			0.30	
v/c Ratio	0.19	0.92		0.29	0.87			0.33			0.20	
Control Delay	11.0	27.7		9.5	23.7			6.1			12.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	11.0	27.7		9.5	23.7			6.1			12.1	
LOS	B	C		A	C			A			B	
Approach Delay		27.3			23.1			6.1			12.1	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)	7	327		11	303			2			15	
Queue Length 95th (ft)	18	#496		25	#460			44			49	
Internal Link Dist (ft)		932			2990			285			455	
Turn Bay Length (ft)	50			100								
Base Capacity (vph)	234	1721		228	1736			522			507	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.19	0.92		0.29	0.87			0.33			0.20	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 23.9

Intersection LOS: C

Intersection Capacity Utilization 71.9%

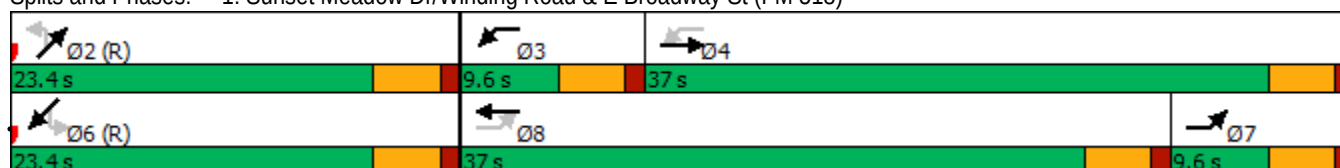
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

2030 PM Peak

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	246	761	162	79	802	132	288	495	110	234	796	350
Future Volume (vph)	246	761	162	79	802	132	288	495	110	234	796	350
Satd. Flow (prot)	1770	3539	1583	1770	3465	0	1770	3444	0	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3465	0	1770	3444	0	1770	3539	1583
Satd. Flow (RTOR)			164		19			25				153
Adj. Flow (vph)	267	827	176	86	872	143	313	538	120	254	865	380
Lane Group Flow (vph)	267	827	176	86	1015	0	313	658	0	254	865	380
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									8
Total Split (s)	13.0	38.5	38.5	9.5	35.0		23.0	28.7		23.3	29.0	29.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	8.5	34.0	34.0	5.0	30.5		18.5	25.6		17.4	24.5	24.5
Actuated g/C Ratio	0.08	0.34	0.34	0.05	0.30		0.18	0.26		0.17	0.24	0.24
v/c Ratio	1.78	0.69	0.27	0.98	0.95		0.96	0.73		0.83	1.00	0.76
Control Delay	405.8	32.0	5.8	139.9	51.8		81.9	38.7		62.1	68.7	31.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	405.8	32.0	5.8	139.9	51.8		81.9	38.7		62.1	68.7	31.4
LOS	F	C	A	F	D		F	D		E	E	C
Approach Delay	107.0			58.7			52.6			58.1		
Approach LOS	F			E			D			E		
Queue Length 50th (ft)	~256	236	5	56	326		199	198		155	291	136
Queue Length 95th (ft)	#413	305	50	#154	#461		#367	265		#272	#425	#271
Internal Link Dist (ft)	496			1080			295			1563		
Turn Bay Length (ft)	200		150	100			200			250		250
Base Capacity (vph)	150	1203	646	88	1070		327	900		332	867	503
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	1.78	0.69	0.27	0.98	0.95		0.96	0.73		0.77	1.00	0.76

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.78

Intersection Signal Delay: 70.0

Intersection LOS: E

Intersection Capacity Utilization 93.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
13 s	35 s	23.3 s	28.7 s
			
Ø5	Ø6	Ø8	Ø7
9.5 s	38.5 s	29 s	23 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	1120	38	88	1170	23	60	21	71	36	26	6
Future Volume (vph)	2	1120	38	88	1170	23	60	21	71	36	26	6
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1712	0	0	1791	0
Flt Permitted	0.151			0.150				0.839			0.764	
Satd. Flow (perm)	281	3522	0	279	3529	0	0	1464	0	0	1405	0
Satd. Flow (RTOR)		6			4			75			7	
Adj. Flow (vph)	2	1217	41	96	1272	25	65	23	77	39	28	7
Lane Group Flow (vph)	2	1258	0	96	1297	0	0	165	0	0	74	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	31.6	28.2		29.9	31.7			8.7			8.7	
Actuated g/C Ratio	0.66	0.59		0.62	0.66			0.18			0.18	
v/c Ratio	0.01	0.61		0.29	0.56			0.51			0.29	
Control Delay	4.5	12.5		6.8	9.5			16.8			19.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.5	12.5		6.8	9.5			16.8			19.2	
LOS	A	B		A	A			B			B	
Approach Delay		12.5			9.3			16.8			19.2	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	0	149		8	85			24			18	
Queue Length 95th (ft)	2	#305		26	#321			67			46	
Internal Link Dist (ft)		1418			1651			1271			991	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	345	2068		334	2335			607			542	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.01	0.61		0.29	0.56			0.27			0.14	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 48

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 11.4

Intersection LOS: B

Intersection Capacity Utilization 58.4%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

 Ø1	 Ø2	 Ø4
9.6 s	27.8 s	22.6 s
 Ø5	 Ø6	 Ø8
9.6 s	27.8 s	22.6 s

BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	1218	75	146	1323	13	54	9	106	13	9	8
Future Volume (vph)	10	1218	75	146	1323	13	54	9	106	13	9	8
Satd. Flow (prot)	1770	3507	0	1770	3536	0	0	1679	0	0	1756	0
Flt Permitted	0.127			0.114				0.880			0.800	
Satd. Flow (perm)	237	3507	0	212	3536	0	0	1502	0	0	1435	0
Satd. Flow (RTOR)		12			2			115			9	
Adj. Flow (vph)	11	1324	82	159	1438	14	59	10	115	14	10	9
Lane Group Flow (vph)	11	1406	0	159	1452	0	0	184	0	0	33	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	9.6	37.2		10.2	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	43.3	33.9		39.6	42.3			8.8			8.8	
Actuated g/C Ratio	0.70	0.55		0.64	0.68			0.14			0.14	
v/c Ratio	0.04	0.73		0.57	0.60			0.59			0.16	
Control Delay	3.9	14.1		17.1	8.3			18.3			19.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.9	14.1		17.1	8.3			18.3			19.3	
LOS	A	B		B	A			B			B	
Approach Delay		14.0			9.2			18.3			19.3	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	1	182		14	101			23			8	
Queue Length 95th (ft)	6	317		#84	328			74			28	
Internal Link Dist (ft)		828			966			420			507	
Turn Bay Length (ft)	100			150								
Base Capacity (vph)	292	1924		278	2415			521			426	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.04	0.73		0.57	0.60			0.35			0.08	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 62

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 11.9

Intersection LOS: B

Intersection Capacity Utilization 67.0%

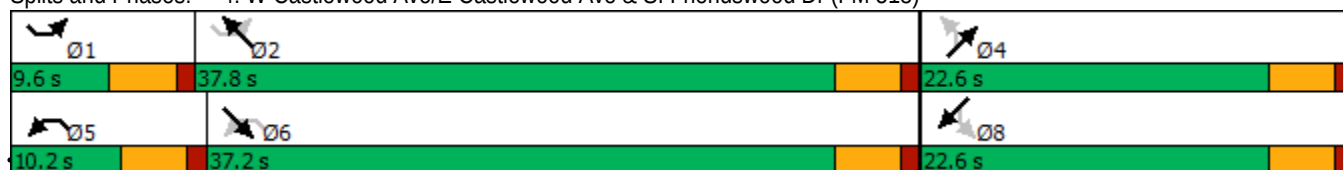
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)



BGE

Synchro 10 Report

Friendswood TX Traffic Study

2030 PM Peak

5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	12	26	426	7	276	1	1199	289	259	1157	2
Future Volume (vph)	0	12	26	426	7	276	1	1199	289	259	1157	2
Satd. Flow (prot)	0	1691	0	0	1775	1583	1770	3539	1583	1770	3539	0
Flt Permitted					0.700		0.195			0.133		
Satd. Flow (perm)	0	1691	0	0	1304	1583	363	3539	1583	248	3539	0
Satd. Flow (RTOR)		28				254			165			
Adj. Flow (vph)	0	13	28	463	8	300	1	1303	314	282	1258	2
Lane Group Flow (vph)	0	41	0	0	471	300	1	1303	314	282	1260	0
Turn Type		NA		Perm	NA	Perm	Perm	NA	Perm	D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	2		
Total Split (s)	32.1	32.1		32.1	32.1	32.1	34.6	34.6	34.6	13.3	47.9	
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effect Green (s)		27.6			27.6	27.6	30.1	30.1	30.1	38.9	43.4	
Actuated g/C Ratio		0.34			0.34	0.34	0.38	0.38	0.38	0.49	0.54	
v/c Ratio		0.07			1.05	0.42	0.01	0.98	0.45	0.98	0.66	
Control Delay		9.7			84.6	6.3	16.0	46.2	10.9	69.3	15.1	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		9.7			84.6	6.3	16.0	46.2	10.9	69.3	15.1	
LOS		A			F	A	B	D	B	E	B	
Approach Delay		9.7			54.1			39.4			25.0	
Approach LOS		A			D			D			C	
Queue Length 50th (ft)		4			~260	15	0	331	50	90	218	
Queue Length 95th (ft)		25			#437	70	4	#481	117	#243	287	
Internal Link Dist (ft)		91			1708			813			746	
Turn Bay Length (ft)							100		100	100		
Base Capacity (vph)		601			449	712	136	1331	698	288	1919	
Starvation Cap Reductn		0			0	0	0	0	0	0	0	
Spillback Cap Reductn		0			0	0	0	0	0	0	0	
Storage Cap Reductn		0			0	0	0	0	0	0	0	
Reduced v/c Ratio		0.07			1.05	0.42	0.01	0.98	0.45	0.98	0.66	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 36.4

Intersection LOS: D

Intersection Capacity Utilization 89.4%

ICU Level of Service E

Analysis Period (min) 15

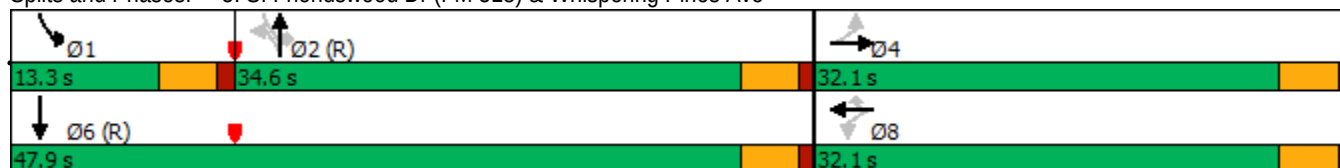
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



Friendswood TX Traffic Study

2030 PM Peak

6: S. Friendswood Dr (FM 518) & Winding Way Dr

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	33	1094	26	258	1298	43	30	36	21	29	60	353
Future Volume (vph)	33	1094	26	258	1298	43	30	36	21	29	60	353
Satd. Flow (prot)	1770	3529	0	1770	3522	0	0	1771	0	0	1833	1583
Flt Permitted	0.950			0.950				0.886			0.892	
Satd. Flow (perm)	1770	3529	0	1770	3522	0	0	1596	0	0	1662	1583
Satd. Flow (RTOR)		4			6			20				292
Adj. Flow (vph)	36	1189	28	280	1411	47	33	39	23	32	65	384
Lane Group Flow (vph)	36	1217	0	280	1458	0	0	95	0	0	97	384
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.6	33.4		19.0	42.8		22.6	22.6		22.6	22.6	22.6
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	5.1	28.9		14.5	38.3			18.1			18.1	18.1
Actuated g/C Ratio	0.07	0.39		0.19	0.51			0.24			0.24	0.24
v/c Ratio	0.30	0.89		0.82	0.81			0.24			0.24	0.64
Control Delay	40.1	31.9		50.3	19.8			20.4			24.9	12.3
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	40.1	31.9		50.3	19.8			20.4			24.9	12.3
LOS	D	C		D	B			C			C	B
Approach Delay		32.1			24.7			20.4			14.8	
Approach LOS		C			C			C			B	
Queue Length 50th (ft)	16	271		126	278			28			36	35
Queue Length 95th (ft)	44	#402		#250	368			65			75	119
Internal Link Dist (ft)		2078			699			1594			1683	
Turn Bay Length (ft)	110			170								
Base Capacity (vph)	120	1362		342	1801			400			401	603
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.30	0.89		0.82	0.81			0.24			0.24	0.64

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 25.8

Intersection LOS: C

Intersection Capacity Utilization 69.0%

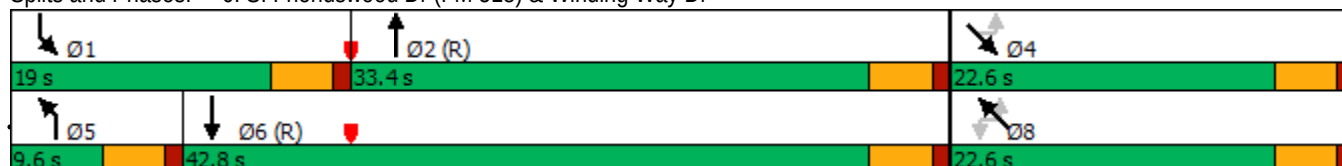
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



Friendswood TX Traffic Study

2030 PM Peak

7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	431	713	213	127	836	413	299	1224	466	354	1679	103
Future Volume (vph)	431	713	213	127	836	413	299	1224	466	354	1679	103
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	4877	0	3433	5040	0
Flt Permitted	0.146			0.191			0.107			0.111		
Satd. Flow (perm)	528	3539	1583	690	3539	1583	387	4877	0	401	5040	0
Satd. Flow (RTOR)			164			164		107			11	
Adj. Flow (vph)	468	775	232	138	909	449	325	1330	507	385	1825	112
Lane Group Flow (vph)	468	775	232	138	909	449	325	1837	0	385	1937	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	6		2	2		6	8			4		
Total Split (s)	14.8	37.1	37.1	9.6	31.9	31.9	11.3	40.5		12.8	42.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	37.7	32.6	32.6	37.7	27.4	27.4	44.3	36.0		44.3	37.5	
Actuated g/C Ratio	0.38	0.33	0.33	0.38	0.27	0.27	0.44	0.36		0.44	0.38	
v/c Ratio	0.94	0.67	0.37	0.34	0.94	0.81	0.86	1.01		0.90	1.02	
Control Delay	51.7	32.6	10.1	24.7	53.6	34.5	40.6	53.6		60.5	57.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	51.7	32.6	10.1	24.7	53.6	34.5	40.6	53.6		60.5	57.8	
LOS	D	C	B	C	D	C	D	D		E	E	
Approach Delay		35.1			45.2			51.6			58.3	
Approach LOS		D			D			D			E	
Queue Length 50th (ft)	102	222	30	26	297	175	58	~412		70	~481	
Queue Length 95th (ft)	#200	289	89	45	#422	#339	#130	#532		#160	#579	
Internal Link Dist (ft)		2375			2078			1141			1176	
Turn Bay Length (ft)	180		100	200		200	250			140		
Base Capacity (vph)	498	1153	626	400	969	552	378	1824		429	1896	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.94	0.67	0.37	0.34	0.94	0.81	0.86	1.01		0.90	1.02	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 49.1

Intersection LOS: D

Intersection Capacity Utilization 94.6%

ICU Level of Service F

Analysis Period (min) 15

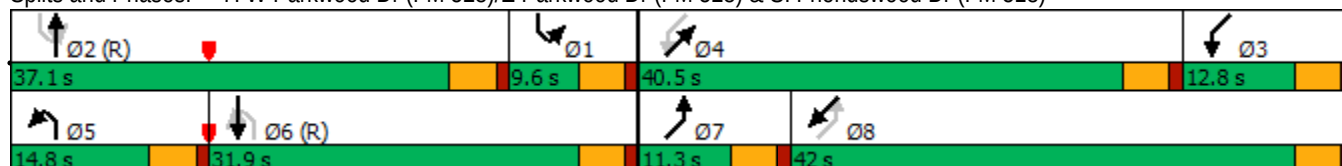
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		 	 			
Traffic Volume (vph)	42	1334	1583	188	100	19
Future Volume (vph)	42	1334	1583	188	100	19
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.093				0.950	
Satd. Flow (perm)	173	3539	3483	0	1770	1583
Satd. Flow (RTOR)			36			21
Adj. Flow (vph)	46	1450	1721	204	109	21
Lane Group Flow (vph)	46	1450	1925	0	109	21
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.6	54.0	44.4		11.0	11.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	49.0	52.6	46.8		6.4	6.4
Actuated g/C Ratio	0.75	0.81	0.72		0.10	0.10
v/c Ratio	0.18	0.51	0.76		0.62	0.12
Control Delay	3.7	3.5	11.6		46.0	14.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	3.7	3.5	11.6		46.0	14.4
LOS	A	A	B		D	B
Approach Delay		3.5	11.6		40.9	
Approach LOS		A	B		D	
Queue Length 50th (ft)	3	85	294		42	0
Queue Length 95th (ft)	8	117	#458		#106	18
Internal Link Dist (ft)		550	2375		438	
Turn Bay Length (ft)	150					
Base Capacity (vph)	258	2864	2519		177	177
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.18	0.51	0.76		0.62	0.12

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 9.2

Intersection LOS: A

Intersection Capacity Utilization 62.8%

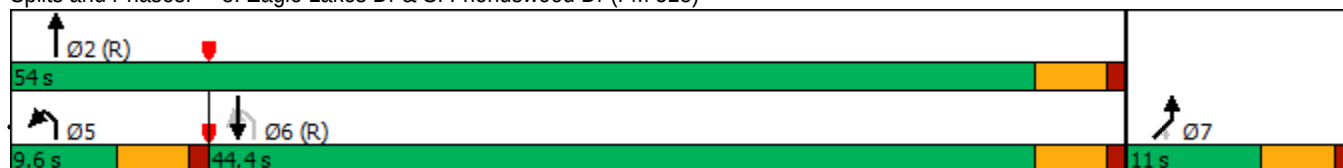
ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	120	1137	210	129	1074	18	145	17	118	8	15	86
Future Volume (vph)	120	1137	210	129	1074	18	145	17	118	8	15	86
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.142			0.119			0.950			0.950		
Satd. Flow (perm)	265	3539	1583	222	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			228			182			128			182
Adj. Flow (vph)	130	1236	228	140	1167	20	158	18	128	9	16	93
Lane Group Flow (vph)	130	1236	228	140	1167	20	158	18	128	9	16	93
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	10.8	41.5	41.5	11.0	41.7	41.7	15.0	28.0	28.0	9.5	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	57.4	48.4	48.4	57.4	48.8	48.8	10.2	17.2	17.2	5.0	6.4	6.4
Actuated g/C Ratio	0.64	0.54	0.54	0.64	0.54	0.54	0.11	0.19	0.19	0.06	0.07	0.07
v/c Ratio	0.42	0.65	0.24	0.47	0.61	0.02	0.79	0.05	0.32	0.09	0.12	0.33
Control Delay	10.0	18.3	2.7	13.0	17.1	0.1	66.7	30.2	8.6	42.6	40.8	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	18.3	2.7	13.0	17.1	0.1	66.7	30.2	8.6	42.6	40.8	3.2
LOS	B	B	A	B	B	A	E	C	A	D	D	A
Approach Delay		15.4			16.4			40.1			11.3	
Approach LOS		B			B			D			B	
Queue Length 50th (ft)	24	258	0	26	234	0	89	8	0	5	9	0
Queue Length 95th (ft)	46	382	38	62	345	0	#187	28	49	20	28	0
Internal Link Dist (ft)		956			2431			1290			159	
Turn Bay Length (ft)	100		890	100		420	120			100		100
Base Capacity (vph)	314	1902	956	298	1919	941	206	486	507	98	372	462
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.65	0.24	0.47	0.61	0.02	0.77	0.04	0.25	0.09	0.04	0.20

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 17.9

Intersection LOS: B

Intersection Capacity Utilization 64.5%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	257	802	221	174	1090	291	231	276	93	236	338	453
Future Volume (vph)	257	802	221	174	1090	291	231	276	93	236	338	453
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.128			0.183			0.200			0.383		
Satd. Flow (perm)	238	3539	1583	341	3539	1583	373	3405	0	713	3235	0
Satd. Flow (RTOR)			240			316		47			284	
Adj. Flow (vph)	279	872	240	189	1185	316	251	300	101	257	367	492
Lane Group Flow (vph)	279	872	240	189	1185	316	251	401	0	257	859	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	15.5	37.9	37.9	13.4	35.8	35.8	14.2	23.5		15.2	24.5	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	42.3	33.7	33.7	42.3	31.3	31.3	29.7	19.1		29.7	20.0	
Actuated g/C Ratio	0.47	0.37	0.37	0.47	0.35	0.35	0.33	0.21		0.33	0.22	
v/c Ratio	0.93	0.66	0.32	0.64	0.96	0.42	0.92	0.53		0.72	0.91	
Control Delay	71.1	26.4	4.0	22.4	48.1	4.4	62.1	30.5		34.0	38.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	71.1	26.4	4.0	22.4	48.1	4.4	62.1	30.5		34.0	38.5	
LOS	E	C	A	C	D	A	E	C		C	D	
Approach Delay		31.5			37.1			42.7			37.5	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	107	214	0	55	343	0	101	94		104	174	
Queue Length 95th (ft)	#260	280	46	93	#486	54	#234	140		#184	#292	
Internal Link Dist (ft)		2502			2504			568			528	
Turn Bay Length (ft)	200		290	220		1000	80			80		
Base Capacity (vph)	299	1325	742	302	1230	756	273	760		361	939	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.93	0.66	0.32	0.63	0.96	0.42	0.92	0.53		0.71	0.91	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 36.3

Intersection LOS: D

Intersection Capacity Utilization 96.1%

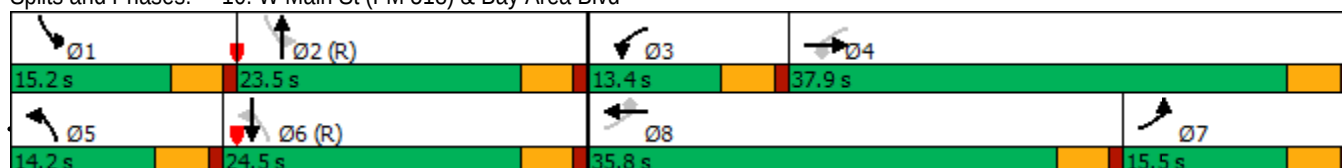
ICU Level of Service F

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	35	211	109	105	213	40	126	948	95	154	1457	86
Future Volume (vph)	35	211	109	105	213	40	126	948	95	154	1457	86
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			149			149			149			104
Adj. Flow (vph)	38	229	118	114	232	43	137	1030	103	167	1584	93
Lane Group Flow (vph)	38	229	118	114	232	43	137	1030	103	167	1584	93
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	22.5	22.5	22.5	23.3	23.3	23.3	13.2	45.6	45.6	18.6	51.0	51.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	16.5	16.5	16.5	18.8	18.8	18.8	8.7	42.1	42.1	13.2	46.5	46.5
Actuated g/C Ratio	0.15	0.15	0.15	0.17	0.17	0.17	0.08	0.39	0.39	0.12	0.43	0.43
v/c Ratio	0.14	0.81	0.32	0.37	0.72	0.11	0.97	0.75	0.15	0.78	1.04	0.13
Control Delay	41.0	66.7	5.8	44.2	56.6	0.6	119.7	33.5	1.6	71.1	67.1	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.0	66.7	5.8	44.2	56.6	0.6	119.7	33.5	1.6	71.1	67.1	3.5
LOS	D	E	A	D	E	A	F	C	A	E	E	A
Approach Delay		45.5			46.8			40.2			64.2	
Approach LOS		D			D			D			E	
Queue Length 50th (ft)	23	156	0	72	157	0	98	334	0	115	~647	0
Queue Length 95th (ft)	54	#267	30	128	#263	0	#224	416	13	#216	#786	26
Internal Link Dist (ft)		1651			3732			5386			1771	
Turn Bay Length (ft)	100		100	100		100	360		200	260		200
Base Capacity (vph)	293	308	386	306	322	397	141	1370	704	229	1516	737
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.74	0.31	0.37	0.72	0.11	0.97	0.75	0.15	0.73	1.04	0.13

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 108.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 52.8

Intersection LOS: D

Intersection Capacity Utilization 79.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 11: Beamer Rd & FM 2351

 Ø2	 Ø6	 Ø3	 Ø4
23.3 s	22.5 s	18.6 s	45.6 s
		 Ø7	 Ø8
		13.2 s	51 s

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	↗
Traffic Volume (vph)	1032	96	87	1567	127	89
Future Volume (vph)	1032	96	87	1567	127	89
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	18					97
Adj. Flow (vph)	1122	104	95	1703	138	97
Lane Group Flow (vph)	1226	0	95	1703	138	97
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	26.3		9.8	36.1	23.9	23.9
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	23.6		5.3	31.4	19.4	19.4
Actuated g/C Ratio	0.39		0.09	0.53	0.32	0.32
v/c Ratio	0.88		0.61	0.92	0.12	0.17
Control Delay	28.1		45.5	23.1	14.7	4.7
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	28.1		45.5	23.1	14.7	4.7
LOS	C		D	C	B	A
Approach Delay	28.1			24.3	10.6	
Approach LOS	C			C	B	
Queue Length 50th (ft)	218		34	269	18	0
Queue Length 95th (ft)	#355		#93	#440	34	27
Internal Link Dist (ft)	687			427	507	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1387		157	1870	1114	579
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.88		0.61	0.91	0.12	0.17

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 59.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 24.7

Intersection LOS: C

Intersection Capacity Utilization 55.0%

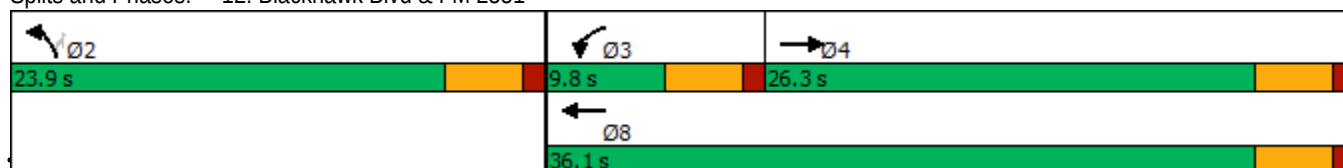
ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 12: Blackhawk Blvd & FM 2351



BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	66	0	77	0	0	0	99	1043	0	0	1494	153
Future Volume (vph)	66	0	77	0	0	0	99	1043	0	0	1494	153
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757					0.095					
Satd. Flow (perm)	0	1410	1583	0	1863	0	177	3539	0	1863	3490	0
Satd. Flow (RTOR)			143								21	
Adj. Flow (vph)	72	0	84	0	0	0	108	1134	0	0	1624	166
Lane Group Flow (vph)	0	72	84	0	0	0	108	1134	0	0	1790	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	22.5	22.5		22.5	22.5		9.5	48.0		9.5	48.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		18.1	76.8				46.1	49.6			42.3	
Actuated g/C Ratio		0.24	1.00				0.60	0.65			0.55	
v/c Ratio		0.22	0.05				0.51	0.50			0.93	
Control Delay		27.5	0.1				16.7	7.8			26.5	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		27.5	0.1				16.7	7.8			26.5	
LOS		C	A				B	A			C	
Approach Delay		12.7						8.6			26.5	
Approach LOS		B						A			C	
Queue Length 50th (ft)		30	0				17	128			404	
Queue Length 95th (ft)		65	0				48	168			#597	
Internal Link Dist (ft)		212			271			289			1965	
Turn Bay Length (ft)							120					
Base Capacity (vph)		333	1583				210	2355			2001	
Starvation Cap Reductn		0	0				0	0			0	
Spillback Cap Reductn		0	0				0	0			0	
Storage Cap Reductn		0	0				0	0			0	
Reduced v/c Ratio		0.22	0.05				0.51	0.48			0.89	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 76.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 18.8

Intersection LOS: B

Intersection Capacity Utilization 67.1%

ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351) & Woodland Trail Dr

 Ø2	 Ø3	 Ø4
22.5 s	9.5 s	48 s
 Ø6	 Ø7	 Ø8
22.5 s	9.5 s	48 s

BGE

Synchro 10 Report

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	107	0	174	9	9	1	145	1073	1	5	1496	128
Future Volume (vph)	107	0	174	9	9	1	145	1073	1	5	1496	128
Satd. Flow (prot)	1770	1583	0	0	1809	0	1770	3539	0	1770	3497	0
Flt Permitted	0.744				0.871		0.078			0.186		
Satd. Flow (perm)	1386	1583	0	0	1613	0	145	3539	0	346	3497	0
Satd. Flow (RTOR)		120			1						15	
Adj. Flow (vph)	116	0	189	10	10	1	158	1166	1	5	1626	139
Lane Group Flow (vph)	116	189	0	0	21	0	158	1167	0	5	1765	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	25.0	25.0		25.0	25.0		12.0	55.4		9.6	53.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	20.5	20.5			20.5		55.4	58.0		59.0	48.0	
Actuated g/C Ratio	0.23	0.23			0.23		0.62	0.65		0.66	0.54	
v/c Ratio	0.37	0.42			0.06		0.71	0.51		0.02	0.94	
Control Delay	33.2	14.9			26.9		34.4	9.7		5.0	30.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	33.2	14.9			26.9		34.4	9.7		5.0	30.3	
LOS	C	B			C		C	A		A	C	
Approach Delay		21.9			26.9			12.7			30.2	
Approach LOS		C			C			B			C	
Queue Length 50th (ft)	56	32			9		39	150		1	457	
Queue Length 95th (ft)	106	91			28		#128	270		4	#651	
Internal Link Dist (ft)		1749			166			1563			466	
Turn Bay Length (ft)	120						180			100		
Base Capacity (vph)	317	455			370		226	2295		309	1904	
Starvation Cap Reductn	0	0			0		0	0		0	0	
Spillback Cap Reductn	0	0			0		0	0		0	0	
Storage Cap Reductn	0	0			0		0	0		0	0	
Reduced v/c Ratio	0.37	0.42			0.06		0.70	0.51		0.02	0.93	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 22.6

Intersection LOS: C

Intersection Capacity Utilization 75.7%

ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln

 Ø2	 Ø3	 Ø4
25 s	9.6 s	55.4 s
 Ø6	 Ø7	 Ø8
25 s	12 s	53 s

BGE

Synchro 10 Report

Friendswood TX Traffic Study

2030 PM Peak
15: W Edgewood Dr (FM 2351) & Sunset Dr

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	30	26	18	186	37	443	23	431	154	454	545	50
Future Volume (vph)	30	26	18	186	37	443	23	431	154	454	545	50
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1790	0	1770	1863	1583
Flt Permitted		0.661			0.722		0.383			0.358		
Satd. Flow (perm)	0	1191	0	0	1345	1583	713	1790	0	667	1863	1583
Satd. Flow (RTOR)		15				482		45				54
Adj. Flow (vph)	33	28	20	202	40	482	25	468	167	493	592	54
Lane Group Flow (vph)	0	81	0	0	242	482	25	635	0	493	592	54
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	24.0	24.0		24.0	24.0		76.0	76.0		76.0	76.0	76.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		19.5			19.5	100.0	71.5	71.5		71.5	71.5	71.5
Actuated g/C Ratio		0.20			0.20	1.00	0.72	0.72		0.72	0.72	0.72
v/c Ratio		0.33			0.92	0.30	0.05	0.49		1.04	0.44	0.05
Control Delay		32.7			80.3	0.5	4.5	7.3		68.4	7.2	1.3
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		32.7			80.3	0.5	4.5	7.3		68.4	7.2	1.3
LOS		C			F	A	A	A		E	A	A
Approach Delay		32.7			27.2			7.2			33.4	
Approach LOS		C			C			A			C	
Queue Length 50th (ft)		36			153	0	4	140		~340	136	0
Queue Length 95th (ft)		81			#300	0	12	209		#537	196	10
Internal Link Dist (ft)		99			1232			1295			2821	
Turn Bay Length (ft)							100			135		135
Base Capacity (vph)		244			262	1583	509	1292		476	1332	1147
Starvation Cap Reductn		0			0	0	0	0		0	0	0
Spillback Cap Reductn		0			0	0	0	0		0	0	0
Storage Cap Reductn		0			0	0	0	0		0	0	0
Reduced v/c Ratio		0.33			0.92	0.30	0.05	0.49		1.04	0.44	0.05

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 25.0

Intersection LOS: C

Intersection Capacity Utilization 87.4%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
24 s	76 s
 Ø6	 Ø8
24 s	76 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	362	1288	46	319	1453	120	133	482	215	169	529	420
Future Volume (vph)	362	1288	46	319	1453	120	133	482	215	169	529	420
Satd. Flow (prot)	3433	5060	0	3433	5029	0	1770	4851	0	1770	4750	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5060	0	3433	5029	0	1770	4851	0	1770	4750	0
Satd. Flow (RTOR)		6			16			114			207	
Adj. Flow (vph)	393	1400	50	347	1579	130	145	524	234	184	575	457
Lane Group Flow (vph)	393	1450	0	347	1709	0	145	758	0	184	1032	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	16.1	34.7		16.6	35.2		13.4	23.5		15.2	25.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	11.6	30.5		11.8	30.7		8.9	19.0		10.7	20.8	
Actuated g/C Ratio	0.13	0.34		0.13	0.34		0.10	0.21		0.12	0.23	
v/c Ratio	0.89	0.84		0.77	0.99		0.83	0.68		0.88	0.87dr	
Control Delay	62.4	33.2		50.4	49.8		76.4	31.2		77.9	32.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	62.4	33.2		50.4	49.8		76.4	31.2		77.9	32.5	
LOS	E	C		D	D		E	C		E	C	
Approach Delay		39.5			49.9			38.4			39.4	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	114	276		99	347		82	124		104	165	
Queue Length 95th (ft)	#195	337		#157	#464		#186	167		#224	217	
Internal Link Dist (ft)		1970			1837			1824			792	
Turn Bay Length (ft)	150			150			100			100		
Base Capacity (vph)	442	1717		461	1725		175	1114		210	1256	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.89	0.84		0.75	0.99		0.83	0.68		0.88	0.82	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 42.8

Intersection LOS: D

Intersection Capacity Utilization 83.1%

ICU Level of Service E

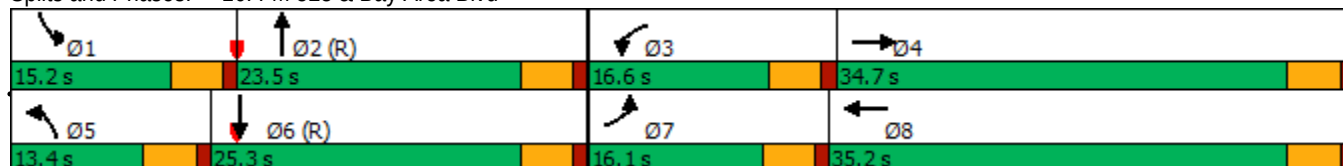
Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 16: FM 528 & Bay Area Blvd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	1446	109	130	2112	206	54	80	12	185	20	99
Future Volume (vph)	121	1446	109	130	2112	206	54	80	12	185	20	99
Satd. Flow (prot)	1770	5034	0	1770	5019	0	1770	3468	0	1770	3097	0
Flt Permitted	0.950			0.950			0.670			0.643		
Satd. Flow (perm)	1770	5034	0	1770	5019	0	1248	3468	0	1198	3097	0
Satd. Flow (RTOR)		16			22			13			108	
Adj. Flow (vph)	132	1572	118	141	2296	224	59	87	13	201	22	108
Lane Group Flow (vph)	132	1690	0	141	2520	0	59	100	0	201	130	0
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Total Split (s)	13.0	49.8		16.2	53.0		9.6	24.0		10.0	24.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	8.5	46.0		11.0	48.5		24.6	19.5		26.2	21.8	
Actuated g/C Ratio	0.08	0.46		0.11	0.48		0.25	0.20		0.26	0.22	
v/c Ratio	0.88	0.73		0.72	1.03		0.18	0.15		0.58	0.17	
Control Delay	94.1	24.1		64.4	52.8		27.4	29.6		38.0	10.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	94.1	24.1		64.4	52.8		27.4	29.6		38.0	10.1	
LOS	F	C		E	D		C	C		D	B	
Approach Delay		29.2			53.4			28.8			27.0	
Approach LOS		C			D			C			C	
Queue Length 50th (ft)	85	311		88	~631		27	24		102	5	
Queue Length 95th (ft)	#194	369		#171	#728		59	47		166	31	
Internal Link Dist (ft)		877			1970			2993			588	
Turn Bay Length (ft)	150			150			150			150		
Base Capacity (vph)	150	2323		207	2445		333	686		345	759	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.88	0.73		0.68	1.03		0.18	0.15		0.58	0.17	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 42.0

Intersection LOS: D

Intersection Capacity Utilization 80.3%

ICU Level of Service D

Analysis Period (min) 15

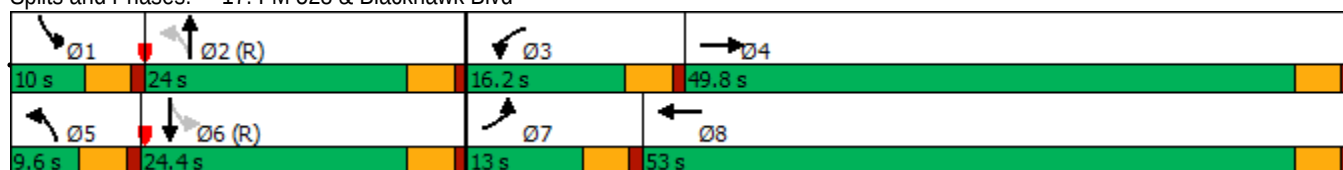
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	248	55	72	35	63	107	102	1396	60	156	1846	287
Future Volume (vph)	248	55	72	35	63	107	102	1396	60	156	1846	287
Satd. Flow (prot)	0	1756	0	0	1829	1583	1770	5055	0	1770	5085	1583
Flt Permitted		0.737			0.823		0.099			0.112		
Satd. Flow (perm)	0	1337	0	0	1533	1583	184	5055	0	209	5085	1583
Satd. Flow (RTOR)		14				116		8				153
Adj. Flow (vph)	270	60	78	38	68	116	111	1517	65	170	2007	312
Lane Group Flow (vph)	0	408	0	0	106	116	111	1582	0	170	2007	312
Turn Type	Perm	NA		Perm	NA	Perm	D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2		2	8			4		8
Total Split (s)	35.8	35.8		35.8	35.8	35.8	9.8	40.2		14.0	44.4	44.4
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		32.8			32.8	32.8	44.6	34.8		43.7	40.4	40.4
Actuated g/C Ratio		0.36			0.36	0.36	0.50	0.39		0.49	0.45	0.45
v/c Ratio		0.82			0.19	0.18	0.60	0.81		0.67	0.88	0.39
Control Delay		41.8			21.6	4.9	26.5	28.2		28.4	28.5	9.9
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		41.8			21.6	4.9	26.5	28.2		28.4	28.5	9.9
LOS		D			C	A	C	C		C	C	A
Approach Delay		41.8			12.8			28.1			26.2	
Approach LOS		D			B			C			C	
Queue Length 50th (ft)		207			42	0	28	281		45	372	54
Queue Length 95th (ft)		#378			80	35	#76	340		#111	444	116
Internal Link Dist (ft)		1683			1296			1176			3206	
Turn Bay Length (ft)						100	240			140		100
Base Capacity (vph)		496			558	650	184	2018		267	2281	794
Starvation Cap Reductn		0			0	0	0	0		0	0	0
Spillback Cap Reductn		0			0	0	0	0		0	0	0
Storage Cap Reductn		0			0	0	0	0		0	0	0
Reduced v/c Ratio		0.82			0.19	0.18	0.60	0.78		0.64	0.88	0.39

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 27.6

Intersection LOS: C

Intersection Capacity Utilization 80.3%

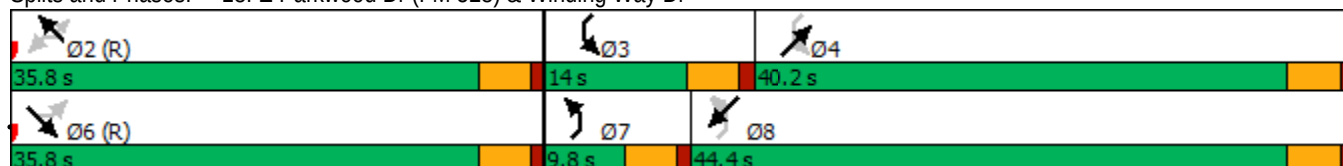
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	367	113	220	160	113	43	181	1517	102	43	1797	382
Future Volume (vph)	367	113	220	160	113	43	181	1517	102	43	1797	382
Satd. Flow (prot)	1681	1722	1583	1770	1786	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.571	0.649		0.397			0.065			0.067		
Satd. Flow (perm)	1010	1148	1583	740	1786	0	121	5040	0	125	3539	1583
Satd. Flow (RTOR)			154		16			13				271
Adj. Flow (vph)	399	123	239	174	123	47	197	1649	111	47	1953	415
Lane Group Flow (vph)	251	271	239	174	170	0	197	1760	0	47	1953	415
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		6	2			8			4		8
Total Split (s)	40.9	40.9	40.9	40.9	40.9		13.5	68.7		10.4	65.6	65.6
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)	36.4	36.4	36.4	36.4	36.4		70.1	61.7		71.0	61.1	61.1
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.30		0.58	0.51		0.59	0.51	0.51
v/c Ratio	0.82	0.78	0.41	0.78	0.31		1.02	0.68		0.22	1.08	0.44
Control Delay	64.7	58.6	18.2	62.7	30.8		99.5	23.7		23.1	77.5	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	64.7	58.6	18.2	62.7	30.8		99.5	23.7		23.1	77.5	7.5
LOS	E	E	B	E	C		F	C		C	E	A
Approach Delay		47.9			46.9			31.4			64.4	
Approach LOS		D			D			C			E	
Queue Length 50th (ft)	192	205	63	123	91		~106	389		13	~892	58
Queue Length 95th (ft)	#346	#346	152	#245	152		#264	393		28	#1030	132
Internal Link Dist (ft)		1366			368			1378			1141	
Turn Bay Length (ft)	50						180			160		
Base Capacity (vph)	306	348	587	224	552		194	2789		217	1801	939
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.82	0.78	0.41	0.78	0.31		1.02	0.63		0.22	1.08	0.44

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 49.2

Intersection LOS: D

Intersection Capacity Utilization 96.7%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr

			
Ø2 (R)		Ø4	Ø3
40.9 s		68.7 s	10.4 s
			
Ø6 (R)		Ø7	Ø8
40.9 s		13.5 s	65.6 s

Friendswood TX Traffic Study

2030 PM Peak

20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	170	1679	149	127	2002	13	93	70	126	23	108	183
Future Volume (vph)	170	1679	149	127	2002	13	93	70	126	23	108	183
Satd. Flow (prot)	1770	3497	0	1770	3536	0	0	1811	1583	0	1846	1583
Flt Permitted	0.067			0.065				0.647			0.924	
Satd. Flow (perm)	125	3497	0	121	3536	0	0	1205	1583	0	1721	1583
Satd. Flow (RTOR)		17			1				122			111
Adj. Flow (vph)	185	1825	162	138	2176	14	101	76	137	25	117	199
Lane Group Flow (vph)	185	1987	0	138	2190	0	0	177	137	0	142	199
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	12.8	66.0		10.8	64.0		23.2	23.2	23.2	23.2	23.2	23.2
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	4.5
Act Effect Green (s)	67.8	61.5		67.8	59.5			18.7	18.7		18.7	18.7
Actuated g/C Ratio	0.68	0.62		0.68	0.60			0.19	0.19		0.19	0.19
v/c Ratio	0.84	0.92		0.75	1.04			0.79	0.35		0.44	0.52
Control Delay	53.1	25.7		42.1	52.7			64.0	11.2		41.1	21.8
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	53.1	25.7		42.1	52.7			64.0	11.2		41.1	21.8
LOS	D	C		D	D			E	B		D	C
Approach Delay		28.0			52.0			41.0			29.8	
Approach LOS		C			D			D			C	
Queue Length 50th (ft)	65	542		35	~800			108	8		81	49
Queue Length 95th (ft)	#185	#712		#131	#941			#219	59		142	119
Internal Link Dist (ft)		1769			1275			1023			92	
Turn Bay Length (ft)	180			180					100			100
Base Capacity (vph)	221	2157		185	2104			225	395		321	386
Starvation Cap Reductn	0	0		0	0			0	0		0	0
Spillback Cap Reductn	0	0		0	0			0	0		0	0
Storage Cap Reductn	0	0		0	0			0	0		0	0
Reduced v/c Ratio	0.84	0.92		0.75	1.04			0.79	0.35		0.44	0.52

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 39.8

Intersection LOS: D

Intersection Capacity Utilization 91.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

		
23.2 s	10.8 s	66 s
		
23.2 s	12.8 s	64 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	66	1	7	36	11	109	12	1479	45	176	1635	135
Future Volume (vph)	66	1	7	36	11	109	12	1479	45	176	1635	135
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.555			0.914		0.068			0.085		
Satd. Flow (perm)	0	1020	0	0	1543	0	127	3525	0	158	3500	0
Satd. Flow (RTOR)		6			117			5			16	
Adj. Flow (vph)	72	1	8	39	12	118	13	1608	49	191	1777	147
Lane Group Flow (vph)	0	81	0	0	169	0	13	1657	0	191	1924	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	52.0		14.6	57.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		20.7			20.7		59.4	46.8		55.8	58.4	
Actuated g/C Ratio		0.23			0.23		0.66	0.52		0.62	0.65	
v/c Ratio		0.34			0.38		0.07	0.90		0.74	0.85	
Control Delay		32.8			13.8		5.3	27.8		43.4	17.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		32.8			13.8		5.3	27.8		43.4	17.5	
LOS		C			B		A	C		D	B	
Approach Delay		32.8			13.8			27.6			19.8	
Approach LOS		C			B			C			B	
Queue Length 50th (ft)		37			24		2	415		52	338	
Queue Length 95th (ft)		81			80		7	#538		#141	#702	
Internal Link Dist (ft)		275			319			544			5578	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		239			445		176	1862		281	2274	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.34			0.38		0.07	0.89		0.68	0.85	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 23.1

Intersection LOS: C

Intersection Capacity Utilization 75.7%

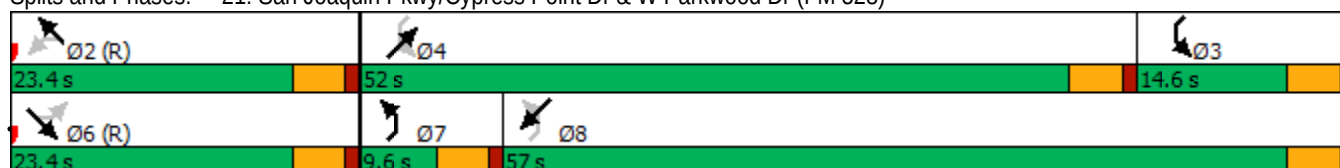
ICU Level of Service D

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	159	11	19	2	2	15	6	1410	17	25	1297	189
Future Volume (vph)	159	11	19	2	2	15	6	1410	17	25	1297	189
Satd. Flow (prot)	0	1763	0	0	1653	0	1770	3532	0	1770	3472	0
Flt Permitted		0.746			0.973		0.088			0.092		
Satd. Flow (perm)	0	1370	0	0	1617	0	164	3532	0	171	3472	0
Satd. Flow (RTOR)		7			16			2			31	
Adj. Flow (vph)	173	12	21	2	2	16	7	1533	18	27	1410	205
Lane Group Flow (vph)	0	206	0	0	20	0	7	1551	0	27	1615	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	22.6	22.6		22.6	22.6		9.6	42.8		9.6	42.8	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		15.0			15.0		50.1	47.2		49.2	49.1	
Actuated g/C Ratio		0.20			0.20		0.67	0.63		0.66	0.65	
v/c Ratio		0.74			0.06		0.03	0.70		0.12	0.71	
Control Delay		43.0			12.9		5.2	13.6		8.3	12.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		43.0			12.9		5.2	13.6		8.3	12.4	
LOS		D			B		A	B		A	B	
Approach Delay		43.0			12.9			13.6			12.3	
Approach LOS		D			B			B			B	
Queue Length 50th (ft)		86			2		1	192		4	204	
Queue Length 95th (ft)		152			17		5	411		12	#501	
Internal Link Dist (ft)		523			1267			1499			1231	
Turn Bay Length (ft)							150			150		
Base Capacity (vph)		335			402		224	2223		220	2284	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.61			0.05		0.03	0.70		0.12	0.71	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 14.7

Intersection LOS: B

Intersection Capacity Utilization 66.6%

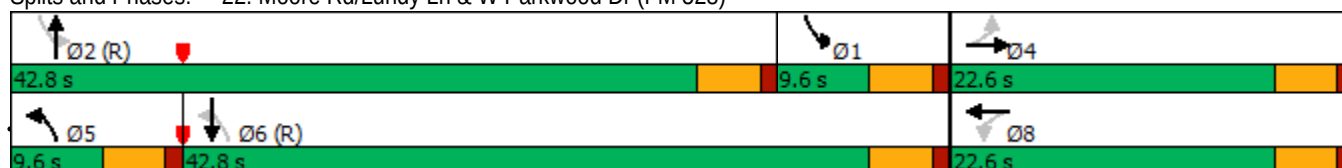
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	55	86	57	34	125	56	48	446	50	48	670	119
Future Volume (vph)	55	86	57	34	125	56	48	446	50	48	670	119
Satd. Flow (prot)	1770	3327	0	1770	3376	0	1770	3486	0	1770	3458	0
Flt Permitted	0.628			0.654			0.265			0.434		
Satd. Flow (perm)	1170	3327	0	1218	3376	0	494	3486	0	808	3458	0
Satd. Flow (RTOR)		62			61			31			53	
Adj. Flow (vph)	60	93	62	37	136	61	52	485	54	52	728	129
Lane Group Flow (vph)	60	155	0	37	197	0	52	539	0	52	857	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		15.1	15.1		15.1	15.1	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.36	0.36		0.36	0.36	
v/c Ratio	0.12	0.11		0.07	0.13		0.30	0.43		0.18	0.67	
Control Delay	9.2	5.7		8.8	6.2		14.5	10.6		10.7	13.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.2	5.7		8.8	6.2		14.5	10.6		10.7	13.6	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		6.7			6.6			10.9			13.4	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	9	6		5	10		9	45		8	80	
Queue Length 95th (ft)	26	20		18	25		29	75		25	125	
Internal Link Dist (ft)		325			462			2964			1178	
Turn Bay Length (ft)	100			50			100			100		
Base Capacity (vph)	501	1459		521	1480		211	1509		345	1510	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.12	0.11		0.07	0.13		0.25	0.36		0.15	0.57	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 42.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 11.1

Intersection LOS: B

Intersection Capacity Utilization 50.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
22.5 s	22.5 s
 Ø6	 Ø8
22.5 s	22.5 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	20	605	6	6	568	60	9	3	8	94	6	48
Future Volume (vph)	20	605	6	6	568	60	9	3	8	94	6	48
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1722	0	0	1726	0
Flt Permitted	0.299			0.312				0.887			0.795	
Satd. Flow (perm)	557	1859	0	581	1837	0	0	1561	0	0	1416	0
Satd. Flow (RTOR)		1			10			9			37	
Adj. Flow (vph)	22	658	7	7	617	65	10	3	9	102	7	52
Lane Group Flow (vph)	22	665	0	7	682	0	0	22	0	0	161	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	32.8		9.6	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	46.2	45.8		46.0	45.7			11.0			11.0	
Actuated g/C Ratio	0.71	0.70		0.71	0.70			0.17			0.17	
v/c Ratio	0.04	0.51		0.01	0.53			0.08			0.59	
Control Delay	4.6	10.4		4.7	11.0			15.8			27.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.6	10.4		4.7	11.0			15.8			27.3	
LOS	A	B		A	B			B			C	
Approach Delay		10.2			10.9			15.8			27.3	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	2	101		1	104			4			45	
Queue Length 95th (ft)	10	#397		5	#421			19			89	
Internal Link Dist (ft)		593			928			273			821	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	504	1310		513	1294			441			420	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.04	0.51		0.01	0.53			0.05			0.38	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 12.4

Intersection LOS: B

Intersection Capacity Utilization 53.6%

ICU Level of Service A

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	528	162	29	495	4	144	6	36	5	3	5
Future Volume (vph)	8	528	162	29	495	4	144	6	36	5	3	5
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1732	0
Flt Permitted	0.390			0.230				0.766			0.894	
Satd. Flow (perm)	726	1798	0	428	1861	0	0	1390	0	0	1579	0
Satd. Flow (RTOR)		30			1			15			5	
Adj. Flow (vph)	9	574	176	32	538	4	157	7	39	5	3	5
Lane Group Flow (vph)	9	750	0	32	542	0	0	203	0	0	13	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	42.8		9.6	42.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	49.6	47.6		50.5	49.5			14.6			14.6	
Actuated g/C Ratio	0.66	0.63		0.67	0.66			0.19			0.19	
v/c Ratio	0.02	0.65		0.08	0.44			0.72			0.04	
Control Delay	5.0	14.4		5.3	9.1			40.4			18.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.0	14.4		5.3	9.1			40.4			18.5	
LOS	A	B		A	A			D			B	
Approach Delay		14.2			8.9			40.4			18.5	
Approach LOS		B			A			D			B	
Queue Length 50th (ft)	1	156		4	98			81			3	
Queue Length 95th (ft)	6	#446		13	254			145			16	
Internal Link Dist (ft)		928			1588			1375			462	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	555	1151		385	1229			346			384	
Starvation Cap Reductn	0	0		0	0			0			0	
Spillback Cap Reductn	0	0		0	0			0			0	
Storage Cap Reductn	0	0		0	0			0			0	
Reduced v/c Ratio	0.02	0.65		0.08	0.44			0.59			0.03	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 15.7

Intersection LOS: B

Intersection Capacity Utilization 62.3%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	21	456	70	42	436	47	63	68	60	67	116	30
Future Volume (vph)	21	456	70	42	436	47	63	68	60	67	116	30
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1800	0
Flt Permitted	0.399			0.280				0.723			0.848	
Satd. Flow (perm)	743	1825	0	522	1835	0	0	1347	1583	0	1550	0
Satd. Flow (RTOR)		15			11				109		14	
Adj. Flow (vph)	23	496	76	46	474	51	68	74	65	73	126	33
Lane Group Flow (vph)	23	572	0	46	525	0	0	142	65	0	232	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6	22.6	22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	34.8	31.5		36.8	35.8			13.3	13.3		13.3	
Actuated g/C Ratio	0.58	0.52		0.61	0.60			0.22	0.22		0.22	
v/c Ratio	0.04	0.59		0.10	0.48			0.48	0.15		0.66	
Control Delay	6.0	16.6		6.7	10.7			24.7	2.3		28.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.0	16.6		6.7	10.7			24.7	2.3		28.3	
LOS	A	B		A	B			C	A		C	
Approach Delay		16.1			10.4			17.7			28.3	
Approach LOS		B			B			B			C	
Queue Length 50th (ft)	3	152		8	110			45	0		71	
Queue Length 95th (ft)	12	#333		m19	m229			82	11		122	
Internal Link Dist (ft)		1588			1447			1640			405	
Turn Bay Length (ft)	100			100								
Base Capacity (vph)	526	964		440	1098			406	553		477	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.04	0.59		0.10	0.48			0.35	0.12		0.49	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 16.0

Intersection LOS: B

Intersection Capacity Utilization 60.7%

ICU Level of Service B

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 26: W Castlewood Ave & Sunset Dr

		
Ø1	Ø2 (R)	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6 (R)	Ø8
9.6 s	27.8 s	22.6 s

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	51	222	21	32	168	58	8	61	15	61	97	59
Future Volume (Veh/h)	51	222	21	32	168	58	8	61	15	61	97	59
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	241	23	35	183	63	9	66	16	66	105	64
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)	4											
Median type	None				None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	246			264			732	678	252	696	658	214
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	246			264			732	678	252	696	658	214
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			97			96	81	98	77	71	92
cM capacity (veh/h)	1320			1300			229	349	786	283	358	825
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	319	281	91	235								
Volume Left	55	35	9	66								
Volume Right	23	63	16	64								
cSH	1320	1300	365	452								
Volume to Capacity	0.04	0.03	0.25	0.52								
Queue Length 95th (ft)	3	2	24	73								
Control Delay (s)	1.7	1.2	18.1	22.4								
Lane LOS	A	A	C	C								
Approach Delay (s)	1.7	1.2	18.1	22.4								
Approach LOS			C	C								
Intersection Summary												
Average Delay			8.4									
Intersection Capacity Utilization			45.4%	ICU Level of Service					A			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	272	26	95	212	27	76
Future Volume (Veh/h)	272	26	95	212	27	76
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	296	28	103	230	29	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			324		746	310
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			324		746	310
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		92	89
cM capacity (veh/h)			1236		349	730
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	324	333	112			
Volume Left	0	103	29			
Volume Right	28	0	83			
cSH	1700	1236	569			
Volume to Capacity	0.19	0.08	0.20			
Queue Length 95th (ft)	0	7	18			
Control Delay (s)	0.0	3.1	12.9			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.1	12.9			
Approach LOS			B			
Intersection Summary						
Average Delay			3.2			
Intersection Capacity Utilization			48.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	86	261	213	18	19	91
Future Volume (Veh/h)	86	261	213	18	19	91
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	93	284	232	20	21	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	252				712	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	252				712	242
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				94	88
cM capacity (veh/h)	1313				371	797
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	377	252	120			
Volume Left	93	0	21			
Volume Right	0	20	99			
cSH	1313	1700	663			
Volume to Capacity	0.07	0.15	0.18			
Queue Length 95th (ft)	6	0	16			
Control Delay (s)	2.5	0.0	11.6			
Lane LOS	A		B			
Approach Delay (s)	2.5	0.0	11.6			
Approach LOS			B			
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization		47.5%		ICU Level of Service		A
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	33	45	25	18	79	25	30	177	12	29	194	26
Future Volume (vph)	33	45	25	18	79	25	30	177	12	29	194	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	36	49	27	20	86	27	33	192	13	32	211	28
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	112	133	238	271								
Volume Left (vph)	36	20	33	32								
Volume Right (vph)	27	27	13	28								
Hadj (s)	-0.05	-0.06	0.03	0.00								
Departure Headway (s)	5.4	5.3	5.0	4.9								
Degree Utilization, x	0.17	0.20	0.33	0.37								
Capacity (veh/h)	600	609	682	694								
Control Delay (s)	9.4	9.6	10.4	10.8								
Approach Delay (s)	9.4	9.6	10.4	10.8								
Approach LOS	A	A	B	B								
Intersection Summary												
Delay			10.3									
Level of Service			B									
Intersection Capacity Utilization			34.6%	ICU Level of Service					A			
Analysis Period (min)			15									

Appendix G

“Year 2040 No-Build” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	17	954	78	11	1186	18	154	0	45	25	2	28
Future Volume (vph)	17	954	78	11	1186	18	154	0	45	25	2	28
Satd. Flow (prot)	1770	3500	0	1770	3532	0	0	1738	0	0	1696	0
Flt Permitted	0.075			0.128				0.749			0.835	
Satd. Flow (perm)	140	3500	0	238	3532	0	0	1352	0	0	1448	0
Satd. Flow (RTOR)		10			2			85			30	
Adj. Flow (vph)	18	1037	85	12	1289	20	167	0	49	27	2	30
Lane Group Flow (vph)	18	1122	0	12	1309	0	0	216	0	0	59	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	78.0		12.0	78.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	68.3	62.4		65.0	62.8			59.2			59.2	
Actuated g/C Ratio	0.51	0.46		0.48	0.47			0.44			0.44	
v/c Ratio	0.13	0.69		0.07	0.80			0.34			0.09	
Control Delay	18.0	30.4		13.9	34.3			18.9			16.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	18.0	30.4		13.9	34.3			18.9			16.2	
LOS	B	C		B	C			B			B	
Approach Delay		30.2			34.1			18.9			16.2	
Approach LOS		C			C			B			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 30.9

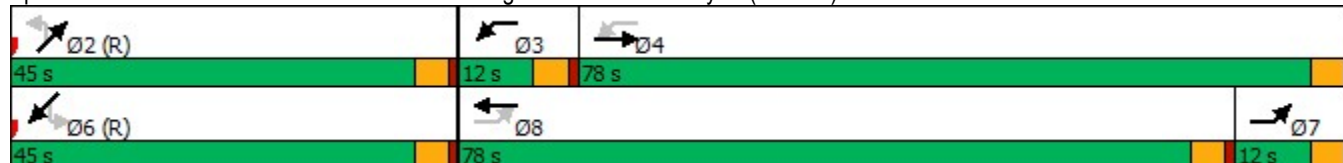
Intersection LOS: C

Intersection Capacity Utilization 58.8%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	323	742	109	149	664	233	189	665	114	305	564	305
Future Volume (vph)	323	742	109	149	664	233	189	665	114	305	564	305
Satd. Flow (prot)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3472	0	1770	3401	0	1770	3461	0	1770	3352	0
Satd. Flow (RTOR)		16			44			17			95	
Adj. Flow (vph)	351	807	118	162	722	253	205	723	124	332	613	332
Lane Group Flow (vph)	351	925	0	162	975	0	205	847	0	332	945	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.8	35.7		19.2	30.1		17.2	26.5		23.6	32.9	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	20.3	32.7		13.2	25.6		12.7	22.0		19.1	28.4	
Actuated g/C Ratio	0.19	0.31		0.13	0.24		0.12	0.21		0.18	0.27	
v/c Ratio	1.03	0.85		0.73	1.13		0.96	1.15		1.03	0.97	
Control Delay	98.4	42.5		63.0	109.2		98.8	119.5		102.5	57.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	98.4	42.5		63.0	109.2		98.8	119.5		102.5	57.0	
LOS	F	D		E	F		F	F		F	E	
Approach Delay		57.8			102.7			115.5			68.9	
Approach LOS		E			F			F			E	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.15

Intersection Signal Delay: 84.3

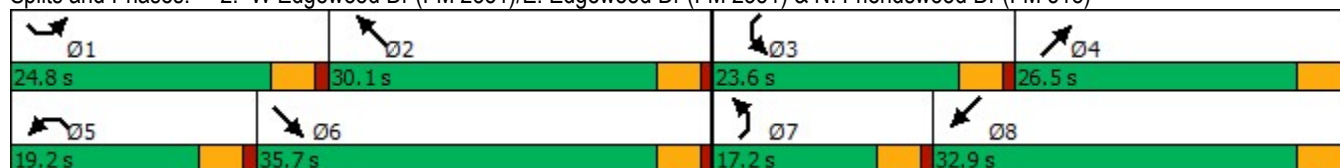
Intersection LOS: F

Intersection Capacity Utilization 97.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	6	997	49	42	1123	11	57	3	63	14	19	6
Future Volume (vph)	6	997	49	42	1123	11	57	3	63	14	19	6
Satd. Flow (prot)	1770	3514	0	1770	3536	0	0	1694	0	0	1791	0
Flt Permitted	0.199			0.217				0.863			0.848	
Satd. Flow (perm)	371	3514	0	404	3536	0	0	1497	0	0	1545	0
Satd. Flow (RTOR)		6			1			36			7	
Adj. Flow (vph)	7	1084	53	46	1221	12	62	3	68	15	21	7
Lane Group Flow (vph)	7	1137	0	46	1233	0	0	133	0	0	43	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	14.0	84.0		15.0	85.0		36.0	36.0		36.0	36.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	90.6	82.8		87.8	89.4			13.0			13.0	
Actuated g/C Ratio	0.80	0.73		0.77	0.79			0.11			0.11	
v/c Ratio	0.02	0.44		0.12	0.44			0.66			0.23	
Control Delay	3.2	7.7		3.6	5.4			49.7			41.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	3.2	7.7		3.6	5.4			49.7			41.7	
LOS	A	A		A	A			D			D	
Approach Delay		7.7			5.4			49.7			41.7	
Approach LOS		A			A			D			D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 113.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 9.2

Intersection LOS: A

Intersection Capacity Utilization 52.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
14 s	85 s	36 s
		
Ø5	Ø6	Ø8
15 s	84 s	36 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	24	1005	56	105	1067	24	82	6	98	24	7	24
Future Volume (vph)	24	1005	56	105	1067	24	82	6	98	24	7	24
Satd. Flow (prot)	1770	3511	0	1770	3529	0	0	1694	0	0	1716	0
Flt Permitted	0.196			0.196				0.847			0.775	
Satd. Flow (perm)	365	3511	0	365	3529	0	0	1466	0	0	1358	0
Satd. Flow (RTOR)		6			3			40			26	
Adj. Flow (vph)	26	1092	61	114	1160	26	89	7	107	26	8	26
Lane Group Flow (vph)	26	1153	0	114	1186	0	0	203	0	0	60	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	13.0	75.0		20.0	82.0		40.0	40.0		40.0	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	83.3	73.7		81.3	79.7			18.1			18.1	
Actuated g/C Ratio	0.74	0.65		0.72	0.71			0.16			0.16	
v/c Ratio	0.08	0.50		0.32	0.48			0.76			0.25	
Control Delay	5.0	11.9		6.8	9.7			54.3			28.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.0	11.9		6.8	9.7			54.3			28.9	
LOS	A	B		A	A			D			C	
Approach Delay		11.8			9.5			54.3			28.9	
Approach LOS		B			A			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 113

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 14.2

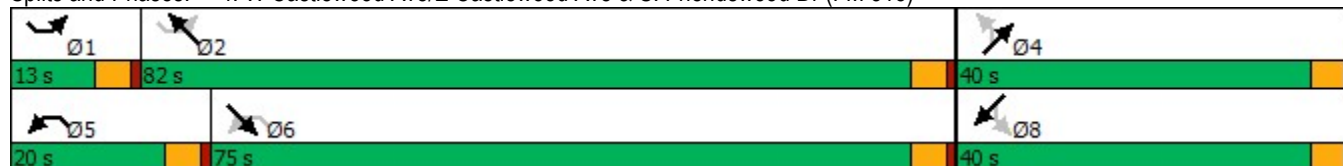
Intersection LOS: B

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	8	2	196	1	203	21	1220	195	137	1030	9
Future Volume (vph)	0	8	2	196	1	203	21	1220	195	137	1030	9
Satd. Flow (prot)	0	1816	0	0	1775	1583	0	3465	0	1770	3536	0
Flt Permitted					0.720			0.920		0.093		
Satd. Flow (perm)	0	1816	0	0	1341	1583	0	3191	0	173	3536	0
Satd. Flow (RTOR)		2				154		23			1	
Adj. Flow (vph)	0	9	2	213	1	221	23	1326	212	149	1120	10
Lane Group Flow (vph)	0	11	0	0	214	221	0	1561	0	149	1130	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	38.0	38.0		38.0	38.0	38.0	84.0	84.0		13.0	97.0	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		24.7			24.7	24.7		80.1		88.2	92.8	
Actuated g/C Ratio		0.20			0.20	0.20		0.63		0.70	0.73	
v/c Ratio		0.03			0.82	0.51		0.77		0.67	0.44	
Control Delay		34.8			72.7	18.5		20.8		27.7	7.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		34.8			72.7	18.5		20.8		27.7	7.9	
LOS		C			E	B		C		C	A	
Approach Delay		34.8			45.2			20.8			10.2	
Approach LOS		C			D			C			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 126.5

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 20.0

Intersection LOS: B

Intersection Capacity Utilization 98.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave

		
Ø1	Ø2	Ø4
13 s	84 s	38 s
		
Ø6		Ø8
97 s		38 s

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	61	866	21	265	938	29	35	54	39	12	35	266
Future Volume (vph)	61	866	21	265	938	29	35	54	39	12	35	266
Satd. Flow (prot)	1770	3525	0	1770	3522	0	0	1763	0	0	1839	1583
Flt Permitted	0.950			0.950				0.896			0.888	
Satd. Flow (perm)	1770	3525	0	1770	3522	0	0	1601	0	0	1654	1583
Satd. Flow (RTOR)		2			4			15				289
Adj. Flow (vph)	66	941	23	288	1020	32	38	59	42	13	38	289
Lane Group Flow (vph)	66	964	0	288	1052	0	0	139	0	0	51	289
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	19.0	57.0		42.0	80.0		36.0	36.0		36.0	36.0	36.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	9.5	60.4		22.9	76.2			13.8			13.8	13.8
Actuated g/C Ratio	0.09	0.55		0.21	0.69			0.12			0.12	0.12
v/c Ratio	0.43	0.50		0.79	0.43			0.65			0.25	0.64
Control Delay	59.2	18.5		57.8	9.7			56.7			47.8	12.3
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	59.2	18.5		57.8	9.7			56.7			47.8	12.3
LOS	E	B		E	A			E			D	B
Approach Delay		21.1			20.1			56.7			17.6	
Approach LOS		C			C			E			B	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 110.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 21.9

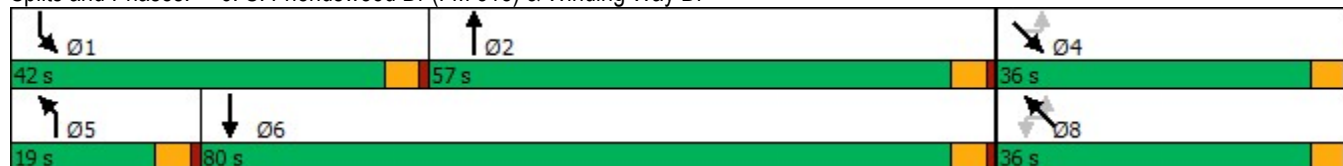
Intersection LOS: C

Intersection Capacity Utilization 64.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



Friendswood TX Traffic Study

No Build AM Peak 2040

7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)

												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	585	847	421	196	588	348	335	1719	444	224	863	77
Future Volume (vph)	585	847	421	196	588	348	335	1719	444	224	863	77
Satd. Flow (prot)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3362	0	1770	3539	1583	1770	4928	0	1770	5024	0
Satd. Flow (RTOR)		69				324		50			10	
Adj. Flow (vph)	636	921	458	213	639	378	364	1868	483	243	938	84
Lane Group Flow (vph)	636	1379	0	213	639	378	364	2351	0	243	1022	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	41.0	50.7		17.3	27.0	27.0	34.2	48.0		19.0	32.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.5	46.2		12.8	22.5	22.5	29.2	43.5		14.5	28.8	
Actuated g/C Ratio	0.27	0.34		0.09	0.17	0.17	0.22	0.32		0.11	0.21	
v/c Ratio	1.33	1.15		1.28	1.08	0.71	0.95	1.45		1.28	0.95	
Control Delay	201.6	117.5		209.6	114.1	17.4	87.5	240.1		206.5	69.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	201.6	117.5		209.6	114.1	17.4	87.5	240.1		206.5	69.1	
LOS	F	F		F	F	B	F	F		F	E	
Approach Delay		144.0			100.9			219.6			95.5	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.45

Intersection Signal Delay: 156.6

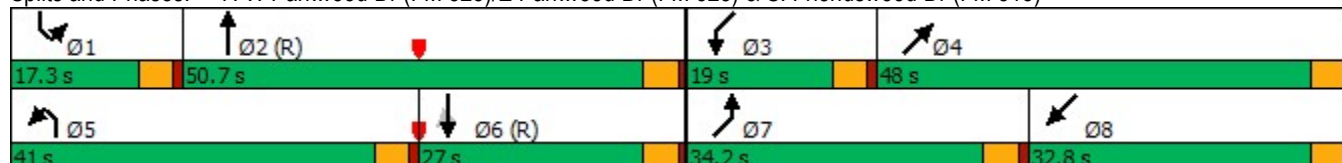
Intersection LOS: F

Intersection Capacity Utilization 119.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	27	1924	1153	89	266	57
Future Volume (vph)	27	1924	1153	89	266	57
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.149				0.950	
Satd. Flow (perm)	278	3539	3500	0	1688	1583
Satd. Flow (RTOR)			10			62
Adj. Flow (vph)	29	2091	1253	97	289	62
Lane Group Flow (vph)	29	2091	1350	0	289	62
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	11.0	100.0	89.0		40.0	40.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	100.5	103.2	96.7		27.8	27.8
Actuated g/C Ratio	0.72	0.74	0.69		0.20	0.20
v/c Ratio	0.11	0.80	0.56		0.82	0.17
Control Delay	7.1	16.1	13.5		72.2	10.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.1	16.1	13.5		72.2	10.5
LOS	A	B	B		E	B
Approach Delay		16.0	13.5		61.3	
Approach LOS		B	B		E	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 19.3

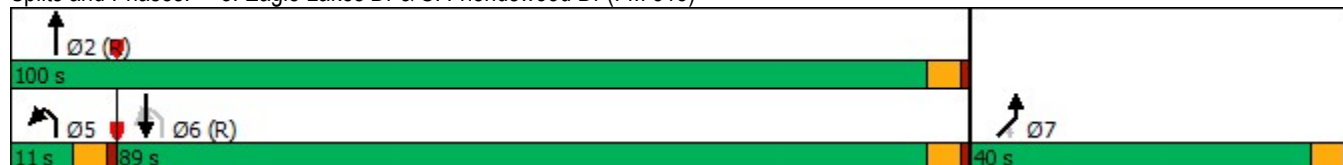
Intersection LOS: B

Intersection Capacity Utilization 75.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	59	672	158	97	1106	13	294	21	142	13	23	219
Future Volume (vph)	59	672	158	97	1106	13	294	21	142	13	23	219
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.091			0.270			0.950			0.950		
Satd. Flow (perm)	170	3539	1583	503	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			172			156			154			156
Adj. Flow (vph)	64	730	172	105	1202	14	320	23	154	14	25	238
Lane Group Flow (vph)	64	730	172	105	1202	14	320	23	154	14	25	238
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	10.0	44.0	44.0	10.0	44.0	44.0	28.0	41.0	41.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	54.5	46.2	46.2	53.6	49.0	49.0	21.8	33.9	33.9	5.5	11.6	11.6
Actuated g/C Ratio	0.52	0.44	0.44	0.51	0.47	0.47	0.21	0.32	0.32	0.05	0.11	0.11
v/c Ratio	0.34	0.47	0.22	0.31	0.73	0.02	0.87	0.04	0.25	0.15	0.12	0.76
Control Delay	18.4	23.4	4.1	15.9	28.4	0.0	63.9	23.5	5.1	51.5	40.5	31.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	23.4	4.1	15.9	28.4	0.0	63.9	23.5	5.1	51.5	40.5	31.8
LOS	B	C	A	B	C	A	E	C	A	D	D	C
Approach Delay		19.6			27.1			43.8			33.6	
Approach LOS		B			C			D			C	

Intersection Summary

Cycle Length: 105

Actuated Cycle Length: 105

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 28.1

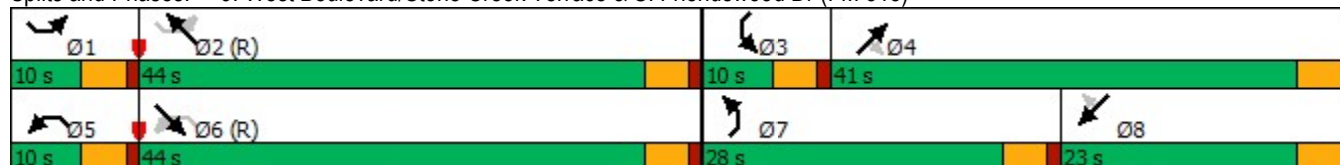
Intersection LOS: C

Intersection Capacity Utilization 71.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	415	890	96	109	779	424	159	443	263	222	103	152
Future Volume (vph)	415	890	96	109	779	424	159	443	263	222	103	152
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3341	0	1770	3224	0
Flt Permitted	0.136			0.163			0.540			0.133		
Satd. Flow (perm)	253	3539	1583	304	3539	1583	1006	3341	0	248	3224	0
Satd. Flow (RTOR)			136			260		96			165	
Adj. Flow (vph)	451	967	104	118	847	461	173	482	286	241	112	165
Lane Group Flow (vph)	451	967	104	118	847	461	173	768	0	241	277	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	32.0	55.4	55.4	10.6	34.0	34.0	11.3	33.8		20.2	42.7	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	56.9	50.8	50.8	56.9	29.5	29.5	45.1	30.1		45.1	38.2	
Actuated g/C Ratio	0.47	0.42	0.42	0.47	0.25	0.25	0.38	0.25		0.38	0.32	
v/c Ratio	0.97	0.65	0.14	0.54	0.97	0.79	0.41	0.84		0.85	0.24	
Control Delay	76.5	29.9	2.0	25.5	69.9	28.8	27.4	47.2		56.5	12.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	76.5	29.9	2.0	25.5	69.9	28.8	27.4	47.2		56.5	12.5	
LOS	E	C	A	C	E	C	C	D		E	B	
Approach Delay		41.8			52.9			43.6			33.0	
Approach LOS		D			D			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 44.7

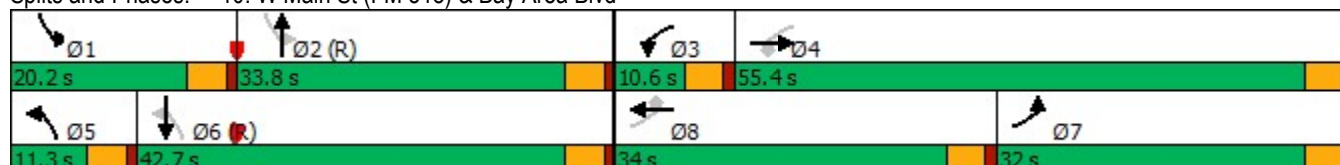
Intersection LOS: D

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	32	215	99	34	335	68	148	1746	52	71	854	114
Future Volume (vph)	32	215	99	34	335	68	148	1746	52	71	854	114
Satd. Flow (prot)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Flt Permitted		0.995			0.996		0.950			0.950		
Satd. Flow (perm)	0	1781	0	0	1816	0	1770	3525	0	1770	3476	0
Satd. Flow (RTOR)		14			7			3			13	
Adj. Flow (vph)	35	234	108	37	364	74	161	1898	57	77	928	124
Lane Group Flow (vph)	0	377	0	0	475	0	161	1955	0	77	1052	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	24.0	24.0		31.6	31.6		20.4	54.4		10.0	44.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		19.5			27.1		14.4	49.9		5.5	41.0	
Actuated g/C Ratio		0.16			0.23		0.12	0.42		0.05	0.34	
v/c Ratio		1.25			1.14		0.76	1.33		0.95	0.88	
Control Delay		178.3			131.5		73.2	185.4		144.6	47.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		178.3			131.5		73.2	185.4		144.6	47.0	
LOS		F			F		E	F		F	D	
Approach Delay		178.3			131.5			176.8			53.6	
Approach LOS		F			F			F			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 137.8

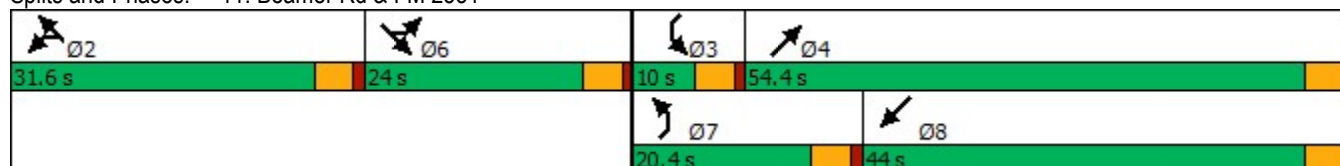
Intersection LOS: F

Intersection Capacity Utilization 95.2%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1531	43	95	881	119	171
Future Volume (vph)	1531	43	95	881	119	171
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	4					186
Adj. Flow (vph)	1664	47	103	958	129	186
Lane Group Flow (vph)	1711	0	103	958	129	186
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	50.0		14.4	64.4	25.6	25.6
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	44.1		8.9	54.8	21.4	21.4
Actuated g/C Ratio	0.52		0.10	0.64	0.25	0.25
v/c Ratio	0.94		0.56	0.42	0.15	0.35
Control Delay	31.9		50.3	7.9	27.6	6.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	31.9		50.3	7.9	27.6	6.6
LOS	C		D	A	C	A
Approach Delay	31.9			12.0	15.2	
Approach LOS	C			B	B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 85.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 23.3

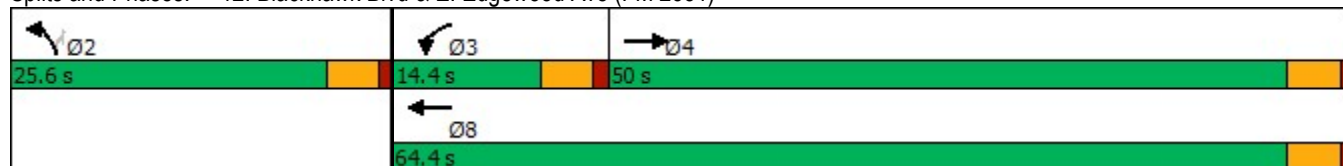
Intersection LOS: C

Intersection Capacity Utilization 64.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & E. Edgewood Ave (FM 2351)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	173	0	147	0	0	0	62	1394	0	0	984	60
Future Volume (vph)	173	0	147	0	0	0	62	1394	0	0	984	60
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.126					
Satd. Flow (perm)	0	1410	1583	0	1863	0	235	3539	0	1863	3507	0
Satd. Flow (RTOR)			160								9	
Adj. Flow (vph)	188	0	160	0	0	0	67	1515	0	0	1070	65
Lane Group Flow (vph)	0	188	160	0	0	0	67	1515	0	0	1135	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.8	73.2				37.8	41.3			32.5	
Actuated g/C Ratio		0.31	1.00				0.52	0.56			0.44	
v/c Ratio		0.43	0.10				0.26	0.76			0.73	
Control Delay		26.3	0.1				9.3	14.7			20.2	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		26.3	0.1				9.3	14.7			20.2	
LOS		C	A				A	B			C	
Approach Delay		14.3						14.5			20.2	
Approach LOS		B						B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 73.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 16.6

Intersection LOS: B

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351 & Royal Ct/Woodland Trail Dr

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	136	6	288	2	1	1	101	1341	2	17	1060	39
Future Volume (vph)	136	6	288	2	1	1	101	1341	2	17	1060	39
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.902		0.127			0.091		
Satd. Flow (perm)	1406	1589	0	0	1623	0	237	3539	0	170	3522	0
Satd. Flow (RTOR)		205			1						5	
Adj. Flow (vph)	148	7	313	2	1	1	110	1458	2	18	1152	42
Lane Group Flow (vph)	148	320	0	0	4	0	110	1460	0	18	1194	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	23.2	23.2			23.2		44.0	44.1		45.9	38.1	
Actuated g/C Ratio	0.29	0.29			0.29		0.55	0.55		0.57	0.48	
v/c Ratio	0.36	0.53			0.01		0.40	0.75		0.09	0.71	
Control Delay	30.5	14.7			25.5		10.8	16.6		6.4	19.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	30.5	14.7			25.5		10.8	16.6		6.4	19.3	
LOS	C	B			C		B	B		A	B	
Approach Delay		19.7			25.5			16.2			19.1	
Approach LOS		B			C			B			B	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 17.8

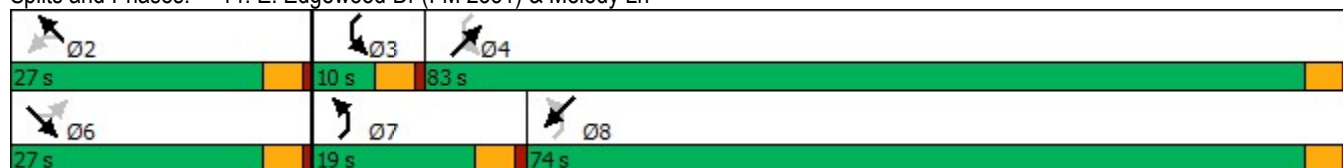
Intersection LOS: B

Intersection Capacity Utilization 70.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	34	39	66	110	9	374	28	450	118	377	319	24
Future Volume (vph)	34	39	66	110	9	374	28	450	118	377	319	24
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	1805	0	1770	1844	0
Flt Permitted		0.906			0.586		0.499			0.339		
Satd. Flow (perm)	0	1580	0	0	1092	1583	930	1805	0	631	1844	0
Satd. Flow (RTOR)		35				407		26			7	
Adj. Flow (vph)	37	42	72	120	10	407	30	489	128	410	347	26
Lane Group Flow (vph)	0	151	0	0	130	407	30	617	0	410	373	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		28.3			28.3	107.6	70.1	70.1		70.1	70.1	
Actuated g/C Ratio		0.26			0.26	1.00	0.65	0.65		0.65	0.65	
v/c Ratio		0.34			0.45	0.26	0.05	0.52		1.00	0.31	
Control Delay		30.9			44.2	0.4	6.1	10.6		63.7	8.2	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		30.9			44.2	0.4	6.1	10.6		63.7	8.2	
LOS		C			D	A	A	B		E	A	
Approach Delay		30.9			11.0			10.3			37.3	
Approach LOS		C			B			B			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 107.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 21.9

Intersection LOS: C

Intersection Capacity Utilization 77.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 			 	
Traffic Volume (vph)	459	2250	121	141	967	96	278	693	437	150	206	264
Future Volume (vph)	459	2250	121	141	967	96	278	693	437	150	206	264
Satd. Flow (prot)	1770	5045	0	1770	5014	0	1770	3334	0	1770	3242	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5045	0	1770	5014	0	1770	3334	0	1770	3242	0
Satd. Flow (RTOR)		8			16			62			125	
Adj. Flow (vph)	499	2446	132	153	1051	104	302	753	475	163	224	287
Lane Group Flow (vph)	499	2578	0	153	1155	0	302	1228	0	163	511	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	84.0		9.5	84.0		9.5	51.0		9.5	51.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	5.0	79.5		5.0	79.5		5.0	46.5		5.0	46.5	
Actuated g/C Ratio	0.03	0.52		0.03	0.52		0.03	0.30		0.03	0.30	
v/c Ratio	8.75	0.99		2.68	0.44		5.30	1.17		2.86	0.48	
Control Delay	3531.8	51.6		829.6	23.7		1984.2	131.4		905.6	34.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3531.8	51.6		829.6	23.7		1984.2	131.4		905.6	34.2	
LOS	F	D		F	C		F	F		F	C	
Approach Delay		616.0			118.0			497.1			244.9	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 8.75

Intersection Signal Delay: 451.6

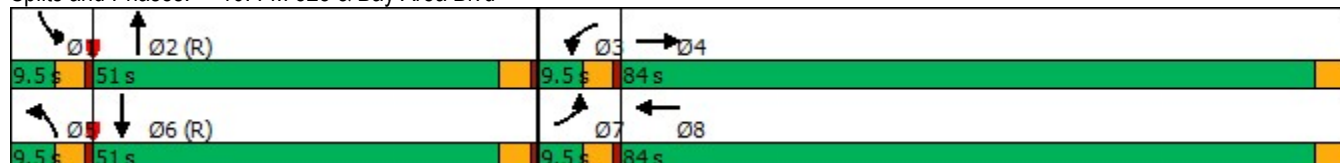
Intersection LOS: F

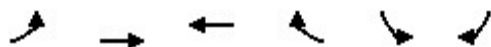
Intersection Capacity Utilization 110.4%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑		↰	↑↑
Traffic Volume (vph)	71	2461	1245	199	327	117
Future Volume (vph)	71	2461	1245	199	327	117
Satd. Flow (prot)	1770	5085	4979	0	1770	1583
Flt Permitted	0.100				0.950	
Satd. Flow (perm)	186	5085	4979	0	1770	1583
Satd. Flow (RTOR)			33			127
Adj. Flow (vph)	77	2675	1353	216	355	127
Lane Group Flow (vph)	77	2675	1569	0	355	127
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	14.0	88.0	74.0		47.0	47.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effect Green (s)	79.7	83.3	73.1		42.7	42.7
Actuated g/C Ratio	0.59	0.62	0.54		0.32	0.32
v/c Ratio	0.38	0.85	0.58		0.64	0.22
Control Delay	16.1	24.4	21.7		45.7	6.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	16.1	24.4	21.7		45.7	6.4
LOS	B	C	C		D	A
Approach Delay		24.1	21.7		35.3	
Approach LOS		C	C		D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 24.5

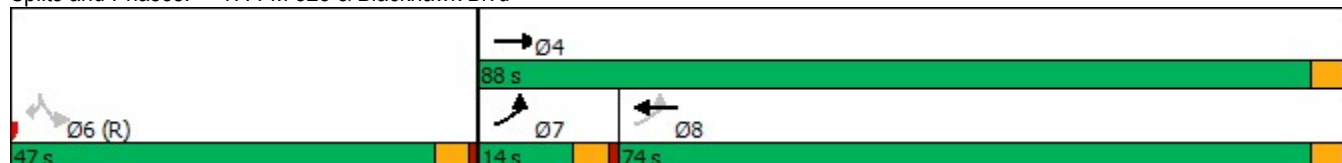
Intersection LOS: C

Intersection Capacity Utilization 73.2%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	285	33	54	45	84	204	77	2110	41	64	995	206
Future Volume (vph)	285	33	54	45	84	204	77	2110	41	64	995	206
Satd. Flow (prot)	0	1758	0	0	1696	0	1770	5070	0	1770	4953	0
Flt Permitted		0.481			0.906		0.117			0.067		
Satd. Flow (perm)	0	878	0	0	1548	0	218	5070	0	125	4953	0
Satd. Flow (RTOR)		8			73			2			39	
Adj. Flow (vph)	310	36	59	49	91	222	84	2293	45	70	1082	224
Lane Group Flow (vph)	0	405	0	0	362	0	84	2338	0	70	1306	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	65.8	65.8		65.8	65.8		11.2	62.0		12.2	63.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		61.3			61.3		65.2	60.0		66.1	58.6	
Actuated g/C Ratio		0.44			0.44		0.47	0.43		0.47	0.42	
v/c Ratio		1.04			0.50		0.48	1.08		0.49	0.62	
Control Delay		95.4			25.1		28.1	81.6		31.3	32.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		95.4			25.1		28.1	81.6		31.3	32.6	
LOS		F			C		C	F		C	C	
Approach Delay		95.4			25.1			79.8			32.5	
Approach LOS		F			C			E			C	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 62.6

Intersection LOS: E

Intersection Capacity Utilization 101.1%

ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr

 Ø2 (R)	 Ø3	 Ø4
65.8 s	12.2 s	62 s
 Ø6 (R)	 Ø7	 Ø8
65.8 s	11.2 s	63 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	524	67	129	30	41	22	191	1976	41	21	1227	520
Future Volume (vph)	524	67	129	30	41	22	191	1976	41	21	1227	520
Satd. Flow (prot)	1770	1678	0	1770	1766	0	1770	5070	0	1770	3539	1583
Flt Permitted	0.712			0.588			0.174			0.148		
Satd. Flow (perm)	1326	1678	0	1095	1766	0	324	5070	0	276	3539	1583
Satd. Flow (RTOR)		140			24			5				565
Adj. Flow (vph)	570	73	140	33	45	24	208	2148	45	23	1334	565
Lane Group Flow (vph)	570	213	0	33	69	0	208	2193	0	23	1334	565
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	26.5	26.5		26.5	26.5		9.6	24.0		9.5	23.9	23.9
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)	22.0	22.0		22.0	22.0		24.5	27.1		28.1	19.4	19.4
Actuated g/C Ratio	0.37	0.37		0.37	0.37		0.41	0.45		0.47	0.32	0.32
v/c Ratio	1.17	0.30		0.08	0.10		0.82	0.96		0.09	1.17	0.63
Control Delay	120.8	6.6		13.2	9.6		39.3	30.0		10.8	107.5	5.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	120.8	6.6		13.2	9.6		39.3	30.0		10.8	107.5	5.4
LOS	F	A		B	A		D	C		B	F	A
Approach Delay		89.7			10.8			30.8			76.3	
Approach LOS		F			B			C			E	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 56.1

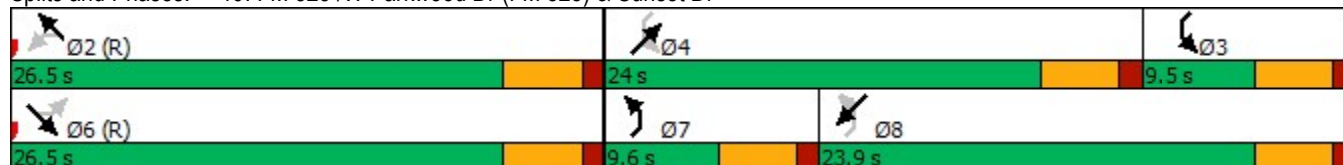
Intersection LOS: E

Intersection Capacity Utilization 91.4%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	309	2037	173	96	1232	21	125	169	289	15	101	149
Future Volume (vph)	309	2037	173	96	1232	21	125	169	289	15	101	149
Satd. Flow (prot)	1770	3497	0	1770	3529	0	0	1824	1583	0	1716	0
Flt Permitted	0.103			0.070				0.491			0.850	
Satd. Flow (perm)	192	3497	0	130	3529	0	0	915	1583	0	1463	0
Satd. Flow (RTOR)		15			3				132		60	
Adj. Flow (vph)	336	2214	188	104	1339	23	136	184	314	16	110	162
Lane Group Flow (vph)	336	2402	0	104	1362	0	0	320	314	0	288	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effct Green (s)	61.5	57.0		62.5	52.0			22.6	22.6		22.6	
Actuated g/C Ratio	0.63	0.58		0.64	0.53			0.23	0.23		0.23	
v/c Ratio	1.23	1.17		0.53	0.72			1.52	0.67		0.75	
Control Delay	152.6	106.4		21.9	19.9			286.0	28.1		41.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	152.6	106.4		21.9	19.9			286.0	28.1		41.9	
LOS	F	F		C	B			F	C		D	
Approach Delay		112.0			20.1			158.3			41.9	
Approach LOS		F			C			F			D	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 97.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.52

Intersection Signal Delay: 87.5

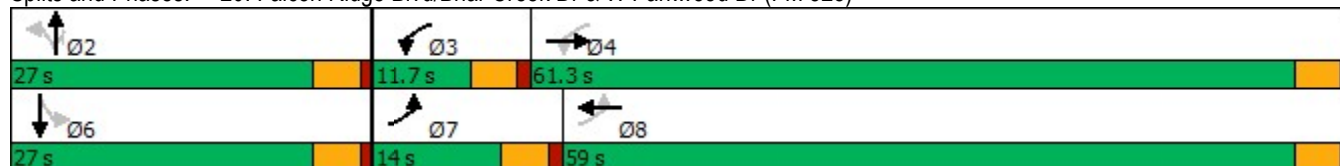
Intersection LOS: F

Intersection Capacity Utilization 113.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	158	4	15	66	1	236	2	1631	18	82	1132	64
Future Volume (vph)	158	4	15	66	1	236	2	1631	18	82	1132	64
Satd. Flow (prot)	0	1763	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.413			0.901		0.135			0.057		
Satd. Flow (perm)	0	761	0	0	1502	0	251	3532	0	106	3511	0
Satd. Flow (RTOR)		4			134			1			7	
Adj. Flow (vph)	172	4	16	72	1	257	2	1773	20	89	1230	70
Lane Group Flow (vph)	0	192	0	0	330	0	2	1793	0	89	1300	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	47.0	47.0		47.0	47.0		10.0	75.0		13.0	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		43.7			43.7		81.4	70.5		77.8	80.3	
Actuated g/C Ratio		0.32			0.32		0.60	0.52		0.58	0.59	
v/c Ratio		0.77			0.57		0.01	0.97		0.59	0.62	
Control Delay		62.5			26.5		10.0	46.9		54.4	19.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		62.5			26.5		10.0	46.9		54.4	19.5	
LOS		E			C		A	D		D	B	
Approach Delay		62.5			26.5			46.8			21.7	
Approach LOS		E			C			D			C	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 36.4

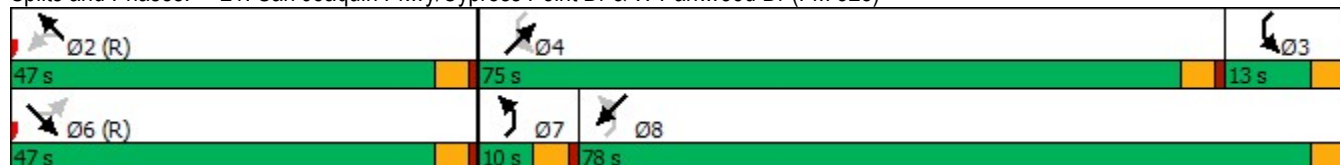
Intersection LOS: D

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	0	23	2	1	35	7	1201	7	14	1009	132
Future Volume (vph)	38	0	23	2	1	35	7	1201	7	14	1009	132
Satd. Flow (prot)	0	1715	0	0	1627	0	1770	3536	0	1770	3479	0
Flt Permitted		0.873			0.980		0.211			0.189		
Satd. Flow (perm)	0	1543	0	0	1597	0	393	3536	0	352	3479	0
Satd. Flow (RTOR)		88			38			1			21	
Adj. Flow (vph)	41	0	25	2	1	38	8	1305	8	15	1097	143
Lane Group Flow (vph)	0	66	0	0	41	0	8	1313	0	15	1240	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	29.0	29.0		29.0	29.0		14.0	87.0		14.0	87.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		6.6			6.6		115.5	111.7		115.5	115.3	
Actuated g/C Ratio		0.05			0.05		0.89	0.86		0.89	0.89	
v/c Ratio		0.41			0.35		0.02	0.43		0.04	0.40	
Control Delay		13.3			27.8		1.3	3.9		1.4	2.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		13.3			27.8		1.3	3.9		1.4	2.5	
LOS		B			C		A	A		A	A	
Approach Delay		13.3			27.8			3.9			2.4	
Approach LOS		B			C			A			A	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 3.8

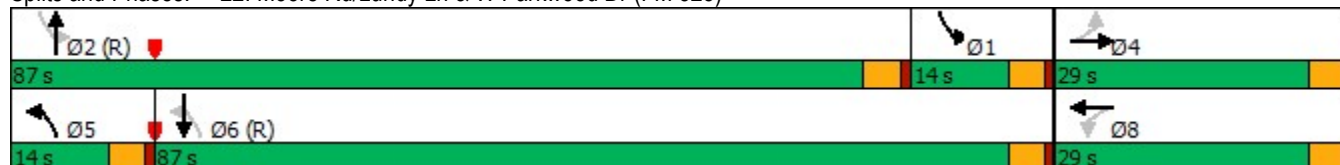
Intersection LOS: A

Intersection Capacity Utilization 51.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	94	106	71	86	81	41	67	419	85	30	363	54
Future Volume (vph)	94	106	71	86	81	41	67	419	85	30	363	54
Satd. Flow (prot)	1770	3327	0	1770	3359	0	1770	3451	0	1770	3472	0
Flt Permitted	0.668			0.631			0.359			0.270		
Satd. Flow (perm)	1244	3327	0	1175	3359	0	669	3451	0	503	3472	0
Satd. Flow (RTOR)		77			45			28			20	
Adj. Flow (vph)	102	115	77	93	88	45	73	455	92	33	395	59
Lane Group Flow (vph)	102	192	0	93	133	0	73	547	0	33	454	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	55.0	55.0		55.0	55.0		65.0	65.0		65.0	65.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	50.6	50.6		50.6	50.6		17.3	17.3		17.3	17.3	
Actuated g/C Ratio	0.66	0.66		0.66	0.66		0.22	0.22		0.22	0.22	
v/c Ratio	0.12	0.09		0.12	0.06		0.49	0.69		0.29	0.57	
Control Delay	6.2	3.5		6.2	3.8		37.5	30.5		31.7	28.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.2	3.5		6.2	3.8		37.5	30.5		31.7	28.1	
LOS	A	A		A	A		D	C		C	C	
Approach Delay		4.4			4.8			31.3			28.3	
Approach LOS		A			A			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 76.9

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 21.9

Intersection LOS: C

Intersection Capacity Utilization 43.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
55 s	65 s
 Ø6	 Ø8
55 s	65 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	25	578	14	7	490	95	7	12	9	141	3	11
Future Volume (vph)	25	578	14	7	490	95	7	12	9	141	3	11
Satd. Flow (prot)	1770	1857	0	1770	1818	0	0	1758	0	0	1763	0
Flt Permitted	0.297			0.320				0.919			0.723	
Satd. Flow (perm)	553	1857	0	596	1818	0	0	1637	0	0	1333	0
Satd. Flow (RTOR)		2			19			10			5	
Adj. Flow (vph)	27	628	15	8	533	103	8	13	10	153	3	12
Lane Group Flow (vph)	27	643	0	8	636	0	0	31	0	0	168	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	46.7	45.7		45.7	43.5			13.4			13.4	
Actuated g/C Ratio	0.67	0.65		0.65	0.62			0.19			0.19	
v/c Ratio	0.06	0.53		0.02	0.56			0.10			0.65	
Control Delay	5.1	10.5		5.4	9.6			16.7			36.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.1	10.5		5.4	9.6			16.7			36.4	
LOS	A	B		A	A			B			D	
Approach Delay		10.3			9.6			16.7			36.4	
Approach LOS		B			A			B			D	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 13.0

Intersection LOS: B

Intersection Capacity Utilization 54.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	353	345	104	392	0	214	9	44	1	12	10
Future Volume (vph)	9	353	345	104	392	0	214	9	44	1	12	10
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1753	0	0	1749	0
Flt Permitted	0.484			0.144				0.752			0.989	
Satd. Flow (perm)	902	1725	0	268	1863	0	0	1370	0	0	1734	0
Satd. Flow (RTOR)		96						14			11	
Adj. Flow (vph)	10	384	375	113	426	0	233	10	48	1	13	11
Lane Group Flow (vph)	10	759	0	113	426	0	0	291	0	0	25	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	40.5	36.3		43.2	42.2			16.9			16.9	
Actuated g/C Ratio	0.58	0.52		0.62	0.60			0.24			0.24	
v/c Ratio	0.02	0.81		0.40	0.38			0.86			0.06	
Control Delay	7.2	20.3		11.9	12.0			49.0			14.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.2	20.3		11.9	12.0			49.0			14.7	
LOS	A	C		B	B			D			B	
Approach Delay		20.1			12.0			49.0			14.7	
Approach LOS		C			B			D			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 22.5

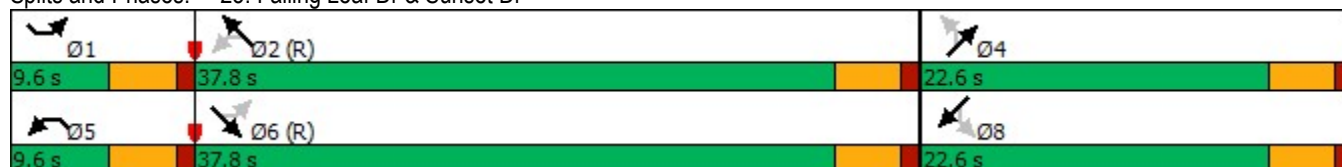
Intersection LOS: C

Intersection Capacity Utilization 78.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	21	335	25	47	344	40	95	85	68	20	89	51
Future Volume (vph)	21	335	25	47	344	40	95	85	68	20	89	51
Satd. Flow (prot)	1770	1844	0	1770	1835	0	0	1814	1583	0	1772	0
Flt Permitted	0.473			0.459				0.684			0.943	
Satd. Flow (perm)	881	1844	0	855	1835	0	0	1274	1583	0	1681	0
Satd. Flow (RTOR)		7			11				94		32	
Adj. Flow (vph)	23	364	27	51	374	43	103	92	74	22	97	55
Lane Group Flow (vph)	23	391	0	51	417	0	0	195	74	0	174	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	43.7	40.4		44.7	42.5			14.5	14.5		14.5	
Actuated g/C Ratio	0.62	0.58		0.64	0.61			0.21	0.21		0.21	
v/c Ratio	0.04	0.37		0.08	0.37			0.74	0.18		0.47	
Control Delay	6.9	16.6		5.5	10.1			42.4	4.7		22.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.9	16.6		5.5	10.1			42.4	4.7		22.9	
LOS	A	B		A	B			D	A		C	
Approach Delay		16.1			9.6			32.0			22.9	
Approach LOS		B			A			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 17.9

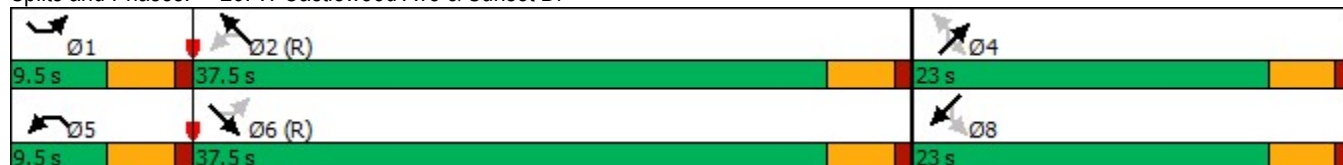
Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	109	302	17	12	668	43	14	83	32	8	29	129
Future Volume (Veh/h)	109	302	17	12	668	43	14	83	32	8	29	129
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	328	18	13	726	47	15	90	35	9	32	140
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	773			346			1504	1372	337	1428	1358	750
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	773			346			1504	1372	337	1428	1358	750
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	86			99			68	27	95	77	75	66
cM capacity (veh/h)	842			1213			47	124	705	40	127	412
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	464	786	140	181								
Volume Left	118	13	15	9								
Volume Right	18	47	35	140								
cSH	842	1213	128	221								
Volume to Capacity	0.14	0.01	1.09	0.82								
Queue Length 95th (ft)	12	1	201	153								
Control Delay (s)	3.8	0.3	173.5	68.4								
Lane LOS	A	A	F	F								
Approach Delay (s)	3.8	0.3	173.5	68.4								
Approach LOS			F	F								
Intersection Summary												
Average Delay			24.6									
Intersection Capacity Utilization			83.0%		ICU Level of Service				E			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	316	21	64	620	49	116
Future Volume (Veh/h)	316	21	64	620	49	116
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	343	23	70	674	53	126
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			366		1168	354
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			366		1168	354
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		74	82
cM capacity (veh/h)			1193		201	689
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	366	744	179			
Volume Left	0	70	53			
Volume Right	23	0	126			
cSH	1700	1193	401			
Volume to Capacity	0.22	0.06	0.45			
Queue Length 95th (ft)	0	5	56			
Control Delay (s)	0.0	1.5	21.0			
Lane LOS		A	C			
Approach Delay (s)	0.0	1.5	21.0			
Approach LOS			C			
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			73.9%	ICU Level of Service		D
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	140	288	566	12	21	116
Future Volume (Veh/h)	140	288	566	12	21	116
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	152	313	615	13	23	126
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	628				1238	622
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	628				1238	622
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				86	74
cM capacity (veh/h)	954				163	487
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	465	628	149			
Volume Left	152	0	23			
Volume Right	0	13	126			
cSH	954	1700	373			
Volume to Capacity	0.16	0.37	0.40			
Queue Length 95th (ft)	14	0	47			
Control Delay (s)	4.3	0.0	21.0			
Lane LOS	A		C			
Approach Delay (s)	4.3	0.0	21.0			
Approach LOS			C			
Intersection Summary						
Average Delay			4.1			
Intersection Capacity Utilization		71.7%		ICU Level of Service		C
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	73	90	109	34	49	66	57	377	77	30	294	21
Future Volume (vph)	73	90	109	34	49	66	57	377	77	30	294	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	79	98	118	37	53	72	62	410	84	33	320	23
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	295	162	556	376								
Volume Left (vph)	79	37	62	33								
Volume Right (vph)	118	72	84	23								
Hadj (s)	-0.15	-0.19	-0.03	0.01								
Departure Headway (s)	7.3	7.8	6.6	7.0								
Degree Utilization, x	0.60	0.35	1.02	0.73								
Capacity (veh/h)	466	411	556	501								
Control Delay (s)	20.4	14.9	69.9	26.2								
Approach Delay (s)	20.4	14.9	69.9	26.2								
Approach LOS	C	B	F	D								
Intersection Summary												
Delay			41.2									
Level of Service			E									
Intersection Capacity Utilization			67.7%	ICU Level of Service					C			
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	1413	194	68	1511	23	126	0	46	24	23	53
Future Volume (vph)	45	1413	194	68	1511	23	126	0	46	24	23	53
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1733	0	0	1708	0
Flt Permitted	0.057			0.046				0.677			0.904	
Satd. Flow (perm)	106	3476	0	86	3532	0	0	1216	0	0	1563	0
Satd. Flow (RTOR)		17			2			76			37	
Adj. Flow (vph)	49	1536	211	74	1642	25	137	0	50	26	25	58
Lane Group Flow (vph)	49	1747	0	74	1667	0	0	187	0	0	109	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	12.0	93.0		13.0	94.0		44.0	44.0		44.0	44.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	95.3	86.6		94.4	88.6			42.1			42.1	
Actuated g/C Ratio	0.64	0.58		0.63	0.59			0.28			0.28	
v/c Ratio	0.32	0.87		0.52	0.80			0.47			0.23	
Control Delay	29.2	32.1		32.6	27.6			31.2			29.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	29.2	32.1		32.6	27.6			31.2			29.6	
LOS	C	C		C	C			C			C	
Approach Delay		32.0			27.8			31.2			29.6	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 30.0

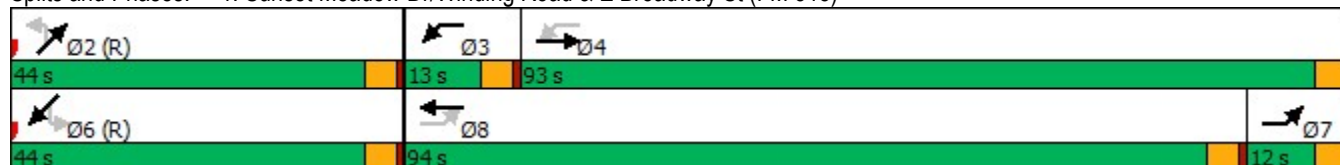
Intersection LOS: C

Intersection Capacity Utilization 77.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



Friendswood TX Traffic Study

No Build PM Peak 2040

2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	272	841	179	87	886	146	318	547	122	258	879	387
Future Volume (vph)	272	841	179	87	886	146	318	547	122	258	879	387
Satd. Flow (prot)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3447	0	1770	3465	0	1770	3444	0	1770	3376	0
Satd. Flow (RTOR)		22			15			22			59	
Adj. Flow (vph)	296	914	195	95	963	159	346	595	133	280	955	421
Lane Group Flow (vph)	296	1109	0	95	1122	0	346	728	0	280	1376	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases												
Total Split (s)	21.0	44.2		12.2	35.4		23.6	35.5		28.1	40.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	16.5	39.7		7.7	30.9		19.1	32.7		21.9	35.5	
Actuated g/C Ratio	0.14	0.33		0.06	0.26		0.16	0.27		0.18	0.30	
v/c Ratio	1.22	0.96		0.84	1.24		1.23	0.76		0.87	1.32	
Control Delay	173.3	57.4		105.8	156.3		173.6	45.4		73.1	186.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	173.3	57.4		105.8	156.3		173.6	45.4		73.1	186.0	
LOS	F	E		F	F		F	D		E	F	
Approach Delay		81.8			152.4			86.7			166.9	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.32

Intersection Signal Delay: 125.2

Intersection LOS: F

Intersection Capacity Utilization 113.5%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)

			
Ø1	Ø2	Ø3	Ø4
21 s	35.4 s	28.1 s	35.5 s
			
Ø5	Ø6	Ø7	Ø8
12.2 s	44.2 s	23.6 s	40 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	2	1237	42	97	1292	25	66	23	78	40	29	7
Future Volume (vph)	2	1237	42	97	1292	25	66	23	78	40	29	7
Satd. Flow (prot)	1770	3522	0	1770	3529	0	0	1712	0	0	1793	0
Flt Permitted	0.145			0.138				0.837			0.677	
Satd. Flow (perm)	270	3522	0	257	3529	0	0	1461	0	0	1245	0
Satd. Flow (RTOR)		5			3			34			4	
Adj. Flow (vph)	2	1345	46	105	1404	27	72	25	85	43	32	8
Lane Group Flow (vph)	2	1391	0	105	1431	0	0	182	0	0	83	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	12.0	72.0		16.0	76.0		32.0	32.0		32.0	32.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effct Green (s)	78.8	67.9		75.1	77.7			15.8			15.8	
Actuated g/C Ratio	0.75	0.65		0.72	0.74			0.15			0.15	
v/c Ratio	0.01	0.61		0.36	0.54			0.73			0.43	
Control Delay	4.5	12.9		7.6	8.0			51.4			45.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.5	12.9		7.6	8.0			51.4			45.2	
LOS	A	B		A	A			D			D	
Approach Delay		12.9			8.0			51.4			45.2	
Approach LOS		B			A			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 104.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 13.6

Intersection LOS: B

Intersection Capacity Utilization 63.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
12 s	76 s	32 s
		
Ø5	Ø6	Ø8
16 s	72 s	32 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	11	1345	83	161	1461	14	60	10	117	14	10	9
Future Volume (vph)	11	1345	83	161	1461	14	60	10	117	14	10	9
Satd. Flow (prot)	1770	3507	0	1770	3536	0	0	1679	0	0	1756	0
Flt Permitted	0.113			0.098				0.881			0.768	
Satd. Flow (perm)	210	3507	0	183	3536	0	0	1503	0	0	1376	0
Satd. Flow (RTOR)		8			1			63			10	
Adj. Flow (vph)	12	1462	90	175	1588	15	65	11	127	15	11	10
Lane Group Flow (vph)	12	1552	0	175	1603	0	0	203	0	0	36	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2			6			4			8		
Total Split (s)	11.0	71.0		20.0	80.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	81.6	67.0		77.9	80.5			15.6			15.6	
Actuated g/C Ratio	0.76	0.63		0.73	0.75			0.15			0.15	
v/c Ratio	0.05	0.71		0.60	0.60			0.75			0.17	
Control Delay	4.5	17.3		20.8	8.7			47.1			33.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	4.5	17.3		20.8	8.7			47.1			33.1	
LOS	A	B		C	A			D			C	
Approach Delay		17.2			9.9			47.1			33.1	
Approach LOS		B			A			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 107

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 15.4

Intersection LOS: B

Intersection Capacity Utilization 73.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)

		
Ø1	Ø2	Ø4
11 s	80 s	29 s
		
Ø5	Ø6	Ø8
20 s	71 s	29 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	14	30	499	8	323	1	1405	339	304	1356	2
Future Volume (vph)	0	14	30	499	8	323	1	1405	339	304	1356	2
Satd. Flow (prot)	0	1690	0	0	1775	1583	0	3437	0	1770	3539	0
Flt Permitted					0.694			0.954		0.222		
Satd. Flow (perm)	0	1690	0	0	1293	1583	0	3278	0	414	3539	0
Satd. Flow (RTOR)		20				238		58				
Adj. Flow (vph)	0	15	33	542	9	351	1	1527	368	330	1474	2
Lane Group Flow (vph)	0	48	0	0	551	351	0	1896	0	330	1476	0
Turn Type		NA		Perm	NA	Perm	Perm	NA		D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	22.5	22.5		9.5	22.5	
Total Lost Time (s)		4.5			4.5	4.5		4.5		4.5	4.5	
Act Effect Green (s)		18.0			18.0	18.0		18.0		23.0	27.5	
Actuated g/C Ratio		0.33			0.33	0.33		0.33		0.42	0.50	
v/c Ratio		0.08			1.29	0.51		1.69		1.10	0.83	
Control Delay		9.3			169.9	8.2		335.6		101.1	16.9	
Queue Delay		0.0			0.0	0.0		0.0		0.0	0.0	
Total Delay		9.3			169.9	8.2		335.6		101.1	16.9	
LOS		A			F	A		F		F	B	
Approach Delay		9.3			107.0			335.6			32.3	
Approach LOS		A			F			F			C	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 1.69

Intersection Signal Delay: 170.1

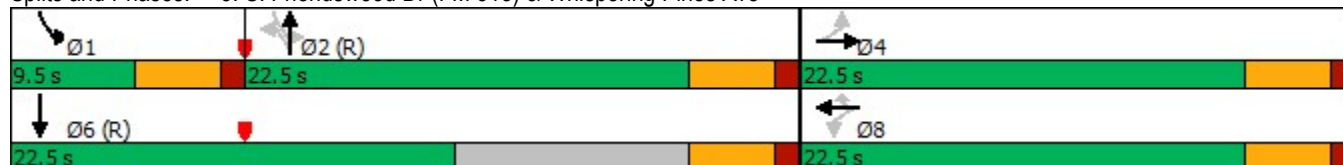
Intersection LOS: F

Intersection Capacity Utilization 133.2%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	39	1282	30	302	1521	50	35	42	25	34	70	414
Future Volume (vph)	39	1282	30	302	1521	50	35	42	25	34	70	414
Satd. Flow (prot)	1770	3526	0	1770	3522	0	0	1771	0	0	1833	1583
Flt Permitted	0.950			0.950				0.888			0.894	
Satd. Flow (perm)	1764	3526	0	1770	3522	0	0	1600	0	0	1665	1583
Satd. Flow (RTOR)		5			6			27				239
Adj. Flow (vph)	42	1393	33	328	1653	54	38	46	27	37	76	450
Lane Group Flow (vph)	42	1426	0	328	1707	0	0	111	0	0	113	450
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		8
Total Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	4.5
Act Effect Green (s)	5.0	18.0		5.0	18.0			18.0			18.0	18.0
Actuated g/C Ratio	0.09	0.33		0.09	0.33			0.33			0.33	0.33
v/c Ratio	0.26	1.22		2.02	1.46			0.20			0.21	0.66
Control Delay	27.4	129.3		488.7	232.4			11.6			14.4	12.6
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	27.4	129.3		488.7	232.4			11.6			14.4	12.6
LOS	C	F		F	F			B			B	B
Approach Delay		126.4			273.7			11.6			13.0	
Approach LOS		F			F			B			B	

Intersection Summary

Cycle Length: 54.5

Actuated Cycle Length: 54.5

Offset: 45 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Pretimed

Maximum v/c Ratio: 2.02

Intersection Signal Delay: 179.8

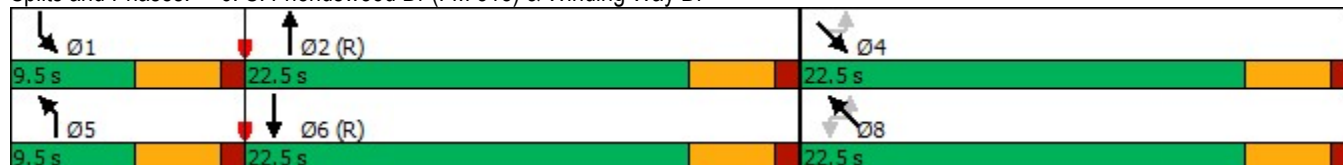
Intersection LOS: F

Intersection Capacity Utilization 79.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	505	836	250	149	980	484	350	1435	546	415	1968	121
Future Volume (vph)	505	836	250	149	980	484	350	1435	546	415	1968	121
Satd. Flow (prot)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3415	0	1770	3539	1583	1770	4877	0	1770	5040	0
Satd. Flow (RTOR)		32				280		72			7	
Adj. Flow (vph)	549	909	272	162	1065	526	380	1560	593	451	2139	132
Lane Group Flow (vph)	549	1181	0	162	1065	526	380	2153	0	451	2271	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6						
Total Split (s)	31.0	48.1		16.4	33.5	33.5	23.2	39.0		26.5	42.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	26.5	43.6		11.9	29.0	29.0	18.7	34.5		22.0	37.8	
Actuated g/C Ratio	0.20	0.34		0.09	0.22	0.22	0.14	0.27		0.17	0.29	
v/c Ratio	1.52	1.01		1.00	1.35	0.92	1.50	1.60		1.51	1.54	
Control Delay	285.8	71.3		129.4	205.0	46.0	281.0	304.5		282.5	281.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	285.8	71.3		129.4	205.0	46.0	281.0	304.5		282.5	281.5	
LOS	F	E		F	F	D	F	F		F	F	
Approach Delay		139.3			150.3			301.0			281.7	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 31 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.60

Intersection Signal Delay: 232.7

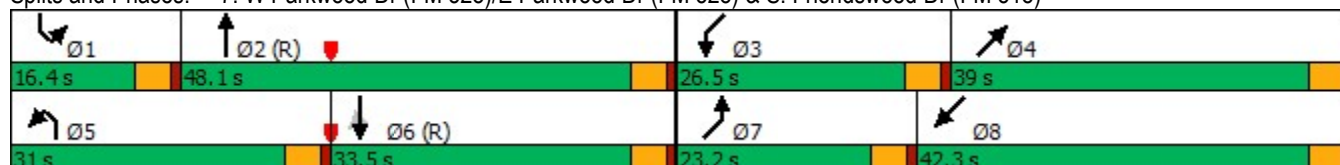
Intersection LOS: F

Intersection Capacity Utilization 133.0%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	49	1563	1855	220	117	22
Future Volume (vph)	49	1563	1855	220	117	22
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.045				0.950	
Satd. Flow (perm)	84	3539	3483	0	1770	1583
Satd. Flow (RTOR)			25			24
Adj. Flow (vph)	53	1699	2016	239	127	24
Lane Group Flow (vph)	53	1699	2255	0	127	24
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	12.0	100.0	88.0		20.0	20.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	94.4	98.0	89.2		13.0	13.0
Actuated g/C Ratio	0.79	0.82	0.74		0.11	0.11
v/c Ratio	0.34	0.59	0.87		0.66	0.12
Control Delay	14.8	5.7	17.5		67.6	18.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	14.8	5.7	17.5		67.6	18.4
LOS	B	A	B		E	B
Approach Delay		6.0	17.5		59.8	
Approach LOS		A	B		E	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 14.2

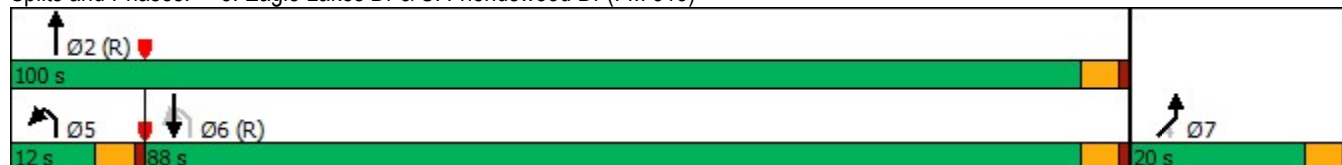
Intersection LOS: B

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	141	1333	246	151	1259	21	170	20	138	9	18	101
Future Volume (vph)	141	1333	246	151	1259	21	170	20	138	9	18	101
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.094			0.073			0.950			0.950		
Satd. Flow (perm)	175	3539	1583	136	3539	1583	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)			267			136			150			136
Adj. Flow (vph)	153	1449	267	164	1368	23	185	22	150	10	20	110
Lane Group Flow (vph)	153	1449	267	164	1368	23	185	22	150	10	20	110
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2		6	6		2			4			8
Total Split (s)	15.0	58.0	58.0	16.0	59.0	59.0	23.0	36.0	36.0	10.0	23.0	23.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	78.7	66.3	66.3	78.7	66.8	66.8	16.3	25.8	25.8	5.5	7.0	7.0
Actuated g/C Ratio	0.66	0.55	0.55	0.66	0.56	0.56	0.14	0.22	0.22	0.05	0.06	0.06
v/c Ratio	0.56	0.74	0.27	0.64	0.69	0.02	0.77	0.06	0.33	0.12	0.19	0.50
Control Delay	19.4	34.2	7.0	41.9	15.2	0.0	70.9	37.8	8.4	58.4	57.0	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	34.2	7.0	41.9	15.2	0.0	70.9	37.8	8.4	58.4	57.0	12.9
LOS	B	C	A	D	B	A	E	D	A	E	E	B
Approach Delay		29.1			17.8			42.6			22.5	
Approach LOS		C			B			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 25.6

Intersection LOS: C

Intersection Capacity Utilization 72.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	301	940	259	204	1278	341	271	323	109	277	396	531
Future Volume (vph)	301	940	259	204	1278	341	271	323	109	277	396	531
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3405	0	1770	3235	0
Flt Permitted	0.092			0.123			0.123			0.333		
Satd. Flow (perm)	171	3539	1583	229	3539	1583	229	3405	0	620	3235	0
Satd. Flow (RTOR)			282			371		34			248	
Adj. Flow (vph)	327	1022	282	222	1389	371	295	351	118	301	430	577
Lane Group Flow (vph)	327	1022	282	222	1389	371	295	469	0	301	1007	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA		D.P+P	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6			2		
Total Split (s)	23.0	56.0	56.0	15.0	48.0	48.0	22.0	38.9		20.1	37.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effect Green (s)	62.0	51.5	51.5	62.0	43.5	43.5	50.0	34.5		50.0	32.5	
Actuated g/C Ratio	0.48	0.40	0.40	0.48	0.33	0.33	0.38	0.27		0.38	0.25	
v/c Ratio	1.06	0.73	0.35	0.95	1.17	0.48	1.00	0.51		0.80	1.01	
Control Delay	114.3	37.1	4.1	72.9	126.1	5.2	89.4	39.7		45.2	68.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	114.3	37.1	4.1	72.9	126.1	5.2	89.4	39.7		45.2	68.2	
LOS	F	D	A	E	F	A	F	D		D	E	
Approach Delay		46.9			97.5			58.9			62.9	
Approach LOS		D			F			E			E	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 69.8

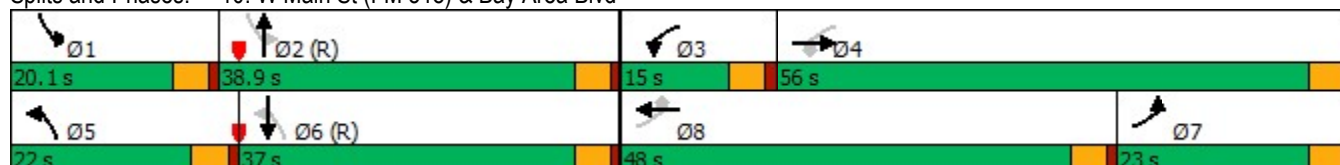
Intersection LOS: E

Intersection Capacity Utilization 110.1%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	39	233	120	116	235	44	139	1047	105	170	1609	95
Future Volume (vph)	39	233	120	116	235	44	139	1047	105	170	1609	95
Satd. Flow (prot)	0	1777	0	0	1809	0	1770	3490	0	1770	3511	0
Flt Permitted		0.995			0.986		0.950			0.950		
Satd. Flow (perm)	0	1777	0	0	1809	0	1770	3490	0	1770	3511	0
Satd. Flow (RTOR)		11			3			6			4	
Adj. Flow (vph)	42	253	130	126	255	48	151	1138	114	185	1749	103
Lane Group Flow (vph)	0	425	0	0	429	0	151	1252	0	185	1852	0
Turn Type	Split	NA		Split	NA		Prot	NA		Prot	NA	
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases												
Total Split (s)	40.0	40.0		43.0	43.0		19.0	68.6		28.4	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		35.5			38.5		14.5	66.0		22.0	73.5	
Actuated g/C Ratio		0.20			0.21		0.08	0.37		0.12	0.41	
v/c Ratio		1.18			1.10		1.06	0.98		0.86	1.29	
Control Delay		164.8			138.2		167.2	75.2		109.2	178.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		164.8			138.2		167.2	75.2		109.2	178.1	
LOS		F			F		F	E		F	F	
Approach Delay		164.8			138.2			85.1			171.8	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 180

Actuated Cycle Length: 180

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.29

Intersection Signal Delay: 139.4

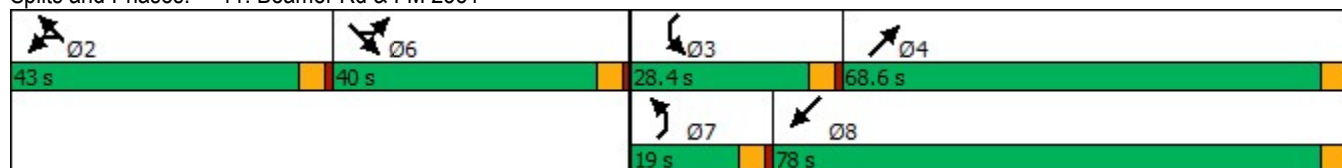
Intersection LOS: F

Intersection Capacity Utilization 112.9%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351



	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1140	106	96	1731	140	98
Future Volume (vph)	1140	106	96	1731	140	98
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	12					107
Adj. Flow (vph)	1239	115	104	1882	152	107
Lane Group Flow (vph)	1354	0	104	1882	152	107
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	69.0		22.0	91.0	29.0	29.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	48.2		11.2	61.1	25.0	25.0
Actuated g/C Ratio	0.51		0.12	0.64	0.26	0.26
v/c Ratio	0.76		0.50	0.83	0.17	0.22
Control Delay	23.0		50.9	16.4	31.5	8.4
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	23.0		50.9	16.4	31.5	8.4
LOS	C		D	B	C	A
Approach Delay	23.0			18.2	22.0	
Approach LOS	C			B	C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 95.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 20.3

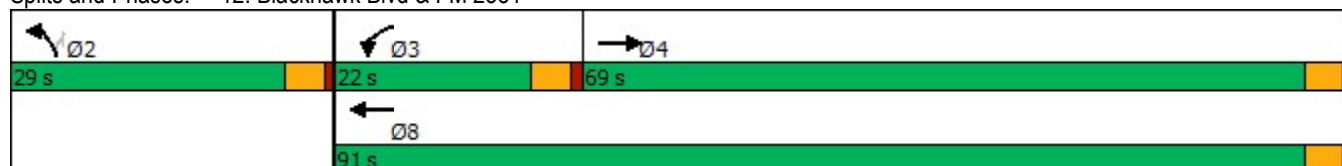
Intersection LOS: C

Intersection Capacity Utilization 59.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	73	0	85	0	0	0	109	1152	0	0	1650	169
Future Volume (vph)	73	0	85	0	0	0	109	1152	0	0	1650	169
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757					0.057					
Satd. Flow (perm)	0	1410	1583	0	1863	0	106	3539	0	1863	3490	0
Satd. Flow (RTOR)			136								17	
Adj. Flow (vph)	79	0	92	0	0	0	118	1252	0	0	1793	184
Lane Group Flow (vph)	0	79	92	0	0	0	118	1252	0	0	1977	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		15.0	83.5		9.5	78.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		22.6	114.8				78.6	83.2			70.0	
Actuated g/C Ratio		0.20	1.00				0.68	0.72			0.61	
v/c Ratio		0.29	0.06				0.60	0.49			0.93	
Control Delay		44.6	0.1				31.9	7.4			28.9	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		44.6	0.1				31.9	7.4			28.9	
LOS		D	A				C	A			C	
Approach Delay		20.6						9.5			28.9	
Approach LOS		C						A			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 114.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 20.9

Intersection LOS: C

Intersection Capacity Utilization 72.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
27 s	9.5 s	83.5 s
 Ø6	 Ø7	 Ø8
27 s	15 s	78 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	118	0	192	10	10	1	160	1185	1	6	1653	141
Future Volume (vph)	118	0	192	10	10	1	160	1185	1	6	1653	141
Satd. Flow (prot)	1770	1583	0	0	1809	0	1770	3539	0	1770	3497	0
Flt Permitted	0.742				0.856		0.056			0.168		
Satd. Flow (perm)	1382	1583	0	0	1585	0	104	3539	0	313	3497	0
Satd. Flow (RTOR)		151			1						12	
Adj. Flow (vph)	128	0	209	11	11	1	174	1288	1	7	1797	153
Lane Group Flow (vph)	128	209	0	0	23	0	174	1289	0	7	1950	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	27.0	27.0		27.0	27.0		19.0	83.0		10.0	74.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	22.6	22.6			22.6		79.5	82.1		83.2	68.0	
Actuated g/C Ratio	0.20	0.20			0.20		0.69	0.71		0.72	0.59	
v/c Ratio	0.48	0.49			0.07		0.73	0.51		0.02	0.95	
Control Delay	49.3	17.7			39.5		45.2	8.8		4.3	33.6	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.3	
Total Delay	49.3	17.7			39.5		45.2	8.8		4.3	33.9	
LOS	D	B			D		D	A		A	C	
Approach Delay		29.7			39.5			13.2			33.8	
Approach LOS		C			D			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 115.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 25.5

Intersection LOS: C

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln

 Ø2	 Ø3	 Ø4
27 s	10 s	83 s
 Ø6	 Ø7	 Ø8
27 s	19 s	74 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	33	29	20	205	41	489	25	476	170	501	602	55
Future Volume (vph)	33	29	20	205	41	489	25	476	170	501	602	55
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	1788	0	1770	1839	0
Flt Permitted		0.651			0.693		0.302			0.308		
Satd. Flow (perm)	0	1173	0	0	1291	1583	563	1788	0	574	1839	0
Satd. Flow (RTOR)		13				532		35			9	
Adj. Flow (vph)	36	32	22	223	45	532	27	517	185	545	654	60
Lane Group Flow (vph)	0	90	0	0	268	532	27	702	0	545	714	0
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		
Total Split (s)	32.0	32.0		32.0	32.0		88.0	88.0		88.0	88.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		27.5			27.5	120.0	83.5	83.5		83.5	83.5	
Actuated g/C Ratio		0.23			0.23	1.00	0.70	0.70		0.70	0.70	
v/c Ratio		0.32			0.91	0.34	0.07	0.56		1.37	0.56	
Control Delay		36.6			79.3	0.6	6.4	10.6		201.6	11.0	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		36.6			79.3	0.6	6.4	10.6		201.6	11.0	
LOS		D			E	A	A	B		F	B	
Approach Delay		36.6			26.9			10.5			93.5	
Approach LOS		D			C			B			F	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.37

Intersection Signal Delay: 52.2

Intersection LOS: D

Intersection Capacity Utilization 94.6%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr

 Ø2	 Ø4
32 s	88 s
 Ø6	 Ø8
32 s	88 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 			 	
Traffic Volume (vph)	424	1510	182	526	1703	141	313	565	252	198	620	492
Future Volume (vph)	424	1510	182	526	1703	141	313	565	252	198	620	492
Satd. Flow (prot)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	5004	0	1770	5029	0	1770	3376	0	1770	3306	0
Satd. Flow (RTOR)		19			12			50			69	
Adj. Flow (vph)	461	1641	198	572	1851	153	340	614	274	215	674	535
Lane Group Flow (vph)	461	1839	0	572	2004	0	340	888	0	215	1209	0
Turn Type	Prot	NA		Prot	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Total Split (s)	9.5	79.0		9.5	79.0		9.5	56.0		9.5	56.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	5.0	72.5		5.0	72.5		7.0	51.5		7.0	51.5	
Actuated g/C Ratio	0.03	0.47		0.03	0.47		0.05	0.33		0.05	0.33	
v/c Ratio	8.09	0.78		10.04	0.84		4.25	0.76		2.69	1.05	
Control Delay	3232.8	36.2		4106.7	39.5		1515.8	48.3		823.7	86.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3232.8	36.2		4106.7	39.5		1515.8	48.3		823.7	86.8	
LOS	F	D		F	D		F	D		F	F	
Approach Delay		676.9			942.6			454.6			198.1	
Approach LOS		F			F			F			F	

Intersection Summary

Cycle Length: 154

Actuated Cycle Length: 154

Offset: 144.5 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 10.04

Intersection Signal Delay: 641.0

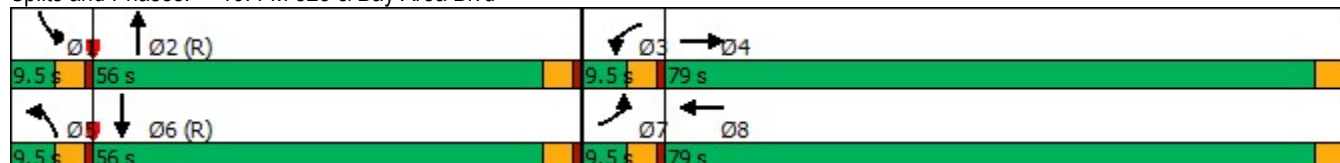
Intersection LOS: F

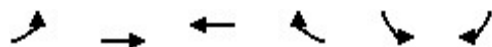
Intersection Capacity Utilization 127.6%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑↑↑	↑↑↑		↰	↰
Traffic Volume (vph)	142	1822	2539	335	240	116
Future Volume (vph)	142	1822	2539	335	240	116
Satd. Flow (prot)	1770	5085	4999	0	1770	1583
Flt Permitted	0.050				0.950	
Satd. Flow (perm)	93	5085	4999	0	1770	1583
Satd. Flow (RTOR)			29			126
Adj. Flow (vph)	154	1980	2760	364	261	126
Lane Group Flow (vph)	154	1980	3124	0	261	126
Turn Type	D.P+P	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	8				6	6
Total Split (s)	19.0	101.0	82.0		34.0	34.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	92.0	96.5	80.3		29.5	29.5
Actuated g/C Ratio	0.68	0.71	0.59		0.22	0.22
v/c Ratio	0.74	0.54	1.05		0.68	0.28
Control Delay	51.6	9.7	57.7		58.3	8.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	51.6	9.7	57.7		58.3	8.7
LOS	D	A	E		E	A
Approach Delay		12.7	57.7		42.1	
Approach LOS		B	E		D	

Intersection Summary

Cycle Length: 135

Actuated Cycle Length: 135

Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 39.6

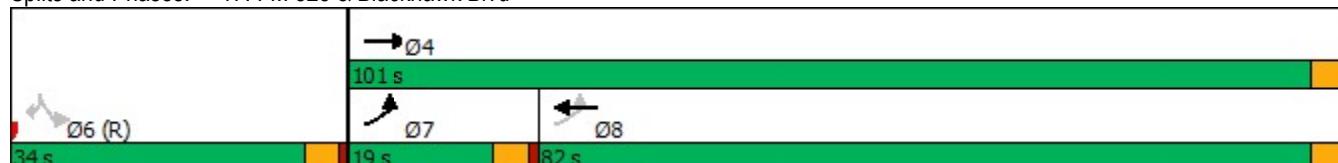
Intersection LOS: D

Intersection Capacity Utilization 88.9%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	291	64	84	41	74	125	120	1636	70	183	2164	336
Future Volume (vph)	291	64	84	41	74	125	120	1636	70	183	2164	336
Satd. Flow (prot)	0	1756	0	0	1717	0	1770	5055	0	1770	4984	0
Flt Permitted		0.587			0.882		0.078			0.086		
Satd. Flow (perm)	0	1065	0	0	1528	0	145	5055	0	160	4984	0
Satd. Flow (RTOR)		12			54			6			30	
Adj. Flow (vph)	316	70	91	45	80	136	130	1778	76	199	2352	365
Lane Group Flow (vph)	0	477	0	0	261	0	130	1854	0	199	2717	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	51.9	51.9		51.9	51.9		12.1	49.9		18.2	56.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		47.4			47.4		59.1	46.6		59.1	51.5	
Actuated g/C Ratio		0.40			0.40		0.49	0.39		0.49	0.43	
v/c Ratio		1.12			0.41		0.75	0.94		0.81	1.26	
Control Delay		113.6			22.8		47.2	46.5		51.9	152.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		113.6			22.8		47.2	46.5		51.9	152.1	
LOS		F			C		D	D		D	F	
Approach Delay		113.6			22.8			46.6			145.2	
Approach LOS		F			C			D			F	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.26

Intersection Signal Delay: 102.2

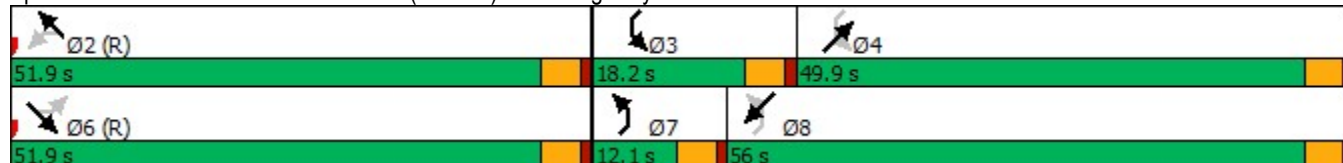
Intersection LOS: F

Intersection Capacity Utilization 109.4%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	430	132	258	188	132	50	212	1778	120	50	2106	448
Future Volume (vph)	430	132	258	188	132	50	212	1778	120	50	2106	448
Satd. Flow (prot)	1770	1678	0	1770	1786	0	1770	5040	0	1770	3539	1583
Flt Permitted	0.544			0.242			0.068			0.063		
Satd. Flow (perm)	1013	1678	0	451	1786	0	127	5040	0	117	3539	1583
Satd. Flow (RTOR)		88			17			13				256
Adj. Flow (vph)	467	143	280	204	143	54	230	1933	130	54	2289	487
Lane Group Flow (vph)	467	423	0	204	197	0	230	2063	0	54	2289	487
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	44.0	44.0		44.0	44.0		14.0	66.4		9.6	62.0	62.0
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)	39.5	39.5		39.5	39.5		67.0	63.5		67.9	57.5	57.5
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.56	0.53		0.57	0.48	0.48
v/c Ratio	1.40	0.69		1.38	0.33		1.15	0.77		0.38	1.35	0.55
Control Delay	231.0	34.2		240.1	29.4		139.7	25.3		34.3	190.3	12.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	231.0	34.2		240.1	29.4		139.7	25.3		34.3	190.3	12.3
LOS	F	C		F	C		F	C		C	F	B
Approach Delay		137.5			136.6			36.8			156.7	
Approach LOS		F			F			D			F	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.40

Intersection Signal Delay: 109.9

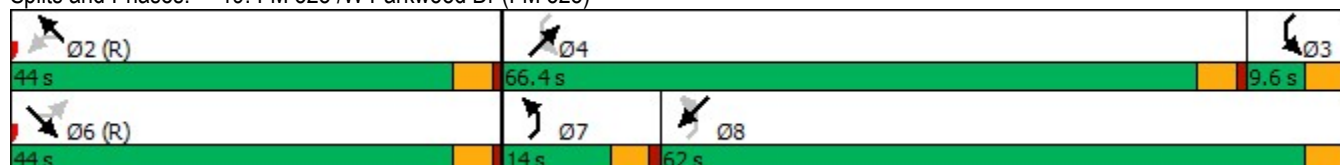
Intersection LOS: F

Intersection Capacity Utilization 118.8%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	199	1968	175	149	2346	15	109	82	148	27	127	214
Future Volume (vph)	199	1968	175	149	2346	15	109	82	148	27	127	214
Satd. Flow (prot)	1770	3497	0	1770	3536	0	0	1811	1583	0	1709	0
Flt Permitted	0.073			0.070				0.283			0.964	
Satd. Flow (perm)	136	3497	0	130	3536	0	0	527	1583	0	1654	0
Satd. Flow (RTOR)		15			1				133		65	
Adj. Flow (vph)	216	2139	190	162	2550	16	118	89	161	29	138	233
Lane Group Flow (vph)	216	2329	0	162	2566	0	0	207	161	0	400	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		
Total Split (s)	14.0	61.3		11.7	59.0		27.0	27.0	27.0	27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	64.0	56.8		64.0	54.5			22.5	22.5		22.5	
Actuated g/C Ratio	0.64	0.57		0.64	0.54			0.22	0.22		0.22	
v/c Ratio	0.89	1.17		0.81	1.33			1.75	0.35		0.95	
Control Delay	60.8	105.1		48.9	176.9			399.2	11.0		65.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	60.8	105.1		48.9	176.9			399.2	11.0		65.9	
LOS	E	F		D	F			F	B		E	
Approach Delay		101.3			169.3			229.4			65.9	
Approach LOS		F			F			F			E	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.75

Intersection Signal Delay: 137.5

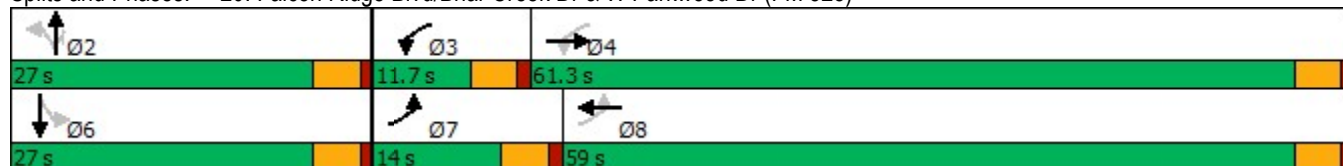
Intersection LOS: F

Intersection Capacity Utilization 123.0%

ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	77	1	8	42	13	128	14	1733	53	206	1916	158
Future Volume (vph)	77	1	8	42	13	128	14	1733	53	206	1916	158
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.444			0.916		0.049			0.061		
Satd. Flow (perm)	0	816	0	0	1546	0	91	3525	0	114	3500	0
Satd. Flow (RTOR)		4			86			4			14	
Adj. Flow (vph)	84	1	9	46	14	139	15	1884	58	224	2083	172
Lane Group Flow (vph)	0	94	0	0	199	0	15	1942	0	224	2255	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	28.0	28.0		28.0	28.0		10.0	70.0		22.0	82.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)		24.6			24.6		84.6	65.5		81.9	82.4	
Actuated g/C Ratio		0.20			0.20		0.70	0.55		0.68	0.69	
v/c Ratio		0.55			0.52		0.11	1.01		0.74	0.94	
Control Delay		55.4			29.5		5.4	42.8		52.3	26.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		55.4			29.5		5.4	42.8		52.3	26.1	
LOS		E			C		A	D		D	C	
Approach Delay		55.4			29.5			42.5			28.5	
Approach LOS		E			C			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 34.9

Intersection LOS: C

Intersection Capacity Utilization 88.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	13	22	2	2	18	7	1653	20	29	1520	222
Future Volume (vph)	186	13	22	2	2	18	7	1653	20	29	1520	222
Satd. Flow (prot)	0	1763	0	0	1646	0	1770	3532	0	1770	3472	0
Flt Permitted		0.743			0.980		0.052			0.052		
Satd. Flow (perm)	0	1365	0	0	1619	0	97	3532	0	97	3472	0
Satd. Flow (RTOR)		4			20			2			23	
Adj. Flow (vph)	202	14	24	2	2	20	8	1797	22	32	1652	241
Lane Group Flow (vph)	0	240	0	0	24	0	8	1819	0	32	1893	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	35.0	35.0		35.0	35.0		10.0	74.8		10.2	75.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		25.0			25.0		85.1	79.9		83.3	84.0	
Actuated g/C Ratio		0.21			0.21		0.71	0.67		0.69	0.70	
v/c Ratio		0.84			0.07		0.05	0.77		0.22	0.78	
Control Delay		68.6			16.3		7.0	19.0		5.3	5.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		68.6			16.3		7.0	19.0		5.3	5.2	
LOS		E			B		A	B		A	A	
Approach Delay		68.6			16.3			18.9			5.2	
Approach LOS		E			B			B			A	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 15.3

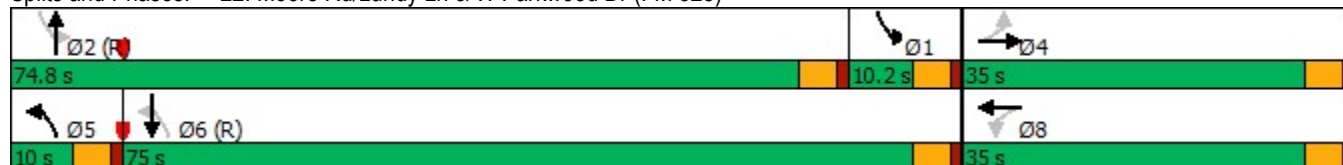
Intersection LOS: B

Intersection Capacity Utilization 75.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	61	95	63	38	138	62	53	493	55	53	740	131
Future Volume (vph)	61	95	63	38	138	62	53	493	55	53	740	131
Satd. Flow (prot)	1770	3327	0	1770	3376	0	1770	3486	0	1770	3458	0
Flt Permitted	0.616			0.644			0.154			0.342		
Satd. Flow (perm)	1147	3327	0	1200	3376	0	287	3486	0	637	3458	0
Satd. Flow (RTOR)		68			61			19			32	
Adj. Flow (vph)	66	103	68	41	150	67	58	536	60	58	804	142
Lane Group Flow (vph)	66	171	0	41	217	0	58	596	0	58	946	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	41.0	41.0		41.0	41.0		79.0	79.0		79.0	79.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	36.7	36.7		36.7	36.7		25.9	25.9		25.9	25.9	
Actuated g/C Ratio	0.51	0.51		0.51	0.51		0.36	0.36		0.36	0.36	
v/c Ratio	0.11	0.10		0.07	0.12		0.56	0.47		0.25	0.74	
Control Delay	11.5	6.7		11.1	7.7		40.9	17.9		18.6	23.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.5	6.7		11.1	7.7		40.9	17.9		18.6	23.1	
LOS	B	A		B	A		D	B		B	C	
Approach Delay		8.0			8.2			20.0			22.8	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 71.6

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 18.6

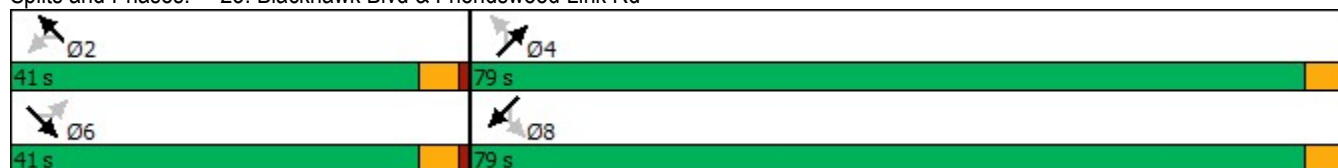
Intersection LOS: B

Intersection Capacity Utilization 53.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	668	7	7	627	66	10	3	9	104	7	53
Future Volume (vph)	22	668	7	7	627	66	10	3	9	104	7	53
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1720	0	0	1726	0
Flt Permitted	0.229			0.267				0.889			0.794	
Satd. Flow (perm)	427	1859	0	497	1837	0	0	1563	0	0	1414	0
Satd. Flow (RTOR)		1			10			10			33	
Adj. Flow (vph)	24	726	8	8	682	72	11	3	10	113	8	58
Lane Group Flow (vph)	24	734	0	8	754	0	0	24	0	0	179	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	47.6	46.6		46.6	44.5			12.5			12.5	
Actuated g/C Ratio	0.68	0.67		0.67	0.64			0.18			0.18	
v/c Ratio	0.06	0.59		0.02	0.64			0.08			0.64	
Control Delay	5.0	11.9		6.7	12.8			16.3			31.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.0	11.9		6.7	12.8			16.3			31.4	
LOS	A	B		A	B			B			C	
Approach Delay		11.7			12.8			16.3			31.4	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 14.3

Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	583	179	32	547	4	159	7	40	6	3	6
Future Volume (vph)	9	583	179	32	547	4	159	7	40	6	3	6
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1723	0
Flt Permitted	0.338			0.159				0.764			0.889	
Satd. Flow (perm)	630	1798	0	296	1861	0	0	1386	0	0	1563	0
Satd. Flow (RTOR)		30			1			16			7	
Adj. Flow (vph)	10	634	195	35	595	4	173	8	43	7	3	7
Lane Group Flow (vph)	10	829	0	35	599	0	0	224	0	0	17	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	37.8		9.6	37.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	44.4	42.4		45.3	44.3			14.8			14.8	
Actuated g/C Ratio	0.63	0.61		0.65	0.63			0.21			0.21	
v/c Ratio	0.02	0.75		0.11	0.51			0.73			0.05	
Control Delay	7.4	17.9		8.2	15.2			38.1			16.1	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.4	17.9		8.2	15.2			38.1			16.1	
LOS	A	B		A	B			D			B	
Approach Delay		17.8			14.8			38.1			16.1	
Approach LOS		B			B			D			B	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.6 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 19.3

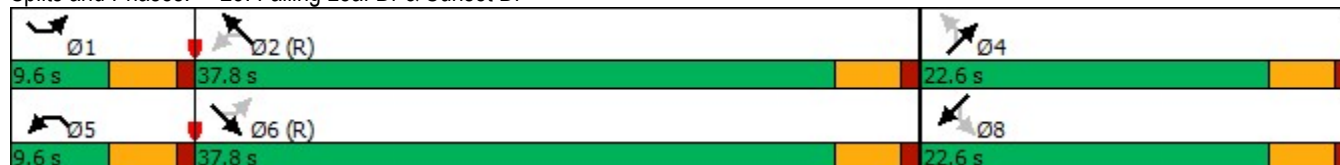
Intersection LOS: B

Intersection Capacity Utilization 67.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	23	504	77	46	482	52	70	75	66	74	128	33
Future Volume (vph)	23	504	77	46	482	52	70	75	66	74	128	33
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1800	0
Flt Permitted	0.340			0.273				0.665			0.821	
Satd. Flow (perm)	633	1825	0	509	1835	0	0	1239	1583	0	1500	0
Satd. Flow (RTOR)		15			11				94		11	
Adj. Flow (vph)	25	548	84	50	524	57	76	82	72	80	139	36
Lane Group Flow (vph)	25	632	0	50	581	0	0	158	72	0	255	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.5	37.5		9.5	37.5		23.0	23.0	23.0	23.0	23.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	42.9	39.8		43.9	41.9			15.3	15.3		15.3	
Actuated g/C Ratio	0.61	0.57		0.63	0.60			0.22	0.22		0.22	
v/c Ratio	0.05	0.61		0.12	0.53			0.59	0.17		0.76	
Control Delay	7.7	20.9		6.1	12.5			32.9	4.4		39.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	7.7	20.9		6.1	12.5			32.9	4.4		39.0	
LOS	A	C		A	B			C	A		D	
Approach Delay		20.4			12.0			24.0			39.0	
Approach LOS		C			B			C			D	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 9.5 (14%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 20.5

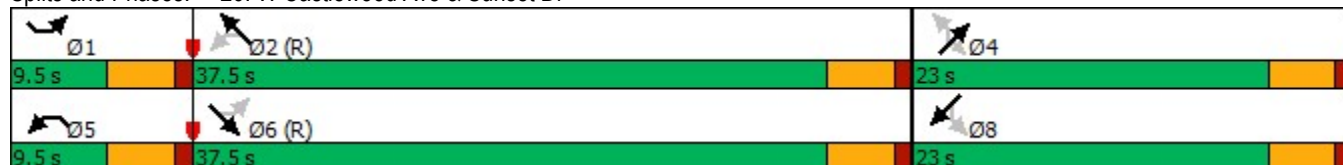
Intersection LOS: C

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	56	245	23	35	186	64	9	67	17	67	107	65
Future Volume (Veh/h)	56	245	23	35	186	64	9	67	17	67	107	65
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	266	25	38	202	70	10	73	18	73	116	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	272			291			842	748	278	768	726	237
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	272			291			842	748	278	768	726	237
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			97			94	77	98	70	64	91
cM capacity (veh/h)	1291			1271			177	315	760	241	324	802
Direction, Lane #	SE 1	NW 1	NE 1	SW 1								
Volume Total	352	310	101	260								
Volume Left	61	38	10	73								
Volume Right	25	70	18	71								
cSH	1291	1271	324	347								
Volume to Capacity	0.05	0.03	0.31	0.75								
Queue Length 95th (ft)	4	2	33	146								
Control Delay (s)	1.7	1.2	21.1	40.6								
Lane LOS	A	A	C	E								
Approach Delay (s)	1.7	1.2	21.1	40.6								
Approach LOS			C	E								
Intersection Summary												
Average Delay			13.4									
Intersection Capacity Utilization			52.7%		ICU Level of Service				A			
Analysis Period (min)			15									

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	300	29	105	234	30	84
Future Volume (Veh/h)	300	29	105	234	30	84
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	326	32	114	254	33	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			358		824	342
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			358		824	342
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			91		89	87
cM capacity (veh/h)			1201		310	701
Direction, Lane #	SE 1	NW 1	NE 1			
Volume Total	358	368	124			
Volume Left	0	114	33			
Volume Right	32	0	91			
cSH	1700	1201	525			
Volume to Capacity	0.21	0.09	0.24			
Queue Length 95th (ft)	0	8	23			
Control Delay (s)	0.0	3.2	14.0			
Lane LOS		A	B			
Approach Delay (s)	0.0	3.2	14.0			
Approach LOS			B			
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			52.5%	ICU Level of Service		A
Analysis Period (min)			15			

						
Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Volume (veh/h)	95	288	235	20	21	101
Future Volume (Veh/h)	95	288	235	20	21	101
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	313	255	22	23	110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	277				785	266
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	277				785	266
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				93	86
cM capacity (veh/h)	1286				332	773
Direction, Lane #	SE 1	NW 1	SW 1			
Volume Total	416	277	133			
Volume Left	103	0	23			
Volume Right	0	22	110			
cSH	1286	1700	629			
Volume to Capacity	0.08	0.16	0.21			
Queue Length 95th (ft)	7	0	20			
Control Delay (s)	2.6	0.0	12.3			
Lane LOS	A		B			
Approach Delay (s)	2.6	0.0	12.3			
Approach LOS			B			
Intersection Summary						
Average Delay			3.3			
Intersection Capacity Utilization		51.4%		ICU Level of Service		A
Analysis Period (min)			15			

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	39	53	29	21	93	29	35	207	14	34	227	30
Future Volume (vph)	39	53	29	21	93	29	35	207	14	34	227	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	58	32	23	101	32	38	225	15	37	247	33
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	132	156	278	317								
Volume Left (vph)	42	23	38	37								
Volume Right (vph)	32	32	15	33								
Hadj (s)	-0.05	-0.06	0.03	-0.01								
Departure Headway (s)	5.7	5.7	5.3	5.2								
Degree Utilization, x	0.21	0.25	0.41	0.46								
Capacity (veh/h)	553	564	635	658								
Control Delay (s)	10.2	10.5	11.8	12.4								
Approach Delay (s)	10.2	10.5	11.8	12.4								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay				11.6								
Level of Service				B								
Intersection Capacity Utilization				39.5%	ICU Level of Service				A			
Analysis Period (min)				15								

Appendix H

“Year 2040 Build” Conditions Analysis

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	12	154	55	8	830	13	108	0	32	18	1	20
Future Volume (vph)	12	154	55	8	830	13	108	0	32	18	1	20
Satd. Flow (prot)	1770	3398	0	1770	3532	0	0	1738	0	0	1694	0
Flt Permitted	0.193			0.610				0.769			0.882	
Satd. Flow (perm)	360	3398	0	1136	3532	0	0	1388	0	0	1530	0
Satd. Flow (RTOR)		60			3			191			22	
Adj. Flow (vph)	13	167	60	9	902	14	117	0	35	20	1	22
Lane Group Flow (vph)	13	227	0	9	916	0	0	152	0	0	43	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	27.0		9.6	27.0		23.4	23.4		23.4	23.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	26.0	20.7		21.7	20.7			28.4			28.4	
Actuated g/C Ratio	0.43	0.34		0.36	0.34			0.47			0.47	
v/c Ratio	0.05	0.19		0.02	0.75			0.20			0.06	
Control Delay	7.8	9.9		9.1	21.6			2.4			8.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	7.8	9.9		9.1	21.6			2.4			8.0	
LOS	A	A		A	C			A			A	
Approach Delay		9.8			21.5			2.4			8.0	
Approach LOS		A			C			A			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 16.8

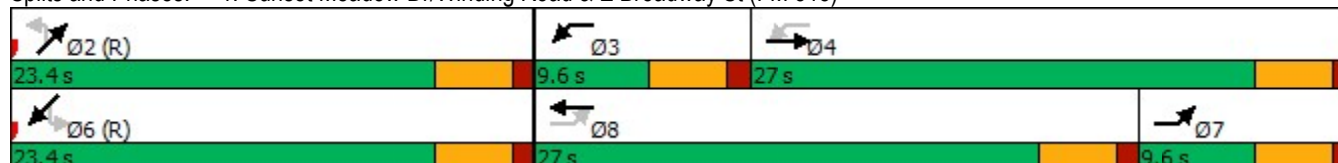
Intersection LOS: B

Intersection Capacity Utilization 43.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	226	742	109	104	465	163	132	466	80	214	395	214
Future Volume (vph)	226	742	109	104	465	163	132	466	80	214	395	214
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			205			205			143			233
Adj. Flow (vph)	246	807	118	113	505	177	143	507	87	233	429	233
Lane Group Flow (vph)	246	807	118	113	505	177	143	507	87	233	429	233
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	17.0	27.8	27.8	12.7	23.5	23.5	14.0	22.5	22.5	17.0	25.5	25.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	13.3	27.7	27.7	8.2	20.4	20.4	12.3	16.1	16.1	12.3	16.0	16.0
Actuated g/C Ratio	0.17	0.35	0.35	0.10	0.26	0.26	0.15	0.20	0.20	0.15	0.20	0.20
v/c Ratio	0.84	0.66	0.17	0.62	0.56	0.32	0.53	0.71	0.20	0.86	0.61	0.46
Control Delay	59.4	27.1	0.8	51.1	29.3	4.4	40.4	35.6	2.4	63.3	32.3	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.4	27.1	0.8	51.1	29.3	4.4	40.4	35.6	2.4	63.3	32.3	6.9
LOS	E	C	A	D	C	A	D	D	A	E	C	A
Approach Delay		31.2			26.9			32.6			33.8	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 31.2

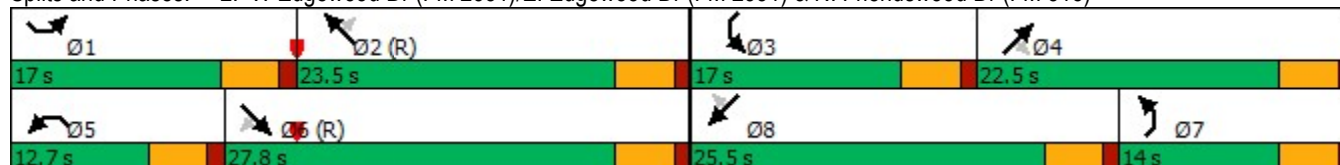
Intersection LOS: C

Intersection Capacity Utilization 66.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	4	695	34	29	786	8	40	2	44	10	13	4
Future Volume (vph)	4	695	34	29	786	8	40	2	44	10	13	4
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1693	0	0	1793	0
Flt Permitted	0.307			0.345				0.838			0.897	
Satd. Flow (perm)	572	3539	1583	643	3539	1583	0	1452	0	0	1639	0
Satd. Flow (RTOR)			119			119		48			4	
Adj. Flow (vph)	4	755	37	32	854	9	43	2	48	11	14	4
Lane Group Flow (vph)	4	755	37	32	854	9	0	93	0	0	29	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2		6	6		2	4			8		
Total Split (s)	9.5	23.0	23.0	9.5	23.0	23.0	22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	
Act Effect Green (s)	39.7	37.2	37.2	38.8	39.4	39.4		7.4			7.4	
Actuated g/C Ratio	0.72	0.68	0.68	0.71	0.72	0.72		0.13			0.13	
v/c Ratio	0.01	0.32	0.03	0.06	0.34	0.01		0.39			0.13	
Control Delay	3.2	6.8	0.1	2.2	2.3	0.0		17.0			19.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	3.2	6.8	0.1	2.2	2.3	0.0		17.0			19.0	
LOS	A	A	A	A	A	A		B			B	
Approach Delay		6.5			2.3			17.0			19.0	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 5.2

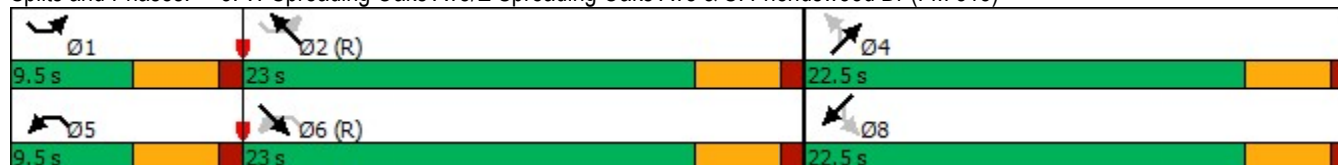
Intersection LOS: A

Intersection Capacity Utilization 38.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	17	704	39	74	747	17	57	4	69	17	5	17
Future Volume (vph)	17	704	39	74	747	17	57	4	69	17	5	17
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1691	0	0	1716	0
Flt Permitted	0.321			0.329				0.839			0.847	
Satd. Flow (perm)	598	3539	1583	613	3539	1583	0	1450	0	0	1485	0
Satd. Flow (RTOR)			119			119		75			18	
Adj. Flow (vph)	18	765	42	80	812	18	62	4	75	18	5	18
Lane Group Flow (vph)	18	765	42	80	812	18	0	141	0	0	41	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2		6	6		2	4			8		
Total Split (s)	9.5	23.0	23.0	9.5	23.0	23.0	22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	
Act Effect Green (s)	38.8	33.7	33.7	37.0	38.4	38.4		8.3			8.3	
Actuated g/C Ratio	0.71	0.61	0.61	0.67	0.70	0.70		0.15			0.15	
v/c Ratio	0.03	0.35	0.04	0.15	0.33	0.02		0.50			0.17	
Control Delay	2.1	4.1	0.2	4.4	6.2	0.0		17.0			14.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	2.1	4.1	0.2	4.4	6.2	0.0		17.0			14.5	
LOS	A	A	A	A	A	A		B			B	
Approach Delay		3.9			5.9			17.0			14.5	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 55

Actuated Cycle Length: 55

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 6.0

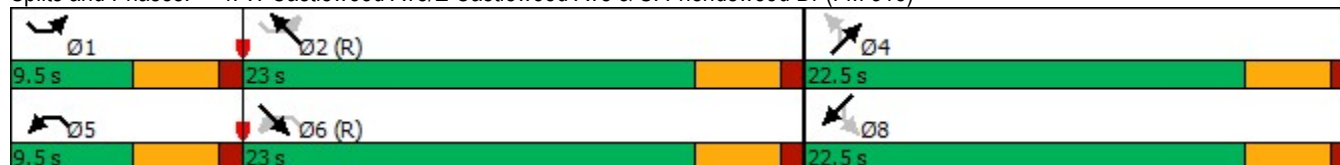
Intersection LOS: A

Intersection Capacity Utilization 45.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	8	2	137	1	142	15	854	137	96	721	6
Future Volume (vph)	0	8	2	137	1	142	15	854	137	96	721	6
Satd. Flow (prot)	0	1816	0	0	1775	1583	1770	3539	1583	1770	3536	0
Flt Permitted					0.720		0.352			0.234		
Satd. Flow (perm)	0	1816	0	0	1341	1583	656	3539	1583	436	3536	0
Satd. Flow (RTOR)		2				154			149		2	
Adj. Flow (vph)	0	9	2	149	1	154	16	928	149	104	784	7
Lane Group Flow (vph)	0	11	0	0	150	154	16	928	149	104	791	0
Turn Type		NA		Perm	NA	Perm	Perm	NA	Perm	D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	2		
Total Split (s)	22.5	22.5		22.5	22.5	22.5	27.5	27.5	27.5	10.0	37.5	
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effect Green (s)		11.9			11.9	11.9	30.1	30.1	30.1	35.5	39.1	
Actuated g/C Ratio		0.20			0.20	0.20	0.50	0.50	0.50	0.59	0.65	
v/c Ratio		0.03			0.56	0.35	0.05	0.52	0.17	0.26	0.34	
Control Delay		15.6			29.2	6.1	11.7	13.3	3.2	6.9	5.8	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		15.6			29.2	6.1	11.7	13.3	3.2	6.9	5.8	
LOS		B			C	A	B	B	A	A	A	
Approach Delay		15.6			17.5			11.9			5.9	
Approach LOS		B			B			B			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 10.3

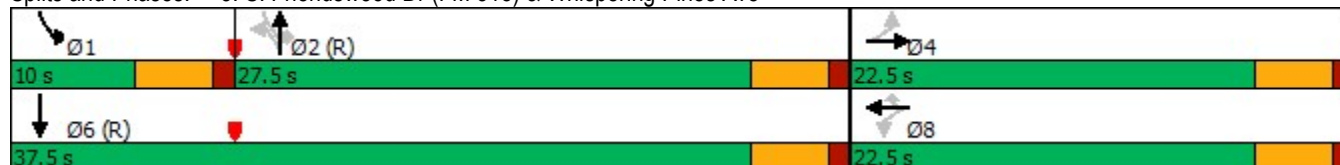
Intersection LOS: B

Intersection Capacity Utilization 54.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	43	606	15	186	657	20	25	38	27	8	25	186
Future Volume (vph)	43	606	15	186	657	20	25	38	27	8	25	186
Satd. Flow (prot)	1770	3525	0	1770	3525	0	0	3333	0	0	3084	0
Flt Permitted	0.950			0.950				0.809			0.941	
Satd. Flow (perm)	1770	3525	0	1770	3525	0	0	2734	0	0	2907	0
Satd. Flow (RTOR)		4			6			29			202	
Adj. Flow (vph)	47	659	16	202	714	22	27	41	29	9	27	202
Lane Group Flow (vph)	47	675	0	202	736	0	0	97	0	0	238	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		
Total Split (s)	9.6	26.5		16.0	32.9		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	7.2	31.7		12.6	41.2			7.2			7.2	
Actuated g/C Ratio	0.11	0.49		0.19	0.63			0.11			0.11	
v/c Ratio	0.24	0.39		0.59	0.33			0.30			0.48	
Control Delay	28.7	12.4		30.4	7.5			21.8			10.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.7	12.4		30.4	7.5			21.8			10.0	
LOS	C	B		C	A			C			A	
Approach Delay		13.5			12.4			21.8			10.0	
Approach LOS		B			B			C			A	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 13.0

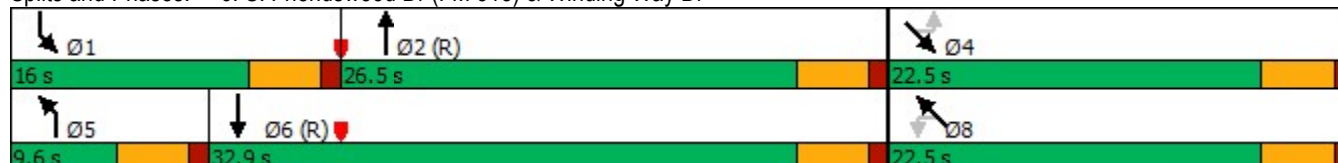
Intersection LOS: B

Intersection Capacity Utilization 53.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	410	593	295	137	412	244	235	1203	311	157	604	54
Future Volume (vph)	410	593	295	137	412	244	235	1203	311	157	604	54
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.419			0.282			0.319			0.195		
Satd. Flow (perm)	1514	3539	1583	1019	3539	1583	594	5085	1583	363	5085	1583
Satd. Flow (RTOR)			295			265			338			234
Adj. Flow (vph)	446	645	321	149	448	265	255	1308	338	171	657	59
Lane Group Flow (vph)	446	645	321	149	448	265	255	1308	338	171	657	59
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	6		2	2		6	8		4	4		8
Total Split (s)	10.2	25.3	25.3	9.5	24.6	24.6	12.0	25.0	25.0	10.2	23.2	23.2
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	25.8	22.7	22.7	26.7	20.1	20.1	26.2	20.5	20.5	26.2	18.7	18.7
Actuated g/C Ratio	0.37	0.32	0.32	0.38	0.29	0.29	0.37	0.29	0.29	0.37	0.27	0.27
v/c Ratio	0.62	0.56	0.45	0.27	0.44	0.41	0.73	0.88	0.48	0.68	0.48	0.10
Control Delay	18.4	22.6	5.8	15.2	22.0	5.1	28.9	32.1	5.1	37.6	23.0	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	22.6	5.8	15.2	22.0	5.1	28.9	32.1	5.1	37.6	23.0	0.3
LOS	B	C	A	B	C	A	C	C	A	D	C	A
Approach Delay		17.5			15.6			26.9			24.3	
Approach LOS		B			B			C			C	

Intersection Summary

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 21.9

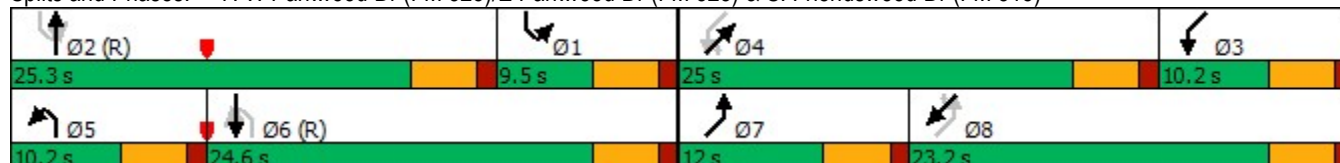
Intersection LOS: C

Intersection Capacity Utilization 70.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations		 	 			
Traffic Volume (vph)	27	1924	1153	89	266	57
Future Volume (vph)	27	1924	1153	89	266	57
Satd. Flow (prot)	1770	3539	3500	0	1770	1583
Flt Permitted	0.168				0.950	
Satd. Flow (perm)	313	3539	3500	0	1550	1583
Satd. Flow (RTOR)			21			62
Adj. Flow (vph)	29	2091	1253	97	289	62
Lane Group Flow (vph)	29	2091	1350	0	289	62
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.6	77.0	67.4		13.0	13.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	70.7	72.5	68.7		8.5	8.5
Actuated g/C Ratio	0.79	0.81	0.76		0.09	0.09
v/c Ratio	0.09	0.73	0.50		1.73	0.30
Control Delay	2.4	6.1	5.4		380.9	14.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	2.4	6.1	5.4		380.9	14.8
LOS	A	A	A		F	B
Approach Delay		6.0	5.4		316.2	
Approach LOS		A	A		F	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.73

Intersection Signal Delay: 34.3

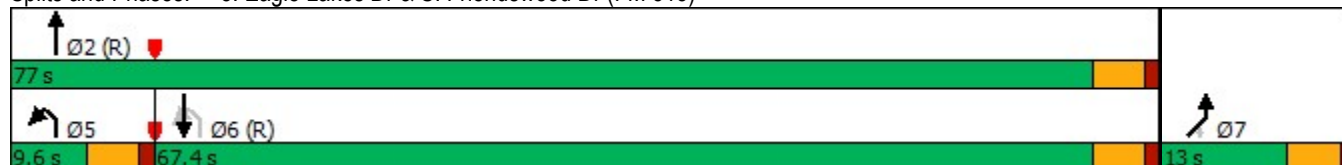
Intersection LOS: C

Intersection Capacity Utilization 75.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	59	672	158	97	1106	13	294	21	142	13	23	219
Future Volume (vph)	59	672	158	97	1106	13	294	21	142	13	23	219
Satd. Flow (prot)	1770	3437	0	1770	3532	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.139			0.238			0.950			0.950		
Satd. Flow (perm)	259	3437	0	443	3532	0	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)		36			1				154			157
Adj. Flow (vph)	64	730	172	105	1202	14	320	23	154	14	25	238
Lane Group Flow (vph)	64	902	0	105	1216	0	320	23	154	14	25	238
Turn Type	D.P+P	NA		D.P+P	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6					4			8
Total Split (s)	14.2	58.0		12.4	56.2		17.0	30.1	30.1	9.5	22.6	22.6
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	68.7	60.3		67.8	62.9		12.5	24.9	24.9	5.0	11.7	11.7
Actuated g/C Ratio	0.62	0.55		0.62	0.57		0.11	0.23	0.23	0.05	0.11	0.11
v/c Ratio	0.25	0.47		0.29	0.60		1.59	0.05	0.32	0.17	0.13	0.77
Control Delay	10.4	16.4		12.7	23.8		321.9	33.7	7.6	55.7	43.1	33.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.4	16.4		12.7	23.8		321.9	33.7	7.6	55.7	43.1	33.7
LOS	B	B		B	C		F	C	A	E	D	C
Approach Delay		16.0			22.9			211.2			35.7	
Approach LOS		B			C			F			D	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.59

Intersection Signal Delay: 52.5

Intersection LOS: D

Intersection Capacity Utilization 72.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	415	890	96	109	779	424	159	443	263	222	103	152
Future Volume (vph)	415	890	96	109	779	424	159	443	263	222	103	152
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.138			0.176			0.681			0.239		
Satd. Flow (perm)	257	3539	1583	328	3539	1583	1269	3539	1583	445	3539	1583
Satd. Flow (RTOR)			136			314			205			165
Adj. Flow (vph)	451	967	104	118	847	461	173	482	286	241	112	165
Lane Group Flow (vph)	451	967	104	118	847	461	173	482	286	241	112	165
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6		2	2		6
Total Split (s)	21.7	53.1	53.1	18.8	50.2	50.2	15.2	25.5	25.5	22.6	32.9	32.9
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	62.9	53.6	53.6	62.9	38.2	38.2	39.1	22.9	22.9	39.1	28.7	28.7
Actuated g/C Ratio	0.52	0.45	0.45	0.52	0.32	0.32	0.33	0.19	0.19	0.33	0.24	0.24
v/c Ratio	1.01	0.61	0.13	0.42	0.75	0.64	0.38	0.72	0.61	0.75	0.13	0.33
Control Delay	87.5	27.6	1.9	17.2	40.8	14.2	30.1	52.8	20.0	43.5	36.6	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	87.5	27.6	1.9	17.2	40.8	14.2	30.1	52.8	20.0	43.5	36.6	7.4
LOS	F	C	A	B	D	B	C	D	B	D	D	A
Approach Delay		43.6			30.2			38.6			30.5	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 36.7

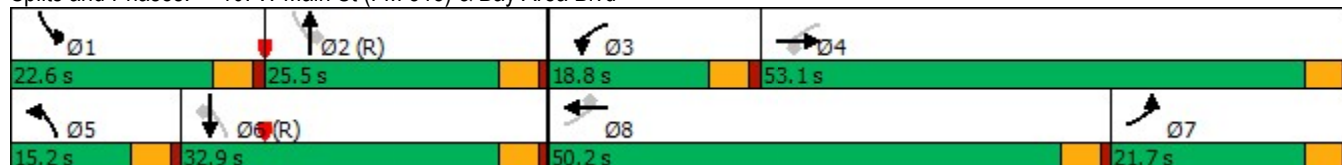
Intersection LOS: D

Intersection Capacity Utilization 84.1%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	32	215	99	34	335	68	148	1746	52	71	854	114
Future Volume (vph)	32	215	99	34	335	68	148	1746	52	71	854	114
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			126			126			126			124
Adj. Flow (vph)	35	234	108	37	364	74	161	1898	57	77	928	124
Lane Group Flow (vph)	35	234	108	37	364	74	161	1898	57	77	928	124
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	22.5	22.5	22.5	23.5	23.5	23.5	16.0	61.8	61.8	22.2	68.0	68.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	13.1	13.1	13.1	19.1	19.1	19.1	11.6	57.7	57.7	10.4	54.0	54.0
Actuated g/C Ratio	0.11	0.11	0.11	0.16	0.16	0.16	0.10	0.50	0.50	0.09	0.47	0.47
v/c Ratio	0.17	0.58	0.37	0.13	0.62	0.20	0.91	1.08	0.07	0.49	0.56	0.15
Control Delay	50.2	55.9	9.6	46.1	51.9	2.1	102.1	75.7	0.2	62.3	24.0	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	55.9	9.6	46.1	51.9	2.1	102.1	75.7	0.2	62.3	24.0	3.6
LOS	D	E	A	D	D	A	F	E	A	E	C	A
Approach Delay		42.1			43.7			75.7			24.4	
Approach LOS		D			D			E			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 116

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 54.7

Intersection LOS: D

Intersection Capacity Utilization 80.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351

 Ø2	 Ø6	 Ø3	 Ø4
23.5 s	22.5 s	22.2 s	61.8 s
		 Ø7	 Ø8
		16 s	68 s

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1531	43	95	881	119	171
Future Volume (vph)	1531	43	95	881	119	171
Satd. Flow (prot)	3525	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3525	0	1770	3539	3433	1583
Satd. Flow (RTOR)	5					161
Adj. Flow (vph)	1664	47	103	958	129	186
Lane Group Flow (vph)	1711	0	103	958	129	186
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	45.0		11.0	56.0	24.0	24.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	40.7		6.5	49.5	21.5	21.5
Actuated g/C Ratio	0.51		0.08	0.62	0.27	0.27
v/c Ratio	0.95		0.72	0.44	0.14	0.34
Control Delay	32.5		65.1	8.5	24.0	8.1
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	32.5		65.1	8.5	24.0	8.1
LOS	C		E	A	C	A
Approach Delay	32.5			13.9	14.6	
Approach LOS	C			B	B	
Queue Length 50th (ft)	406		51	107	26	10
Queue Length 95th (ft)	#588		#129	143	47	59
Internal Link Dist (ft)	687			427	507	
Turn Bay Length (ft)			200		100	
Base Capacity (vph)	1797		143	2278	920	542
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.95		0.72	0.42	0.14	0.34

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 24.3

Intersection LOS: C

Intersection Capacity Utilization 64.4%

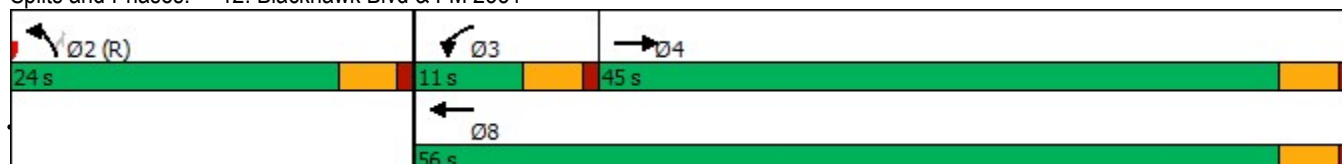
ICU Level of Service C

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	173	0	147	0	0	0	62	1394	0	0	984	60
Future Volume (vph)	173	0	147	0	0	0	62	1394	0	0	984	60
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3507	0
Flt Permitted		0.757					0.147					
Satd. Flow (perm)	0	1410	1583	0	1863	0	274	3539	0	1863	3507	0
Satd. Flow (RTOR)			160								11	
Adj. Flow (vph)	188	0	160	0	0	0	67	1515	0	0	1070	65
Lane Group Flow (vph)	0	188	160	0	0	0	67	1515	0	0	1135	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	24.0	24.0		24.0	24.0		9.8	56.5		9.5	56.2	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		19.9	67.1				35.6	38.1			32.7	
Actuated g/C Ratio		0.30	1.00				0.53	0.57			0.49	
v/c Ratio		0.45	0.10				0.25	0.75			0.66	
Control Delay		26.3	0.1				8.4	13.3			15.6	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		26.3	0.1				8.4	13.3			15.6	
LOS		C	A				A	B			B	
Approach Delay		14.3						13.1			15.6	
Approach LOS		B						B			B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 67.1

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 14.2

Intersection LOS: B

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
24 s	9.5 s	56.5 s
 Ø6	 Ø7	 Ø8
24 s	9.8 s	56.2 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	136	6	288	2	1	1	101	1341	2	17	1060	39
Future Volume (vph)	136	6	288	2	1	1	101	1341	2	17	1060	39
Satd. Flow (prot)	1770	1589	0	0	1756	0	1770	3539	0	1770	3522	0
Flt Permitted	0.755				0.893		0.135			0.097		
Satd. Flow (perm)	1406	1589	0	0	1607	0	251	3539	0	181	3522	0
Satd. Flow (RTOR)		164			1						7	
Adj. Flow (vph)	148	7	313	2	1	1	110	1458	2	18	1152	42
Lane Group Flow (vph)	148	320	0	0	4	0	110	1460	0	18	1194	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		11.6	57.0		9.6	55.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	19.6	19.6			19.6		41.0	41.2		42.9	35.7	
Actuated g/C Ratio	0.27	0.27			0.27		0.56	0.56		0.59	0.49	
v/c Ratio	0.39	0.59			0.01		0.39	0.73		0.08	0.69	
Control Delay	30.6	19.0			24.5		9.6	14.7		5.6	16.9	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	30.6	19.0			24.5		9.6	14.7		5.6	16.9	
LOS	C	B			C		A	B		A	B	
Approach Delay		22.7			24.5			14.3			16.7	
Approach LOS		C			C			B			B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 73.3

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 16.4

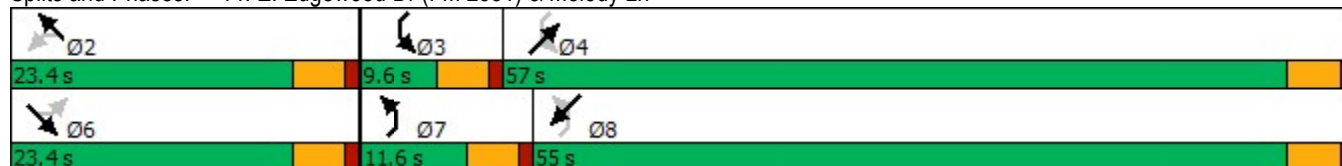
Intersection LOS: B

Intersection Capacity Utilization 70.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	34	39	66	110	9	374	28	450	118	377	319	24
Future Volume (vph)	34	39	66	110	9	374	28	450	118	377	319	24
Satd. Flow (prot)	0	1723	0	0	1781	1583	1770	3429	0	1770	3539	1583
Flt Permitted		0.909			0.632		0.544			0.399		
Satd. Flow (perm)	0	1585	0	0	1177	1583	1013	3429	0	743	3539	1583
Satd. Flow (RTOR)		41				407		82				26
Adj. Flow (vph)	37	42	72	120	10	407	30	489	128	410	347	26
Lane Group Flow (vph)	0	151	0	0	130	407	30	617	0	410	347	26
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	24.0	24.0		24.0	24.0		76.0	76.0		76.0	76.0	76.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)		20.7			20.7	75.4	45.1	45.1		45.1	45.1	45.1
Actuated g/C Ratio		0.27			0.27	1.00	0.60	0.60		0.60	0.60	0.60
v/c Ratio		0.32			0.40	0.26	0.05	0.30		0.92	0.16	0.03
Control Delay		23.8			34.0	0.4	5.0	5.8		40.7	6.0	1.8
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		23.8			34.0	0.4	5.0	5.8		40.7	6.0	1.8
LOS		C			C	A	A	A		D	A	A
Approach Delay		23.8			8.5			5.8			24.0	
Approach LOS		C			A			A			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 75.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 14.5

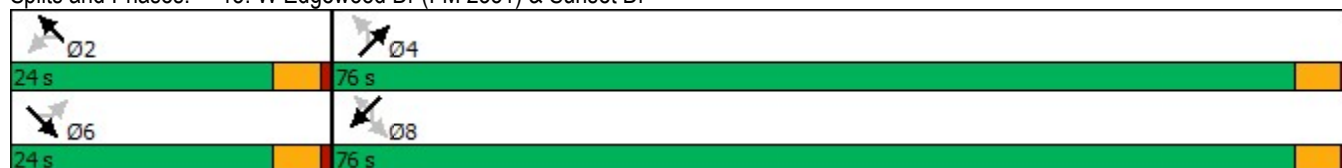
Intersection LOS: B

Intersection Capacity Utilization 63.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	459	2250	121	141	967	96	278	693	437	150	206	264
Future Volume (vph)	459	2250	121	141	967	96	278	693	437	150	206	264
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	1770	5085	1583	1770	5085	1583
Satd. Flow (RTOR)			136			177			136			287
Adj. Flow (vph)	499	2446	132	153	1051	104	302	753	475	163	224	287
Lane Group Flow (vph)	499	2446	132	153	1051	104	302	753	475	163	224	287
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Total Split (s)	29.8	60.4	60.4	10.6	41.2	41.2	25.0	32.8	32.8	16.2	24.0	24.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	22.0	55.9	55.9	6.1	40.0	40.0	20.5	28.3	28.3	11.7	19.5	19.5
Actuated g/C Ratio	0.18	0.47	0.47	0.05	0.33	0.33	0.17	0.24	0.24	0.10	0.16	0.16
v/c Ratio	0.79	1.03	0.16	0.88	0.62	0.16	1.00	0.63	1.00	0.95	0.27	0.58
Control Delay	56.4	59.6	3.3	99.2	36.1	0.5	101.9	43.9	73.4	110.4	45.0	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.4	59.6	3.3	99.2	36.1	0.5	101.9	43.9	73.4	110.4	45.0	10.2
LOS	E	E	A	F	D	A	F	D	E	F	D	B
Approach Delay		56.7			40.6			64.5			46.0	
Approach LOS		E			D			E			D	
Queue Length 50th (ft)	191	~745	0	61	251	0	237	192	280	128	56	0
Queue Length 95th (ft)	244	#837	32	#125	312	0	#422	238	#506	#264	82	80
Internal Link Dist (ft)		2394			1837			501			792	
Turn Bay Length (ft)	450		150	500		150	200		200	200		400
Base Capacity (vph)	723	2368	810	174	1694	645	302	1199	477	172	826	497
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	1.03	0.16	0.88	0.62	0.16	1.00	0.63	1.00	0.95	0.27	0.58

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 54.2

Intersection LOS: D

Intersection Capacity Utilization 90.1%

ICU Level of Service E

Analysis Period (min) 15

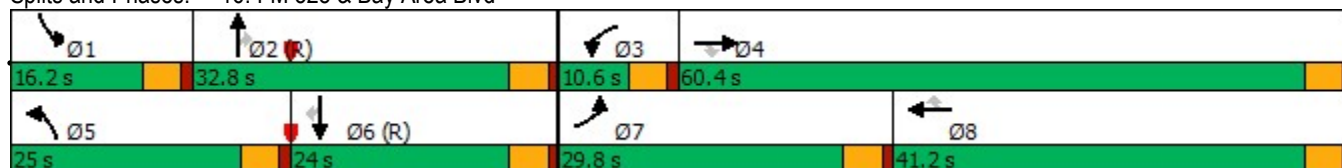
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 16: FM 528 & Bay Area Blvd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			  			 			 	
Traffic Volume (vph)	71	2461	0	0	1245	199	0	0	0	327	0	117
Future Volume (vph)	71	2461	0	0	1245	199	0	0	0	327	0	117
Satd. Flow (prot)	1770	5085	0	1863	4979	0	1863	3539	0	1770	3008	0
Flt Permitted	0.117									0.757		
Satd. Flow (perm)	218	5085	0	1863	4979	0	1863	3539	0	1410	3008	0
Satd. Flow (RTOR)					53						157	
Adj. Flow (vph)	77	2675	0	0	1353	216	0	0	0	355	0	127
Lane Group Flow (vph)	77	2675	0	0	1569	0	0	0	0	355	127	0
Turn Type	D.P+P	NA		Perm	NA		Perm			Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	8			8			2			6		
Total Split (s)	11.2	75.2		64.0	64.0		22.5	22.5		24.8	24.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	66.5	70.1			61.2					20.9	20.9	
Actuated g/C Ratio	0.66	0.70			0.61					0.21	0.21	
v/c Ratio	0.32	0.75			0.51					1.21	0.17	
Control Delay	8.1	11.1			11.5					157.0	3.6	
Queue Delay	0.0	0.0			0.0					0.0	0.0	
Total Delay	8.1	11.1			11.5					157.0	3.6	
LOS	A	B			B					F	A	
Approach Delay		11.0			11.5						116.6	
Approach LOS		B			B						F	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 21.8

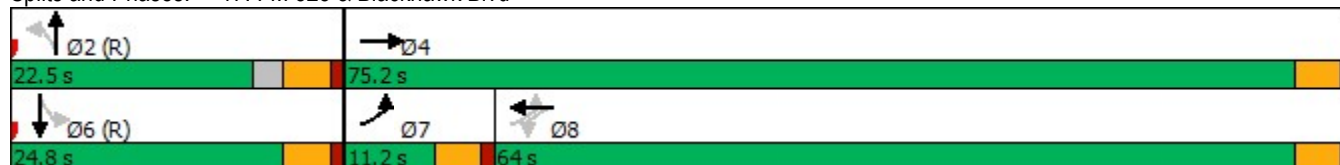
Intersection LOS: C

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	285	33	54	45	84	204	77	2110	41	64	995	206
Future Volume (vph)	285	33	54	45	84	204	77	2110	41	64	995	206
Satd. Flow (prot)	0	3333	0	0	3191	0	1770	5070	0	1770	5085	1583
Flt Permitted		0.616			0.841		0.216			0.106		
Satd. Flow (perm)	0	2132	0	0	2703	0	402	5070	0	197	5085	1583
Satd. Flow (RTOR)		25			142			5				224
Adj. Flow (vph)	310	36	59	49	91	222	84	2293	45	70	1082	224
Lane Group Flow (vph)	0	405	0	0	362	0	84	2338	0	70	1082	224
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	23.5	23.5		23.5	23.5		9.5	38.1		13.4	42.0	42.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		19.0			19.0		43.4	37.9		43.4	39.4	39.4
Actuated g/C Ratio		0.25			0.25		0.58	0.51		0.58	0.53	0.53
v/c Ratio		1.29dl			0.46		0.26	0.91		0.28	0.41	0.24
Control Delay		32.9			16.2		7.7	25.5		8.6	11.8	2.3
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		32.9			16.2		7.7	25.5		8.6	11.8	2.3
LOS		C			B		A	C		A	B	A
Approach Delay		32.9			16.2			24.9			10.1	
Approach LOS		C			B			C			B	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 20.5

Intersection LOS: C

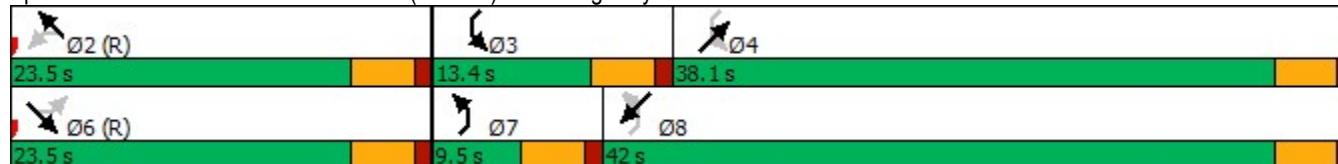
Intersection Capacity Utilization 86.8%

ICU Level of Service E

Analysis Period (min) 15

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations								  			  	
Traffic Volume (vph)	524	67	129	30	41	22	191	1976	41	21	1227	520
Future Volume (vph)	524	67	129	30	41	22	191	1976	41	21	1227	520
Satd. Flow (prot)	1681	1704	1583	1770	1766	0	1770	5085	1583	1770	5085	1583
Flt Permitted	0.712	0.729		0.397			0.099			0.069		
Satd. Flow (perm)	1260	1290	1583	740	1766	0	184	5085	1583	129	5085	1583
Satd. Flow (RTOR)			140		24				55			565
Adj. Flow (vph)	570	73	140	33	45	24	208	2148	45	23	1334	565
Lane Group Flow (vph)	319	324	140	33	69	0	208	2148	45	23	1334	565
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		6	2			8		4	4		8
Total Split (s)	47.5	47.5	47.5	47.5	47.5		23.4	63.0	63.0	9.5	49.1	49.1
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	47.1	47.1	47.1	47.1	47.1		59.4	58.2	58.2	63.3	44.8	44.8
Actuated g/C Ratio	0.39	0.39	0.39	0.39	0.39		0.50	0.48	0.48	0.53	0.37	0.37
v/c Ratio	0.65	0.64	0.20	0.11	0.10		0.73	0.87	0.06	0.17	0.70	0.60
Control Delay	37.6	37.2	6.1	26.9	17.7		39.7	32.4	3.4	19.9	34.3	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.6	37.2	6.1	26.9	17.7		39.7	32.4	3.4	19.9	34.3	5.1
LOS	D	D	A	C	B		D	C	A	B	C	A
Approach Delay		31.8			20.7			32.5			25.5	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 29.6

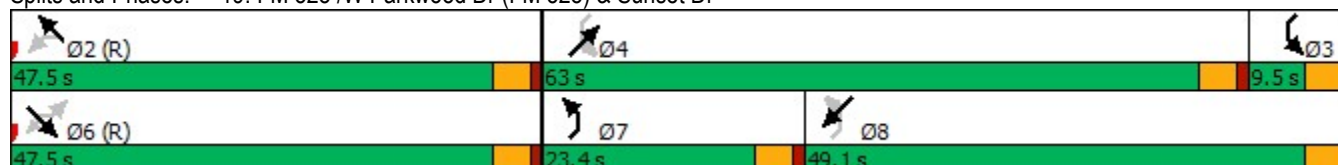
Intersection LOS: C

Intersection Capacity Utilization 76.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	309	2037	173	96	1232	21	125	169	289	15	101	149
Future Volume (vph)	309	2037	173	96	1232	21	125	169	289	15	101	149
Satd. Flow (prot)	1770	5024	0	1770	5070	0	0	1824	1583	0	1852	1583
Flt Permitted	0.134			0.086				0.786			0.875	
Satd. Flow (perm)	250	5024	0	160	5070	0	0	1464	1583	0	1630	1583
Satd. Flow (RTOR)		23			4				178			162
Adj. Flow (vph)	336	2214	188	104	1339	23	136	184	314	16	110	162
Lane Group Flow (vph)	336	2402	0	104	1362	0	0	320	314	0	126	162
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	14.0	51.6		13.4	51.0		25.0	25.0	25.0	25.0	25.0	25.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	4.5
Act Effect Green (s)	51.5	46.6		52.5	41.9			20.6	20.6		20.6	20.6
Actuated g/C Ratio	0.60	0.54		0.61	0.49			0.24	0.24		0.24	0.24
v/c Ratio	1.05	0.88		0.44	0.55			0.91	0.61		0.32	0.32
Control Delay	85.6	22.4		14.7	16.0			65.0	19.0		31.1	6.9
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	85.6	22.4		14.7	16.0			65.0	19.0		31.1	6.9
LOS	F	C		B	B			E	B		C	A
Approach Delay		30.2			15.9			42.2			17.5	
Approach LOS		C			B			D			B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 85.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 26.9

Intersection LOS: C

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

 Ø2	 Ø3	 Ø4
25 s	13.4 s	51.6 s
 Ø6	 Ø7	 Ø8
25 s	14 s	51 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	158	4	15	66	1	236	2	1631	18	82	1132	64
Future Volume (vph)	158	4	15	66	1	236	2	1631	18	82	1132	64
Satd. Flow (prot)	0	1763	0	0	1649	0	1770	3532	0	1770	3511	0
Flt Permitted		0.343			0.916		0.153			0.071		
Satd. Flow (perm)	0	632	0	0	1527	0	285	3532	0	132	3511	0
Satd. Flow (RTOR)		4			156			2			11	
Adj. Flow (vph)	172	4	16	72	1	257	2	1773	20	89	1230	70
Lane Group Flow (vph)	0	192	0	0	330	0	2	1793	0	89	1300	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	61.4		15.2	67.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		25.3			25.3		64.8	56.2		63.2	63.8	
Actuated g/C Ratio		0.25			0.25		0.65	0.56		0.63	0.64	
v/c Ratio		1.19			0.66		0.01	0.90		0.45	0.58	
Control Delay		166.3			26.2		4.5	27.2		27.4	11.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		166.3			26.2		4.5	27.2		27.4	11.5	
LOS		F			C		A	C		C	B	
Approach Delay		166.3			26.2			27.2			12.5	
Approach LOS		F			C			C			B	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.19

Intersection Signal Delay: 28.8

Intersection LOS: C

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)

 Ø2 (R)	 Ø4	 Ø3
23.4 s	61.4 s	15.2 s
 Ø6 (R)	 Ø7	 Ø8
23.4 s	9.6 s	67 s

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	0	23	2	1	35	7	1201	7	14	1009	132
Future Volume (vph)	38	0	23	2	1	35	7	1201	7	14	1009	132
Satd. Flow (prot)	0	1715	0	0	1627	0	1770	3536	0	1770	3479	0
Flt Permitted		0.847			0.986		0.203			0.186		
Satd. Flow (perm)	0	1497	0	0	1607	0	378	3536	0	346	3479	0
Satd. Flow (RTOR)		127			38			1			27	
Adj. Flow (vph)	41	0	25	2	1	38	8	1305	8	15	1097	143
Lane Group Flow (vph)	0	66	0	0	41	0	8	1313	0	15	1240	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	23.0	23.0		23.0	23.0		9.6	57.4		9.6	57.4	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		6.4			6.4		75.7	75.6		75.7	75.5	
Actuated g/C Ratio		0.07			0.07		0.84	0.84		0.84	0.84	
v/c Ratio		0.29			0.28		0.02	0.44		0.04	0.42	
Control Delay		3.9			19.2		1.7	3.5		1.9	3.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		3.9			19.2		1.7	3.5		1.9	3.4	
LOS		A			B		A	A		A	A	
Approach Delay		3.9			19.2			3.5			3.4	
Approach LOS		A			B			A			A	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 3.7

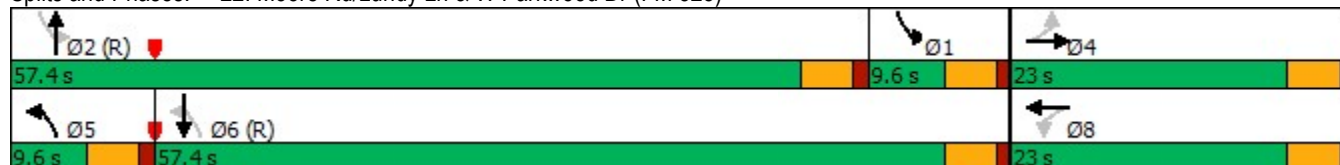
Intersection LOS: A

Intersection Capacity Utilization 51.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	94	106	71	86	81	41	67	419	85	30	363	54
Future Volume (vph)	94	106	71	86	81	41	67	419	85	30	363	54
Satd. Flow (prot)	1770	3327	0	1770	3359	0	1770	3451	0	1770	3472	0
Flt Permitted	0.668			0.631			0.490			0.422		
Satd. Flow (perm)	1244	3327	0	1175	3359	0	913	3451	0	786	3472	0
Satd. Flow (RTOR)		77			45			63			44	
Adj. Flow (vph)	102	115	77	93	88	45	73	455	92	33	395	59
Lane Group Flow (vph)	102	192	0	93	133	0	73	547	0	33	454	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		11.5	11.5		11.5	11.5	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.30	0.30		0.30	0.30	
v/c Ratio	0.18	0.12		0.17	0.08		0.27	0.51		0.14	0.43	
Control Delay	8.2	4.8		8.2	5.2		12.7	11.4		10.9	10.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.2	4.8		8.2	5.2		12.7	11.4		10.9	10.8	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		6.0			6.5			11.6			10.8	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 38.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 9.6

Intersection LOS: A

Intersection Capacity Utilization 43.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd

 Ø2	 Ø4
22.5 s	22.5 s
 Ø6	 Ø8
22.5 s	22.5 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	25	578	14	7	490	95	7	12	9	141	3	11
Future Volume (vph)	25	578	14	7	490	95	7	12	9	141	3	11
Satd. Flow (prot)	1770	1857	0	1770	1818	0	0	1758	0	0	1763	0
Flt Permitted	0.285			0.311				0.918			0.723	
Satd. Flow (perm)	531	1857	0	579	1818	0	0	1635	0	0	1333	0
Satd. Flow (RTOR)		2			19			10			6	
Adj. Flow (vph)	27	628	15	8	533	103	8	13	10	153	3	12
Lane Group Flow (vph)	27	643	0	8	636	0	0	31	0	0	168	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	32.8		9.6	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	42.2	41.2		41.2	39.0			12.9			12.9	
Actuated g/C Ratio	0.65	0.63		0.63	0.60			0.20			0.20	
v/c Ratio	0.06	0.55		0.02	0.58			0.09			0.62	
Control Delay	5.4	11.8		5.4	13.8			15.1			32.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.4	11.8		5.4	13.8			15.1			32.5	
LOS	A	B		A	B			B			C	
Approach Delay		11.5			13.7			15.1			32.5	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 14.8

Intersection LOS: B

Intersection Capacity Utilization 54.4%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	353	345	104	392	0	214	9	44	1	12	10
Future Volume (vph)	9	353	345	104	392	0	214	9	44	1	12	10
Satd. Flow (prot)	1770	1725	0	1770	1863	0	0	1753	0	0	1749	0
Flt Permitted	0.485			0.166				0.752			0.989	
Satd. Flow (perm)	903	1725	0	309	1863	0	0	1370	0	0	1734	0
Satd. Flow (RTOR)		96						12			11	
Adj. Flow (vph)	10	384	375	113	426	0	233	10	48	1	13	11
Lane Group Flow (vph)	10	759	0	113	426	0	0	291	0	0	25	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	42.8		9.6	42.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	45.0	41.0		47.7	46.7			17.4			17.4	
Actuated g/C Ratio	0.60	0.55		0.64	0.62			0.23			0.23	
v/c Ratio	0.02	0.77		0.38	0.37			0.89			0.06	
Control Delay	5.1	19.7		9.1	9.0			58.0			16.3	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.1	19.7		9.1	9.0			58.0			16.3	
LOS	A	B		A	A			E			B	
Approach Delay		19.5			9.0			58.0			16.3	
Approach LOS		B			A			E			B	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.9

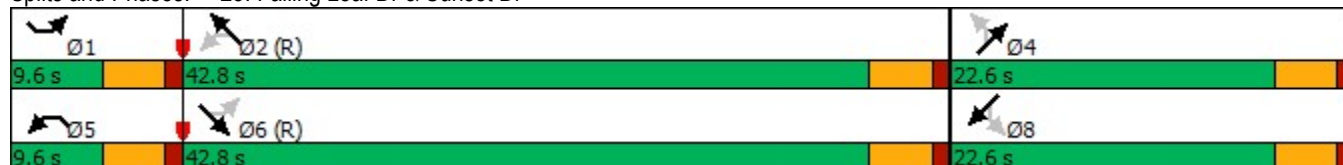
Intersection LOS: C

Intersection Capacity Utilization 78.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	21	335	25	47	344	40	95	85	68	20	89	51
Future Volume (vph)	21	335	25	47	344	40	95	85	68	20	89	51
Satd. Flow (prot)	1770	1844	0	1770	1835	0	0	1814	1583	0	1772	0
Flt Permitted	0.497			0.425				0.723			0.943	
Satd. Flow (perm)	926	1844	0	792	1835	0	0	1347	1583	0	1681	0
Satd. Flow (RTOR)		7			11				109		40	
Adj. Flow (vph)	23	364	27	51	374	43	103	92	74	22	97	55
Lane Group Flow (vph)	23	391	0	51	417	0	0	195	74	0	174	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6	22.6	22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	35.1	31.7		37.0	36.0			13.1	13.1		13.1	
Actuated g/C Ratio	0.58	0.53		0.62	0.60			0.22	0.22		0.22	
v/c Ratio	0.04	0.40		0.09	0.38			0.67	0.17		0.44	
Control Delay	5.9	12.5		7.4	11.3			32.1	2.9		17.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	5.9	12.5		7.4	11.3			32.1	2.9		17.9	
LOS	A	B		A	B			C	A		B	
Approach Delay		12.1			10.9			24.1			17.9	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 14.9

Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr

		
Ø1	Ø2 (R)	Ø4
9.6 s	27.8 s	22.6 s
		
Ø5	Ø6 (R)	Ø8
9.6 s	27.8 s	22.6 s

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	109	302	17	12	668	43	14	83	32	8	29	129
Future Volume (Veh/h)	109	302	17	12	668	43	14	83	32	8	29	129
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	328	18	13	726	47	15	90	35	9	32	140
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												4
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	773			346			978	1372	173	1256	1358	386
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	773			346			978	1372	173	1256	1358	386
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	86			99			87	27	96	80	75	77
cM capacity (veh/h)	838			1210			113	123	840	45	126	612
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	SW 1						
Volume Total	282	182	376	410	140	181						
Volume Left	118	0	13	0	15	9						
Volume Right	0	18	0	47	35	140						
cSH	838	1700	1210	1700	155	476						
Volume to Capacity	0.14	0.11	0.01	0.24	0.91	0.38						
Queue Length 95th (ft)	12	0	1	0	160	44						
Control Delay (s)	5.1	0.0	0.4	0.0	106.9	22.8						
Lane LOS	A		A		F	C						
Approach Delay (s)	3.1		0.2		106.9	22.8						
Approach LOS					F	C						
Intersection Summary												
Average Delay			13.2									
Intersection Capacity Utilization			56.0%		ICU Level of Service		B					
Analysis Period (min)			15									

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	140	316	21	64	566	12	49	0	116	21	0	116
Future Volume (Veh/h)	140	316	21	64	566	12	49	0	116	21	0	116
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	152	343	23	70	615	13	53	0	126	23	0	126
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	628			366			1232	1426	183	1363	1432	314
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	628			366			1232	1426	183	1363	1432	314
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	84			94			42	100	85	70	100	82
cM capacity (veh/h)	950			1189			91	106	828	76	105	682
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	SW 1						
Volume Total	324	194	378	320	179	149						
Volume Left	152	0	70	0	53	23						
Volume Right	0	23	0	13	126	126						
cSH	950	1700	1189	1700	244	305						
Volume to Capacity	0.16	0.11	0.06	0.19	0.73	0.49						
Queue Length 95th (ft)	14	0	5	0	127	63						
Control Delay (s)	5.4	0.0	2.0	0.0	51.8	27.6						
Lane LOS	A		A		F	D						
Approach Delay (s)	3.4		1.1		51.8	27.6						
Approach LOS					F	D						
Intersection Summary												
Average Delay			10.3									
Intersection Capacity Utilization			57.9%		ICU Level of Service		B					
Analysis Period (min)			15									

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	73	90	109	34	49	66	57	377	77	30	294	21
Future Volume (vph)	73	90	109	34	49	66	57	377	77	30	294	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	79	98	118	37	53	72	62	410	84	33	320	23
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1					
Volume Total (vph)	177	118	90	72	472	84	376					
Volume Left (vph)	79	0	37	0	62	0	33					
Volume Right (vph)	0	118	0	72	0	84	23					
Hadj (s)	0.26	-0.67	0.24	-0.67	0.10	-0.67	0.01					
Departure Headway (s)	8.1	7.2	8.5	7.6	7.0	6.2	7.1					
Degree Utilization, x	0.40	0.24	0.21	0.15	0.92	0.14	0.74					
Capacity (veh/h)	429	481	401	446	504	562	491					
Control Delay (s)	15.2	11.2	12.6	10.7	46.8	9.1	27.8					
Approach Delay (s)	13.6		11.7		41.1		27.8					
Approach LOS	B		B		E		D					
Intersection Summary												
Delay			28.2									
Level of Service			D									
Intersection Capacity Utilization			64.0%	ICU Level of Service				B				
Analysis Period (min)			15									

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	32	989	136	48	1058	16	88	0	32	17	16	37
Future Volume (vph)	32	989	136	48	1058	16	88	0	32	17	16	37
Satd. Flow (prot)	1770	3476	0	1770	3532	0	0	1733	0	0	1708	0
Flt Permitted	0.159			0.166				0.757			0.931	
Satd. Flow (perm)	296	3476	0	309	3532	0	0	1359	0	0	1609	0
Satd. Flow (RTOR)		29			3			191			40	
Adj. Flow (vph)	35	1075	148	52	1150	17	96	0	35	18	17	40
Lane Group Flow (vph)	35	1223	0	52	1167	0	0	131	0	0	75	0
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2			6		
Total Split (s)	9.6	27.0		9.6	27.0		23.4	23.4		23.4	23.4	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	29.4	23.3		26.4	25.2			21.9			21.9	
Actuated g/C Ratio	0.49	0.39		0.44	0.42			0.36			0.36	
v/c Ratio	0.13	0.89		0.20	0.78			0.21			0.12	
Control Delay	9.7	28.0		9.0	20.9			2.0			9.2	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	9.7	28.0		9.0	20.9			2.0			9.2	
LOS	A	C		A	C			A			A	
Approach Delay		27.5			20.4			2.0			9.2	
Approach LOS		C			C			A			A	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NETL and 6:SWTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 22.5

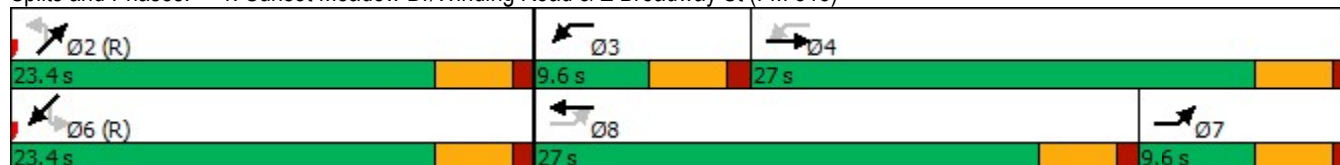
Intersection LOS: C

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Sunset Meadow Dr/Winding Road & E Broadway St (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	190	589	125	61	620	102	223	383	85	181	615	271
Future Volume (vph)	190	589	125	61	620	102	223	383	85	181	615	271
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			205			205			143			257
Adj. Flow (vph)	207	640	136	66	674	111	242	416	92	197	668	295
Lane Group Flow (vph)	207	640	136	66	674	111	242	416	92	197	668	295
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	16.0	28.8	28.8	11.7	24.5	24.5	17.0	22.7	22.7	16.8	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	11.3	27.0	27.0	6.8	20.6	20.6	12.4	18.4	18.4	11.7	17.7	17.7
Actuated g/C Ratio	0.14	0.34	0.34	0.08	0.26	0.26	0.16	0.23	0.23	0.15	0.22	0.22
v/c Ratio	0.83	0.54	0.20	0.44	0.74	0.20	0.88	0.51	0.19	0.76	0.85	0.54
Control Delay	62.1	24.5	1.6	44.0	33.3	0.8	66.7	29.5	2.6	53.0	42.1	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.1	24.5	1.6	44.0	33.3	0.8	66.7	29.5	2.6	53.0	42.1	9.6
LOS	E	C	A	D	C	A	E	C	A	D	D	A
Approach Delay		29.2			29.9			38.2			35.7	
Approach LOS		C			C			D			D	

Intersection Summary

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NWT and 6:SET, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 33.2

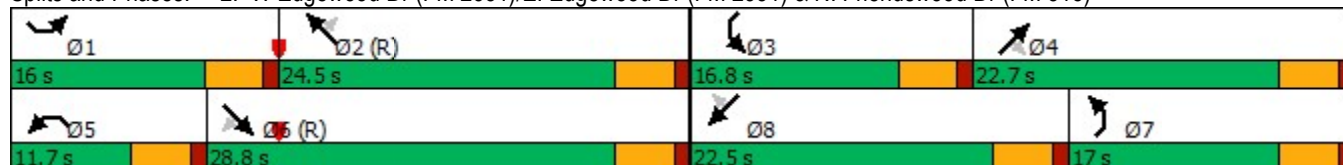
Intersection LOS: C

Intersection Capacity Utilization 72.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: W Edgewood Dr (FM 2351)/E. Edgewood Dr (FM 2351) & N. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	866	29	68	904	18	46	16	55	28	20	5
Future Volume (vph)	1	866	29	68	904	18	46	16	55	28	20	5
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1710	0	0	1793	0
Flt Permitted	0.258			0.261				0.846			0.796	
Satd. Flow (perm)	481	3539	1583	486	3539	1583	0	1475	0	0	1465	0
Satd. Flow (RTOR)			109			109		60			5	
Adj. Flow (vph)	1	941	32	74	983	20	50	17	60	30	22	5
Lane Group Flow (vph)	1	941	32	74	983	20	0	127	0	0	57	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2		6	6		2	4			8		
Total Split (s)	9.5	28.0	28.0	9.5	28.0	28.0	22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	
Act Effect Green (s)	43.6	38.6	38.6	41.8	43.4	43.4		8.5			8.5	
Actuated g/C Ratio	0.73	0.64	0.64	0.70	0.72	0.72		0.14			0.14	
v/c Ratio	0.00	0.41	0.03	0.16	0.38	0.02		0.49			0.27	
Control Delay	4.0	9.0	0.1	1.4	0.9	0.0		19.9			23.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	4.0	9.0	0.1	1.4	0.9	0.0		19.9			23.5	
LOS	A	A	A	A	A	A		B			C	
Approach Delay		8.7			0.9			19.9			23.5	
Approach LOS		A			A			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 6.0

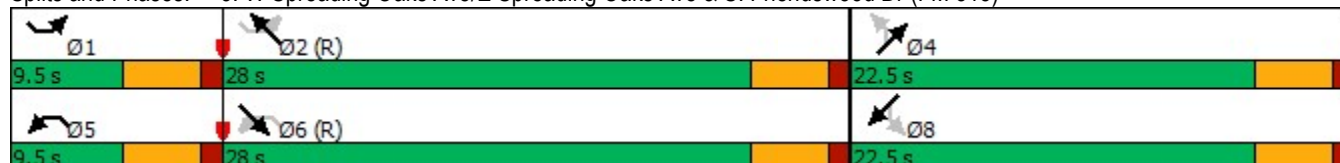
Intersection LOS: A

Intersection Capacity Utilization 48.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: W Spreading Oaks Ave/E Spreading Oaks Ave & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	8	942	58	113	1023	10	42	7	82	10	7	6
Future Volume (vph)	8	942	58	113	1023	10	42	7	82	10	7	6
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	1679	0	0	1758	0
Flt Permitted	0.216			0.224				0.882			0.839	
Satd. Flow (perm)	402	3539	1583	417	3539	1583	0	1505	0	0	1507	0
Satd. Flow (RTOR)			109			109		89			7	
Adj. Flow (vph)	9	1024	63	123	1112	11	46	8	89	11	8	7
Lane Group Flow (vph)	9	1024	63	123	1112	11	0	143	0	0	26	0
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	2		6	6		2	4			8		
Total Split (s)	9.5	28.0	28.0	9.5	28.0	28.0	22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5		4.5			4.5	
Act Effect Green (s)	44.0	36.4	36.4	41.3	43.7	43.7		8.1			8.1	
Actuated g/C Ratio	0.73	0.61	0.61	0.69	0.73	0.73		0.14			0.14	
v/c Ratio	0.02	0.48	0.06	0.28	0.43	0.01		0.51			0.12	
Control Delay	1.1	4.4	0.1	5.1	6.3	0.0		17.0			18.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	1.1	4.4	0.1	5.1	6.3	0.0		17.0			18.7	
LOS	A	A	A	A	A	A		B			B	
Approach Delay		4.1			6.1			17.0			18.7	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 6.0

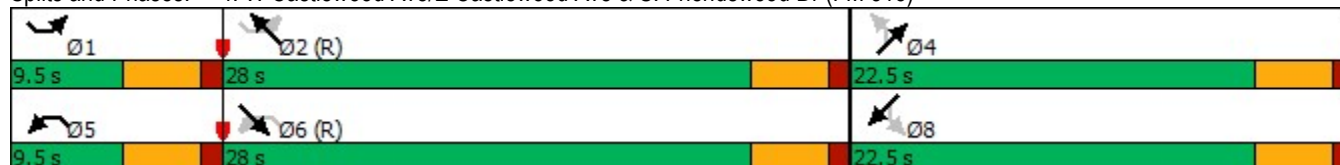
Intersection LOS: A

Intersection Capacity Utilization 52.7%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: W Castlewood Ave/E Castlewood Ave & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	10	21	349	6	226	1	984	237	212	949	1
Future Volume (vph)	0	10	21	349	6	226	1	984	237	212	949	1
Satd. Flow (prot)	0	1693	0	0	1775	1583	1770	3539	1583	1770	3539	0
Flt Permitted					0.705		0.277			0.127		
Satd. Flow (perm)	0	1693	0	0	1313	1583	516	3539	1583	237	3539	0
Satd. Flow (RTOR)		23				246			132			
Adj. Flow (vph)	0	11	23	379	7	246	1	1070	258	230	1032	1
Lane Group Flow (vph)	0	34	0	0	386	246	1	1070	258	230	1033	0
Turn Type		NA		Perm	NA	Perm	Perm	NA	Perm	D.P+P	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2		2	2		
Total Split (s)	40.2	40.2		40.2	40.2	40.2	41.8	41.8	41.8	18.0	59.8	
Total Lost Time (s)		4.5			4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Act Effct Green (s)		32.6			32.6	32.6	41.8	41.8	41.8	53.9	58.4	
Actuated g/C Ratio		0.33			0.33	0.33	0.42	0.42	0.42	0.54	0.58	
v/c Ratio		0.06			0.90	0.36	0.00	0.72	0.35	0.73	0.50	
Control Delay		11.5			57.5	4.6	20.0	29.0	12.1	32.1	13.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		11.5			57.5	4.6	20.0	29.0	12.1	32.1	13.9	
LOS		B			E	A	B	C	B	C	B	
Approach Delay		11.5			36.9			25.7			17.2	
Approach LOS		B			D			C			B	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 24.4

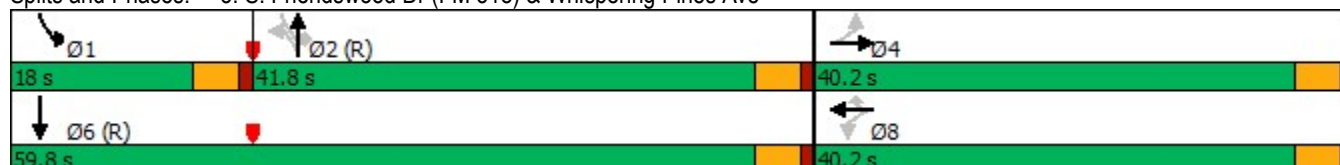
Intersection LOS: C

Intersection Capacity Utilization 76.5%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 5: S. Friendswood Dr (FM 518) & Whispering Pines Ave



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	27	897	21	211	1065	35	25	29	18	24	49	290
Future Volume (vph)	27	897	21	211	1065	35	25	29	18	24	49	290
Satd. Flow (prot)	1770	3527	0	1770	3522	0	0	3347	0	0	3105	0
Flt Permitted	0.950			0.950				0.678			0.928	
Satd. Flow (perm)	1761	3527	0	1770	3522	0	0	2308	0	0	2890	0
Satd. Flow (RTOR)		4			6			20			279	
Adj. Flow (vph)	29	975	23	229	1158	38	27	32	20	26	53	315
Lane Group Flow (vph)	29	998	0	229	1196	0	0	79	0	0	394	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases							4			8		
Total Split (s)	9.6	26.5		16.0	32.9		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	6.6	29.4		13.4	42.4			8.7			8.7	
Actuated g/C Ratio	0.10	0.45		0.21	0.65			0.13			0.13	
v/c Ratio	0.16	0.62		0.63	0.52			0.24			0.63	
Control Delay	28.2	17.7		31.3	9.1			20.6			12.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	28.2	17.7		31.3	9.1			20.6			12.7	
LOS	C	B		C	A			C			B	
Approach Delay		18.0			12.7			20.6			12.7	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 14.8

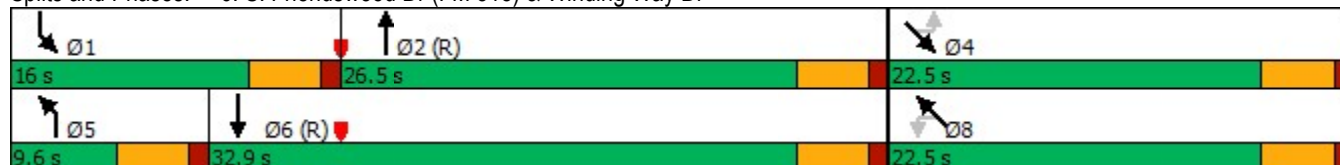
Intersection LOS: B

Intersection Capacity Utilization 67.8%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 6: S. Friendswood Dr (FM 518) & Winding Way Dr



												
Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	 	 		 	 			  			  	
Traffic Volume (vph)	354	585	175	104	686	339	245	1005	382	291	1378	85
Future Volume (vph)	354	585	175	104	686	339	245	1005	382	291	1378	85
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.207			0.257			0.170			0.196		
Satd. Flow (perm)	748	3539	1583	929	3539	1583	317	5085	1583	365	5085	1583
Satd. Flow (RTOR)			218			284			257			218
Adj. Flow (vph)	385	636	190	113	746	368	266	1092	415	316	1498	92
Lane Group Flow (vph)	385	636	190	113	746	368	266	1092	415	316	1498	92
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	6		2	2		6	8		4	4		8
Total Split (s)	10.2	24.5	24.5	9.5	23.8	23.8	13.0	25.2	25.2	15.8	28.0	28.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	25.0	21.9	21.9	25.9	19.3	19.3	32.0	20.4	20.4	32.0	23.5	23.5
Actuated g/C Ratio	0.33	0.29	0.29	0.35	0.26	0.26	0.43	0.27	0.27	0.43	0.31	0.31
v/c Ratio	0.85	0.62	0.31	0.23	0.82	0.60	0.89	0.79	0.67	0.85	0.94	0.14
Control Delay	37.0	26.8	3.9	17.8	35.3	10.9	48.5	30.1	15.3	45.2	39.5	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.0	26.8	3.9	17.8	35.3	10.9	48.5	30.1	15.3	45.2	39.5	2.9
LOS	D	C	A	B	D	B	D	C	B	D	D	A
Approach Delay		26.4			26.3			29.4			38.7	
Approach LOS		C			C			C			D	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 31.1

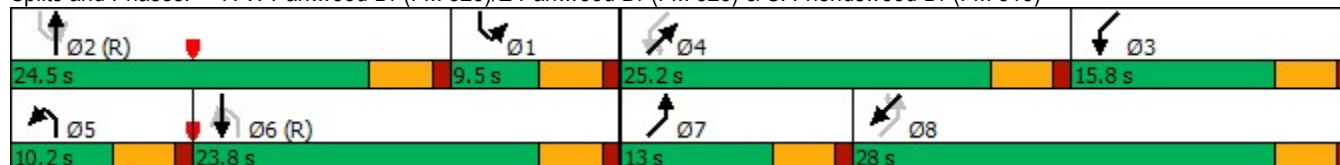
Intersection LOS: C

Intersection Capacity Utilization 84.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 7: W Parkwood Dr (FM 528)/E Parkwood Dr (FM 528) & S. Friendswood Dr (FM 518)



						
Lane Group	NBL	NBT	SBT	SBR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	49	1563	1855	220	117	22
Future Volume (vph)	49	1563	1855	220	117	22
Satd. Flow (prot)	1770	3539	3483	0	1770	1583
Flt Permitted	0.062				0.950	
Satd. Flow (perm)	115	3539	3483	0	1770	1583
Satd. Flow (RTOR)			33			24
Adj. Flow (vph)	53	1699	2016	239	127	24
Lane Group Flow (vph)	53	1699	2255	0	127	24
Turn Type	D.P+P	NA	NA		Prot	Perm
Protected Phases	5	2	6		7	
Permitted Phases	6					7
Total Split (s)	9.6	77.0	67.4		13.0	13.0
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5
Act Effct Green (s)	69.9	72.6	66.8		8.4	8.4
Actuated g/C Ratio	0.78	0.81	0.74		0.09	0.09
v/c Ratio	0.29	0.60	0.87		0.77	0.14
Control Delay	7.2	4.3	14.6		70.2	17.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.2	4.3	14.6		70.2	17.3
LOS	A	A	B		E	B
Approach Delay		4.4	14.6		61.8	
Approach LOS		A	B		E	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBT and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 12.0

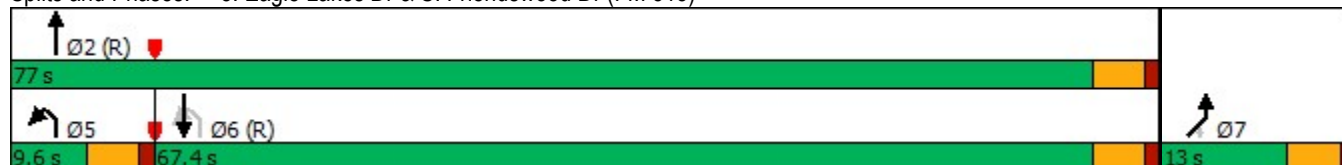
Intersection LOS: B

Intersection Capacity Utilization 72.3%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 8: Eagle Lakes Dr & S. Friendswood Dr (FM 518)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	141	1333	246	151	1259	21	170	20	138	9	18	101
Future Volume (vph)	141	1333	246	151	1259	21	170	20	138	9	18	101
Satd. Flow (prot)	1770	3458	0	1770	3532	0	1770	1863	1583	1770	1863	1583
Flt Permitted	0.090			0.071			0.950			0.950		
Satd. Flow (perm)	168	3458	0	132	3532	0	1770	1863	1583	1770	1863	1583
Satd. Flow (RTOR)		27			2				150			149
Adj. Flow (vph)	153	1449	267	164	1368	23	185	22	150	10	20	110
Lane Group Flow (vph)	153	1716	0	164	1391	0	185	22	150	10	20	110
Turn Type	D.P+P	NA		D.P+P	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	2			6					4			8
Total Split (s)	14.2	58.0		12.4	56.2		17.0	30.1	30.1	9.5	22.6	22.6
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	72.7	60.3		72.7	61.7		12.5	21.9	21.9	5.0	6.8	6.8
Actuated g/C Ratio	0.66	0.55		0.66	0.56		0.11	0.20	0.20	0.05	0.06	0.06
v/c Ratio	0.56	0.90		0.60	0.70		0.92	0.06	0.35	0.12	0.18	0.46
Control Delay	20.9	30.5		30.6	25.5		94.9	37.8	9.0	54.0	51.9	9.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.9	30.5		30.6	25.5		94.9	37.8	9.0	54.0	51.9	9.8
LOS	C	C		C	C		F	D	A	D	D	A
Approach Delay		29.7			26.0			55.3			18.9	
Approach LOS		C			C			E			B	

Intersection Summary

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:NWSE and 6:NWSE, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 30.2

Intersection LOS: C

Intersection Capacity Utilization 80.4%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 9: West Boulevard/Stone Creek Terrace & S. Friendswood Dr (FM 518)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	301	940	259	204	1278	341	271	323	109	277	396	531
Future Volume (vph)	301	940	259	204	1278	341	271	323	109	277	396	531
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.088			0.139			0.348			0.373		
Satd. Flow (perm)	164	3539	1583	259	3539	1583	648	3539	1583	695	3539	1583
Satd. Flow (RTOR)			282			349			177			294
Adj. Flow (vph)	327	1022	282	222	1389	371	295	351	118	301	430	577
Lane Group Flow (vph)	327	1022	282	222	1389	371	295	351	118	301	430	577
Turn Type	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	8		4	4		8	6		2	2		6
Total Split (s)	21.7	53.1	53.1	18.8	50.2	50.2	15.2	25.5	25.5	22.6	32.9	32.9
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	62.9	50.2	50.2	62.9	45.7	45.7	39.1	21.7	21.7	39.1	28.4	28.4
Actuated g/C Ratio	0.52	0.42	0.42	0.52	0.38	0.38	0.33	0.18	0.18	0.33	0.24	0.24
v/c Ratio	1.03	0.69	0.34	0.75	1.03	0.45	0.95	0.55	0.27	0.79	0.51	0.96
Control Delay	103.6	31.8	3.8	34.5	69.7	5.3	73.8	48.7	2.8	46.0	42.4	51.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	103.6	31.8	3.8	34.5	69.7	5.3	73.8	48.7	2.8	46.0	42.4	51.5
LOS	F	C	A	C	E	A	E	D	A	D	D	D
Approach Delay		41.4			53.7			51.3			47.2	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 48.4

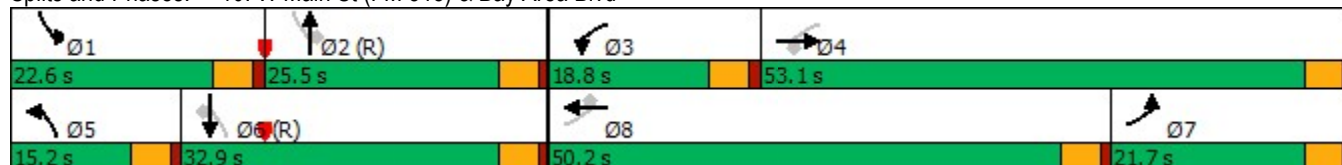
Intersection LOS: D

Intersection Capacity Utilization 94.5%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 10: W Main St (FM 518) & Bay Area Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	39	233	120	116	235	44	139	1047	105	170	1609	95
Future Volume (vph)	39	233	120	116	235	44	139	1047	105	170	1609	95
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Satd. Flow (RTOR)			130			126			126			88
Adj. Flow (vph)	42	253	130	126	255	48	151	1138	114	185	1749	103
Lane Group Flow (vph)	42	253	130	126	255	48	151	1138	114	185	1749	103
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	6	6		2	2		7	4		3	8	
Permitted Phases			6			2			4			8
Total Split (s)	22.5	22.5	22.5	23.5	23.5	23.5	16.0	61.8	61.8	22.2	68.0	68.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	14.2	14.2	14.2	19.0	19.0	19.0	11.5	58.7	58.7	16.3	63.5	63.5
Actuated g/C Ratio	0.11	0.11	0.11	0.15	0.15	0.15	0.09	0.47	0.47	0.13	0.50	0.50
v/c Ratio	0.21	0.64	0.44	0.47	0.48	0.14	0.94	0.69	0.14	0.81	0.98	0.12
Control Delay	53.2	61.1	13.3	56.3	52.9	0.8	113.5	30.0	3.2	79.8	48.8	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	61.1	13.3	56.3	52.9	0.8	113.5	30.0	3.2	79.8	48.8	5.1
LOS	D	E	B	E	D	A	F	C	A	E	D	A
Approach Delay		45.7			48.1			36.8			49.4	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 126.2

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 44.8

Intersection LOS: D

Intersection Capacity Utilization 80.0%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 11: Beamer Rd & FM 2351

 Ø2	 Ø6	 Ø3	 Ø4
23.5 s	22.5 s	22.2 s	61.8 s
		 Ø7	 Ø8
		16 s	68 s

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘↗	↗
Traffic Volume (vph)	1140	106	96	1731	140	98
Future Volume (vph)	1140	106	96	1731	140	98
Satd. Flow (prot)	3493	0	1770	3539	3433	1583
Flt Permitted			0.950		0.950	
Satd. Flow (perm)	3493	0	1770	3539	3433	1583
Satd. Flow (RTOR)	18					107
Adj. Flow (vph)	1239	115	104	1882	152	107
Lane Group Flow (vph)	1354	0	104	1882	152	107
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Total Split (s)	31.0		10.0	41.0	24.0	24.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Act Effect Green (s)	28.5		5.5	36.5	19.5	19.5
Actuated g/C Ratio	0.44		0.08	0.56	0.30	0.30
v/c Ratio	0.88		0.70	0.95	0.15	0.19
Control Delay	26.4		56.1	26.0	17.2	5.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	26.4		56.1	26.0	17.2	5.2
LOS	C		E	C	B	A
Approach Delay	26.4			27.6	12.2	
Approach LOS	C			C	B	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 26.0

Intersection LOS: C

Intersection Capacity Utilization 59.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 12: Blackhawk Blvd & FM 2351



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	73	0	85	0	0	0	109	1152	0	0	1650	169
Future Volume (vph)	73	0	85	0	0	0	109	1152	0	0	1650	169
Satd. Flow (prot)	0	1770	1583	0	1863	0	1770	3539	0	1863	3490	0
Flt Permitted		0.757					0.077					
Satd. Flow (perm)	0	1410	1583	0	1863	0	143	3539	0	1863	3490	0
Satd. Flow (RTOR)			127								20	
Adj. Flow (vph)	79	0	92	0	0	0	118	1252	0	0	1793	184
Lane Group Flow (vph)	0	79	92	0	0	0	118	1252	0	0	1977	0
Turn Type	Perm	NA	Free				D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		Free	2			8			4		
Total Split (s)	24.0	24.0		24.0	24.0		9.8	56.5		9.5	56.2	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		19.5	90.0				57.0	61.5			51.7	
Actuated g/C Ratio		0.22	1.00				0.63	0.68			0.57	
v/c Ratio		0.26	0.06				0.63	0.52			0.98	
Control Delay		32.0	0.1				27.8	7.9			35.9	
Queue Delay		0.0	0.0				0.0	0.0			0.0	
Total Delay		32.0	0.1				27.8	7.9			35.9	
LOS		C	A				C	A			D	
Approach Delay		14.8						9.6			35.9	
Approach LOS		B						A			D	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 24.6

Intersection LOS: C

Intersection Capacity Utilization 72.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 13: FM 2351/E. Edgewood Ave (FM 2351)

 Ø2	 Ø3	 Ø4
24 s	9.5 s	56.5 s
 Ø6	 Ø7	 Ø8
24 s	9.8 s	56.2 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	118	0	192	10	10	1	160	1185	1	6	1653	141
Future Volume (vph)	118	0	192	10	10	1	160	1185	1	6	1653	141
Satd. Flow (prot)	1770	1583	0	0	1809	0	1770	3539	0	1770	3497	0
Flt Permitted	0.742				0.857		0.074			0.159		
Satd. Flow (perm)	1382	1583	0	0	1587	0	138	3539	0	296	3497	0
Satd. Flow (RTOR)		112			1						16	
Adj. Flow (vph)	128	0	209	11	11	1	174	1288	1	7	1797	153
Lane Group Flow (vph)	128	209	0	0	23	0	174	1289	0	7	1950	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		11.6	57.0		9.6	55.0	
Total Lost Time (s)	4.5	4.5			4.5		4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.9	18.9			18.9		57.6	60.2		61.2	50.5	
Actuated g/C Ratio	0.21	0.21			0.21		0.64	0.67		0.68	0.56	
v/c Ratio	0.44	0.50			0.07		0.80	0.54		0.02	0.99	
Control Delay	36.6	19.4			28.4		45.6	9.4		4.7	38.6	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	36.6	19.4			28.4		45.6	9.4		4.7	38.6	
LOS	D	B			C		D	A		A	D	
Approach Delay		25.9			28.4			13.7			38.5	
Approach LOS		C			C			B			D	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 27.7

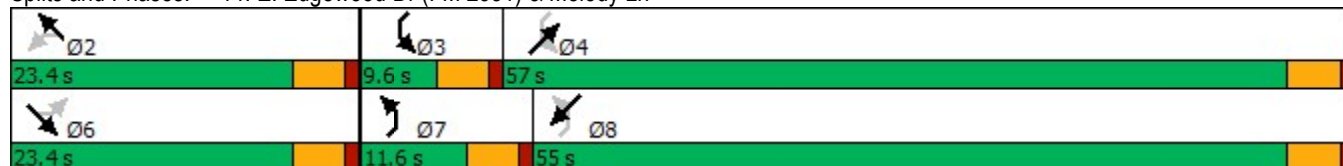
Intersection LOS: C

Intersection Capacity Utilization 82.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 14: E. Edgewood Dr (FM 2351) & Melody Ln



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	33	29	20	205	41	489	25	476	170	501	602	55
Future Volume (vph)	33	29	20	205	41	489	25	476	170	501	602	55
Satd. Flow (prot)	0	1765	0	0	1788	1583	1770	3398	0	1770	3539	1583
Flt Permitted		0.575			0.705		0.391			0.369		
Satd. Flow (perm)	0	1036	0	0	1313	1583	728	3398	0	687	3539	1583
Satd. Flow (RTOR)		14				522		127				60
Adj. Flow (vph)	36	32	22	223	45	532	27	517	185	545	654	60
Lane Group Flow (vph)	0	90	0	0	268	532	27	702	0	545	654	60
Turn Type	Perm	NA		Perm	NA	Free	Perm	NA		Perm	NA	Perm
Protected Phases		6			2			4			8	
Permitted Phases	6			2		Free	4			8		8
Total Split (s)	24.0	24.0		24.0	24.0		76.0	76.0		76.0	76.0	76.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effct Green (s)		19.5			19.5	100.0	71.5	71.5		71.5	71.5	71.5
Actuated g/C Ratio		0.20			0.20	1.00	0.72	0.72		0.72	0.72	0.72
v/c Ratio		0.42			1.05	0.34	0.05	0.28		1.11	0.26	0.05
Control Delay		36.7			109.9	0.6	4.5	4.4		92.4	5.3	1.3
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay		36.7			109.9	0.6	4.5	4.4		92.4	5.3	1.3
LOS		D			F	A	A	A		F	A	A
Approach Delay		36.7			37.2			4.4			42.8	
Approach LOS		D			D			A			D	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 31.3

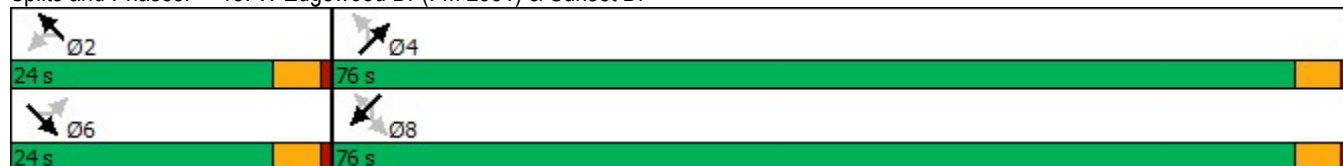
Intersection LOS: C

Intersection Capacity Utilization 77.8%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 15: W Edgewood Dr (FM 2351) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	1510	54	374	1703	141	156	565	252	198	620	492
Future Volume (vph)	424	1510	54	374	1703	141	156	565	252	198	620	492
Satd. Flow (prot)	3433	5085	1583	3433	5085	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	5085	1583	3433	5085	1583	1770	5085	1583	1770	5085	1583
Satd. Flow (RTOR)			115			115			262			260
Adj. Flow (vph)	461	1641	59	407	1851	153	170	614	274	215	674	535
Lane Group Flow (vph)	461	1641	59	407	1851	153	170	614	274	215	674	535
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Total Split (s)	18.3	41.1	41.1	17.4	40.2	40.2	14.6	24.0	24.0	17.5	26.9	26.9
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	13.8	36.6	36.6	12.9	35.7	35.7	10.1	19.5	19.5	13.0	22.4	22.4
Actuated g/C Ratio	0.14	0.37	0.37	0.13	0.36	0.36	0.10	0.20	0.20	0.13	0.22	0.22
v/c Ratio	0.97	0.88	0.09	0.92	1.02	0.24	0.96	0.62	0.53	0.93	0.59	0.96
Control Delay	78.1	32.8	1.7	71.0	58.9	8.1	103.2	40.0	9.4	89.3	37.2	50.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.1	32.8	1.7	71.0	58.9	8.1	103.2	40.0	9.4	89.3	37.2	50.9
LOS	E	C	A	E	E	A	F	D	A	F	D	D
Approach Delay		41.6			57.7			42.2			50.2	
Approach LOS		D			E			D			D	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 48.9

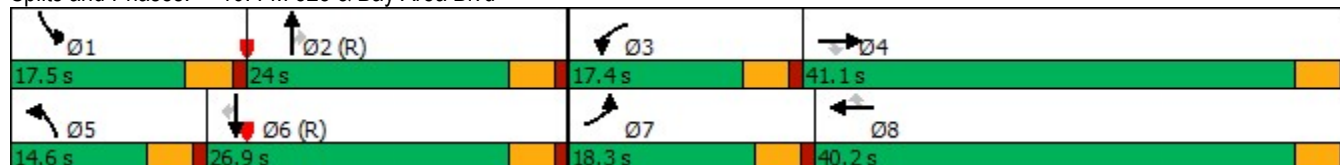
Intersection LOS: D

Intersection Capacity Utilization 83.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 16: FM 528 & Bay Area Blvd



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	142	1695	128	152	2475	241	63	94	14	217	23	116
Future Volume (vph)	142	1695	128	152	2475	241	63	94	14	217	23	116
Satd. Flow (prot)	1770	5029	0	1770	5019	0	1770	3472	0	1770	3097	0
Flt Permitted	0.067			0.090			0.656			0.678		
Satd. Flow (perm)	125	5029	0	168	5019	0	1222	3472	0	1263	3097	0
Satd. Flow (RTOR)		29			28			14			112	
Adj. Flow (vph)	154	1842	139	165	2690	262	68	102	15	236	25	126
Lane Group Flow (vph)	154	1981	0	165	2952	0	68	117	0	236	151	0
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	8			8			2			6		
Total Split (s)	11.2	75.2		64.0	64.0		22.5	22.5		24.8	24.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	66.2	70.7		59.5	59.5		20.3	20.3		20.3	20.3	
Actuated g/C Ratio	0.66	0.71		0.60	0.60		0.20	0.20		0.20	0.20	
v/c Ratio	0.80	0.56		1.67	0.98		0.27	0.16		0.92	0.21	
Control Delay	48.9	7.7		347.5	36.5		37.2	29.6		80.2	11.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	48.9	7.7		347.5	36.5		37.2	29.6		80.2	11.6	
LOS	D	A		F	D		D	C		F	B	
Approach Delay		10.6			53.0			32.4			53.4	
Approach LOS		B			D			C			D	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.67

Intersection Signal Delay: 36.8

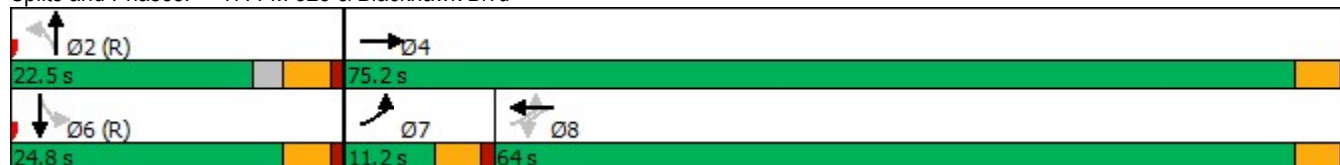
Intersection LOS: D

Intersection Capacity Utilization 92.2%

ICU Level of Service F

Analysis Period (min) 15

Splits and Phases: 17: FM 528 & Blackhawk Blvd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	291	64	84	41	74	125	120	1636	70	183	2164	336
Future Volume (vph)	291	64	84	41	74	125	120	1636	70	183	2164	336
Satd. Flow (prot)	0	3327	0	0	3234	0	1770	5055	0	1770	5085	1583
Flt Permitted		0.673			0.794		0.103			0.115		
Satd. Flow (perm)	0	2313	0	0	2591	0	192	5055	0	214	5085	1583
Satd. Flow (RTOR)		37			136			11				365
Adj. Flow (vph)	316	70	91	45	80	136	130	1778	76	199	2352	365
Lane Group Flow (vph)	0	477	0	0	261	0	130	1854	0	199	2352	365
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		8
Total Split (s)	23.5	23.5		23.5	23.5		9.5	38.1		13.4	42.0	42.0
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	4.5
Act Effect Green (s)		19.4			19.4		43.0	33.7		42.1	39.0	39.0
Actuated g/C Ratio		0.26			0.26		0.57	0.45		0.56	0.52	0.52
v/c Ratio		1.02dl			0.34		0.60	0.81		0.68	0.89	0.37
Control Delay		33.4			12.4		27.5	11.8		25.1	22.4	2.4
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		33.4			12.4		27.5	11.8		25.1	22.4	2.4
LOS		C			B		C	B		C	C	A
Approach Delay		33.4			12.4			12.9			20.1	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 18.3

Intersection LOS: B

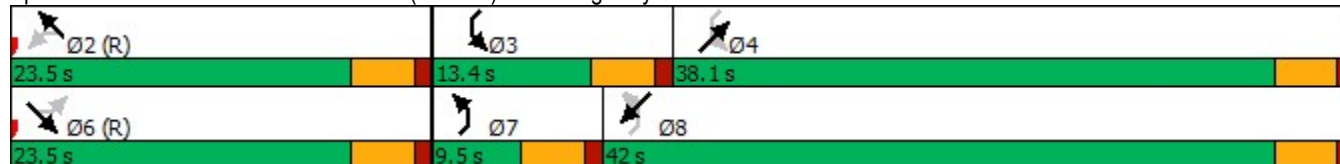
Intersection Capacity Utilization 86.8%

ICU Level of Service E

Analysis Period (min) 15

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 18: E Parkwood Dr (FM 528) & Winding Way Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	430	132	258	188	132	50	212	1778	120	50	1474	448
Future Volume (vph)	430	132	258	188	132	50	212	1778	120	50	1474	448
Satd. Flow (prot)	1770	1863	1583	1770	1786	0	1770	5085	1583	1770	5085	1583
Flt Permitted	0.595			0.658			0.116			0.099		
Satd. Flow (perm)	1108	1863	1583	1226	1786	0	216	5085	1583	184	5085	1583
Satd. Flow (RTOR)			278		24				88			487
Adj. Flow (vph)	467	143	280	204	143	54	230	1933	130	54	1602	487
Lane Group Flow (vph)	467	143	280	204	197	0	230	1933	130	54	1602	487
Turn Type	Perm	NA	Perm	Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6		6	2			8		4	4		8
Total Split (s)	47.5	47.5	47.5	47.5	47.5		14.4	43.0	43.0	9.5	38.1	38.1
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	43.0	43.0	43.0	43.0	43.0		43.5	40.4	40.4	44.4	33.6	33.6
Actuated g/C Ratio	0.43	0.43	0.43	0.43	0.43		0.44	0.40	0.40	0.44	0.34	0.34
v/c Ratio	0.98	0.18	0.33	0.39	0.25		0.93	0.94	0.19	0.34	0.94	0.57
Control Delay	66.8	18.4	3.4	22.3	16.9		67.0	40.0	8.6	30.1	44.1	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.8	18.4	3.4	22.3	16.9		67.0	40.0	8.6	30.1	44.1	5.2
LOS	E	B	A	C	B		E	D	A	C	D	A
Approach Delay		39.1			19.6			40.9			34.9	
Approach LOS		D			B			D			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 36.9

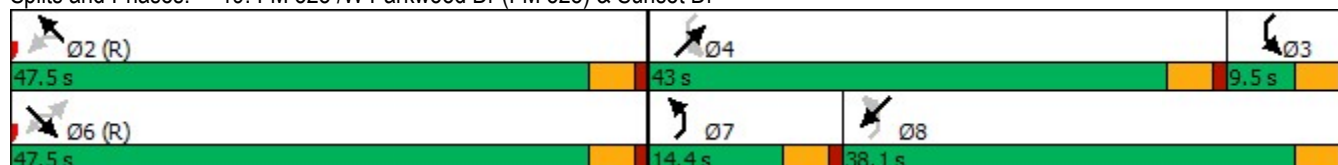
Intersection LOS: D

Intersection Capacity Utilization 89.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 19: FM 528 /W Parkwood Dr (FM 528) & Sunset Dr



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	199	1968	175	149	2346	15	109	82	148	27	127	214
Future Volume (vph)	199	1968	175	149	2346	15	109	82	148	27	127	214
Satd. Flow (prot)	1770	5024	0	1770	5080	0	0	1811	1583	0	1846	1583
Flt Permitted	0.086			0.084				0.640			0.921	
Satd. Flow (perm)	160	5024	0	156	5080	0	0	1192	1583	0	1716	1583
Satd. Flow (RTOR)		24			1				161			176
Adj. Flow (vph)	216	2139	190	162	2550	16	118	89	161	29	138	233
Lane Group Flow (vph)	216	2329	0	162	2566	0	0	207	161	0	167	233
Turn Type	D.P+P	NA		D.P+P	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	8			4			2		2	6		6
Total Split (s)	14.0	51.6		13.4	51.0		25.0	25.0	25.0	25.0	25.0	25.0
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	4.5
Act Effect Green (s)	55.8	47.6		55.8	46.5			20.5	20.5		20.5	20.5
Actuated g/C Ratio	0.62	0.53		0.62	0.52			0.23	0.23		0.23	0.23
v/c Ratio	0.82	0.87		0.66	0.97			0.76	0.33		0.43	0.47
Control Delay	43.7	23.1		28.7	34.5			52.4	7.0		33.7	12.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	43.7	23.1		28.7	34.5			52.4	7.0		33.7	12.1
LOS	D	C		C	C			D	A		C	B
Approach Delay		24.8			34.2			32.5			21.1	
Approach LOS		C			C			C			C	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 89.8

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 29.3

Intersection LOS: C

Intersection Capacity Utilization 90.2%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 20: Falcon Ridge Blvd/Briar Creek Dr & W Parkwood Dr (FM 528)

 Ø2	 Ø3	 Ø4
25 s	13.4 s	51.6 s
 Ø6	 Ø7	 Ø8
25 s	14 s	51 s

												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	77	1	8	42	13	128	14	1733	53	206	1916	158
Future Volume (vph)	77	1	8	42	13	128	14	1733	53	206	1916	158
Satd. Flow (prot)	0	1759	0	0	1669	0	1770	3525	0	1770	3500	0
Flt Permitted		0.431			0.917		0.059			0.070		
Satd. Flow (perm)	0	792	0	0	1548	0	110	3525	0	130	3500	0
Satd. Flow (RTOR)		5			103			5			16	
Adj. Flow (vph)	84	1	9	46	14	139	15	1884	58	224	2083	172
Lane Group Flow (vph)	0	94	0	0	199	0	15	1942	0	224	2255	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases	6			2			8			4		
Total Split (s)	23.4	23.4		23.4	23.4		9.6	61.4		15.2	67.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		18.9			18.9		70.3	56.9		67.6	68.3	
Actuated g/C Ratio		0.19			0.19		0.70	0.57		0.68	0.68	
v/c Ratio		0.61			0.53		0.09	0.97		0.85	0.94	
Control Delay		54.1			23.4		5.2	35.2		60.5	25.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		54.1			23.4		5.2	35.2		60.5	25.1	
LOS		D			C		A	D		E	C	
Approach Delay		54.1			23.4			35.0			28.3	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 31.4

Intersection LOS: C

Intersection Capacity Utilization 88.3%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 21: San Joaquin Pkwy/Cypress Point Dr & W Parkwood Dr (FM 528)



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	13	22	2	2	18	7	1653	20	29	1520	222
Future Volume (vph)	186	13	22	2	2	18	7	1653	20	29	1520	222
Satd. Flow (prot)	0	1763	0	0	1646	0	1770	3532	0	1770	3472	0
Flt Permitted		0.743			0.977		0.069			0.074		
Satd. Flow (perm)	0	1365	0	0	1614	0	129	3532	0	138	3472	0
Satd. Flow (RTOR)		6			20			2			31	
Adj. Flow (vph)	202	14	24	2	2	20	8	1797	22	32	1652	241
Lane Group Flow (vph)	0	240	0	0	24	0	8	1819	0	32	1893	0
Turn Type	Perm	NA		Perm	NA		D.P+P	NA		D.P+P	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6			2		
Total Split (s)	23.0	23.0		23.0	23.0		9.6	57.4		9.6	57.4	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)		17.7			17.7		62.4	57.6		60.6	61.4	
Actuated g/C Ratio		0.20			0.20		0.69	0.64		0.67	0.68	
v/c Ratio		0.88			0.07		0.04	0.80		0.17	0.80	
Control Delay		66.9			15.0		4.9	17.1		9.8	14.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		66.9			15.0		4.9	17.1		9.8	14.4	
LOS		E			B		A	B		A	B	
Approach Delay		66.9			15.0			17.1			14.3	
Approach LOS		E			B			B			B	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBSB and 6:NBSB, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 18.7

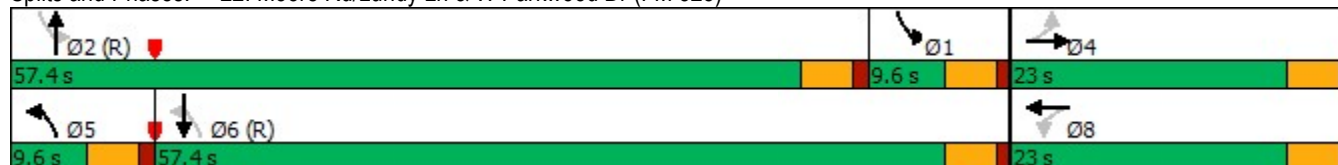
Intersection LOS: B

Intersection Capacity Utilization 75.6%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 22: Moore Rd/Lundy Ln & W Parkwood Dr (FM 528)



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	61	95	63	38	138	62	53	493	55	53	740	131
Future Volume (vph)	61	95	63	38	138	62	53	493	55	53	740	131
Satd. Flow (prot)	1770	3327	0	1770	3376	0	1770	3486	0	1770	3458	0
Flt Permitted	0.616			0.644			0.245			0.395		
Satd. Flow (perm)	1147	3327	0	1200	3376	0	456	3486	0	736	3458	0
Satd. Flow (RTOR)		68			67			31			53	
Adj. Flow (vph)	66	103	68	41	150	67	58	536	60	58	804	142
Lane Group Flow (vph)	66	171	0	41	217	0	58	596	0	58	946	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Act Effect Green (s)	18.1	18.1		18.1	18.1		16.3	16.3		16.3	16.3	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.38	0.38		0.38	0.38	
v/c Ratio	0.14	0.12		0.08	0.15		0.34	0.45		0.21	0.71	
Control Delay	9.5	5.8		9.0	6.4		16.0	10.7		11.2	14.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.5	5.8		9.0	6.4		16.0	10.7		11.2	14.2	
LOS	A	A		A	A		B	B		B	B	
Approach Delay		6.9			6.8			11.2			14.0	
Approach LOS		A			A			B			B	

Intersection Summary

Cycle Length: 45

Actuated Cycle Length: 43.4

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 11.5

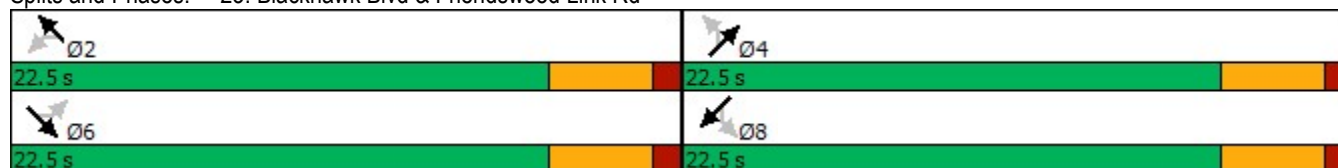
Intersection LOS: B

Intersection Capacity Utilization 53.8%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 23: Blackhawk Blvd & Friendswood Link Rd



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	22	668	7	7	627	66	10	3	9	104	7	53
Future Volume (vph)	22	668	7	7	627	66	10	3	9	104	7	53
Satd. Flow (prot)	1770	1859	0	1770	1837	0	0	1720	0	0	1726	0
Flt Permitted	0.215			0.256				0.887			0.794	
Satd. Flow (perm)	400	1859	0	477	1837	0	0	1560	0	0	1414	0
Satd. Flow (RTOR)		1			10			10			37	
Adj. Flow (vph)	24	726	8	8	682	72	11	3	10	113	8	58
Lane Group Flow (vph)	24	734	0	8	754	0	0	24	0	0	179	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	32.8		9.6	32.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	43.2	42.1		42.3	40.0			11.9			11.9	
Actuated g/C Ratio	0.66	0.65		0.65	0.62			0.18			0.18	
v/c Ratio	0.06	0.61		0.02	0.66			0.08			0.62	
Control Delay	5.1	13.2		5.1	16.1			15.0			28.0	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.1	13.2		5.1	16.1			15.0			28.0	
LOS	A	B		A	B			B			C	
Approach Delay		12.9			16.0			15.0			28.0	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 65

Actuated Cycle Length: 65

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 15.9

Intersection LOS: B

Intersection Capacity Utilization 58.3%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 24: Cowards Creek Dr/W Spreading Oaks Block & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	9	583	179	32	547	4	159	7	40	6	3	6
Future Volume (vph)	9	583	179	32	547	4	159	7	40	6	3	6
Satd. Flow (prot)	1770	1798	0	1770	1861	0	0	1747	0	0	1723	0
Flt Permitted	0.345			0.175				0.764			0.900	
Satd. Flow (perm)	643	1798	0	326	1861	0	0	1386	0	0	1583	0
Satd. Flow (RTOR)		30			1			15			7	
Adj. Flow (vph)	10	634	195	35	595	4	173	8	43	7	3	7
Lane Group Flow (vph)	10	829	0	35	599	0	0	224	0	0	17	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Total Split (s)	9.6	42.8		9.6	42.8		22.6	22.6		22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Act Effect Green (s)	48.9	46.9		49.8	48.8			15.3			15.3	
Actuated g/C Ratio	0.65	0.63		0.66	0.65			0.20			0.20	
v/c Ratio	0.02	0.73		0.11	0.49			0.76			0.05	
Control Delay	5.1	17.3		5.7	10.0			43.3			17.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	
Total Delay	5.1	17.3		5.7	10.0			43.3			17.6	
LOS	A	B		A	B			D			B	
Approach Delay		17.2			9.8			43.3			17.6	
Approach LOS		B			A			D			B	

Intersection Summary

Cycle Length: 75

Actuated Cycle Length: 75

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.76

Intersection Signal Delay: 17.9

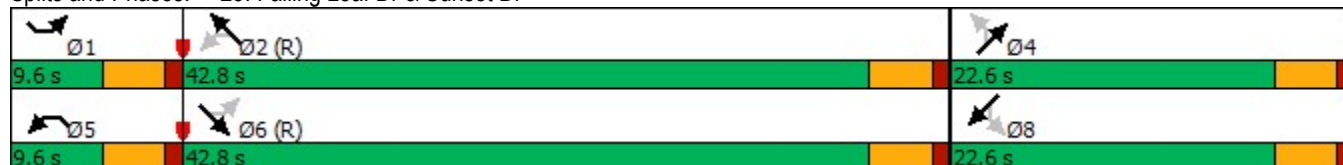
Intersection LOS: B

Intersection Capacity Utilization 67.4%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 25: Falling Leaf Dr & Sunset Dr



												
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	23	504	77	46	482	52	70	75	66	74	128	33
Future Volume (vph)	23	504	77	46	482	52	70	75	66	74	128	33
Satd. Flow (prot)	1770	1825	0	1770	1835	0	0	1820	1583	0	1800	0
Flt Permitted	0.344			0.226				0.700			0.842	
Satd. Flow (perm)	641	1825	0	421	1835	0	0	1304	1583	0	1539	0
Satd. Flow (RTOR)		15			11				109		14	
Adj. Flow (vph)	25	548	84	50	524	57	76	82	72	80	139	36
Lane Group Flow (vph)	25	632	0	50	581	0	0	158	72	0	255	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4		4	8		
Total Split (s)	9.6	27.8		9.6	27.8		22.6	22.6	22.6	22.6	22.6	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5	4.5		4.5	
Act Effect Green (s)	34.2	30.8		36.1	35.1			14.0	14.0		14.0	
Actuated g/C Ratio	0.57	0.51		0.60	0.58			0.23	0.23		0.23	
v/c Ratio	0.05	0.67		0.13	0.54			0.52	0.16		0.69	
Control Delay	6.2	19.4		6.6	13.0			25.5	2.7		29.4	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	6.2	19.4		6.6	13.0			25.5	2.7		29.4	
LOS	A	B		A	B			C	A		C	
Approach Delay		18.9			12.5			18.4			29.4	
Approach LOS		B			B			B			C	

Intersection Summary

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 18.1

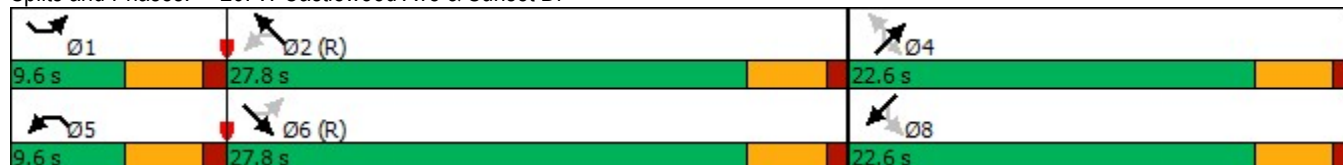
Intersection LOS: B

Intersection Capacity Utilization 65.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 26: W Castlewood Ave & Sunset Dr



												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	56	245	23	35	186	64	9	67	17	67	107	65
Future Volume (Veh/h)	56	245	23	35	186	64	9	67	17	67	107	65
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	266	25	38	202	70	10	73	18	73	116	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)	4											
Median type	None				None							
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	272			291			636	748	146	622	726	136
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	272			291			636	748	146	622	726	136
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			97			96	77	98	74	64	92
cM capacity (veh/h)	1288			1268			228	313	875	281	323	888
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	SW 1						
Volume Total	194	158	139	171	101	260						
Volume Left	61	0	38	0	10	73						
Volume Right	0	25	0	70	18	71						
cSH	1288	1700	1268	1700	340	422						
Volume to Capacity	0.05	0.09	0.03	0.10	0.30	0.62						
Queue Length 95th (ft)	4	0	2	0	30	100						
Control Delay (s)	2.8	0.0	2.4	0.0	20.0	27.2						
Lane LOS	A		A		C	D						
Approach Delay (s)	1.5		1.1		20.0	27.2						
Approach LOS					C	D						
Intersection Summary												
Average Delay			9.7									
Intersection Capacity Utilization			43.3%		ICU Level of Service				A			
Analysis Period (min)			15									

												
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	95	300	29	1	235	20	30	0	84	21	0	1
Future Volume (Veh/h)	95	300	29	1	235	20	30	0	84	21	0	1
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	326	32	1	255	22	33	0	91	23	0	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	277			358			678	827	179	728	832	138
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	277			358			678	827	179	728	832	138
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			100			90	100	89	91	100	100
cM capacity (veh/h)	1283			1197			317	281	833	260	279	884
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	SW 1						
Volume Total	266	195	128	150	124	24						
Volume Left	103	0	1	0	33	23						
Volume Right	0	32	0	22	91	1						
cSH	1283	1700	1197	1700	581	268						
Volume to Capacity	0.08	0.11	0.00	0.09	0.21	0.09						
Queue Length 95th (ft)	7	0	0	0	20	7						
Control Delay (s)	3.6	0.0	0.1	0.0	12.9	19.8						
Lane LOS	A		A		B	C						
Approach Delay (s)	2.1		0.0		12.9	19.8						
Approach LOS					B	C						
Intersection Summary												
Average Delay			3.4									
Intersection Capacity Utilization			35.4%		ICU Level of Service		A					
Analysis Period (min)			15									

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	39	53	29	21	93	29	35	207	14	34	227	30
Future Volume (vph)	39	53	29	21	93	29	35	207	14	34	227	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	42	58	32	23	101	32	38	225	15	37	247	33
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1					
Volume Total (vph)	100	32	124	32	263	15	317					
Volume Left (vph)	42	0	23	0	38	0	37					
Volume Right (vph)	0	32	0	32	0	15	33					
Hadj (s)	0.24	-0.67	0.13	-0.67	0.11	-0.67	-0.01					
Departure Headway (s)	6.7	5.8	6.6	5.8	5.9	5.2	5.8					
Degree Utilization, x	0.19	0.05	0.23	0.05	0.43	0.02	0.51					
Capacity (veh/h)	487	556	501	564	571	659	597					
Control Delay (s)	10.1	7.9	10.3	7.9	12.2	7.1	14.7					
Approach Delay (s)	9.6		9.8		11.9		14.7					
Approach LOS	A		A		B		B					
Intersection Summary												
Delay			12.2									
Level of Service			B									
Intersection Capacity Utilization			51.2%	ICU Level of Service				A				
Analysis Period (min)			15									

Appendix I

Local Street Condition Analysis

Summary of the Unsignalized “Existing & No-Build Year 2025” Traffic Operations

Analyses Years	Peak Period	LOS/Delay				
		Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave						
Existing	AM	A/5.8	D/31.1	C/18.8	A/0.2	A/3.0
	PM	A/6.8	B/14.9	C/17.8	A/1.1	A/1.6
Year 2025 No Build	AM	A/8.2	E/48.4	C/25.0	A/0.2	A/3.2
	PM	A/8.1	C/16.6	C/22.1	A/1.2	A/1.6
28. Greenbriar Dr at Wilderness Trail						
Existing	AM	A/2.6	B/13.9	-	A/1.2	A/0.0
	PM	A/2.9	B/11.5	-	A/2.9	A/0.0
Year 2025 No Build	AM	A/2.9	C/15.8	-	A/1.3	A/0.0
	PM	A/3.1	B/12.3	-	A/3.0	A/0.0
29. Greenbriar Dr at Briarmeadow Ave						
Existing	AM	A/3.0	-	B/14.5	A/0.0	A/3.5
	PM	A/2.9	-	B/10.7	A/0.0	A/2.3
Year 2025 No Build	AM	A/3.3	-	C/16.0	A/0.0	A/3.8
	PM	A/3.0	-	B/11.2	A/0.0	A/2.4
30. Falcon Ridge Blvd at Eagle Lakes Dr						
Existing	B/12.6	B/11.3	B/10.1	B/14.5	B/11.9	B/12.6
	A/9.2	A/8.7	A/8.8	A/9.3	A/9.4	A/9.2
Year 2025 No Build	C/15.1	B/12.8	B/11.0	C/18.5	B/13.8	C/15.1
	A/9.7	A/9.1	A/9.2	A/9.8	B/10.0	A/9.7

Summary of the Unsignalized “Existing & Build Year 2025 ” Traffic Operations

Analyses Years	LOS/Delay					
	Peak Period	Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave Unsignalized Intersection						
Existing	AM	A/5.8	D/31.1	C/18.8	A/0.2	A/3.0
	PM	A/6.8	B/14.9	C/17.8	A/1.1	A/1.6
Year 2025	AM	A/7.3	E/46.5	C/18.8	A/0.2	A/3.2
	PM	A/8.0	C/16.6	C/21.8	A/1.2	A/1.6
28. Greenbriar Dr at Wilderness Trail Unsignalized Intersection						
Existing	AM	A/2.6	B/13.9	-	A/1.2	A/0.0
	PM	A/2.9	B/11.5	-	A/2.9	A/0.0
Year 2025	AM	A/2.9	C/15.8	-	A/1.3	A/0.0
	PM	A/3.1	B/12.3	-	A/3.0	A/0.0
29. Greenbriar Dr at Briarmeadow Ave Unsignalized Intersection						
Existing	AM	A/3.0	-	B/14.5	A/0.0	A/3.5
	PM	A/2.9	-	B/10.7	A/0.0	A/2.3
Year 2025	AM	A/3.3	-	C/16.0	A/0.0	A/3.8
	PM	A/3.0	-	B/11.2	A/0.0	A/2.4
30. Falcon Ridge Blvd at Eagle Lakes Dr Unsignalized Intersection						
Existing	AM	B/12.6	B/11.3	B/10.1	B/14.5	B/11.9
	PM	A/9.2	A/8.7	A/8.8	A/9.3	A/9.4
Year 2025	AM	C/15.1	B/12.8	B/11.0	C/18.5	B/13.8
	PM	A/9.7	A/9.1	A/9.2	A/9.8	B/10.0

Summary of the Unsignalized “No-Build Year 2025 & No-Build Year 2030” Traffic Operations

Analyses Years	Peak Period	LOS/Delay				
		Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave						
Year 2025	AM	A/8.2	E/48.4	C/25.0	A/0.2	A/3.2
	PM	A/8.1	C/16.6	C/22.1	A/1.2	A/1.6
Year 2030	AM	B/12.2	F/79.6	D/33.9	A/0.3	A/3.5
	PM	A/9.7	C/18.2	D/27.4	A/1.2	A/1.7
28. Greenbriar Dr at Wilderness Trail						
Year 2025	AM	A/2.9	C/15.8	-	A/1.3	A/0.0
	PM	A/3.1	B/12.3	-	A/3.0	A/0.0
Year 2030	AM	A/3.2	C/17.5	-	A/1.3	A/0.0
	PM	A/3.2	B/12.9	-	A/3.1	A/0.0
29. Greenbriar Dr at Briarmeadow Ave						
Year 2025	AM	A/3.3	-	C/16.0	A/0.0	A/3.8
	PM	A/3.0	-	B/11.2	A/0.0	A/2.4
Year 2030	AM	A/3.6	-	C/17.7	A/0.0	A/4.0
	PM	A/3.1	-	B/11.6	A/0.0	A/2.5
30. Falcon Ridge Blvd at Eagle Lakes Dr						
Year 2025	AM	B/12.8	B/11.0	C/18.5	B/13.8	C/15.1
	PM	A/9.1	A/9.2	A/9.8	B/10.0	A/9.7
Year 2030	AM	C/19.4	B/14.8	B/12.2	D/25.9	C/16.5
	PM	B/10.3	A/9.4	A/9.6	B/10.4	B/10.8

Summary of Unsignalized “Build Year 2025 & Build Year 2030 ” Traffic Operations

Analyses Years	LOS/Delay					
	Peak Period	Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave Unsignalized Intersection						
Year 2025	AM	A/7.3	E/46.5	C/18.8	A/0.2	A/3.2
	PM	A/8.0	C/16.6	C/21.8	A/1.2	A/1.6
Year 2030	AM	B/10.4	F/75.0	C/21.6	A/0.3	A/3.5
	PM	A/8.4	C/18.1	C/22.4	A/1.2	A/1.7
28. Greenbriar Dr at Wilderness Trail Unsignalized Intersection						
Year 2025	AM	A/2.9	C/15.8	-	A/1.3	A/0.0
	PM	A/3.1	B/12.3	-	A/3.0	A/0.0
Year 2030	AM	A/3.2	C/17.5	-	A/1.3	A/0.0
	PM	A/3.2	B/12.9	-	A/3.1	A/0.0
29. Greenbriar Dr at Briarmeadow Ave Unsignalized Intersection						
Year 2025	AM	A/3.3	-	C/16.0	A/0.0	A/3.8
	PM	A/3.0	-	B/11.2	A/0.0	A/2.4
Year 2030	AM	A/3.6	-	C/17.7	A/0.0	A/4.0
	PM	A/3.1	-	B/11.6	A/0.0	A/2.5
30. Falcon Ridge Blvd at Eagle Lakes Dr Unsignalized Intersection						
Year 2025	AM	C/15.1	B/12.8	B/11.0	C/18.5	B/13.8
	PM	A/9.7	A/9.1	A/9.2	A/9.8	B/10.0
Year 2030	AM	C/19.4	B/14.8	B/12.2	D/25.9	C/16.5
	PM	B/10.3	A/9.4	A/9.6	B/10.4	B/10.8

Summary of the Unsignalized “No-Build Year 2030 & No-Build Year 2040” Traffic Operations

Analyses Years	Peak Period	LOS/Delay				
		Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave						
Year 2030 No Build	AM	B/12.2	F/79.6	D/33.9	A/0.3	A/3.5
	PM	A/9.7	C/18.2	D/27.4	A/1.2	A/1.7
Year 2040 No Build	AM	C/24.6	F/173.5	F/68.4	A/0.3	A/3.8
	PM	B/13.4	C/21.1	E/40.6	A/1.2	A/1.7
28. Greenbriar Dr at Wilderness Trail						
Year 2030 No Build	AM	A/3.2	C/17.5	-	A/1.3	A/0.0
	PM	A/3.2	B/12.9	-	A/3.1	A/0.0
Year 2040 No Build	AM	A/3.8	C/21.0	-	A/1.5	A/0.0
	PM	A/3.4	B/14.0	-	A/0.0	A/3.2
29. Greenbriar Dr at Briarmeadow Ave						
Year 2030 No Build	AM	A/3.6	-	C/17.7	A/0.0	A/4.0
	PM	A/3.1	-	B/11.6	A/0.0	A/2.5
Year 2040 No Build	AM	A/4.1	-	C/21.0	A/4.3	A/0.0
	PM	A/3.3	-	B/12.3	A/0.0	A/2.6
30. Falcon Ridge Blvd at Eagle Lakes Dr						
Year 2030 No Build	AM	C/19.4	B/14.8	B/12.2	D/25.9	C/16.5
	PM	B/10.3	A/9.4	A/9.6	B/10.4	B/10.8
Year 2040 No Build	AM	E/41.2	C/20.4	B/14.9	F/69.9	D/26.2
	PM	B/11.6	A/10.2	A/10.5	B/11.8	B/12.4

Summary of Unsignalized “Build Year 2030 & Build Year 2040 ” Traffic Operations

Analyses Years	LOS/Delay					
	Peak Period	Overall	EB	WB	NB	SB
27. Greenbriar Dr at W. Castlewood Ave Unsignalized Intersection						
Year 2030	AM	B/10.4	F/75.0	C/21.6	A/0.3	A/3.5
	PM	A/8.4	C/18.1	C/22.4	A/1.2	A/1.7
Year 2040	AM	B/13.2	F/106.9	C/22.8	A/0.4	A/3.1
	PM	A/9.7	C/20.0	D/27.2	A/1.1	A/1.5
29. Greenbriar Dr at Wilderness Trail/Briarmeadow Ave Unsignalized Intersection						
Intersections were separate under Year 2030 analysis						
Year 2040	AM	A/9.0	E/40.4	C/21.6	A/1.2	A/3.1
	PM	A/3.3	B/12.9	C/17.8	A/0.0	A/1.9
30. Falcon Ridge Blvd at Eagle Lakes Dr Unsignalized Intersection						
Year 2030	AM	C/19.4	B/14.8	B/12.2	D/25.9	C/16.5
	PM	B/10.3	A/9.4	A/9.6	B/10.4	B/10.8
Year 2040	AM	D/28.2	B/13.6	B/11.7	E/41.1	D/27.8
	PM	B/12.2	A/9.4	A/9.8	B/11.9	B/14.7

Appendix J

Public Meeting Comments August 14, 2019

City of Friendswood Traffic Study					
8/14/2019 Public Meeting #1 Comments - Friendswood Texas					
Commenter Number	Date Received	Source	Representing	Comment	Response
1	8/14/2019	Comment Card	Family	Dual left turn lanes on 518 & 528 (Middle lane). Need a light at 518 and Back of the school. Very dangerous intersection. Centennial Park Light 2 left turn lanes at 518 and 528 possible light at 518 and Leisure Lane to prevent traffic from flowing into subdivisions on Winding Way.	The comments will be study and implemented if needed.
2	8/14/2019	Comment Card	Family	FM 528 at FM 518 both directions: make right lane RIGHT TURN ONLY, center lane STRAIGHT ONLY and left lane LEFT TURN ONLY. FM 518 from Pearland at FM 2351: Remove grass median and lengthen the left turn lane to accommodate more than 4-5 cars (This is a horrible bottle neck) Room for about 150 more storage. FM 2351 westbound after 518: Add signs and arrows on pavement indicaitng RIGHT ENDS 500'. Sunset and FM 528 facing HEB : MAKE RIGHT LANE right turn only. Left lane left turn or straight. 518 north at 528 by Jack in the box: Finish making right turn lane Looks like they started a right turn/yiel but stopped. FM 528 at FM 518 both directions: make right lane RIGHT TURN ONLY, center lane STRAIGHT ONLY AHEAD 500' in advance. Bay Area Blvd at FM 528, both directions: make right lane RIGHT TURN ONLY. FM 528 westbound at SUnset (by HEB):: Add signs and arrows on pavement indicating RIGHT LANE TURN ONLY AHEAD 500' in advance. Birar Creek at FM 528 across Falcon Ridge: Paint approach signifying two lanes and make right lane a RIGHT TURN ONLY. Left lane straight or left turn. Work with citizen group to do study on traffic light settings and adding sensors at key intersections.	The comments will be study and implemented if needed.
3	8/14/2019	Comment Card	Family	528/518 Right hand turn from 518 to 528, in front of Jack in the box. Need paint and remove barriers.	
4	8/14/2019	Comment Card	Family	1- The light to get off Spreading Oaks to turn onto 518 takes too long. 2- Proposed livable cneter will just increase traffic to residentail lots. Friendswood residents are not going to walk. 3- Increase timeline on Friendswood Parkway to decrease traffic through 518.	
5	8/14/2019	Comment Card	Family	1-Winding way needs a right turn lane northbound at FM 528 2- Remove the concrete islands on FM 518 south of FM 528 and replace them with a right/left turn lane rounded with yellow striping 3- Remove medians/islands for road widening 4- Add a right turn lane on FM 518 at FM 528 northbound	The comments will be study and implemented if needed.
6	8/14/2019	Comment Card	Friendswood Lakes resident	2040 is a long time to wait for Friendswood Lakes Boulevard currently 3 neighborhoods are using Stoney Lanes/Sandy Lake and Pampas trails as a cut through to 518/ Junior High. During my own traffic study I found that 25-28 cars passed my house in 10 minutes. This is not sustainable and very dangerous for emergencies. Currently Streling creeks is continuing to build its just going worse and more dangerous. 100 k hourses at these streets Soney Lakes Drive, Pampas Trails and Sandy Lake Drive.	Friendswood Lakes expansion will be implemented by the Year 2025.
7	8/14/2019	Comment Card	Heritage Park Area	Great info and plans based on consultants work. Additional consideration must be given to Beamer as it goes south past FM 2351. While it may be outside of Friendswood city limits the overflow traffic leading from IH-45 towards Friendswood is utilizing a "shortcut" via Rex Road.This added traffic along with the laydown area used by the TxDOT contractors is creating a safety issue not only for traffic flow, but also for road hazards due to increased and non-maintained road conditions on Rex Road. My hope is that Beamer expansion to El Dorado will be a timely and cooperative activity between the City and the County.	Agency coordination will be recommended at the FM 2351 at Beamer intersection

Appendix K

“Year 2025” Benefit-Cost Analysis

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 518
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	22,866

2018 Peak Period traffic Volume	2,113
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$26,161

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$33,398

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	33,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$14,929

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	1.93
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,700
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$760

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1674
Estimated Average Travel Time without project (in Hrs)	0.2021
Estimate Average Delay without project (in Hrs)	0.0346
Estimate Delay Reduced	0.0069
Estimated Delay with project	0.0277
Average Peak Travel Time with project	0.1951

Daily Travel Demand	
2018 ADT	22866

2018 Peak Period Traffic Volume	9,832
Peak Period Traffic Volume in Year Open to Traffic	2,380

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	464	481

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	9,832
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Roadway Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$1,143

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1343
Estimated Average Travel Time without project (in Hrs)	0.1852
Estimate Average Delay without project (in Hrs)	0.0509
Estimate Delay Reduced	0.0102
Estimated Delay with project	0.0407
Average Peak Travel Time with project	0.1750

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,437

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	601	636

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$2,428

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0760
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0253
Estimate Delay Reduced	0.0051
Estimated Delay with project	0.0203
Average Peak Travel Time with project	0.0963

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,547

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	245	258

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	33,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$895

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0869
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0145
Estimate Delay Reduced	0.0029
Estimated Delay with project	0.0116
Average Peak Travel Time with project	0.0984

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	255

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	25	26

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,700
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$51

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	6
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	22,866
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	25,751
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	32,365

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$4,909
Discounted VOC Benefits @ 7% (2018 \$)	\$835

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$5,743

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.89
VOC Emission Reductions (tons)	1.27

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	5
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$8,564
Discounted VOC Benefits @ 7% (2018 \$)	\$1,773

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$10,337

Total Emissions Reductions	
NOx Emission Reductions (tons)	3.30
VOC Emission Reductions (tons)	2.69

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$4,058
Discounted VOC Benefits @ 7% (2018 \$)	\$840

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$4,898

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.56
VOC Emission Reductions (tons)	1.27

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$216
Discounted VOC Benefits @ 7% (2018 \$)	\$37

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$253

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.08
VOC Emission Reductions (tons)	0.06

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	W. Castlewood
Limits (From)	Greenbriar Dr
Limits (To)	W. Castlewood
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$18

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	W. Castlewood Ave
Limits (From)	W. Castlewood Ave
Limits (To)	Greenbriar Dr
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	255

Estimated Free Flow Speed before improvement	30
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,400
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,400

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0013
Estimated Average Travel Time without project (in Hrs)	0.0016
Estimate Average Delay without project (in Hrs)	0.0003
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0002
Average Peak Travel Time with project	0.0015

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	0	0

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$2

INPUTS

Project Information	
Name:	Greenbriar Dr at W. Castlewood Ave
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

- Data entered by the sponsors
- Data populated/calculated based on inputs
- HGAC regional travel demand model data provided by HGAC
- Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	30
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$8
Discounted VOC Benefits @ 7% (2018 \$)	\$0

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$9

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.00
VOC Emission Reductions (tons)	0.00

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Install Pavement Markings
Work Type Code	401
Appropriate Crash Reduction Factor (%):	20%
Service Life (years):	2

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	13,400
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	13,400
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	13,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$44

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset
Limits (From)	FM 528
Limits (To)	Sunset
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,547

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	13,200
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	13,200
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	13,200

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0011
Estimated Average Travel Time without project (in Hrs)	0.0013
Estimate Average Delay without project (in Hrs)	0.0002
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0001
Average Peak Travel Time with project	0.0013

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	3	3

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$10

INPUTS

Project Information	
Name:	FM 528 at Sunset Dr
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$117
Discounted VOC Benefits @ 7% (2018 \$)	\$20

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$137

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.05
VOC Emission Reductions (tons)	0.03

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Greenbriar
Limits (From)	Falling Leaf
Limits (To)	W. Castlewood
Length (in Miles)	0.19
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Widen Lane(s)
Work Type Code	502
Appropriate Crash Reduction Factor (%):	30%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$160

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Greenbriar
Limits (From)	Falling Leaf
Limits (To)	W. Castlewood
Length (in Miles)	0.19
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	255

Estimated Free Flow Speed before improvement	30
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,400
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,400

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0063
Estimated Average Travel Time without project (in Hrs)	0.0076
Estimate Average Delay without project (in Hrs)	0.0013
Estimate Delay Reduced	0.0005
Estimated Delay with project	0.0008
Average Peak Travel Time with project	0.0071

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	2	2

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$9

INPUTS

Project Information	
Name:	Greenbriar Widening
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	30
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$39
Discounted VOC Benefits @ 7% (2018 \$)	\$2

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$41

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.00

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Greenbriar
Limits (From)	Falling Leaf
Limits (To)	W. Castlewood
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Left Turn Lane
Work Type Code	519
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$36

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Greenbriar
Limits (From)	Falling Leaf
Limits (To)	W. Castlewood
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	255

Estimated Free Flow Speed before improvement	30
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,400
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,400

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0027
Estimated Average Travel Time without project (in Hrs)	0.0032
Estimate Average Delay without project (in Hrs)	0.0005
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0030

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	1	1

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$4

INPUTS

Project Information	
Name:	Greenbriar Dr
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	30
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$16
Discounted VOC Benefits @ 7% (2018 \$)	\$1

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$17

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.00

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Bay Area Blvd
Limits (From)	500 feet N of the intersection
Limits (To)	500 feet S of the intersection
Length (in Miles)	0.38
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	36,000
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$4,722

INPUTS

Project Information	
Name:	Bay Area Blvd
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$169
Discounted VOC Benefits @ 7% (2018 \$)	\$96

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$265

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.06
VOC Emission Reductions (tons)	0.15

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Bay Area
Limits (From)	500 feet N of the intersection
Limits (To)	500 feet S of the intersection
Length (in Miles)	0.38
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

Data entered by the sponsors

HGAC regional travel demand model data provided by HGAC

Data populated/calculated based on inputs

Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,437

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	36,000
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0084
Estimated Average Travel Time without project (in Hrs)	0.0109
Estimate Average Delay without project (in Hrs)	0.0024
Estimate Delay Reduced	0.0010
Estimated Delay with project	0.0014
Average Peak Travel Time with project	0.0099

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	34	37

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$230

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Greenbriar
Limits (From)	Falling Leaf
Limits (To)	W. Castlewood
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Left Turn Lane
Work Type Code	519
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$36

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 528
Limits (To)	Bay Area Blvd
Length (in Miles)	0.09
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,437

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	36,000
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0020
Estimated Average Travel Time without project (in Hrs)	0.0026
Estimate Average Delay without project (in Hrs)	0.0006
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0023

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	8	9

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$54

INPUTS

Project Information	
Name:	Bay Area Blvd
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$35
Discounted VOC Benefits @ 7% (2018 \$)	\$20

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$56

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.03

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Left Turn Lane
Work Type Code	519
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$777

INPUTS

Project Information	
Name:	FM 518 at FM 528
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$238
Discounted VOC Benefits @ 7% (2018 \$)	\$67

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$305

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.09
VOC Emission Reductions (tons)	0.10

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.15
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,437

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0033
Estimated Average Travel Time without project (in Hrs)	0.0050
Estimate Average Delay without project (in Hrs)	0.0017
Estimate Delay Reduced	0.0007
Estimated Delay with project	0.0010
Average Peak Travel Time with project	0.0043

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	15	17

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$159

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$283

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Lengthen Left Turn Lane
Work Type Code	520
Appropriate Crash Reduction Factor (%):	40%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$714

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Harris
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,547

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	30,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0020
Estimated Average Travel Time without project (in Hrs)	0.0023
Estimate Average Delay without project (in Hrs)	0.0003
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0002
Average Peak Travel Time with project	0.0022

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	6	6

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$15

INPUTS

Project Information	
Name:	FM 2351 at FM 518
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$50
Discounted VOC Benefits @ 7% (2018 \$)	\$14

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$64

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.02
VOC Emission Reductions (tons)	0.02

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$279

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,547

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	30,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0011
Estimated Average Travel Time without project (in Hrs)	0.0017
Estimate Average Delay without project (in Hrs)	0.0006
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0014

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	4	4

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$39

INPUTS

Project Information	
Name:	FM 2351 at FM 518
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2025
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$23
Discounted VOC Benefits @ 7% (2018 \$)	\$6

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$29

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.01

Appendix L

“Year 2030” Benefit-Cost Analysis

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 518
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	22,866

2018 Peak Period traffic Volume	2,113
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$19,749

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$25,213

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	33,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$11,271

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	1.93
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,700
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$573

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1674
Estimated Average Travel Time without project (in Hrs)	0.2021
Estimate Average Delay without project (in Hrs)	0.0346
Estimate Delay Reduced	0.0069
Estimated Delay with project	0.0277
Average Peak Travel Time with project	0.1951

Daily Travel Demand	
2018 ADT	22866

2018 Peak Period Traffic Volume	9,832
Peak Period Traffic Volume in Year Open to Traffic	2,520

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	492	509

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	9,832
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Roadway Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$967

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1343
Estimated Average Travel Time without project (in Hrs)	0.1852
Estimate Average Delay without project (in Hrs)	0.0509
Estimate Delay Reduced	0.0102
Estimated Delay with project	0.0407
Average Peak Travel Time with project	0.1750

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,639

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	637	674

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$2,053

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0760
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0253
Estimate Delay Reduced	0.0051
Estimated Delay with project	0.0203
Average Peak Travel Time with project	0.0963

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,697

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	260	273

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	33,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$757

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0869
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0145
Estimate Delay Reduced	0.0029
Estimated Delay with project	0.0116
Average Peak Travel Time with project	0.0984

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	270

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	27	27

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,700
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$43

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	6
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	22,866
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	25,751
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	32,365

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$3,690
Discounted VOC Benefits @ 7% (2018 \$)	\$627

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$4,317

Total Emissions Reductions	
NOx Emission Reductions (tons)	2.00
VOC Emission Reductions (tons)	1.34

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	5
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$6,437
Discounted VOC Benefits @ 7% (2018 \$)	\$1,333

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$7,770

Total Emissions Reductions	
NOx Emission Reductions (tons)	3.49
VOC Emission Reductions (tons)	2.85

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$3,050
Discounted VOC Benefits @ 7% (2018 \$)	\$632

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$3,682

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.66
VOC Emission Reductions (tons)	1.35

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$162
Discounted VOC Benefits @ 7% (2018 \$)	\$28

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$190

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.09
VOC Emission Reductions (tons)	0.06

INPUTS

Project Information	
Project Title:	FM 528 at Sunset Drive--SB Dual Left-Turn Lanes
County	Galveston
Facility Type	Non-Freeway
Street Name:	Sunset Dr
Limits (From)	FM 528
Limits (To)	FM 528
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$469

INPUTS

Project Identification	
Project Title:	FM 528 at Sunset Dr SB Dual Left-Turn Lane
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset Dr
Limits (From)	FM 528
Limits (To)	FM 528
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0013
Estimated Average Travel Time without project (in Hrs)	0.0017
Estimate Average Delay without project (in Hrs)	0.0005
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0015

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,639

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	6	6

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$38

INPUTS

Project Information	
Name:	FM 528 at Sunset Dr
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,287
Discounted VOC Benefits @ 7% (2018 \$)	\$267

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,554

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.70
VOC Emission Reductions (tons)	0.57

INPUTS

Project Information	
Project Title:	FM 528 at Winding Way Dr-- NB Right-Turn Lane
County	Galveston
Facility Type	Non-Freeway
Street Name:	Winding Way Dr
Limits (From)	FM 528
Limits (To)	FM 528
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$375

INPUTS

Project Identification	
Project Title:	FM 528 at Winding Way--NB Right-Turn Lane
County	Galveston
Facility Type	Non Freeway
Street Name:	Winding Way Dr
Limits (From)	FM 528
Limits (To)	FM 528
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0010
Estimated Average Travel Time without project (in Hrs)	0.0014
Estimate Average Delay without project (in Hrs)	0.0004
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0002
Average Peak Travel Time with project	0.0012

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,639

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	4	5

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$31

INPUTS

Project Information	
Name:	FM 528 at Winding Way Dr
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,287
Discounted VOC Benefits @ 7% (2018 \$)	\$267

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,554

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.70
VOC Emission Reductions (tons)	0.57

INPUTS

Project Information	
Project Title:	FM 518 at FM 528
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 518
Length (in Miles)	0.13
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Left Turn Lane
Work Type Code	519
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$694

INPUTS

Project Identification	
Project Title:	FM 518 at FM 528 EB and WB Dual Left-Turn Lanes
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 518
Length (in Miles)	0.13
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0033
Estimated Average Travel Time without project (in Hrs)	0.0045
Estimate Average Delay without project (in Hrs)	0.0012
Estimate Delay Reduced	0.0004
Estimated Delay with project	0.0009
Average Peak Travel Time with project	0.0041

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,639

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	15	16

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$75

INPUTS

Project Information	
Name:	FM 518 at FM 528
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,287
Discounted VOC Benefits @ 7% (2018 \$)	\$267

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,554

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.70
VOC Emission Reductions (tons)	0.57

INPUTS

Project Information	
Project Title:	FM 2351 at Beamer Rd
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	Beamer Rd
Limits (To)	Beamer Rd
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	33,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$463

INPUTS

Project Identification	
Project Title:	FM 2351 at Beamer Rd--NB and SB Right-Turn Lanes
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	Beamer Rd
Limits (To)	Beamer Rd
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0028
Estimated Average Travel Time without project (in Hrs)	0.0037
Estimate Average Delay without project (in Hrs)	0.0009
Estimate Delay Reduced	0.0003
Estimated Delay with project	0.0006
Average Peak Travel Time with project	0.0034

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,697

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	9	10

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	33,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$41

INPUTS

Project Information	
Name:	FM 2351 at Beamer Rd
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,017
Discounted VOC Benefits @ 7% (2018 \$)	\$211

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,227

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.55
VOC Emission Reductions (tons)	0.45

INPUTS

Project Information	
Project Title:	Blackhawk Blvd 4-lane Extension
County	Galveston
Facility Type	Non-Freeway
Street Name:	Blackhawk Blvd
Limits (From)	FM 528
Limits (To)	Bay Area Blvd
Length (in Miles)	0.66
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$6,192

INPUTS

Project Identification	
Project Title:	Blackhawk Blvd 4-lane Extension
County	Galveston
Facility Type	Non Freeway
Street Name:	Blackhawk Blvd
Limits (From)	FM 528
Limits (To)	Bay Area Blvd
Length (in Miles)	0.66
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0165
Estimated Average Travel Time without project (in Hrs)	0.0228
Estimate Average Delay without project (in Hrs)	0.0063
Estimate Delay Reduced	0.0025
Estimated Delay with project	0.0038
Average Peak Travel Time with project	0.0203

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	3,639

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	74	83

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$505

INPUTS

Project Information	
Name:	Blackhawk Blvd Ext.
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$3,528
Discounted VOC Benefits @ 7% (2018 \$)	\$730

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$4,258

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.91
VOC Emission Reductions (tons)	1.56

INPUTS

Project Information	
Project Title:	FM 518 at Whispering Pines Ave
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 518
Limits (From)	Whispering Pines
Limits (To)	Whispering Pines
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Left Turn Lane
Work Type Code	519
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	20,853

2018 Peak Period traffic Volume	1,887
2018 Peak Period Capacity	24,700
Estimated 2025 Peak Period Traffic Volume	2,125
2025 Peak Period Capacity	24,700
Estimate 2045 Peak Period Traffic Volume	2,671
2045 Peak Period Capacity	24,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$279

INPUTS

Project Identification	
Project Title:	FM 518 at Whispering Pines NB Left & Right Turn Lanes
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 518
Limits (From)	Whispering Pines
Limits (To)	Whispering Pines
Length (in Miles)	0.08
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0023
Estimated Average Travel Time without project (in Hrs)	0.0028
Estimate Average Delay without project (in Hrs)	0.0005
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0026

Daily Travel Demand	
2018 ADT	20853

2018 Peak Period Traffic Volume	8,967
Peak Period Traffic Volume in Year Open to Traffic	2,250

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	6	6

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	8,967
2018 Peak Period Roadway Capacity	24,700
Estimated 2025 Peak Period Traffic Volume	2,125
2025 Peak Period Roadway Capacity	24,700
Estimated 2045 Peak Period Traffic Volume	2,671
2045 Peak Period Roadway Capacity	24,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$18

INPUTS

Project Information	
Name:	FM 518 at Whispering Pines Ave
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	20,853
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	23,484
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	29,576

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$561
Discounted VOC Benefits @ 7% (2018 \$)	\$95

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$657

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.30
VOC Emission Reductions (tons)	0.20

INPUTS

Project Information	
Project Title:	FM 518 at FM 2351
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	Pecan Dr
Limits (To)	FM 518
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$169

INPUTS

Project Identification	
Project Title:	FM 518 at FM 2351 WB Right-Turn Lane
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	Pecan Dr
Limits (To)	FM 518
Length (in Miles)	0.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0011
Estimated Average Travel Time without project (in Hrs)	0.0014
Estimate Average Delay without project (in Hrs)	0.0003
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0002
Average Peak Travel Time with project	0.0013

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	2,697

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	4	4

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$11

INPUTS

Project Information	
Name:	FM 518 at FM 2351
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2030
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$677
Discounted VOC Benefits @ 7% (2018 \$)	\$115

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$792

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.37
VOC Emission Reductions (tons)	0.25

Appendix M

“Year 2040” Benefit-Cost Analysis

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 518
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	22,866

2018 Peak Period traffic Volume	2,113
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$11,255

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$14,369

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	33,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$6,424

INPUTS

Project Information	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non-Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	1.93
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Improve Traffic Signals
Work Type Code	108
Appropriate Crash Reduction Factor (%):	22%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,700
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$326

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	
Limits (From)	
Limits (To)	
Length (in Miles)	5.86
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1674
Estimated Average Travel Time without project (in Hrs)	0.2021
Estimate Average Delay without project (in Hrs)	0.0346
Estimate Delay Reduced	0.0069
Estimated Delay with project	0.0277
Average Peak Travel Time with project	0.1951

Daily Travel Demand	
2018 ADT	22866

2018 Peak Period Traffic Volume	9,832
Peak Period Traffic Volume in Year Open to Traffic	2,825

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	551	571

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	9,832
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,380
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	2,991
2045 Peak Period Roadway Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$437

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	5.37
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1343
Estimated Average Travel Time without project (in Hrs)	0.1852
Estimate Average Delay without project (in Hrs)	0.0509
Estimate Delay Reduced	0.0102
Estimated Delay with project	0.0407
Average Peak Travel Time with project	0.1750

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	714	755

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	29
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$927

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0760
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0253
Estimate Delay Reduced	0.0051
Estimated Delay with project	0.0203
Average Peak Travel Time with project	0.0963

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	3,024

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	291	306

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	33,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$342

INPUTS

Project Identification	
Project Title:	Signal Timings
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset Dr
Limits (From)	
Limits (To)	
Length (in Miles)	3.04
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Signal Operations & Management
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0869
Estimated Average Travel Time without project (in Hrs)	0.1013
Estimate Average Delay without project (in Hrs)	0.0145
Estimate Delay Reduced	0.0029
Estimated Delay with project	0.0116
Average Peak Travel Time with project	0.0984

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	302

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	30	31

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,700
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,700
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$20

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	6
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	22,866
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	25,751
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	32,365

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,435
Discounted VOC Benefits @ 7% (2018 \$)	\$244

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,679

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.17
VOC Emission Reductions (tons)	0.79

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	5
Average Roadway Speed Before Improvement (mph)	29
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$2,503
Discounted VOC Benefits @ 7% (2018 \$)	\$518

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$3,022

Total Emissions Reductions	
NOx Emission Reductions (tons)	2.05
VOC Emission Reductions (tons)	1.67

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$1,186
Discounted VOC Benefits @ 7% (2018 \$)	\$246

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$1,432

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.97
VOC Emission Reductions (tons)	0.79

INPUTS

Project Information	
Name:	Signal Timings
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$63
Discounted VOC Benefits @ 7% (2018 \$)	\$11

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$74

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.05
VOC Emission Reductions (tons)	0.03

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Sunset Drive
Limits (From)	FM 528
Limits (To)	Sunset Drive
Length (in Miles)	0.2
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$730

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Sunset Drive
Limits (From)	FM 528
Limits (To)	Sunset Drive
Length (in Miles)	0.2
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0044
Estimated Average Travel Time without project (in Hrs)	0.0057
Estimate Average Delay without project (in Hrs)	0.0013
Estimate Delay Reduced	0.0005
Estimated Delay with project	0.0008
Average Peak Travel Time with project	0.0052

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	21	23

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	68,800

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$46

INPUTS

Project Information	
Name:	Sunset Drive
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$26
Discounted VOC Benefits @ 7% (2018 \$)	\$15

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$41

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.02
VOC Emission Reductions (tons)	0.05

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Greenbriar
Limits (From)	Wilderness Trail
Limits (To)	Briar Meadow
Length (in Miles)	0.5
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Construct Interchange
Work Type Code	515
Appropriate Crash Reduction Factor (%):	65%
Service Life (years):	30

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$268

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Greenbriar
Limits (From)	Wilderness Trail
Limits (To)	Briar Meadow
Length (in Miles)	0.5
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Access Management
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0167
Estimated Average Travel Time without project (in Hrs)	0.0200
Estimate Average Delay without project (in Hrs)	0.0033
Estimate Delay Reduced	0.0010
Estimated Delay with project	0.0023
Average Peak Travel Time with project	0.0190

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	302

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	6	6

Estimated Free Flow Speed before improvement	30
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,400
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$7

INPUTS

Project Information	
Name:	Wilderness Trail realignment
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

Data entered by the sponsors

Data populated/calculated based on inputs

HGAC regional travel demand model data provided by HGAC

Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	30
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$30
Discounted VOC Benefits @ 7% (2018 \$)	\$2

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$31

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.02
VOC Emission Reductions (tons)	0.01

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Falcon Ridge Blvd
Limits (From)	Eagle Lakes
Limits (To)	Falcon Ridge Blvd
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	4,143

2018 Peak Period traffic Volume	414
2018 Peak Period Capacity	9,000
Estimated 2025 Peak Period Traffic Volume	466
2025 Peak Period Capacity	9,000
Estimate 2045 Peak Period Traffic Volume	586
2045 Peak Period Capacity	9,000

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$43

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Falcon Ridge Blvd
Limits (From)	Eagle Lakes
Limits (To)	Falcon Ridge Blvd
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0031
Estimated Average Travel Time without project (in Hrs)	0.0055
Estimate Average Delay without project (in Hrs)	0.0024
Estimate Delay Reduced	0.0009
Estimated Delay with project	0.0014
Average Peak Travel Time with project	0.0046

Daily Travel Demand	
2018 ADT	4143

2018 Peak Period Traffic Volume	1,781
Peak Period Traffic Volume in Year Open to Traffic	553

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	3	3

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	20
2018 Peak Period Traffic Volume	1,781
2018 Peak Period Roadway Capacity	9,000
Estimated 2025 Peak Period Traffic Volume	466
2025 Peak Period Roadway Capacity	9,000
Estimated 2045 Peak Period Traffic Volume	586
2045 Peak Period Roadway Capacity	9,000

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$12

INPUTS

Project Information	
Name:	Eagle lakes
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	20
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	4,143
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	4,666
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	5,864

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$22
Discounted VOC Benefits @ 7% (2018 \$)	\$2

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$24

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.02
VOC Emission Reductions (tons)	0.01

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Greenbriar
Limits (From)	FM 528
Limits (To)	W. Castlewood
Length (in Miles)	0.8
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Widen Lane(s)
Work Type Code	502
Appropriate Crash Reduction Factor (%):	30%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	2,013

2018 Peak Period traffic Volume	226
2018 Peak Period Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Capacity	10,400
Estimate 2045 Peak Period Traffic Volume	320
2045 Peak Period Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$198

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Greenbriar
Limits (From)	FM 528
Limits (To)	W. Castlewood
Length (in Miles)	0.8
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0267
Estimated Average Travel Time without project (in Hrs)	0.0320
Estimate Average Delay without project (in Hrs)	0.0053
Estimate Delay Reduced	0.0021
Estimated Delay with project	0.0032
Average Peak Travel Time with project	0.0299

Daily Travel Demand	
2018 ADT	2013

2018 Peak Period Traffic Volume	866
Peak Period Traffic Volume in Year Open to Traffic	302

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	9	10

Estimated Free Flow Speed before improvement	30
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	866
2018 Peak Period Roadway Capacity	10,400
Estimated 2025 Peak Period Traffic Volume	255
2025 Peak Period Roadway Capacity	10,400
Estimated 2045 Peak Period Traffic Volume	320
2045 Peak Period Roadway Capacity	10,400

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$14

INPUTS

Project Information	
Name:	Greenbriar Widening
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	30
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	2,013
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	2,267
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	2,849

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$48
Discounted VOC Benefits @ 7% (2018 \$)	\$3

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$50

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.04
VOC Emission Reductions (tons)	0.01

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Beamer Road
Limits (From)	North of FM 2351
Limits (To)	South of FM 2351
Length (in Miles)	2.25
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Convert 2-Lane Facility to 4-Lane Divided
Work Type Code	538
Appropriate Crash Reduction Factor (%):	45%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	13,200
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	13,200
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	27,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$10,431

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Beamer Road
Limits (From)	North of FM 2351
Limits (To)	South of FM 2351
Length (in Miles)	2.25
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	3,024

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	2,262
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	13,200
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	27,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0643
Estimated Average Travel Time without project (in Hrs)	0.0900
Estimate Average Delay without project (in Hrs)	0.0257
Estimate Delay Reduced	0.0103
Estimated Delay with project	0.0154
Average Peak Travel Time with project	0.0797

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	241	272

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$694

INPUTS

Project Information	
Name:	Beamer Road
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	2
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$2,262
Discounted VOC Benefits @ 7% (2018 \$)	\$195

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$2,457

Total Emissions Reductions	
NOx Emission Reductions (tons)	1.85
VOC Emission Reductions (tons)	0.63

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	Friendswood Lakes Blvd
Limits (To)	IH 45
Length (in Miles)	5.4
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$19,723

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	Friendswood Lakes Blvd
Limits (To)	IH 45
Length (in Miles)	5.4
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.1200
Estimated Average Travel Time without project (in Hrs)	0.1800
Estimate Average Delay without project (in Hrs)	0.0600
Estimate Delay Reduced	0.0240
Estimated Delay with project	0.0360
Average Peak Travel Time with project	0.1560

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	636	734

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$2,185

INPUTS

Project Information	
Name:	FM 528 widening
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$69
Discounted VOC Benefits @ 7% (2018 \$)	\$20

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$89

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.06
VOC Emission Reductions (tons)	0.06

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	East of Rustic Lane
Length (in Miles)	3.2
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$9,230

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	East of Rustic Lane
Length (in Miles)	0.25
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	3,024

Estimated Free Flow Speed before improvement	35
Average Peak Period Corridor Speed before improvement	25
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	2,262
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	13,200
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	27,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0071
Estimated Average Travel Time without project (in Hrs)	0.0100
Estimate Average Delay without project (in Hrs)	0.0029
Estimate Delay Reduced	0.0011
Estimated Delay with project	0.0017
Average Peak Travel Time with project	0.0089

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	27	30

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$77

INPUTS

Project Information	
Name:	FM 2351
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	3
Average Roadway Speed Before Improvement (mph)	25
Average Roadway Speed After Improvement (mph)	35
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$3,218
Discounted VOC Benefits @ 7% (2018 \$)	\$277

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$3,495

Total Emissions Reductions	
NOx Emission Reductions (tons)	2.63
VOC Emission Reductions (tons)	0.89

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 528
Limits (To)	Sunset Drive
Length (in Miles)	0.07
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$213

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 528
Limits (To)	Sunset Drive
Length (in Miles)	0.07
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0016
Estimated Average Travel Time without project (in Hrs)	0.0023
Estimate Average Delay without project (in Hrs)	0.0008
Estimate Delay Reduced	0.0003
Estimated Delay with project	0.0005
Average Peak Travel Time with project	0.0020

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	8	10

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$28

INPUTS

Project Information	
Name:	FM 528 at Sunset Drive
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$69
Discounted VOC Benefits @ 7% (2018 \$)	\$20

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$89

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.06
VOC Emission Reductions (tons)	0.06

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$120

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.05
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	3,024

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	30,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0011
Estimated Average Travel Time without project (in Hrs)	0.0017
Estimate Average Delay without project (in Hrs)	0.0006
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0014

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	4	5

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$15

INPUTS

Project Information	
Name:	FM 2351 at FM 518
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$7
Discounted VOC Benefits @ 7% (2018 \$)	\$2

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$8

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.01

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Lengthen Left Turn Lane
Work Type Code	520
Appropriate Crash Reduction Factor (%):	40%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	25,160

2018 Peak Period traffic Volume	2,262
2018 Peak Period Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Capacity	30,600
Estimate 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Capacity	30,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$423

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Harris
Facility Type	Non Freeway
Street Name:	FM 2351
Limits (From)	FM 518
Limits (To)	FM 2351
Length (in Miles)	0.11
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

Data entered by the sponsors

HGAC regional travel demand model data provided by HGAC

Data populated/calculated based on inputs

Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Daily Travel Demand	
2018 ADT	25160

2018 Peak Period Traffic Volume	10,819
Peak Period Traffic Volume in Year Open to Traffic	3,024

Estimated Free Flow Speed before improvement	40
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	10,819
2018 Peak Period Roadway Capacity	30,600
Estimated 2025 Peak Period Traffic Volume	2,547
2025 Peak Period Roadway Capacity	30,600
Estimated 2045 Peak Period Traffic Volume	3,202
2045 Peak Period Roadway Capacity	30,600

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0028
Estimated Average Travel Time without project (in Hrs)	0.0031
Estimate Average Delay without project (in Hrs)	0.0004
Estimate Delay Reduced	0.0001
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0030

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	9	10

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$8

INPUTS

Project Information	
Name:	FM 528 at FM 518
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$14
Discounted VOC Benefits @ 7% (2018 \$)	\$8

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$22

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.03

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	Winding Way Dr
Limits (From)	FM 528
Limits (To)	FM 518
Length (in Miles)	1.17
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Through Lane
Work Type Code	517
Appropriate Crash Reduction Factor (%):	28%
Service Life (years):	20

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$4,273

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	Winding Way Dr
Limits (From)	FM 528
Limits (To)	FM 518
Length (in Miles)	1.17
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0260
Estimated Average Travel Time without project (in Hrs)	0.0334
Estimate Average Delay without project (in Hrs)	0.0074
Estimate Delay Reduced	0.0030
Estimated Delay with project	0.0045
Average Peak Travel Time with project	0.0305

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	124	136

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	68,800

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$271

INPUTS

Project Information	
Name:	Winding Way Drive
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	1
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$152
Discounted VOC Benefits @ 7% (2018 \$)	\$87

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$238

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.12
VOC Emission Reductions (tons)	0.28

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.15
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$456

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.15
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0033
Estimated Average Travel Time without project (in Hrs)	0.0050
Estimate Average Delay without project (in Hrs)	0.0017
Estimate Delay Reduced	0.0007
Estimated Delay with project	0.0010
Average Peak Travel Time with project	0.0043

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	18	20

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$61

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.25
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Lengthen Left Turn Lane
Work Type Code	520
Appropriate Crash Reduction Factor (%):	40%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$1,216

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 518
Limits (To)	FM 528
Length (in Miles)	0.25
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Intersection Turn Lanes
Estimated Delay Reductions (in %)	30%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0056
Estimated Average Travel Time without project (in Hrs)	0.0071
Estimate Average Delay without project (in Hrs)	0.0016
Estimate Delay Reduced	0.0005
Estimated Delay with project	0.0011
Average Peak Travel Time with project	0.0067

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	27	29

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$43

INPUTS

Project Information	
Name:	FM 2351 at FM 518
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	40
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	25,160
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	28,334
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	35,612

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$15
Discounted VOC Benefits @ 7% (2018 \$)	\$4

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$19

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.01

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 518
Limits (From)	FM 518
Limits (To)	Winding way Dr
Length (in Miles)	0.075
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$228

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 518
Limits (From)	FM 518
Limits (To)	Winding way Dr
Length (in Miles)	0.075
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0017
Estimated Average Travel Time without project (in Hrs)	0.0025
Estimate Average Delay without project (in Hrs)	0.0008
Estimate Delay Reduced	0.0003
Estimated Delay with project	0.0005
Average Peak Travel Time with project	0.0022

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	9	10

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$30

INPUTS

Project Information	
Name:	FM 518 at Winding Way
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$35
Discounted VOC Benefits @ 7% (2018 \$)	\$10

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$45

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.03
VOC Emission Reductions (tons)	0.03

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	Bay Area Blvd
Limits (To)	FM 528
Length (in Miles)	0.09
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Add Right Turn Lane
Work Type Code	521
Appropriate Crash Reduction Factor (%):	25%
Service Life (years):	10

Daily Travel Demand	
2018 Volume (ADT)	31,860

2018 Peak Period traffic Volume	3,052
2018 Peak Period Capacity	51,700
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Capacity	51,700
Estimate 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$274

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	FM 528
Limits (To)	Bay Area Blvd
Length (in Miles)	0.09
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Adding New Lanes or Roads
Estimated Delay Reductions (in %)	40%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0020
Estimated Average Travel Time without project (in Hrs)	0.0026
Estimate Average Delay without project (in Hrs)	0.0006
Estimate Delay Reduced	0.0002
Estimated Delay with project	0.0003
Average Peak Travel Time with project	0.0023

Daily Travel Demand	
2018 ADT	31860

2018 Peak Period Traffic Volume	13,700
Peak Period Traffic Volume in Year Open to Traffic	4,080

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	10	10

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	35
2018 Peak Period Traffic Volume	13,700
2018 Peak Period Roadway Capacity	36,000
Estimated 2025 Peak Period Traffic Volume	3,437
2025 Peak Period Roadway Capacity	51,700
Estimated 2045 Peak Period Traffic Volume	4,320
2045 Peak Period Roadway Capacity	51,700

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$21

INPUTS

Project Information	
Name:	Bay Area Blvd
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	35
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	31,860
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	35,880
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	45,096

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$10
Discounted VOC Benefits @ 7% (2018 \$)	\$6

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$16

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.02

INPUTS

Project Information	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non-Freeway
Street Name:	FM 528
Limits (From)	SH 99
Limits (To)	FM 528
Length (in Miles)	2
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC upon request
	Populated based on selection in cell "C18"
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Safety Improvement Type	Construct Interchange
Work Type Code	515
Appropriate Crash Reduction Factor (%):	65%
Service Life (years):	30

Daily Travel Demand	
2018 Volume (ADT)	4,143

2018 Peak Period traffic Volume	414
2018 Peak Period Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	466
2025 Peak Period Capacity	33,600
Estimate 2045 Peak Period Traffic Volume	586
2045 Peak Period Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Safety Benefits @ 7% (2018 \$, '000s)	\$2,205

INPUTS

Project Identification	
Project Title:	City of Friendswood Traffic Study
County	Galveston
Facility Type	Non Freeway
Street Name:	FM 528
Limits (From)	SH 99
Limits (To)	FM 528
Length (in Miles)	2
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A

	Data entered by the sponsors
	HGAC regional travel demand model data provided by HGAC
	Data populated/calculated based on inputs
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Grade Separation
Estimated Delay Reductions (in %)	20%
Service Life (years):	20

Interim Calculations for Delay Reductions	
Estimated Free flow Travel Time (in Hrs)	0.0444
Estimated Average Travel Time without project (in Hrs)	0.0667
Estimate Average Delay without project (in Hrs)	0.0222
Estimate Delay Reduced	0.0044
Estimated Delay with project	0.0178
Average Peak Travel Time with project	0.0622

Daily Travel Demand	
2018 ADT	4143

2018 Peak Period Traffic Volume	1,781
Peak Period Traffic Volume in Year Open to Traffic	553

VHT Improvements	With Project	Without Project
VHT (Daily) In year open to traffic	34	37

Estimated Free Flow Speed before improvement	45
Average Peak Period Corridor Speed before improvement	30
2018 Peak Period Traffic Volume	1,781
2018 Peak Period Roadway Capacity	33,600
Estimated 2025 Peak Period Traffic Volume	466
2025 Peak Period Roadway Capacity	33,600
Estimated 2045 Peak Period Traffic Volume	586
2045 Peak Period Roadway Capacity	33,600

OUTPUTS

Benefit Results	
Discounted Delay Benefits @ 7% (2018 \$, '000s)	\$55

INPUTS

Project Information	
Name:	FM 528 at SH 99
Application ID Number:	N/A
Sponsor ID Number (CSJ, etc.):	N/A
Project County	Galveston

	Data entered by the sponsors
	Data populated/calculated based on inputs
	HGAC regional travel demand model data provided by HGAC
	Benefits calculated by the template

Proposed Improvements Information	
Year Open to Traffic? (Must be >=2021)	2040
Type of Improvement	Roadway Improvements
Type of Facility	Non-Freeway
Total Length of Corridors Effected by Project (miles)	0
Average Roadway Speed Before Improvement (mph)	30
Average Roadway Speed After Improvement (mph)	45
Service Life of Project (from MoSERS)	20

Daily Travel Demand	
Total 2018 Daily Traffic Volume for Corridors Effected by project	4,143
Total Estimated 2025 Daily Traffic Volume for Corridors Effected by project	4,666
Total Estimated 2045 Daily Traffic Volume for Corridors Effected by project	5,864

OUTPUTS

Benefit Results	
Discounted NOx Benefits @ 7% (2018 \$)	\$9
Discounted VOC Benefits @ 7% (2018 \$)	\$3

Total Emissions Benefit Results	
Discounted Emissions Benefits @ 7% (2018 \$)	\$12

Total Emissions Reductions	
NOx Emission Reductions (tons)	0.01
VOC Emission Reductions (tons)	0.01

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/19/2020

Prepared by: Katina Hampton, Director of Administrative Services

Subject: Presentation of the 2019 Comprehensive Annual Financial Report (CAFR) from auditors Whitley Penn, presented by Engagement Partner Lupe Garcia, CPA

Originating Department: Administrative Services

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

The City Charter (Section 8.07) requires an annual audit of financial records and accounts by an independent certified public accountant. The requirement also states that the accountant provide a summary of the audit results which will be filed with the City Secretary's office for public record and in the Friendswood Public Library for public information. The comprehensive annual financial report (CAFR) with the auditor's opinion on the statement and the financial management practices of the City serves as the audit summary. In addition to filing the report with the City Secretary's office and at the Library, it is also submitted to the City's financial advisors, Municipal Advisory Council of Texas, bond rating agencies, bank depositories and grant funding agencies.

The annual audit and financial reporting is also a requirement by Texas Local Government Code (Section 103) and is the standard recommended by Governmental Accounting Standards Board (GASB), American Institute of Certified Public Accountants (AICPA), Government Finance Officers Association (GFOA), Generally Accepted Accounting Principles (GAAP) and Governmental Accounting, Auditing, and Financial Reporting (GAAFR).

Lupe Garcia, CPA, a partner with Whitley Penn will present the 2018-2019 Comprehensive Annual Financial Report and Single Audit Report. The presentation will be a brief overview of the reports. He will distribute copies of the reports to Mayor and Council at that time.

The City's CAFR for fiscal year 2018-2019 will be submitted to GFOA in hopes of earning the 33rd consecutive Certificate of Excellence in Financial Reporting.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

1. Whitley Penn - CAFR Presentation



Fiscal Year 2019 Audit Results

Financial Statement Audit and Federal Single Audit



City of
Friendswood
Texas



Engagement Team



Lupe Garcia, CPA
Engagement Partner



Tom Pedersen, CPA
Concurring Partner



Dan Hernandez, CPA
Senior Manager



Corbitt Nixon, CPA
Senior Associate



Chau Nguyen
Associate

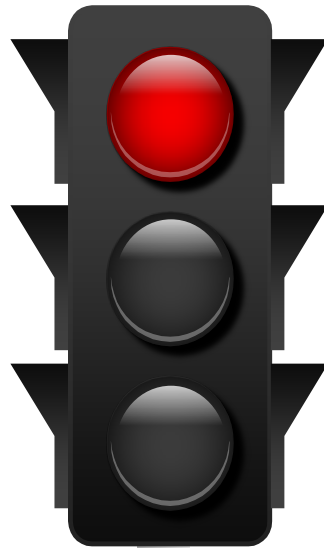


Kevin Green
Associate

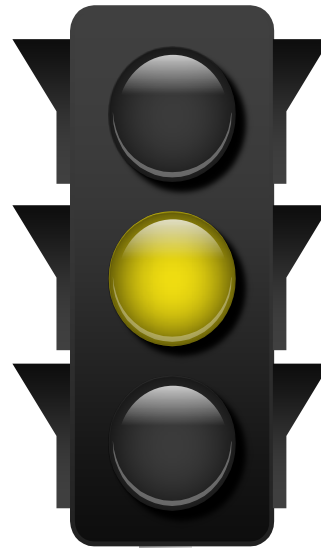
The Audit Process



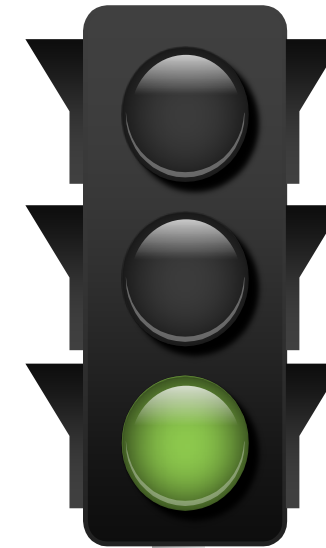
Types of Auditor Opinions



Disclaimer
(No Assurance)



Modified
(Qualified or Adverse)



Unmodified
(Clean Opinion)

Auditor's Report on Financials

- Unmodified or “clean” opinion
- Highest level of assurance that can be given on a set of financial statements
- Audit conducted in accordance with Generally Accepted Auditing Standards and *Government Auditing Standards*

Clean Report



Auditor's Report on IC and Compliance

- Internal control over financial reporting
 - No material weakness identified
 - No significant deficiencies reported
- No instances of noncompliance material to the financial statements were noted

Clean Report



Federal Single Audit – Major Program

Total Schedule of Expenditures of Federal Awards

- \$1.1 million

Disaster Grants – Public Assistance (Hurricane Harvey)

- \$0.9 million

Auditor's Report on Major Programs

- Internal control over federal major program
 - No material weakness identified
 - No significant deficiencies reported
- Unmodified opinion on compliance for federal major program
- No instances of noncompliance or questioned costs were noted

Clean Report



Statement of Net Position (\$M) (p. 23)

Total Primary Government (Governmental and Business-type Activities)	As of September 30, 2019	As of September 30, 2018
Current and other assets	\$61,636	\$42,938
Capital assets, net	157,799	158,903
Total Assets (a)	219,435	201,841
Total Deferred Outflows of Resources (b)	6,858	3,658
Other liabilities	5,194	3,045
Noncurrent liabilities	103,250	80,089
Total Liabilities (c)	108,444	83,134
Total Deferred Inflows of Resources (d)	529	2,418
Total Net Position (e)	\$117,320	\$119,947

Accounting formula: $a + b - c - d = e$

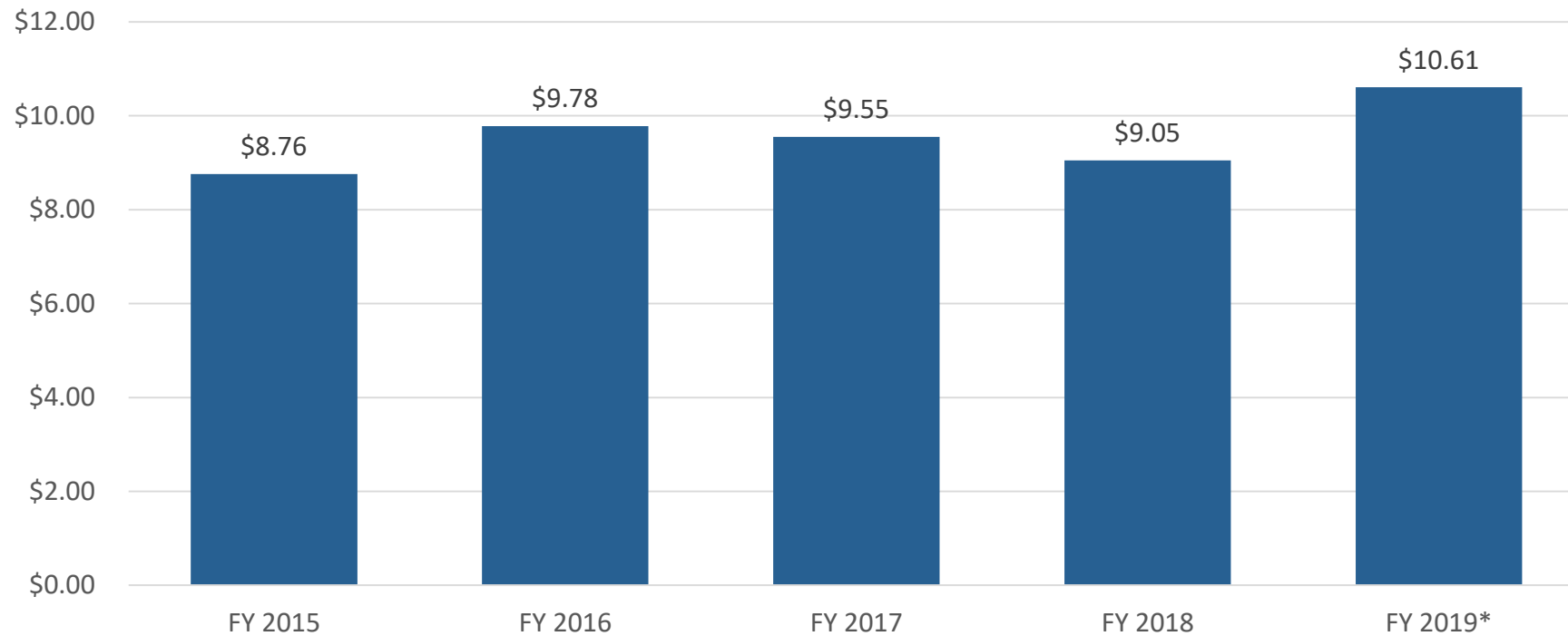
Noncurrent (Long-term) Liabilities

Total Primary Government (Governmental and Business-type Activities)	September 30, 2019	September 30, 2018
General obligation bonds	\$54,170,000	\$57,970,000
Revenue bonds	25,230,000	5,290,000
Capital lease	436,620	791,305
Total OPEB liability	1,596,372	1,755,598
Net pension liability	14,426,100	7,972,169
Bond premiums	6,508,591	5,461,150
Compensated absences	882,751	848,979
Total	\$103,250,434	\$80,089,201

Statement of Revenues, Expenditures, and Changes in Fund Balance - General Fund (p. 74-81)

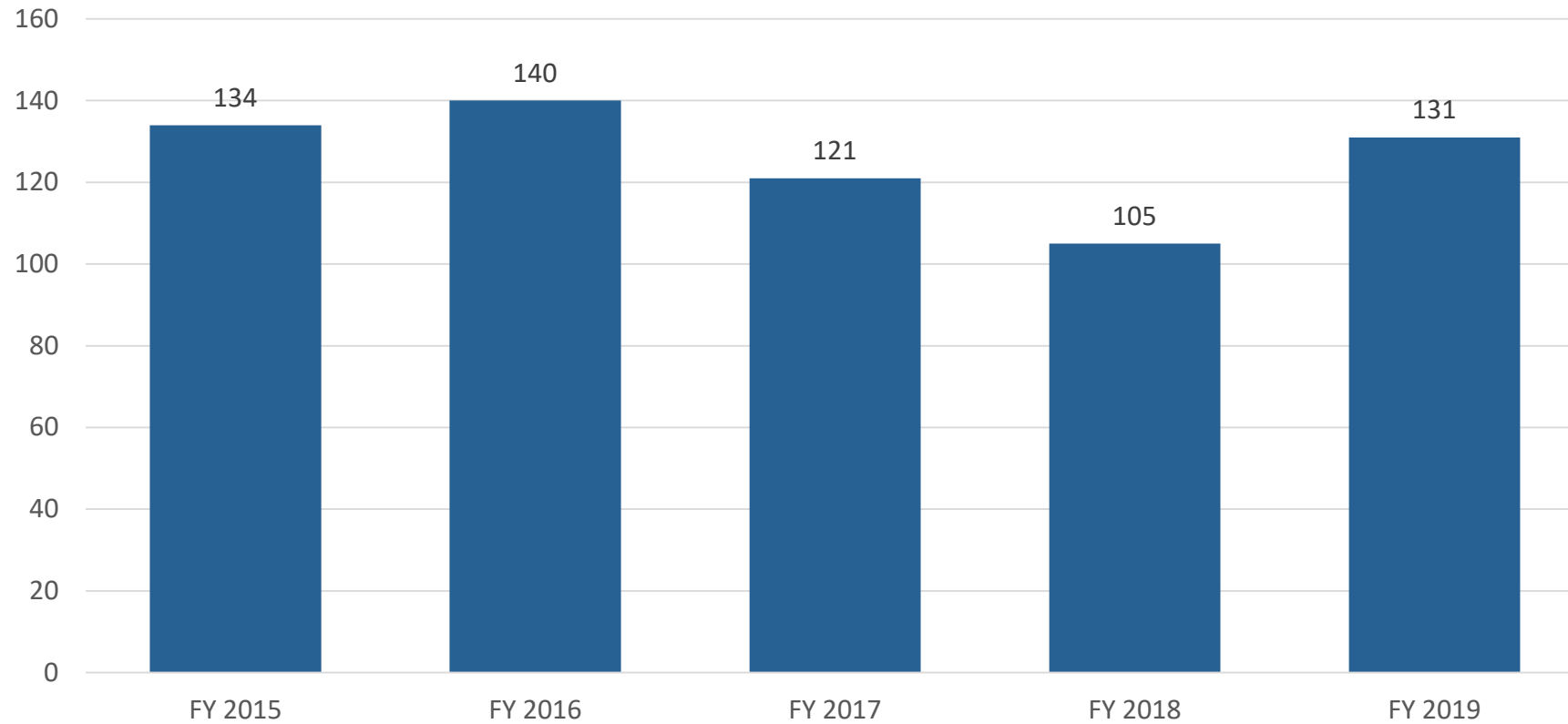
For the Year Ended September 30, 2019	Final Budget	Actual	Variance
Total Revenues	\$26,437,730	\$27,793,590	\$1,355,860
Total Expenditures	32,429,325	29,523,521	2,903,804
Deficiency of Revenues Over Expenditures	(5,989,595)	(1,729,931)	4,259,664
Other Financing Sources (Uses), net	1,533,023	1,668,114	135,091
Net Change in Fund Balance	(4,456,572)	(61,817)	4,394,755
Fund Balance – Beginning	14,285,306	14,285,306	
Fund Balance – Ending	\$9,828,734	\$14,223,489	

General Fund Unassigned Fund Balance (\$M)



*Unassigned Fund Balance includes the City's 90 day reserve requirement.

General Fund Unassigned Fund Balance (Days) whitleypenn



Statement of Revenues, Expenses, and Changes in Net Position - Water and Sewer Fund (p. 32)

	Year Ended September 30, 2019
Operating revenues	\$13,128,303
Operating expenses	11,274,205
Non-operating revenues (expenses), net	(590,320)
Transfers out	(1,456,690)
Change in net position	(192,912)
Net Position – Beginning	41,291,188
Net Position – Ending	\$41,098,276

Net Position - Water and Sewer Fund

	FY 2017	FY 2018	FY 2019
Investment in capital assets	\$29,305,429	\$27,088,280	\$27,038,046
Restricted for debt service	-0-	407,562	1,912,622
Restricted for capital projects	260,703	175,135	70,044
Unrestricted	10,584,764	13,620,211	12,077,564*
Total Net Position	\$40,150,896	\$41,291,188	\$41,098,276

Unrestricted net position at 9/30/2019 represents 129% or 470 days of operating expenses (excluding depreciation).

* Unrestricted Net Position includes the City's 90 day reserve requirement.

Required Communications

Auditors' Responsibility Under Generally Accepted Auditing Standards

- The financial statements are the responsibility of management.
- Our audit provides reasonable, rather than absolute, assurance that the financial statements are free of material misstatements.
- As a part of our audit, we obtained an understanding of internal control sufficient to plan our audits and to determine the nature and extent of testing performed.

Required Communications

- Significant Accounting Policies
 - The City's accounting policies and methods are appropriate and in accordance with industry standards.
- Accounting Estimates
 - The preparation of the financial statements requires that certain estimates and judgments be made by management. These judgments and estimates include:
 - Allowances for doubtful accounts - property tax and utilities
 - Depreciation expense
 - Pension and OPEB liabilities, deferred inflows and outflows of resources, and pension and OPEB expense
 - We concluded that management has a reasonable basis for significant judgments and estimates that impact the financial statements.

Required Communications

- Difficulties Encountered in Performing the Audit
 - We encountered no difficulties in dealing with management in performing and completing our audit
- Corrected or Uncorrected Misstatements
 - There were no material misstatements that were identified by us that required management's correction
- Disagreements with Management
 - We had no disagreements with management over the application of accounting principles or management's judgments about accounting estimates.

Required Communications

- Management Representations
 - We have requested certain representations from management
- Consultation with Other Accountants
 - We are not aware of any situations in which management consulted with other accountants on accounting or financial reporting matters.
- Major Issues Discussed with Management Prior to Retention
 - We discussed the application of accounting principles and auditing standards, however, our responses were not a condition to our retention.



whitleypenn 

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 12/27/2019

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Proposed amendments to Appendix C, Zoning Ordinance Sections 10-12 regarding board of adjustment establishment and procedure, powers and duties, and appeals from the board of adjustment and Section 20, Definitions, to be consistent with state law, particularly Chapter 211 of the Local Government Code.

Originating Department: Community Development

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

These proposed amendments are regarding the authority of the Zoning Board of Adjustment. Discussion started at the senior staff level, and then discussion was had with City Council in a work session setting. Council members were agreeable to considering amendments to our local ordinance to allow ZBOA the full flexibility and authority that state law allows. In October 2019, the suggestion was also brought up to the Zoning Board Of Adjustments (ZBOA), and they too were in agreement of the changes.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Adopting a simpler ordinance will remove some of the restrictions the current ordinance places upon the board.

RECOMMENDATIONS

Following a public hearing on Thursday, February 13, 2020, the Planning and Zoning Commission voted unanimously (6 to 0; Clark was absent) in favor of the proposed amendments.

ATTACHMENTS

1. Local Government Code Section 211.008
2. Zoning Ord Section 10-12 and 20 ZBOA Clean
3. Zoning Ord Section 10-12 and 20 ZBOA Redline
4. PZ Recommendation Memo ZBOA Amendments 02-13-2020

Sec. 211.008. BOARD OF ADJUSTMENT. (a) The governing body of a municipality may provide for the appointment of a board of adjustment. In the regulations adopted under this subchapter, the governing body may authorize the board of adjustment, in appropriate cases and subject to appropriate conditions and safeguards, to make special exceptions to the terms of the zoning ordinance that are consistent with the general purpose and intent of the ordinance and in accordance with any applicable rules contained in the ordinance.

(b) A board of adjustment must consist of at least five members to be appointed for terms of two years. The governing body must provide the procedure for appointment. The governing body may authorize each member of the governing body, including the mayor, to appoint one member to the board. The appointing authority may remove a board member for cause, as found by the appointing authority, on a written charge after a public hearing. A vacancy on the board shall be filled for the unexpired term.

(c) The governing body, by charter or ordinance, may provide for the appointment of alternate board members to serve in the absence of one or more regular members when requested to do so by the mayor or city manager. An alternate member serves for the same period as a regular member and is subject to removal in the same manner as a regular member. A vacancy among the alternate members is filled in the same manner as a vacancy among the regular members.

(d) Each case before the board of adjustment must be heard by at least 75 percent of the members.

(e) The board by majority vote shall adopt rules in accordance with any ordinance adopted under this subchapter and with the approval of the governing body. Meetings of the board are held at the call of the presiding officer and at other times as determined by the board. The presiding officer or acting presiding officer may administer oaths and compel the attendance of witnesses. All meetings of the board shall be open to the public.

(f) The board shall keep minutes of its proceedings that indicate the vote of each member on each question or the fact that a member is absent or fails to vote. The board shall keep records of its examinations and other official actions. The minutes and records shall be filed immediately in the board's office and are public records.

(g) The governing body of a Type A general-law municipality by ordinance may grant the members of the governing body the authority to act as a board of adjustment under this chapter.

Acts 1987, 70th Leg., ch. 149, Sec. 1, eff. Sept. 1, 1987.
Amended by Acts 1993, 73rd Leg., ch. 126, Sec. 1, eff. Sept. 1, 1993; Acts 1995, 74th Leg., ch. 724, Sec. 1, eff. Aug. 28, 1995; Acts 1997, 75th Leg., ch. 363, Sec. 1, eff. Sept. 1, 1997.

Amended by:

Acts 2019, 86th Leg., R.S., Ch. 820 (H.B. [2497](#)), Sec. 1, eff. September 1, 2019.

Sec. 211.009. AUTHORITY OF BOARD. (a) The board of adjustment may:

(1) hear and decide an appeal that alleges error in an order, requirement, decision, or determination made by an administrative official in the enforcement of this subchapter or an ordinance adopted under this subchapter;

(2) hear and decide special exceptions to the terms of a zoning ordinance when the ordinance requires the board to do so;

(3) authorize in specific cases a variance from the terms of a zoning ordinance if the variance is not contrary to the public interest and, due to special conditions, a literal enforcement of the ordinance would result in unnecessary hardship, and so that the spirit of the ordinance is observed and substantial justice is done; and

(4) hear and decide other matters authorized by an ordinance adopted under this subchapter.

(b) In exercising its authority under Subsection (a)(1), the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose the board has the same authority as the administrative official.

(c) The concurring vote of 75 percent of the members of the board is necessary to:

(1) reverse an order, requirement, decision, or determination of an administrative official;

(2) decide in favor of an applicant on a matter on which the board is required to pass under a zoning ordinance; or

(3) authorize a variation from the terms of a zoning ordinance.

Acts 1987, 70th Leg., ch. 149, Sec. 1, eff. Sept. 1, 1987.

Amended by Acts 1993, 73rd Leg., ch. 126, Sec. 2, eff. Sept. 1, 1993; Acts 1995, 74th Leg., ch. 724, Sec. 2, eff. Aug. 28, 1995.

Sec. 211.010. APPEAL TO BOARD. (a) Except as provided by Subsection (e), any of the following persons may appeal to the board of adjustment a decision made by an administrative official that is not related to a specific application, address, or project:

(1) a person aggrieved by the decision; or

(2) any officer, department, board, or bureau of the municipality affected by the decision.

(a-1) Except as provided by Subsection (e), any of the following persons may appeal to the board of adjustment a decision made by an administrative official that is related to a specific application, address, or project:

(1) a person who:

(A) filed the application that is the subject of the decision;

(B) is the owner or representative of the owner of the property that is the subject of the decision; or

(C) is aggrieved by the decision and is the owner of real property within 200 feet of the property that is the subject of the decision; or

(2) any officer, department, board, or bureau of the municipality affected by the decision.

(b) The appellant must file with the board and the official from whom the appeal is taken a notice of appeal specifying the grounds for the appeal. The appeal must be filed not later than the 20th day after the date the decision is made. On receiving the notice, the official from whom the appeal is taken shall immediately transmit to the board all the papers constituting the record of the action that is appealed.

(c) An appeal stays all proceedings in furtherance of the action that is appealed unless the official from whom the appeal is taken certifies in writing to the board facts supporting the official's opinion that a stay would cause imminent peril to life or property. In that case, the proceedings may be stayed only by a restraining order granted by the board or a court of record on application, after notice to the official, if due cause is shown.

(d) The board shall set a reasonable time for the appeal hearing and shall give public notice of the hearing and due notice to the parties in interest. A party may appear at the appeal hearing in person or by agent or attorney. The board shall decide the appeal at the next meeting for which notice can be provided following the hearing and not later than the 60th day after the date the appeal is filed.

(e) A member of the governing body of the municipality who serves on the board of adjustment under Section 211.008(g) may not bring an appeal under this section.

Acts 1987, 70th Leg., ch. 149, Sec. 1, eff. Sept. 1, 1987.
Amended by Acts 1997, 75th Leg., ch. 363, Sec. 2, eff. Sept. 1, 1997.

Amended by:

Acts 2019, 86th Leg., R.S., Ch. 820 (H.B. [2497](#)), Sec. 2, eff. September 1, 2019.

Sec. 211.011. JUDICIAL REVIEW OF BOARD DECISION. (a) Any of the following persons may present to a district court, county court, or county court at law a verified petition stating that the decision of the board of adjustment is illegal in whole or in part and specifying the grounds of the illegality:

- (1) a person aggrieved by a decision of the board;
- (2) a taxpayer; or
- (3) an officer, department, board, or bureau of the municipality.

(b) The petition must be presented within 10 days after the date the decision is filed in the board's office.

(c) On the presentation of the petition, the court may grant a writ of certiorari directed to the board to review the board's decision. The writ must indicate the time by which the board's return must be made and served on the petitioner's attorney, which must be after 10 days and may be extended by the court. Granting of the writ does not stay the proceedings on the decision under appeal, but on application and after notice to the board the court may grant a restraining order if due cause is shown.

(d) The board's return must be verified and must concisely state any pertinent and material facts that show the grounds of the decision under appeal. The board is not required to return the original documents on which the board acted but may return certified or sworn copies of the documents or parts of the documents as required by the writ.

(e) If at the hearing the court determines that testimony is necessary for the proper disposition of the matter, it may

take evidence or appoint a referee to take evidence as directed. The referee shall report the evidence to the court with the referee's findings of fact and conclusions of law. The referee's report constitutes a part of the proceedings on which the court shall make its decision.

(f) The court may reverse or affirm, in whole or in part, or modify the decision that is appealed. Costs may not be assessed against the board unless the court determines that the board acted with gross negligence, in bad faith, or with malice in making its decision.

(g) The court may not apply a different standard of review to a decision of a board of adjustment that is composed of members of the governing body of the municipality under Section 211.008(g) than is applied to a decision of a board of adjustment that does not contain members of the governing body of a municipality.

Acts 1987, 70th Leg., ch. 149, Sec. 1, eff. Sept. 1, 1987.
Amended by Acts 1997, 75th Leg., ch. 363, Sec. 3, eff. Sept. 1, 1997; Acts 1999, 76th Leg., ch. 646, Sec. 1, eff. Aug. 30, 1999.

Sec. 211.012. ENFORCEMENT; PENALTY; REMEDIES. (a) The governing body of a municipality may adopt ordinances to enforce this subchapter or any ordinance or regulation adopted under this subchapter.

(b) A person commits an offense if the person violates this subchapter or an ordinance or regulation adopted under this subchapter. An offense under this subsection is a misdemeanor, punishable by fine, imprisonment, or both, as provided by the governing body. The governing body may also provide civil penalties for a violation.

(c) If a building or other structure is erected, constructed, reconstructed, altered, repaired, converted, or maintained or if a building, other structure, or land is used in violation of this subchapter or an ordinance or regulation

adopted under this subchapter, the appropriate municipal authority, in addition to other remedies, may institute appropriate action to:

- (1) prevent the unlawful erection, construction, reconstruction, alteration, repair, conversion, maintenance, or use;
- (2) restrain, correct, or abate the violation;
- (3) prevent the occupancy of the building, structure, or land; or
- (4) prevent any illegal act, conduct, business, or use on or about the premises.

Acts 1987, 70th Leg., ch. 149, Sec. 1, eff. Sept. 1, 1987.

Section 10. - Board of adjustment—Establishment and procedure.

A board of adjustment is hereby established, which shall consist of five members and four alternates to be appointed by the city council, each for a term of two years. Members and alternates of the board of adjustment may be removed from office by the city council when absent from two consecutive meetings without an excuse or for cause upon written charges and after public hearing. Vacancies shall be filled by the city council for the unexpired term of the member affected.

A. *Proceedings of the board of adjustment.*

- (1) The board of adjustment shall adopt rules necessary to the conduct of its affairs, elect a chairperson and an acting chairperson, and act in keeping with the provisions of this appendix. Meetings shall be held at the call of the chairperson and at such other times as the board may determine. The chairperson, or in his absence the acting chairperson, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.
- (2) The board of adjustment shall keep minutes of its proceedings, showing the vote of each member upon each question, or if absent or failing to vote indicating such fact, and shall keep records of its examinations and all of which shall be immediately filed in the office of the board and shall be public record.

B. *Application.* Appeals to the board of adjustment concerning interpretation or administration of this appendix may be taken by any person aggrieved by the decision or any officer, department, board, or bureau of the city affected by the decision of the administrative official. Such appeals shall be filed not later than the 20th day after the date the decision is made, by filing with the official from whom the appeal is taken and with the board of adjustment a notice of appeal specifying the grounds thereof. On receiving the notice, the official from whom the appeal is taken shall immediately transmit to the board all the papers constituting the record of the action that is appealed.

A member of the governing body of the municipality who serves on the board of adjustment may not bring an appeal under this section.

C. *Notification.* Any request for an appeal, variance or special exception shall require a public hearing before the board. A written notice of the hearing shall be sent to owners of property situated within 200 feet of the exterior boundary of the property with respect to which such appeal, variance or exception is requested ten days prior to public hearing. It shall be sufficient that such written notice is addressed to the owner appearing on the most current tax roll of the city and addressed to such owner at the address stated on said roll. If no owner is stated on the tax roll, or no address appears thereon, the written notice to such property owner shall not be required.

The city council and planning and zoning commission shall be informed of any hearing for an appeal, variance or special exception of the zoning or sign ordinance.

D. *Fee.* A processing fee as described in subsection 14 shall be paid to the city in advance of the hearing. In the event the application is withdrawn prior to the mailing of the required written notification or publication in the official newspaper, the fee shall be refunded.

E. *Hearings.* The board shall set a reasonable time for the appeal hearing. A party may appear at the hearing in person or by agent or by attorney. The board shall decide the appeal at the next meeting for which notice can be provided following the hearing and not later than the 60th day after the date the appeal is filed.

F. *Stay of proceedings.* An appeal stays all proceedings in furtherance of the action that is appealed, unless the official from whom the appeal is taken certifies in writing to the board facts supporting the official's opinion that a stay would cause imminent peril to life or property. In that case, the proceedings may be stayed only by a restraining order granted by the board of adjustment or by a court of record on application, after notice to the official, if due cause is shown.

Section 11. - Same—Powers and duties.

- A. The board of adjustment shall have the following powers and duties:
- (1) *Appeals*. To hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the enforcement of this appendix.
 - (2) *Variance*. To authorize in specific cases, a variance from the terms of a zoning ordinance if the variance is not contrary to the public interest and, due to special conditions, a literal enforcement of the ordinance would result in unnecessary hardship, and so that the spirit of the ordinance is observed and substantial justice is done.
 - (a) *Exceptions*. Under no circumstances shall the board of adjustment grant a variance to allow a use not permissible under the terms of a zoning ordinance in the district involved, or any use, expressly or impliedly, prohibited by the terms of this appendix in said district.
 - (3) *Special exceptions*. To hear and decide special exceptions to the terms of a zoning ordinance when this appendix requires the board to do so.
 - (4) To hear and decide other matters authorized by a zoning ordinance.
 - (5) In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose the board has the same authority as the administrative official.
- B. *Vote required*. The concurring vote of four members of the board shall be necessary to reverse any order, requirements, decision, or determination of an administrative official, decide in favor of an applicant on a matter on which the board is required to pass under a zoning ordinance.

(Ord. No. 90-18, § 2, 7-23-1990; Ord. No. 2009-04, § 1, 5-24-2009)

Section 12. - Appeals from the board of adjustment.

- A. Any person aggrieved by a decision of the board of adjustment, or any taxpayer, or officer, department, board, or bureau of the city may present to a district court, county court, or county court at law a verified petition stating that the decision of the board of adjustment is illegal in whole or in part and specify the grounds of illegality within 10 days after the date the decision is filed in the board's office and in the manner provided by the laws of the state, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. *Reapplication*. No application for a variance, special exception, or appeal which has been denied shall be again filed earlier than one year from date of original denial, unless there has been a material change. For the purposes of this section, material change shall mean a substantial change in conditions or circumstances as it relates to the property in question.

Section 13. - Duties of administrative official, board of adjustment, city council, and courts on matters of appeal.

- A. It is the intent of this section that all questions of interpretation and enforcement shall be first presented to the administrative official, and that such questions shall be presented to the board of adjustment only on appeal from the decision of the administrative official, and that recourse from the decisions of the board of adjustment shall be to the courts in the manner provided by law, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. It is further the intent of this section that the duties of the city council in connection with this appendix shall not include hearing and deciding questions of interpretation and enforcement that may arise. The procedure for deciding such questions shall be as stated in this section and this appendix. Under this appendix, the city council shall have only the duties of considering and adopting or rejecting proposed

amendments or the repeal of this appendix, as provided by law, and of establishing a schedule of fees
and charges as stated in section 14.

Section 14. - Schedule of fees, charges, and expenses.

- A. The city council shall establish a schedule of fees, charges, and expenses and a collection procedure for building permits, certificates of zoning compliance, specific use permits, and changes in district classification, appeals, and other matters pertaining to this appendix. The schedule of fees shall be maintained in the office of the city secretary and in the office of the administrative official, and may be altered or amended only by the city council. It is set by resolution and printed in Appendix D to this Code.
- B. Until all applicable fees, charges, and expenses have been paid in full, no action shall be taken on any application or appeal.

Section 20. - Definitions.

- (a) The following words, terms and phrases, when used in this appendix, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Accessory use or structure means a use or structure on the same lot with, and of a nature customarily incidental and subordinate to, the principal use or structure.

Adult entertainment business shall have the same meaning as "sexually oriented business," as that term is defined in V.T.C.A., Local Government Code ch. 243, and chapter 62 of the Code of Ordinances, and shall include, but not be limited to, an adult arcade, adult bookstore or adult video store, adult cabaret, adult motel, adult motion picture theater, adult tanning salon, adult theater, escort agency, nude modeling studio, sexual encounter center, or any other commercial enterprise, the primary business of which is the offering of a service or the selling, renting, or exhibiting of devices or any other items intended to provide sexual stimulation or sexual gratification to the customer. Such uses shall be allowed only as specifically authorized under the terms of this appendix and chapter 62 of the Code of Ordinances. The determination of what constitutes an adult entertainment business shall be made by the police chief or his/her designee, in accordance with the definitions contained in chapter 62 of the Code of Ordinances, and such determination shall be appealable to the zoning board of adjustment.

Apartment house means any building or portion thereof used as a multiple dwelling for the purpose of providing three or more separate dwelling units which may share means of egress and other essential facilities.

Automobile graveyard means an establishment or place of business that is maintained, used, or operated for storing, keeping, buying, or selling wrecked, scrapped, ruined, or dismantled motor vehicles or motor vehicle parts.

Building means any structure designed or built for the support, enclosure, shelter, or protection of persons, animals, chattels or property of any kind. The term "building" includes the term "structure."

Building area means the surface of the lot covered or occupied by all structures placed thereon, excluding only driveways, walkways and uncovered patios.

Building line means a line parallel or approximately parallel to the street line and beyond which buildings may not be erected.

Childcare center means a childcare facility that is licensed to care for seven or more children for less than 24 hours per day, at a location other than the permit holder's home (pursuant to Texas Administrative Code, Title 40, Part 19, Chapter 746). Compliance with all applicable state regulations is required. A childcare center shall also obtain a certificate of zoning compliance pursuant to section 9.D ("Administration and enforcement—Building permits and certificates of zoning compliance").

1. *Registered childcare home.* In a registered childcare home, the registered primary caregiver provides care in the caregiver's own residence for not more than six children from birth through 13 years, and may provide care after-school hours for not more than six additional elementary school children. The total number of children in care at any given time, including the children related to the caregiver, must not exceed 12 (pursuant to Tex. Admin. Code, Title 40, Part 19, Chapter 747). Compliance with all applicable state regulations is required. A registered childcare home shall also obtain a certificate of zoning compliance pursuant to section 9.D.
2. *Licensed childcare home.* The total number of children in care varies with the ages of the children, but the total number of children in care in a licensed childcare home at any given time, including the children related to the caregiver, must not exceed 12 (pursuant to Tex. Admin. Code, Title 40, Part 19, Chapter 747). Compliance with all applicable state regulations is required. A licensed childcare home shall also obtain a certificate of zoning compliance pursuant to section 9.D.

Cluster housing development means a residential development containing attached or detached units on a limited portion of land with the remaining land areas consolidated into common open space areas.

Comprehensive plan means graphic and textual form policies which govern the future development of the city and which consist of various components governing specific geographic areas and functions and services of the city.

Density means living units per acre in a platted subdivision. The term "density" pertains to total platted acreage, including streets.

Dwelling, garden home, means a dwelling unit which is structurally attached to another dwelling unit but which does not share a common wall.

Dwelling, multiple-family, means any building, or portion thereof, which is designed, built, rented, leased or intended to be occupied as three or more dwelling units or apartments and which includes facilities for food preparation and sleeping.

Dwelling, single-family, means a detached building having accommodations for and occupied by not more than one family.

Dwelling, two-family, means a detached building having accommodations for and occupied by not more than two families. In calculating minimum lot area, a two-family dwelling shall be considered to be two dwelling units.

Dwelling unit means a building or portion of a building which is arranged, occupied, or intended to be occupied as living quarters for one family.

Family means a single individual or a number of individuals domiciled together, whose relationship is of a continuing, nontransient, domestic character and who are cooking and living together as a single, nonprofit housekeeping unit. This shall not include any society, club, fraternity, sorority, association, lodge, coterie, organization, or group of students or other individuals whose relationship is of a transitory or seasonal nature or for anticipated limited duration of school terms or other similar determinable period.

Fence means any structure enclosing, demarcating or surrounding an area of ground to mark a boundary, control access, or prevent escape, in part or in whole.

Graduated fence means a fence required by city ordinance, the height of which may be reduced for some portion of its required length, either in a stair-step configuration or by gradually reducing such height in a straight or radial line. The length and height of the fence so reduced will be determined on the basis of a combination of factors, including, but not limited to, security, public welfare, and pedestrian and traffic safety.

Green space means natural undeveloped areas, such as prairies, farmland, barren land, forests, wetlands and lakes. The term "green space" may also include landscaped perimeters and green landscape reserves along thoroughfares.

Height.

- a. The height of a building shall be measured to:
 - (1) The top of ridge of the highest roof of a sloped roof (i.e., gable);
 - (2) The top of the highest deck of a mansard roof; or
 - (3) The top of the highest parapet wall of a flat roof.
- b. For buildings not located in the floodplain, height is measured from the top of the finished first floor of the building which can be no more than two feet above the finished grade at the site. Finished grade shall mean the highest grade elevation within five feet of the foundation or wall of the building, said grade having been established by means of an approved grading and/or drainage plan. Finished grade may also be the existing grade elevation when no terrain alteration is proposed, or where otherwise applicable. Any fill which is not required to achieve positive site drainage or slope stabilization, or which is otherwise proposed to raise the finished first floor elevation for any other purpose, shall not be considered to be finished grade for the purpose of measuring building height.

- c. For buildings located in the floodplain, height is measured from the top of the first finished floor which shall be two feet above the average base flood elevation at the site, as established by the latest available flood elevation maps for the city.
- d. No part of a building or structure is allowed to exceed the maximum height allowed in a specific zoning district except for the following:
 - (1) Elements inclusive of, but not limited to, chimneys, vents, and roof-top mechanical equipment, provided that the maximum allowed building or structure height is not exceeded by more than four feet; or
 - (2) Elements inclusive of, but not limited to, radio or television antennae or aerials (but not including microwave receivers, transmitters, repeaters, or satellite receivers), provided that the maximum allowed building or structure height is not exceeded by more than ten feet.

Home occupation means an occupation or profession engaged in by the occupants of a dwelling, the conduct of which does not result in the dwelling being identified as a business by the external and objective evidence of a business, such as signs, displays, deliveries, continuous or repetitive traffic (rather than occasional or sporadic traffic) generated by the home occupation, or by regular gatherings of clients or customers for business purposes. Home occupations are a permitted use in accordance with this section, provided that:

1. The occupation or profession conducted within a residential dwelling unit must be clearly incidental and subordinate to the use of the premises as a residential dwelling unit.
2. The home occupation shall be conducted entirely within the dwelling unit or accessory structure.
3. Only members of the family residing on the premises are employed.
4. No internal or external alterations, special construction, or features are involved.
5. There is no advertising of any type on the premises and no other display or storage of materials or exterior identification of the home occupation or variation from the residential character of the main building or any accessory building; however, advertising of the home occupation by published or printed matter is allowed.
6. No equipment is used which creates offensive noises, vibrations, sound, smoke or dust, odors, heat, glare, X-ray or electrical disturbances to radio or television.
7. Vehicles used in conjunction with the home occupation must park completely in the driveway of the resident without blocking the sidewalk.
8. The home occupation must not change the character of the residential area.
9. A childcare center as defined in this section is not recognized as a home occupation.
10. A personal care facility as defined in this section is not recognized as a home occupation.
11. The use of off-site personal services at a residence by the occupant, such as lawn care, maid services, etc., does not constitute a home occupation and is not limited by this appendix.

Junkyard means an establishment or place of business maintained, used, or operated for storing, keeping, buying or selling junk, for processing scrap metal, or for maintaining or operating an automobile graveyard. The term "junkyard" includes garbage dumps and sanitary fills.

Lot includes the term "plot" or "parcel."

Lot measurements.

1. *Depth.* The distance between the midpoint of straight lines connecting the foremost points of the side lot lines in front and the rearmost points of the side lot lines in the rear.
2. *Width.* The distance between straight lines connecting front and rear lot lines at each side of the lot, measured across the rear of the required front yard, provided, however, that width between side lot lines at their foremost point (where they intersect with the street lines) shall not be less

than 90 percent of the required lot width except in the case of lots on the turning circle of culs-de-sac where the 90 percent requirement shall not apply.

Office park means one or more commercial buildings with multiple businesses providing services but not delivering products directly to customers and consisting of two or more tenants using common driveways.

Open space means a restricted reserve located within a development with limited low-impact amenities, including, but not limited to, green space, both natural and landscaped, detention areas, trails, lakes, pavilions, benches, outdoor cooking facilities, and active recreational facilities, such as ball and soccer fields, playgrounds, and the like. Amenities may be passive or active.

Parking space, off-street, means a space adequate for parking an automobile with room for opening doors on both sides, together with properly related access to a public street or alley and maneuvering room. Required off-street parking areas for three or more automobiles shall have individual spaces marked, and shall be so designed, maintained and regulated that no parking or maneuvering incidental to parking shall be on any public street, walk, or alley, and so that any automobile may be parked and unparked without moving another. For purposes of rough computation, an off-street parking space and necessary access for maneuvering room may be estimated at 300 square feet, but off-street parking requirements will be considered to be met only when actual spaces meeting the requirements above are provided and maintained, improved in a manner appropriate to the circumstances of the case, and in accordance with all ordinances and regulations of the city.

Personal care facility means any establishment that furnishes food and shelter to four or more persons who are unrelated to the proprietor of the establishment and provides personal care services as that term is defined in V.T.C.A., Health and Safety Code § 247.002, and as further provided for in V.T.C.A., Human Resources Code § 123.004.

Planned unit development means a district with development characterized by a unified site development plan which may provide for a mixture or combination of residential, recreation and open space and commercial uses.

Servant's or caretaker's quarters means an accessory building located on the same lot as the main building, or a portion of the main building, used as living quarters by persons acting as caretakers of the property or by employed servants and not rented or otherwise used as a separate domicile and not used except as an accessory use to the primary use of the property.

Shopping center means a group of commercial establishments which is planned, developed, owned and managed as a unit related in its location, size and type of shops to the trade area that the unit serves.

Specific use means a use that would not be appropriate generally or without restrictions throughout the zoning district but would, if controlled as to number, area, location or relation to the neighborhood, promote the property held, safety, welfare, morals, order, comfort, convenience, appearance, prosperity or general welfare. Such uses may be permitted in a zoning district as special exceptions, if specific provision for such special exceptions is made in this appendix.

Street means a public or private thoroughfare which affords a principal means of access to abutting property.

Street line means the right-of-way line of a street.

Structural alterations means any change in the supporting member of a structure, such as bearing walls, columns, beams or girders.

Structure means anything constructed or erected with a fixed location on the ground or attached to something having a fixed location on the ground.

Townhouse means a row of three or more attached, one-family dwellings, separated by vertical party or lot line walls, and each having private entrances.

Variance means a relaxation of the terms of a zoning ordinance if the variance is not contrary to the public interest and, due to special conditions, a literal enforcement of the ordinance would result in unnecessary hardship, so that the spirit of the ordinance is observed and substantial justice is done.

Yard means an open space, other than a court, on a lot, unoccupied and unobstructed from the ground upward except for fences and walls.

Yard, front, means a yard extending across the full width of the lot, the depth of which is the minimum horizontal distance between the front lot line and a line parallel thereto on the lot as specified in each zoning district.

Yard, rear, means a yard extending across the full width of the lot, the depth of which is the minimum horizontal distance between the rear lot line and a line parallel thereto on the lot as specified in each zoning district. On corner lots, the rear yard shall be considered as parallel to the street upon which the lot has its least dimensions. On both corner and interior lots, the rear yard shall in all cases be at the opposite end of the lot from the front yard.

Yard, side, means a yard between a building and the side lot line, extending from the front yard, or front lot line where no front yard is required, to the rear yard. The width of the required side yard shall be measured horizontally from the nearest point of the side lot line toward the nearest part of the building.

- (b) The present tense includes the future tense; the singular number includes the plural; and the plural number includes the singular.
- (c) The term "shall" is mandatory; the term "may" is permissive.
- (d) The terms "used" and "occupied" include the words "intended, designed or arranged to be used or occupied."
- (e) The term "person" includes an individual, firm, association, organization, partnership, trust, company or corporation.

(Ord. No. 89-9, § 1, 9-11-1989; Ord. No. 89-29, § 1, 1-22-1990; Ord. No. 90-5, § 1, 3-5-1990; Ord. No. 95-36, § 1, 1-8-1996; Ord. No. 96-6, § 2, 5-20-1996; Ord. No. 98-14, §§ 2, 3, 8-17-1998; Ord. No. 98-17, § 2, 9-14-1998; Ord. No. 2001-23, § 2, 11-19-2001; Ord. No. 2005-36, § 1, 11-21-2005; Ord. No. 2008-06, § 3, 2-18-2008; Ord. No. 2009-05, § 1, 6-15-2009; Ord. No. 2013-45, §§ 2, 3, 12-2-2013; Ord. No. 2015-04, § 2, 2-2-2015; Ord. No. 2017-23, § 3, 9-11-2017

Section 10. - Board of adjustment—Establishment and procedure.

A board of adjustment is hereby established, which shall consist of five members and four alternates to be appointed by the city council, each for a term of two years. Members and alternates of the board of adjustment may be removed from office by the city council when absent from two consecutive meetings without an excuse or for cause upon written charges and after public hearing. Vacancies shall be filled by the city council for the unexpired term of the member affected.

A. *Proceedings of the board of adjustment.*

- (1) The board of adjustment shall adopt rules necessary to the conduct of its affairs, elect a chairperson and an acting chairperson, and act in keeping with the provisions of this appendix. Meetings shall be held at the call of the chairperson and at such other times as the board may determine. The chairperson, or in his absence the acting chairperson, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.
- (2) The board of adjustment shall keep minutes of its proceedings, showing the vote of each member upon each question, or if absent or failing to vote indicating such fact, and shall keep records of its examinations and all of which shall be immediately filed in the office of the board and shall be public record.

- B. ~~Hearings, appeals and notices~~Application. Appeals to the board of adjustment concerning interpretation or administration of this appendix may be taken by any person aggrieved by the decision or ~~by~~ any officer, department, board, or bureau of the city affected by the decision of the administrative official. Such appeals shall be ~~taken within a reasonable time, not to exceed 45 days~~filed not later than the 20th day after the date the decision is made, by filing with the ~~official officer~~ from whom the appeal is taken and with the board of adjustment a notice of appeal specifying the grounds thereof. On receiving the notice, t~~The official officer~~ from whom the appeal is taken shall ~~forthwith~~immediately transmit to the board all the papers constituting the record of the action that is appealed~~upon which the action appealed from was taken~~.

A member of the governing body of the municipality who serves on the board of adjustment may not bring an appeal under this section.

- C. ~~Notification, and hearing process~~. Any request for an appeal, variance or special exception shall require a public hearing before the board. A written notice of the hearing shall be sent to owners of property situated within 200 feet of the exterior boundary of the property with respect to which such appeal, variance or exception is requested ten days prior to public hearing. It shall be sufficient that such written notice is addressed to the owner appearing on the most current tax roll of the city and addressed to such owner at the address stated on said roll. If no owner is stated on the tax roll, or no address appears thereon, the written notice to such property owner shall not be required.

The city council and planning and zoning commission shall be informed of any hearing for an appeal, variance or special exception of the zoning or sign ordinance.

- D. Fee. A processing fee as described in subsection 14 shall be paid to the city in advance of the hearing. In the event the application is withdrawn prior to the mailing of the required written notification or publication in the official newspaper, the fee shall be refunded.

- E. Hearings. The board shall set a reasonable time for the appeal hearing. A party may appear at the hearing in person or by agent or by attorney. The board shall decide the

appeal at the next meeting for which notice can be provided following the hearing and not later than the 60th day after the date the appeal is filed.

- FD.** *Stay of proceedings.* An appeal stays all proceedings in furtherance of the action that is appealed ~~from~~, unless the ~~official~~officer from whom the appeal is taken certifies in writing to the board ~~of adjustment after the notice of appeal shall have been filed with him that, by reason of facts stated in the certificate, a stay would, in his opinion, cause imminent peril to life or property~~facts supporting the official's opinion that a stay would cause imminent peril to life or property. In ~~such that~~ case, the proceedings ~~shall not~~may be stayed ~~other than~~only by a restraining order ~~which may be~~ granted by the board of adjustment or by a court of record on application, ~~on after~~ notice to the ~~official~~officer, ~~from whom the appeal is taken and~~ on if due cause is shown.

Section 11. - Same—Powers and duties.

A. The board of adjustment shall have the following powers and duties:

- (1)A.** *Administrative review*~~Appeals~~. To hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the enforcement of this appendix. ~~In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose the board has the same authority as the administrative official.~~ The board shall apply the following standards in deciding the appeal:

- ~~1. That there is a reasonable difference of interpretation as to the specific intent of the zoning regulations or zoning map.~~
- ~~2. That the resulting interpretation will not grant a special privilege to one property inconsistent with other properties or uses similarly situated.~~
- ~~3. The decision of the board must be such as will be in the best interest of the community and consistent with the spirit and interest of the city's zoning laws.~~

- (2)B.** *Variance; conditions governing applications; authority and limitations.* To authorize upon appeal in specific cases, such a variance from the terms of this appendix a zoning ordinance as will not be if the variance is not contrary to the public interest and, due where, owing to special conditions, a literal enforcement of the provisions of this appendix ordinance would result in unnecessary hardship, and so that the spirit of the appendix ordinance is shall be observed and substantial justice is done. ~~In exercising such powers of variance, the board may, in conformity with the provisions of this appendix, reverse or affirm, wholly or partly, or may modify the order, requirement, decision, or determination appealed from and make such order, requirement, decision, or determination as ought to be made, and to that end the board shall have all the powers of the officer from whom the appeal is taken.~~

- ~~1. In granting any variance, the board of adjustment may describe appropriate conditions and safeguards in conformity with this appendix. Violations of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this appendix.~~

- (a)2.** *Exceptions.* Under no circumstances shall the board of adjustment grant a variance to allow a use not permissible under the terms of this appendix a zoning ordinance in

the district involved, or any use, expressly or impliedly, prohibited by the terms of this appendix in said district.

~~(3)C. *Special exceptions.* To hear and decide special exceptions to the terms of this appendix a zoning ordinance upon which when this appendix requires the board is required to pass under this appendix do so.~~

- ~~1. *Authority and scope.* The board shall have the power to grant temporary and permanent special exceptions from the city's zoning ordinance.~~
- ~~2. *Permanent special exceptions.* A permanent special exception may be granted only for the following reasons:~~
 - ~~a. *Interpretive authority.* If a definition or term of the city's zoning ordinance is ambiguous or contrary to common understanding, the board would clarify the definition or term based on the common definition or understanding of the term. (Example: An attached garage is normally understood to mean one where there are one or more common walls and a roof structure between the garage and the main property building. A board determination may be that roof structures alone are not considered walls so one or more buildings with a breezeway between them may not be considered as "attached.") No additional special exception shall be granted based on the board's initially interpreted definition.~~
 - ~~b. *De minimus exception.* The board may grant a special exception for very small exceptions to the zoning ordinance, where the spirit of the Code is met and there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city. (An example would be where a 9½-foot setback for building would be allowed where a ten-foot setback is required, to allow the property owner to save an oak tree.)~~
 - ~~c. *Medical necessity.* The board may grant a special exception to the above cited portions of the zoning ordinance if a medical necessity is proven, or to meet the requirements of the Americans with Disabilities Act. For medical reasons or necessity, the reason for the special exception must be related to the medical condition and be supported by a letter from the applicant's physician defining the physical limitations of the applicant.~~
 - ~~d. *No other permanent special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.*~~
 - ~~e. *A permanent special exception shall have no expiration date.*~~
- ~~3. *Temporary special exceptions.* A temporary special exception, not to exceed 90 days in term, may be granted by the board to allow for the construction of noncomplying structures for reasons in addition to ambiguous definitions or terms, medical reasons/necessity, or de minimus circumstances. In order for a request for a temporary special exception to be brought before the board, there needs to be:~~
 - ~~1) A finding by the city's building official that an issue of noncompliance with the city's zoning ordinance would exist by virtue of applicant's construction; and~~
 - ~~2) There are demonstrated significant reasons why immediate action cannot reasonably be taken by the applicant to achieve compliance with the city's zoning ordinance.~~

~~No other temporary special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.~~

~~4. *Requirements.* Temporary or permanent special exceptions may be granted only after the following items have been addressed:~~

- ~~a. The city's building official has denied the applicant a permit or permits based on noncompliance with the city's zoning ordinance;~~
- ~~b. The applicant has made a written request for a special exception in accordance with V.T.C.A., Local Government Code § 211.010, and section 10.B;~~
- ~~c. The applicant's request is based on ambiguous definitions or terms, medical reasons or necessity or ADA compliance, or other special de minimis circumstances, and that there are demonstrated significant economic reasons why action cannot be taken by the applicant to achieve compliance with the city's zoning ordinance;~~
- ~~d. There has been notice and a public hearing as required section 10.C;~~
- ~~e. The applicant agrees to accept reasonable conditions or actions that the board may suggest to mitigate potential issues with or objections to the applicant's request; however, the board cannot require such conditions or actions to be accepted in return for a favorable decision by the board, rather the case must be otherwise decided on its merits. (An example is installing additional property drainage as a condition for side setback relief);~~
- ~~f. In no case shall the board be authorized to grant permanent special exceptions or temporary special exceptions that would in effect allow a violation of the city's health code, life safety code or fire safety code; and~~
- ~~g. Under no circumstances shall the board grant a request for a special exception that would have the effect of allowing a use not permissible under the terms of the zoning ordinance in the district involved, or any use, expressly or impliedly, prohibited by the terms of the zoning ordinance in the subject district.~~

~~5. *Finding.* A special exception shall not be granted unless the board shall make a determination that the granting of the special exception will not adversely affect the public interest. In making its determination, the board shall duly consider, where applicable, the following:~~

- ~~a. The most appropriate use of the land and conservation and stabilization of property values;~~
- ~~b. Adequate open spaces for light and air and required yards and other open spaces;~~
- ~~c. Congestion of public streets, including ingress and egress to property with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe;~~
- ~~d. Off-street parking, loading and service areas where required;~~
- ~~e. Economic, noise, dust, heat, glare or odor effects of the special exception on surrounding properties or the city;~~
- ~~f. Utilities, with reference to locations, availability, adequacy and compatibility;~~
- ~~g. Screens and buffers with reference to type, dimensions, character and adequacy;~~

- h. ~~General compatibility with surrounding properties and general welfare of the persons residing and working in the area;~~
- i. ~~Whether, at the public hearing, there are objections from the surrounding and affected property owners and whether the objections, if any, can be or have been resolved;~~
- j. ~~For the medical necessity exception, whether the medical condition is proven and the requested exception reasonably relates to the medical condition;~~
- k. ~~For the de minimis exception, whether there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city; and~~
- l. ~~The spirit of this Code is met.~~

(4) To hear and decide other matters authorized by a zoning ordinance.

(5) In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose the board has the same authority as the administrative official.

DB. ~~Vote required: appeals; variances; special exceptions.~~ The concurring vote of four members of the board shall be necessary to reverse any order, requirements, decision, or determination of an administrative official, ~~or to effect any variation in the application of this appendix, or to decide in favor of an~~ the applicant on any matter ~~or special exception upon which it the board~~ is required to pass ~~or decide under this appendix a~~ zoning ordinance.

(Ord. No. 90-18, § 2, 7-23-1990; Ord. No. 2009-04, § 1, 5-24-2009)

Section 12. - Appeals from the board of adjustment.

- A. Any person ~~or persons, jointly or severally,~~ aggrieved by any decision of the board of adjustment, or any taxpayer, or officer, department, board, or bureau of the city may present to a district court, county court, or county court at law a verified petition stating that the decision of the board of adjustment is illegal in whole or in part and specify the grounds of illegality~~seek review by a court of record of such decision within 10 days after the date the decision is filed in the board's office and~~ in the manner provided by the laws of the state, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. *Reapplication.* No application for a variance, special exception, or appeal which has been denied shall be again filed earlier than one year from date of original denial, unless there has been a material change. For the purposes of this section, material change shall mean a substantial change in conditions or circumstances as it relates to the property in question.

Section 13. - Duties of administrative official, board of adjustment, city council, and courts on matters of appeal.

- A. It is the intent of this section that all questions of interpretation and enforcement shall be first presented to the administrative official, and that such questions shall be presented to the board of adjustment only on appeal from the decision of the administrative official, and that recourse from the decisions of the board of adjustment shall be to the courts in the manner provided by law, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. It is further the intent of this section that the duties of the city council in connection with this appendix shall not include hearing and deciding questions of interpretation and enforcement that may arise. The procedure for deciding such questions shall be as stated in this section and this appendix. Under this

appendix, the city council shall have only the duties of considering and adopting or rejecting proposed amendments or the repeal of this appendix, as provided by law, and of establishing a schedule of fees and charges as stated in section 14.

Section 14. - Schedule of fees, charges, and expenses.

- A. The city council shall establish a schedule of fees, charges, and expenses and a collection procedure for building permits, certificates of zoning compliance, specific use permits, and changes in district classification, appeals, and other matters pertaining to this appendix. The schedule of fees shall be maintained in the office of the city secretary and in the office of the administrative official, and may be altered or amended only by the city council. It is set by resolution and printed in Appendix D to this Code.
- B. Until all applicable fees, charges, and expenses have been paid in full, no action shall be taken on any application or appeal.

Section 20. - Definitions.

- (a) The following words, terms and phrases, when used in this appendix, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Accessory use or structure means a use or structure on the same lot with, and of a nature customarily incidental and subordinate to, the principal use or structure.

Adult entertainment business shall have the same meaning as "sexually oriented business," as that term is defined in V.T.C.A., Local Government Code ch. 243, and chapter 62 of the Code of Ordinances, and shall include, but not be limited to, an adult arcade, adult bookstore or adult video store, adult cabaret, adult motel, adult motion picture theater, adult tanning salon, adult theater, escort agency, nude modeling studio, sexual encounter center, or any other commercial enterprise, the primary business of which is the offering of a service or the selling, renting, or exhibiting of devices or any other items intended to provide sexual stimulation or sexual gratification to the customer. Such uses shall be allowed only as specifically authorized under the terms of this appendix and chapter 62 of the Code of Ordinances. The determination of what constitutes an adult entertainment business shall be made by the police chief or his/her designee, in accordance with the definitions contained in chapter 62 of the Code of Ordinances, and such determination shall be appealable to the zoning board of adjustment.

Apartment house means any building or portion thereof used as a multiple dwelling for the purpose of providing three or more separate dwelling units which may share means of egress and other essential facilities.

Automobile graveyard means an establishment or place of business that is maintained, used, or operated for storing, keeping, buying, or selling wrecked, scrapped, ruined, or dismantled motor vehicles or motor vehicle parts.

Building means any structure designed or built for the support, enclosure, shelter, or protection of persons, animals, chattels or property of any kind. The term "building" includes the term "structure."

Building area means the surface of the lot covered or occupied by all structures placed thereon, excluding only driveways, walkways and uncovered patios.

Building line means a line parallel or approximately parallel to the street line and beyond which buildings may not be erected.

Childcare center means a childcare facility that is licensed to care for seven or more children for less than 24 hours per day, at a location other than the permit holder's home (pursuant to Texas Administrative Code, Title 40, Part 19, Chapter 746). Compliance with all applicable state regulations is required. A childcare center shall also obtain a certificate of zoning compliance pursuant to section 9.D ("Administration and enforcement—Building permits and certificates of zoning compliance").

1. *Registered childcare home.* In a registered childcare home, the registered primary caregiver provides care in the caregiver's own residence for not more than six children from birth through 13 years, and may provide care after-school hours for not more than six additional elementary school children. The total number of children in care at any given time, including the children related to the caregiver, must not exceed 12 (pursuant to Tex. Admin. Code, Title 40, Part 19, Chapter 747). Compliance with all applicable state regulations is required. A registered childcare home shall also obtain a certificate of zoning compliance pursuant to section 9.D.
2. *Licensed childcare home.* The total number of children in care varies with the ages of the children, but the total number of children in care in a licensed childcare home at any given time, including the children related to the caregiver, must not exceed 12 (pursuant to Tex. Admin. Code, Title 40, Part 19, Chapter 747). Compliance with all applicable state regulations is required. A licensed childcare home shall also obtain a certificate of zoning compliance pursuant to section 9.D.

Cluster housing development means a residential development containing attached or detached units on a limited portion of land with the remaining land areas consolidated into common open space areas.

Comprehensive plan means graphic and textual form policies which govern the future development of the city and which consist of various components governing specific geographic areas and functions and services of the city.

Density means living units per acre in a platted subdivision. The term "density" pertains to total platted acreage, including streets.

Dwelling, garden home, means a dwelling unit which is structurally attached to another dwelling unit but which does not share a common wall.

Dwelling, multiple-family, means any building, or portion thereof, which is designed, built, rented, leased or intended to be occupied as three or more dwelling units or apartments and which includes facilities for food preparation and sleeping.

Dwelling, single-family, means a detached building having accommodations for and occupied by not more than one family.

Dwelling, two-family, means a detached building having accommodations for and occupied by not more than two families. In calculating minimum lot area, a two-family dwelling shall be considered to be two dwelling units.

Dwelling unit means a building or portion of a building which is arranged, occupied, or intended to be occupied as living quarters for one family.

Family means a single individual or a number of individuals domiciled together, whose relationship is of a continuing, nontransient, domestic character and who are cooking and living together as a single, nonprofit housekeeping unit. This shall not include any society, club, fraternity, sorority, association, lodge, coterie, organization, or group of students or other individuals whose relationship is of a transitory or seasonal nature or for anticipated limited duration of school terms or other similar determinable period.

Fence means any structure enclosing, demarcating or surrounding an area of ground to mark a boundary, control access, or prevent escape, in part or in whole.

Graduated fence means a fence required by city ordinance, the height of which may be reduced for some portion of its required length, either in a stair-step configuration or by gradually reducing such height in a straight or radial line. The length and height of the fence so reduced will be determined on the basis of a combination of factors, including, but not limited to, security, public welfare, and pedestrian and traffic safety.

Green space means natural undeveloped areas, such as prairies, farmland, barren land, forests, wetlands and lakes. The term "green space" may also include landscaped perimeters and green landscape reserves along thoroughfares.

Height.

- a. The height of a building shall be measured to:
 - (1) The top of ridge of the highest roof of a sloped roof (i.e., gable);
 - (2) The top of the highest deck of a mansard roof; or
 - (3) The top of the highest parapet wall of a flat roof.
- b. For buildings not located in the floodplain, height is measured from the top of the finished first floor of the building which can be no more than two feet above the finished grade at the site. Finished grade shall mean the highest grade elevation within five feet of the foundation or wall of the building, said grade having been established by means of an approved grading and/or drainage plan. Finished grade may also be the existing grade elevation when no terrain alteration is proposed, or where otherwise applicable. Any fill which is not required to achieve positive site drainage or slope stabilization, or which is otherwise proposed to raise the finished first floor elevation for any other purpose, shall not be considered to be finished grade for the purpose of measuring building height.

- c. For buildings located in the floodplain, height is measured from the top of the first finished floor which shall be two feet above the average base flood elevation at the site, as established by the latest available flood elevation maps for the city.
- d. No part of a building or structure is allowed to exceed the maximum height allowed in a specific zoning district except for the following:
 - (1) Elements inclusive of, but not limited to, chimneys, vents, and roof-top mechanical equipment, provided that the maximum allowed building or structure height is not exceeded by more than four feet; or
 - (2) Elements inclusive of, but not limited to, radio or television antennae or aerials (but not including microwave receivers, transmitters, repeaters, or satellite receivers), provided that the maximum allowed building or structure height is not exceeded by more than ten feet.

Home occupation means an occupation or profession engaged in by the occupants of a dwelling, the conduct of which does not result in the dwelling being identified as a business by the external and objective evidence of a business, such as signs, displays, deliveries, continuous or repetitive traffic (rather than occasional or sporadic traffic) generated by the home occupation, or by regular gatherings of clients or customers for business purposes. Home occupations are a permitted use in accordance with this section, provided that:

1. The occupation or profession conducted within a residential dwelling unit must be clearly incidental and subordinate to the use of the premises as a residential dwelling unit.
2. The home occupation shall be conducted entirely within the dwelling unit or accessory structure.
3. Only members of the family residing on the premises are employed.
4. No internal or external alterations, special construction, or features are involved.
5. There is no advertising of any type on the premises and no other display or storage of materials or exterior identification of the home occupation or variation from the residential character of the main building or any accessory building; however, advertising of the home occupation by published or printed matter is allowed.
6. No equipment is used which creates offensive noises, vibrations, sound, smoke or dust, odors, heat, glare, X-ray or electrical disturbances to radio or television.
7. Vehicles used in conjunction with the home occupation must park completely in the driveway of the resident without blocking the sidewalk.
8. The home occupation must not change the character of the residential area.
9. A childcare center as defined in this section is not recognized as a home occupation.
10. A personal care facility as defined in this section is not recognized as a home occupation.
11. The use of off-site personal services at a residence by the occupant, such as lawn care, maid services, etc., does not constitute a home occupation and is not limited by this appendix.

Junkyard means an establishment or place of business maintained, used, or operated for storing, keeping, buying or selling junk, for processing scrap metal, or for maintaining or operating an automobile graveyard. The term "junkyard" includes garbage dumps and sanitary fills.

Lot includes the term "plot" or "parcel."

Lot measurements.

1. *Depth.* The distance between the midpoint of straight lines connecting the foremost points of the side lot lines in front and the rearmost points of the side lot lines in the rear.
2. *Width.* The distance between straight lines connecting front and rear lot lines at each side of the lot, measured across the rear of the required front yard, provided, however, that width between side lot lines at their foremost point (where they intersect with the street lines) shall not be less

than 90 percent of the required lot width except in the case of lots on the turning circle of culs-de-sac where the 90 percent requirement shall not apply.

Office park means one or more commercial buildings with multiple businesses providing services but not delivering products directly to customers and consisting of two or more tenants using common driveways.

Open space means a restricted reserve located within a development with limited low-impact amenities, including, but not limited to, green space, both natural and landscaped, detention areas, trails, lakes, pavilions, benches, outdoor cooking facilities, and active recreational facilities, such as ball and soccer fields, playgrounds, and the like. Amenities may be passive or active.

Parking space, off-street, means a space adequate for parking an automobile with room for opening doors on both sides, together with properly related access to a public street or alley and maneuvering room. Required off-street parking areas for three or more automobiles shall have individual spaces marked, and shall be so designed, maintained and regulated that no parking or maneuvering incidental to parking shall be on any public street, walk, or alley, and so that any automobile may be parked and unparked without moving another. For purposes of rough computation, an off-street parking space and necessary access for maneuvering room may be estimated at 300 square feet, but off-street parking requirements will be considered to be met only when actual spaces meeting the requirements above are provided and maintained, improved in a manner appropriate to the circumstances of the case, and in accordance with all ordinances and regulations of the city.

Personal care facility means any establishment that furnishes food and shelter to four or more persons who are unrelated to the proprietor of the establishment and provides personal care services as that term is defined in V.T.C.A., Health and Safety Code § 247.002, and as further provided for in V.T.C.A., Human Resources Code § 123.004.

Planned unit development means a district with development characterized by a unified site development plan which may provide for a mixture or combination of residential, recreation and open space and commercial uses.

Servant's or caretaker's quarters means an accessory building located on the same lot as the main building, or a portion of the main building, used as living quarters by persons acting as caretakers of the property or by employed servants and not rented or otherwise used as a separate domicile and not used except as an accessory use to the primary use of the property.

Shopping center means a group of commercial establishments which is planned, developed, owned and managed as a unit related in its location, size and type of shops to the trade area that the unit serves.

Specific use means a use that would not be appropriate generally or without restrictions throughout the zoning district but would, if controlled as to number, area, location or relation to the neighborhood, promote the property held, safety, welfare, morals, order, comfort, convenience, appearance, prosperity or general welfare. Such uses may be permitted in a zoning district as special exceptions, if specific provision for such special exceptions is made in this appendix.

Street means a public or private thoroughfare which affords a principal means of access to abutting property.

Street line means the right-of-way line of a street.

Structural alterations means any change in the supporting member of a structure, such as bearing walls, columns, beams or girders.

Structure means anything constructed or erected with a fixed location on the ground or attached to something having a fixed location on the ground.

Townhouse means a row of three or more attached, one-family dwellings, separated by vertical party or lot line walls, and each having private entrances.

Variance means a relaxation of the terms of ~~this appendix~~ [a zoning ordinance](#) where such if the variance ~~will not be~~ [is not](#) contrary to the public interest and, ~~due to special conditions, as the result of the actions of the applicant,~~ [a literal enforcement of the regulations of this appendix](#) ~~ordinance~~ would result in

~~unnecessary and undue hardship, so that the spirit of the ordinance is observed and substantial justice is done. As used in this appendix, a variance is authorized only for height, area and size of structure or size of yards and open spaces. Establishment or expansion of a use otherwise prohibited shall not be allowed by a variance, nor shall a variance be granted because of the presence of nonconformities in the zoning district or uses in an adjoining zoning district.~~

Yard means an open space, other than a court, on a lot, unoccupied and unobstructed from the ground upward except for fences and walls.

Yard, front, means a yard extending across the full width of the lot, the depth of which is the minimum horizontal distance between the front lot line and a line parallel thereto on the lot as specified in each zoning district.

Yard, rear, means a yard extending across the full width of the lot, the depth of which is the minimum horizontal distance between the rear lot line and a line parallel thereto on the lot as specified in each zoning district. On corner lots, the rear yard shall be considered as parallel to the street upon which the lot has its least dimensions. On both corner and interior lots, the rear yard shall in all cases be at the opposite end of the lot from the front yard.

Yard, side, means a yard between a building and the side lot line, extending from the front yard, or front lot line where no front yard is required, to the rear yard. The width of the required side yard shall be measured horizontally from the nearest point of the side lot line toward the nearest part of the building.

- (b) The present tense includes the future tense; the singular number includes the plural; and the plural number includes the singular.
- (c) The term "shall" is mandatory; the term "may" is permissive.
- (d) The terms "used" and "occupied" include the words "intended, designed or arranged to be used or occupied."
- (e) The term "person" includes an individual, firm, association, organization, partnership, trust, company or corporation.

(Ord. No. 89-9, § 1, 9-11-1989; Ord. No. 89-29, § 1, 1-22-1990; Ord. No. 90-5, § 1, 3-5-1990; Ord. No. 95-36, § 1, 1-8-1996; Ord. No. 96-6, § 2, 5-20-1996; Ord. No. 98-14, §§ 2, 3, 8-17-1998; Ord. No. 98-17, § 2, 9-14-1998; Ord. No. 2001-23, § 2, 11-19-2001; Ord. No. 2005-36, § 1, 11-21-2005; Ord. No. 2008-06, § 3, 2-18-2008; Ord. No. 2009-05, § 1, 6-15-2009; Ord. No. 2013-45, §§ 2, 3, 12-2-2013; Ord. No. 2015-04, § 2, 2-2-2015; Ord. No. 2017-23, § 3, 9-11-2017

Memo

To: Mayor and City Council

From: Joe Matranga, Planning & Zoning Commission Chairman

Date: February 20, 2020

Re: Proposed amendments to Appendix C Zoning Ordinance Sections 10-12 regarding board of adjustment establishment and procedure, powers and duties, and appeals from the board of adjustment and Section 20, Definitions, to be consistent with state law, particularly Chapter 211 of the Local Government Code



At the Planning and Zoning Commission (P&Z Commission) meeting held February 13, 2020, following the Public Hearing, the City of Friendswood Planning and Zoning Commission voted unanimously 6-0 (Commissioner Clark was absent) to approve the proposed amendments to the Zoning Ordinance as shown below. These proposed amendments expand the flexibility and authority of the Zoning Board Of Adjustments (ZBOA) to be consistent with state law, primarily Chapter 211 of the Local Government Code. The P&Z Commission and the ZBOA recommend making these changes.

Appendix C; Zoning Ordinance

Section 10. - Board of adjustment—Establishment and procedure.

A board of adjustment is hereby established, which shall consist of five members and four alternates to be appointed by the city council, each for a term of two years. Members and alternates of the board of adjustment may be removed from office by the city council when absent from two consecutive meetings without an excuse or for cause upon written charges and after public hearing. Vacancies shall be filled by the city council for the unexpired term of the member affected.

A. *Proceedings of the board of adjustment.*

- (1) The board of adjustment shall adopt rules necessary to the conduct of its affairs, elect a chairperson and an acting chairperson, and act in keeping with the provisions of this appendix. Meetings shall be held at the call of the chairperson and at such other times as the board may

determine. The chairperson, or in his absence the acting chairperson, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.

- (2) The board of adjustment shall keep minutes of its proceedings, showing the vote of each member upon each question, or if absent or failing to vote indicating such fact, and shall keep records of its examinations and all of which shall be immediately filed in the office of the board and shall be public record.

- B. ~~Hearings, appeals and notices~~Application. Appeals to the board of adjustment concerning interpretation or administration of this appendix may be taken by any person aggrieved by the decision or by any officer, department, board, or bureau of the city affected by the decision of the administrative official. Such appeals shall be taken within a reasonable time, not to exceed 45 days filed not later than the 20th day after the date the decision is made, by filing with the ~~official officer~~ from whom the appeal is taken and with the board of adjustment a notice of appeal specifying the grounds thereof. On receiving the notice, the official officer from whom the appeal is taken shall forthwith immediately transmit to the board all the papers constituting the record of the action that is appealed upon which the action appealed from was taken.

A member of the governing body of the municipality who serves on the board of adjustment may not bring an appeal under this section.

- C. ~~Notification and hearing process~~. Any request for an appeal, variance or special exception shall require a public hearing before the board. A written notice of the hearing shall be sent to owners of property situated within 200 feet of the exterior boundary of the property with respect to which such appeal, variance or exception is requested ten days prior to public hearing. It shall be sufficient that such written notice is addressed to the owner appearing on the most current tax roll of the city and addressed to such owner at the address stated on said roll. If no owner is stated on the tax roll, or no address appears thereon, the written notice to such property owner shall not be required.

The city council and planning and zoning commission shall be informed of any hearing for an appeal, variance or special exception of the zoning or sign ordinance.

- D. Fee. A processing fee as described in subsection 14 shall be paid to the city in advance of the hearing. In the event the application is withdrawn prior to the mailing of the required written notification or publication in the official newspaper, the fee shall be refunded.

- E. Hearings. The board shall set a reasonable time for the appeal hearing. A party may appear at the hearing in person or by agent or by attorney. The board shall decide the appeal at the next meeting for which notice can be provided following the hearing and not later than the 60th day after the date the appeal is filed.

- ~~FD.~~ Stay of proceedings. An appeal stays all proceedings in furtherance of the action that is appealed ~~from~~, unless the ~~official officer~~ from whom the appeal is taken certifies in writing to the board of adjustment ~~after the notice of appeal shall have been filed with him that, by reason of facts stated in the certificate, a stay would, in his opinion, cause imminent peril to life or property~~ facts supporting the official's opinion that a stay would cause imminent peril to life or property. In ~~such that~~ case, the proceedings ~~shall not may~~ be stayed other than only by a restraining order ~~which may be granted by~~ the board of adjustment or by a court of record on application, on after notice to the ~~official officer~~, ~~from whom the appeal is taken and on if~~ due cause is shown.

Section 11. - Same—Powers and duties.

- A. The board of adjustment shall have the following powers and duties:

- (1) ~~A.~~ Administrative reviewAppeals. To hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the enforcement of this appendix. In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision,

~~or determination, and for that purpose the board has the same authority as the administrative official. The board shall apply the following standards in deciding the appeal:~~

- ~~1. That there is a reasonable difference of interpretation as to the specific intent of the zoning regulations or zoning map.~~
- ~~2. That the resulting interpretation will not grant a special privilege to one property inconsistent with other properties or uses similarly situated.~~
- ~~3. The decision of the board must be such as will be in the best interest of the community and consistent with the spirit and interest of the city's zoning laws.~~

~~(2)B. Variance; conditions governing applications; authority and limitations. To authorize upon appeal in specific cases, such a variance from the terms of this appendix zoning ordinance as will not be if the variance is not contrary to the public interest and, due where, owing to special conditions, a literal enforcement of the provisions of this appendix ordinance would result in unnecessary hardship, and so that the spirit of the appendix ordinance is shall be observed and substantial justice is done. In exercising such powers of variance, the board may, in conformity with the provisions of this appendix, reverse or affirm, wholly or partly, or may modify the order, requirement, decision, or determination appealed from and make such order, requirement, decision, or determination as ought to be made, and to that end the board shall have all the powers of the officer from whom the appeal is taken.~~

- ~~1. In granting any variance, the board of adjustment may describe appropriate conditions and safeguards in conformity with this appendix. Violations of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this appendix.~~

~~(a)2. Exceptions. Under no circumstances shall the board of adjustment grant a variance to allow a use not permissible under the terms of this appendix zoning ordinance in the district involved, or any use, expressly or impliedly, prohibited by the terms of this appendix in said district.~~

~~(3)C. Special exceptions. To hear and decide special exceptions to the terms of this appendix zoning ordinance upon which when this appendix requires the board is required to pass under this appendix do so.~~

- ~~1. Authority and scope. The board shall have the power to grant temporary and permanent special exceptions from the city's zoning ordinance.~~
- ~~2. Permanent special exceptions. A permanent special exception may be granted only for the following reasons:~~
 - ~~a. Interpretive authority. If a definition or term of the city's zoning ordinance is ambiguous or contrary to common understanding, the board would clarify the definition or term based on the common definition or understanding of the term. (Example: An attached garage is normally understood to mean one where there are one or more common walls and a roof structure between the garage and the main property building. A board determination may be that roof structures alone are not considered walls so one or more buildings with a breezeway between them may not be considered as "attached.") No additional special exception shall be granted based on the board's initially interpreted definition.~~
 - ~~b. De minimus exception. The board may grant a special exception for very small exceptions to the zoning ordinance, where the spirit of the Code is met and there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city. (An example would be where a 9½-foot setback for building would be allowed where a ten-foot setback is required, to allow the property owner to save an oak tree.)~~
 - ~~c. Medical necessity. The board may grant a special exception to the above-cited portions of the zoning ordinance if a medical necessity is proven, or to meet the requirements of the Americans with Disabilities Act. For medical reasons or necessity, the reason for the special exception must be related to the medical condition and be supported by a letter from the applicant's physician defining the physical limitations of the applicant.~~

d. ~~No other permanent special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.~~

e. ~~A permanent special exception shall have no expiration date.~~

3. ~~*Temporary special exceptions.* A temporary special exception, not to exceed 90 days in term, may be granted by the board to allow for the construction of noncomplying structures for reasons in addition to ambiguous definitions or terms, medical reasons/necessity, or de minimis circumstances. In order for a request for a temporary special exception to be brought before the board, there needs to be:~~

1) ~~A finding by the city's building official that an issue of noncompliance with the city's zoning ordinance would exist by virtue of applicant's construction; and~~

2) ~~There are demonstrated significant reasons why immediate action cannot reasonably be taken by the applicant to achieve compliance with the city's zoning ordinance.~~

~~No other temporary special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.~~

4. ~~*Requirements.* Temporary or permanent special exceptions may be granted only after the following items have been addressed:~~

a. ~~The city's building official has denied the applicant a permit or permits based on noncompliance with the city's zoning ordinance;~~

b. ~~The applicant has made a written request for a special exception in accordance with V.T.C.A., Local Government Code § 211.010, and section 10.B;~~

c. ~~The applicant's request is based on ambiguous definitions or terms, medical reasons or necessity or ADA compliance, or other special de minimis circumstances, and that there are demonstrated significant economic reasons why action cannot be taken by the applicant to achieve compliance with the city's zoning ordinance;~~

d. ~~There has been notice and a public hearing as required section 10.C;~~

e. ~~The applicant agrees to accept reasonable conditions or actions that the board may suggest to mitigate potential issues with or objections to the applicant's request; however, the board cannot require such conditions or actions to be accepted in return for a favorable decision by the board, rather the case must be otherwise decided on its merits. (An example is installing additional property drainage as a condition for side setback relief);~~

f. ~~In no case shall the board be authorized to grant permanent special exceptions or temporary special exceptions that would in effect allow a violation of the city's health code, life safety code or fire safety code; and~~

g. ~~Under no circumstances shall the board grant a request for a special exception that would have the effect of allowing a use not permissible under the terms of the zoning ordinance in the district involved, or any use, expressly or impliedly, prohibited by the terms of the zoning ordinance in the subject district.~~

5. ~~*Finding.* A special exception shall not be granted unless the board shall make a determination that the granting of the special exception will not adversely affect the public interest. In making its determination, the board shall duly consider, where applicable, the following:~~

a. ~~The most appropriate use of the land and conservation and stabilization of property values;~~

b. ~~Adequate open spaces for light and air and required yards and other open spaces;~~

c. ~~Congestion of public streets, including ingress and egress to property with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe;~~

- d.—Off street parking, loading and service areas where required;
- e.—Economic, noise, dust, heat, glare or odor effects of the special exception on surrounding properties or the city;
- f.—Utilities, with reference to locations, availability, adequacy and compatibility;
- g.—Screens and buffers with reference to type, dimensions, character and adequacy;
- h.—General compatibility with surrounding properties and general welfare of the persons residing and working in the area;
- i.—Whether, at the public hearing, there are objections from the surrounding and affected property owners and whether the objections, if any, can be or have been resolved;
- j.—For the medical necessity exception, whether the medical condition is proven and the requested exception reasonably relates to the medical condition;
- k.—For the de minimis exception, whether there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city; and
- l.—The spirit of this Code is met.

(4) To hear and decide other matters authorized by a zoning ordinance.

(5) In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose the board has the same authority as the administrative official.

DB. Vote required: ~~appeals; variances; special exceptions~~. The concurring vote of four members of the board shall be necessary to reverse any order, requirements, decision, or determination of an administrative official, or to effect any variation in the application of this appendix, or to decide in favor of ~~an~~the applicant on any matter or special exception upon which ~~it~~the board is required to pass or decide under this appendixa zoning ordinance.

Section 12. - Appeals from the board of adjustment.

- A. Any person ~~or persons, jointly or severally,~~ aggrieved by ~~any~~ decision of the board of adjustment, or any taxpayer, or officer, department, board, or bureau of the city may present to a district court, county court, or county court at law a verified petition stating that the decision of the board of adjustment is illegal in whole or in part and specify the grounds of illegality seek review by a court of record of such decision within 10 days after the date the decision is filed in the board's office and in the manner provided by the laws of the state, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. *Reapplication.* No application for a variance, special exception, or appeal which has been denied shall be again filed earlier than one year from date of original denial, unless there has been a material change. For the purposes of this section, material change shall mean a substantial change in conditions or circumstances as it relates to the property in question.

Section 13. - Duties of administrative official, board of adjustment, city council, and courts on matters of appeal.

- A. It is the intent of this section that all questions of interpretation and enforcement shall be first presented to the administrative official, and that such questions shall be presented to the board of adjustment only on appeal from the decision of the administrative official, and that recourse from the decisions of the board of adjustment shall be to the courts in the manner provided by law, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. It is further the intent of this section that the duties of the city council in connection with this appendix shall not include hearing and deciding questions of interpretation and enforcement that may arise. The procedure for deciding such questions shall be as stated in this section and this appendix. Under this appendix, the city council shall have only the duties of considering and adopting or rejecting proposed amendments or the repeal of this appendix, as provided by law, and of establishing a schedule of fees and charges as stated in section 14.

Section 14. - Schedule of fees, charges, and expenses.

- A. The city council shall establish a schedule of fees, charges, and expenses and a collection procedure for building permits, certificates of zoning compliance, specific use permits, and changes in district classification, appeals, and other matters pertaining to this appendix. The schedule of fees shall be maintained in the office of the city secretary and in the office of the administrative official, and may be altered or amended only by the city council. It is set by resolution and printed in Appendix D to this Code.
- B. Until all applicable fees, charges, and expenses have been paid in full, no action shall be taken on any application or appeal.

Section 20. Definitions.

...

Variance means a relaxation of the terms of ~~this appendix a zoning ordinance where such if the~~ variance ~~will not be is not~~ contrary to the public interest and, due to special conditions, as the result of the actions of the applicant, a literal enforcement of the ~~regulations of this appendix ordinance~~ would result in unnecessary ~~and undue~~ hardship, so that the spirit of the ordinance is observed and substantial justice is done. ~~As used in this appendix, a variance is authorized only for height, area and size of structure or size of yards and open spaces. Establishment or expansion of a use otherwise prohibited shall not be allowed by a variance, nor shall a variance be granted because of the presence of nonconformities in the zoning district or uses in an adjoining zoning district.~~

- (c) The term "shall" is mandatory; the term "may" is permissive.
- (d) The terms "used" and "occupied" include the words "intended, designed or arranged to be used or occupied."
- (e) The term "person" includes an individual, firm, association, organization, partnership, trust, company or corporation.

...

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/23/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Proposed amendments to Appendix C, Zoning Ordinance, Section 7. P. 6. Permitted Use Table regarding changes for NAICS Use #447 Gasoline Stations, #511 Publishing Industries, and #713940 Fitness and Recreational Sports Centers.

Originating Department: Community Development

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

As a result of the annual review of the Permitted Use Table (Zoning Ord. Section 7.P.6.), staff and the Planning and Zoning Commission are proposing amendments in three categories.

The proposed amendments include...

447 - Gasoline Stations - change S in DD to blank, which would not allow gasoline stations in the Downtown District (DD)

511 - Publishing Industries - add P in CSC to allow; change S in DD to P to allow by right in the Downtown District (DD)

Publishing is classified in the Information Sector; whereas Printing remains under Manufacturing. The classification of book and newspaper publishing is intended to portray their roles in a modern economy, in which they do not resemble manufacturing activities.

713940 - Fitness and Recreational Sports Centers - change S to P in DD to allow gyms and fitness centers by right in Downtown District (DD)

This would allow uses such as aerobic dance or exercise centers, ice or roller skating rinks, gymnasiums, swimming or wave pools, physical fitness centers, handball, racquetball, or tennis club facilities in DD. Previous concerns for these types of uses was parking, however, square footage will regulate the number of parking spaces. Parking requirements for fitness and recreational sports is 7 parking spaces per 1,000 square feet of gross floor area.

Full NAICS descriptions of each use are included in the backup materials.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Any existing uses that would become non-conforming with these changes would be allowed to remain. The business could change owners and business name, as long as the use remained. If the structure that the non-conforming use occupies was damaged more than 50%, the owner would be allowed to rebuild a new structure (in conformance with current zoning regulations) and continue the use. If a non-conforming use is abandoned for 12 months or more or voluntarily changed to a conforming use, the non-conforming use is no longer allowed.

RECOMMENDATIONS

Following a public hearing on Thursday, February 13, 2020, the Planning and Zoning Commission voted unanimously (6 to 0; Clark was absent) in favor of the proposed amendments.

ATTACHMENTS

1. Permitted Use Table Redline
2. NAICS Description 447 Gasoline Stations
3. NAICS Description 511 Publishing Industries
4. NAICS Description 713940 Fitness and Recreational Sports Centers
5. PZ Recommendation Memo PUT Amendments 02-13-2020

	2017 NAICS Industry Descriptions	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
	Sexually oriented businesses (Ch. 62)														S	
11	<i>Agriculture, Forestry, Fishing and Hunting</i>															
111	Crop production							O	O		O	O	P			
1114	Greenhouse, nursery and floriculture production										O	O	P	S	S	O
112	Animal production							O	O		O	O	P			
113	Forestry and logging										O	O	P	S	P	
1133	Logging										O	O	S		S	
114	Fishing, hunting and trapping										O	O	P			
115	Support activities for agriculture and forestry							O	O		O	O	P		O	
21	<i>Mining</i>															
211	Oil and gas extraction										O	O	S	S	S	
212	Mining, except oil and gas										O	O	S	S	S	
213	Support activities for mining										O	O	S	S	S	
22	<i>Utilities</i>															
221	Utilities										O	O		S	P	O
23	<i>Construction</i>															
236	Construction of buildings							O	O		O	O		P	P	P
237	Heavy and civil engineering construction							O	O		O	O		P	P	S
238	Specialty trade contractors							O	O		O	O		P	P	P
31—33	<i>Manufacturing</i>															
311	Food manufacturing							O			O	O		S	S	S
311811	Retail bakeries							P	P			P				
312	Beverage and tobacco product manufacturing							O			O	O		S	S	S
313	Textile mills							O			O	O		S	S	S
314	Textile product mills							O			O	O		S	S	S
315	Apparel manufacturing							O			O	O		S	S	S

316	Leather and allied product manufacturing							O			O	O		S	P	S
	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
3161	Leather and hide tanning and finishing							O			O	O		O	S	O
321	Wood product manufacturing							O			O	O		S	P	S
322	Paper manufacturing							O			O	O		O	S	O
323	Printing and related support activities							S			O	S		P	P	P
323113	Commercial screen printing							P	S		O	P		P	P	P
324	Petroleum and coal products manufacturing							O			O	O		S	S	S
325	Chemical manufacturing							O			O	O		S	S	S
325412	Pharmaceutical preparation manufacturing							O			O	O		P	P	P
326	Plastics and rubber products manufacturing							O			O	O		S	P	S
3262	Rubber product manufacturing							O			O	O		O	P	O
327	Nonmetallic mineral product manufacturing							O			O	O		O	P	O
331	Primary metal manufacturing							O			O	O		O	S	O
332	Fabricated metal product manufacturing							O			O	O		S	P	S
333	Machinery manufacturing							O			O	O		S	P	S
334	Computer and electronic product manufacturing							O			O	O		P	P	P
335	Electrical equipment, appliance and component manufacturing							O			O	O		P	P	P
33591	Battery manufacturing							O			O	O		O	S	O
336	Transportation equipment manufacturing							O			O	O		S	P	S
337	Furniture and related products manufacturing							O			O	O		S	P	S
339	Miscellaneous manufacturing							O			O	O		P	P	S
3391	Medical equipment and supplies manufacturing							O			O	O		P	P	P
42	Wholesale Trade															
423	Merchant wholesalers, durable goods							O			O	O		P	P	P

424	Merchant wholesalers, nondurable goods							O			O	O		P	P	P
	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
425	Wholesale electronic markets and agents and brokers							O			O	O		P	P	P
44—45	Retail Trade															
4411	Automobile dealers							O			O	O		P	P	O
4412	Other motor vehicle dealers							O			O	O		P	P	O
4413	Automotive parts, accessories and tire stores							P	S		O	O		P	P	P
442	Furniture and home furnishing stores							P	P		O	P		S	S	P
443	Electronics and appliance stores							P	P		O	P		S	S	P
444	Building material and garden equipment and supplies dealers							P	P		O	P		P	P	P
444190	Other building material dealers							S	S		O	O		S	S	S
445	Food and beverage stores							P	P		O	P		S		S
446	Health and personal care stores							P	P		O	P		P		P
447	Gasoline stations							P	P		O	S		P	P	
447190	Other gasoline stations										O	O		S	S	
448	Clothing and clothing accessory stores							P	P		O	P				P
451	Sporting goods, hobby, book and music stores							P	P		O	P				P
452	General merchandise stores							P	P		O	P		P	P	P
453	Miscellaneous store retailers							P	P		O	P		P	P	P
4533	Used merchandise stores							P	P			P		P	P	P
45393	Manufactured (mobile) home dealers										O	O			S	
45399	All other miscellaneous store retailers							P	P			P		P	P	P
454	Nonstore retailers							S	S		O	S		S	S	S
48—49	Transportation and Warehousing															
481	Air transportation										O	O		O	O	O
482	Rail transportation										O	O		S	P	S

Commented [BB1]: Remove Specific Use Permit and do not allow Gasoline Stations in the Downtown District.

483	Water transportation										O	O		O	S	O
	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
484	Truck transportation										O	O		P	P	S
485	Transit and ground passenger transportation							S	S		O	S		S	S	S
486	Pipeline transportation	S	S	S	S	S	S	S	S		S	S	S	S	S	S
487	Scenic and sightseeing transportation							S			O	P				P
488	Support activities for transportation							S	S		O	O		S	P	P
48841	Motor vehicle towing										O	O		S	P	O
491	Postal service							P	P		O	P		P	P	P
492	Couriers and messengers							P	P		O	P		P	P	P
493	Warehousing and storage										O	S		P	P	P
51	Information															
511	Publishing industries							P			O	PS		P	P	P
512	Motion picture and sound recording industries							S			O	S		S	S	S
515	Broadcasting (except internet)							S	S		O	O		P	P	P
517	Telecommunications							S	S		O	S		P	P	P
517911	Telecommunication resellers							P	P		O	P		P	P	P
518	Data processing, hosting and related services							S	S		O	S		S	P	P
519	Other information services							S	S		O	S		S	P	P
52	Finance and Insurance															
521	Monetary authorities—Central bank							P	P		P	P		P		P
522	Credit intermediation and related activities							P	P		P	P		P		P
522298	All other nondepository credit intermediation(i.e., pawn shops)							S			O	S		S	P	P
523	Securities, commodity contracts, and other financial investments and related activities							P	P		P	P		P		P
524	Insurance carriers and related activities							P	P		P	P		P		P
525	Funds, trusts, and other financial vehicles							P	P		P	P		P		P

Commented [BB2]: Publishing is classified in the Information Sector; whereas Printing remains under Manufacturing. The classification of book and newspaper publishing is intended to portray their roles in a modern economy, in which they do not resemble manufacturing activities.

53	Real Estate and Rental and Leasing															
	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
531	Real estate							P	P		P	P		P	P	P
53113	Lessors of miniwarehouses and self-storage units							O	O		O	O		O	P	P
532	Rental and leasing services							P	S		O	S		P	P	P
53212	Truck, utility trailer and RV rental							O	O		O	O		O	P	P
533	Lessors of nonfinancial intangible assets (except copyrighted works)							P	P		P	P		P	P	P
54	Professional, Scientific and Technical Services															
541	Professional, scientific and technical services							P	P		P	P		P		P
54138	Testing laboratories							S			O	S		S	P	P
55	Management of Companies and Enterprises															
551	Management of companies and enterprises							P	P		P	P		P		P
56	Administration/Support Waste Management/Remediation Services															
561	Administrative and support services							P	P		O	P		P		P
561730	Landscaping services							S			O	O		S	P	S
56179	Other services to buildings and dwellings							S			O	O		S	P	P
562	Waste management and remediation services										O	O		S	P	S
61	Educational Services															
6111	Elementary and secondary schools	S	S	S	S	S	S	S	S		O	S	S	S	S	S
6112	Junior colleges							S			O	S	S	S	S	S
6113	Colleges, universities and professional schools							S			O	S	S	S	S	S
6114	Business schools and computer and management training							S			O	S	S	S	S	S
6115	Technical and trade schools							S			O	S	S	S	S	S
6116	Other school and instruction							P	P		P	P	S	P	P	

62	Health Care and Social Assistance															
	2017 NAICS	SFR and SFR-E	MFR-GHD	MFR-L	MFR-M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
621	Ambulatory health care services							P	P		P	P				P
622	Hospitals							P			O	S		P		P
6231	Nursing care facilities—Skilled nursing facilities							S	S		O	S				
6232	Residential, intellectual and development disability, mental health, and substance abuse facilities	S1	S1													
623311	Continuing care retirement communities (with on-site nursing)	S1	S1					S	S		O	S				
623312	Assisted living facilities for the elderly (without on-site nursing)	S1	S1					S	S		O	S				
624	Social assistance							S			O	S				S
6244	Child day care services (childcare centers)							P	P		O	P				
6244	Child day care services (registered and/or licensed childcare home)	P	P													
71	Arts, Entertainment and Recreation															
7111	Performing arts							P			O	P				P
7112	Spectator sports							S			O	O				P
7113	Promoters of performing arts, sports and similar events							P			O	P				P
712	Museums, historical sites and similar institutions	S	S	S	S	S	S	P	S		O	P	S	S	S	S
7131	Amusement parks and arcades											S		S	P	
7132	Gambling industries															
7139	Other amusement and recreation industries											S		S	P	
713940	Fitness and recreational sports centers							P	S			S-P		P	P	
72	Accommodation and Food Services															

Commented [BB3]: Aerobic dance or exercise centers
Ice or roller skating rinks
Gymnasiums
Swimming or wave pools
Physical fitness centers
Handball, racquetball, or tennis club facilities

7211	Traveler accommodation							S			O	S		S	S	S
	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
7212	RV (recreational vehicle) parks and recreational camps										O			S	S	
7213	Roominghouses and boardinghouses							S			O	S		S	S	S
7223	Special food services							P	P		O	P		P		P
7224	Drinking places (more than 75% sales of alcoholic beverages)							S				S		S		S
7225	Restaurants and other eating places							P	P		O	P		P		P
81	Other Services (Except Public Administration)															
8111	Automotive repair and maintenance							P	S		O	S		S	P	
81112	Automotive body, paint, interior and glass repair							S	S		O	S		S	P	
8112	Electronic and precision equipment repair and maintenance							S			O	O		S	P	P
8113	Commercial and industrial machinery and equipment (except automotive and electronic repair and maintenance)							S			O	O		S	P	P
8114	Personal and household goods repair and maintenance							S			O	O		S	P	P
8121	Personal care services							P	P		P	P		P		P
8122	Death care services							S	S		O	S		S		S
8123	Dry cleaning and laundry services							P	P		P	P		P		P
8129	Other personal services							P	P		P	P		P		P
8131	Religious organizations	S	S	S	S	S	S	S	S		O	S	S			
8132	Grantmaking and giving services							O	O		O	O		O		O
8133	Social advocacy organizations							O	O		O	O		O	P	O
8134	Civic and social organizations							O	O		O	O		O	P	O

8139	Business, professional, labor, political, and similar organizations							O	O		O	O		O		O
	2017 NAICS	SFR and SFR-E	MFR-GHD	MFR-L	MFR-M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
814	Private households	P	P	P	P	P	P					P (a)	P			
92	Public Administration															
921	Executive, legislative, and other general government support							P			O	P		P		P
922	Justice, public order and safety activities							P			O	P		P		P
92214	Correctional institutions														S	
923	Administration of human resource programs							P			O	P		P		P
924	Administration of environment quality programs							P			O	P		P		P
925	Administration of housing programs, urban planning, and community development							P			O	P		P		P
926	Administration of economic programs							P			O	P		P		P
927	Space research and technology							P			O	P		P		P
928	National security and international affairs							P			O	P		P		P

Cross-References. Establishments primarily engaged in--

- Retailing specialized health and personal care merchandise via electronic home shopping, mail-order, or direct sale--are classified in Subsector 454, Nonstore Retailers;
- Retailing food supplement products--are classified in U.S. Industry 446191, Food (Health) Supplement Stores;
- Retailing prescription or nonprescription drugs and medicines--are classified in Industry 446110, Pharmacies and Drug Stores;
- Retailing eyeglasses and contact lenses--are classified in Industry 446130, Optical Goods Stores;
- Retailing perfumes, cosmetics, and beauty supplies--are classified in Industry 446120, Cosmetics, Beauty Supplies, and Perfume Stores;
- Retailing orthopedic shoes--are classified in Industry 448210, Shoe Stores; and
- Retailing orthopedic and prosthetic appliances that are made on the premises--are classified in U.S. Industry 339113, Surgical Appliance and Supplies Manufacturing.

447 Gasoline Stations

Industries in the Gasoline Stations subsector retail automotive fuels (e.g., gasoline, diesel fuel, gasohol, alternative fuels) and automotive oils or retail these products in combination with convenience store items. These establishments have specialized equipment for storing and dispensing automotive fuels.

4471 Gasoline Stations**44711 Gasoline Stations with Convenience Stores**

See industry description for 447110.

447110 Gasoline Stations with Convenience Stores

This industry comprises establishments engaged in retailing automotive fuels (e.g., diesel fuel, gasohol, gasoline) in combination with convenience store or food mart items. These establishments can either be in a convenience store (i.e., food mart) setting or a gasoline station setting. These establishments may also provide automotive repair services.

Cross-References. Establishments primarily engaged in--

- Retailing automotive fuels without a convenience store--are classified in Industry 447190, Other Gasoline Stations; and
- Retailing a limited line of goods, known as convenience stores or food marts (except those with fuel pumps)--are classified in Industry 445120, Convenience Stores.

44719 Other Gasoline Stations

See industry description for 447190.

447190 Other Gasoline Stations

This industry comprises establishments known as gasoline stations (except those with convenience stores) primarily engaged in (1) retailing automotive fuels (e.g., diesel fuel, gasohol, gasoline, alternative fuels) or (2) retailing these fuels in combination with activities, such as providing repair services; selling automotive oils, replacement parts, and accessories; and/or providing food services.

Illustrative Examples:

Gasoline stations without convenience stores
Truck stops

Marine service stations

T—Canadian, Mexican, and United States industries are comparable.

census.gov/naics

Cross-References. Establishments primarily engaged in--

- Repairing motor vehicles without retailing automotive fuels--are classified in Industry Group 8111, Automotive Repair and Maintenance; and
- Retailing automotive fuels in combination with a convenience store or food mart--are classified in Industry 447110, Gasoline Stations with Convenience Stores.

448 Clothing and Clothing Accessories Stores

Industries in the Clothing and Clothing Accessories Stores subsector retail new clothing and clothing accessories from fixed point-of-sale locations. Establishments in this subsector have similar display equipment and staff that is knowledgeable regarding fashion trends and the proper match of styles, colors, and combinations of clothing and accessories to the characteristics and tastes of the customer.

4481 Clothing Stores

This industry group comprises establishments primarily engaged in retailing new clothing.

44811 Men's Clothing Stores

See industry description for 448110.

448110 Men's Clothing Stores

This industry comprises establishments primarily engaged in retailing a general line of new men's and boys' clothing. These establishments may provide basic alterations, such as hemming, taking in or letting out seams, or lengthening or shortening sleeves.

Cross-References. Establishments primarily engaged in--

- Retailing men's and boys' clothing via electronic home shopping, mail-order, or direct sale--are classified in Subsector 454, Nonstore Retailers;
- Retailing custom men's clothing made on the premises--are classified in Industry Group 3152, Cut and Sew Apparel Manufacturing;
- Retailing new men's and boys' accessories--are classified in Industry 448150, Clothing Accessories Stores;
- Retailing specialized new apparel, such as raincoats, leather coats, fur apparel, and swimwear--are classified in Industry 448190, Other Clothing Stores;
- Retailing new clothing for all genders and age groups--are classified in Industry 448140, Family Clothing Stores;
- Retailing secondhand clothes--are classified in Industry 453310, Used Merchandise Stores; and
- Providing clothing alterations and repair--are classified in Industry 811490, Other Personal and Household Goods Repair and Maintenance.

44812 Women's Clothing Stores

See industry description for 448120.

448120 Women's Clothing Stores

This industry comprises establishments primarily engaged in retailing a general line of new women's, misses', and juniors' clothing, including maternity wear. These establishments may provide basic alterations, such as hemming, taking in or letting out seams, or lengthening or shortening sleeves.

Cross-References. Establishments primarily engaged in--

- Retailing women's clothing via electronic home shopping, mail-order, or direct sale--are classified in Subsector 454, Nonstore Retailers;

T—Canadian, Mexican, and United States industries are comparable.

example, can be printed locally or by the final consumer. Similarly, packaged software is available mainly on-line. The NAICS Information sector is designed to make such economic changes transparent as they occur, or to facilitate designing surveys that will monitor the new phenomena and provide data to analyze the changes.

Many of the industries in the NAICS Information sector are engaged in producing products protected by copyright law, or in distributing them (other than distribution by traditional wholesale and retail methods). Examples are traditional publishing industries, software and directory and mailing list publishing industries, and film and sound industries. Broadcasting and telecommunications industries and information providers and processors are also included in the Information sector, because their technologies are so closely linked to other industries in the Information sector.

511 Publishing Industries (except Internet)^T

Industries in the Publishing Industries (except Internet) subsector group establishments engaged in the publishing of newspapers, magazines, other periodicals, and books, as well as directory and mailing list and software publishing. In general, these establishments, which are known as publishers, issue copies of works for which they usually possess copyright. Works may be in one or more formats including traditional print form, CD-ROM, or proprietary electronic networks. Publishers may publish works originally created by others for which they have obtained the rights and/or works that they have created in-house. Software publishing is included here because the activity, creation of a copyrighted product and bringing it to market, is equivalent to the creation process for other types of intellectual products.

In NAICS, publishing--the reporting, writing, editing, and other processes that are required to create an edition of a newspaper--is treated as a major economic activity in its own right, rather than as a subsidiary activity to a manufacturing activity, printing. Thus, publishing is classified in the Information sector; whereas, printing remains in the Manufacturing sector. In part, the NAICS classification reflects the fact that publishing increasingly takes place in establishments that are physically separate from the associated printing establishments. More crucially, the NAICS classification of book and newspaper publishing is intended to portray their roles in a modern economy, in which they do not resemble manufacturing activities.

Music publishers are not included in the Publishing Industries (except Internet) subsector, but are included in the Motion Picture and Sound Recording Industries subsector. Reproduction of prepackaged software is treated in NAICS as a manufacturing activity; on-line distribution of software products is in the Information sector; and custom design of software to client specifications is included in the Professional, Scientific, and Technical Services sector. These distinctions arise because of the different ways that software is created, reproduced, and distributed.

The Publishing Industries (except Internet) subsector includes establishments that publish software exclusively on the Internet but excludes establishments that publish other content exclusively on the Internet. Establishments publishing content other than software exclusively on the Internet are included in Subsector 519, Other Information Services. The Publishing Industries (except Internet) subsector also excludes products, such as manifold business forms and appointment books. Information is not the essential component of these items. Establishments producing these items are included in Subsector 323, Printing and Related Support Activities.

5111 Newspaper, Periodical, Book, and Directory Publishers^T

This industry group comprises establishments primarily engaged in publishing newspapers, magazines, other periodicals, books, directories and mailing lists, and other works, such as calendars, greeting cards, and maps. These works are characterized by the intellectual creativity required in their development and are usually protected by copyright. Publishers distribute or arrange for the distribution of these works.

Publishing establishments may create the works in-house, or contract for, purchase, or compile works that were originally created by others. These works may be published in one or more formats, such as print and/or electronic form, including proprietary electronic networks. Establishments in this industry may print, reproduce, or offer direct access to the works themselves or may arrange with others to carry out such functions.

Establishments that both print and publish may fill excess capacity with commercial or job printing. However, the publishing activity is still considered to be the primary activity of these establishments.

51111 Newspaper Publishers^T

See industry description for 511110.

^T—Canadian, Mexican, and United States industries are comparable.

511110 Newspaper Publishers

This industry comprises establishments known as newspaper publishers. Establishments in this industry carry out operations necessary for producing and distributing newspapers, including gathering news; writing news columns, feature stories, and editorials; and selling and preparing advertisements. These establishments may publish newspapers in print or electronic form.

Cross-References.

- Establishments publishing newspapers exclusively on the Internet are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals;
- Establishments primarily engaged in printing newspapers without publishing are classified in Industry 32311, Printing;
- Establishments, such as trade associations, schools and universities, and social welfare organizations, that publish newsletters for distribution to their membership, but that are not commonly known as newspaper publishers, are classified according to their primary activity designation;
- Establishments primarily engaged in supplying the news media with information, such as news, reports, and pictures, are classified in Industry 519110, News Syndicates; and
- Establishments of independent representatives primarily engaged in selling advertising space are classified in Industry 541840, Media Representatives.

51112 Periodical Publishers^T

See industry description for 511120.

511120 Periodical Publishers

This industry comprises establishments known either as magazine publishers or periodical publishers. These establishments carry out the operations necessary for producing and distributing magazines and other periodicals, such as gathering, writing, and editing articles, and selling and preparing advertisements. These establishments may publish magazines and other periodicals in print or electronic form.

Illustrative Examples:

Comic book publishers (except exclusive Internet publishing)
Radio and television guide publishers (except exclusive Internet publishing)
Magazine publishers (except exclusive Internet publishing)

Scholarly journal publishers (except exclusive Internet publishing)
Newsletter publishers (except exclusive Internet publishing)
Trade journal publishers (except exclusive Internet publishing)

Cross-References.

- Establishments publishing periodicals exclusively on the Internet are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals;
- Establishments primarily engaged in printing periodicals without publishing are classified in Industry 32311, Printing;
- Establishments, such as trade associations, schools and universities, and social welfare organizations, that publish magazines and periodicals for distribution to their membership, but that are not commonly known as periodical publishers, are classified according to their primary activity designation;
- Establishments primarily engaged in publishing directories and mailing lists are classified in Industry 511140, Directory and Mailing List Publishers; and
- Establishments of independent representatives primarily engaged in selling advertising space are classified in Industry 541840, Media Representatives.

^T—Canadian, Mexican, and United States industries are comparable.

51113 Book Publishers^T

See industry description for 511130.

511130 Book Publishers

This industry comprises establishments known as book publishers. Establishments in this industry carry out design, editing, and marketing activities necessary for producing and distributing books. These establishments may publish books in print, electronic, or audio form.

Illustrative Examples:

Atlas publishers (except exclusive Internet publishing)
 Religious book publishers (except exclusive Internet publishing)
 Book publishers (except exclusive Internet publishing)
 School textbook publishers (except exclusive Internet publishing)

Encyclopedia publishers (except exclusive Internet publishing)
 Technical manual publishers (except exclusive Internet publishing)
 Map publishers (except exclusive Internet publishing)
 Travel guide book publishers (except exclusive Internet publishing)

Cross-References.

- Establishments publishing books on the Internet exclusively are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals;
- Establishments primarily engaged in printing books without publishing are classified in U.S. Industry 323117, Books Printing;
- Establishments known as music publishers are classified in Industry 512230, Music Publishers;
- Establishments, such as trade associations, schools and universities, and social welfare organizations, that publish books for distribution to their membership, that are not commonly known as book publishers, are classified according to their primary activity designation; and
- Book clubs primarily engaged in direct sales activities without publishing are classified in Industry 454390, Other Direct Selling Establishments.

51114 Directory and Mailing List Publishers^T

See industry description for 511140.

511140 Directory and Mailing List Publishers

This industry comprises establishments primarily engaged in publishing directories, mailing lists, and collections or compilations of fact. The products are typically protected in their selection, arrangement and/or presentation. Examples are lists of mailing addresses, telephone directories, directories of businesses, collections or compilations of proprietary drugs or legal case results, compilations of public records, etc. These establishments may publish directories and mailing lists in print or electronic form.

Illustrative Examples:

Business directory publishers (except exclusive Internet publishing)
 Mailing list publishers (except exclusive Internet publishing)

Directory publishers (except exclusive Internet publishing)
 Telephone directory publishers (except exclusive Internet publishing)

^T—Canadian, Mexican, and United States industries are comparable.

Cross-References. Establishments primarily engaged in--

- Operating Web search portals or developing and publishing, exclusively on the Internet, collections or compilations of creative works or facts--are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals;
- Compiling mailing lists in conjunction with providing direct mail advertising services--are classified in Industry 541860, Direct Mail Advertising;
- Printing without publishing directories and mailing lists--are classified in Industry 32311, Printing;
- Publishing computer software--are classified in Industry 511210, Software Publishers;
- Creating and publishing encyclopedias and similar collections of creative works in print and/or electronic media--are classified in Industry 511130, Book Publishers; and
- Creating and publishing collections of creative works that are periodically updated--are classified in Industry 511120, Periodical Publishers.

51119 Other Publishers^T

This industry comprises establishments known as publishers (except newspaper, magazine, book, directory, mailing list, and music publishers). These establishments may publish works in print or electronic form.

Illustrative Examples:

Art print publishers (except exclusive Internet publishing)
Greeting card publishers (except exclusive Internet publishing)

Calendar publishers (except exclusive Internet publishing)

Cross-References.

- Establishments publishing exclusively on the Internet are classified in Industry 51913, Internet Publishing and Broadcasting and Web Search Portals;
- Establishments known as newspaper publishers are classified in Industry 51111, Newspaper Publishers;
- Establishments known as magazine and other periodical publishers are classified in Industry 51112, Periodical Publishers;
- Establishments known as book publishers are classified in Industry 51113, Book Publishers;
- Establishments primarily engaged in publishing directories and mailing lists are classified in Industry 51114, Directory and Mailing List Publishers;
- Establishments known as music publishers are classified in Industry 51223, Music Publishers; and
- Establishments primarily engaged in manufacturing appointment books and/or manifold business forms are classified in Industry 32311, Printing.

51191 Greeting Card Publishers

This U.S. industry comprises establishments primarily engaged in publishing greeting cards.

Cross-References. Establishments primarily engaged in--

- Publishing greeting cards exclusively on the Internet--are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals; and
- Printing greeting cards without publishing--are classified in Industry 32311, Printing.

51199 All Other Publishers

This U.S. industry comprises establishments generally known as publishers (except newspaper, magazine, book, directory, database, music, and greeting card publishers). These establishments may publish works in print or electronic form.

^T—Canadian, Mexican, and United States industries are comparable.

Illustrative Examples:

Art print publishers (except exclusive Internet publishing)

Calendar publishers (except exclusive Internet publishing)

Cross-References.

- Establishments publishing exclusively on the Internet are classified in Industry 519130, Internet Publishing and Broadcasting and Web Search Portals;
- Establishments known as newspaper publishers are classified in Industry 511110, Newspaper Publishers;
- Establishments known as magazine or other periodical publishers are classified in Industry 511120, Periodical Publishers;
- Establishments known as book publishers are classified in Industry 511130, Book Publishers;
- Establishments primarily engaged in publishing directories and mailing lists are classified in Industry 511140, Directory and Mailing List Publishers;
- Establishments primarily engaged in greeting card publishing are classified in U.S. Industry 511191, Greeting Card Publishers;
- Establishments known as music publishers are classified in Industry 512230, Music Publishers; and
- Establishments primarily engaged in manufacturing appointment books and/or manifold business forms are classified in U.S. Industry 323111, Commercial Printing (except Screen and Books).

5112 Software Publishers^T**51121 Software Publishers^T**

See industry description for 511210.

511210 Software Publishers

This industry comprises establishments primarily engaged in computer software publishing or publishing and reproduction. Establishments in this industry carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. These establishments may design, develop, and publish, or publish only. These establishments may publish and distribute software remotely through subscriptions and downloads.

Cross-References.

Establishments primarily engaged in--

- Reselling packaged software--are classified in Sector 42, Wholesale Trade, or Sector 44-45, Retail Trade;
- Providing access for clients to software published by others from a central host site--are classified in Industry 518210, Data Processing, Hosting, and Related Services;
- Designing software to meet the needs of specific users--are classified in U.S. Industry 541511, Custom Computer Programming Services; and
- Mass duplication of software--are classified in U.S. Industry 334614, Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing.

512 Motion Picture and Sound Recording Industries^T

Industries in the Motion Picture and Sound Recording Industries subsector group establishments involved in the production and distribution of motion pictures and sound recordings. While producers and distributors of motion pictures and sound recordings issue works for sale as traditional publishers do, the processes are sufficiently different to warrant placing establishments engaged in these activities in a separate subsector. Production is typically a complex process that involves several distinct types of establishments that are engaged in activities, such as contracting with performers, creating the film or sound content, and providing technical postproduction services. Film distribution is often to exhibitors, such as theaters and broadcasters, rather than through the wholesale and retail distribution chain. When the product is in a mass-produced form, NAICS treats production and distribution as

^T—Canadian, Mexican, and United States industries are comparable.

713 Amusement, Gambling, and Recreation Industries^T

Industries in the Amusement, Gambling, and Recreation Industries subsector (1) operate facilities where patrons can primarily engage in sports, recreation, amusement, or gambling activities and/or (2) provide other amusement and recreation services, such as supplying and servicing amusement devices in places of business operated by others; operating sports teams, clubs, or leagues engaged in playing games for recreational purposes; and guiding tours without using transportation equipment.

This subsector does not cover all establishments providing recreational services. Other sectors of NAICS also provide recreational services. Providers of recreational services are often engaged in processes classified in other sectors of NAICS. For example, operators of resorts and hunting and fishing camps provide both accommodation and recreational facilities and services. These establishments are classified in Subsector 721, Accommodation, partly to reflect the significant costs associated with the provision of accommodation services and partly to ensure consistency with international standards. Likewise, establishments using transportation equipment to provide recreational and entertainment services, such as those operating sightseeing buses, dinner cruises, or helicopter rides, are classified in Sector 48-49, Transportation and Warehousing.

The industry groups in this subsector highlight particular types of activities: amusement parks and arcades, gambling industries, and other amusement and recreation industries. The groups, however, are not all-inclusive of the activity. The Gambling Industries industry group does not provide for full coverage of gambling activities. For example, casino hotels are classified in Subsector 721, Accommodation; and horse and dog racing tracks are classified in Industry Group 7112, Spectator Sports.

7131 Amusement Parks and Arcades^T

This industry group comprises establishments primarily engaged in operating amusement parks and amusement arcades and parlors.

71311 Amusement and Theme Parks^T

See industry description for 713110.

713110 Amusement and Theme Parks

This industry comprises establishments, known as amusement or theme parks, primarily engaged in operating a variety of attractions, such as mechanical rides, water rides, games, shows, theme exhibits, refreshment stands, and picnic grounds. These establishments may lease space to others on a concession basis.

Cross-References. Establishments primarily engaged in--

- Operating mechanical or water rides on a concession basis in amusement parks, fairs, and carnivals or operating a single attraction, such as a waterslide--are classified in Industry 713990, All Other Amusement and Recreation Industries;
- Operating refreshment stands on a concession basis--are classified in Industry 72251, Restaurants and Other Eating Places;
- Supplying and servicing coin-operated amusement (except gambling) devices in places of business operated by others--are classified in Industry 713990, All Other Amusement and Recreation Industries;
- Supplying and servicing coin-operated gambling devices (e.g., slot machines or video gambling terminals) in places of business operated by others--are classified in Industry 713290, Other Gambling Industries; and
- Organizing, promoting, and/or managing events, such as carnivals and fairs, with or without facilities--are classified in Industry Group 7113, Promoters of Performing Arts, Sports, and Similar Events.

71312 Amusement Arcades^T

See industry description for 713120.

^T—Canadian, Mexican, and United States industries are comparable.

713120 Amusement Arcades

This industry comprises establishments primarily engaged in operating amusement (except gambling, billiard, or pool) arcades and parlors.

Cross-References. Establishments primarily engaged in--

- Supplying and servicing coin-operated amusement (except gambling) devices in places of business operated by others or in operating billiard or pool parlors--are classified in Industry 713990, All Other Amusement and Recreation Industries;
- Operating bingo, off-track betting, or slot machine parlors or in supplying and servicing coin-operated gambling devices (e.g., slot machines or video gambling terminals) in places of business operated by others--are classified in Industry 713290, Other Gambling Industries;
- Operating casinos (except casino hotels)--are classified in Industry 713210, Casinos (except Casino Hotels); and
- Operating casino hotels--are classified in Industry 721120, Casino Hotels.

7132 Gambling Industries^T

This industry group comprises establishments (except casino hotels) primarily engaged in operating gambling facilities, such as casinos, bingo halls, and video gaming terminals, or in the provision of gambling services, such as lotteries and off-track betting. Casino hotels are classified in Industry 72112, Casino Hotels.

71321 Casinos (except Casino Hotels)^T
See industry description for 713210.

713210 Casinos (except Casino Hotels)

This industry comprises establishments primarily engaged in operating gambling facilities that offer table wagering games along with other gambling activities, such as slot machines and sports betting. These establishments often provide food and beverage services. Included in this industry are floating casinos (i.e., gambling cruises, riverboat casinos).

Cross-References. Establishments primarily engaged in--

- Operating bingo, off-track betting, or slot machine parlors or in supplying and servicing coin-operated gambling devices, such as slot machines and video gaming terminals, in places of business operated by others--are classified in Industry 713290, Other Gambling Industries; and
- Operating casino hotels--are classified in Industry 721120, Casino Hotels.

71329 Other Gambling Industries^T
See industry description for 713290.

713290 Other Gambling Industries

This industry comprises establishments primarily engaged in operating gambling facilities (except casinos or casino hotels) or providing gambling services.

Illustrative Examples:

Bingo, off-track betting, or slot machine parlors
Coin-operated gambling device concession operators
(i.e., supplying and servicing in others' facilities)

Bookmakers
Lottery ticket sales agents (except retail stores)
Card rooms (e.g., poker rooms)

^T—Canadian, Mexican, and United States industries are comparable.

Cross-References. Establishments primarily engaged in--

- Operating casinos--are classified in Industry 713210, Casinos (except Casino Hotels);
- Operating casino hotels--are classified in Industry 721120, Casino Hotels;
- Operating facilities with coin-operated amusement (except gambling) devices--are classified in Industry 713120, Amusement Arcades;
- Supplying and servicing coin-operated amusement (except gambling) devices in places of business operated by others--are classified in Industry 713990, All Other Amusement and Recreation Industries; and
- Operating racetracks or presenting live racing or sporting events--are classified in Industry 71121, Spectator Sports.

7139 Other Amusement and Recreation Industries^T

This industry group comprises establishments primarily engaged in operating golf courses and country clubs; skiing facilities; marinas; fitness and recreational sports centers; bowling centers; and providing other amusement and recreation services.

71391 Golf Courses and Country Clubs^T

See industry description for 713910.

713910 Golf Courses and Country Clubs

This industry comprises (1) establishments primarily engaged in operating golf courses (except miniature) and (2) establishments primarily engaged in operating golf courses, along with dining facilities and other recreational facilities that are known as country clubs. These establishments often provide food and beverage services, equipment rental services, and golf instruction services.

Cross-References. Establishments primarily engaged in--

- Operating driving ranges and miniature golf courses--are classified in Industry 713990, All Other Amusement and Recreation Industries; and
- Operating resorts where golf facilities are combined with accommodations--are classified in Industry Group 7211, Traveler Accommodation.

71392 Skiing Facilities^T

See industry description for 713920.

713920 Skiing Facilities

This industry comprises establishments engaged in (1) operating downhill, cross country, or related skiing areas and/or (2) operating equipment, such as ski lifts and tows. These establishments often provide food and beverage services, equipment rental services, and ski instruction services. Four season resorts without accommodations are included in this industry.

Cross-References.

Establishments primarily engaged in operating resorts where skiing facilities are combined with accommodations are classified in Industry Group 7211, Traveler Accommodation.

71393 Marinas^T

See industry description for 713930.

T—Canadian, Mexican, and United States industries are comparable.

713930 Marinas

This industry comprises establishments, commonly known as marinas, engaged in operating docking and/or storage facilities for pleasure craft owners, with or without one or more related activities, such as retailing fuel and marine supplies; and repairing, maintaining, or renting pleasure boats.

Cross-References. Establishments primarily engaged in--

- Building ships--are classified in U.S. Industry 336611, Ship Building and Repairing;
- Building boats--are classified in U.S. Industry 336612, Boat Building;
- Renting pleasure boats--are classified in U.S. Industry 532284, Recreational Goods Rental;
- Repairing pleasure boats--are classified in Industry 811490, Other Personal and Household Goods Repair and Maintenance;
- Retailing marine supplies--are classified in U.S. Industry 441222, Boat Dealers; and
- Retailing fuel for boats--are classified in Industry 447190, Other Gasoline Stations.

71394 Fitness and Recreational Sports Centers^T

See industry description for 713940.

713940 Fitness and Recreational Sports Centers

This industry comprises establishments primarily engaged in operating fitness and recreational sports facilities featuring exercise and other active physical fitness conditioning or recreational sports activities, such as swimming, skating, or racquet sports.

Illustrative Examples:

Aerobic dance or exercise centers
Ice or roller skating rinks
Gymnasiums

Physical fitness centers
Handball, racquetball, or tennis club facilities
Swimming or wave pools

Cross-References.

- Establishments primarily engaged in providing non-medical services to assist clients in attaining or maintaining a desired weight are classified in U.S. Industry 812191, Diet and Weight Reducing Centers;
- Establishments primarily engaged in providing personal fitness training services are classified in Industry 812990, All Other Personal Services;
- Establishments primarily engaged in operating health resorts and spas where recreational facilities are combined with accommodations are classified in Industry 721110, Hotels (except Casino Hotels) and Motels; and
- Recreational sports clubs (i.e., sports teams) not operating sports facilities are classified in Industry 713990, All Other Amusement and Recreation Industries.

71395 Bowling Centers^T

See industry description for 713950.

713950 Bowling Centers

This industry comprises establishments engaged in operating bowling centers. These establishments often provide food and beverage services.

71399 All Other Amusement and Recreation Industries^T

See industry description for 713990.

^T—Canadian, Mexican, and United States industries are comparable.

Memo

To: Mayor and City Council

From: Joe Matranga, Planning & Zoning Commission Chairman 

Date: February 20, 2020

Re: Proposed amendments to Appendix C Zoning Ordinance Section 7. P. 6. Permitted Use Table regarding changes for NAICS Use #447 Gasoline Stations, #511 Publishing Industries, and #713940 Fitness and Recreational Sports Centers

At the Planning and Zoning Commission meeting held February 13, 2020, following the Public Hearing, the City of Friendswood Planning and Zoning Commission voted unanimously 6-0 (Commissioner Clark was absent) to approve the following amendments as written and reflected in the "Permitted Use Table" to the Zoning Ordinance as shown below:

- To change NAICS Use #447, Gasoline Stations, to change from requiring a Specific Use Permit (S) in Downtown District (DD) to "blank," which would not allow gasoline stations in the Downtown District (DD);
- To change NAICS Use #511, Publishing Industries, by adding a Permitted (P) to allow the use by right in Community Shopping Center (CSC) and to change from requiring a Specific Use Permit (S) in Downtown District (DD) to Permitted (P) to allow the use by right; and
- To change NACIS Use #713940, Fitness and Recreational Sports Centers, to change from requiring a Specific Use Permit (S) to Permitted (P) in Downtown District (DD) to allow the use by right.

	2017 NAICS	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
	Industry Descriptions															
44-45	<i>Retail Trade</i>															
447	Gasoline stations							P	P		O	S		P	P	
51	<i>Information</i>															
511	Publishing industries							<u>P</u>			O	<u>PS</u>		P	P	P
71	<i>Arts, Entertainment and Recreation</i>															
713940	Fitness and recreational sports centers							P	S			<u>PS</u>		P	P	

These proposed changes resulted from the normal ongoing reviews of the Zoning Ordinance. In general, these changes have the following impacts:

- Changing NAICS Use #447, Gasoline Stations, from requiring a Specific Use Permit (S) in Downtown District (DD) to "blank," would no longer allow new gasoline stations to be located in Downtown District (DD). Any existing gas stations in Downtown District (DD) would be allowed to remain as an existing use prior to this proposed change.
- Changing NAICS Use #511, Publishing Industries, to Permitted (P) in Community Shopping Center (CSC) and in Downtown District (DD) recognizes the changing nature of book and newspaper publishing in the modern economy where they no longer resemble manufacturing activities.
- Changing NACIS Use #713940, Fitness and Recreational Sports Centers, to change from requiring a Specific Use Permit (S) to Permitted (P) in Downtown District (DD) will allow aerobic dance or exercise centers, ice or roller skating rinks, gymnasiums, swimming or wave pools, physical fitness centers, handball, racquetball, or tennis club facilities to be located in Downtown District (DD) without requiring a specific use permit. Required parking spaces will be set by the size, in square feet, of the facility.

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/28/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Youth Sports Day

Originating Department: City Manager

Degree of importance: Elective

SUMMARY / ORIGINATING CAUSE

Youth Sports Day is scheduled for Saturday, March 21st at 9 a.m. The Parade will travel from Heritage Drive to Renwick Park where Little League and Girls Softball will kick off the season with the first pitch thrown by members of City Council.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/28/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Hurricane Harvey Update

Originating Department: City Manager

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

- **HMGP Acquisition Grant** - Since last month, the City continues to close on the thirteen properties remaining in the program.
- **TWDB** -Staff recently received word that FEMA has obligated this project and awarded our grant application to acquire four Severe Repetitive Loss Properties along Clear and Cowards Creek. Staff is still awaiting an executable contract for the City's consideration. However, in an effort to keep the program moving, appraisals have been authorized for the four properties on the list.
- **CDBG-DR (Harris County)** - As reported last month, conditional approvals have been granted for both the Blackhawk Facility and the Forest Bend flood mitigation project. Staff is working toward the procurement of professional services for architectural, engineering, and environmental activities associated with these projects once Harris County Commissioners Court authorizes us to proceed.
- **CDBG-DR (Galveston County)** - Still awaiting GLO approval of our acquisition and flood mitigation project applications. Staff has solicited the assistance of State Senator Taylor and Representatives Bonnen and Paul.
- **FEMA Disaster Assistance** - Enlisted the assistance of both Congressman Weber's and Olson's office to finalize the Deepwood facility claim. Both offices responded quickly and said they'll follow up with FEMA.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/28/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Annual report from Planning and Zoning Commission Chair Joe Matranga

Originating Department: Community Development

Degree of importance: Choose an Option

SUMMARY / ORIGINATING CAUSE

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

1. PZ Activity Report 2019
2. 2019 Summary of P&Z Actions
3. Planning Zoning Commission 2019 Review - Final



Summary of Actions

4 Preliminary Plats; 4 Extensions
7 Final Plats/Replats; 1 Extensions
10 Commercial Site Plans; 5 Amendments/Extensions
0 Vacating Plats
10 Zone Change recommendations
0 - Vacate ROW/Easement recommendations
(Detailed spreadsheet attached)

Accomplished:

- 2 Commissioners and 2 staff members attended the American Planning Association (APA) Texas Chapter Conference in Waco, Texas
- Adopted new ordinances to improve Scenic City scores including additional landscaping dumpster screening requirements
- Achieved Platinum Certification from Scenic City (previously Bronze)
- Changed public hearing process from joint public hearings to separate public hearings
- Changes to Downtown District (DD)
 - o Amended boundary
 - o Changed allowance for on-street, head in parking
 - o Allow cement fiber board
 - o Prohibit LED storefront lights
- Adopted new official zoning map
- Changed ordinances regarding building materials – per HB 2439
- Amended sidewalk ordinance to add an exception for in-fill development, flood homes and new homes in neighborhoods without sidewalks
- Held a Retreat to establish and prioritize goals for the Commission

Ongoing projects/To Do List:

- Work with City Council to update the Comprehensive Plan
 - o Future Land Use Map
- Review/update Zoning Ordinance – focus on consistency with State law; Planned Unit Developments (PUD) and Garden Home District zoning
- Review/update Subdivision Ordinance – focus on consistency with State law; park dedication requirements

2019 Summary of Planning and Zoning Actions

Date	App Type	Project Name	Action	Expiration	Council Action
1/3/2019	Preliminary Plat	Industry Park Friendswood	Approved	7/17/2019	n/a
1/3/2019	Preliminary Plat	Robertson Estate	Approved	7/17/2019	n/a
1/3/2019	Commercial Site Plan	Chick-Fil-A - 1757 S Friendswood Dr	Approved	1/17/2020	n/a
1/17/2019	Replat	Howard Subdivision Partial Replat No 2 (revision)	Approved	1/17/2020	n/a
2/4/2019	Final Plat	Industry Park Friendswood	Approved	2/4/2020	n/a
2/4/2019	Zone Change	104 Whispering Pines Ave (SFR to DD)	Positive Recommendation	n/a	JPH 2-4-19 1st Reading 2-4-19 2nd Reading 3-4-19 Ordinance 2019-08
2/4/2019	Recommendation	Zoning Ordinance Sec 8 Supplementary District Regulations to add landscaping and dumpster requirements	Positive Recommendation	n/a	JPH 2-4-19 1st Reading 2-4-19 2nd Reading 3-4-19 Ordinance 2019-05 & 2019-06
2/4/2019	Recommendation	Subdivision Ordinance Sec IV Parkland Dedication, f. Additional Requirements to limit impervious cover	Positive Recommendation	n/a	JPH 2-4-19 1st Reading 2-4-19 2nd Reading 3-4-19 Ordinance 2019-07
2/21/2019	Preliminary Plat Extension	Sterling Creek Section 3-B	Approved	8/21/2019	n/a
3/4/2019	Final Plat	Sterling Creek Section 3-B	Approved	3/4/2020	n/a
3/4/2019	Zone Change	1 Hatcher Ln (CSC to DD)	Positive Recommendation	n/a	JPH 3-4-19 1st Reading 3-4-19 2nd Reading 4-1-19 Ordinance 2019-10
3/4/2019	Zone Change	Avalon PUD (SFR to PUD)	Positive Recommendation	n/a	JPH 3-4-19 1st Reading 4-1-19 2nd Reading 5-6-19 Ordinance 2019-11
3/21/2019	Preliminary Plat Extension	Georgetown Section 1	Approved	9/21/2019	n/a
3/21/2019	Preliminary Plat Extension	Georgetown Section 2	Approved	9/21/2019	n/a
3/21/2019	Preliminary Plat Extension	Georgetown Boulevard Street Dedication Phase 2	Approved	9/21/2019	n/a

2019 Summary of Planning and Zoning Actions

Date	App Type	Project Name	Action	Expiration	Council Action
4/1/2019	Final Plat	Paintball Zone	Approved	4/1/2020	n/a
4/1/2019	Final Plat	Robertson Estate	Approved	4/1/2020	n/a
4/1/2019	Recommendation	Chapter 70 and Zoning Ord Sec 15 to change from Joint Public Hearings to Separate Public Hearings	Positive Recommendation	n/a	JPH 4-1-19 1st Reading 4-1-19 2nd Reading 5-6-19 Ordinance 2019-13
4/18/2019	Commercial Site Plan	Site One Landscape - 4448 FM 2351	Approved	4/18/2020	n/a
4/18/2019	Final Plat Extension	Friendswood Trails Sections 1,2, and Commercial	Approved	4/18/2020	n/a
4/18/2019	Recommendation	Amend R2010-09 Rules of Procedure to move meeting days to 2nd and 4th Thursday	Positive Recommendation	n/a	1st Reading 5-6-19 Resolution R2019-15
5/6/2019	Recommendation	App C Section 8.N.1. Geographic Limits to amend the Downtown District boundary	Negative Recommendation	n/a	JPH 5-6-19 1st Reading 5-6-19 2nd Reading 6-3-19 Ordinance 2019-16
5/6/2019	Recommendation	App C relocate Section 8.F. Off-street parking to 8.N.3. Parking; reduce head in parking	Positive Recommendation	n/a	JPH 5-6-19 1st Reading 5-6-19 2nd Reading 6-3-19 Ordinance 2019-17
5/6/2019	Recommendation	App C Section 7.I and 8.N.4. to allow cement fiber board; Section 8.N.4. copy COD requirements to DD	Positive Recommendation	n/a	JPH 5-6-19 1st Reading 5-6-19 2nd Reading 6-3-19 Ordinance 2019-18
5/6/2019	Recommendation	App C Section 8.N.8. duplicating buffer requirements from I.2.; Section 8.N.3. duplicating parking requirements from I.2.c.; relocating PUD modification from 8.H. to 7.J.	Positive Recommendation	n/a	JPH 5-6-19 1st Reading 5-6-19 2nd Reading 6-3-19 Ordinance 2019-19
5/6/2019	Recommendation	Appendix A Section 9. Prohibited Signs to prohibit LED storefront lights in Downtown District	Positive Recommendation	n/a	JPH 5-6-19 1st Reading 5-6-19 2nd Reading 6-3-19 Ordinance 2019-20
5/6/2019	Site Plan Amendment	407 S. Friendswood Drive	Approved	5/6/2020	n/a
5/6/2019	Site Plan Amendment	Salem Square Apts - 107 Clearview Ave	Approved	5/6/2020	n/a
5/16/2019	Site Plan Amendment	Farmers Insurance - 104 Melody Ln	Tabled	n/a	n/a
5/16/2019	Commercial Site Plan	Chipotle Mexican Grill - 1705 S. Friendswood Dr.	Approved	5/16/2020	n/a

2019 Summary of Planning and Zoning Actions

Date	App Type	Project Name	Action	Expiration	Council Action
6/13/2019	Site Plan Amendment	Farmers Insurance - 104 Melody Ln	Approved	6/13/2020	n/a
6/13/2019	Site Plan Amendment	West Parkwood Plaza - 1501 W. Parkwood Ave.	Approved	6/13/2020	n/a
6/13/2019	Zone Change	Calvary Chapel - 17158 Blackhawk Blvd (NC to NC/SUP)	Positive Recommendation	n/a	PZ PH 6-13-19 CC PH & 1st Reading 7-1-19 2nd Reading 8-5-19 Ordinance 2019-15
6/13/2019	Zone Change	108 Whispering Pines Ave (SFR to DD)	Positive Recommendation	n/a	PZ PH 6-13-19 CC PH & 1st Reading 7-1-19 2nd Reading 8-5-19 Ordinance 2019-24
6/13/2019	Zone Change	110 Whispering Pines Ave (SFR to DD)	Negative Recommendation	n/a	PZ PH 6-13-19 CC PH & 1st Reading 7-1-19 2nd Reading 8-5-19 Ordinance 2019-25
7/11/2019	Zone Change	402 E. Edgewood Dr (PUD/SUP 2015-26 to revised PUD/SUP) to add NAICS use #8121	Positive Recommendation	n/a	PZ PH 7-11-19 CC PH & 1st Reading 8-5-19 2nd Reading 9-9-19 Ordinance 2019-23
7/11/2019	Zone Change	103, 105, 107 Shadwell Ln (PUD 2016-01 to revised PUD)	Positive Recommendation	n/a	PZ PH 7-11-19 CC PH & 1st Reading 8-5-19 2nd Reading 9-9-19 Ordinance 2019-21
7/11/2019	Zone Change	Avalon at Friendswood (PUD 2019-11 to revised PUD)	Withdrawn	n/a	
7/11/2019	Commercial Site Plan Extension	Ranch Express - 2210 S. Friendswood Dr.	Approved	1/11/2020	n/a
7/25/2019	Commercial Site Plan	Walgreens / Village Medical - 102 N. Friendswood Dr.	Approved	7/11/2020	n/a
7/25/2019	Commercial Site Plan	Paintball Zone - 14100 Beamer Rd.	Approved	7/11/2020	n/a
7/25/2019	Commercial Site Plan	Clear Creek Community Church - 3801 FM 528	Tabled	n/a	n/a
7/25/2019	Preliminary Plat	Kessel Chateau	Approved	1/11/2020	n/a
8/8/2019	Replat	Empere Chateau Lot 11	Approved	8/8/2020	n/a
8/8/2019	Zone Change	2407 W Parkwood Ave #108 (CSC to CSC/SUP to allow NAICS #: 8131 Religious Organizations	Withdrawn	n/a	PZ PH 8-08-19 CC PH 9-9-19 Tabled Withdrawn 9-23-19

2019 Summary of Planning and Zoning Actions

Date	App Type	Project Name	Action	Expiration	Council Action
8/22/2019	Commercial Site Plan	Clear Creek Community Church - 3801 FM 528	Approved	8/22/2020	n/a
9/12/2019	Zone Change	Avalon at Friendswood (PUD 2019-11 to revised PUD)		n/a	PZ PH 9-12-19 CC PH & 1st Reading 10-7-19 2nd Reading 11-4-19 Ordinance 2019-37
9/12/2019	Commercial Site Plan	HEB Curbside Expansion - 701 W. Parkwood Ave.	Approved	9/12/2020	n/a
9/12/2019	Commercial Site Plan	Valvoline Instant Oil - 1701 S. Friendswood Dr.	Approved	9/12/2020	n/a
9/26/2019	Commercial Site Plan	E Squared Marine - 4440 FM 2351	Approved	9/26/2020	n/a
10/17/2019	Zone Change	Sterling Creek Section 5 (SFR to MFR-GHD)			PZ PH 10-17-19 CC PH & 1st Reading 11-4-19 2nd Reading 12-2-19 Ordinance 2019-42
11/14/2019	Final Plat	Kessel Chateau	Approved	11/14/2020	n/a
11/14/2019	Commercial Site Plan	315 S. Friendswood Drive	Approved	11/14/2020	n/a
12/12/2019	Preliminary Plat	Sterling Creek Section 4	Approved	6/12/2020	n/a
12/12/2019	Recommendation	Adoption of an updated zoning map Appendix C, Zoning Ordinance Section 3	Positive Recommendation	n/a	PZ PH 12-12-19 CC PH & 1st Reading 1-6-2020 2nd Reading 2-3-2020 Ordinance 2020-05
12/12/2019	Recommendation	Appendix C, Zoning Ordinance Sections 7., 7.5, and 8 to change building material requirements per HB 2439	Positive Recommendation	n/a	PZ PH 12-12-19 CC PH & 1st Reading 1-6-2020 2nd Reading 2-3-2020 Ordinance 2020-04
12/12/2019	Recommendation	Appendix B, Subdivision Ordinance Section III.k.3. to not require sidewalks in residential areas if sidewalks do not already exist	Positive Recommendation	n/a	PZ PH 12-12-19 CC PH & 1st Reading 1-6-2020 2nd Reading 2-3-2020 Ordinance 2020-03

Totals:

Commercial Site Plans - 10

Commercial Site Plan Amendments & Extensions - 5

Preliminary Plats - 4

Preliminary Plat Extensions - 4

2019 Summary of Planning and Zoning Actions

Date	App Type	Project Name	Action	Expiration	Council Action
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Final Plats/Replats - 7
Final Plat Extensions - 1
Vacating Plat -
* SUP extension & Personal Care Facility not counted

City of Friendswood Planning & Zoning Commission 2019 Year In Review

Staff Support

Aubrey Harbin
Becky Bennett
Mary Kay Fischer

Commissioners

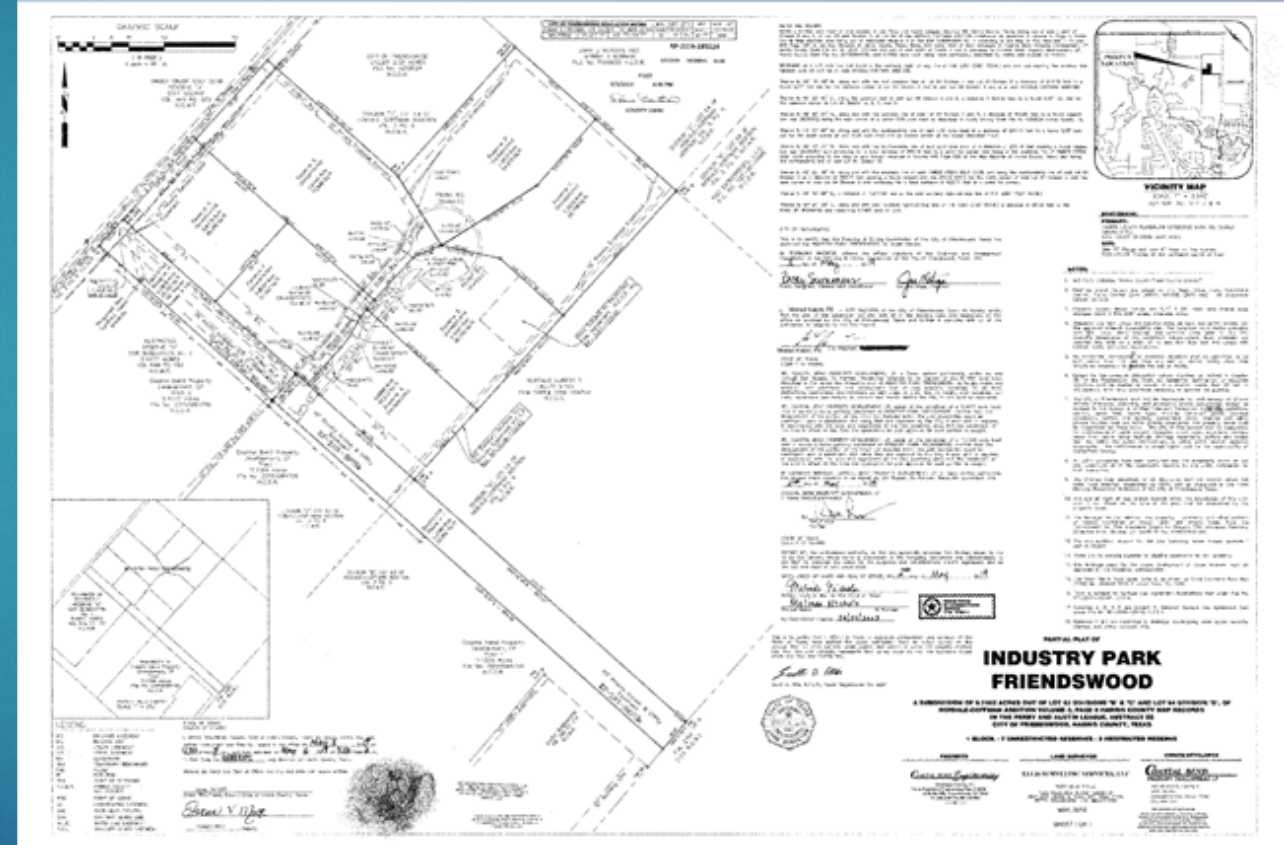
Brett Banfield
Richard Clark
Eric Guenther
Lisa Lundquist
Joe Matranga
Marcus Perry
Richard Sasson

Council Liaisons

Trish Hanks
Sally Branson

2019 P&Z Actions Taken – Plats

- ◆ Approved 8 Preliminary Plats & Extensions
 - ◆ Industry Park Friendswood
 - ◆ Robertson Estate
 - ◆ Kessel Chateau
 - ◆ Sterling Creek Section 4
 - ◆ Sterling Creek Section 3-B (Ext.)
 - ◆ Georgetown Sections 1&2 (Ext.)
 - ◆ Georgetown Street Dedication (Ext.)
- ◆ Approved 8 Final Plats/Replats & Extensions
 - ◆ Howard Subdivision
 - ◆ Industry Park Friendswood
 - ◆ Sterling Creek Section 3-B
 - ◆ Paintball Zone
 - ◆ Robertson Estate
 - ◆ Empere Chateau Lot
 - ◆ Kessel Chateau
 - ◆ Friendswood Trails (Ext.)



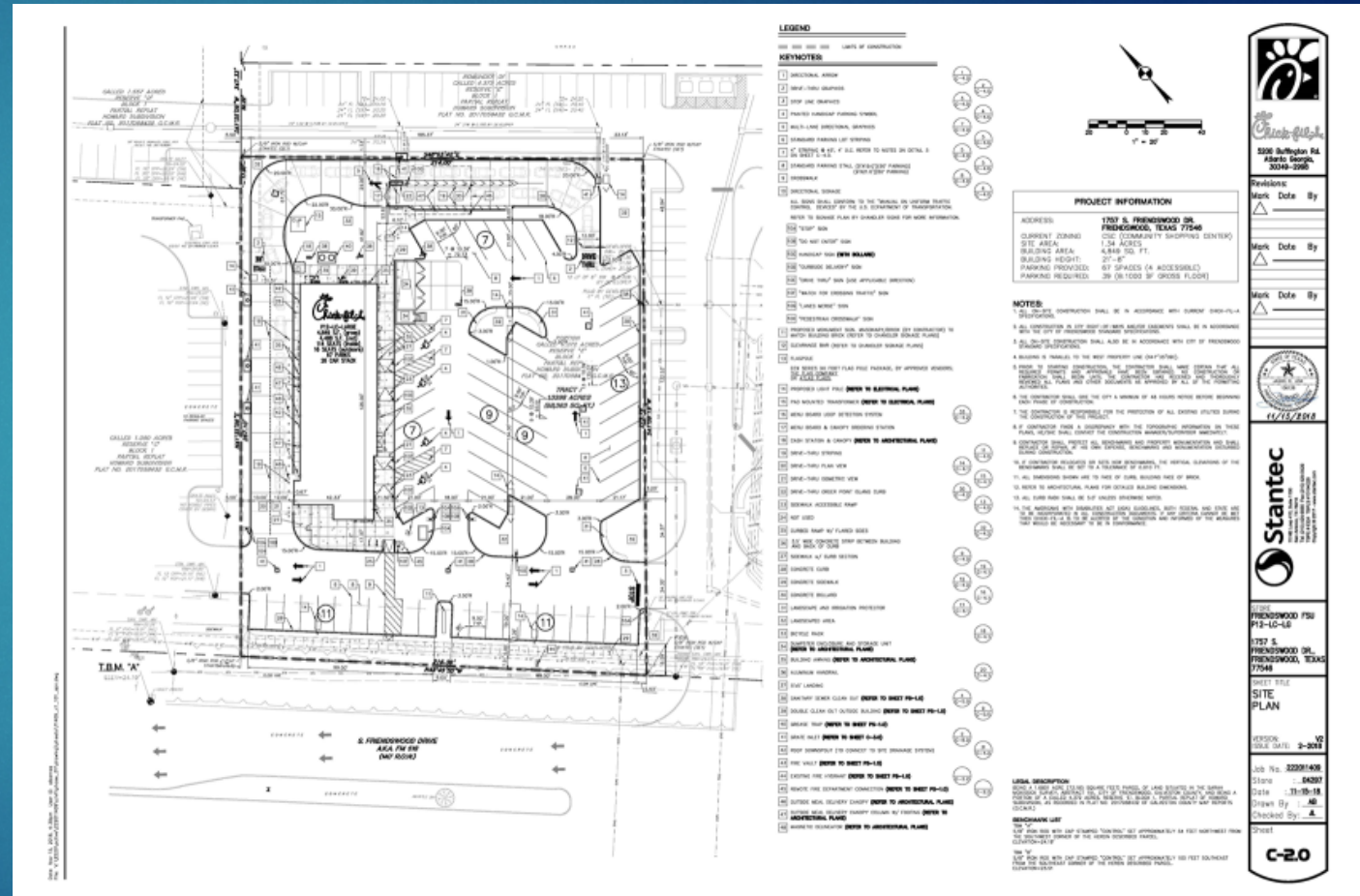
2019 P&Z Actions Taken – Commercial Site Plans

◆ Approved 10 Commercial Site Plans

- ◆ Chick-Fil-A
- ◆ Site One Landscape
- ◆ Chipotle Mexican Grill
- ◆ Walgreens/Village Medical
- ◆ Paintball Zone
- ◆ Clear Creek Community Church
- ◆ HEB Curbside Expansion
- ◆ Valvoline Instant Oil
- ◆ E Squared Marine
- ◆ 315 S. Friendswood Drive

◆ Approved 5 Site Plan Amendments & Extensions

- ◆ 407 S. Friendswood Dr.
- ◆ Salem Square Apartments
- ◆ Farmers Insurance
- ◆ West Parkwood Plaza
- ◆ Ranch Express (Ext.)



2019 Actions Taken – Zoning Changes

- ◆ Recommended 10 Zoning Changes
 - ◆ 104 Whispering Pines Ave – SFR to DD
 - ◆ 1 Hatcher Lane – CSC to DD
 - ◆ Avalon Subdivision – SFR to PUD
 - ◆ Calvary Chapel - NC to NC/SUP
 - ◆ 108 Whispering Pines Ave - SFR to DD
 - ◆ 110 Whispering Pines Ave - SFR to DD
 - ◆ 402 E. Edgewood Dr - PUD/SUP to revised PUD/SUP
 - ◆ 103, 105, 107 Shadwell Ln - PUD to revised PUD
 - ◆ Avalon at Friendswood - PUD to revised PUD
 - ◆ Sterling Creek Section 5 - SFR to MFR-GHD



Additional 2019 P&Z Activities

- ◆ Held 18 Commission Meetings and Many Subcommittees Meetings
- ◆ Conducted the Annual Review of the Permitted Use Table and the NAICS Codes
- ◆ Provided Recommendations to City Council On:
 - ◆ Major Thoroughfare Plan Update – Positive Recommendation
 - ◆ Stairs on Elevated Homes Ordinance – Positive Recommendation
 - ◆ Study for Land Use Assumptions, Capital Improvements Plan, and Impact Fees Update – Positive Recommendation
- ◆ Helped Achieve Platinum Certification from Scenic City by adding new ordinances
- ◆ Changed the public hearing process from joint to separate public hearings to enhance communication
- ◆ Developed recommended changes to Downtown District (DD)
- ◆ Developed and adopted a new official zoning map
- ◆ Changed ordinances regarding building materials as a result of HB 2439
- ◆ Amended the sidewalk ordinance to add an exception for in-fill development, flood homes and new homes in neighborhoods without sidewalks
- ◆ 2 Commissioners and 2 Staff Members Attended the American Planning Association Conference in Waco, TX

Planning & Zoning Key 2020 Projects

- ◆ Work with City Council to update the Comprehensive Plan
 - ◆ Future Land Use Map
- ◆ Review/update Zoning Ordinance – focus on consistency with State law and Planned Unit Developments (PUD) and Garden Home District zoning
- ◆ Review/Update the Subdivision Ordinance – focus on consistency with State law and park dedication requirements

Any Questions
Or
Comments?

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 12/12/2019

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Discussion and possible action regarding the approval of changes to the event permitting process.

Originating Department: Parks and Recreation

Degree of importance: Significant

It's important that our guidelines, procedures and most importantly our fees are not only fair for the rental groups but also fair for the city as we strive to cover operation, maintenance, and damage cost.

SUMMARY / ORIGINATING CAUSE

Create guidelines, establish procedures and implement a fee structure in the form of a Special Event Permit Application. The special event permit will be used for large special event groups requesting the use of city parks and facilities.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

In the past, we've had groups damage the park but the deposit collected was not nearly enough to cover those damages. Current budget does not allow for covering unexpected or unplanned expenditures caused by Special Event rental groups

RECOMMENDATIONS

Staff recommends Mayor and Council approve the Special Event Permit Application as presented.

ATTACHMENTS

1. Special Event Permit Application



City of Friendswood Parks & Recreation Department
910 S. Friendswood Dr., Friendswood, TX 77546
281-996-3220 / rec@friendswood.com / www.friendswood.com

PUBLIC EVENT/SPECIAL EVENT PERMIT APPLICATION

FIRST TIME EVENTS: It is recommended to schedule a meeting with the Parks & Rec Dept. to discuss the application in detail for first time applicants. Please call (281) 996-3220 to make arrangements.

Reservations can be made 12 months in advance for any public event, special event or company picnic.
Set-Up Date: _____ Start time: _____ End Time: _____
Event Date(s): _____ Start time: _____ End Time: _____
Event Date(s): _____ Start time: _____ End Time: _____
(Two-day event) / add additional line for 3+ day event
Break-down Date: _____ Start time: _____ End Time: _____
Park Requested: _____
Facility/Facilities Requested: _____

including but not limited to: pavilions, gazebos, sports fields, amphitheater, restrooms, etc.
Type of event _____ Fair/Festival _____ Concert _____ Tournament
Mark all that apply: _____ Fundraiser _____ Company Picnic _____ Race/Fun Run
_____ Other: _____
Estimated # attending event: _____ (include vendors, staff, volunteers and participants)
Descriptive summary of the event (attach additional sheets if necessary): _____

Event Name: _____
Name of Applicant: _____ (Photo ID req. / age 21+)
Company Name (if applicable): _____
Individual/Tax-Exempt, For-Profit or Commercial: _____
(attach proof of current tax-exempt/non-profit status, including IRS form 990)
Mailing address: _____ City: _____
State: _____ Zip: _____ Email address: _____
Cell Phone () _____ Other Phone () _____
Day of Event Contact Name: _____ Phone () _____
Is the event being sponsored, co-sponsored or supported by another organization or group? If yes,
attach a list of supporting organization(s). _____ YES _____ NO
Will gate, admission or registration fees be charged? _____ YES _____ NO
If yes, attach a list of proposed fees and their purpose
How will the event be promoted? _____ TV Ads _____ Social Media _____ Radio
_____ Flyers/posters _____ Billboards _____ Internet
Separate permit needed for signs _____ Signs _____ Other _____
Event website: _____

Event Location Layout - Please list the proposed event location and attach a map of the proposed logistical layout for your event.

Event Size: _____ # of Participants _____ Total Number of Attendees at one time
_____ # of Staff/Volunteers _____ **Total Number of Attendees**

Event History: Is this a first time event? _____ YES _____ NO

Is this an Annual Event? _____ YES _____ NO

How many years in existence? _____ YEARS Highest Number of Attendees _____

Previous Name(s) of Event: _____

If your previous year's application is on file, are there any changes from the previous year?

List: _____

Activities and Entertainment - Please attach a list of scheduled activities and entertainment with times (i.e. bands, contests, arts & crafts show, cook-off, performers, etc.).

Structures - Please check all structural elements that apply.

_____ Tent(s) _____ Booth(s) _____ Table(s) _____ Chair(s) _____ Stage(s)

_____ Fencing _____ Light Tower(s) _____ Generator(s) _____ RV(s) _____ Amusements

_____ Other(s), please list: _____

You will need to provide sizes of all structures and include means of fire apparatus access along with any flame resistance certifications. Depending on structure sizes, you may need to have a trained crowd manager present.

Event Parking - What parking arrangements have been made for your event? If you are using alternate parking lots, an approval letter from the property owner must accompany this application. An event parking map will need to be submitted with this application.

Event Participant Parking Area (vendors, staff, volunteers, media): _____

Event Attendees Parking Area _____

Grass Parking - If you are requesting to utilize a grass parking area, what will you do in the event of inclement weather?

Street/Lane Closures: Are you requesting any street/lane closures? ____ YES ____ NO

Please list any street/lane closures you are requesting and attach a map:

***Portable Toilets:** Indicate the number of portable toilets you will have at your event. The closure of free-standing park restrooms may be required depending on the # of participants expected. Any event exceeding 500 in attendance may require portable toilets.

_____ # of Regular _____ # of ADA

When will they be delivered? _____

*For multi-day events, servicing of port-a-lets is required!

Food/Beverages: Please indicate all food/beverage elements that apply:

_____ Sale of food/beverages _____ Distribution of food/beverages

A Health Permit is required for each vendor selling or distributing food/beverages.

_____ Distribution of Alcoholic beverages (The sale of alcohol is not permitted)

You must obtain a TABC Permit for the distribution of alcoholic beverages and will need permission from the City of Friendswood Parks & Recreation Department To obtain your permit, if required.

Please state your alcohol control plan, such as limits, enforcement, shuttle services, etc.

First Aid Plan: Will you have a first aid station on-site? _____ YES _____ NO

What are your plans for a minor/major emergency? _____

Does your event layout provide for emergency vehicle access? _____ YES _____ NO

Utilities

Will you need electricity? _____ YES _____ NO (see page 7, item #14)

Electricity for: _____

Will you need access to water? _____ YES _____ NO

Water for: _____

Inclement Weather Plan:

What are your plans in case of inclement weather? _____

Name and phone number of weather monitor: _____

Event Notification: The applicant understands that they may be required to serve notices to residents and/or businesses in the area where the event will be held and furnish proof to the Department. Notices should include event date, times, and details.

Security:

The applicant is responsible for adequate security for the permitted event, including crowd control, emergency response access and safeguarding the attendees and park property. The City of Friendswood Police Department will determine how many officers will be necessary for your event. The rate for security will be \$55 per officer per hour.

Insurance Requirements:

Public liability and property damage insurance is required for all athletic user groups, special event permit applicants, amusement vendors (i.e. moonwalks), special event organizers producing events that are open to the public, and for-profit commercial vendors, otherwise known as "vendor" in the amounts set forth below.....acts or omissions of the vendor. Insurance must be issued by a casualty company authorized to do business in the State of Texas, and in standard form approved by the Board of Insurance Commissioners of the State of Texas, with coverage provisions insuring the public from any loss or damage that may arise to any person or property by reason of the acts or omissions of the vendor.

Vendor must at its own expense be required to carry the following minimum insurance coverage:

- For damages arising out of bodily injury to or death of one person in any one occurrence – one hundred thousand and no/100 dollars (\$100,000.00);
- For damages arising out of bodily injury to or death of two or more persons in any one occurrence – three hundred thousand and no/100 dollars (\$300,000.00);
- For damage to or destruction of property in any one occurrence – one hundred thousand and no/100 dollars (\$100,000.00);
- Alcohol - If alcoholic beverages are served, or allowed to be consumed during the event, the insurance certificate must state specifically that it also covers any losses resulting from the consumption of alcohol at the event.

Certificate Holder:

The Certificate Holder is: City of Friendswood, 910 S. Friendswood Dr., Friendswood, TX 77546

Additional Insured Required:

The City of Friendswood must be named as additional insured on policies listed in subparagraphs above and must be notified of any changes to the policy(ies).

General Requirements:

- Insurance is to be placed with insurers having a best rating of no less than A.
- The vendor must furnish the City with certificates of insurance and original endorsements affecting coverage required by these insurance clauses.
- The insurance certificates and endorsements for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf.
- Proof of insurance must be provided at least five (5) business days before the start of the event, athletic season, or first permitted date, or the permit/event will be cancelled.
- The City reserves the right to pursue other remedies permitted by law or in equity.
- In no event must the City be liable for any damage to or destruction of any property belonging to the event organizer/vendor unless specified in writing and agreed upon by both parties.

Indemnification

Vendor agrees to indemnify, defend and hold harmless CITY, its officers, officials, agents, and employees from any claim, loss, damage, causes of action, suits and liability of every kind, including all expenses of litigation, court costs, and attorney's fees, for injury to, or death of any person, or for damage to any personal or real property, arising out of, or in conjunction with the Vendor's event, or any act or omission of Vendor, its officers, employees, agents, or subcontractors during the conduct of Vendor's event.

Special Event Permit Fees:

Fees for these permits are based on the number of people projected to be attending the event and whether or not gate/admission or registration fees are charged. Depending on the site, parks may include outdoor picnic shelters, outdoor pavilions and other outdoor amenities. Special Event Applications must be submitted at least 90 calendar days in advance of the event date and are made on a first-come, first serve basis.

Attendance	Deposit	User Fees	
		Non-Profit/Tax-Exempt	Commercial/For Profit
Less than 250	\$600	\$150	\$250
250-500 persons	\$600	\$250	\$500
501-1,000 persons	\$1,000	\$350	\$700
1,001-3,000 persons	\$2,500	\$400	\$800
3,001 or more	\$2,500	\$500	\$1,000

Cleaning Attendants:

Any large event with 75 or more people must secure the services of at least two Cleaning Attendants to ensure the integrity of the reserved park is upheld.

- Cleaning Attendants must be scheduled at least two weeks prior to any large event.
- Changes, or event cancellations must be made 48 hours prior to scheduled event. Changes made within 48 hours will be subject to additional fees paid to the City of Friendswood.
- Any additional hours needed and not paid for prior will be taken out of the paid deposit
- Cleaning Attendants are only responsible for the duties assigned on this agreement.
- Cleaning Attendant fee is \$14.25 per hour and paid at time of reservation

Cleaning Attendants Responsibilities:

- Cleaning/pick up of trash on park grounds.
- Empty all garbage cans, dispose of bags in dumpsters and refill with new bags.
- Clean and restock all restrooms.
- For maintenance repairs to park facility, please call 281-996-3300 to dispatch a Parks & Recreation staff member.

Security Fees:

- City of Friendswood Police Officers will be present at all large events. All security fees are paid to the Parks & Recreation Department at a rate of \$55 per hour per officer. The number of officers needed for your event will be determined by the City of Friendswood Police Department.

SPECIAL EVENT CONTRACT RULES: The undersigned applies for a special event permit and agrees to the regulations listed below as established by the City of Friendswood Parks & Recreation Department.

1. Please have your Permit in possession during your use of the permitted facility.
2. The layout approved for this event denotes the permitted activities and must be followed in the staging and placement of parking, concession stands, booths, inflatables and amusements, trash receptacles, portable restrooms, performance staging and other support amenities. Any deviation from the approved layout, except in the instance of minor on-site adjustments must receive permission from the Parks & Recreation Director.
3. No motorized vehicles may be driven upon or parked on grass areas or sidewalks unless approved in the layout.
4. Cancellations: If applicant wishes to cancel the event, the notification must be given in writing at least 7-calendar days in advance. Failure to comply with these deadlines may result in the forfeiture of user fees. Cancellations may be charged a \$30 administrative fee.
5. Concession Stands, exhibit booths, tents, awnings, and/or similar support structures may not be attached to, set against, or situated so as to damage any wall, column, tree, post, light standard or any other park amenity.
6. The Permit Holder must leave all facilities in good or better condition that existed before the event. Following the conclusion of the event all or part of the deposit may be refunded, depending upon the condition in which the facility are left. If the facility is damaged or not thoroughly cleaned, the Permit holder agrees, as a condition of the issuance of the Permit to pay such additional charges as are assessed by the Department. Permit Holders are responsible for damage to any furniture, equipment, and building along with the surrounding grounds. Deposits must be made when the reservation is made and will be deposited. Following the event, a refund will be issued to the permit holder approximately 14-30 days after the conclusion of the event (if applicable).
7. No banners, flags, temporary signs, or similar visual effects may be attached to lights, sign posts, trees or secured by stapling, taping, nailing, or other means that may cause damage to park structures or amenities. Rice, birdseed, confetti, silly string, piñatas and glitter are not allowed.
8. No glass containers are allowed.
9. Please note that should the City need to utilize the park for emergency purposes, Applicant will be given notice at the earliest opportunity and User Fees will be refunded.
10. The completed "Public Event/Special Event Permit Application" must be submitted to the Parks & Rec Office a minimum of 30 calendar days in advance but not more than 12 months in advance. Deposit payments are due at the time the reservation is made. The Applicant will be required to pay 100% of all Special Event Permit Fees, thirty (15) calendar days prior to the event date. Gate fee applicants must pay required fees at the conclusion of their event.
11. Permit holder is responsible for obtaining any noise/sound or additional permits are required by the City that the event is held in.
12. Sites and Facilities are limited. For this reason, reservations should be made as far in advance as is reasonably possible. Special event reservations can be made up to 12 months in advance.
13. All electrical connections and hook-ups installed by the applicant must meet appropriate safety and city or county code requirements. Special event permits are issued for the use of existing electrical systems and outlets only. Total amperage required by the applicant may not exceed safe capacity of existing park service.

SPECIAL EVENT CONTRACT RULES - Continued

14. Existing faucets or hose bibs may be used for water connections, but no temporary connections or modifications to the park's water supply may be made without prior approval.
15. Adherence to the date and time allotments of this application/permit are mandatory, and is inclusive of set-up, strike and clean-up.
16. Failure to abide by any of these General Conditions will automatically revoke the Permit and cancel the Reservation. All policies and fees in this application are subject to change.
17. All Reservation Application Forms must include a valid telephone number, email address, cell phone number. Facility and/or User Reservation Fees are to be paid by Cash, Personal Check, Cashier's Check, Money Order, or by credit card (Visa, MasterCard, Discover) made payable to the City of Friendswood. A convenience fee of 2.5% will be assessed on all debit card and credit card transactions.
18. The Applicant must provide for the Event, at no additional charge to the public, an adequate number of portable toilets (one per 100 attendees), including a proper ratio of such toilets that meet the Americans with Disabilities Act specifications (ADA).
19. The Permittee must obtain a Fire Inspection (if necessary).
20. Depending on the size and nature of the event, the Permittee may be required to meet with the Development Review Committee (DRC). This informal meeting allows the Permittee and all involving departments within the City of Friendswood to discuss all logistics for the event. DRC meetings are held on Wednesday mornings at 9am, 10am, and 11am.
21. The Permittee may use, for the event, any electrical outlets that currently exist at the site. It is the Permittee's responsibility to contact the Department at least 72 hours before the Event to ensure that the electrical power is turned on. If the Event takes place at a Site where no electrical outlets are currently in place or if the Permittee has additional electrical requirements, it will be the Permittee's responsibility to safely provide for the Event's additional needs.
22. Any misrepresentation of the signed special event application or failure to meet the requirements set forth herein will result in retention of the deposit fee.
23. Following the conclusion of the Event, if the Facility, or Grounds is damaged, the Permittee agrees, as a condition of the issuance of the Permit to pay such charges as are assessed by the City. If a dispute arises out of or relates to the breach of this Agreement, and if the dispute cannot be resolved through negotiation, then the City and Permittee agree to submit the dispute to mediation. In the event that the City or Permittee desire to mediate any dispute, that party must notify the other party in writing of the dispute it desires to mediate. Within thirty (30) days after receipt of the written notice of the dispute and the request to mediate, the parties must attend a mediation conducted by a mutually agreeable mediator. If the parties do not achieve a resolution of the dispute by mediation, within ten (10) days after the mediator declares an impasse, either party may file a lawsuit in Galveston County, Texas.

Applicant's Name

Applicant's Signature

Date

Checklist / Notes:

For Office Staff Only:

Staff Initials: _____

Permit #: _____

Receipt Attached _____

Initial Meeting Date: _____

On-Site Meeting Date: _____

Routed to other Departments:

_____ Parks Dept. _____ Galveston County _____ Police Dept. _____ EMS _____ FMO _____ CDD

Rental Supervisor Checklist

- Event Layout: _____
- Event Parking Map: _____
- Copy of Event Flyer _____
- Handicap Parking _____
- Activity & Structures Listing: _____
- Insurance: _____
- TABC Permit: _____
- Sound Permit: _____
- Security Scheduled: _____
- Park Attendants Scheduled _____
- Street Closure Map: _____
- Written Emergency Action Plan (EAP): _____
- Fire Inspection: _____

Rental Supervisor Signature: _____

Date: _____

NOTES/SPECIAL REQUESTS:

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/5/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Discussion and possible action regarding appointments to the following committees, boards and commissions:

4th of July Steering Committee – Appoint Nancy Sims to an unexpired term expiring November 2022 to replace Corey Kirkland who resigned; appoint Larry Sims to an unexpired term expiring November 2022 to replace Nicole Morgan who was not reappointed.

Originating Department: City Secretary

Degree of importance: Elective

SUMMARY / ORIGINATING CAUSE

Mayor Foreman endorses the following appointments as recommended by:

Council Liaison John Scott: 4th of July Steering Committee – Appoint Nancy Sims to an unexpired term expiring November 2022 to replace Corey Kirkland who resigned; appoint Larry Sims to an unexpired term expiring November 2022 to replace Nicole Morgan who was not reappointed.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Mayor Foreman recommends Council consider approving the appointments to the above committee.

ATTACHMENTS

1. sims, larry
2. sims, nancy

**CC:M & CC
CITY MGR**

James Toney, P&R



BE A FRIENDSWOOD VOLUNTEER

It is the desire and intent of City Council to encourage and support citizen participation in an advisory capacity governing the affairs of the City. Service through membership on a board, commission, or committee is a valued, important opportunity for participation in an advisory capacity. To these ends, a policy has been adopted that sets out an orderly process for citizens interested in serving as members of a City board, commission, or committee and for the City Council to oversee appointments.

THIS INFORMATION WILL BECOME PUBLIC RECORD

VOLUNTEER APPLICATION

NAME: Larry Sims HOME PHONE: 803-493-5353
HOME ADDRESS: 1115 Rykers Switch Ln WORK PHONE: 800 969-5678
EMAIL ADDRESS: Lsims@vectorcog.com CELL PHONE: 803-493-5353
OCCUPATION: Sls Management

SPECIAL INTERESTS AND TALENTS: Loud + outgoing

Are you currently serving as a member of any Friendswood governmental body? No

If so, please name the body: _____

AREAS OF INTEREST

Please indicate your primary and secondary interests.

GENERAL ADMINISTRATION

☐ ELECTION WORKER

PLANNING & PRESERVATION

- ☐ PLANNING & ZONING COMMISSION
☐ ZONING BOARD OF ADJUSTMENT & APPEALS
☐ KEEP FRIENDSWOOD BEAUTIFUL COMMITTEE
☐ COMMUNITY & ECONOMIC DEVELOPMENT
☐ CONSTRUCTION BOARD OF ADJUSTMENT & APPEALS
☐ INVESTMENT COMMITTEE
☐ FRIENDSWOOD DOWNTOWN ECONOMIC
☐ DEVELOPMENT CORPORATION

I AM AVAILABLE FOR

- ☒ LONG-TERM PROJECTS
☒ SHORT-TERM PROJECTS
☐ DAYTIME
☒ EVENING
☐ SUMMER

RECREATION

- ☒ 4TH OF JULY STEERING COMMITTEE
☒ 4TH OF JULY VOLUNTEER
☐ SENIOR CITIZENS ADVISORY COMMITTEE

EDUCATION

- ☐ LIBRARY BOARD
☐ LIBRARY VOLUNTEER

SPECIAL COMMITTEES AS CALLED

OTHER

- ☒ WEST RANCH MANAGEMENT DISTRICT
☐ ANIMAL SHELTER ADVISORY COMMITTEE
☐ VOLUNTEER FIRE DEPT/EMS
☐ CHARTER REVIEW (AS NEEDED)

Please use the space below for additional comments.

volunteer @ 4th of July w/ KC's
" Christmas Parade

These questions are asked because the City Council wants to maintain balance to insure proper representation on boards and commissions.

DATE OF BIRTH: 10-19-63
SEX: M
FRIENDSWOOD RESIDENT FOR 5 YEARS

Have you been convicted of a crime, other than minor traffic violations in the past 10 years? No

What experience do you have that may qualify you for service on a particular board or commission (i.e. license, degrees, and certificates)?

Mary Water/Wastewater Certification
Storm Water Experience
South Carolina Strawberry Festival Steering Com

Please list any civic or community endeavors in which you have been involved: _____

I hereby affirm the information provided herein is true and correct, to the best of my knowledge. I am aware a background check may be required.

I understand that the information provided on this application may be available to the public upon request and will be kept on file for at least three years.


Signature of Applicant

25 August 2019
Date

Thank you for taking the time to complete this application.

Please return the original application to the address below:

MELINDA WELSH
CITY SECRETARY
CITY OF FRIENDSWOOD
910 S. FRIENDSWOOD DRIVE
FRIENDSWOOD, TX 77546-4856
(281) 996-3270
FAX (281) 482-1634

CITY OF FRIENDSWOOD

BOARDS AND COMMISSIONS

INFORMATION STATEMENT AND APPLICATION

If you have ever been a member of a Friendswood Board, Committee or Commission before, please indicate the Board, Committee or Commission and appropriate dates of service.

Name of Board, Committee or Commission:

Dates of Service:

PERSONAL REFERENCES:

Tony Scarpa - 832-457-5150

Please list at least two references.

NAME: Anthony Dittrich

ADDRESS: 901 Essex Dr

PHONE: 281-808-5322

NAME: Rich Costello

ADDRESS: Farris Valley Ln, Friendswood

PHONE: 832 547 0443

CC: M & CC

James Toney, P&R



BE A FRIENDSWOOD VOLUNTEER

It is the desire and intent of City Council to encourage and support citizen participation in an advisory capacity governing the affairs of the City. Service through membership on a board, commission, or committee is a valued, important opportunity for participation in an advisory capacity. To these ends, a policy has been adopted that sets out an orderly process for citizens interested in serving as members of a City board, commission, or committee and for the City Council to oversee appointments.

THIS INFORMATION WILL BECOME PUBLIC RECORD

VOLUNTEER APPLICATION

NAME: Nancy Sims HOME PHONE: 803-493-1815
HOME ADDRESS: 1115 Ryuers Switch Ln WORK PHONE: "
EMAIL ADDRESS: nsimgang@gmail.com CELL PHONE: "
OCCUPATION: engineer, consultant (part time)
SPECIAL INTERESTS AND TALENTS: organized,

Are you currently serving as a member of any Friendswood governmental body? no

If so, please name the body: —

AREAS OF INTEREST

Please indicate your primary and secondary interests.

GENERAL ADMINISTRATION

☐ ELECTION WORKER

PLANNING & PRESERVATION

- ☐ PLANNING & ZONING COMMISSION
- ☐ ZONING BOARD OF ADJUSTMENT & APPEALS
- ☐ KEEP FRIENDSWOOD BEAUTIFUL COMMITTEE
- ☐ COMMUNITY & ECONOMIC DEVELOPMENT
- ☐ CONSTRUCTION BOARD OF ADJUSTMENT & APPEALS
- ☐ INVESTMENT COMMITTEE
- ☐ FRIENDSWOOD DOWNTOWN ECONOMIC
- ☐ DEVELOPMENT CORPORATION

I AM AVAILABLE FOR

- ☒ LONG-TERM PROJECTS
- ☒ SHORT-TERM PROJECTS
- ☒ DAYTIME
- ☒ EVENING
- ☒ SUMMER

RECREATION

- ☒ 4TH OF JULY STEERING COMMITTEE
- ☒ 4TH OF JULY VOLUNTEER
- ☐ SENIOR CITIZENS ADVISORY COMMITTEE

EDUCATION

- ☐ LIBRARY BOARD
- ☐ LIBRARY VOLUNTEER

SPECIAL COMMITTEES AS CALLED

OTHER

- ☐ WEST RANCH MANAGEMENT DISTRICT
- ☐ ANIMAL SHELTER ADVISORY COMMITTEE
- ☐ VOLUNTEER FIRE DEPT/EMS
- ☐ CHARTER REVIEW (AS NEEDED)

Please use the space below for additional comments.

I have volunteered with Friendswood Youth Lacrosse and had a booth and a float in the 4th of July parade & park event in past years. I have also volunteered with the 4th of July KCs group and assisted with parade lineup. It has been a fun event and I am ready to take part in the overall process.

These questions are asked because the City Council wants to maintain balance to insure proper representation on boards and commissions.

DATE OF BIRTH: 12/11/1969
SEX: F
FRIENDSWOOD RESIDENT FOR 5 YEARS

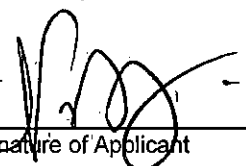
Have you been convicted of a crime, other than minor traffic violations in the past 10 years? NO

What experience do you have that may qualify you for service on a particular board or commission (i.e. license, degrees, and certificates)?

Please list any civic or community endeavors in which you have been involved: Friendswood Youth Lacrosse president and board member, SC Strawberry Festival (Fort Mill SC) steering committee member and volunteer coordinator.

I hereby affirm the information provided herein is true and correct, to the best of my knowledge. I am aware a background check may be required.

I understand that the information provided on this application may be available to the public upon request and will be kept on file for at least three years.



Signature of Applicant

8/25/2019

Date

Thank you for taking the time to complete this application.

Please return the original application to the address below:

MELINDA WELSH
CITY SECRETARY
CITY OF FRIENDSWOOD
910 S. FRIENDSWOOD DRIVE
FRIENDSWOOD, TX 77546-4856
(281) 996-3270
FAX (281) 482-1634

CITY OF FRIENDSWOOD

BOARDS AND COMMISSIONS

INFORMATION STATEMENT AND APPLICATION

If you have ever been a member of a Friendswood Board, Committee or Commission before, please indicate the Board, Committee or Commission and appropriate dates of service.

Name of Board, Committee or Commission:

Dates of Service:

PERSONAL REFERENCES:

Please list at least two references.

NAME: Korin Brody
ADDRESS: 5306 Val Verde St, Houston
PHONE: 979-218-2043

NAME: Diane Ritchey
ADDRESS: Rymers South Ln, FW
PHONE: 847 539 9129

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/19/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Discussion and possible action regarding the acceptance of the Certification of Unopposed Candidates.

Originating Department: City Secretary

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

This request is for Mayor and Council to accept a Certification of Unopposed Candidates for the May 02, 2020, General Election.

There were no contested races for the positions of Council Position No. 2 and Council Position No. 5. Only the incumbents, Council members Sally Branson and John Scott, filed for the positions. No others filed during the regular filing period or for the write-in period. As a result, the City Secretary has provided a certification that there are no contested races. The certification is attached as Exhibit A in Ordinance 2020-15, canceling the General Election.

Sally Branson and John Scott's names will still appear on the ballot but as "Unopposed Candidates Declared Elected".

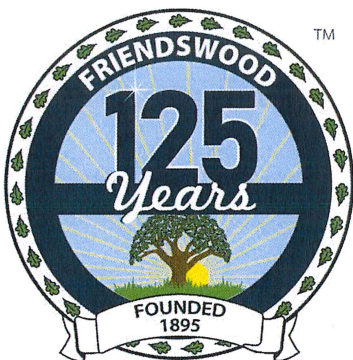
IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Approve the Certification of Unopposed Candidates

ATTACHMENTS

1. Certificate of Unopposed Candidates



**CITY OF FRIENDSWOOD
OFFICE OF THE CITY SECRETARY**

Melinda K. Welsh, TRMC
910 S. Friendswood Drive
Friendswood, Texas 77546
mwelsh@friendswood.com
Phone: 281-996-3270

**CERTIFICATION OF UNOPPOSED CANDIDATES
CERTIFICACIÓN DE CANDIDATOS ÚNICOS**

To: Presiding Officer of Governing Body
Al: Presidente de la entidad gobernante

As the authority responsible for having the official ballot prepared, I hereby certify that the following candidates are unopposed for election to office for the General Election scheduled to be held on May 02, 2020.

Como autoridad a cargo de la preparación de la boleta de votación oficial, por la presente certifico que los siguientes candidatos son candidatos únicos para elección general para un cargo en la elección que se llevará a cabo el 02 de Mayo, 2020.

List offices and names of candidates:
Lista de cargos y nombres de los candidatos:

Office(s) Cargo(s)

Candidate(s) Candidato(s)

Councilperson Position 2

Sally Branson

Miembros de Concilio Posicione numero 2

Councilperson Position 5

John Scott

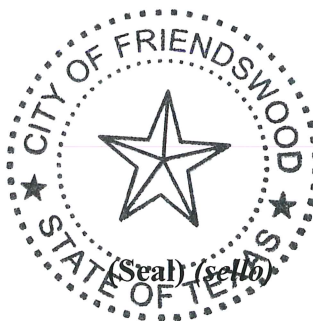
Miembros de Concilio Posicione numero 5


Signature (Firma)

Melinda K. Welsh
Printed name (Nombre en letra de molde)

City Secretary
Title (Puesto)

February 18, 2020 @ 7:20 PM
Date of signing (Fecha de firma)



FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/14/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Resolution No. R2020-04: A resolution of City of Friendswood, Texas, declaring March 6, 2020, as Wedgewood Elementary School Day in the City of Friendswood, Texas.

Originating Department: City Secretary

Degree of importance: Elective

SUMMARY / ORIGINATING CAUSE

Select second-grade students from Wedgewood Elementary will be participating in the Council meeting to take part in a mock governance simulation. These students will step up to the dais to replace the Mayor, City Council, and Staff. They will consider and vote on a resolution declaring March 06, 2020, as Wedgewood Elementary Day in Friendswood.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

To show the students government in action.

RECOMMENDATIONS

ATTACHMENTS

1. R2020-04 Wedgewood Elementary School Day on March 6, 2020

RESOLUTION NO. R2020-04

**A RESOLUTION OF CITY OF FRIENDSWOOD, TEXAS,
DECLARING MARCH 6, 2020, AS WEDGEWOOD
ELEMENTARY SCHOOL DAY IN THE CITY OF
FRIENDSWOOD, TEXAS.**

* * * * *

**NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF
FRIENDSWOOD, TEXAS, THAT MARCH 6, 2020, IS HEREBY DECLARED AS
WEDGEWOOD ELEMENTARY SCHOOL DAY IN FRIENDSWOOD, TEXAS.**

PASSED, APPROVED AND ADOPTED this the 2nd day of March, 2020.

Mike Foreman
Mayor

Attest:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/29/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Resolution No. R2020-05: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, authorizing participation in North Central Texas Council of Governments' North Texas Share Program.

Originating Department: Administrative Services

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

Chapter 791 of the Texas Government Code allows municipalities to contract with interlocal purchasing cooperatives in an effort to increase the efficiency and effectiveness of a city's purchasing function. The North Central Texas Council of Governments (NCTCOG) was established to assist local governments in the planning for common needs, cooperating for the mutual benefit, and coordinating for sound regional development. The NCTCOG established North Texas SHARE as a public sector solution center which includes a cooperative purchasing program for goods and services.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

The Interlocal Agreement with NCTCOG to participate in the North Texas SHARE Program will allow the City to utilize any contracts for goods and services that are available under this program and to receive products and services of the highest quality at the lowest prices. There is no annual membership fee to join.

RECOMMENDATIONS

Staff is recommending Council approve the Interlocal Agreement with NCTCOG and participation in the NCTCOG's North Texas Share Program.

ATTACHMENTS

1. R2020-05 North Central Texas Council of Governments' North Texas Share Program
2. North Texas Share ILA

RESOLUTION NO. R2020-05

**A RESOLUTION OF THE CITY OF FRIENDSWOOD,
TEXAS, GALVESTON/HARRIS COUNTIES,
AUTHORIZING PARTICIPATION IN NORTH CENTRAL
TEXAS COUNCIL OF GOVERNMENTS' NORTH TEXAS
SHARE PROGRAM.**

WHEREAS, the North Central Texas Council of Governments, hereinafter referred to as NCTCOG, is a voluntary association of, by and for local governments organized under Chapter 791 of the Texas Government Code and was established to assist local governments in the planning for common needs, cooperating for the mutual benefit, and coordinating for sound regional development; and,

WHEREAS, the NCTCOG established North Texas SHARE as a public sector solution center which includes a cooperative purchasing program for goods and services; and,

WHEREAS, North Texas SHARE procures goods and services in accordance with applicable State laws and regulations regarding contract and procurement proceedings; and,

WHEREAS, the City of Friendswood, pursuant to the authority granted under Sections 271.101 to 271.102 of the Local Government Code and Chapter 791 of the Government Code, desires to participate in the North Texas SHARE cooperative purchasing program.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, TEXAS:

Section 1. The City of Friendswood shall be authorized to execute an Interlocal Agreement with NCTCOG to participate in the North Texas SHARE Program and utilize any contracts for goods and services available thereunder.

PASSED, APPROVED AND RESOLVED on this 2nd day of March, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

MASTER INTERLOCAL PURCHASING AGREEMENT

THIS MASTER INTERLOCAL AGREEMENT (“ILA”), made and entered into pursuant to the Texas Interlocal Cooperation Act, Chapter 791, Texas Government Code (the “Act”), by and between the North Central Texas Council of Governments, hereinafter referred to as “NCTCOG,” having its principal place of business at 616 Six Flags Drive, Arlington, TX 76011, and _____, a local government, a state agency, or a non-profit corporation created and operated to provide one or more governmental functions and services, hereinafter referred to as “Participant,” having its principal place of business at _____

WHEREAS, NCTCOG is a regional planning commission and political subdivision of the State of Texas operating under Chapter 391, Texas Local Government Code; and

WHEREAS, pursuant to the Act, NCTCOG is authorized to contract with eligible entities to perform governmental functions and services, including the purchase of goods and services; and

WHEREAS, in reliance on such authority, NCTCOG has instituted a cooperative purchasing program under which it contracts with eligible entities under the Act; and

WHEREAS, Participant has represented that it is an eligible entity under the Act, that it is authorized to enter into this Agreement on _____ (Date), and that it desires to contract with NCTCOG on the terms set forth below;

NOW, THEREFORE, NCTCOG and the Participant do hereby agree as follows:

ARTICLE 1: LEGAL AUTHORITY

The Participant represents and warrants to NCTCOG that (1) it is eligible to contract with NCTCOG under the Act for the purposes recited herein because it is one of the following: a local government, as defined in the Act (a county, a municipality, a special district, or other political subdivision of the State of Texas or any other state, or a combination of two or more of those entities, a state agency (an agency of the State of Texas as defined in Section 771.002 of the Texas Government Code, or a similar agency of another state), or a non-profit corporation created and operated to provide one or more governmental functions and services, and (2) it possesses adequate legal authority to enter into this Agreement.

ARTICLE 2: SCOPE OF SERVICES

The Participant appoints NCTCOG its true and lawful purchasing agent for the purchase of certain products and services (“Products” or “Services”) through the **North Texas SHARE** program. Participant will access the Program through **www.NorthTexasSHARE.org**. All purchases under this Agreement shall comply with applicable Texas competitive bidding statutes as well as the specifications, contract terms and pricing applicable to such purchases. NCTCOG may also serve as a coordinating agent to administer the use of eligible Participant contracts to other participants of North Texas SHARE. The eligibility of such contracts will be determined by incorporation of coordinating agent authorization in Participant’s solicitation documents. Title to all products purchased under the North Texas SHARE program shall be held by Participant unless otherwise agreed. Nothing in this Agreement shall preclude the Participant from purchasing Products and/or Services offered in the North Texas SHARE program directly from the vendor/supplier.

ARTICLE 3: PAYMENTS

Upon delivery of goods or services purchased and presentation of a properly documented invoice, the Participant shall promptly, and in any case within thirty (30) days, pay the contracted provider the full amount of the invoice. All payments for goods or services will be made from current revenues available to the paying party. In no event shall NCTCOG have any financial liability to the Participant for any goods or services Participant purchases through the North Texas SHARE program.

ARTICLE 4: PERFORMANCE PERIOD

This Agreement shall be effective when signed by the last party whose signing makes the Agreement fully executed and will remain in full force and effect for one (1) year. This Agreement shall automatically renew for successive one-year terms unless sooner terminated in accordance with Article 6 below. Any modification of this Agreement must comply with the requirements of Article 5 below.

ARTICLE 5: CHANGES AND AMENDMENTS

This Agreement may be amended only by a written amendment executed by both parties, except that any alternations, additions, or deletions to the terms of this Agreement which are required by changes in Federal and State law or regulations are automatically incorporated into this Agreement without written amendment hereto and shall become effective on the date designated by such law or regulation. NCTCOG reserves the right from time to time to make changes in the scope of products and services offered through the North Texas SHARE program.

ARTICLE 6: TERMINATION PROCEDURES

NCTCOG or the Participant may cancel this Agreement for any reason and at any time upon thirty (30) days written notice by certified mail to the other party to this Agreement. The obligation of the Participant to pay for any Service and/or Products purchased under this Agreement, shall survive such cancellation, as well as any other Participant costs incurred prior to the effective date of the cancellation.

ARTICLE 7: APPLICABLE LAWS

NCTCOG and the Participant agree to conduct all activities under this Agreement in accordance with all applicable rules, regulations, and ordinances and laws in effect or promulgated during the term of this Agreement.

ARTICLE 8: DISPUTE RESOLUTION

The parties to this Agreement agree to the extent possible and not in contravention of any applicable state or federal law or procedure established for dispute resolution, to attempt to resolve any dispute between them regarding this Agreement informally through voluntary mediation, arbitration or any other local dispute mediation process before resorting to litigation.

ARTICLE 9: MISCELLANEOUS

- a. This Agreement has been made under and shall be governed by the laws of the State of Texas. Venue and jurisdiction of any suit or cause of action arising under, or in connection with, this Agreement shall lie exclusively in Tarrant County, Texas.
- b. The persons executing this Agreement hereby represent that they have authorization to sign on behalf of their respective entities.
- c. This Agreement and the rights and obligations contained herein may not be assigned by either party without the prior written approval of the other party to this Agreement.

- d. All parties agree that should any provision of this Agreement be determined to be invalid or unenforceable, such determination shall not affect any other term of this Agreement, which shall continue in full force and effect.
- e. To the extent that either party to this Agreement shall be wholly or partially prevented from the performance within the term specified of any obligation or duty placed on such party by reason of or through strikes, stoppage of labor, riot, fire, flood, acts of war, insurrection, accident, order of any court, act of God, or specific cause reasonably beyond the party's control and not attributable to its neglect or nonfeasance, in such event, the time for the performance of such obligation or duty shall be suspended until such disability to perform is removed; provided, however, force majeure shall not excuse an obligation solely to pay funds.
- f. This Agreement and any attachments/addendums, as provided herein, constitute the complete agreement between the parties hereto, and supersede any and all oral and written agreements between the parties relating to matters herein.

THIS INSTRUMENT HAS BEEN EXECUTED IN TWO ORIGINALS BY THE PARTIES HERETO AS FOLLOWS:

North Central Texas Council of Governments

North Texas SHARE
 616 Six Flags Drive, Arlington, Texas 76011

 Name of Participant Agency

 NCTCOG Executive Director or Designee

 Mailing Address

 Signature of Executive Director or Designee

 City State Zip

 Date

 Name and Title of Authorized Official or Designee

 Signature

 Date

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/5/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Resolution No. R2020-06: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, approving Capital Equipment Leasing Financing terms for the purchase of a fire truck.

Originating Department: Administrative Services

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

On November 5, 2018, Council approved the purchase of a new fire truck to replace Engine 1.

The 2019 - 2020 adopted budget includes the purchase of the replacement vehicle; with estimated debt service payment \$85,000 for the fire truck with Fire/EMS donations as the funding source for the debt service payments.

The fire truck are scheduled for delivery by the end of February 2020.

Staff requested financing proposals, and a summary of those proposals is included as an attachment.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Paying for the large equipment purchases over a period of time lessen the financial burden for the City.

RECOMMENDATIONS

Government Capital Corporation offered 2.77% interest rate on a 7-year lease financing of the fire engine with annual lease payments of \$93,281.88.

Branch Banking & Trust (now Truist) offered 2.05% interest on a 7-year lease financing of the fire engine with annual lease payments of \$89,789.25.

Staff recommends that Council accept the financing proposal from BB&T (now Truist) for a term of 7 annual payments of \$89,789.25 on the fire engine and authorize the Mayor to sign the financing terms agreement resolution.

ATTACHMENTS

1. R2020-06 FVFD Fire Truck Financing Terms
2. BB&T (Truist) Capital Lease Proposal

3. Government Finance Capital Lease Proposal

RESOLUTION NO. R2020-06

**A RESOLUTION OF THE CITY OF FRIENDSWOOD,
TEXAS, GALVESTON/HARRIS COUNTIES, APPROVING
CAPITAL EQUIPMENT LEASING FINANCING TERMS
FOR THE PURCHASE OF A FIRE TRUCK.**

* * * * *

WHEREAS, the City of Friendswood, Texas (the “Borrower”) has previously determined to undertake a project for the financing of the purchase of an engine fire truck (the “Project”), and the finance officer (“Finance Officer”) has now presented a proposal for the financing of such Project.

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD,
STATE OF TEXAS:**

Section 1. That the Borrower hereby determines to finance the Project through Truist Bank (“Lender”) in accordance with the proposal dated February 14, 2020. The amount financed shall not exceed \$580,000.00, the annual interest rate (in the absence of default or change in tax status) shall not exceed 2.05%, and the financing term shall not exceed seven (7) years from closing.

Section 2. That all financing contracts and all related documents for the closing of the financing (the “Financing Documents”) shall be consistent with the foregoing terms. All officers and employees of the Borrower are hereby authorized and directed to execute and deliver any Financing Documents, and to take all such further action as they may consider necessary or desirable, to carry out the financing of the Project as contemplated by the proposal and this resolution.

Section 3. That the Finance Officer is hereby authorized and directed to hold executed copies of the Financing Documents until the conditions for the delivery of the Financing Documents have been completed to such officer's satisfaction. The Finance Officer is authorized to approve changes to any Financing Documents previously signed by Borrower officers or employees, provided that such changes shall not substantially alter the intent of such documents

or certificates from the intent expressed in the forms executed by such officers. The Financing Documents shall be in such final forms as the Finance Officer shall approve, with the Finance Officer's release of any Financing Document for delivery constituting conclusive evidence of such officer's final approval of the Document's final form.

Section 4. That the Borrower shall not take or omit to take any action the taking or omission of which shall cause its interest payments on this financing to be includable in the gross income for federal income tax purposes of the registered owners of the interest payment obligations. The Borrower hereby designates its obligations to make principal and interest payments under the Financing Documents as "qualified tax-exempt obligations" for the purpose of Internal Revenue Code Section 265(b)(3).

Section 5. That the Borrower intends that the adoption of this resolution will be a declaration of the Borrower's official intent to reimburse expenditures for the Project that are to be financed from the proceeds of the Lender financing described above. The Borrower intends that funds that have been advanced, or that may be advanced, from the Borrower's general fund or any other Borrower fund related to the Project, for project costs may be reimbursed from the financing proceeds.

Section 6. That all prior actions of Borrower officers in furtherance of the purposes of this resolution are hereby ratified, approved and confirmed. All other resolutions (or parts thereof) in conflict with this resolution are hereby repealed, to the extent of the conflict. This resolution shall take effect immediately.

Passed, approved and adopted this 2nd day of March, 2020.

Mike Foreman
Mayor

Attest:

Melinda Welsh, TRMC
City Secretary

Governmental Finance
5130 Parkway Plaza Boulevard
Charlotte, North Carolina 28217
Phone (704) 954-1700
Fax (704) 954-1799

February 14, 2020

Ms. Katina Hampton, MBA, CGFO
Director of Administrative Services
City of Friendswood Texas

Via Electronic Mail: KHampton@friendswood.com;

Dear Ms.Hampton:

Truist Bank ("Lender") is pleased to offer this proposal for the financing requested by the City of Friendswood, Texas ("Borrower").

PROJECT:	Lease Purchases for A. Fire Engine B. Ambulance
AMOUNT:	A. \$580,000.00 B. \$203,000.00
TERM:	A. 7 Years B. 5 Years
INTEREST RATE:	A. 2.05% (Fire Truck/7 Years) B. 1.98% (Ambulance/5 Years)
TAX STATUS:	Tax Exempt-BQ
PAYMENTS:	<u>Interest:</u> Annual <u>Principal:</u> Annual
INTEREST RATE CALCULATION:	30/360
SECURITY:	First lien security interest in vehicles and equipment purchased with proceeds
PREPAYMENT TERMS:	Callable in whole at par at any time
RATE EXPIRATION:	3/28/2020
DOCUMENTATION/ LEGAL REVIEW FEE:	\$0

FUNDING: Proceeds will be deposited into an account held at Lender pending disbursement unless equipment is delivered prior to closing.

DOCUMENTATION: Lender proposes to use its standard form financing contracts and related documents for this installment financing. We shall provide a sample of those documents to you should Lender be the successful proposer.

REPORTING

REQUIREMENTS: Lender will require financial statements to be delivered within 270 days after the conclusion of each fiscal year end throughout the term of the financing.

Should we become the successful proposer, we have attached the form of a resolution that your governing board can use to award the financing to Lender. If your board adopts this resolution, then Lender shall not require any further board action prior to closing the transaction.

Lender shall have the right to cancel this offer by notifying the Borrower of its election to do so (whether this offer has previously been accepted by the Borrower) if at any time prior to the closing there is a material adverse change in the Borrower's financial condition, if we discover adverse circumstances of which we are currently unaware, if we are unable to agree on acceptable documentation with the Borrower or if there is a change in law (or proposed change in law) that changes the economic effect of this financing to Lender.

Costs of counsel for the Borrower and any other costs will be the responsibility of the Borrower.

The stated interest rate assumes that the Borrower expects to borrow less than \$10,000,000 in the current calendar year and that the financing will be bank qualified and tax exempt under the Internal Revenue Code. Lender reserves the right to terminate this bid or to negotiate a mutually acceptable interest rate if the financing is not bank qualified and tax exempt.

Truist appreciates the opportunity to offer this financing proposal. Please call me at (704) 954-1706 with your questions and comments. We look forward to hearing from you.

Sincerely,

Truist Bank



Mary Parrish Coley
Senior Vice President

City of Friendswood, Texas
Lease Purchase for Engine Fire Truck
Sample Payment Schedule
Seven (7) Years; Annual Payments in Arrears

Nominal Annual Rate: 2.050%

TValue Amortization Schedule - Normal, 360 Day Year

	Date	Payment	Interest	Principal	Balance
Loan	02/14/2020				580,000.00
2020 Totals		0.00	0.00	0.00	
1	02/14/2021	89,789.25	11,890.00	77,899.25	502,100.75
2021 Totals		89,789.25	11,890.00	77,899.25	
2	02/14/2022	89,789.25	10,293.07	79,496.18	422,604.57
2022 Totals		89,789.25	10,293.07	79,496.18	
3	02/14/2023	89,789.25	8,663.39	81,125.86	341,478.71
2023 Totals		89,789.25	8,663.39	81,125.86	
4	02/14/2024	89,789.25	7,000.31	82,788.94	258,689.77
2024 Totals		89,789.25	7,000.31	82,788.94	
5	02/14/2025	89,789.25	5,303.14	84,486.11	174,203.66
2025 Totals		89,789.25	5,303.14	84,486.11	
6	02/14/2026	89,789.25	3,571.18	86,218.07	87,985.59
2026 Totals		89,789.25	3,571.18	86,218.07	
7	02/14/2027	89,789.25	1,803.66	87,985.59	0.00
2027 Totals		89,789.25	1,803.66	87,985.59	
Grand Totals		628,524.75	48,524.75	580,000.00	

ANNUAL PERCENTAGE RATE	FINANCE CHARGE	Amount Financed	Total of Payments
The cost of your credit as a yearly rate.	The dollar amount the credit will cost you.	The amount of credit provided to you or on your behalf.	The amount you will have paid after you have made all payments as scheduled.

2.050%	\$48,524.75	\$580,000.00	\$628,524.75
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City of Friendswood, Texas
Lease Purchase for Ambulance
Sample Payment Schedule
Five (5) Years; Annual Payments in Arrears

Nominal Annual Rate: 1.980%

TValue Amortization Schedule - Normal, 360 Day Year

	Date	Payment	Interest	Principal	Balance
Loan	02/14/2020				203,000.00
2020 Totals		0.00	0.00	0.00	
1	02/14/2021	43,043.16	4,019.40	39,023.76	163,976.24
2021 Totals		43,043.16	4,019.40	39,023.76	
2	02/14/2022	43,043.16	3,246.73	39,796.43	124,179.81
2022 Totals		43,043.16	3,246.73	39,796.43	
3	02/14/2023	43,043.16	2,458.76	40,584.40	83,595.41
2023 Totals		43,043.16	2,458.76	40,584.40	
4	02/14/2024	43,043.16	1,655.19	41,387.97	42,207.44
2024 Totals		43,043.16	1,655.19	41,387.97	
5	02/14/2025	43,043.16	835.72	42,207.44	0.00
2025 Totals		43,043.16	835.72	42,207.44	
Grand Totals		215,215.80	12,215.80	203,000.00	

ANNUAL PERCENTAGE RATE	FINANCE CHARGE	Amount Financed	Total of Payments
The cost of your credit as a yearly rate.	The dollar amount the credit will cost you.	The amount of credit provided to you or on your behalf.	The amount you will have paid after you have made all payments as scheduled.
1.980%	\$12,215.80	\$203,000.00	\$215,215.80



February 14, 2020

Mrs. Katina Hampton
Friendswood City Hall
(281) 996-3221
khampton@ci.friendswood.tx.us

Dear Mrs. Hampton,

Thank you for the opportunity to present proposed financing for Friendswood City Hall. I am submitting for your review the following proposed structure:

ISSUER:	City of Friendswood City Hall, TX	
FINANCING STRUCTURE:	Tax Exempt Structure w/ \$1.00 purchase	
EQUIPMENT COST:	\$ 580,000	
TERM:	5 Annual Payments	7 Annual Payments
INTEREST RATE:	2.77%	2.79%
PAYMENT AMOUNT:	\$ 127,073.28	\$ 93,281.88
PAYMENTS BEGINNING:	One year from signing, annually thereafter	
EQUIPMENT COST:	\$ 203,000	
TERM:	5 Annual Payments	7 Annual Payments
INTEREST RATE:	2.77%	2.79%
PAYMENT AMOUNT:	\$ 44,475.65	\$ 32,648.66
PAYMENTS BEGINNING:	One year from signing, annually thereafter	

Financing for these projects would be simple, fast and easy due to the fact that:

- ✓ We have an existing relationship with you and have your financial statements on file, expediting the process. Please keep in mind we may also need current year statements.
- ✓ We can provide familiar documentation for your legal counsel.

Government Capital is registered with Texas Ethics Commission to be HB 1295 compliant. The above proposal is subject to audit analysis, assumes non-bank qualification and mutually acceptable documentation. The terms outlined herein are subject to change and rates are valid for fourteen (14) days from the date of this proposal. If funding does not occur within this time period, rates will be indexed to markets at such time. The above payment amount includes all applicable fees expressed as 1%. These costs can include documentation fees, legal fees, issuance expenses, etc.

Our finance programs are flexible and my goal is customer delight. If you have any questions regarding other payment terms, frequencies or conditions, please do not hesitate to call.

With Best Regards,

Stephanie Cates

Stephanie Cates
Client Services
CC: Landon Newton
Main: 817-421-5400

The transaction described herein is an arm's length, commercial transaction between you and Government Capital Corporation ("GCC"), in which GCC: (i) is acting solely for its own financial and other interests that may differ from yours; (ii) is not acting as your municipal advisor or financial advisor, and has no fiduciary duty to you with respect to this transaction; and (iii) is not recommending that you take an action with respect to this transaction.

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/6/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Resolution No. R2020-07: A resolution approving and adopting updates/amendments to the "Design Criteria Manual" for the City of Friendswood, Texas; approving the standards contained therein for the design, construction and installation of public infrastructure and related facilities and improvements within the City; and repealing all prior design criteria manuals and repealing other resolutions or parts of resolutions inconsistent or in conflict herewith.

Originating Department: Engineering

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

The City's Design Criteria Manual is updated periodically to provide for the most current and comprehensive standards covering the design, construction, and installation of public infrastructure and related improvements within the City of Friendswood.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Included are updates that take into consideration changes in how the City Engineering, Community Development, and Public Works Departments operate. Also addressed within this update are the requirements of State House Bill 3163 (2019) in relation parking for persons with disabilities and the responsibility cities now have regarding the regulation of handicap parking spaces.

Changes to the Manual are catalogued beginning on Page 2.

RECOMMENDATIONS

Staff recommends approval of the resolution adopting the updates and amendments to the City's Design Criteria Manual.

ATTACHMENTS

1. R2020-07 Design Criteria Manual Update
2. 2020 Design Criteria Manual - Copy for Council Meeting

RESOLUTION NO. R2020-07

**A RESOLUTION APPROVING AND ADOPTING
UPDATES/AMENDMENTS TO THE “DESIGN CRITERIA
MANUAL” FOR THE CITY OF FRIENDSWOOD, TEXAS;
APPROVING THE STANDARDS CONTAINED THEREIN
FOR THE DESIGN, CONSTRUCTION AND
INSTALLATION OF PUBLIC INFRASTRUCTURE AND
RELATED FACILITIES AND IMPROVEMENTS WITHIN
THE CITY; AND REPEALING ALL PRIOR DESIGN
CRITERIA MANUALS AND REPEALING OTHER
RESOLUTIONS OR PARTS OF RESOLUTIONS
INCONSISTENT OR IN CONFLICT HEREWITH.**

* * * * *

WHEREAS, consistent with APPENDIX B "Subdivisions", Section III(a), of The City Code of the City of Friendswood, the City of Friendswood Design Criteria Manual shall be updated from time to time and adopted by Resolution; and,

WHEREAS, the City Council has determined a need for updating the City of Friendswood Design Criteria Manual to provide for the most current and comprehensive standards covering the design, construction, and installation of public infrastructure and related improvements within the City; and,

WHEREAS, the City of Friendswood – Department of Engineering and Projects "Design Criteria Manual," which document is updated/amended and on file with the City Secretary's office, shall be approved and adopted as the most recent Design Criteria Manual for the City of Friendswood.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, TEXAS:

Section 1. The facts and matters set forth in the preamble of this Resolution are hereby found to be true and correct.

Section 2. That certain City of Friendswood – Department of Engineering and Projects "Design Criteria Manual," dated March 2020, a true and correct copy of which is on file in the office of the City Secretary and for all things made a part hereof, is hereby adopted. The standards and related documents contained and referred to therein shall control and are hereby established as minimum design, construction, and installation standards for certain public infrastructure and related improvements within the City of Friendswood, Texas, for City projects and subdivision and other related development. In the event of conflict between any provision of the Design Criteria Manual and any ordinance of the City, or between the Design Criteria Manual and any condition of plat or development approval imposed by the City, the provisions of any such ordinance or term or condition of approval shall control.

Section 3. The Director of Engineering and Projects shall maintain copies of such Design Criteria Manual and related documents, which shall be made available, upon payment of the reasonable costs of publication thereof, to any person requesting same. The Director is further directed to periodically evaluate and review such standards and, when deemed necessary and appropriate, recommend changes to City Council.

Section 4. All other resolutions adopting prior versions of the Design Criteria Manual or any resolution inconsistent or in conflict herewith, are, to the extent of such inconsistency or conflict, hereby repealed.

PASSED, APPROVED AND RESOLVED on this 2nd day of March, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

CITY OF FRIENDSWOOD

DEPARTMENT OF ENGINEERING & PROJECTS

DESIGN CRITERIA MANUAL



Jildardo Arias, PE, CFM

Director of Engineering &
Projects/City Engineer

APPROVED BY
RESOLUTION NO. 2020-XX
MARCH 2020

Changes in the 2020 revision of the City of Friendswood Design Criteria Manual shall be listed here by Section.

Changes to Section I – Graphic and Design Requirements:

1.0.A – delete “*latter two (2)*” and replace with “*three (3)*”.

1.03 – swap *Item C* with *Item B*.

1.03 – Insert the following subsection:

D. “PDF – a file format that provides an electronic image of text or text and graphics that looks like a printed document and can be viewed, printed and electronically transmitted.”

1.04.B – delete “*or twenty-two (22) inches by thirty-four (34) inches overall paper stock.*”

1.04.H – delete “*, except for short streets or lines originating from a major intersection.*”
And swap *Item H* and *Item I*.

1.04.I – delete “*This requirement is waived under the following conditions:*”

1.04.I.1 – delete “*Short sections of improvements fitted on a sheet that otherwise has the north arrow correctly shown.*”

1.04.I.2 – delete “*Stationing is intended to start from the cardinal points of the compass and proceed in the direction of construction.*”

1.04.J.2.b – delete “*1 inch = 40 feet horizontal, 1 inch = 4 feet vertical.*”

1.04 – Insert the following subsection between *Item O* and *Item P*:

P. End and beginning of alignment shall include coordinates based upon the state plane.

1.04.S.5 – insert “*left and right*” after “*proposed*”.

Changes to Section II – Wastewater Collection System:

1.04.A – insert “*, PDF, and*” before “*CADD files*”.

1.04.F.4 – insert “*and called out on plan and profile*” after “*maintained*”.

1.04.F.6 – delete “*City Project Manager*” and replace with “*City Engineer or his designated appointee*”.

1.04.H.5 – insert *“and shall be constructed of Class 150 [one hundred fifty (150) psi] pressure pipe”* after *“design”*.

1.04.J – insert *“unless approved by City Engineer”* after *“rights-of-way”*.

1.04.K.21 – insert *“Unless City Zoning regulations mandate another material,”* before *“Provide”*. Insert *“6” width* after *“redwood”*. Insert *“and include a 2”x12” rot board”* after *“high”*.

1.04.K – insert new subsection after *Item 21*:

22. *“Fence design shall be certified by a Texas-licensed engineer”*.

1.04.K – insert new subsection after *Item 24*:

25. *“Under no circumstances may a lift station be located in a regulatory floodway”*.

1.06.B – insert the following subsection:

4. *“Copy of Engineer’s Summary Transmittal Letter to TCEQ.”*

Changes to Section III – Water Line Distribution System:

1.0 – insert the following subsection after *Item A*:

B. *“Should any section conflict with TCEQ Regulations, the more stringent of the two (2) shall govern.”*

1.02 – insert the following subsection after *Item E*:

F. *“International Fire Code (IFC).”*

1.04.G.3 – delete *“or”* after *“steel”* and insert *“, or polyethylene”* after *“joint”*.

1.04.N.g – underline *“permanent”*.

1.05.D.2 – delete *Item a* and *Item b* and insert the following subsection:

a. *“Hydrant spacing shall be governed by the International Fire Code as adopted and amended by the City of Friendswood.”*

1.05.F.1.f – delete *“Public Works”* and insert *“of Engineering and Projects”* after *“Department”*

Changes to Section IV – Street Paving:

1.04.A.1 – delete “All”.

1.04.C.1.a – insert “no greater than” after “joints”.

1.04.C.2.a – insert “no greater than” after “joints”.

1.04.I.2 – delete “Section 70-66” and replace with “Section 70-64”.

Changes to Section V – Storm Drainage: NONE

Changes to Section VI – Site Development:

1.02 – insert the following subsection:

“E. Architectural Barriers Texas Accessibility Standards (TAS)”

1.04.11.j – remove all text and insert “*The number of accessible parking spaces shall comply with the latest edition of the Architectural Barriers Texas Accessibility Standards (TAS).*”

1.04.11.k – insert the following subsection:

“k. Accessible parking spaces must be paved and must include:

- a. The international symbol of access painted conspicuously on the surface in a color that contrasts the pavement;*
- b. The words “NO PARKING” painted on any access aisle adjacent to the parking space. The words must be painted:*
 - i. In all capital letters;*
 - ii. With a letter height of at least one (1) foot, and a stroke width of at least two (2) inches; and*
 - iii. Centered within each access aisle adjacent to the parking space; and*
- c. A sign identifying the consequences of parking illegally in a paved accessible space. The sign must:*
 - i. At a minimum state “Violators Subject to Fine and Towing” in a letter height of at least one inch;*
 - ii. Be mounted on a pole, post, wall, or freestanding board;*
 - iii. Be no more than eight (8) inches below a sign required by Texas Accessibility Standards, 502.6; and*
 - iv. Be installed so the bottom edge of the sign is no lower than four (4) feet and no higher than six (6) feet above ground level.*

d. A sign that meets the requirements set in Texas Accessibility Standards, 502.6, that includes the required language in subsection (c)(i) satisfies these requirements.”

Changes to Appendix A – Attachments:

Page 3 – Disclaimer for completion was moved outside of the paragraph.

Page 5 – Enlarged box for Engineer Seal to 2”x2”. Rename “ZC” to “Zip” under “List of Supporting Documentation”. Rename “Public Works” to “Engineering & Projects”.

Changes to Appendix B – Figures: NONE

Changes to Appendix C – Parking Group Tables: NONE

Changes to Appendix D – Qualified Tree List: NONE

Changes to Appendix E – Downtown District Amenities: NONE

Changes to Appendix F – Culverts and Driveways Policy: NONE

Changes to Appendix G – Traffic Control Sign Policy: NONE

Changes to Appendix H – Streetlight Policy: NONE

Updated address on Streetlight Request Form.

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SECTION I

GRAPHIC AND DESIGN REQUIREMENTS

1.0 GENERAL

- A. Should any portion of this Section conflict with any provisions of the Subdivision Ordinance or Zoning Ordinance, the more stringent of the three (3) shall govern.
- B. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- C. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.

1.01 CHAPTER INCLUDES

Graphic and design requirements for construction drawings.

1.02 REFERENCES

The City of Friendswood Standard Details and City of Friendswood Technical Specifications, latest versions. These can be downloaded from the City's website at: www.friendswood.com/publications

1.03 DEFINITIONS

- A. CADD (Computer Aided Drafting Design) – the preparation of documents utilizing computer facilities for the production of drawings, plans, prints, and other related documents.
- B. GCCDD – Galveston County Consolidated Drainage District.
- C. HCFCD – Harris County Flood Control District.
- D. PDF – a file format that provides an electronic image of text or text and graphics that looks like a printed document and can be viewed, printed and electronically transmitted.

1.04 DESIGN REQUIREMENTS

- A. Provide a cover sheet for all projects involving three or more design drawings (excluding standard detail sheets). Drawing sheet numbers shall be shown on the

cover sheet or area key map. Include a vicinity map to identify project locations. Also provide current City of Friendswood Standard Details Signature Block that has a note stating that approval is valid for only one (1) year from the date of signatures.

- B. Preliminary drawings shall be prepared on nominal twenty-four (24) inches by thirty-six (36) inches.
- C. Final drawings shall be produced by CADD on paper stock. The engineer shall also submit, at the time of plan approval, an electronic PDF and DWG version of the CADD drawings on CD-ROM of the development showing all lot lines and associated lot information, rights-of-way, easements, contour-lines, utilities, and all drainage and paving improvements.
- D. Details of special structures (not covered by approved standard drawings such as stream or gully crossings, special manholes, or junction boxes, etc.) shall be drawn with vertical and horizontal scales equal to each other, and shown on a separate sheet(s) from the Standard Detail sheets.
- E. Each set of construction drawings shall contain paving and utility key drawings indexing specific plan and profile sheets. City of Friendswood Standard Detail drawings, where applicable, shall be included. All sheets shall have standard title blocks and be sequentially numbered. Where applicable, show HCFCDD or GCCDD key drawings and numbers.
- F. A drawing index shall be shown on the overall cover sheet.
- G. Overall project layouts shall be drawn to a minimum scale of 1 inch = 100 feet and provided with a drawing index.
- H. A north arrow shall be shown on all sheets (except standard or special detail sheets) and shall be located either toward the top or to the right.
- I. Plan and profile sheet stationing must run from left to right.
- J. Standard scales permitted for plans and profiles of paving and utility construction drawings are as follows:
 - 1. Major thoroughfares, major collectors, and boulevards over four hundred (400) feet in length, or special intersections/situation.
 - a. 1 inch = 20 feet horizontal, 1 inch = 2 feet vertical
 - 2. Minor collectors or local streets.

- a. 1 inch = 20 feet horizontal, 1 inch = 2 feet vertical
 - b. 1 inch = 50 feet horizontal, 1 inch = 5 feet vertical
- 3. Scales in Paragraph No. 2 above are a minimum; larger scales may be used to show details of construction.
- K. Each plan and profile sheet shall have a benchmark elevation and description of the benchmark, along with a current flood zone determination statement. Also include the temporary benchmark (TBM) with their elevation and coordinates.
- L. The seal, date, and original signature of the Professional Engineer licensed to practice engineering in the State of Texas, and who is responsible for the drawings, shall be required on each sheet developed by the engineer, along with their firm's registration information. The engineer may use a stamped or embossed imprint for his/her seal; however, the embossed imprint must be shaded such that it will reproduce on prints.
- M. A copy of the final plat for new developments shall be included with the final drawings when submitted for final approval.
- N. If a roadway exists where drawings are being prepared to improve or construct new pavement or a utility, label the existing roadway width, surface type, and thickness. Pavement thickness shall be ascertained by coring with the core hole and grout filled to protect pavement prior to construction.
- O. Show all street and/or road alignments on drawings.
- P. End and beginning of alignment shall include coordinates based upon State Plane.
- Q. Develop drawings to accurate scale showing proposed pavement, typical cross sections, details, lines and grade, and all existing topography within street rights-of-way, and any easement contiguous with the rights-of-way. At the intersection, the cross street details shall be shown at a sufficient distance [twenty (20) foot minimum distance outside the primary roadway rights-of-way] in each direction along the cross street in order to design adequate street crossings or transitions.
- R. Match lines between plan and profile sheets shall not be placed or shown within cross street intersections including cross street rights-of-way.
- S. Natural ground profiles shall be shown as follows:
 - 1. For privately-funded projects, center line profiles are satisfactory except where a difference of one-half (0.5) foot or more exists from one (1) rights-

of-way or easement line to the other, in which case, dual profiles are required.

2. For City of Friendswood projects, provide natural ground profiles at each rights-of-way line. Easement profiles shall conform to S.1 below.

T. Basic plan and profile sheets shall contain the following information:

1. Identify all lot lines, property lines, easements, and/or rights-of-way.
2. Label each plan sheet as to street/easement widths, pavement widths, pavement thickness where applicable, type of roadway materials, curbs, intersection radii, curve data, stationing, existing utilities (type and location), and any other pertinent feature affecting design.
3. Show all utility lines four (4) inches in diameter or larger within the rights-of-way or construction easement in profile view. Show all utility lines, regardless of size, including franchise utility lines, in the plan view.
4. Graphically, show flow line elevations and direction of flow for all existing ditches.
5. Label proposed left and right top of curb elevations and grades, except at railroad crossings. Centerline elevation and grades are acceptable only for paving without curb-and-gutters.
6. Curb return elevations and grades for turnouts shall be shown in profile.
7. The centerline elevation at the property line of all existing driveways shall be shown in profile.
8. Station all esplanade noses or the centerline of all esplanade openings with esplanade width shown, both existing and proposed.
9. The design of both roadways is required on all paving sections with an esplanade.
10. Station all Points of Curvature (PCs), Points of Tangency (PTs), radius returns, and grade change Points of Intersection (PIs) in the plan view. Station all radius returns and grade change Points of Intersection (PIs) in profile with their respective elevations.

U. Provide a Storm Water Pollution Prevention Plan (SWPPP) with legend. See Section VI – Site Development under Design Requirements.

- V. The Drainage Plan shall have a current FEMA flood zone determination statement.
- W. All “No Objection” letters expire one (1) year after issuance.

SECTION II

WASTEWATER COLLECTION SYSTEM DESIGN REQUIREMENTS

1.0 GENERAL

- A. Should any portion of this Section conflict with the Subdivision Ordinance or the Zoning Ordinance, the more stringent of the latter two (2) shall govern.
- B. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- C. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.
- D. Sanitary sewers located on private property that are not in a dedicated easement, are under the jurisdiction of the International Plumbing Code, as adopted and amended by ordinance, and will be addressed/reviewed by the Building Official.

1.01 CHAPTER INCLUDES

Criteria for the design of wastewater collection systems.

1.02 REFERENCES

- A. Texas Commission on Environmental Quality (TCEQ) – "Design Criteria for Sewerage Systems" – Texas Administration Code – Chapter 217 (current revision).
- B. Galveston County Health Department.
- C. City of Friendswood Standard Details and Technical Specifications, latest version. These can be downloaded from www.friendswood.com/publications.

1.03 DEFINITIONS

Where used in these regulations, the following terms shall be construed to carry the meanings given below:

- A. Public Sanitary Sewer – A closed conduit which conveys wastewater flow and which is located within the public rights-of-way or dedicated public easement. A public sanitary sewer (or public sewer system) is intended to serve more than one (1) "owner".
- B. Private Sanitary Sewer – A closed conduit which conveys wastewater flow and is constructed and maintained by a private entity (ies) (i.e., homeowner's association). Private sanitary sewers may be located in areas such as a private street or common area, and are subject to the design and construction requirements of the International Plumbing Code, as adopted and amended by ordinance. Private sanitary sewers must discharge to a public sanitary sewer.
- C. Sanitary Sewer Main – A sanitary sewer which receives the flow from one (1) or more lateral sanitary sewers.
- D. Lateral Sanitary Sewer – A sanitary sewer running laterally down a street, alley, or easement, which receives only the flow from the abutting property.
- E. Service Lead – A sanitary sewer which branches off a public sanitary sewer and extends to the limits of the public rights-of-way. It shall be construed as having reference to a public sanitary sewer branching off from a main or lateral sanitary sewer to serve one (1) or more houses, single-family lots, or other types of small land tracts situated in the same block with the said main or lateral sanitary sewer, but not directly adjacent thereto. Such a line shall never exceed one hundred fifty (150) feet in length. If the sanitary sewer is designed to serve more than two (2) houses, or the equivalent of two single-family residences along a street, a lateral sanitary sewer as defined above shall be constructed.
- F. Service Connection – A private sanitary sewer from a single source to the main or lateral sanitary sewer in the street, alley, or easement adjacent thereto. Service connections are covered by the International Plumbing Code, as adopted and amended by ordinance. It will be owned and maintained by the owner of the property being served by said sanitary sewer.
- G. Project Area – The area within the immediate vicinity of the public sanitary sewer to be constructed. For example, if a public sanitary sewer were to be constructed within the public rights-of-way, the project area would extend ten (10) feet to either side of the public rights-of-way. If as an example, a public sanitary sewer is to be constructed within a dedicated easement adjacent to the public rights-of-way, the project area would extend ten (10) feet to either side of the dedicated easement, depending upon the existing topographical elements, unless impacted by a permanent structure (i.e., telephone pole, trees, drainage ditches, etc.) If, as

an example, a public sanitary sewer is to be constructed within a side lot easement (if approved by the City), the same criteria would apply as for a dedicated easement adjacent to public rights-of-way.

- H. Stack – A riser pipe constructed on main or lateral sanitary sewers which are deeper than six (6) feet, measured from finished grade at manhole to facilitate construction of service leads or service connections.
- I. Force Main – A pressure-rated conduit (i.e. ductile iron pipe, pressure-rated PVC, etc.) that conveys wastewater from a pump station to a discharge point.
- J. All references hereafter to sewer, public sewer, private sewer, sewer main, lateral sewer, service lead, service connections, stack, and force mains shall mean elements of a sanitary sewer system.

1.04 DESIGN REQUIREMENTS

- A. Drawings to be furnished:

Before any main or lateral sewer is constructed and before a permit shall be issued for the construction of same, plans and profiles of the proposed sewer shall be prepared and submitted to the City for approval. All reproducible drawings, PDF, and CADD files shall become the property of the City and shall remain on file in the City for the use of any person who may be interested in such information.

- B. Details to be shown on drawings:

The detailed plan view will show the exact location of public sewer lines in the street, alley, or easement with respect to the edge of the particular rights-of-way, the survey base line, and any nearby utilities, major landscaping, and other structures affecting construction.

- C. Main and Lateral Sewers

- 1. Sewers in curved easements, easements defined by property lines, and combined easements containing other public utilities shall be shown both in detailed plan and profile views.
- 2. The profile shall show other underground and surface utilities, and facilities, both in parallel and at crossings; the size, grade of the proposed line, the elevation of same to hundreds of a foot at all manholes, changes of grade and dead-ends, and the proposed finished grade over the sewer.

It shall show the actual ground line as it exists prior to construction of the sewer. Where proposed fill or cut is contemplated, the proposed new ground line shall be shown as a separate line from the actual ground line. Type of pipe and bedding shall comply with City of Friendswood Technical Specifications and Standard Details.

3. Where public sewers are to be placed between existing pavement and the street rights-of-way (or interior easement line) or under existing pavement or shoulders of pavement, show the existing ground line at both sides (or the closest side for sewers near the edge) of the rights-of-way or adjacent sewer easement.

D. Sewer mains – plan and profile required

1. Sanitary sewer layouts for single-family residential subdivisions should use a scale of one hundred (100) feet or less per inch. A scale of two hundred (200) feet per inch may be used provided the following information is shown on the layout:
 - a. All easements containing or buffering sanitary sewers shall have points of size change shown, and all manhole locations shall be shown.
 - b. The sewer alignment shall accurately reflect the relative location of the sewer as shown on the detailed plan view.
 - c. All service leads that cross street pavement or serve adjacent property shall be shown on the layout. The detail plans and profiles shall show the flow lines of all service leads at the street or easement rights-of-way.
 - d. The number and size of the lots depicted on both the overall sewer layout sheet and the individual plan and profile sheets shall match the number and size of the lots depicted on the final plat after recordation.
 - e. On the overall sanitary sewer layout sheet the size and direction of flow for all existing and proposed sewers shall be shown.
 - f. The location of the proposed sewer within the public rights-of-way, a dedicated easement adjacent to the public rights-of-way, or side lot easement (if allowed by the City).

- g. The overall sanitary sewer layout sheet shall show the area, in acres, which the proposed sewer(s) is (are) designed to serve. A location map shall be included that references the average proximity to nearby major thoroughfare and boulevard streets. The scale of the location map shall be 1 inch = 2,000 feet or less.
- 2. Non-residential subdivision sanitary sewer layouts for large areas, and with a scale of four hundred (400) feet or more per inch, shall have an additional set of layouts at not more than two hundred (200) feet per inch, with match lines and a small index map showing which portion of the overall layout that each sheet's layout represents.
- 3. Acceptable horizontal scales for the detailed plan and profile views shall be ten (10) feet, twenty (20) feet, forty (40) feet, and not more than fifty (50) feet maximum per inch. Horizontal scale for major thoroughfares and boulevards shall be 1 inch = 20 feet or less.
- 4. Acceptable vertical scales for detailed profile views shall be two (2) feet, four (4) feet, and not more than five (5) feet maximum per inch unless otherwise approved. Vertical scale for major thoroughfares and boulevards shall be 1 inch = 2 feet or less.
- 5. The plan view shall show, at a minimum, the following information for the project area:
 - a. All topographical features;
 - b. Stationing for the proposed sewers;
 - c. All existing underground and overhead utilities (i.e. telephone, gas, power, etc.);
 - d. Any significant landscaping and/or other structures which might impact construction and/or construction related activities;
 - e. The width and type of all existing and proposed easements;
 - f. All proposed service leads;
 - g. The limits of bore and/or tunnel;

- h. Locations where pressure rated pipe is to be installed at water line crossings;
 - i. Drawings for single-family residential subdivisions shall show the proposed location by stations of all service leads, service connections, and stacks. The distance from the sewer or survey base line station to the nearest existing manhole shall be shown in the plan view or on an additional sewer layout sheet with a scale no more than 1 inch = 100 feet.
- 6. The profile view shall show, at a minimum, the following information for the project area:
 - a. Underground and/or surface utilities/facilities which are either parallel to the proposed sewer or cross the proposed sewers;
 - b. The proposed sewer's diameter and grade for each manhole section;
 - c. The flow line elevation for all sanitary sewers at each manhole;
 - d. The rim elevation of all existing and proposed manholes;
 - e. The flow line elevation at each sheet "break" [i.e., from one (1) sheet to another];
 - f. Type of pipe bedding/backfill shall be noted on each plan/profile sheet;
 - g. The finished grade for proposed and existing pavement where "fill" and/or "cut" is proposed, the proposed new ground elevation line shall be shown as a separate line from the existing ground elevation line;
 - h. The existing ground elevation line for the "near side" of the public rights-of-way where a sewer is to be placed between the edge of existing pavement and the edge of the public rights-of-way;
 - i. The existing ground elevation line at the centerline of the proposed sanitary sewer where a sanitary sewer is to be placed within an existing easement;

- j. Show any proposed and/or existing pavement;
- k. The flow line elevation of all service leads where they cross the edge of the public rights-of-way or the dedicated easement adjacent to the public rights-of-way;
- l. The limits of bore and/or tunnel;
- m. Locations where pressure rated pipe is to be installed at water line crossings;
- n. The location of special backfill and/or proposed stacks shall be identified by "stations" indicated on the design plans;
- o. The location of stacks shall be labeled with stations.

E. Service leads

- 1. Service leads shall be sized in accordance with Paragraph 1.04.G of this Section.
- 2. Service leads shall be at the property line between two (2) adjoining lots, or as directed by the City. A single six (6) inch service lead located at the property line between two (2) adjoining lots would serve two (2) single-family residences with a wye placed at the end of the service lead. Do not extend the wye clean-outs beyond the edge of either the public rights-of-way or dedicated easement.
- 3. Any service lead extension of more than fifty (50) feet parallel to the street rights-of-way shall be treated as a lateral sewer.
- 4. Service leads from developments with more than seventeen thousand five hundred (17,500) gallons-per-day flow shall discharge into a proposed or existing manhole. Where the flow line of the service is thirty (30) inches or greater above the flow line of the manhole, provide a standard drop to manhole.
 - a. Service leads shall be provided to serve each lot within a proposed development;
 - b. Service leads shall be six (6) inches in diameter (minimum). If the length of a service lead exceeds one hundred (100) feet or the

width of the public rights-of-way by more than twenty (20) feet, the minimum diameter shall be eight (8) inches and a manhole shall be utilized for connection to the public sewer;

- c. Service leads with a diameter of six (6) inches shall utilize "full body" fitting (extruded or factory-fabricated) for connection to the proposed public sewer or an approved saddle-type connector for connection to an existing public sewer;
- d. Saddle-type connectors shall be installed with the "stub" oriented between the "spring line" (3 o'clock and 9 o'clock positions) and forty-five (45) degrees from the "spring line" ("1:30" and "10:30" positions). Tees (aka, "full body fittings") shall be oriented in the same manner;
- e. The service lead shall be designated to minimize the use of bends as site conditions will permit;
- f. Service leads exceeding the limits defined in 1.04.E.3 shall have a manhole at each end; as well as, a plan/profile drawing for each rights-of-way crossing. All, or part, of these service leads which are located in a public rights-of-way, alley or dedicated sanitary sewer or public utility easement may be treated as a public sewer, depending upon the location of the terminal manhole and any intermediate manholes;
- g. For all existing lots (which are not served in accordance with these guidelines) that need a service lead, if the distance to the nearest existing sewer is less than fifty (50) feet, the service lead falls under the jurisdiction of the International Plumbing Code, as adopted and amended by ordinance, and the Building Official.

F. General Requirements

- 1. Sanitary sewers shall allow for orderly expansion of the system and shall conform to the comprehensive water and sewer plan for the City of Friendswood.
- 2. Sewers shall be sized based on the minimum requirements set out in this standard and the standard wastewater flow rates as established by the City of Friendswood;

3. All sewers shall conform to the minimum requirements of the Title 30 of the Texas Administrative Code, Chapter 217 of Texas Commission on Environmental Quality (TCEQ), and Galveston County Health District.
4. Sewers shall be separated from water lines by a minimum of nine (9) feet. Where the minimum separation is not maintained, refer to Section VII for allowable clearances. Sewers crossing utilities other than water, a minimum of six (6) inches of clearance must be maintained and called out on plan and profile.
5. As maintained by the City of Friendswood, the public sanitary sewer shall be defined as all sewers, including stacks and service leads, that serve more than one sewer connection, and that are located in public easements or street rights-of-way, and that are installed in accordance with these Standards.
6. Sanitary lines greater than six (6) feet deep shall require stacks to facilitate construction of service leads or service connections. Stacks shall be shown on plans with station numbers. Place stacks and wyes or tees as shown. Where no stacks are shown, it is the responsibility of the licensed plumber to place a City approved saddle for connection to the line and the responsibility of the City Engineer or his designated appointee to determine that such saddle is water tight and properly installed.
7. Materials and construction shall conform to latest City of Friendswood specifications with all amendments thereto, including standard leak test.
8. Unless noted otherwise, all public sewers and service leads shall be completely embedded in cement-stabilized sand to six (6) inches below the pipe, twelve (12) inches above the pipe and to six (6) inches on each side. All such bedding shall be compacted to ninety-five (95) percent standard proctor density. The cross-section so described herein shall be termed the "embedment zone."
9. Backfill all excavation areas/trenches under or within twelve (12) inches of existing or proposed pavement or shoulder of pavement with cement-stabilized sand from the top of the pipe "embedment zone" to the bottom of the subgrade. Cement-stabilized sand must develop one hundred (100) psi compression at forty-eight (48) hours. Backfill shall be compacted to ninety-five (95) percent standard proctor density.

10. The location of all special backfill and of proposed stacks shall be shown by stations in the drawings.
11. Construction notes shall designate the kind and class of pipe with exceptions to the construction notes to be shown on the plan and profile sheets.
12. Non-sanitary sewer easements or fee strips such as pipeline, power company, drainage district, railroad, etc., are in and of themselves insufficient and unacceptable to permit laying of sanitary sewers and/or force mains across or along the underlying private property or restricted non-sanitary use type of public property.
13. The final determination as to that portion of a street, alley, or easement to be occupied by a proposed sewer rests with the City Engineer who will take into consideration existing, planned and proposed facilities such as manholes, pavement, pipe/conduits, along with existing trees, shrubs, or other unique surface conditions when arriving at a decision.;
14. Where an easement for a public sewer ends at a public rights-of-way, the last manhole shall be extended into the public rights-of-way at a minimum of two (2) feet beyond the property line; or as close to the public rights-of-way as possible due to acceptable clearances required for other utilities (i.e., water line and storm sewers).
15. The drawings for the sewer shall show the location of any existing known pipe, duct, or other obstacles that might interfere with the construction of the sewer and call such to the attention of the City any known obstacles that might be encountered in constructing the sewer in any location under consideration. The Professional Engineer for the project, who shall be licensed to practice engineering in the State of Texas, shall determine the existence of pipes, ducts, and/or obstacles from a visual survey on the ground plus research of all public records and private records when available.
16. All sanitary sewer mains shall be constructed utilizing pressure rated pipe SDR 26, unless specifically approved otherwise by the City Engineer.
17. In new developments, sanitary sewer lines shall be centered in sanitary sewer line easements.

G. Line Size

1. The minimum pipe diameter for a public sanitary sewer shall be eight (8) inches.
2. Four (4) inch service leads shall be confined to the limits of the lot which they serve and shall serve only the equivalent of one (1) single-family lot. No four (4) inch sewer shall be laid in any street, alley, or rights-of-way.
3. Six (6) inch service leads shall not serve more than the equivalent of two (2) single-family lots or other types of small land tracts.
4. Four (4) inch and six (6) inch service leads for single-family residential lots shall have a minimum grade of one (1.0) percent and one-half (0.5) percent, respectively.
5. For commercial service leads such as street bores, submit a copy of the approved plumbing drawings to establish the required size of the line. The minimum size lead shall be six (6) inch.
6. All main and lateral sewers shall end in manholes, except for special and/or unusual situations that are subject to specific approval by the City Engineer.
7. All sewer lines shall be laid at a size and depth to conform to designs permitting an orderly expansion of the sewer system of the City, and so as to avoid a duplication of lines in the future.
8. The City Engineer shall have final approval as to what sizes and depths are required, along with exceptions to "lateral service leads" as previously defined.

H. Line Depth

1. The sewer should be laid with the top of the pipe a minimum of three (3) feet below finished grade or top of curb, whichever is lower.
2. Sewer laid in street rights-of-way with curb-and-gutter paved streets shall have a minimum cover of four (4) feet from the top of the pipe to the top of the curb to anticipate future sewer extension.

3. Sewers laid in street rights-of-way with crowned roads and side ditches shall have a minimum cover of five (5) feet from the average ground elevation line at the adjacent street rights-of-way to the top of pipe.
4. Where the minimum cover as specified in paragraphs H.1, H.2, and H.3 above is not possible, the sewer shall be laid in Class 150 [one hundred fifty (150) psi] pressure pipe or rigid factory made pipe with cement-stabilized sand backfill as shown on the City's Standard Details. Ductile iron pipe shall be lined with either a polyethylene or polyurethane coating as approved by the pipe manufacturer and applied by either the pipe manufacturer or an approved application. The minimum liner thickness shall be forty (40) mils.
5. Maximum depth for eight (8) inch, ten (10) inch, and twelve (12) inch collection lines shall be twenty (20) feet from average ground surface to pipe invert. Depths greater than twenty (20) feet are subject to approval by the City Engineer if justified for site-specific reasons during the preliminary engineering phase of the project design and shall be constructed of Class 150 [one hundred fifty (150) psi] pressure pipe.

I. Line Grades

The following table lists the minimum and maximum grades for six (6) inch through twenty-seven (27) inch public sewers. The minimum grade is based on a minimum full pipe velocity of two (2) feet per second. The maximum grade is based on a maximum full pipe velocity of ten (10) feet per second. In both cases, the Manning Formula has been used with an "n" of thirteen-thousandths (0.013). The use of different pipe materials will not alter the use of thirteen-thousandths (0.013) for the purpose of the Design Criteria Manual.

Inside Dimension (I.D.) of Pipe in Inches	Minimum Slope (in Percent) to Develop V=2.0 ft./sec.	Maximum Slope (in Percent) to Develop V=10.0 ft./sec.
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65

For sewers larger than twenty-seven (27) inches in diameter, the Professional Engineer of record, who shall be licensed to practice engineering in the State of Texas, shall determine the appropriate grade utilizing the Manning Formula, $n = 0.013$ and a full pipe velocity of two (2.0) fps minimum and ten (10.0) fps maximum.

J. Manholes

1. All manholes shall be precast concrete, unless the Professional Engineer of record, who is licensed to practice engineering in the State of Texas, submits a "cast in place" manhole design for review and approval by the City Engineer. All precast manholes are required to incorporate a "boot type connector" for sewer diameters up to twenty-four (24) inches. For sewer diameters greater than twenty-foot (24) inches, utilize either the "boot" type connector (if available) or an integral gasket. All precast manholes shall conform to the latest ASTM requirements. No manholes may be placed in the paved portion of the City rights-of-way unless approved by City Engineer.
2. For all public sewers, manholes shall be placed at all changes in alignment, changes in grade, junction points, dead-end mains, laterals, and at street, alley, or easement intersections as designs may require.
 - a. Sewers laid in easements shall have a manhole in each street crossed by the sewer.
 - b. The maximum distance between manholes shall be three hundred fifty (350) feet for eight (8) inch to forty-eight (48) inch pipe

diameters. Spacing for lines of a diameter larger than forty-eight (48) inches shall be determined on an individual project basis.

- c. Sewers with the same or approximate flow line elevation shall intersect each other at a ninety (90) degree angle. However, where a true perpendicular intersection cannot be obtained, and where the entering sewer intersects the receiving sewer at or about the same flow line, one (1) or more manholes shall be utilized to maintain a minimum eighty (80) degree angle at the point of intersection. When the entering sewer is on the upstream side of the manhole, the minimum angle between the sewers may be reduced to a forty-five (45) degree angle; provided:
 - 1) A distinct flow channel can be maintained within the manhole when the flowline elevations of the sewers are at, or within, one (1) pipe diameter of the smaller pipe; or
 - 2) When the flow line elevation of the "entering" pipe is above the crown of the "primary" sewer and clearance can be provided between the sewers.
- d. Criteria for connections to, and utilization of, manholes:
 - 1) Where manholes are utilized to facilitate connections between public sewers, when possible the sewers shall either match the manhole's flow line or match the elevation of each other's crown or utilize a manhole drop.
 - 2) Connections between public sewers at the manhole shall adhere to the following criteria when possible:
 - a) The elevation of the crown of the discharging sewer shall either match the elevation of the crown of the receiving sewer or be approved as special cases by the City Engineer.
 - b) A standard drop connection is required when the difference in elevation between discharging sewer flowline and receiving flowline is greater than thirty (30) inches.

- 3) The routing of service connection directly to manholes is the preferred method of termination. Where the flowline elevation of the existing sanitary sewer is more than ten (10) feet below grade and there is no available stack, and either:
 - a) The lot to be so connected is a single-family, owner-occupied, single lot residence connection to an existing manhole; or
 - b) The lot to be so connected is a single-family, owner-occupied, single lot residence connecting to a proposed manhole at the end of a cul-de-sac.
- 4) When routing an approved service connection to a manhole (see Item 3 above), the wall penetration shall not be greater than ten (10) inches in diameter and shall be cored and sealed using approved grout.
- 5) When routing an approved service connection to a manhole (see Item 3 above), the connections shall utilize a "drop (either inside or outside) and shall adhere to the following criteria:
 - a) The manhole wall penetration shall be a minimum of ten (10) feet below the manhole rim elevation and shall not be greater than ten (10) inches in diameter;
 - b) The drop shall be six (6) inches in diameter and shall be constructed of SDR 26 PVC pipe (ATSM D 3034, latest edition);
 - c) The drop shall be located forty-five (45) degrees from the upstream side of the main sewer;
 - d) An internal drop shall be affixed to the manhole wall utilizing stainless steel bands and anchor bolts.
 - e) An internal drop shall terminate with a forty-five (45) degree bend. Said forty-five (45) degree bend

shall not extend below the "top of pipe" elevation of receiving sanitary sewer and;

- f) The wall penetration (core) shall be sealed using a "grout" as approved by the City Engineer.
- g) All public sewers shall terminate in a manhole. Clean-outs will not be utilized except at the end of each service lead.
- h) The manhole cover shall have a minimum diameter of thirty-two (32) inches.
- i) All sanitary sewer manholes shall have inflow protectors.
- j) All manhole covers shall have the City of Friendswood seal and "SANITARY SEWER" imprinted on the lid as shown in the City of Friendswood Standard Sanitary Sewer Details.
- k) Commercial pressured discharge lines terminating in a manhole shall result in the manhole being protected by either a coating or concrete admixture to the interior walls of the manhole.

K. Lift Stations

1. Lift station design shall comply with the City of Friendswood Technical Specifications. In addition, it shall be confirmed that a storage volume, in the design of the wet well, shall equal to one and one-half (1.5) times the peak design flow to the lift station. Add ten (10) percent to account for volume displaced by pumps.
2. A natural gas standby generator shall be required for all new lift stations. The generator is required to be sized to operate all pumps during an emergency power failure.
3. A startup package for the pumps shall be submitted to the City Engineer before final acceptance. This package should also include a completed start up log sheet with field and product data. See Attachment 1.

4. Minimum site size shall be forty (40) feet by forty (40) feet. Smaller sites that are adjacent to public rights-of-way and are contiguous to green space or similar land use areas, may be approved when adequate odor control provisions are provided.
5. Pumps shall be sized to operate at optimum efficiency. Minimum acceptable efficiency at the operating point will be sixty (60) percent unless specifically approved by the City Engineer.
6. Operation and maintenance shall be considered in the design of the station and the location of the station.
7. Wet well working volume shall be sized to allow for the recommended pump cycle of six (6) minutes for each pump.
8. Prior to installation, controls and equipment shall be approved by the City Engineer.
9. Emergency operations shall be considered. Provide fittings and a blind flange that will be readily accessible for emergency bypass pumping.
10. The inlet structure shall be designed to minimize turbulence.
11. The velocity in the force main and riser pipes shall be less than 8 feet per second and greater than three (3) feet per second.
12. The wet well shall be sized to provide adequate clearance between the pumps (refer to manufacturers recommended clearances).
13. A peak factor of four (4) shall be used for lift station design.
14. A minimum of two (2) feet of clearance shall be provided between pumps and between pump and wall.
15. Low water levels shall be at least six (6) inches above impeller, or higher if required by manufacturer.
16. Complete immersion of submersible pump motor at low water level is preferred, if possible.
17. Tie reinforcing steel in lift station bottom to wall reinforcing steel (includes caisson construction situation) to provide watertight wetwell.

18. Nuts, bolts, chains, and all other metal components within wetwell shall be stainless steel, not carbon steel.
19. Vent pipe shall be eight (8) inch minimum diameter equipped with odor control system.
20. The following Hazen-Williams Coefficient shall be used for various pipe types:

PVC	New	C = 160
	10-year	C = 140
DIP	New	C = 140
	10-year	C = 100
21. Unless City Zoning regulations mandate another material, provide board fence (either cedar or heart redwood 6" width) with steel posts set in concrete. Fence shall be at least eight (8) feet high and include a 2"x12" rot board.
22. Fence design shall be certified by a Texas-licensed engineer.
23. Entrance drive to be at least fourteen (14) feet wide concrete pavement. Provide enough room to park vehicles inside lift station site.
24. Indicate method of drainage of site on site plan. Internal drainage, sheet flow and valley gutter driveways are acceptable. Drain to street or storm sewer, never onto adjacent private property.
25. Under no circumstances may a lift station be located within a regulatory floodway.
26. Locate the control panel and wetwell hatch above the One Hundred (100) Year Flood Plain. Call out the One Hundred (100) Year Flood Plain elevation on the plans.
27. Stainless steel guide rails (or other pump removal method that avoids entering wetwell) are required for submersible pumps.
28. A tee, plug valve (or gate valve), and blind flange assembly is required on the force main on the downstream side of the discharge valves and header.

This is required so truck-mounted pumps can bypass the lift station pumps and piping while maintenance work is being done on lift station.

29. Bedding for PVC force main shall be bank sand.
30. PVC force mains shall be AWWA C-900.
31. Ductile Iron Pipe (DIP) force mains shall be bedded in bank sand and polyethylene wrapped.
32. When calculating headloss in force main and piping, use of K factors on fittings, with the Hazen-Williams formula, is preferred.
33. Backfill structural excavations (wetwell, etc.) with cement-stabilized sand.
34. Lift station site plans shall be submitted in scales of 1 inch = 5 feet or 1 inch = 10 feet.
35. Provide a protective coating or concrete additive to the interior walls of the wetwell. The City Engineer shall approve coating or additive used.
36. Lift station shall be equipped with a telemetry system, approved by the City Engineer, and shall be compatible with existing systems in the City. A submersible transducer for SCADA shall be installed and connected to telemetry system to monitor status of lift station.
37. Power supply to lift station shall be three (3) phase and four hundred eighty (480) volts where possible.
38. A system of floats shall be provided to control pumps.
39. A pressure gauge suitable for application shall be installed on each discharge pipe.
40. A 1 inch minimum water service equipped with backflow prevention shall be provided at the lift station site.

L. Grease Traps/Grease Interceptors

Gravity grease interceptors shall be designed to remove grease from effluent and shall be sized in accordance with this section. Gravity grease interceptors shall

also be designed to retain grease until accumulations can be removed by pumping the interceptor.

1. Each grease trap/grease interceptor shall be installed in such a manner that it can be easily accessible for inspection, cleaning, and removal of the intercepted grease. All permitting, construction, design, and inspection activities must be completed in accordance with the manufacturer's instructions and the International Plumbing Code. Additionally, the following specifications must be incorporated into grease trap design:
 - a. The grease trap/grease interceptor shall be constructed with a minimum of two baffles.
 - b. Grease traps/grease interceptors are to be installed at a minimum distance of 10 feet from sinks and dishwashers to allow for adequate cooling of the wastewater. Water temperatures must be less than one hundred twenty (120) degrees prior to entering grease trap.
 - c. All grease bearing waste streams should be routed through an appropriate grease traps/grease interceptor, including: three-compartment sinks, pot/pan sinks, soup kettles, hand-washing sinks, dishwashers, mop sinks, and floor drains. *Notable Exceptions:* Drains that receive "clear waste" only, such as from ice machines, condensate from coils, and drink stations, may be plumbed to the sanitary system without passing through the grease trap.
 - d. All exterior or recessed grease traps/grease interceptors are to be installed with an effluent sampling well.
2. Requirements for traps are as follows:
 - a. Equipment and facilities of a type and capacity approved by the approving authority shall be provided.
 - b. The trap shall be located in a manner that provides ready and easy accessibility for cleaning and inspection.
 - c. The trap shall be maintained in effective operating condition so as to meet an effluent oil/grease test parameter of less than one hundred (100) mg/l.

- d. Traps shall conform to a minimum detention time of thirty (30) minutes and a maximum of sixty (60) minutes.
- e. The minimum size shall be one thousand (1,000) gallons or greater as determined by the design engineer.

1.05 APPURTENANCES – Reserved

1.06 SUBMITTALS

A. Preliminary design – submit the following for review and comment:

- 1. Copies of any documents which grant approval of exceptions to the City's Design Criteria.
- 2. Design calculations for line sizes and grades.
- 3. Contour map for overall area.
- 4. Plan and profile sheets showing proposed improvements (City projects only).
- 5. Geotechnical soils report for the project (City projects only).

B. Final design – submit the following for approval:

- 1. Final documents of the above plus plan and profile sheets and Geotechnical soils reports for non-City projects.
- 2. Review prints.
- 3. Original drawings.
- 4. Copy of Engineer's Summary Transmittal Letter to TCEQ.

1.07 QUALITY ASSURANCE

Prepare calculations and construction drawings under the supervision of a Professional Engineer licensed to practice engineering in the State of Texas and trained in the disciplines required by the drawings. The final construction drawings must be sealed,

signed, and dated by the Professional Engineer licensed to practice engineering in the State of Texas, and shall be responsible for the development of the drawings along with their firm's registration information.

2.0 EXECUTION

2.01 RESEARCH REQUIREMENTS

- A. Research existing utility and rights-of-way information.
- B. Verify that no restrictions exist that will deny approval of the project concept.

2.02 DESIGN ANALYSIS

Calculations of design flows for overall development project.

2.03 DRAWINGS

Drawings shall include layout sheets with contours, plan and profile sheets, and detail sheets for special items and treatment plants.

SECTION III

WATER LINE DISTRIBUTION SYSTEM DESIGN REQUIREMENTS

1.0 GENERAL

- A. Should any portion of this Section conflict with the Subdivision Ordinance or the Zoning Ordinance, the more stringent of the latter two (2) shall govern.
- B. Should any section conflict with TCEQ Regulations, the more stringent of the two (2) shall govern.
- C. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- D. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.

1.01 CHAPTER INCLUDES:

Criteria for the design of water lines.

1.02 REFERENCES:

- A. Texas Commission on Environmental Quality (TCEQ), Water Utilities Division "Rules and Regulations for Public Water Systems," latest revision.
- B. American Water Works Association (AWWA).
- C. National Sanitation Foundation (NSF).
- D. Texas Department of Health.
- E. Texas State Board of Insurance.
- F. International Fire Code (IFC).
- G. City of Friendswood Standard Details and Technical Specifications, latest version. These can be downloaded from: www.friendswood.com/publications.

1.03 DEFINITIONS:

Revised: 02/28/2020

Section III

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Water Line – Closed conduits designed to distribute potable water for human consumption to various areas and provide fire protection. Line size and fire protection accessory locations are dependent on distance from primary source and quantity of demand.

1.04 DESIGN REQUIREMENTS:

A. Easements for water lines.

1. Lines shall be located within street rights-of-way, permanent access easements with overlapping public utility easements, easements adjacent to street rights-of way or recorded water line easements.
2. When outside of a public street rights-of-way or permanent access easement with an overlapping public utility easement, easements must be dedicated and restricted for water lines only.
3. When possible, easements shall be contiguous with public rights-of-way.
4. Except for side lot easements, water line easements shall be contiguous to a paved access.
5. For water lines twelve (12) inches or smaller located outside of street rights-of-way, minimum width of easement shall be ten (10) feet.
6. For water lines fourteen (14) inches or larger located outside of street rights-of-way, the minimum width of easement shall be fifteen (15) feet.
7. For water mains located less than five (5) feet from the rights-of-way line, the outside edge of a water line easement shall be located from the rights-of-way line as follows:

Twelve (12) inch and smaller pipe – five (5) feet
Fourteen (14) inch and larger pipe – ten (10) feet
8. Water lines along State rights-of-way shall be installed outside of the rights-of-way whenever possible and in a separate ten (10) foot minimum contiguous easement.
9. No back lot easements shall be allowed for the installation of water lines, unless specifically approved by the City.

10. Commercial developments requiring on-site fire hydrants must provide a minimum fifteen (15) foot water line easement for the water line and fire hydrant.
11. In new developments, water lines shall be centered in water line easements.
12. When using side lot easements, such easements shall be a minimum of ten (10) feet in width, located on one (1) lot or centered between lots. If centered between lots, the water line may be centered within the five (5) foot easement on one (1) lot, or centered in the full ten (10) foot easement.
13. Location of water lines in an easement not adjoining a public rights-of-way shall be prohibited, except as specifically approved by the City Engineer. When approved, these water mains will be centered in a fifteen (15) foot wide exclusive easement restricted to water only.

B. Location of water lines.

1. Locate within street rights-of-way.
2. Location of water lines within an easement – locate water lines in the center of a ten (10) foot minimum width dedicated waterline easement. Within a commercial development, center water lines within a fifteen (15) foot easement. Obtain approval for lines to be located in wider or multi-use easements.
3. When a water main is placed parallel to another utility line at or near the same grade, it shall have a minimum of nine (9) feet of horizontal separation. When the other utility is a sanitary sewer and a minimum of nine (9) feet cannot be maintained, the sanitary sewer must be constructed of pressure type pipe with watertight joints as used in water main construction and the clearances must be defined as in the following sections or as specifically approved by the City Engineer. When a water main crosses a utility other than sanitary sewer, a minimum of six (6) inches of clearance must be maintained, and the water main shall have one (1) joint of pipe, a minimum of eighteen (18) feet long, centered on the other utility.
4. When water mains and sanitary sewers are installed, they shall be installed no closer to each other than nine (9) feet in all directions, and parallel lines must be installed in separate trenches. Where the nine (9) foot separation distance cannot be achieved, the following procedures shall be used:

- a. Where a sanitary sewer parallels the water main, the sanitary sewer shall be constructed of ductile iron, or PVC pipe meeting AWWA specifications, having a minimum working pressure rating of one hundred fifty (150) psi or greater, and equipped with pressure type joints. The water mains and sanitary sewer shall be separated by a minimum vertical distance of two (2) feet, and a minimum horizontal distance of four (4) feet, measured between the nearest outside diameters of the pipes, and the water main shall be located above the sewer.
- b. Where a sanitary sewer crosses the water main, and that portion of the sewer is constructed within nine (9) feet of the water, as described above, the water line may be placed no closer than six (6) inches from the sewer. The separation distance must be measured between the nearest outside pipe diameters and the water line shall be located at a higher elevation than the sewer, and one (1) joint [a minimum of eighteen (18) feet long] of the new pipe must be centered on the existing line.

C. Water line size.

1. Six (6) inch lines may be used on dead-end lines within cul-de-sacs, or if the line is less than one thousand (1,000) feet in length and interconnected between two (2) lines which are eight (8) inches in size or larger. The maximum number of fire hydrants on any length of six (6) inch line is one (1).
2. Eight (8) inch lines may be used for lines over one thousand (1,000) feet long, or when two (2) or more fire hydrants are required.
3. Twelve (12) inch and larger lines – line length, usage, etc., to be determined by a Professional Engineer of record licensed to practice engineering in the State of Texas, and approved by the City Engineer.

D. Dead-end lines.

1. Dead-end lines within public rights-of-way.
 - a. On permanent dead-end lines, other than on cul-de-sacs, the dimension of the line shall be six (6) inches and shall not exceed more than five hundred (500) feet in length from the closest

interconnecting main line. In addition, it shall terminate with a fire hydrant.

- b. On permanent dead-end lines on cul-de-sacs it will be required to reduce the pipe size successively. It is required to carry an eight (8) inch pipe to the next to last hydrant, then from that point use a six (6) inch pipe to the line's end. It is required to place the last service as near as possible to the end, and install a fire hydrant or two (2) inch blow-off at the end of the six (6) inch line. The maximum length of this reduced line size configuration shall not exceed eight hundred (800) feet.

2. Dead-end lines with one (1) on-site fire hydrant.

- a. Six (6) inch lines may be used for lengths less than two hundred (200) feet provided domestic service is taken from the end of the line.
- b. Eight (8) inch lines may be used for lengths greater than two hundred (200) feet but less than five hundred (500) feet, provided domestic service is taken from the end of the line.

E. Depth of cover.

1. Fourteen (14) inch and smaller mains shall have a minimum cover of four (4) feet from top of curb. For open ditch roadway sections, lines fourteen (14) inches and smaller shall be installed at least three (3) feet below the ultimate flowline of the ditch or six (6) feet below natural ground at the rights-of-way line, whichever is deeper and maintain the elevation throughout that section of line.
2. Sixteen (16) inch and larger mains shall have minimum cover of five (5) feet from top of curb. For open ditch roadway sections, lines sixteen (16) inches and larger shall be installed at least three (3) feet below the flow line of the ditch or seven (7) feet below natural ground at the rights-of-way line, whichever is deeper and maintain the elevation throughout that section of line.
3. Changes in grade, to clear other utilities or underground features, may be made by deflecting pipe joints. The maximum designed deflection shall be one-half (0.5) of the manufacturer's allowable deflection. If a depth greater than eight (8) feet to the top of the pipe is required, a welded steel section shall be used. The standard depth of cover is to be maintained

above the water main, and the grade change shall be made using the welded steel section. The installation of fittings for vertical deflections, or changes in elevation, shall not be allowed except with specific approval by the City Engineer.

F. Water line crossings.

1. Public and private utility crossings other than sanitary sewer.

Where a water line crosses another utility other than a sanitary sewer, a minimum of six (6) inches of clearance must be maintained between the outside wall of the water line and the outside wall of the utility being crossed.

2. Stream and Ditch Crossings.

a. Elevated Crossings.

- 1) All water lines shall be steel or restrained-joint metallic pipe, and shall extend a minimum of fifteen (15) feet beyond the last bend or to the rights-of-way line, whichever is greater.
- 2) Elevated crossings are preferred rather than underground crossings.
- 3) Use a separate elevated supporting structure for sixteen (16) inch and larger water lines, unless otherwise approved by the City Engineer. The structure shall be located a minimum of ten (10) feet from any other existing or proposed structure.
- 4) Support water lines on existing or proposed bridges. The following criteria may be used for fourteen (14) inch and smaller lines when approved in advance by the City Engineer.
 - a) Adequate structural capacity shall be required.
 - b) Sufficient clearance above the bent cap elevation shall be required for installation under a bridge.

- 5) Design elevated crossings with the elevation of the bottom of the water line above the low chord of the nearest adjacent bridge, or a minimum of one and one-half (1.5) feet above the One Hundred (100) Year Flood Plain elevation, whichever is higher.
- 6) Extend pipe from rights-of-way to rights-of-way for crossings.
- 7) Provide sufficient span length to accommodate for the cross section of any future widening of the stream or ditch, if available.
- 8) Support the line on columns spaced to accommodate the structural capacity of the pipe, considering deflection and loading.
- 9) Base column support design on soil capacity, spacing, loading, and structural requirements.

G. Underground crossings.

1. Provide a minimum three (3) foot clearance above the top of the pipe to the ultimate flow line of the ditch.
2. Provide sufficient length to exceed the ultimate future development of the stream or ditch.
3. All water lines shall be steel, restrained joint, or polyethylene pipe and shall extend a minimum of fifteen (15) feet beyond the last bend or to the rights-of-way, whichever is greater. In addition, the water lines shall have valves located on both sides of the crossing.

H. TxDOT highway and county road crossings

1. Extend carrier pipe from rights-of-way to rights-of-way.
2. Use welded steel pipe, or restrained joint pipe in steel casing, under existing and future roadways. The pipe shall be installed from a point fifteen (15) feet outside of the service road, or outside of pavement toward the rights-of-way, to a similar point on the other side of the highway

across the rights-of-way. For highway or roadway crossings with open ditch sections, extend the casing from rights-of-way to rights-of-way.

3. Highway and county road crossings shall be constructed in conformance with the applicable requirements of where the line is located. (i.e. Texas Department of Transportation, Galveston County or Harris County)
4. When additional rights-of-way has been acquired, or will be required for future widening, the casing where required, shall be carried to within ten (10) feet of each future rights-of-way line.

I. Street crossings

1. All water mains and sprinkler line crossings, under major thoroughfare boulevards, shall be encased using a minimum SDR rated or PVC pipe as required by the City's construction detail for "Water Main Encasement." Welded steel pipe may be substituted on street crossings, when specifically approved by the City Engineer.
2. Crossings under existing concrete streets, other than major thoroughfares, shall be constructed by boring and jacking. PVC and SDR rated pipe shall be jacked into place with equipment designed for that purpose. Water may be used to facilitate boring and jacking operations. Jetting the pipe main into place shall not be permitted. When conditions exist that warrant an open cut across the existing street, approval by the City Engineer shall specifically be required.
3. All open cut installations, under existing or proposed streets, shall be backfilled as required by City's Standard Details.
4. All street crossings shall be constructed in accordance with construction plans approved by the City. All street crossings shall be inspected by a City Project Manager, and shall meet the requirements of these standards.

J. Oil and gas pipeline crossings.

Metallic pipe shall not be used when crossing oil or gas transmission lines, unless a properly designed cathodic system is approved by the City Engineer and it is properly installed. Other pipe may be used, regardless of depth, subject to approval by the City Engineer. There must be a minimum of two (2) feet of separation between the pipeline and waterline.

K. On-site fire loops within commercial and multi-family developments.

1. For commercial and multi-family developments, requiring on-site fire hydrants, the following requirements shall be complied with to allow maintenance and future repair operations:
 - a. Placement of structures or equipment pads within the easement shall not be permitted.
 - b. Provide a ten (10) foot wide longitudinal pavement joint along the easement lines where the water line is located under a driveway, paved parking, or street pavement.

L. Additional requirements.

1. The carrier line shall extend a minimum of one (1) foot beyond the end of the casing to allow flanged joints to be connected.
2. For welded steel bends, extend steel pipe a minimum of five (5) feet beyond the bend.

M. Auger (bore) construction.

1. Use the following general criteria for establishing auger or bore sections:
 - a. Auger or bore sections shall be clearly shown on drawings.
 - b. Improved streets – use auger construction to cross the street regardless of surface. Auger length shall be calculated utilizing the roadway width, at the proposed bore location, plus an additional five (5) feet to either side of the roadway, as applicable.
 - c. Sidewalks – when the water line crosses under a sidewalk, four (4) feet or more in width and in good condition, the sidewalk shall be bored and jacked or the sidewalk shall be removed and replaced to the City of Friendswood Standard Details requirements, whichever is most cost effective. Bore and jack length shall be at least the width of the sidewalk. The proposed type of construction shall be noted on the plans.
 - d. Bore Pits – Bore pits shall be at least three (3) feet from back of curb and shall be at least five (5) feet from the back of curb on a boulevard or major thoroughfare. All bore pits shall be shored in accordance with OSHA requirements. Bore pits and/or receiving

pits to be located in a street or driveway paving, shall be shown on the plans.

N. Water quality – overall system layout.

1. Circulation and flushing – The layout of the overall water distribution system shall provide the maximum circulation of water to prevent future problems of odor, taste, or color due to stagnant water.
 - a. Provide a source of fresh water at each end, or at multiple points of a subdivision. Provide ways to create circulation, and valves and fire hydrants shall be located to allow simple flushing of all lines.
 - b. Dead-ends shall be avoided whenever possible; if absolutely necessary, dead-ends shall be isolated with a line valve, kept as short as possible, and equipped with a fire hydrant near the line's end.
 - c. Where stubs are provided for future extensions, isolate the stub with a valve, and place one (1) full pipe joint beyond the valve, plug end of pipes. Service connections are to not be connected to the stub.
 - d. Water mains shall be looped unless physically impossible.
 - e. All materials which come in contact with public drinking water in any stage shall conform to ANSI/NSF Standard 60.
 - f. Layout and size of all water mains shall be consistent with the overall layout and phasing plan of the City's water system. The overall water system shall be designed to maintain adequate pressure throughout the system.
 - g. In an unavoidable permanent dead-end situation, reduce the sizes of pipe successively. Carry an eight (8) inch pipe to the next to last fire hydrant and use a six (6) inch PVC to the end of the line. Provide a fire hydrant or two (2) inch blow-off at the end of the main.

O. Clearance of water line from other utilities. (New water lines constructed near sanitary sewers and force mains).

1. New water lines parallel to sanitary sewers and force mains.

- a. Water lines shall be located a minimum of nine (9) feet horizontally, outside wall to outside wall, when parallel to sanitary sewers or force mains. Use the following procedure when nine (9) feet of separation cannot be achieved:

When a new water line is to parallel to an existing sanitary sewer force main and/or gravity sanitary sewer, and the nine (9) foot minimum separation distance cannot be maintained, the existing sanitary sewer shall be replaced with lined ductile iron or PVC pipe meeting ASTM specifications. In addition, the waterline shall have a minimum working pressure rating of one hundred fifty (150) psi or greater, and be equipped with pressure type joints. The water lines and sanitary sewer shall be separated as per the design requirements of TCEQ, at a minimum horizontal distance of four (4) feet measured between the nearest outside walls of the pipe. In all cases, the water line shall be located above the sanitary sewer. When a water main crosses a utility other than sanitary sewer, a minimum of six (6) inches of clearance must be maintained, and the water main shall have one (1) joint of pipe [a minimum eighteen (18) feet long] centered along the other utility line.

- b. Where a sanitary sewer crosses a water main and that portion of the sanitary sewer within nine (9) feet of the water is constructed as described in Section 290.44(e) of the TCEQ Rules and Regulations, the water line may be placed no closer than six (6) inches from the sewer. The separation distance must be measured between the nearest outside pipe diameters. The water line shall be located at a higher elevation than the sanitary sewer wherever possible and one (1) joint of the new pipe [a minimum of eighteen (18) feet long] shall be centered on the existing line.

2. When water lines are installed in areas which have existing sanitary sewers, every effort should be made to maintain nine (9) feet of separation between the outside pipe diameters of the two (2) lines. Where this separation cannot be achieved because of local conditions, which must be fully documented in any planning material submitted, the following spacing's shall be observed:

- a. Where a new water line is to cross or be installed parallel with an existing sanitary sewer and the sanitary sewer is constructed as described in Section 290.44(e) of the TCEQ Rules and

Regulations, the separation distances specified in those rules shall apply as though the sanitary sewer was new.

- b. Where a new water line is to be installed parallel to an existing clay, truss, or concrete gravity sanitary sewer showing no evidence of leakage vertically and horizontally for a distance of four (4) feet, the sanitary sewer is not to be disturbed. Should excavation for the water line produce evidence that the sanitary sewer is leaking; the sanitary sewer shall be repaired.
 - c. Where a new water line is to cross an existing clay, truss, or concrete gravity sewer showing no evidence of leakage vertically or horizontally for a distance of four (4) feet, the sewer is not to be disturbed if the water line is installed at least twenty-four (24) inches above the existing sanitary sewer. One (1) full joint of the water line [at least eighteen (18) feet long] shall be centered over the sanitary sewer crossing, so as to provide maximum protection against contamination.
 - d. Where there is an existing clay, truss or concrete sanitary sewer pipe showing no evidence of leakage, and because of physical limitations shall remain at a higher elevation than the proposed intersecting water line, an exception to the nine (9) foot requirement may be granted as long as the water line is inserted in a joint of pressure type carrier pipe at least eight (8) feet and two (2) nominal sizes larger than the waterline. The carrier pipe shall be centered on the sanitary sewer crossing and both ends sealed with cement grout. In lieu of this procedure, that portion of the sanitary sewer within nine (9) feet of the water line may be replaced with cast iron or ductile iron pipe with water-tight joints as described in Section 290.44(e) of the TCEQ Rules and Regulations, above.
3. Sanitary sewer manholes – provide a minimum nine (9) foot horizontal clearance from outside wall of existing or proposed sanitary sewer manholes, unless manholes and connecting sanitary sewers can be made water-tight and tested for no leakage. If a nine (9) foot clearance cannot be obtained, the water line may be located closer to a manhole when prior approval has been obtained from the City Engineer using one (1) of the procedures below; however in no case shall the clearance be less than four (4) feet:

- a. A steel water line may be encased in a steel carrier pipe. Open cut and backfill with compacted cement-stabilized sand.
 - b. The water line may be augured past the manhole, as long as one (1) - twenty (20) foot section of C-900 PVC pipe [one hundred fifty (150) psi], is installed centered on the existing sanitary sewer manhole and a bentonite/clay mixture is utilized during the auguring process.
4. Fire hydrants shall not be installed vertically or horizontally within nine (9) feet of sanitary sewer mains, service leads, and force mains regardless of construction.

1.05 APPURTENANCES:

A. Valves.

- 1. Shall be set at maximum distances along water lines as follows:
 - a. Six (6) inch through fourteen (14) inch – one thousand (1,000) feet.
 - b. Sixteen (16) inch through twenty (20) inch – two thousand (2,000) feet.
 - c. The total number of valves at any intersection shall equal the total number of lines leading out from the intersection point minus one (1), three (3) valves for a cross, and two (2) valves for a tee, unless otherwise specified.

B. Valve Types.

- 1. Valve types (all valves shall open counterclockwise and have mechanical joints):
 - a. Six (6) inch through fourteen (14) inch – gate valves.
 - b. Sixteen (16) inch through twenty (20) inch – butterfly valves.

C. Valve Location.

1. All water lines shall be valved within the street rights-of-way. Valves shall not be placed under or within two (2) feet of ultimate pavement, except as specifically approved by the City Engineer.
2. Valves shall be located on the projection of intersecting street rights-of-way lines, or at the curb return adjoining a paved street across the main. Tapping Sleeves and Valves are excluded from this requirement.
3. Fire hydrants shall be isolated from the service line with a valve located at the fire hydrant branch. This valve shall not be located in the slope or flowline of ditches on open ditch streets.
4. Intermediate valves, not located on the projection line of the rights-of-way line, shall be located on lot lines or five (5) feet from the fire hydrants. The valves are not set in driveways or sidewalks.
5. Locate valves a minimum of nine (9) feet horizontally from sanitary sewer crossings.

D. Fire Hydrants.

1. Spacing.
 - a. Hydrant spacing shall be governed by the International Fire Code as adopted and amended by the City of Friendswood.
2. Location in or along street rights-of-way.
 - a. Fire hydrants shall be located at street intersections where possible, but in any case, not more than the spacing noted in 1a and 1b.
 - b. Locate fire hydrants at P.C.'s of the intersection curb radius, three (3) feet behind the existing curb or location of a future curb.
 - c. On all TxDOT highways, county roads and open-ditch streets, fire hydrants shall be set within three (3) feet of rights-of-way lines. Fire hydrants lead valves shall not be located in the slopes or flowlines of ditches.
 - d. Fire hydrants located between rights-of-way intersections should be set at a lot line, however, this location may be adjusted five (5)

feet either way to miss driveways or other obstructions, in which case the fire hydrant should not be closer than three (3) feet from curbed driveways or five (5) feet from non-curbed driveways.

- e. Fire hydrants shall not be installed within nine (9) feet of a sanitary sewer system under any condition.

3. Location of fire hydrants outside the street rights-of-way.

- a. The City Fire Marshal will establish and approve the location of fire hydrants in apartment complexes, and platted private street developments within the City.
- b. Locate fire hydrants in protected, easily accessible areas behind curb lines.
- c. For fire hydrants, which are located adjacent to water lines constructed in ten (10) foot wide waterline easements, the fire hydrant shall be centered in a minimum ten (10) foot by ten (10) foot separate easement.
- d. For commercial and multi-family developments, provide isolation valves at each end of fire loops requiring on-site fire hydrants.

4. Fire Flow Requirements for Buildings.

- a. The minimum fire flow requirements for one (1) and two (2) family dwellings, having a fire-flow calculation area which does not exceed three thousand six hundred (3,600) square feet, shall be one thousand (1,000) gallons per minute. Fire flow and flow duration for dwellings having a fire-flow calculation area in excess of three thousand six hundred (3,600) square feet shall not be less than that specified in Exhibit A – Table B105.1 of the International Building Code, as adopted and amended by ordinance.

5. Fire hydrants should be audited for flow and pressure, and painted per City Technical Specifications.

E. Fittings.

- 1. All fittings shall be identified and described on the construction plans.

2. Fittings are not permitted in fire hydrant leads, except as specifically approved by the City Engineer.
3. Water line fittings shall be mechanical joints only. Push-on joints may be used at special locations, if specifically approved by the City Engineer.
4. All plugs shall be provided with retention clamps.
5. Polyethylene tube encasement shall conform to the minimum requirements of "Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids", ANSI/AWWA C105, current revision. Soils within the project shall be tested in accordance with Appendix A of ANSI/AWWA C105 to adequately determine the requirements for encasement.
6. Concrete thrust blocking shall be required on all bends, tees, plugs and combinations thereof.
7. All fittings and fire hydrants shall be tied together with three-quarter (0.75) inch stainless steel all-threads and I-bolts or approved equal (i.e., Mega Lug Fittings).

F. Water main service.

1. Water main service for lines in or along street rights-of-way.
 - a. Meters two (2) inch and smaller – shall be located in rights-of-way, water line easements, or in a minimum five (5) foot x five (5) foot separate water meter easement on private property.
 - b. Meters three (3) inches and larger – shall be located at the property line or in a minimum ten (10) foot x twenty (20) foot separate water meter easement if necessary.
 - c. Meters shall be located in areas with easy access and protected from traffic and adjacent to rights-of-way whenever possible.
 - d. Meters shall not be located in areas enclosed by fences.
 - e. Separate tap and service leads shall be designed for each meter.

- f. Meters larger than two (2) inches must have a bypass assembly and coupling for easy change out. Contact the Department of Engineering and Projects for additional requirements.
 - g. The minimum sized line for two (2) meters shall be three (3) inches or larger.
- 2. For proposed apartments or town homes in private street developments, provide one (1) master meter sized for the entire development. Exceptions may be granted by the City Engineer for unusual circumstances. If an exception is approved, multiple meters shall not be interconnected.
- 3. All sprinkler and irrigation lines shall be equipped with a backflow prevention device according to its application as required by current TCEQ regulations. The backflow assembly shall be located after the water meter for an irrigation system, and in a vault near the building for a sprinkler system. A certified technician shall test applicable backflow prevention assemblies annually, and submit the results to the City.

1.06 SUBMITTALS:

- A. General – Conform to the following submittal requirements in addition to those of general procedure of the City of Friendswood.
- B. Water Line Sizes – Submit justification, calculations, and locations for proposed six (6) inch lines, and for lines twelve (12) inch and larger, for approval by the City Engineer, unless water line sizes are provided by the City in advance.
- C. Valves – Submit information for approval by the City Engineer with justification and locations for the use of sixteen (16) inch and twenty (20) inch gate valves proposed as substitutes for butterfly valves.
- D. Water Meter Service.
 - 1. A permit shall be obtained from the Building Division for meter services and metered sprinkler connections prior to construction.
 - 2. Requests for more than one (1) service meter on a proposed private street, or a multi-family development, shall be submitted to the Department of Public Works.
- E. Elevated stream or ditch crossings – Submit design calculations for support columns and column spacing.

- F. Master Development Plan – For multiple-phase developments, submit a master development plan along with construction plans.
- G. Backflow Prevention – All irrigation and sprinklers must be equipped with backflow prevention devices per current TCEQ regulations.
- H. A double check backflow prevention assembly is required for three (3) inch and larger lines.

1.07 QUALITY ASSURANCE

Prepare calculations and construction drawings under the supervision of a Professional Engineer licensed to practice engineering in the State of Texas and trained in the disciplines required by the drawings. The final construction drawings must be sealed, signed, and dated by the Professional Engineer licensed to practice engineering in the State of Texas, shall be responsible for the development of the drawings along with their firm's registration information.

2.0 EXECUTION

2.01 RESEARCH REQUIREMENTS:

- A. Research existing utility and rights-of-way information.
- B. Verify that no restrictions exist that will deny approval of the project concept.

2.02 DESIGN ANALYSIS:

- A. Water line sizes – Prepare narrative justification and calculations for proposed six (6) inch lines, and for lines twelve (12) inches and larger, unless sizing is provided by the City in advance.
- B. Elevated stream or Ditch Crossings – Prepare design calculations for support columns and column spacing.

2.03 DRAWINGS:

- A. General: Conform to the following drawing requirements, in addition to those identified within the City's Standard Water Line Details, the City's Technical Specifications, and within "Section I – Graphic Requirements" of this manual.
- B. Appurtenances – Identify, describe, and enclose in rectangular box on drawings.

1. Valves

- a. Designate six (6) inch through twelve (12) inch gate valves with box as GV&B.
- b. Provide complete description and size for other valves.

2. Water meters, service leads, and metered sprinkler connections.

- a. Show the location of service line tees, tapping sleeve valves, valve boxes, and temporary plugs to be installed to serve future three (3) inch or larger meters.
- b. Develop plan and profile sheets for four (4) inch and larger leads, and connections that cross public rights-of-way or other utilities.

C. Construction features.

Show all special construction features required to complete the project, in a safe, convenient, and economical manner.

D. Auger Construction.

- 1. If the construction is predominately open cut, all portions of the street that must be augured shall be clearly shown on drawings by location and length. Include designation of sections at trees with six (6) inches or larger diameters, located within ten (10) feet of a water line.
- 2. Curbs – Include a requirement on drawings for construction of ADA ramps at street intersections where curbs are to be removed, or are damaged by water line construction. Conform to the City's Standard Details for ADA ramps.

SECTION IV

STREET PAVING DESIGN REQUIREMENTS

1.0 GENERAL

- A. Should any portion of this Section conflict with the Subdivision Ordinance or the Zoning Ordinance, the more stringent of the latter two (2) shall govern.
- B. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- C. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.

1.01 CHAPTER INCLUDES

Geometric design guidelines for streets, criteria for street paving, and standard paving notes for drawing call outs.

1.02 REFERENCES

- A. ASHTO – American Association of State Highway and Transportation Officials.
- B. ASTM – American Society for Testing Materials.
- C. ACI – American Concrete Institute.
- D. TMUTCD – Texas Manual on Uniform Traffic Control Devices.
- E. City of Friendswood Standard Details and Technical Specifications, latest version. These can be downloaded from www.friendswood.com/publications.

1.03 DEFINITIONS

- A. Geotechnical Engineer – An engineer certified by the American Association for Laboratory Accreditation (A2LA).
- B. HMAC – Hot Mix Asphaltic Concrete.

- C. Curb-and-Gutter Streets – Full-width reinforced concrete pavement or asphaltic pavement with curbs. Curb-and-gutter streets require inlets and underground storm sewers.
- D. Open-Ditch Streets – Full-width reinforced concrete pavement or asphaltic pavement with open ditches. Open-ditch streets do not require underground storm sewers; however, the ditches shall be designed to accommodate the storm water runoff.

1.04 DESIGN REQUIREMENTS

The following design requirements are applicable to all street pavement constructed within rights-of-way.

- A. General:
 - 1. Paving and construction plans for all streets shall be approved by the City Engineer.
 - 2. Street design shall conform to all applicable planning tools, such as the Texas Manual on Uniform Traffic Control Devices, major thoroughfare plans, master plans, etc. Other considerations for design shall include street function, street capacity, service levels, traffic safety, pedestrian safety, and utility locations. These additional considerations may affect the minimum requirements set forth herein. Refer to the City of Friendswood Major Thoroughfare Plan for streets requiring additional considerations.
 - 3. Designs shall conform to the City of Friendswood Standard Details and Technical specifications.
 - 4. The use of individual pavers are not allowed in the City of Friendswood rights-of-way. The only exception for use of individual pavers in the rights-of-way is for sidewalks in the Downtown District. Stamped concrete is allowed in the City of Friendswood rights-of-way.
 - 5. No asphalt turnouts are allowed in the City of Friendswood rights-of-way.
 - 6. Concrete mix design shall conform to the City of Friendswood Technical Specifications.

B. Minimum Width Requirements for Concrete Paving:

1. Curb-and-gutter concrete and HMAC streets for low-density residential developments such as SFR, MFR-L, and MFR-GHD: twenty-eight (28) feet from back of curb to the back of curb.
2. Pavement for open-ditch streets used for only SFR residential developments with minimum one hundred twenty (120) foot wide lots: twenty-six (26) feet from edge of pavement to edge of pavement.
3. Streets for medium to high density residential, commercial, and collector streets: forty-one (41) feet from back of curb to back of curb, or from edge of pavement to edge of pavement.
4. Streets for major thoroughfares or boulevards: two (2) divided pavement sections of twenty-five (25) feet from back of curb to back of curb [Four (4) lane divided roadway], or two (2) pavement sections thirty-four (34) feet from back of curb to back of curb [six (6) lane divided].
5. Radius for cul-de-sac pavement on any street shall be a minimum of fifty (50) feet, measured from the face of curb. Radius of rights-of-way for cul-de-sacs shall be ten (10) feet greater than the cul-de-sac pavement, but not less than sixty (60) feet.

C. Minimum Thickness and Reinforcement Requirements for Concrete and HMAC Pavement:

The following requirements shall be the minimum allowable. Pavement thickness and reinforcement, not less than the minimum requirements, shall be designed by a Professional Engineer licensed to practice engineering in the State of Texas and who is responsible for the project. The design shall be based on a current soils analysis and recommendations conducted by a qualified geotechnical engineer.

1. For pavement widths twenty-eight (28) feet from back of curb to back of curb or twenty-six (26) feet from edge of pavement to edge of pavement:
 - a. Minimum concrete slab thickness shall be six (6) inches with a f_c equal to three thousand (3,000) psi, and reinforcement shall be Grade 60, $f_y = 60,000$ psi, #4 deformed reinforcing bars shall be spaced at sixteen (16) inches center to center, both ways and with a minimum lap length of eighteen (18) inches. Expansion joints shall be placed at the end of each curb return, and at a maximum

spacing of sixteen (60) feet with control joints no greater than every twelve (12) feet.

- b. Minimum stabilized subgrade thickness shall be six (6) inches.
- 2. For pavement widths greater than twenty-eight (28) feet from back of curb to back of curb, or twenty-six (26) feet from edge of pavement to edge of pavement, and for boulevard or major thoroughfare sections:
 - a. Minimum concrete slab thickness shall be seven (7) inches with $f_c = 3,000$ psi and reinforcement shall be Grade 60, $f_y = 60,000$ psi, #4 deformed reinforcing bars shall be spaced at sixteen (16) inches center to center, both ways, and with minimum lap length of eighteen (18) inches. Expansion joints shall be placed at the end of each curb return, at a maximum spacing of sixty (60) feet on both residential and collector streets, boulevards, and major thoroughfares, with control joints no greater than every twelve (12) feet.
 - b. Minimum stabilized subgrade thickness shall be eight (8) inches.
- 3. For HMA pavements:
 - a. Minimum thickness shall be two (2) inches.
 - b. Minimum subgrade thickness shall be eight (8) inches of stabilized crushed concrete or limestone, and six (6) inches of lime-stabilized subgrade.
- D. Subgrade Treatment: The geotechnical engineer shall base the depth of the subgrade stabilization on the structural number (SN) in conjunction with pavement thickness design. The following is general guidance for subgrade treatment:
 - 1. For subgrade soil conditions with a clay content of ten (10.0) percent or higher, and a plasticity index (PI) of ten (10) or more, the subgrade shall be stabilized with lime. Subgrade shall be stabilized with a minimum six (6) percent lime by weight at required thickness, and compacted to ninety-five (95) percent standard Proctor density. Alternative subgrade stabilization may be substituted when specific recommendations are made by the geotechnical engineer for the project, and when specifically approved by the City Engineer.

2. For subgrade soil conditions containing clean sand with no clay content, the subgrade shall be stabilized with cement.
- E. Requirements for Intersections, Turnouts, Transitions, and Boulevards or Thoroughfares:
1. At a "T" intersection with a street that has not been improved to its ultimate width, the concrete pavement shall be stopped either at the rights-of-way line, or the end of the curb return, whichever would require less concrete removal at a future date.
 2. For roadway turnouts placed at an existing street intersection, the turnout shall be designed to fit the ultimate pavement width of the intersecting cross street and then transitioned to the existing roadway.
 3. The transition length for meeting an open-ditch street, shall be fifty (50) feet for street widths less than or equal to twenty-eight (28) feet from back of curb to back of curb; seventy-five (75) feet for twenty-nine (29) feet to forty (40) feet from back of curb to back of curb; and one hundred (100) feet for forty-one (41) feet from back of curb to back of curb or greater.
 - a. Streets other than concrete shall have transitions with a minimum thickness of eight (8) inches of lime-stabilized subgrade, six (6) inches of hot-mix asphaltic concrete base, or approved equal, with two (2) inches of hot-mix asphaltic surfacing.
 - b. Concrete streets shall have transitions with a minimum thickness of six (6) inches of stabilized subgrade and six (6) inches of concrete pavement.
 4. When paving only one section of a proposed two-section thoroughfare or boulevard (boulevard section), all left-turn lanes and esplanade crossovers shall be paved to the centerline of the street right-of-way.
- F. Requirements for Ditches on Open-Ditch Streets:
1. Minimum grade on ditches shall be two-tenths (0.2) percent.
 2. Ditch capacity shall be designed to handle the storm water runoff as determined within "Section V – Storm Drainage" section of this manual.

3. The maximum side slope shall not be steeper than three (3) horizontal to one (1) vertical.
4. Culverts for roadside ditches only shall be designed to carry the storm water runoff, but shall not be less than eighteen (18) inch diameter pipe constructed of reinforced concrete.

G. Requirements for Pavement on Curb-and-gutter Streets:

1. Inlet spacing:
 - a. Curb inlets shall be spaced and sized to intercept the calculated storm water runoff for the design storm. The design water surface elevation for the design storm flow at the inlet, shall be less than or equal to the top of curb adjacent to the inlet.
 - b. Maximum travel distance of water in the street from a high point to a curb inlet shall be three hundred (300) feet on major thoroughfares, boulevards, commercial streets and collector streets unless otherwise approved by the City Engineer. The maximum travel distance of water in the street from a high point to a curb inlet permitted on residential streets shall be three hundred (300) feet unless otherwise approved by the City Engineer.
 - c. Maximum drop of grade tangents from opposite directions to a common inlet shall be one and one-half (1.5) feet.
 - d. Curb inlets shall be located on the intersecting side street at an intersection with a higher classification street. Location of curb inlets required on a major thoroughfare, at intersections, shall be specifically approved by the City Engineer.
 - e. Backfill around inlets below grade shall be one and one-half (1.5) sacks per cubic yard of cement-stabilized sand, and to the top of the first stage of inlet.
2. Design gutter grade shall be three-tenths (0.3) percent; if the gutter grade is less than three-tenths (0.3) percent and approved by the City Engineer, then the City Engineer shall determine the required inlet spacing. The minimum acceptable gutter grade shall be two-tenths (0.2) percent.

3. Maximum cut from finished grade at property line to top of curb, shall be one and three-quarters (1.75) feet.
4. Minimum grade shall be one (1.0) percent fall around intersection turnout for a minimum radius of twenty-five (25) feet. Grades for larger radius shall be determined on an individual basis.
5. Vertical curves shall be installed when algebraic differences in intersecting grades exceed one (1.0) percent. Elevations shall be shown at ten (10) foot intervals through vertical curves. Maintain a minimum of three-hundredths (0.03) foot elevation change at ten (10) foot intervals by altering the calculated elevations.
6. When a curb-and-gutter intersects a drainage ditch, the elevation of the adjacent gutter shall be above the design water surface elevation in the ditch.
7. Minimum gutter grade around a cul-de-sac shall be six-tenths (0.6) percent.
8. Curves on major thoroughfares shall be superelevated in accordance with AASHTO whenever the centerline radius of any lane of pavement is less than two thousand (2,000) feet.
9. The amount of cross slope over the pavement section shall be shown on the drawings. The required cross slope shall be three-eighths (3/8) inch per foot from curb line to quarter point, and one-quarter (1/4) inch per foot from quarter point to the center line, and one-quarter (1/4) inch per foot for left-turn lanes.
10. A minimum grade of four-tenths (0.4) percent around the longest radius is required on an L-Type street intersection.
11. When meeting an existing upright curbed street, top of new curb elevations shall be designed to meet an elevation six (6) inches above the existing gutter/pavement, or gutters shall be matched and new top of six (6) inch curb transitioned to top of existing curb. At existing inlets, top of new curb elevations shall be designed to match existing top of existing inlets.
12. When the curb elevations are not established below the natural ground, fill lines shall be shown on the drawings and shall be of sufficient height to

ensure a minimum of three-eighths (3/8) inch per foot transverse slope toward the curb from the property line between a point, two (2) feet outside the rights-of-way and the top of curb. If this type of fill is required, and the pavement is adjacent to a nonparticipating property owner, fill easements from this property owner shall be obtained, filed, and a copy of the easements shall accompany the final drawings. Construction of this nature will require back-slope drainage design to prevent trapping storm water runoff.

13. Elevations and grades shall be labeled for all tops of curb. Centerline elevations and grades are acceptable for open-ditch sections only.

H. Requirements for Inlets on Curb-and-gutter Streets:

1. Type "BB," with grate or plate tops, or type "H-2" inlets, shall be used on all curb-and-gutter streets depending on storm water runoff requirements, unless otherwise approved by the City Engineer.
2. Inlets shall be placed at the end of pavement in order to eliminate direct drainage of storm water from the pavement gutter into an open-ditch or onto adjacent property.
3. On open-ditch streets, place stub-outs with ring grates from inlets to ditches.

I. Requirements for Curbs and Sidewalks:

1. For curbs located along the outside edges of residential streets, the standard dimensions shall be four (4) inches tall and twelve (12) inches wide. Curb height for streets other than residential shall be six (6) inches tall. The curb height on all esplanades shall be six (6) inches.
2. Sidewalks are required as set out in Section III of the Subdivision Ordinance and Section 70-64 of the Code of Ordinances. Where sidewalks are required, they shall have a minimum width of four (4) feet, except on TxDOT rights-of-way where the minimum width shall be five (5) feet.
3. Sidewalk wheelchair ramps shall be required at all intersections, and at or through all driveways where required. The design and installation of such ramps shall comply with Texas Accessibility Standards Architectural Barriers requirements.

4. All sidewalks shall be constructed in accordance with the City of Friendswood Standard Details, including through all driveways where required. The design and installation of such sidewalks shall comply with the Texas Accessibility Standards Architectural Barriers requirements.
5. The location of all proposed and existing sidewalks shall be shown on the construction drawings.

J. Requirements for Miscellaneous Items:

1. The type and amount of subgrade treatment shall be shown on the drawings.
2. Paving headers shall be placed at the end of all concrete pavements.
3. All concrete to be removed, shall be saw cut one half of the pavement depth before removal.
4. Sight distance requirements shall be based on the latest version of the AASHTO design practices.
5. Standard City of Friendswood barricades shall be placed at the end of all dead-end streets not terminating in a cul-de-sac.
6. The appropriate drainage agency approval shall be obtained before City approval is granted if the design involves a drainage way or other drainage facility.
7. A letter of agreement from the affected pipeline company(s) is required when any paving is placed over a transmission pipeline or any utility line is placed over or under such lines.
8. When new concrete pavement meets existing concrete pavement, horizontal dowels shall be used if no exposed reinforcing steel for interconnection with new pavement exists. Horizontal dowels shall be Grade 60, #5 reinforcing bars, twenty-four (24) inches long, drilled and embedded twelve (12) inches into the center of the existing slab and epoxied. Dowels shall be spaced at sixteen (16) inches center to center, unless otherwise specified.

9. Dead-end streets or ends of concrete streets designed to be extended in the future shall have paving headers and twelve (12) inches of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap, or shall have paving headers and dowel type expansion joint for future pavement tie-in.
10. Pavement extensions shall connect to the existing pavement as shown on the City of Friendswood Standard Details.
11. A design for concrete pavement thickness is required for all pavements within industrial areas and on major thoroughfares. Concrete pavement thickness design shall be based on the latest version of the AASHTO design procedures for rigid pavements.
12. The pavement structure for each roadway shall be designed based on soil data from the site, and based on the anticipated traffic volume, loading, and service life of the proposed pavement structure. The design engineer is responsible for ensuring that the pavement structure is designed to withstand the anticipated loads on the roadway.

1.05 APPURTENANCES – Reserved

1.06 SUBMITTALS – Reserved

1.07 QUALITY ASSURANCE

- A. All construction drawings and specifications shall be prepared by or under the supervision of a Professional Engineer licensed to practice engineering in the State of Texas, and all documents shall be sealed, dated, and signed by the engineer responsible for their preparation along with their firm's registration information.
- B. All geotechnical testing, environmental, and similar services for design and testing shall be performed by or under the supervision of a Professional Engineer licensed to practice engineering in the State of Texas, and trained in the science of soil analysis. All design and testing reports and documents shall be sealed, dated, and signed by the engineer responsible for their preparation along with their firm's registration information.

2.0 EXECUTION

2.01 RESEARCH REQUIREMENTS – Reserved

2.02 DESIGN ANALYSIS

- A. All pavement design shall be supported by calculations to establish the required thickness and reinforcement.
- B. The appropriate geotechnical soils report shall be the basis for design considering the use, loading, and life span of the proposed pavement.
- C. All drainage improvements shall be designed to accommodate the anticipated storm runoff.

2.03 DRAWINGS

- A. Construction drawings shall be prepared in compliance with the City of Friendswood Design Criteria Manual, Section I – Graphic and Design Requirements.
- B. Refer to The City of Friendswood Design Criteria Manual, Appendix B, Figure 1 “Geometric Street Design Standards” for additional information and guidance.

SECTION V

STORM DRAINAGE DESIGN REQUIREMENTS

1.0 GENERAL

- A. Should any portion of this Section conflict with any provisions of the Subdivision Ordinance, Zoning Ordinance, the Galveston County Consolidated Drainage District or the Harris County Flood Control District, the more stringent of the latter four (4) will govern.
- B. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- C. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.

1.01 CHAPTER INCLUDES

Criteria for the design of storm drainage improvements.

1.02 REFERENCES

- A. City of Friendswood Standard Details and Technical Specifications, latest version. These can be downloaded from www.friendswood.com/publications.
- B. City of Friendswood Flood Damage Prevention Ordinance, Chapter 34 of the Code of Ordinances, and any subsequent revisions.
- C. Galveston County Consolidated Drainage District Criteria Manual.
- D. Harris County Flood Control District Design Criteria Manual. Ordinance No. T2007-20 amends the Flood Damage Prevention Ordinance by adopting the Harris County floodplain maps as revised on June 18, 2007.
- E. TX DOT Bridge Division Hydraulic Manual, the latest edition.
- F. National Weather Service Documents – TP-40 Rainfall Frequency Atlas of the United States.
- G. Harris County/City of Friendswood Memorandum of Understanding regarding maintenance of Harris County Hydraulic and Hydrologic models.

1.03 DEFINITIONS

- A. Acceptance Procedures – For projects in Galveston County, the Galveston County Consolidated Drainage District must accept and approve all detention ponds or other drainage facilities entering their system before the City of Friendswood accepts the infrastructure. The acceptance of the facility shall be placed on the next available Board agenda for approval and acceptance subject to the contractor’s one (1) year maintenance period. For projects in Harris County, the Harris County Flood Control District will accept and approve all detention ponds as applicable.
- B. Conduit – any open or closed device for conveying storm water.
- C. Development – A change in land use that alters the impervious coverage of the tract of land. Impervious cover includes, but is not limited to, concrete, asphalt, stabilized soil, tennis courts, water features, pools, sidewalks, crushed concrete, limestone, and roofing.
- D. Drainage Area Map – Area map of a watershed which is subdivided to show each area served by each subsystem.
- E. Design requirements – The drainage criteria developed by the City of Friendswood, and complemented by those of the Galveston County Consolidated Drainage District and the Harris County Flood Control District, are intended to provide design guidelines for protection of all areas of the City from structural flooding resulting from a one hundred (100) year storm event. This is accomplished with the application of various drainage enhancements such as storm sewers, roadside ditches, open channels, detention, and sheet flow runoff. The combined system is intended to prevent structural flooding from extreme events up to a one hundred (100) year storm; all development must account for the one hundred (100) year storm event as further detailed in this Section.
- F. FEMA – Federal Emergency Management Agency
- G. Flood Control – The City of Friendswood is a participant in the National Flood Insurance Program. The intent of the flood insurance program is to make insurance available at a reasonable cost by providing for measures that may reduce the likelihood of structural flooding.
- H. GCCDD – Galveston County Consolidated Drainage District.
- I. HCFCD – Harris County Flood Control District.

- J. Hydraulic Grade Line – A line representing the pressure head available at any given point within the drainage system.
- K. In-Fill Development – Development of open tracts of land in areas where the storm drainage infrastructure is already in place and takes advantage of the existing infrastructure as a drainage outlet.
- L. Public storm sewers – Defined as sewers and appurtenances that provide drainage for public rights-of-way, more than one private tract, and are located in public rights-of-way or drainage easements.
- M. Private storm sewers – Defined as sewers and appurtenances that provide drainage for a private development, one or more than one private tract, and are located in private drainage easements.
- N. Rainfall frequency – Probability of a rainfall event defined by a percent chance of occurring in any given year. Information on rainfall frequency is published by the National Weather Service. For the purpose of storm drainage design, the following frequencies are applicable:
 - 1. Five (5) year frequency – a rainfall intensity having a twenty (20) percent probability of occurrence in any given year or nominally likely to occur once every five (5) years.
 - 2. Ten (10) year frequency – a rainfall intensity having a ten (10) percent probability of occurrence in any given year or nominally likely to occur once every ten (10) years.
 - 3. Twenty-five (25) year frequency – a rainfall intensity having a four (4) percent probability of occurrence in any given year or nominally likely to occur every twenty-five (25) years.
 - 4. One hundred (100) year frequency – a rainfall intensity having a one (1) percent probability of occurrence in any given year or nominally likely to occur every one hundred (100) years.
- O. Relationship to the Platting Process – Approval and review of storm drainage is a part of the review process for planning and platting of new developments. The review of storm drainage is overseen by the Community Development Department, Public Works Department, and the Galveston County Consolidated Drainage District.
- P. Sheet Flow – Overland storm water run-off that is not conveyed in a defined conduit.

- Q. Storm Sewer – Storm sewers and roadside ditch conduits are designed as a balance of capacity and economics. These conduits are designed to convey less intense, more frequent rainfalls with the intent of allowing for traffic movement on streets during these events.
- R. Street Drainage – When rainfall events exceed the capacity of storm sewer systems, the additional runoff is intended to be stored, detained, or conveyed overland in a manner that reduces the threat of flooding to structures. Street ponding of a short duration is anticipated and street drainage is designed accordingly to contribute to the overall capability of the drainage system.

1.04 DESIGN REQUIREMENTS

All designs of drainage facilities shall meet the requirements of the City of Friendswood Standard Details and Technical Specifications.

A. Determination of Runoff

Design Storm Events – All drainage improvements shall be designed for the following storm frequencies as established by the City of Friendswood, Galveston County Consolidated Drainage District, and Harris County Flood Control District.

<u>Type of Facility</u>	<u>Frequency</u>
Road Side Ditch	five (5) year
Storm Sewers	five (5) year
Channels/Storm Sewers/Culverts draining One hundred (100) acres or less	twenty-five (25) year
Creeks/Channels/Culverts draining One hundred (100) acres or more	one hundred (100) year

B. The Rational Method shall be used for determining the peak flow rate in the sizing of all drainage improvements.

1. Time of Concentration (in minutes) is the time required for peak runoff, from the entire upstream contributing area, to reach the point of interest. Time of concentration can be calculated based upon an analysis of the actual travel time from the most remote point in the drainage area. The travel path should be clearly denoted and a sketch included in the design calculations.

$$t_c = D/60V + 10 \text{ (minutes)}$$

$$D = \text{flow distance (ft)}$$

$$V = \text{flow velocity (ft/sec)}$$

For purposes of calculating t_c , the following velocities are recommended:

$V = 1$ ft/sec for overland flow

$V = 1.5$ ft/sec for flow across paved surfaces or along gutter flowlines.

$V = 2$ ft/sec for flow in a ditch or channel

$V = 3$ ft/sec for flow in a storm sewer

2. Rainfall Intensity (inches/hour) shall be calculated using the following formula:

$$I = \frac{b}{(d + t_c)^e}$$

b , d , and e values are derived from a single frequency rainfall intensity graph.

b = the y-intercept of the straight line

d = a constant used to adjust the relationship to plot as a straight line

e = the slope of the straight line

Values typically used in Friendswood are listed below:

$t_c \leq 60$ min			
Rainfall			
<u>Frequency</u>	<u>b</u>	<u>d</u>	<u>e</u>
3-year	90.6	19.5	0.803
5-year	92.9	19.7	0.788
10-year	107.9	23.6	0.781
25-year	98.5	24.0	0.729
50-year	107.0	21.1	0.734
100-year	90.8	16.5	0.685

$t_c > 60$ min			
Rainfall			
<u>Frequency</u>	<u>b</u>	<u>d</u>	<u>e</u>
3-year	71.0	8.4	0.774
5-year	70.1	7.7	0.752
10-year	96.6	17.2	0.770
25-year	89.2	10.4	0.736
50-year	86.5	10.0	0.709
100-year	84.0	11.0	0.679

3. The Rational Method is a method for calculating the peak flow rate for a storm drain system. The formula for determining the peak flow rate is:

$$Q = C_f CIA$$

Where:

Q = Flow rate (cubic feet per second (cfs))

C_f = Frequency factor, the product of C_f and C should not exceed 1.0

C = Runoff Coefficient

I = Rainfall intensity (inches/hour) for a given storm frequency
(Typically 5 year, 25 year, and 100 year).

A = Area (acres)

For the purposes of peak flow calculations, use the following “ C_f ”

C_f = 1.00, for storm frequencies of 10 years or less

C_f = 1.10, for storm frequencies of 25 years

C_f = 1.25, for storm frequencies of 100 years

For the purposes of peak flow calculations, use the following runoff coefficient “C,” which are in no way related to the lot coverage percentage as defined in the Zoning Ordinance.

<u>Land Use Type</u>	<u>Run-off Coefficient</u>
Raw Undeveloped Acres	0.20
Improved Undeveloped Acres (i.e., mowed, filled, re-graded, etc.)	0.30
Parkland	0.40
Residential:	
SFR-Estates	0.45
SFR	0.55
Multi-family:	
MFR-GHD	0.65
MFR-L	0.75
MFR-M	0.80
MFR-H	0.85
MHR	0.85
Commercial/Industrial:	
OPD/BP	0.90
DD/CSC/NC	0.95
LI/I	0.95
Pond (detention and amenity)	1.00

Alternatively, for estate-sized lots [greater than two (2.0) acres], the runoff coefficient “C” in the Rational Method formula can be calculated from the equation:

$$C = 0.6Ia + 0.2$$

Where:

C = watershed coefficient

Ia = impervious area/total area

If the alternate form is to be submitted, the calculation of the runoff coefficient “C” shall be provided as part of the drainage calculations.

C. Design of storm sewers

1. Design Frequency

a. Areas of New Development

The design storm event for sizing storm sewers for new development areas shall be a five (5) year storm. In any case where new development interferes with the natural sheet flow of the existing adjacent land, the storm system shall accommodate the runoff. Stubbed out streets next to undeveloped areas shall have storm sewer lines continuing to an approved outfall.

b. In-fill Development

1) An existing storm sewer and structures shall be evaluated using a five (5) year storm, assuming no development takes place. The storm sewer and structures shall then be evaluated with the development in place.

a) If the proposed development has a lower or equal impervious cover, no modifications to the existing storm sewer system are required.

b) If the hydraulic gradient of the existing storm drain is below the top of the curb, no improvements to the existing storm sewer system are required.

c. Private Drainage Systems

- 1) Storm sewers for private drainage systems shall conform to the City of Friendswood Technical Specifications and Standards Details for public drainage systems. Minimum diameter pipe for a private storm sewer system is ten (10) inches.
 - a) Unless otherwise approved by the City Engineer, all private drainage systems shall be constructed in conformance with the public storm sewer standards.
 - b) An approved permit shall be obtained from the City before any work shall be done on a private drainage system and shall include plan and profile sheets detailing the scope of the work, with elevations.
 - c) Open ditch areas may be converted into storm sewer lines with the approval of a Development Permit and Specifications for Residential Storm Sewer Installation Specification Form. Guidelines for the process are defined in Appendix F of this Design Criteria Manual.
 - d) Private storm sewer connections to public storm sewers shall occur at a manhole, or at the back of an inlet, as approved by the City Engineer.

2. Pipe Velocity and Slope Design

- a. All storm drains shall be designed by the application of Manning's Equation and the Continuity Equation.

Manning's Equation:

$$V = (1.486/n) R^{2/3} S^{1/2}$$

Where

V = velocity (ft/sec)

R = hydraulic radius (area in square feet/wetted perimeter in feet)

S = slope of energy line in feet/feet (same as conduit bottom slopes for uniform flow)

n = coefficient of roughness

- n = 0.013 for concrete pipes,
- n = 0.024 for CMP (Corrugated Metal Pipe)
- n = 0.011 for PVC (Polyvinyl Chloride)
- n = 0.010 for HDPE (High Density Polyethylene)

**Note: All public storm sewers in or on public rights-of-way and public drainage easements shall be constructed of RCP (Reinforced Concrete Pipe) unless otherwise approved by the City Engineer. Manning's roughness coefficients for CMP, PVC, and HDPE shall be used for storm sewers on private property only. CMP pipes shall be used for public storm sewers only upon specific approval of the City Engineer and/or the applicable drainage district entity (GCCDD or HCFCD).*

Continuity Equation:

$$Q = VA$$

Where

Q = discharge (cfs)

V = velocity (ft/sec)

A = wetted cross sectional area of conduit (A2)

- b. Design velocities shall be three (3) feet per second with the pipe flowing full.
- c. Maximum velocities shall not exceed seven (7) feet per second without the approval of the City Engineer.
- d. Minimum Public Storm Sewer Pipe Slopes:

Pipe Diameter	% Slope
18"*	0.26
24"	0.18
30"	0.14
36"	0.11
42"	0.08
48"	0.07
54"	0.06
60"	0.05
*Used for Inlet leads only.	

- e. For pipe sizes not listed above, the minimum slope shall be determined utilizing a design velocity of three (3) feet per second.

3. Pipe Sizes and Placement

- a. Public storm sewer lines and inlet leads shall be a minimum of twenty-four (24) inch inside diameter and eighteen (18) inch inside diameter, respectively, or equivalent. Box culverts shall be at least two (2) feet x two (2) feet inside dimension.
- b. Larger pipes located upstream shall not flow downstream into smaller pipes unless it is intended for detention requirements.
- c. Match crowns of pipe at any size change unless severe depth constraints prohibit such, or engineering calculations show flowlines should be matched.
- d. Locate public storm sewers in public street rights-of-way, in parallel and adjoining easements, or in other approved easements. Easements shall be at least twenty (20) feet wide, and the storm sewer shall be centered in the easement.

4. Starting Water Surface and Hydraulic Gradient

- a. The hydraulic gradient shall be calculated assuming the top of the outfall pipe as the starting water surface.
- b. At drops in pipe flowline, should the upstream pipe be higher than the hydraulic grade line, the hydraulic grade line shall be re-calculated assuming the starting water surface to be at the top of pipe at that point.
- c. For the design storm, the hydraulic gradient shall at all times be below the gutter line elevations at any point along the street.
- d. Hydraulic grade lines shall be shown on all profile drawings.

5. Manhole Locations

Manholes are required at the following locations:

- a. Size or cross section changes.
- b. Inlet lead and conduit intersections.
- c. Changes in pipe grade.

- d. Street intersections.
- e. A maximum spacing of six hundred (600) feet measured along the conduit run.
- f. Manholes shall not be placed or located in driveway or sidewalk areas.
- g. Adjust manhole frames and covers within the limits of the pavement to meet the proposed final top of slab.

6. Inlets

- a. Locate inlets at all low points in gutter.
- b. Valley gutters across intersections are not permitted.
- c. Inlet spacing is generally a function of gutter slope. For minimum gutter slopes of three-tenths (0.3) percent, the maximum spacing of inlets shall result from a maximum gutter run of three hundred (300) feet from a high point in the pavement to an inlet on a continuously graded street section, for a maximum spacing of six hundred (600) feet between inlets.
- d. If gutter slopes are less than three-tenths (0.3) percent, the City Engineer shall determine the inlet spacing. The acceptable minimum gutter grade is two-tenths (0.2) percent.
- e. Use only Standard Inlets:

Inlet	Application	Capacity
Type A	Parking Lots/Small Areas	2.5 cfs
Type B-B	Residential	5.0 cfs
Type D	Parking Lots	2.0 cfs
Type E	Roadside ditches	20.0 cfs
Type H-2	Residential / Commercial	5.0 cfs

- f. Do not use "Beehive" style grate inlets or other specialty inlets.
- g. Do not use grate top inlets in an unlined roadside ditch.

- h. Place inlets at the end of curb returns on side streets, when such streets intersect streets of a higher classification, unless special conditions warrant otherwise and are approved by the City Engineer.
- i. Storm sewer inlets shall be established in such numbers and in such locations as to effectively drain storm water from paved sections. A graphical plan and calculations of the hydraulic gradient shall be furnished by the design engineer.

D. Consideration of Overland Flow

- 1. Design Frequency – the design frequency for consideration of overland sheet flow shall consider extreme storm events which exceed the capacity of the underground storm sewer system resulting in ponding and overland sheet flow through the development to the primary drainage outlet.
- 2. Relationship of Structures to Street – all structures shall be constructed as per the Flood Damage Prevention Ordinance, and shall be higher than the highest level of ponding resulting from the extreme storm event as shown on the latest City adopted flood maps.
- 3. Calculation of Flow:
 - a. Streets will be designed so that consecutive high points in the street will provide for a gravity flow of drainage to the ultimate outlet.
 - b. The maximum depth of ponding at high points will be the top of curb of streets with curbs, or the elevation of the centerline of roads without curbs.
 - c. The maximum depth of ponding at low points will be nine (9) inches above the gutter elevation of curb of streets with curbs, or three (3) inches above the elevation of the centerline of streets without curbs.
 - d. Sheet flow between lots can be provided only through a defined drainage easement.
 - e. A map shall be provided to delineate the flow direction of the extreme event through a proposed development, and how this flow is discharged to the primary drainage outlet.
 - f. In areas where ponding occurs and no sheet flow path exists, a calculation shall be provided to show that runoff from the one

hundred (100) year event can be conveyed and remain in compliance with the other terms of this Section.

4. Overland flow shall enter outfall drainage facilities (channels or detention ponds) through a storm sewer with its last run sized to convey the one hundred (100) year event. Calculations shall be submitted for sizing the structure and determining that adequate inlet capacity exists.
5. Maintain pre-existing natural overland flow of storm water, and provide protection for adjacent properties from redirected storm water flows.
6. For development greater than five (5) acres, show contours of adjacent properties within two hundred (200) feet, and account for natural and existing overland flow or channelized flows.

E. Design of Open Channels

1. Design Frequency
 - a. Open channels shall be designed according to methods described in the Galveston County Consolidated Drainage District (GCCDD) and Harris County Flood Control District (HCFCD) Criteria Manuals.
 - b. Design standards for channel construction shall follow the requirements specified in the GCCDD & HCFCD Criteria Manuals.
 - c. Design standards for the outfalls into channels shall conform to those in the GCCDD & HCFCD Criteria Manuals.
2. Determination of Water Surface Elevations:
 - a. Water surface elevations shall be calculated using Manning's Equation and the Continuity equation.
 - b. For the design storm event, the water surface for ditches and channels shall be calculated to remain within the banks and at or below the required freeboard.

3. Design of Culverts

Head losses in culverts shall conform to TxDOT Bridge Division Hydraulics Manual, Chapter 4 – Culverts.

F. Design of Roadside Ditches

1. Design Frequency

- a. Roadside ditches are permissible only for single family residential lots having widths larger than, or equal to, one hundred twenty (120) feet.
- b. Design storm event for a roadside ditch shall provide one-half (0.5) foot of freeboard below the edge of pavement, or the natural ground at the rights-of-way line, whichever is lower.
- c. The design must include an extreme event analysis to indicate that adjoining structures will not be flooded.

2. Velocity Considerations

- a. For grass lined sections, the design velocity shall be two (2.0) feet per second during the design storm event. The maximum velocity shall be five (5) feet per second.
- b. A grass lined or unimproved roadside ditch shall have side slopes no steeper than three (3) horizontal to one (1) vertical.
- c. Minimum grades for roadside ditches shall be two-tenths (0.2) percent.
- d. Calculation of velocity shall use a Manning's roughness coefficient of four hundredths (0.04) for earthen sections, and twenty-five-hundredths (0.025) for ditches with paved inverts.
- e. Use erosion control methods acceptable to the City when design velocities are calculated to be greater than three (3) feet per second and are approved by the City Engineer.

3. Culverts

- a. Culverts shall be placed at all driveway and roadway crossings and other locations where appropriate.
- b. Culverts shall be designed assuming inlet control.
- c. Roadside culverts shall be sized based on drainage area. Calculations shall provide for each block based on drainage design criteria presented in this manual.
- d. Cross open channels with roadside culverts no smaller than eighteen (18) inch diameter or equivalent. The size of culvert used shall not create a head loss of more than two-tenths (0.2) feet greater than the normal water surface profile without the culvert.
- e. Use erosion control methods acceptable to the City when design velocities are calculated to be greater than three (3) feet per second and approved by the City Engineer.
- f. Sloped End Treatments (S.E.T.'s) are required on all TxDOT Highways.

4. Depth and Size Limitations for Open Ditches

- a. Residential streets – the maximum depth shall not exceed two and one-half (2.5) feet below the edge of pavement.
- b. Roadside ditch bottoms shall be at least two (2) feet wide.
- c. Ditches in adjoining and parallel easements shall have the top of bank not less than two (2) feet from the outside easement line or edge of pavement when applicable.
- d. Roadside ditch side slopes shall not exceed three (3) horizontal to one (1) vertical.
- e. The design storm event for a roadside ditch shall provide one-half (0.5) foot of freeboard below the edge of pavement, or the natural ground at the rights-of-way line, whichever is lower.

G. Design of Outfalls.

1. Outfall design shall conform to GCCDD and HCFCD standards as applicable.
2. Detention pond and storm sewer outfalls shall be placed one foot above the flowline of the receiving channels, creeks, and detention pond, or two foot above normal water elevation, whichever is greater.
3. Flowlines of storm sewer outfalls shall be located six (6) inches above the flowline of a receiving roadside ditch.

H. Storm Water Detention

1. Application of Detention.
 - a. As a normal consideration, storm water detention shall be required. The use of on-site detention is required in order to mitigate potential damage to existing structures unless: the current infrastructure has been improved and provides mitigation for the development, the City has developed a plan for a detention facility to serve the overall area, the development is within an existing subdivision served by a detention facility that is within the platted boundaries of said subdivision and that has been previously accepted and approved by the City and the GCCDD, or a development qualifies for the purchase of regional detention under certain circumstances enumerated in 1.04.H.8.
 - b. Design calculations for sizing the detention basin and related structures shall be performed by the applicable method described in the following sections.
 - c. All calculations shall be sealed and signed by a Professional Engineer licensed to practice engineering in the State of Texas.
 - d. All commercial and non-residential new developments, additions, or redevelopments will require a new or revised drainage plan for additional impervious cover. The standard minimum rate of detention referenced in paragraph 2 below will apply to this impervious cover.

- e. A parking lot with a curb may be used as part of the detention system, provided that the maximum depth of water over the inlet throat flow line does not exceed nine (9) inches, and the maximum depth in any parking stall does not exceed six (6) inches.
2. Calculation of Detention volume using the Hydrologic Method for Projects of one hundred (100) acres or less.
- a. Minimum Rate of Detention for Projects of one hundred (100) acres or less.

When using any of the methods detailed below for calculating the required amount of detention, the minimum amount of detention provided shall never be less than the following standard minimum rates as follows:

For the purpose of determining the standard minimum rate, all the acreage used in the calculation must include proposed or existing development. Raw/undeveloped acreage may not be included in the calculation to lower the standard minimum rate.

- 1) Commercial Projects – Defined as projects with ninety (90) percent or more impervious cover or a runoff coefficient of nine-tenths (0.9) or larger – Standard minimum rate of six-tenths (0.6) ac.ft. per acre.
- 2) Multi-Family Projects – Defined as projects with eighty (80) percent or more impervious cover or a runoff coefficient of eight-tenths (0.8) or larger – Standard minimum detention rate fifty-five-hundredths (0.55) ac.ft. per acre.
- 3) Residential Projects – Defined as projects with forty (40) percent or more impervious cover or runoff coefficient of fifty-five-hundredths (0.55) or larger – Standard minimum detention rate of five-tenths (0.5) ac.ft. per acre.
- 4) Estate Lot Projects – Defined as projects with less than forty (40) percent impervious cover or a runoff coefficient less than fifty-five-hundredths (0.55) – No Standard minimum detention rate shall apply.

- 5) Mixed Use Projects – The Standard minimum rate of detention shall be determined based upon weighted average of the minimum rates set forth above.

- b. Modified Rational Method.

The modified rational method may be used to determine detention storage for all projects less than five (5) acres.

- c. Simplified Method

For projects less than five (5) acres, the standard minimum rate may be used in lieu of performing a more complex analysis. This coefficient multiplied by the total acreage will yield the total detention volume required.

- d. Optional Detention Storage Methodology for Projects of one hundred (100) acres or less.

The maximum allowable release rate from the detention facility during the one hundred (100) year storm event is the one hundred (100) year peak flow rate from the area under pre-development conditions. The undeveloped peak flow rate shall be determined using the rational method.

The following method will be acceptable for determining storage volume if the simplified method is not utilized.

3. The Triangular Hydrograph Method may be used; or

4. The Unit Hydrograph Method may be used.

For developments with more than one hundred (100) acres, a detailed hydrologic analysis utilizing the HEC-1 or HEC-HMS Flood Hydrograph method shall be required per the applicable governing entities.

5. Calculation of Outlet Size:

Outfalls which utilize a pipe restrictor to control outflow shall use the orifice equation.

- a. Reducer or Restrictor Pipes shall be sized as follows:

- 1) Use the following equations to calculate the required outflow orifice:

$$\text{Area of pipe} = \pi d^2/4$$

$$Q = CA (2 gh)^{1/2}$$

$$D = Q^{1/2} / 2.25 h^{-1/4}$$

Where

Q = outflow discharge in cfs.

C = 0.8

h = water surface differential (ft)

D = orifice diameter (ft)

A = area of pipe (ft²)

g = gravity (32.2 ft/s²)

New flow into receiving storm sewer cannot exceed undeveloped flow.

- 2) For head differential in systems outfalling into a roadside ditch or storm sewer, the actual head loss or 1 foot, whichever is greater, shall be used. For all other discharge conditions, use 2 feet, or the difference between one hundred (100) year water surface elevation and the elevation of the twenty-five (25) year storm in the receiving channel, whichever is greater.
- 3) For detention systems outfalling into a public storm sewer, the restrictor shall be sized based upon the peak five (5) year developed flow.
- 4) For detention systems outfalling into a public roadside ditch, the restrictor shall be sized based upon the peak five (5) year undeveloped flow.
- 5) For detention systems outfalling into creeks, channels, or storm sewers sized to carry the twenty-five (25) year or one hundred (100) year storm, the restrictor shall be metered to release the five (5) year, twenty-five (25) year, and one hundred (100) year undeveloped flows.
- 6) Restrictor shall be either the required diameter or the equivalent cross-sectional area. The orifice diameter "D" shall be a minimum of six (6) inches.

- 7) Detention ponds less than 1 acre in size shall have a minimum of 4 inches of freeboard. All ponds one (1) acre or larger in size shall have at least one (1) foot of freeboard. Freeboard shall be measured from the maximum one hundred (100) year water surface elevation and shall not be used in the calculation of storage or mitigation.

6. Detention Pond Structural Requirements:

- a. Side slopes shall not exceed a slope of four (4) horizontal to one (1) vertical.
- b. Maintenance berms will be required in accordance with the Galveston County Consolidated Drainage District Design Criteria Manual.
- c. Ponds with lengths over fifty (50) feet shall have a concrete pilot channel.
- d. Concrete pilot channels shall have a minimum width of four (4) feet and a minimum thickness of four (4) inches with #3 rebar spaced at twelve (12) inches on center each way. The concrete pilot channels shall be constructed of 5-sack cement concrete with a compressive strength of three thousand (3,000) psi at twenty-eight (28) days. Provide a one (1) inch depression per every one (1) foot of transverse slope, with redwood headers spaced every forty (40) feet.
- e. Single-user ponds may use a GCCDD-approved alternative for concrete pilot channels.
- f. Appropriate covering (grass, slope paving, etc.) shall be established on side slopes and pond bottom, to prevent erosion during periods of maximum water velocity
- g. A concrete gravity spillway, set at the maximum ponding elevation, shall be provided at the detention pond outfall structure.
- h. Wet detention ponds, and ponds with vertical walls, shall provide access for safety and maintenance purposes. Wet detention systems shall have a method in place to minimize stagnation, such as an aeration system.
- i. "Dry" detention ponds shall not be designed with less than two (2) feet of depth.

7. Ownership and Easements:

a. Private Facilities:

- 1) Pumped systems shall not be allowed. Only detention facilities which rely on gravity to discharge storm runoff will be allowed by the City and the GCCDD.
- 2) Responsibility for maintenance of the detention facility must be indicated on the plat.
- 3) All private properties being served shall have drainage access to the pond.
- 4) A private maintenance agreement must be provided when multiple tracts are being served.

b. Public Facilities:

- 1) Facilities will only be accepted for maintenance by the City when such is in the public interest.
- 2) The City will require a maintenance work area twenty (20) feet wide surrounding the extent of the detention area. Public rights-of-way or permanent access easements may be included as a portion of this twenty (20) foot width.
- 3) A dedication of easements or reserves must be provided by the plat.
- 4) Proper dedication of public access to the detention pond must be shown on the plat or by separate instrument. This includes permanent access easements with overlapping public utility easements.

8. Off-Site Detention in the Galveston County Consolidated Drainage District:

- a. It is the desire of the City of Friendswood that regional detention be utilized when available. If new development is within the service area of a publicly owned or operated regional storm water detention

facility, connection to such regional facility shall be as required by the drainage master plan applicable to such facility.

- b. In Galveston County, offsite detention, such as regional or sub-regional detention, may be purchased from the Galveston County Consolidated Drainage District provided:
 - 1) The development drains to the Clear Creek watershed or the tributaries of Clear Creek.
 - 2) All lots or tracts must outfall into a conveyance system with adequate capacity, excluding single family residential construction on lots or tracts containing five (5) acres or less.
 - 3) The proposed improvements do not include the subdivision of land.
 - 4) The developed site does not exceed eight (8) acres for single-family residential lots or tracts, five (5) acres for multi-family residential lots or tracts, and five (5) acres for commercial lots or tracts.
 - 5) Regional detention for site development relating to single-family residential construction on lots or tracts containing five (5) acres or less may be purchased based on square feet of impervious cover by completing the Attachment #4, a copy of which is made a part of this manual. All other site development qualifying for the purchase of regional detention must submit a new or revised drainage plan.

9. Detention Requirements Summary:

Lot or Tract Type	Acreage	Off-Site Detention Available	Engineered Drainage Plans	Detention Volume Calculation Method	Rates	Attachment #4* Required	GCCDD Board Approval
SFR	0-5	Yes	Not Required	Purchase Regional Detention Based On: New Impervious Coverage in SF x \$0.25/SF Calculation of Detention Volume Unnecessary	\$0.25 per SF	Yes	Not Required
	5-8	Yes	Required	Engineer Determines the Detention Volume by an Approved Method	\$25,000 per AC-FT	No	Required
	8+	No	Required	Engineer On-Site Detention	NA	No	Required
MFR	0-5	Yes	Required	Engineer Determines the Detention Volume by an Approved Method	\$25,000 per AC-FT	No	Required
	5+	No	Required	Engineer On-Site Detention	NA	No	Required
COM	0-5	Yes	Required	Engineer Determines the Detention Volume by an Approved Method	\$25,000 per AC-FT	No	Required
	5+	No	Required	Engineer On-Site Detention	NA	No	Required

10. Conveyance:

- a. The developer shall provide conveyance to a detention facility without having a detrimental effect on any adjacent properties.
- b. If conveyance is directed through properties not directly owned by the developer, an executed contract or recorded deed between the parties agreeing to the said conveyance must be presented to the City and the appropriate drainage district entity.
- c. This procedure is approved by both the City and the corresponding drainage district entity (GCCDD or HCFD) during preliminary plan review.

1.05 RESERVED

1.06 SUBMITTALS

A. Preliminary Submittals- Submit for Review and Comment:

1. One line drawings are required as part of the platting process. One line drawings shall include:
 - a. Approximate definition of lots and street patterns.
 - b. The approximate drainage areas for each system.
 - c. A definition of the proposed drainage system by single line.
 - d. The proposed pipe diameters.
 - e. Any proposed drainage easements.
 - f. Floodplain and floodway boundaries, if any.

B. Final Design – Submit the following for approval:

1. Copies of any documents which show approval of exceptions to the City Design Criteria.
2. Design calculations for storm line sizes and grades, and for detention facilities, if any.

3. Design calculations for the hydraulic grade line of each line or ditch, and for detention facilities, if any.
 4. Contour map and drainage area map of the project.
 5. Plan and profile sheets showing storm sewer or open ditch design (public facilities only).
 6. Projects located within a floodplain boundary or within a floodplain management area shall:
 - a. Show the floodplain boundary or floodplain area, as appropriate, on the one-line drawing or drainage area map.
 7. Soil boring logs.
 8. All drainage plans shall have a current FEMA flood zone determination statement.
- C. Signature State – Submit the Following for Approval:
1. Review prints.
 2. Original drawings.
 3. Storm water detention maintenance agreement letters.

1.07 QUALITY ASSURANCE

Prepare calculations and construction drawings under the supervision of a Professional Engineer licensed to practice engineering in the State of Texas and trained in the disciplines required by the drawings. The final construction drawings and all design calculations shall be sealed, signed, and dated by the Professional Engineer licensed to practice engineering in the State of Texas responsible for the development of the drawings along with their firm's registration information.

2.0 EXECUTION

2.01 RESEARCH REQUIREMENTS – Reserved

2.02 DESIGN ANALYSIS

- A. All projects shall be tied to National Geodetic Survey (NGS) Datum adjustment which matches the Federal Emergency Management Agency (FEMA) rate maps or the most current NGVD which matches the FEMA rate maps. In the event GPS surveying is used to establish benchmarks, at least two (2) references to benchmarks relating to the FEMA rate maps must be identified. Equations may be used to translate other datum adjustments to the required adjustment.
- B. Plan sets shall include a drainage area map which shall contain all storm sewer drainage calculations.
- C. All drainage systems for curb-and-gutter pavements shall be underground closed conduits; individual residential lot drainage is exempt. Drainage systems for pavements without curb-and-gutter shall be roadside open ditch sections.
- D. Soil boring with logs shall be made along the alignment of all storm sewers having a cross section equal to or greater than seventy-two (72) inches in diameter or equivalent cross section area. Boring should be taken at intervals not to exceed five hundred (500) linear feet, and to a depth not less than three (3) feet below the flow line of the sewer. The required bedding will be determined from the soil boring.
- E. Plan sets shall include the five (5) year Hydraulic Grade Line for storm sewers and roadside ditches on the plan and profile sheets.

SECTION VI

SITE DEVELOPMENT

1.0 GENERAL

- A. Should any portion of this Section conflict with the Subdivision Ordinance or the Zoning Ordinance, the more stringent of the latter two (2) shall govern.
- B. The City Engineer shall have the final interpretation of any provisions in this Design Criteria Manual.
- C. The City Engineer has the right to issue administrative orders or design criteria modifications for just cause related to any provisions or conditions in this Design Criteria Manual.

1.01 CHAPTER INCLUDES

Criteria for the design of site development plans.

1.02 REFERENCES

- A. City of Friendswood Zoning Ordinance.
- B. City of Friendswood Subdivision Ordinance.
- C. City of Friendswood Standard Details and Technical Specifications, latest version. These details can be downloaded from:

www.friendswood.com/publications
- D. Texas Department of Transportation – Traffic Control Plan
- E. Architectural Barriers Texas Accessibility Standards (TAS)

1.03 DEFINITIONS

Commission – Planning and Zoning Commission.

1.04 DESIGN REQUIREMENTS

- A. Site Development Requirements:

1. General Requirements:

- a. Site development plans for all site developments shall be approved by the City Engineer prior to construction.
- b. Site developments, not including single family residential, shall include any project that affects public water, wastewater, storm drainage, sidewalks, or paving facilities.
- c. All sidewalks in new developments shall be a minimum of five (5) feet from the back of curb, two (2) feet from the edge of the public rights-of-way and shall not be in any utility easements.
- d. All site developments shall conform to the requirements of these Standards, the latest version of the International Code Series, as amended, and all applicable rules and regulations of the City of Friendswood.
- e. All wastewater, drainage, and paving site development improvements, up to and including the connection to the public system, shall be privately owned, operated, and maintained. All water site development improvements up to but not including the meter and meter vault, shall be privately owned, operated, and maintained
- f. Restore the City of Friendswood rights-of-way or easements to existing or better condition than that prior to start of work.
- g. Private utilities and service lines shall be placed in an easement on the property being served.
- h. Streets that change direction a minimum of ninety (90) degrees will require a different name.

2. Design Review Requirements for Site Development Plans

- a. All site development plans for proposed developments shall be submitted to the Community Development Department for approval prior to construction. Site development plans shall show all proposed water, wastewater, paving, parking, drainage, street signage, streetlight locations, flood protection facilities, and sidewalks with approved ADA ramps locations, and a traffic control plan.

- b. A traffic impact study shall be required for any development proposal expected to generate traffic volumes that will significantly impact the capacity and/or safety of the street system. All proposed developments generating volumes of five thousand (5,000) trips per day or greater shall abide by this criterion. The trip estimate shall be based on the latest version of the Institute of Transportation Engineers' Trip Generation Manual.
- c. The developer should first schedule a Development Review Committee (DRC) meeting with Community Development Department staff. At this meeting, infrastructure issues and the feasibility of developing the site will be discussed.
- d. The developer shall prepare a site plan for submittal to be reviewed by staff. The developer shall consult with staff until all significant issues surrounding the proposed site plan and development are resolved, prior to proceeding to the Planning and Zoning Commission.
 - 1) The submittal for the site plan requires five (5) copies of the following:
 - a) Cover Sheet
 - b) Site Plan
 - c) Landscaping Plan
 - d) Building Elevation Plan
 - e) Photometric Plan
 - 2) and two (2) copies of:
 - a) Drainage Plan
 - b) Utility Plan
 - c) Grading Plan
 - d) Storm Water Pollution Prevention Plan

- e. The final site plan will be presented to the Planning and Zoning Commission by City Staff for consideration. The Planning and Zoning Commission reviews the final document for completeness and public awareness.
 - f. The final site plan submittal to be provided to Community Development Department staff at least ten (10) days prior to the next regularly scheduled Planning and Zoning Commission meeting.
 - g. Once the site plan is approved, the developer may begin the building permitting process. Approval from the appropriate drainage entity is required prior to the issuance of building permits.
 - h. Three (3) copies of the site development plans shall be submitted to the Building Official for review. The City will typically respond within two (2) to four (4) weeks of the initial submittal.
 - i. When plan changes are requested, two (2) copies of the revised site development plans shall be submitted to the City for review, which will ultimately result in the reissuance of any applicable permit(s).
- 3. Building Slab Elevations – Minimum building slab elevations shall conform to the requirements of the City of Friendswood Flood Damage Prevention Ordinance and latest adopted flood zone maps.
 - 4. Water Service – Water service lines and meters shall be sized in accordance with requirements set out in the Waterline Distribution System Design Requirements.
 - 5. Sanitary Sewer Service – Sanitary sewer service leads are normally installed during construction of the public sanitary sewer. When a sanitary sewer service lead is to be installed for a site development, refer to the Wastewater Collection System Design Requirements. All lots, tracts, or reserves shall be connected directly to a public sanitary sewer by a single lead, except as specifically approved by the City Engineer. The City Department of Public Works shall be contacted for all sanitary sewer connections for commercial projects.
 - 6. Site Drainage Requirements – All commercial, industrial, office, recreational, and multi-family tracts shall have an internal drainage system. The internal drainage system shall collect all site runoff and direct it into a private storm sewer system that shall connect to the public

drainage facilities in the area. Any exceptions require specific approval from the City.

- a. The internal site storm sewer shall be connected to a public storm sewer at a manhole or at an inlet adjoining the site. The site drainage outfall shall be connected to the nearest existing drainage system with adequate capacity to serve the drainage area. Where extension of the existing drainage system is required, all costs for extension shall be the responsibility of the developer.
- b. All internal facilities shall be designed by a Professional Engineer licensed to practice engineering in the State of Texas, and shall be sized to drain the site in accordance with these standards.
- c. Drainage calculations shall be submitted with all site development plans. Additional supporting data may be required by the City.
- d. When the site drains directly into a Galveston County or Harris County facility, and/or into a TxDOT or county rights-of-way, the appropriate governmental entity(s) shall approve the site development connection to the public facilities.

7. Driveways

- a. It is desirable to minimize the number of non-residential driveways on all streets in order to reduce the number of conflict points and facilitate traffic flow. It is recognized, however, that certain existing tracts may not be able to fully comply with the following standards due to limited frontage or other constraints.
- b. When compliance with these criteria is precluded for any reasons, attempts should be made to obtain alternative access where feasible, including joint access driveways, access easements to adjoining properties, or access to intersecting streets.
- c. If it can be demonstrated to the City Engineer that sufficient attempts to secure alternative access have been made, and that such access is still not possible, the City Engineer may accept a Traffic Impact Analysis performed by a Professional Engineer licensed to practice engineering in the State of Texas. If approved, the analysis will be used to allow a deviation to the driveway spacing requirements indicated herein.

- d. Residential driveways shall be a minimum of twelve (12) feet wide and a maximum of twenty-five (25) feet wide at the rights-of-way line, unless otherwise approved by the City Engineer, and should be placed at least twenty-five (25) feet away from the property line at the intersection of two (2) streets and at least five (5) feet from a property line between two (2) properties.
- e. Residential lots must have a minimum of one hundred (100) feet of frontage in order to be eligible for a circular driveway on the lot, and the two (2) driveways shall have at least forty-five (45) feet of separation between them from the inside edges of driveways.
- f. Non-residential driveways shall be a minimum of twenty-five (25) feet wide and a maximum of thirty-five (35) feet wide. Non-residential driveways shall be spaced with a minimum of fifty (50) foot separation.
- g. Non-residential driveways on major thoroughfares/boulevard streets shall be placed no closer than one hundred (125) feet from the ultimate curb line of the intersecting major thoroughfare or boulevard street. Non-residential driveways on collector/ minor streets are to be placed no closer than seventy-five (75) feet from the ultimate curb line of the intersecting major thoroughfare/boulevard street. Non-residential driveways on major thoroughfares/boulevard streets are to be placed no closer than seventy-five (75) feet from the ultimate curb line of the intersecting collector commercial/minor street.
- h. For purposes of determining the separation distance, the back of curb or edge of street shall be used in conjunction with the edge of driveway which is closest and parallel to the street from which the measurement is to be taken.
- i. Non-residential tracts with less than one hundred fifty (150) feet of frontage on a public street shall have no more than one (1) driveway. Non-residential tracts between one hundred (150) feet and three hundred twenty (320) feet of frontage on a public street shall have no more than two (2) driveways. Non-residential tracts between three hundred twenty-one (321) feet and six hundred (600) feet of frontage on a public street shall have no more than three (3) driveways. Non-residential tracts with over six hundred (600) feet of frontage on a public street shall have the number of

driveways specially designated and specifically approved by the City.

- j. Non-residential driveway connections to the public street shall be approved and inspected by the City, TxDOT, county representative, or appropriate entity.
- k. Driveway radii shall not extend beyond the projection of a property line perpendicular to the back of the curb.
- l. Driveways shall be installed according to the latest version of the City of Friendswood Standard Details and Technical Specifications.
- m. Driveways shall be evaluated with respect to location of existing or proposed signage, landscaping, and structures for adequate sight distance.
- n. A note stating, "Access to adjacent property and common driveways may be required" shall be placed on the site plan.
- o. Curb returns for driveways shall be, at a minimum:
 - 1) For residential driveways:
 - a) Five (5) feet on local streets less than twenty-eight (28) feet in width.
 - b) Ten (10) feet on collector streets, major thoroughfares and boulevards, and local streets greater than twenty-eight (28) feet in width.
 - 2) For non-residential driveways:
 - a) Twenty-five (25) feet on local streets less than twenty-eight (28) feet in width
 - b) Thirty-five (35) feet on collector streets, major thoroughfares, boulevards, and local streets greater than twenty-eight (28) feet in width

8. Fire Lanes

- a. Fire lanes shall be required on all multi-family and non-residential tracts if any part of a building is greater than one hundred fifty (150) feet from either a fire lane, private street, or public street rights-of-way.
- b. Fire lanes shall be either twenty (20) feet wide with a twenty-five (25) foot radius or twenty-five (25) feet wide with a twenty (20) foot radius.
- c. Fire lanes shall be constructed using the same pavement structural requirements as a public pavement. Alternate materials may be used with specific approval from the City Engineer.
- d. Fire lanes shall be designed to drain in compliance with the Site Development Requirement.
- e. Fire lane markings shall be provided as specified in the Friendswood Code of Ordinances.
- f. An emergency vehicle turn-around, whether a cul-de-sac of a radius required by the Fire Marshal or a T-head at least one hundred twenty (120) feet in length, shall be required under certain conditions.

9. Controlled Access Gate Requirements

- a. Plans for access control systems shall be submitted to the Fire Marshal's Office and approved prior to construction.
- b. All access control gates shall have emergency means of operation in the event of power loss.
- c. Access control gates shall provide a clear, passable width of at least twenty (20) feet.
- d. A Knox® key switch shall be provided for all controlled access gates. The key switch shall operate all gates.
- e. A Knox® pad lock shall be provided for all non-motorized gates.

- f. The location of the key switch shall be approved by the Fire Marshal's Office.
- g. The owner or homeowners' association shall maintain all parts of the access system and keep them in good working order.
- h. The Fire Marshal's Office and Police Dispatch shall be notified immediately of any damage to the access system that hinders access including but not limited to, damage to the key box, lock, and gates.
- i. Access gates shall be far enough back to provide at least forty (40) feet of stacking space.

10. Storm Water Pollution Prevention Plan

- a. A storm water pollution prevention plan shall be provided for all site development projects.
- b. Filter fabric fence shall be installed at the perimeter of the site before construction begins.
- c. Once construction is complete, the filter fabric fence may be removed; provided a minimum of five (5) feet of hydro-mulch or sod shall be installed at the back of all curbs, or other Best Management Practices, shall be implemented and/or installed.
- d. Refer to the Storm Water Ordinance for additional requirements.

11. Parking Lot Guidelines

A parking lot layout is required to ensure that adequate off-street parking is provided with the construction, alteration, or remodeling of any building.

- a. Concrete pavement thickness shall be a minimum of five (5) inches with eight (8) inches of stabilized subgrade. Reinforcement shall be Grade 60, $f_y = 60,000$ psi, #4 deformed reinforcing bars spaced at sixteen (16) inches center to center both ways and minimum lap lengths of eighteen (18) inches.
- b. Hot Mix Asphalt Concrete pavement thickness shall be a minimum of two (2) inches with eight (8) inches of stabilized crushed

concrete or limestone and six (6) inches of lime-stabilized subgrade.

- c. Off-street parking spaces shall be located on the same lot, tract, parcel, or premises as the use being served, or on other property of the same or less restrictive zoning classification that the owner of the premises being served has a continuing right to use for parking. When the off-street parking spaces are not located on the same lot, tract, parcel, or premises being served, the distance from the center of the parking lot to an entrance to the building, shall not exceed five hundred (500) feet in distance measured along the shortest available pedestrian route with public access.
- d. Any existing building that is enlarged, structurally altered, or remodeled by more than fifty (50) percent as it existed shall be accompanied by off-street parking for the entire building. When the enlargement, structural alteration, or remodel is not increased or changed by more than fifty (50) percent, additional off-street parking shall only be required for the increased or changed floor area.
- e. Existing parking spaces may not be used to satisfy additional off-street parking requirements unless, the existing spaces exceed the number recommended for the building or use for which the existing spaces are associated.
- f. The number of off-street parking spaces required for each building or use shall be determined by reference to the Parking Group Table in Appendix C – Design Criteria Manual. Where several different property uses will share a joint parking area, the parking should be computed based upon the overall development.
- g. The design and dimensions of off-street parking areas shall be in accordance with the following table of minimum dimensions. Minimum stall width shall be nine feet, except for residential and all-day office parking which may utilize stalls eight and one-half (8.5) feet in width, provided that minimum aisle widths are increased by one (1) foot. In addition, the dimensions of up to twenty (20) percent of the total number of off-street parking spaces may be reduced to eight (8) feet in width and sixteen (16) feet in depth to accommodate compact automobiles (such spaces must be so marked). All dimensions below are in feet:

	<i>Angle (degrees)</i>				
	<i>0°</i>	<i>35°</i>	<i>45°</i>	<i>60°</i>	<i>90°</i>
Stall, parallel to aisle	23.0	18.0	12.7	10.4	9.0
Stall, perpendicular to aisle	9.0	16.5	19.0	20.0	18.0
Aisle width, one-way	12.0	12.0	12.0	16.0	24.0
Aisle width, one-way	22.0	22.0	22.0	24.0	24.0
Cross aisle, one-way	11.0	11.0	11.0	11.0	11.0
Cross aisle, two-way	22.0	22.0	22.0	22.0	22.0
Refer to Appendix B – Figure 8 of this Design Criteria Manual for Off-street Parking Diagrams					

- h. Off-street parking spaces shall be clearly marked. Parking spaces abutting an adjoining property line or street rights-of-way shall be provided with wheel guards or bumper guards located such that no part of a normally parked vehicle will extend beyond the property line. When wheel guards are used, they shall be centered two and one-half (2.5) feet from the property line for ninety (90) degree parking, two and one-third (2.3) feet for sixty (60) degree parking, and two (2.0) feet for forty-five (45) degree and thirty (30) degree parking.
- i. The parking layout and design of all off-street parking areas shall be approved by the City Engineer. The City Engineer shall determine that spaces provided are usable, and that the circulation pattern within the area is adequate.
- j. The number of accessible parking spaces shall comply with the latest edition of the Architectural Barriers Texas Accessibility Standards (TAS).
- k. Accessible parking spaces must be paved and must include:
 - a. The international symbol of access painted conspicuously on the surface in a color that contrasts the pavement;
 - b. The words “NO PARKING” painted on any access aisle adjacent to the parking space. The words must be painted:
 - i. In all capital letters;
 - ii. With a letter height of at least one (1) foot, and a stroke width of at least two (2) inches; and
 - iii. Centered within each access aisle adjacent to the parking space; and

- c. A sign identifying the consequences of parking illegally in a paved accessible space. The sign must:
 - i. At a minimum state “Violators Subject to Fine and Towing” in a letter height of at least one inch;
 - ii. Be mounted on a pole, post, wall, or freestanding board;
 - iii. Be no more than eight (8) inches below a sign required by Texas Accessibility Standards, 502.6; and
 - iv. Be installed so the bottom edge of the sign is no lower than four (4) feet and no higher than six (6) feet above ground level.
- d. A sign that meets the requirements set in Texas Accessibility Standards, 502.6, that includes the required language in subsection (c)(i) satisfies these requirements.

12. Pipelines

All new Pipelines shall be a minimum depth of ten (10) foot in depth to the top of the pipe in all new or existing road rights-of-way.

13. Utility and Cable Installation

- a. Utility infrastructure shall be mounted on pads at ground level; if within the rights-of-way, utility infrastructure shall not block sidewalks or visibility at intersections.
- b. For future individual utility service, lines which originate in a public road right-of-way and extended to any building or structure shall be installed underground.
- c. On side streets with above-ground utility services which intersect a roadway with underground utility lines, the first pole supporting the above ground service shall be placed on such a side street at least one hundred (100) feet from the center of the roadway with the underground utilities.

2.0 EXECUTION

2.01 RESEARCH REQUIREMENTS

- A. Discuss project concepts outlining proposed features and usage with the City.

- B. Research existing utility and rights-of-way information.
- C. Verify that no restrictions exist that could result in denial of the project concept.

2.02 DESIGN ANALYSIS – Reserved

2.03 DRAWINGS

- A. The site development plan shall include layout sheet(s) providing a photometric layout of the site complete with location of proposed lights, information on light heights, and type of light standard proposed.
- B. The site development plan shall include an overall drainage layout showing:
 - 1. Total area (in acres) of site to be drained.
 - 2. Area (in acres) drained to each inlet.
 - 3. Contours or an adequate number of spot elevations to indicate area drained to each inlet.
 - 4. Top elevation and flowline elevation at each inlet.
 - 5. Gradient and size on each private storm sewer.
 - 6. Computations to support pipe sizes and grades shown [minimum private storm size shall be ten (10) inches].
 - 7. Design velocity for storm sewers shall be three (3) feet per second.
 - 8. A TxDOT or a county permit shall be required for drainage affecting a state or county owned/maintained facility. Submit permit with site plan.
 - 9. The drawings shall be prepared and sealed by a Professional Engineer licensed to practice engineering in the State of Texas.
 - 10. The size and location of any required detention facility shall be indicated on the plans, along with the size and location of the outfall structure.
- C. All site development plans shall be approved by the appropriate drainage entity prior to City approval being granted.

- D. The site plan shall show all water and sewer service lines with sizes, grades and alignments; and illustrate any proposed ties into the existing public lines.
- E. The site development plan shall show all parking areas.
- F. The site development plan shall indicate the types and location of all existing and proposed landscaping. Landscaping shall meet the minimum requirements as set forth in the Zoning Ordinance. If no trees exist, a note to that effect shall be placed on the site development plan. The Qualified Tree List can be found in Appendix D of this Design Criteria manual.
- G. The site development plan shall show the location, height, and area of all proposed buildings. All setback lines as required by the Zoning Ordinance shall also be shown with a dimension called out on the site plan between the building and the site boundary.
- H. The land use for all adjacent property shall be shown on the site development plan.
- I. All parking lot pavements for site development plans shall be engineered to provide for operation by vehicles normally expected to utilize the parking area, and the thickness of paving shall be based upon the soil conditions underlying the parking area. A Professional Engineer licensed to practice engineering in the State of Texas shall certify the design submitted for approval.
- J. Concrete sidewalks [a minimum of four (4) feet wide and four (4) inches thick with steel reinforcement] shall be required along all street frontages. The design and installation of such sidewalks shall comply with Texas Accessibility Standards Architectural Barriers requirements and the City of Friendswood Standard Details and Technical Specifications. The location of all proposed and existing sidewalks shall be shown on the site development plan.
- K. Show location of signs, screening walls or fences [indicate height, material, and appurtenances], and dumpsters (with appropriate screening).
- L. If the site is located within the Community Overlay District, a plan note shall be made on the site development plan indicating such; and that the site development will conform to the Zoning Ordinance requirements.
- M. No improvements in or to public rights-of-way shall be made without prior approval from the City Engineer. This includes planting trees in public rights-of-way, within residential and non-residential areas, or in any utility or drainage easement. Only Class 2 and Class 3 trees listed in Appendix D of this Design

Criteria Manual may be planted in public rights-of way if such planting is approved by the City Engineer. No trees of any class may be planted in utility or drainage easements.

APPENDIX A

Attachments

ATTACHMENTS

1. Lift Station Start-up Log
2. Design Criteria Modification Form
3. GCCDD Form DR-001

City of Friendswood Lift Station Start-Up Log								
Date:			Site:			Pump Number:		
Address:			Pump Designation:					
Name Plate Data								
Pump Data								
Pump Make:				Size:				
Pump Model:				TDH:				
Serial Number:				Impeller Number or Size				
				Flow in GPM:				
Pump Motor Data								
Make (if applicable):				Phase:				
Serial Number (if applicable):				Name Plate Voltages:				
RPM:				Name Plate Full Load Amps:				
Service Factor:				Pump is wired for:				
Start-Up Trial Data								
Insulation Test			Pre-Start Voltage Test					
L1 to GND	L2 to GND	L3 to GND	L1 - L2	L2 - L3	L3 - L1	L1 - GND	L2 - GND	L3 - GND
M	M	M	V	V	V	V	V	V
			Run Voltage Test			Run Amperage Test		
Phase Rotation			L1 - L2	L2 - L3	L3 - L1	L1	L2	L3
ABC		CBA						
Operator:								

**CITY OF FRIENDSWOOD
DESIGN CRITERIA MODIFICATION FORM**

Modifications to standards identified in the Design Criteria Manual may be permitted by the City of Friendswood's City Engineer. The modification proposal must be submitted by a Professional Engineer licensed by the State of Texas and shall follow generally accepted engineering standards for traffic, sidewalk and other infrastructure as applicable, and such proposal contains the following information and substantiates the findings in Paragraph 4 below. If an appeal to the City of Friendswood City Engineer decision is requested, the Construction Board of Adjustment (hereinafter referred to as "the City") will review that appeal.

**This entire form must be completed in its entirety. If form is
submitted incomplete, it will be administratively rejected.**

PROJECT NAME:

PROJECT ENGINEER:

SUBMITTAL DATE:

SUBDIVISION NAME:

MODIFICATION LOCATION:

1. Set forth the proposed deviation to the technical standard.

SPECIFIC PROPOSED DEVIATION FROM TECHNICAL STANDARD:

2. Set forth the impact such deviation has on speed differential and street capacity, the likelihood of accidents, the long term maintenance and operation effect, the degree of functionality and efficiency, the technological advancements involved, and other relevant matters.

IMPACT OF DEVIATION:

3. Show a comparison of the technical standard to the proposed deviation with respect to overall safety and quality, speed differential, street capacity, existing and projected accidents, long-term maintenance and operation, degree of functionality, degree of efficiency, technological advancements, and other relevant matters.

COMPARISON OF TECHNICAL STANDARD TO PROPOSED DEVIATION:

4. Describe all mitigating improvements that reduce the negative impact of the proposed deviation on overall safety and quality, speed differential, street capacity, accident occurrences, long-term maintenance and operation, degree of functionality, degree of efficiency and demonstrating the degree to which the proposed deviation detrimentally affects the foregoing. Other relevant factors, including technological advances, should be explained by describing how they will affect the proposed development. Mitigating improvements can include but are not limited to, traffic control devices, pavement improvements, added acceleration or deceleration lanes, or reservoirs, and other on-site improvements.

MITIGATING IMPROVEMENTS THAT REDUCE NEGATIVE IMPACT:

SUMMARY & CONCLUSION/RECOMMENDATION FOR MODIFICATION:

List of Supporting Documentation Attached?

Yes____

No____

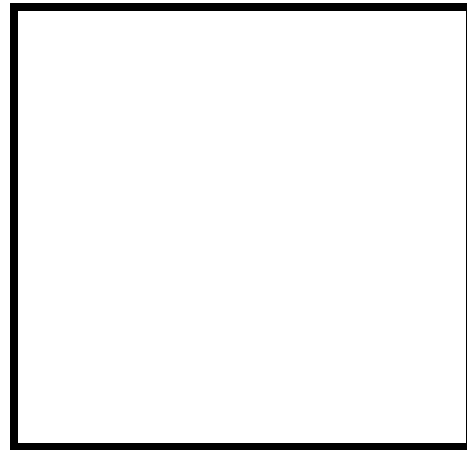
Engineer's Name

Engineering Firm

Address

City, ST, Zip

Telephone



Seal of Professional Engineer

Department of Engineering & Projects Use ONLY

Reviewed By:

Date

Modification Request Approved / Denied By:
Copies of Backup Information/Notes Attached

City Engineer

Date

NAME OF APPLICANT: _____
ADDRESS: _____
LEGAL DESCRIPTION: _____
TOTAL ACREAGE: _____
DATE OF PLAT OR RE-PLAT: _____

QUALIFICATIONS FOR PURCHASING REGIONAL DETENTION

PER THE INTERLOCAL AGREEMENT BETWEEN THE CITY OF FRIENDSWOOD AND GCCDD DATED MARCH 7, 2011:

SINGLE FAMILY RESIDENTIAL (SFR) LOTS OF 3.5 ACRES OR LESS QUALIFY
MUST PROVIDE SUPPORTING DOCUMENTATION FOR THE CALCULATION OF IMPERVIOUS COVER

FEE CALCULATIONS BASED ON SQUARE FEET OF IMPERVIOUS COVER:

_____ SF OF IMPERVIOUS COVER X \$0.25 = _____

PLEASE MAKE CHECKS PAYABLE TO THE GCCDD

* IMPERVIOUS COVER AREA SHALL BE DEFINED AS SURFACE COVER WHICH DOES NOT ALLOW THE PASSAGE OF STORM WATER INTO THE UNDERLYING SOIL, AND INCLUDES, BUT IS NOT LIMITED TO CONCRETE, ASPHALT, STABILIZED SOIL, TENNIS COURTS, WATER FEATURES, POOLS, SIDEWALKS, CRUSHED CONCRETE, LIMESTONE, AND ROOFING

APPENDIX B

Figures

Figure

1. Geometric Street Design Standards
2. Divided Roadway Cross Sections – Urban
3. Roadway Tapers For Subdivision Streets
4. Undivided Roadway Cross Sections – Urban
5. Typical Length of Median and Median Opening
6. Median Nose and Left Turn Bay Design
7. Cul-de Sac
8. Driveway spacing and other measurements
9. Off-Street Parking

FIGURE 1
GEOMETRIC STREET DESIGN STANDARDS (MINIMUM STANDARDS)

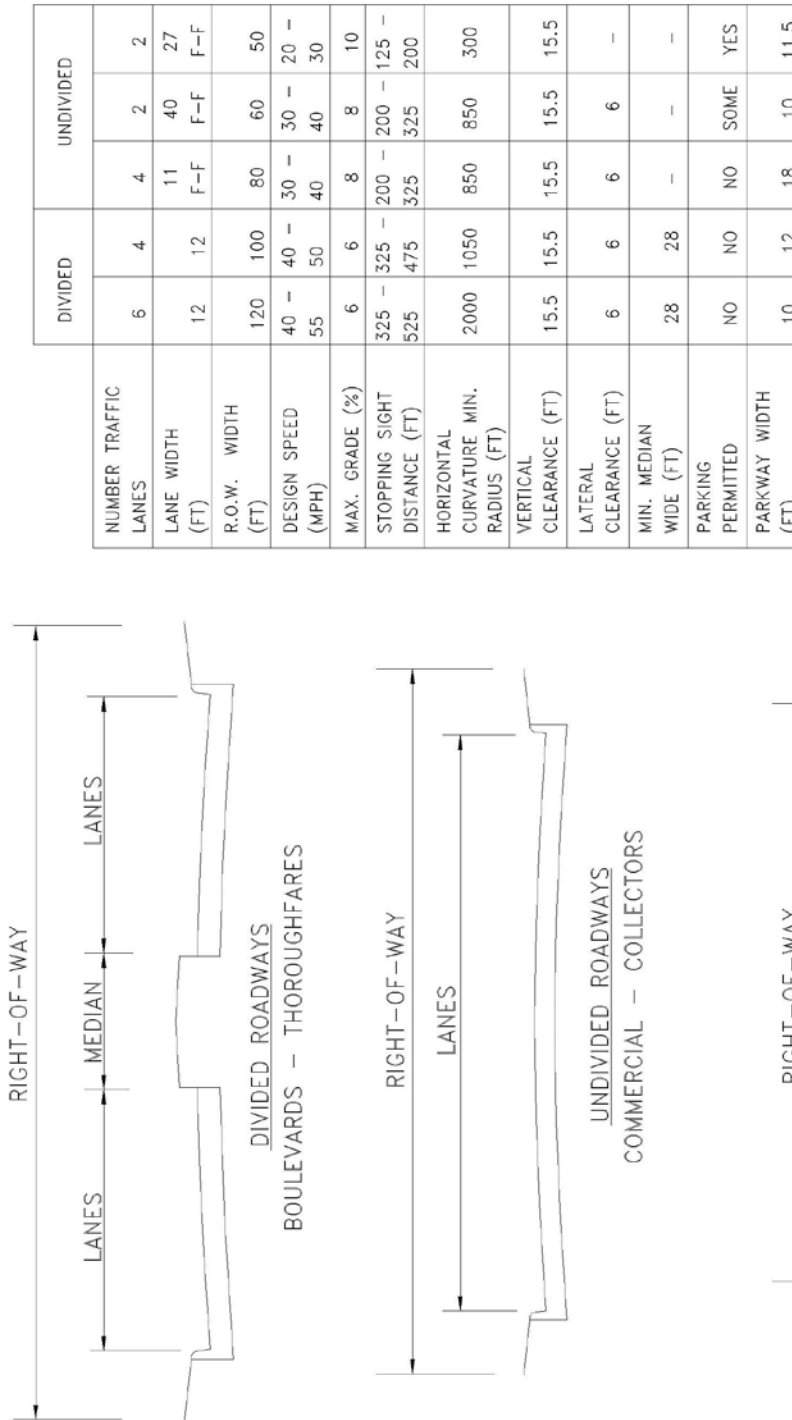
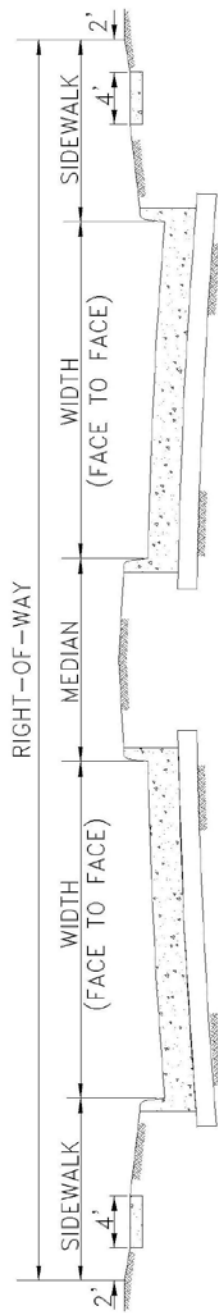


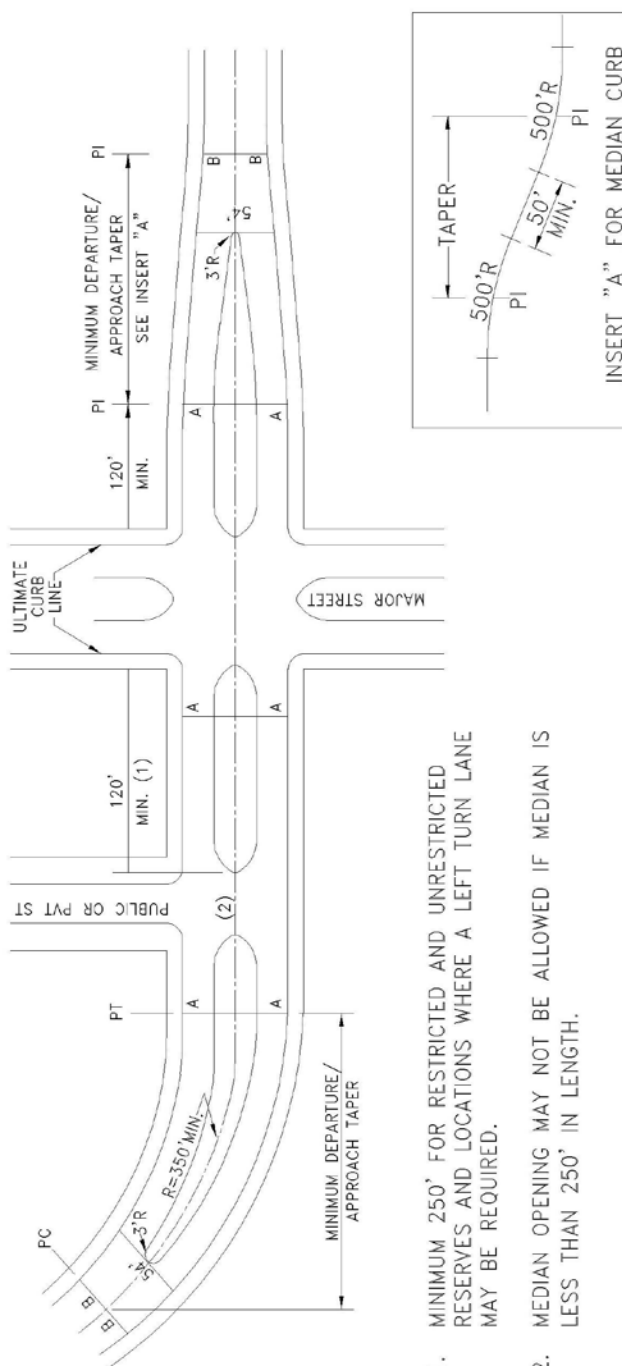
FIGURE 2
DIVIDED ROADWAY CROSS SECTIONS—URBAN



DIVIDED ROADWAY DIMENSIONS (In Feet)			
R.O.W.	80	100	100
WIDTH	24	24	33
MEDIAN	14	28	14
SIDEWALK	9	12	10

NOTE:
THIS DESIGN REPRESENTS THE PRESENCE OF A TYPICAL CURB AND GUTTER,
AND DOES NOT IMPLY OR RECOMMEND A SPECIFIC DRAINAGE DESIGN

FIGURE 3
ROADWAY TAPERS FOR SUBDIVISION STREETS



1. MINIMUM 250' FOR RESTRICTED AND UNRESTRICTED RESERVES AND LOCATIONS WHERE A LEFT TURN LANE MAY BE REQUIRED.
2. MEDIAN OPENING MAY NOT BE ALLOWED IF MEDIAN IS LESS THAN 250' IN LENGTH.

NOTE:

- a. APPROACH AND DEPARTURE TAPER REQUIREMENT:

$L = \frac{WS^2}{60}$ WHERE L = LENGTH IN FEET
S = SPEED IN M.P.H.

W = LATERAL OFFSET IN FEET.

S = 30 M.P.H. MINIMUM DESIGN SPEED FOR SUBDIVISION STREETS

$$W = A - B$$

- b. 350' MINIMUM CENTERLINE RADIUS FOR HORIZONTAL CURVE WITH APPROACH OR DEPARTURE TAPERS

QUICK REFERENCE GUIDE		TAPER L=WS ² =60 (FEET)
ROADWAY CROSS SECTION (FEET)		
A+A	B+B	
80	60	150
80	40	300
80	27	400

FIGURE 4
UNDIVIDED ROADWAY CROSS SECTIONS—URBAN

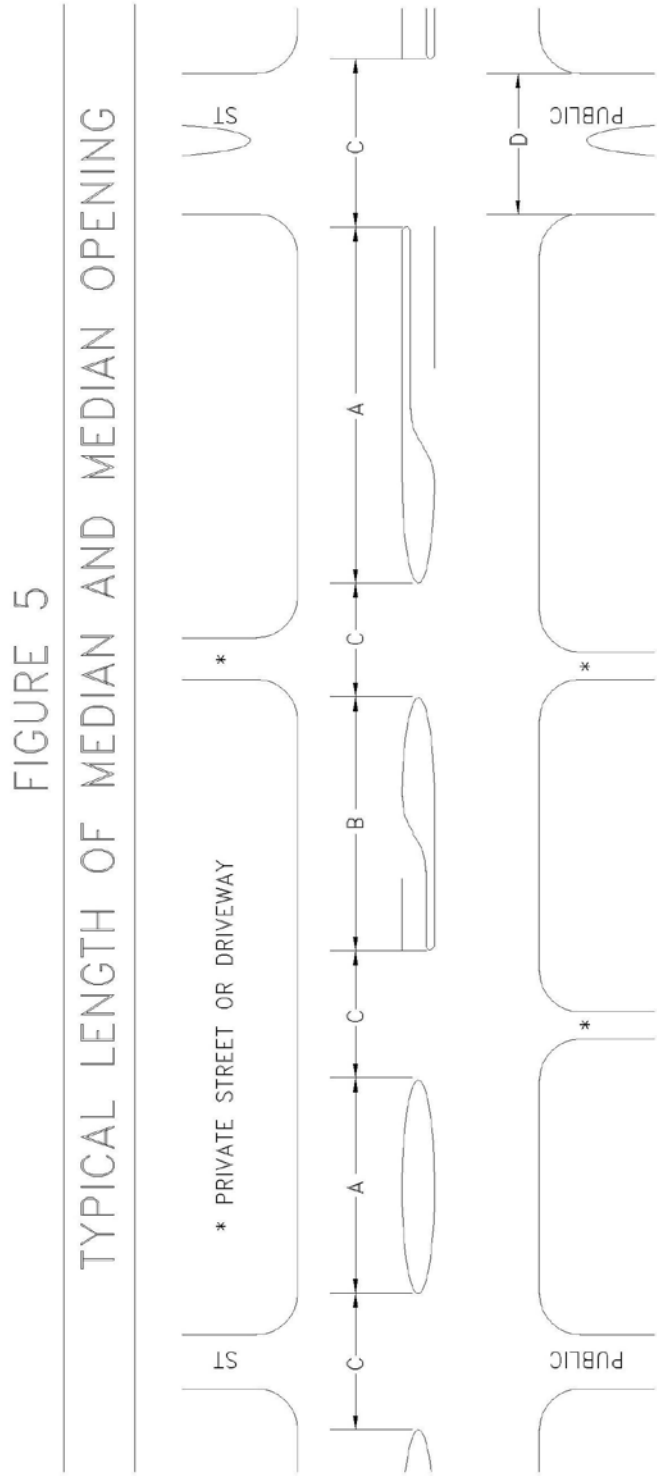


UNDIVIDED ROADWAY DIMENSIONS (In Feet)				
ABUTTING LAND USE	RESIDENTIAL		ALL OTHER	
	MFR-GHD	SFR	MINOR/(2) COMM.	
R.O.W.	50*(1)	60	60	80
WIDTH	27	27	40	44
SIDEWALK	11.5	16.5	10	18

(1) RIGHT-OF-WAY IN MFR-GHD SHALL MEAN THE DRAINAGE AND UTILITY EASEMENT UTILIZED WHEN PRIVATE STREETS ARE CONSTRUCTED.

(2) MINOR/COMM.— ANY PROPERTY USE OTHER THAN SINGLE FAMILY OR A COLLECTOR OR MINOR THOROUGHFARE

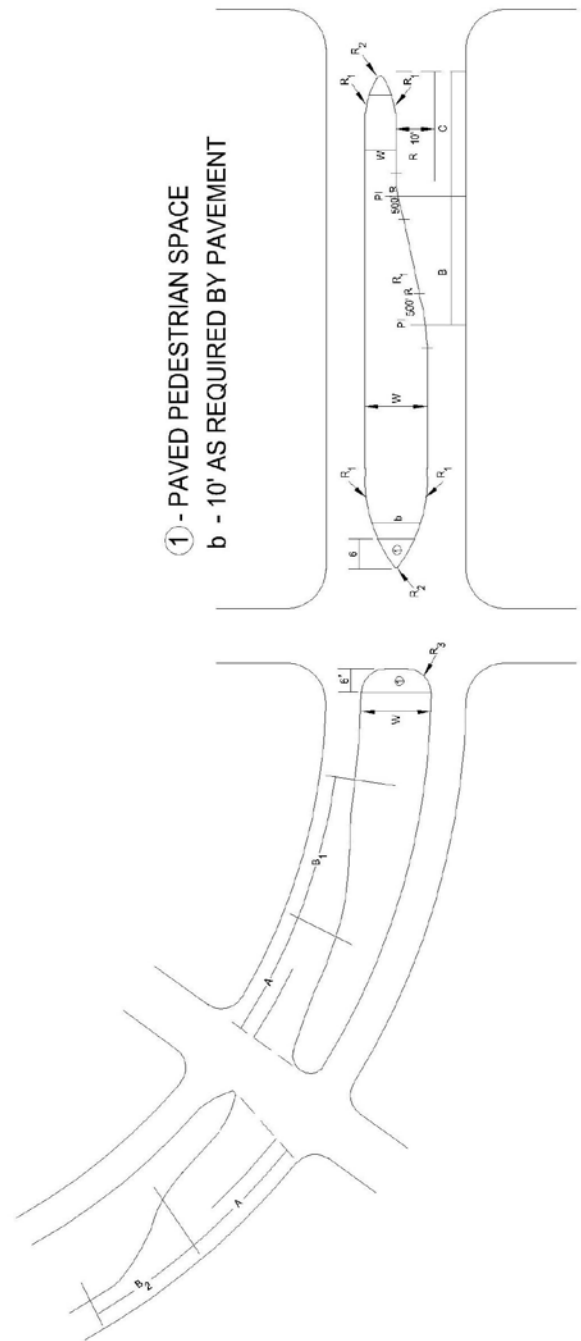
NOTE:
THIS DESIGN REPRESENTS THE PRESENCE OF A TYPICAL CURB AND GUTTER, AND DOES NOT IMPLY OR RECOMMEND A SPECIFIC DRAINAGE DESIGN



TYPICAL LENGTH OF MEDIAN OPENING "C" = 50' OR D+10', WHICHEVER IS GREATER.

IF PLANNED DIVIDED STREET IS:	PURPOSE OF MEDIAN INTERRUPTION		
	MAJOR STREET/THOROUGHFARE (A)	COLLECTOR STREET (A)	LOCAL STREET (A)
MAJOR STREET/THOROUGHFARE	350'	300'	300'
COLLECTOR STREET	300'	250'	250'
LOCAL STREET	250'	250'	200'

FIGURE 6
MEDIAN NOSE AND LEFT TURN BAY DESIGN

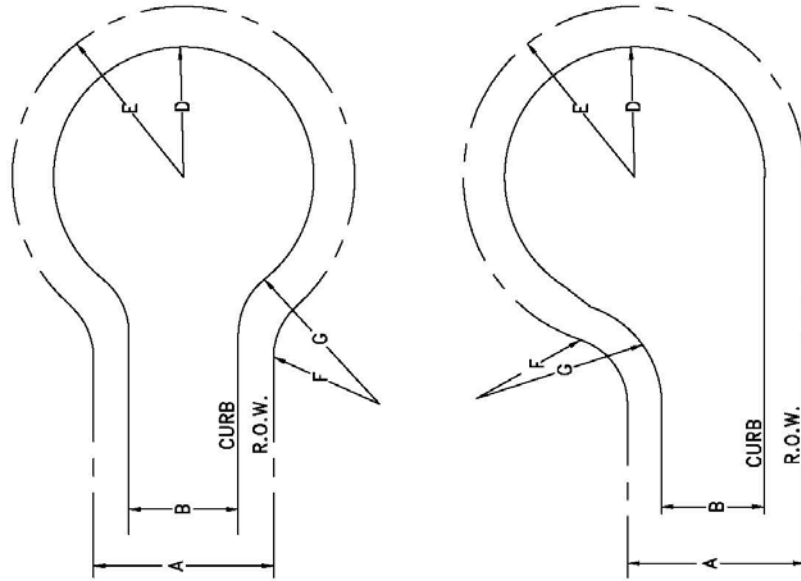


① - PAVED PEDESTRIAN SPACE
 b - 10' AS REQUIRED BY PAVEMENT

MEDIAN DIMENSIONS					LEFT TURN BAY DIMENSIONS				
W	R_1	R_2	R_3		A	B	B_1	B_2	NOTE
$\leq 8'$	NONE	$\frac{W}{2}$	NA		$A = 150'$ MINIMUM AT INTERSECTION OF TWO MAJOR STREETS. $= 100'$ MINIMUM AT ALL OTHER INTERSECTIONS.	$B = 100'$ MINIMUM ON STRAIGHT ROADWAY.	$B_1 =$ TAPER LENGTH MAY BE SHORTER IF IT IS ON A HORIZONTAL CURVE TO THE LEFT.	$B_2 =$ TAPER LENGTH MAY BE LONGER IF IT IS ON A HORIZONTAL CURVE TO THE RIGHT.	NOTE: DIMENSIONS MAY BE ADJUSTED AS DETERMINED BY TxDOT.
$>8' \leq 38'$	90°	$\frac{W}{5}$	NA						
$>38'$	NONE	NONE	15°						

NA - NOT APPLICABLE

FIGURE 7
CUL-DE-SAC DESIGN FOR STREET TERMINATION



ABUTTING LAND USE	
SINGLE FAMILY *	ALL OTHER
A ALL WIDTHS	60'
B ALL WIDTHS	ALL WIDTHS
D 50'	55'
E 60'	65'
F 25'	25'
G 35'	35'

ALL DIMENSIONS MEASURED IN FEET TO FACE OF CURB.

* NOT OPENING ONTO A MAJOR THOROUGHFARE

MAXIMUM CUL-DE-SAC LENGTH SHALL BE 750 FEET.

FIGURE 8
DRIVEWAY SPACING AND OTHER MEASUREMENTS

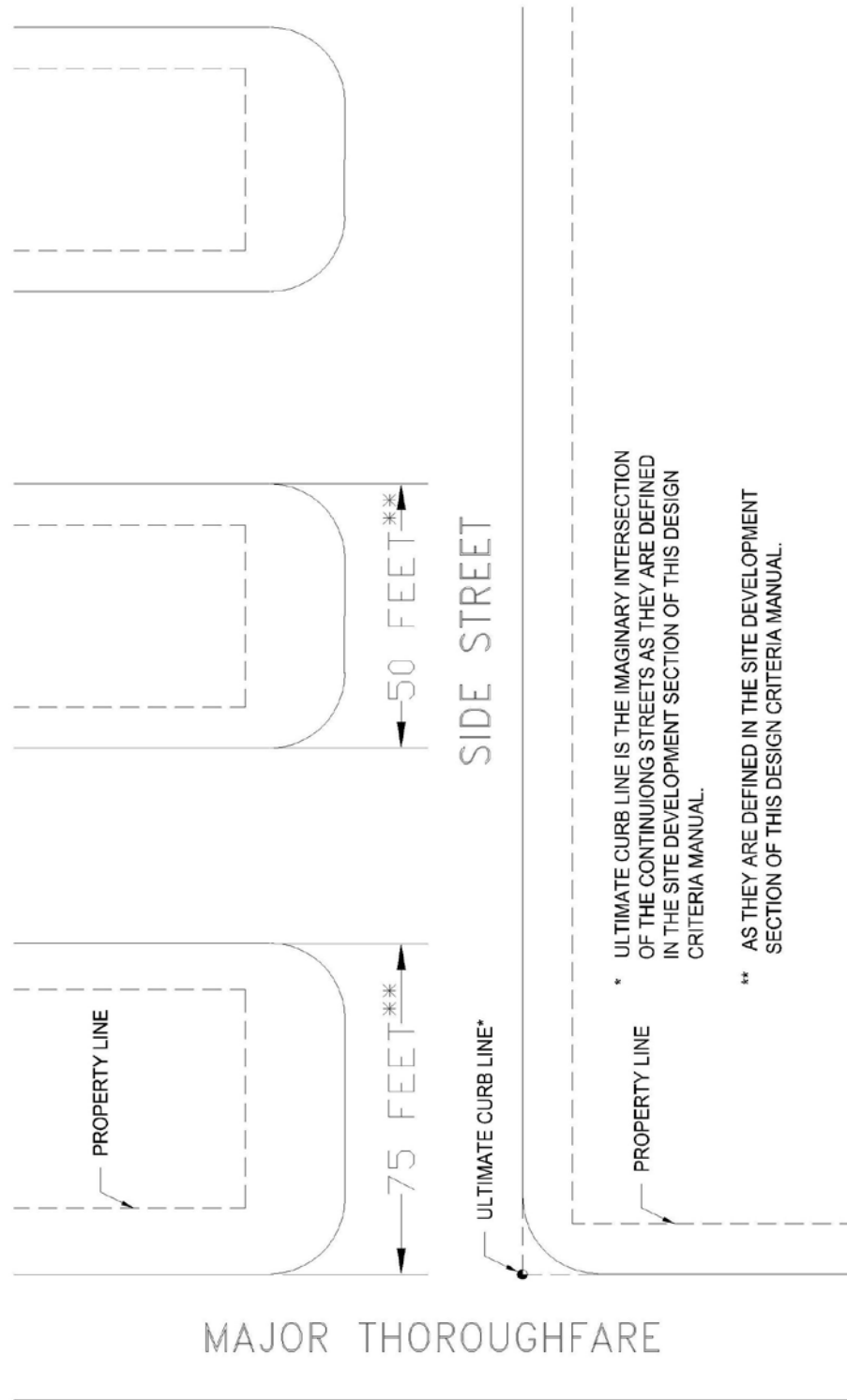
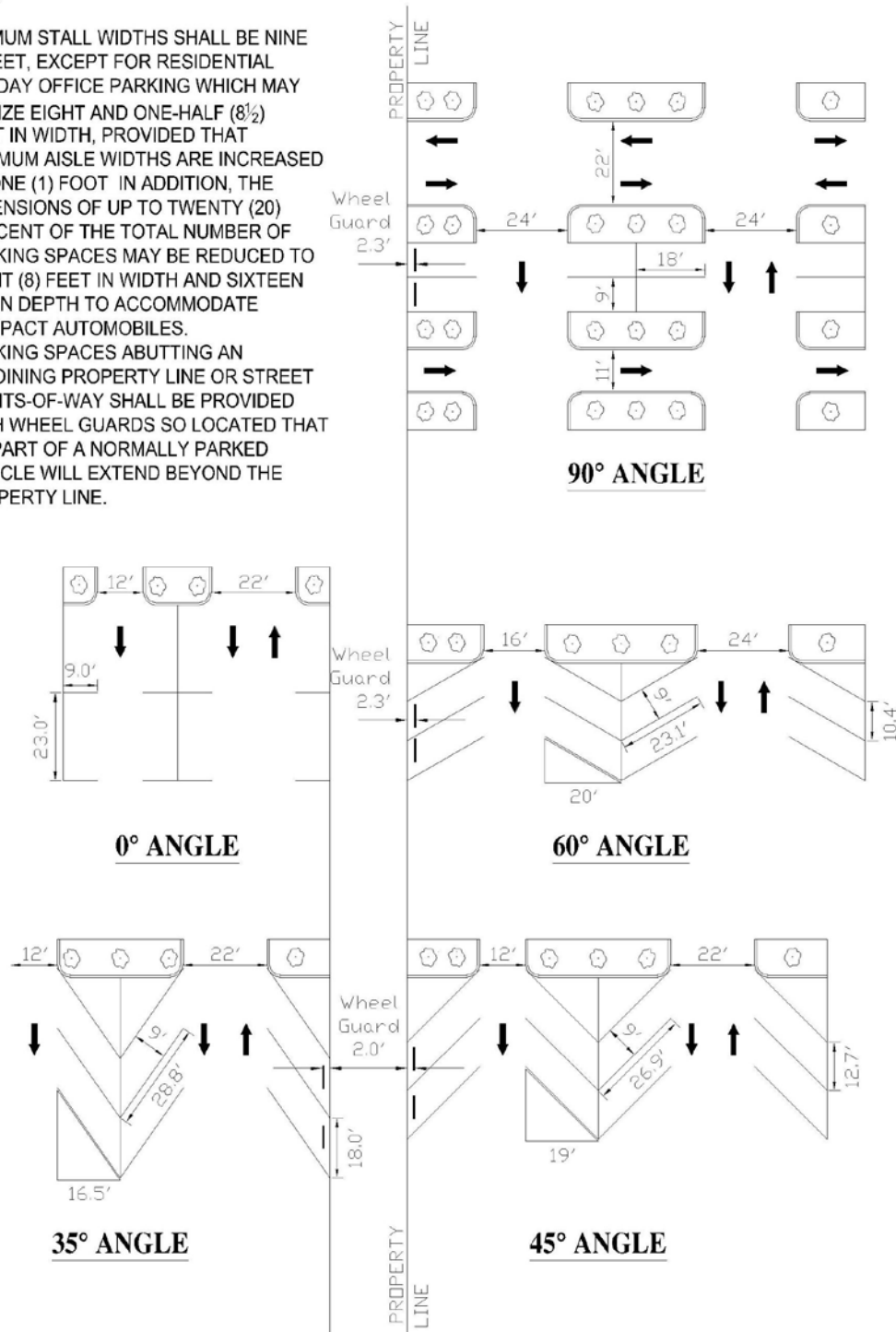


FIGURE 9 OFFSTREET PARKING

NOTES:

1. MINIMUM STALL WIDTHS SHALL BE NINE (9) FEET, EXCEPT FOR RESIDENTIAL ALL-DAY OFFICE PARKING WHICH MAY UTILIZE EIGHT AND ONE-HALF (8½) FEET IN WIDTH, PROVIDED THAT MINIMUM AISLE WIDTHS ARE INCREASED BY ONE (1) FOOT. IN ADDITION, THE DIMENSIONS OF UP TO TWENTY (20) PERCENT OF THE TOTAL NUMBER OF PARKING SPACES MAY BE REDUCED TO EIGHT (8) FEET IN WIDTH AND SIXTEEN (16) IN DEPTH TO ACCOMMODATE COMPACT AUTOMOBILES.
2. PARKING SPACES ABUTTING AN ADJOINING PROPERTY LINE OR STREET RIGHTS-OF-WAY SHALL BE PROVIDED WITH WHEEL GUARDS SO LOCATED THAT NO PART OF A NORMALLY PARKED VEHICLE WILL EXTEND BEYOND THE PROPERTY LINE.



APPENDIX C

Parking Group Table

Parking Use Category	Parking Spaces*
Accommodation	
<i>Accommodations:</i>	1.25 spaces per sleeping room or unit, plus the following meeting per banquet space: - less than 10 sq. ft. per sleeping room = none; - 10 to 20 sq. ft. per sleeping room = 30 spaces per 1,000 sq. ft. GFA; - 21 to 50 sq. ft. per sleeping room and over 50 sq. ft. per sleeping room = 20 spaces per 1,000 sq. ft. GFA.
<i>Accommodations with food:</i>	1.25 spaces per sleeping room or unit, plus 10 spaces per 1000 sq. ft. GFA restaurant lounge, plus the following for meeting/banquet space: - less than 10 sq. ft. per sleeping room = none; - 10 to 20 sq. ft. per sleeping room = 30 spaces per 1,000 sq. ft. GFA; - 21 to 50 sq. ft. per sleeping room and over 50 sq. ft. per sleeping room = 20 spaces per 1,000 sq. ft. GFA.
Adult Establishment	1 space for every 4 seats or 1 space for every 50 sq. ft. of customer service area, whichever is greater.
Agricultural, Forestry, Fishing, and Hunting Uses	2 per site plus 1 per 1,000 sq. ft. enclosed floor area.
Amusement and Recreation Industries	
<i>Arcade:</i>	1 space per 200 sq. ft. GFA.
<i>Driving/Archery/Shooting Range:</i>	1 space per 200 sq. ft. GFA of indoor facilities plus 1 space per tee or target.
<i>Fairground, Exhibition, Carnival:</i>	1 space per 500 sq. ft. of outdoor site area plus 1 space per 4 fixed spectator seats.
<i>Fitness and Recreational Sports:</i>	7 spaces per 1,000 sq. ft. GFA.
<i>Golf Course:</i>	1 space per 150 sq. ft. GFA of indoor facilities plus 5 spaces per green.
<i>Miniature Golf:</i>	1 space per 200 sq. ft. GFA of indoor facilities plus 1.5 spaces per hole.
<i>Rodeo, Circus, Auto/Motorcycle Racing:</i>	1 space per 3 spectator seats.
<i>Skateboarding, Water Slide:</i>	1 space per 200 sq. ft. GFA of indoor facilities plus 1 space per 2 persons design capacity of outdoor facilities.
<i>Sports fields, Swimming Pools, Private Parks, and Playgrounds:</i>	1 space per 100 sq. ft. GFA of indoor facilities plus 1 space per 4 persons design capacity of outdoor facilities, including both participants and spectators, as applicable.
<i>Tennis Courts and Other Sports Courts:</i>	2 spaces per court.
Arts, Entertainment, and Recreations	
<i>Arena:</i>	- .33 spaces per seat.
<i>Baseball Stadium:</i>	- .35 spaces per seat.
<i>Football Stadium:</i>	- .31 spaces per seat.

Parking Use Category	Parking Spaces*
Arts, Entertainment, and Recreations (cont.):	
<i>Theater (live performances):</i>	- .40 spaces per seat.
<i>All Other Public Assembly:</i>	- .25 spaces per person in permitted capacity.
<i>Convention Centers, Meeting/Banquet Facilities, not within a hotel or in a hotel, but exceeding 100 sq. ft. per sleeping room:</i>	- up to 25,000 sq. ft. = 30 spaces per 1,000 sq. ft. GFA; plus - 25,000 to 50,000 sq. ft. = 20 spaces per 1,000 sq. ft. GFA; plus - 50,000 and 100,000 sq. ft. = 10 spaces per 1,000 sq. ft. GFA; plus - 100,000 or more sq. ft. = 6 spaces per 1,000 sq. ft. GFA.
Automotive Repair	3 spaces per service bay (service bays not included as parking).
Broadcast and Telecommunication	1 space for each 300 sq. ft. GFA.
Car Wash	2 per wash bay plus 3 stacking spaces per bay.
Civic, Social, and Fraternal Associations:	1 space for each 300 sq. ft. GFA.
Educational Services (based on maximum design capacity)	
<i>Daycare Center or Pre-Elementary:</i>	.3 spaces per person licensed capacity enrollment.
<i>Elementary, Middle Schools:</i>	Higher of .2 spaces per seat in auditorium/gym or .25 spaces per student.
<i>Secondary Schools:</i>	Higher of .3 spaces per seat in auditorium/gym or .3 spaces per student.
<i>College or University:</i>	To be established based on a study of parking needs prepared specifically for the subject institution.
<i>Other Classroom based:</i>	6 spaces per 1,000 sq. ft. GFA;
<i>Other Not Classroom based:</i>	10 spaces per 1,000 sq. ft. GFA.
Finance and Insurance	
<i>General Business Offices:</i>	- up to 25,000 sq. ft. = 3.8 spaces per 1,000 sq. ft. GFA; plus - 25,000 to 100,000 sq. ft. = 3.4 spaces per 1,000 sq. ft. GFA; plus - 100,000 or more sq. ft. = 2.8 spaces per 1,000 sq. ft. GFA.
<i>Consumer Service Offices:</i>	4.6 spaces per 1,000 sq. ft. GFA.
<i>Data Processing, Telemarketing, Operations:</i>	6 spaces per 1,000 sq. ft. GFA.
Food Service	
<i>Restaurant:</i>	10 spaces per 1,000 sq. ft. GFA;
<i>Restaurant bar area:</i>	15 spaces per 1,000 sq. ft. GFA;
<i>Fast Food:</i>	8 spaces per 1,000 sq. ft. GFA;
<i>Take Out and Delivery Only:</i>	3 spaces per 1,000 sq. ft. GFA;
<i>Night Clubs:</i>	15 spaces per 1,000 sq. ft. GFA.
Gas Station	1 space for each side of a gasoline pump unit.
Health Care and Social Assistance	
<i>Medical Offices (not on hospital campus):</i>	4.5 spaces per 1,000 sq. ft. GFA.
<i>Medical Offices (on hospital campus):</i>	4 spaces per 1,000 sq. ft. GFA.

Parking Use Category	Parking Spaces*
Hospitals, Nursing, and Residential Care Facilities	
<i>Hospital/Medical Center:</i>	To be established based on a study of parking needs prepared specifically for the subject institution.
<i>Elderly Housing:</i>	1 space per dwelling unit.
<i>Congregate Care/Assisted Living:</i>	.35 spaces per dwelling unit.
<i>Group, Convalescent, and Nursing Home:</i>	.5 spaces per bed.
Information Services	3 spaces for each 5 employees on largest shift.; or 1 space per 600 sq. ft. GFA.
<i>Cinemas:</i>	- Single screen - 2 to 5 screens - 5 to 10 screens - Over 10 screens
Mining, Utilities, Construction, Manufacturing, Transportation, and Warehousing	3 spaces for each 5 employees on largest shift.; or 1 space per 600 sq. ft. GFA.
<i>Industrial/Manufacturing:</i>	1.85 spaces per 1,000 sq. ft. GFA plus required parking spaces for office, sales, or similar use where those uses exceed 10% GFA.
Mobile Home	2.5 spaces per trailer unit.
Non-Store Retailers	1 space for each 2,000 sq. ft. GFA.
Other Services	1 space for each 250 sq. ft. GFA.
Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administration/Support Services	
<i>General Business Offices:</i>	- up to 25,000 sq. ft. = 3.8 spaces per 1,000 sq. ft. GFA; plus - 25,000 to 100,000 sq. ft. = 3.4 spaces per 1,000 sq. ft. GFA; plus - 100,000 or more sq. ft. = 2.8 spaces per 1,000 sq. ft. GFA.
Public Administration	1 space for each 300 sq. ft. GFA.
Real Estate, Rental, and Leasing	1 space for each 300 sq. ft. GFA.
Religious Organizations	.4 spaces per seat.
Residential Uses	
<i>Single Family Dwellings</i>	- less than 3,000 sq. ft. = 2 spaces per dwelling unit; - more than 3,000 sq. ft. = 3 spaces per dwelling unit
<i>Multi-Family Dwellings Rental:</i>	- 1 space per dwelling unit for efficiency units; - 1.5 spaces per dwelling unit for 1st bedroom in units with 1 or more bedrooms, plus .25 spaces for each additional bedroom.
<i>Multi-Family Dwellings Owned:</i>	- 1.0 spaces per dwelling unit for efficiency units; - 1.75 spaces per dwelling unit for the 1st bedroom in units with 1 or more bedrooms, plus .25 spaces for each additional bedroom.
<i>Rental in University District</i>	1 space per dwelling unit for efficiency and 1 bedroom units; plus .5 spaces for each additional bedroom.

Parking Use Category	Parking Spaces*
Retail Trade	4 spaces per 1,000 sq. ft. GFA.
Shopping Centers	- 6 spaces per 1,000 sq. ft. GFA up to 200,000 sq. ft.; - 5.5 spaces per 1,000 sq. ft. GFA over 200,000 sq. ft.
Transit and Ground Passenger Transportation; Scenic & Sightseeing	1 space per 100 sq. ft. GFA.
Truck Transportation; Warehousing & Storage	1 space for each 1,000 sq. ft. non-office floor area, plus 1 space for each 300 sq. ft. office area.
Vehicle Dealers	1 space for each 5,000 sq. ft. of lot area.
Wholesale Trade	1 space per 2,000 sq. ft. gross floor storage per sales area.

**Staff may approve a 5% deviation from the recommended parking requirements, unless an alternative plan is approved by the Planning and Zoning Commission.*

APPENDIX D

Qualified Tree List

<u>Common name</u>	<u>Botanical name</u>	<u>Class</u>	<u>N/I</u>	<u>Site</u>	<u>Light</u>	<u>Size</u>	<u>Foilage</u>
Bald Cypress	Taxodium distichum	1	N	2, 3	2	1	D
Bur Oak	Quercus macrocarpa	1	N	2	1	1	D
Cedar Elm	Ulmus crassifolia	1	N	2	1	2	D
Drummond Red Maple	Acer rubrum var. drummondii	1	N	2	1	2	D
Eastern Redbud	Cercis canadensis	1	N	2	2	2	D
Live Oak	Quercus virginiana	1	N	2	1	1	SE
Overcup Oak	Quercus lyrata	1	N	2, 3	1	1	D
Pecan	Carya illinoensis	1	N	2	1	1	D
Possumhaw Holly	Ilex decidua	1	N	2	1, 2	3	D
Shumard Red Oak	Quercus shumardii	1	N	2	1	1	D
Southern Magnolia	Magnolia grandiflora	1	N	2	1	1	E
Swamp Chestnut Oak	Quercus michauxii	1	N	2, 3	1	1	D
Sweet-Bay Magnolia	Magnolia virginiana	1	N	2	2	2	E
Wax Myrtle	Myrica cerifera	1	N	2, 3	1	3	E
American Elm	Ulmus americana	2	N	2	1	1	D
American Sycamore	Platanus occidentalis	2	N	2	1	1	D
Anacua/Sandpaper Tree	Ehretia anacua	2	N	2	1	2	E
Arrow-wood Viburnum	Viburnum dentatum	2	N	2	2	3	D
Black Hickory	Carya texana	2	N	2	1, 2	2	D
Black Walnut	Juglans nigra	2	N	2	1, 2	1	D
Blackgum	Nyssa sylvatica	2	N	2, 3	1, 2	3	D
Callery Pear/Braford	Pyrus calleryana	2	I	2	1	3	D
Carolina buckthorn	Rhamnus caroliniana	2	N	2	1, 2	3	D
Chalk Maple	Acer leucoderme	2	N	2	2	2	D
Cherry Laurel	Prunus caroliniana	2	N	2	2	2	E
Chinese Elm	Ulmus parvifolia	2	I	2	1	2	D
Chinquapin Oak	Quercus muhlenbergii	2	N	2	1	1	D
Common Crapemyrtle	Lagerstroemia indica	2	I	2	1	3	D
Common Fig	Ficus carica	2	I	2	1	3	D
Common Persimmon	Diospyros virginiana	2	N	2	1	2	D
Eastern Red Cedar	Juniperus virginiana	2	N	2	1, 2	2	E
Eve's Necklace	Sophora affinis	2	N	1	1	3	D
Green Ash	Fraxinus pennsylvanica	2	N	2, 3	1, 2	1	D
Huisache	Acacia farnesiana	2	N	1	1	3	D
Loblolly Pine	Pinus taeda	2	N	2	1	1	E
Mexican Plum	Prunus mexicana	2	N	1	1	3	D
Nuttall Oak	Quercus nuttallii	2	N	2, 3	1	1	D
Ornamental Holly	Ilex spp.	2	I	2	1, 2	3	E
Paloverde	Parkinsonia aculeata	2	N	1	1	2	D

<u>Common name</u>	<u>Botanical name</u>	<u>Class</u>	<u>N/I</u>	<u>Site</u>	<u>Light</u>	<u>Size</u>	<u>Foliage</u>
Parsley Hawthorn	Crataegus marshallii	2	N	2	2	3	D
Post Oak	Quercus stellata	2	N	2	2	1	D
Red Bay	Persea borbonia	2	N	2	2	2	E
River Birch	Betula nigra	2	N	2, 3	2	2	D
Rough-leaf Dogwood	Cornus drummondii	2	N	1, 2	3	3	D
Rusty Blackhaw Viburnum	Viburnum rufidulum	2	N	2	2	3	D
Sassafras	Sassafras albidum	2	N	2	2	2	D
Scarlet (Red) Buckeye	Aesculus pavia	2	N	2	2	3	D
Shagbark Hickory	Carya ovata	2	N	2	1	1	D
Slash Pine	Pinus elliottii	2	I	2	1	1	E
Snowbell	Styrax americana	2	N	2	1, 2	3	D
Southern Red Oak	Quercus falcata var. pagoda	2	N	2	1	1	D
Sweetgum	Liquidambar styraciflua	2	N	2	1	1	D
Texas Mountain-Laurel	Sophora secundiflora	2	N	1	1	3	E
Texas Persimmon	Diospyros virginiana(male)	2	N	1	1	3	D
Texas Pistache	Pistacia texana	2	N	1	1	3	D
Texas Redbud	Cercis canadensis texensis	2	N	1, 2	2	3	D
Water Hickory	Carya aquatica	2	N	2, 3	1	2	D
Water Oak	Quercus nigra	2	N	2, 3	1	1	D
Western Soapberry	Sapindus drummondii	2	N	2	1	2	D
White Ash	Fraxinus americana	2	N	2	1	1	D
White Oak	Quercus alba	2	N	2	1	1	D
Willow Oak	Quercus phellos	2	N	2, 3	1	1	D
Winged Elm	Ulmus alata	2	N	2	1	2	D
Woollybucket Bumelia	Bumelia lanuginosa	2	N	2	2	2	D
Wright Acacia	Acacia wrightii	2	N	1	1	3	D
Yaupon Holly	Ilex vomitoria	2	N	2	1, 2	3	E
American Elderberry	Sambucus canadensis	3	N	2	2	3	D
American Holly	Ilex opaca	3	N	2	2	2	E
American Hornbeam	Carpinus caroliniana	3	N	2	2	2	D
Black Locust	Robinia pseudoacacia	3	N	2, 3	1	2	D
Black Willow	Salix nigra	3	N	3	1	2	D
Box-Elder Maple	Acer negundo	3	N	2	2	2	D
Camphor-Tree	Cinnamomum camphora	3	I	2	1	2	E
Catalpa	Catalpa bignonioides	3	N	2	1	2	D
Common Pear	Pyrus communis	3	N	2	1	2	D
Eastern Cottonwood	Populus deltoides (male)	3	N	2	1	1	D
Flowering Crabapple	Malus spp.	3	I	2	1	3	D
Hercules-Club Prickly-Ash	Zanthoxylum clava-herculis	3	N	1	1	3	D
Honey-Locust	Gleditsia triacanthos	3	N	2, 3	1	2	D
Japanese Yew	Podocarpus macrophyllus	3	I	2	1	2	E
Japanese Maple	Acer palmatum	3	I	2	2	3	D
Loquat	Eriobotrya japonica	3	I	2	2	3	E
Mesquite	Prosopis glandulosa	3	N	1	1	2	D

<u>Common name</u>	<u>Botanical name</u>	<u>Class</u>	<u>N/I</u>	<u>Site</u>	<u>Light</u>	<u>Size</u>	<u>Foliage</u>
Mexican Buckeye	Ungnadia speciosa	3	N	1	1	3	D
Red Mulberry	Morus rubra	3	N	2	1	2	D
Sugar Hackberry	Celtis laevigata	3	N	2	1, 2	2	D
Vitex	Vitex agnus-castus	3	I	1	1	3	D
Water Tupelo	Nyssa aquatica	3	N	3	2	1	D
Weeping Willow	Salix babylonica	3	I	3	1	2	D
Arborvitae	Thuja spp.	4	I				
Arizona Ash	Fraxinus velutina	4	I				
Berlandier Ash	Fraxinus berlandieriana	4	I				
Chinaberry	Melia azedarach	4	I				
Chinese Pistache	Pistacia chinensis	4	I	2	1	2	D
Chinese Tallow	Sapium sebiferum	4	I				
Eucalyptus	Eucalyptus spp.	4	1	1, 2	1	3	E
Golden-Raintree	Koelreuteria paniculata	4	I	2	1	2	D
Japanese Black Pine	Pinus thunbergi	4	I	2	1	2	E
Mimosa(Silktree)	Albizia julibrissin	4	I				
Mulberry	Morus alba	4	I	2	1	2	D
Siberian Elm	Ulmus pumila	4	I				
Silver Maple	Acer saccharinum	4	I				
Tulip-Tree	Liriodendron tulipifera	4	I	2	1	1	D

Trees are divided into four classes. Class 1 and 2 trees are considered the most valuable in enhancing the environment and are the most likely to prosper in the Friendswood area. Therefore, only Class 1 and 2 trees shall be approved as new plantings for a) city parks and property, and parking lots and; b) for streets or other public right-of-ways, respectively, unless otherwise approved by the City Engineer on the advice of an Urban Forester. Species that are classified as shade trees will reach a height and size that will conflict with overhead powerlines, permanent structures, or the canopy will exceed the limits of a confined space. Species that are classified as small trees will not provide the protection or aesthetic impact of a large shade tree, yet they are suitable for planting beneath powerlines and are good alternatives for areas of limited space.

Class 1: For the most part this class is for trees that are native, will do relatively well in the Friendswood area, have few diseases or pest problems, are easy to find in local nurseries, and with few exceptions (redbud, possumhaw, and waxmyrtle) are larger in size.

Class 2: This class is for trees that are mostly native, will still do well in the Friendswood area, have little disease or pest problems, sometimes not quite as easy to find in nurseries, are more varied in size, and in many cases are more suitable for wildlife. These trees tend to have larger and messier fruit and/or are thornier than trees in Class 1. Some of these trees are also more prone to some decay at maturity and might not do as well in urbanized areas.

Class 3: This class starts to pick up more introduced species, the trees might or might not do as well in the Friendswood area, require a little more maintenance and care, the natives

might be harder to find in a nursery while the introduced species may be more readily available and in some cases these trees are more prone to decay, disease and pest problems.

Class 4: this class is exclusively introduced species. They may or may not do well in Friendswood. If they do grow well they have the potential to become invasive species and cause problems for local ecosystems and are more prone to decay, disease and pest problems. **NOT RECOMMENDED FOR PLANTINGS.**

Classifications:

- N – Native
- I – Introduced

Site:

- 1 – Xerophytic (requires little water)
- 2 – Mesic (requires moderate water with good drainage)
- 3 – Aquatic (tolerates poor drainage once established 3 years)

Light:

- 1 – Full Sun (requires a minimum of 6 hours of direct sunlight)
- 2 – Partial Sun (requires a minimum of 3 to 6 hours of direct sunlight)
- 3 – Shade (requires less than 3 hours of direct sunlight)

NOTE: Lower rating number on this scale is the minimum, but can use the next higher rating (i.e. a rating of 2 can also use the rating of 1, a rating of 3, can also use the ratings of 1 and 2)

Size:

- 1 – 60 feet and greater ultimate height (large shade tree)
- 2 – 30 to 60 feet in ultimate height (medium tree)
- 3 – 30 feet and less in ultimate height (small tree)

Foliage:

- D – Deciduous (sheds leaves annually) If placed on the south and west walls will reduce indoor temperatures in summer by shading the roof and walls. In winter, these trees allow sunlight through to help heat the building.
- E – Evergreen (having green leaves/needles throughout the year) can create a wind break if placed on the northwest side of a building.
- SE – Semi evergreen

For example, the code for Live Oak is 1/N/2/1/1, which indicates that the Live Oak is a Class 1 species that is native to Texas, requires moderate water with good drainage, demands or tolerates full sun, and will exceed 60 feet in ultimate height. As a shade tree, the Live Oak will provide protection and has aesthetic impact but the tree is not suitable for planting beneath powerlines or within confined spaces, or in streets or other public rights-of-way.

APPENDIX E

Downtown District Amenities

Streetscape furnishings, as required by City of Friendswood Code of Ordinances, Appendix C – Zoning Ordinance for the Downtown District, are important functional elements and amenities. They should be of high quality, designed for outdoor use, and require minimal maintenance. All provided amenities shall be permanently maintained by the property owner, including paved walkways.

SEATING

Seating should be durable and comfortable. Sharp edges and poorly designed or fabricated furniture should be avoided. Metal is the required material. The seating design should complement other furnishings. All seating should be secured permanently to paved surfaces for safety and to avoid vandalism. The bench below is the preferred model; however, other benches of similar size and features may be approved by the Planning and Zoning Commission.



Manufacturer: Webcoat Products
Product: Metal benches
Model: B5WBCLASSIC
Size: 5'
Color/finish: Black finish
Aluminum frame w/contoured backs

TREE WELLS

Tree wells are an attractive way to protect trees planted in paved areas. Appropriate tree grates and tree wells should be similar to the following:



TREE GRATES

Manufacture: Neenah Foundry Company
Product: Tree grate
Model: ASTM A-48, Metropolitan Series



TREE WELLS

LIGHT POLES

Lighting plays an important part in the character, function, and security of a streetscape. It should be consistent with other streetscape elements and integrate the historic nature of the Downtown District. Light poles shall be the “Bishop’s Crook” style. The light pole below is the preferred model; however, other light poles of similar size and features may be approved by the Planning and Zoning Commission.

	Manufacturer:	Hadco
	Product:	Aluminum Pole w/Teardrop Fixture
	Color/finish:	Black powder coat
		Lighting must be metal halide or LED with full cutoff or semi cutoff fixtures that emits 7,000 to 8,000 lumen, or the equivalent thereof, and 5,000 to 6,000K (Kelvin – color temperature).

Lamp height maximum shall be 12’. Lamp height minimum shall be 10’. Lamp shall be positioned towards the rights-of-way to illuminate the public walkway.

Lamp height is the actual lamp height above ground measured at the bottom of the lamp fixture, where the globe or bulb begins.

TRASH RECEPTACLES

Trash receptacles should be easily accessible for pedestrians and trash collection. They must be placed to be unobtrusive yet effective and their design should relate to other site furnishings. Trash receptacles should be firmly attached to paving to avoid vandalism. They should include covered tops and sealed bottoms to keep contents dry and out of sight at all times. Appropriate trash receptacles should be similar to the following:

	Manufacturer:	Victor Stanley, Inc.
	Product:	Trash receptacle
	Model:	Steelsites RB series
	Color/finish:	Black finish TGIC polyester powder coat

PAVERS

Brick pavers must be used to construct the required brick-paved sidewalk in accordance with the specifications below. The paver color and pattern below is the preferred design; however, other pavers of similar colors and patterns may be approved by the Planning and Zoning Commission.

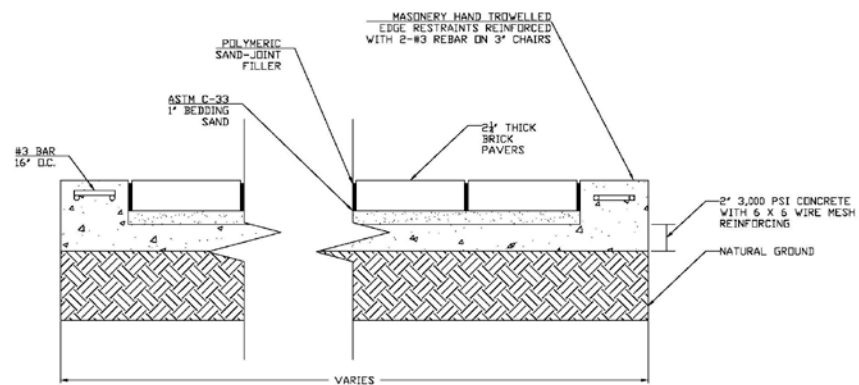
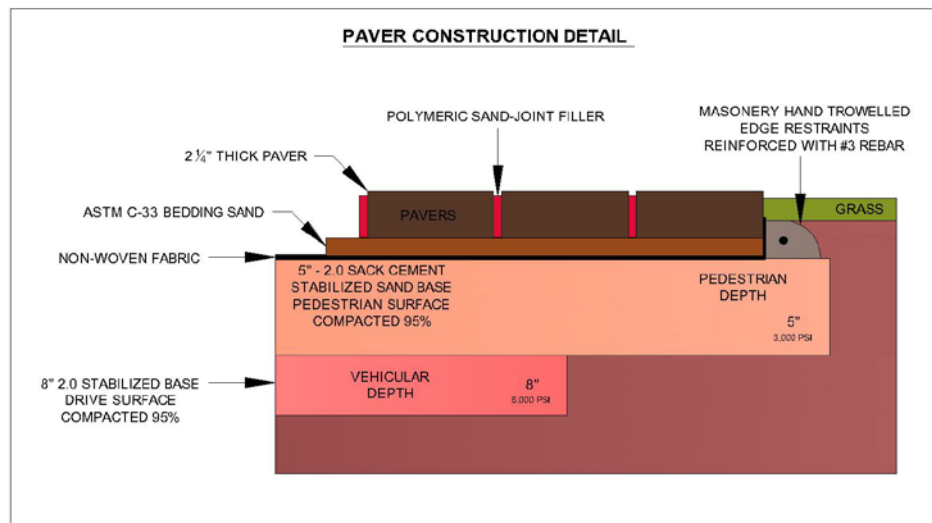
	Manufacturer:	Pine Hall Brick Company, Inc.
	Product:	Pavers
	Model:	Pathway Series, Full Range
	Size:	4" W x 8" L x 2 ¼" thick
	Color:	Red
	Pattern:	Stretcher Bond

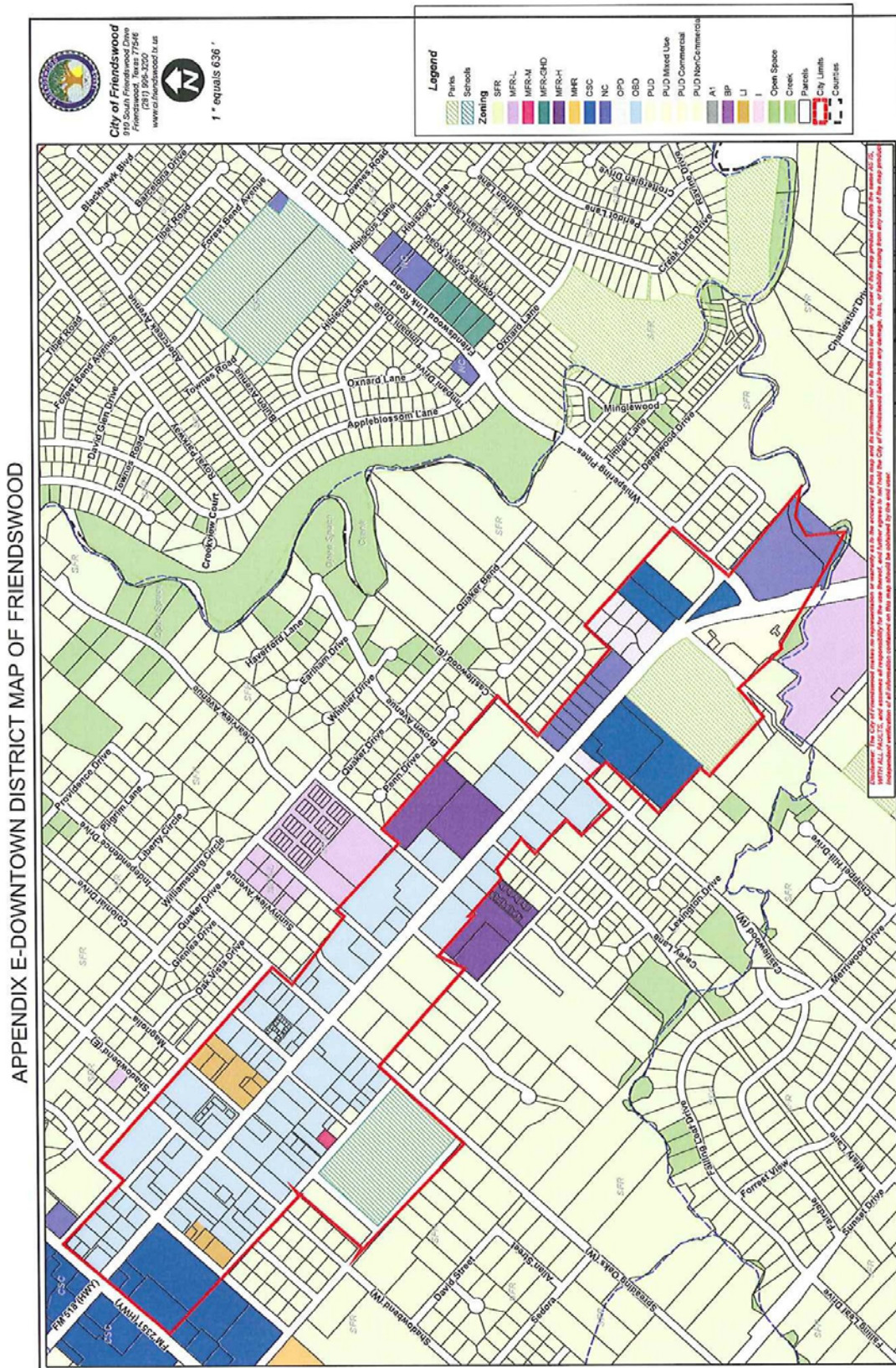
Brick pavers must be set on a sand base with a concrete border as stated below and shown on the attached construction detail drawing. No concrete or stamped concrete is allowed for the sidewalk surface.

Paver installation specs:

- 5" of 2.0 sack cement stabilized sand base
- Non-woven fabric weed block
- 1" of ASTM C-33 bedding sand
- 2 ¼" thick brick unit paver
- Polymeric joint sand
- Masonry hand troweled edge restraints reinforced with #3 rebar

If the pavers are a part of a drive surface for vehicular traffic, an 8" 2.0 stabilized base drive surface, compacted 95% must be installed below the 5" of 2.0 sack cement stabilized sand base.





APPENDIX F

Culverts and Driveways Policy

The purpose of this policy is to establish guidelines, procedures, and standard practices regarding installation, maintenance, and repair of culverts and driveways in new and old subdivisions with open ditches.

I. REPLACEMENT OF DRIVEWAY/CULVERTS DUE TO REPAIRS

- A. If a failure occurs on an existing paved driveway located within the City rights-of-way due to a defect in the existing public infrastructure (i.e., leaking or broken water or sanitary sewer line, failure in storm sewer, culvert failure, etc.) the City will remove the damaged pavement, repair or replace the damaged infrastructure, and replace the pavement up to the rights-of-way line at no cost to the property owner.
- B. If a failure occurs on an existing paved driveway located within the City rights-of-way due to age, wear, or subsidence, and the public infrastructure is found to be in good condition, the property owner shall be responsible for the removal and replacement of the driveway, such replacement being accomplished according to the Ordinances, Design Criteria, Standard Details, and Technical Specifications of the City. In addition, the property owner shall be responsible for any damages that may occur to existing public infrastructure, including the culverts, during the construction process. The property owner shall obtain a building permit from the City for the driveway replacement and shall call in for inspections as needed.
- C. If the driveway to be replaced is on an open ditch street, the culverts may be replaced with the same size as existing with no drainage calculations required, unless:
 - i. They are smaller than the 18" minimum requirements, or
 - ii. The whole drainage ditch is being enclosed (see paragraph III).
- D. When new culverts are installed and concrete paving is being replaced, construction joints shall be installed as shown in Detail A.

II. PROPOSED DRIVEWAY CONSTRUCTION/CULVERT INSTALLATION

- A. When a property owner chooses to make improvements to an existing driveway, the property owner is responsible for removing and replacing the culverts as well as the existing paving.

- B. When a property owner chooses to construct a new driveway, the property owner shall install the proper driveway culverts and new pavement.
- C. All work shall be completed in accordance with the City of Friendswood Technical Specifications and Standard Details, latest edition.
- D. When new culverts are installed and concrete paving is being installed, construction joints shall be installed as shown in Detail A.

III. PROPOSED CULVERT INSTALLATION FOR THE PURPOSE OF ENCLOSING OPEN DITCHES FRONTING RESIDENTIAL PROPERTY.

A. Development Permit:

- i. An approved City of Friendswood Development Permit shall be required prior to installation of residential storm sewer (unless the storm sewer is being installed as part of a new residential building, in which case it shall fall underneath the building permit). Development permits shall only be valid for 1 year.
- ii. A plan drawing shall be submitted with the Development Permit Application. The plan shall be drawn to a 1" = 20' scale.
- iii. Pipe diameters, pipe flow lines, inlet flow lines, and inlet rim elevations shall be shown on the drawings.
- iv. All residential storm sewer projects shall extend from property line to property line.
- v. A Traffic Control Plan shall be provided if any of the proposed work involves obstruction of traffic or lane closures of City streets.
- vi. All residential storm sewers shall be made of Reinforced Concrete Pipe (RCP) Class III, with a minimum 18" diameter, and shall be designed for the purpose intended.
- vii. Alternate sizes and styles may be used as long as they meter the same square inch area of the required pipe size, and is approved by the City Engineer.

B. Installation:

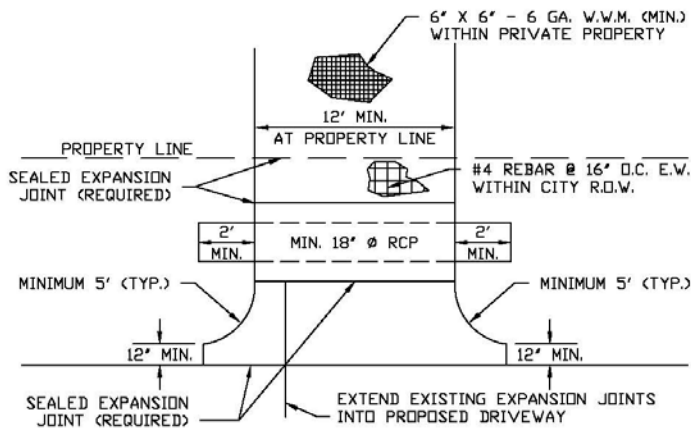
- i. Storm sewer inlets shall be located no farther than 15 feet from the property line.
- ii. Storm sewer inlets shall be no farther than 30 feet from center to center.

- iii. Only Type “A” Inlet (Detail B) or Type “S” Inlet (Detail C) shall be used.
- iv. Inlet and junction box size and design shall be approved by the City Engineer.
- v. High points shall be located halfway between inlets with mild swales (see Detail D).
- vi. Elevations on inlet rims shall be a minimum of 3 inches lower than the surrounding high points (see Detail D).
- vii. All storm sewer projects are subject to inspections by City of Friendswood personnel before they are covered up. Such inspections may require changes or corrections to all or part of the culvert installations during any phase of the work. All inspections shall be called into the Building Division at (281) 996-3201 a minimum of 24 hours prior to inspections.
- viii. Contractor shall have a means to determine flows on site (i.e., laser level, level, etc.).
- ix. All storm sewers shall receive a final inspection and approval by City of Friendswood personnel upon completion. Any deficiencies noted shall be completed within 30 days of such notice.
- x. The City of Friendswood reserves the right to adjust or remove all or part of the storm sewer at any time for any reason.
- xi. All work shall be completed in accordance with the latest revisions of this Design Criteria Manual, City of Friendswood Technical Specifications, and City of Friendswood Standard Detail; which can be found online at:

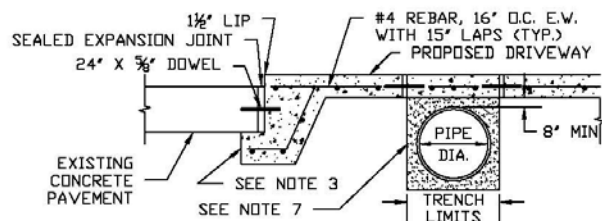
www.ci.friendswood.tx.us.com/publications

IV. ACKNOWLEDGEMENT

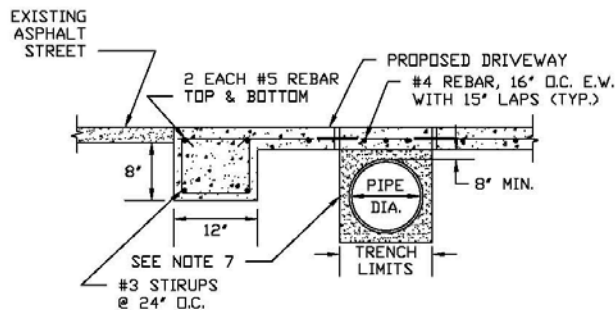
By signing the permit application, the applicant acknowledges they have received and fully understand the requirements pertaining to the installation of residential storm sewers.



PLAN - ALL STREETS



PROFILE - CONCRETE STREETS



PROFILE - ASPHALT STREETS

NOTES:

1. EXPANSION JOINT ON CONCRETE STREETS SHALL BE NOMINAL REDWOOD OR ASPHALTIC EXPANSION JOINT MATERIAL WITH 1" PULL-OF STRIP TO BE FILLED WITH APPROVED JOINT SEALANT.
2. 1 1/2' LIP (CONCRETE STREETS ONLY) SHALL NOT BE REQUIRED ON STREETS WITH 4' X 12' MOUNTABLE CURB.
3. CONCRETE PAVEMENT HEADERS SHALL BE BUILT IN ACCORDANCE WITH CITY OF FRIENDSWOOD PAVING DETAILS.
4. CONNECTION TO EXISTING ASPHALT STREETS SHALL BE MADE BY BLOCKING NEW CONCRETE WITH EDGE OF PAVEMENT. A 8" DEEP BY 12" WIDE BEAM SHALL BE PLACED ALONG THE EDGE OF THE ASPHALT PAVEMENT. NO EXPANSION JOINT MATERIAL REQUIRED BETWEEN EXISTING ASPHALT STREET AND NEW CONCRETE DRIVEWAY.
5. DAMAGE TO EXISTING STREETS, WHETHER ASPHALT OR CONCRETE, SHALL BE REPAIRED AT CONTRACTORS EXPENSE.
6. ALL CONCRETE SHALL BE CLASS 'A', 3,000 PSI AT TWENTY-EIGHT DAYS.
7. USE MATERIAL AND DIMENSION AS SPECIFIED IN STORM SEWER DETAILS FOR TRENCH WIDTHS AND BACKFILL.
8. NO MORE THAN ONE (1) DRIVEWAY ON LOTS WITH LESS THAN 120' OF FRONTAGE.
9. 24" X 3/4" DOWELS SHALL BE EMBEDDED A MINIMUM OF 12" INTO EXISTING CONCRETE ROADWAY. DOWELS TO BE INSTALLED AT 12' O.C.



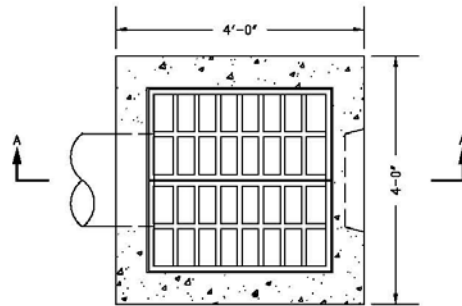
**RESIDENTIAL CONCRETE DRIVEWAY
(OPEN DITCH STREETS)**

DEPARTMENT OF PUBLIC WORKS

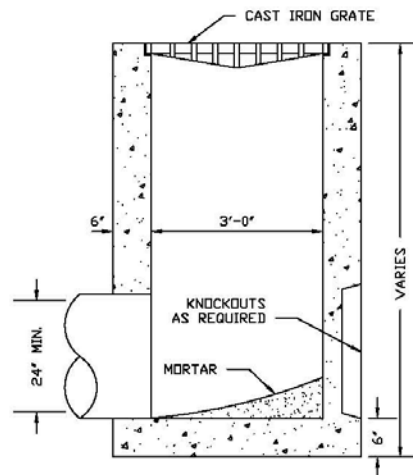
DRAWN: 12/09

SCALE: N.T.S.

DRAWING: B.S. #11



PLAN



SECTION A-A

TYPE "A" INLET

NOTES:

1. USE #4 REBAR IN 12" D.C.E.W.
2. CONCRETE SHALL BE CLASS "A" WITH A TWENTY-EIGHT DAY COMPRESSIVE STRENGTH OF 4,000 PSI.
3. GRATES SHALL BE CAST IRON.



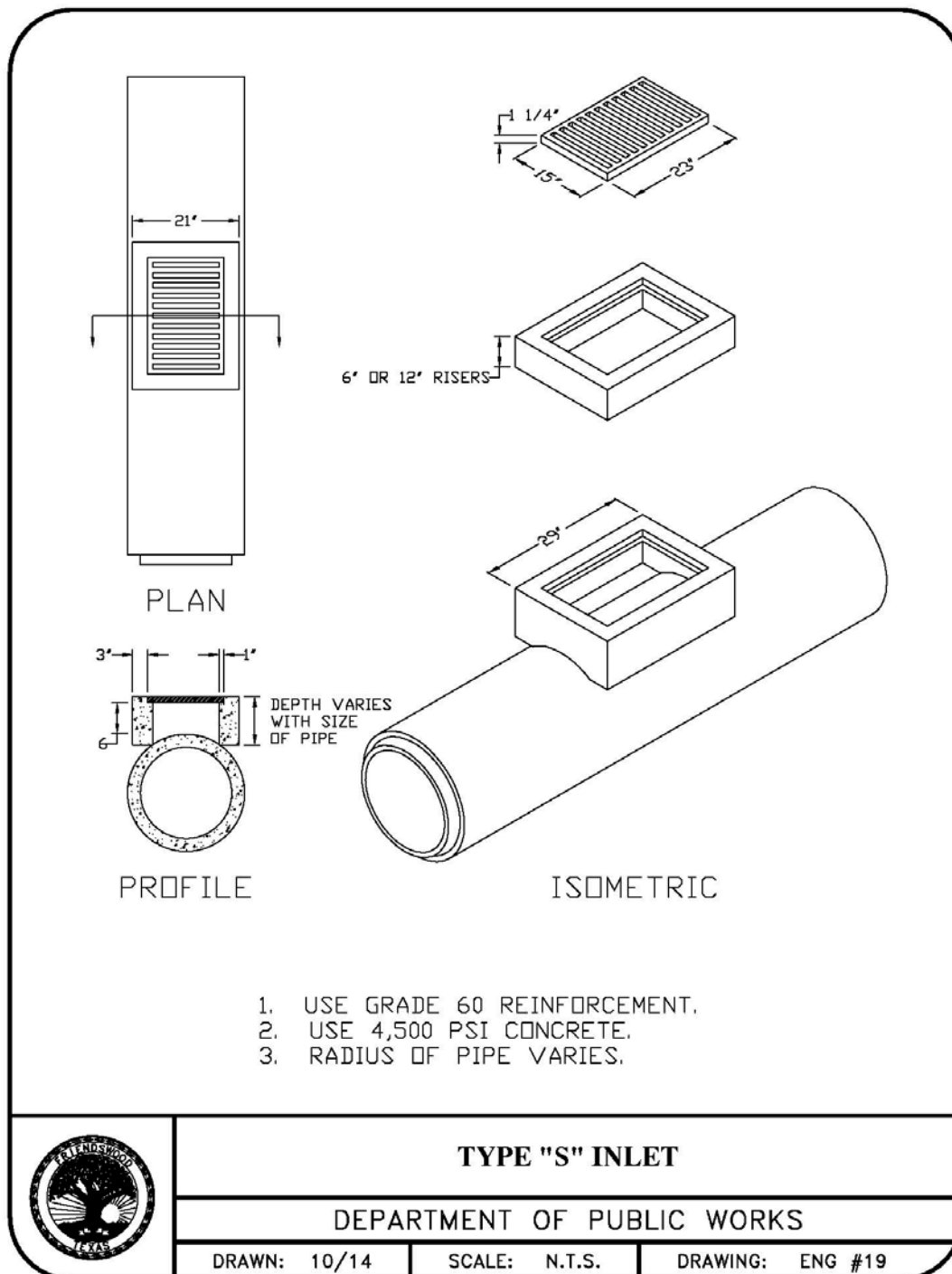
TYPE "A" INLET

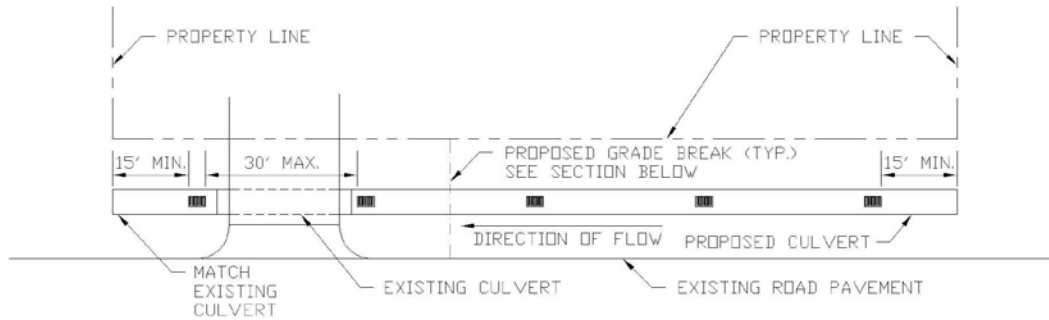
DEPARTMENT OF PUBLIC WORKS

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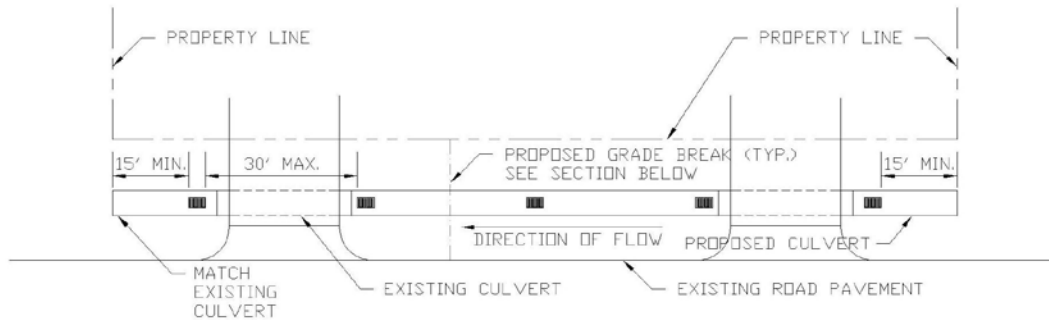
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DRAWING: B.S. #14

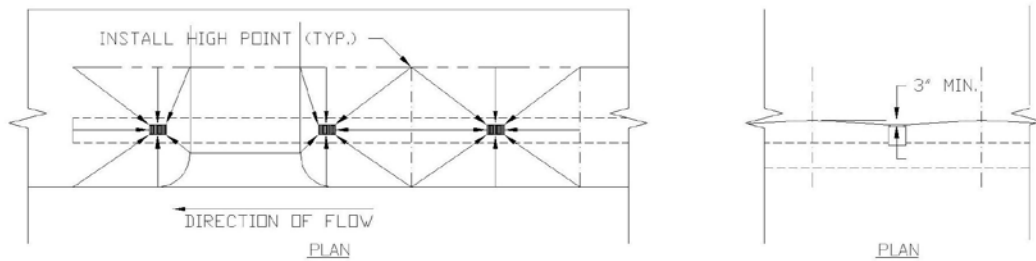




PLAN VIEW FOR SINGLE DRIVEWAY



PLAN VIEW FOR DOUBLE DRIVEWAY



DRAINAGE GRADING



**REQUIREMENTS FOR FILLING IN ROADSIDE
DITCHES IN RESIDENTIAL AREAS**

DEPARTMENT OF PUBLIC WORKS

DRAWN: 10/16

SCALE: N.T.S.

DRAWING: ENG #21

APPENDIX G

Traffic Control Sign Policy

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PURPOSE

This policy establishes consistent procedures for addressing traffic-related concerns that may occasionally arise along roadways within or nearby residential areas in the city. Traffic concerns specifically addressed in this policy include the following:

- No Parking/Parking Zone Requests
- Cut Through Traffic Mitigation Requests
- Pedestrian Treatment Requests
- School Zone Safety Requests
- Speed Control Requests
- Intersection Control Requests (Multi-way Stops, Traffic Signals, and Roundabouts)
- “Children at Play” Sign Requests
- Other Advisory or Advanced Warning Sign Requests
- Other Public Safety and Traffic Issue Requests

Other traffic concerns not specifically addressed in this policy may be presented to staff for review by any citizen, Homeowners Association (HOA) business, or group. The Engineering staff will work with those parties to review their situation and formulate an appropriate response as necessary.

In accordance with the City of Friendswood Code of Ordinances Chapter 82 – Traffic and Vehicles and further stated in Ordinance 300, the Traffic Engineer or their designee, will be responsible for all traffic investigations in the City of Friendswood.

SCOPE

The City of Friendswood is committed to improving the quality of life within its City. When a request is made to review a traffic concern, the City’s direct efforts are to work and coordinate with the requesting party in understanding and addressing concerns in a defined area. The Engineering Division of the Department of Public Works (hereafter called “Engineering”) will inform the affected residents of any significant changes. This policy is applicable only to non-state routes.

The adoption of this policy is not intended and should not be construed to affect or waive the City’s immunity from damages under the Texas Tort Claims Act (CPRC Chapter 101) or any other law or ordinance. This policy does not require the City to install, remove, or modify any traffic control device, sign, signal, or warning device if the City has, in the absence of this policy, the discretion under State law to install, remove, or modify the traffic control device, sign, signal, or warning device. All investigations for traffic concerns and signage shall be investigated and warranted in compliance as outlined in the Texas Manual on Uniform Traffic Control Devices (TMUTCD), latest edition.

TERMS

City Traffic Director – The Duties of the City Traffic Director will be encompassed by the City Engineer. The City Manager will retain the final approval/disapproval authority over all decisions of the City Traffic Director.

Engineering Judgment – The evaluation of available pertinent information, and application of appropriate principles, provisions, and practices as contained in the TMUTCD (see below) and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, licensed to practice engineering in the State of Texas, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgement is not required.

HOA – Homeowners Association approved, recognized, and incorporated by law.

Ordinance 300 – The City of Friendswood Ordinance 300 grants the power to the City Traffic Director the authority to determine installation and proper timing and maintenance of traffic control devices, to conduct engineering analyses of traffic accidents to devise remedial measures, to conduct engineering investigations of traffic conditions, to plan the operation of traffic on the streets and highways of the City of Friendswood, and to cooperate with other officials in the development of ways and means to improve traffic conditions, and to carry out the additional powers and duties imposed by the ordinances of this City.

ROW – Right(s)-of-way, the area between property lines given the legal right by usage or grant, for traffic or pedestrian travel.

TMUTCD – Texas Manual on Uniform Traffic Control Devices. The TMUTCD is the authoritative manual on installation, implementation, and maintenance of all types of traffic control devices, both permanent and temporary, for the State of Texas.

Traffic Committee – The Traffic Committee is composed of employees of the City of Friendswood representing the Police Department, the Fire Marshal's Office, Department of Public Works Administration, and Public Works Engineering Division.

Traffic Study – A traffic study is the procedures and other investigations as described in the TMUTCD to determine if a warrant is necessary for a traffic concern.

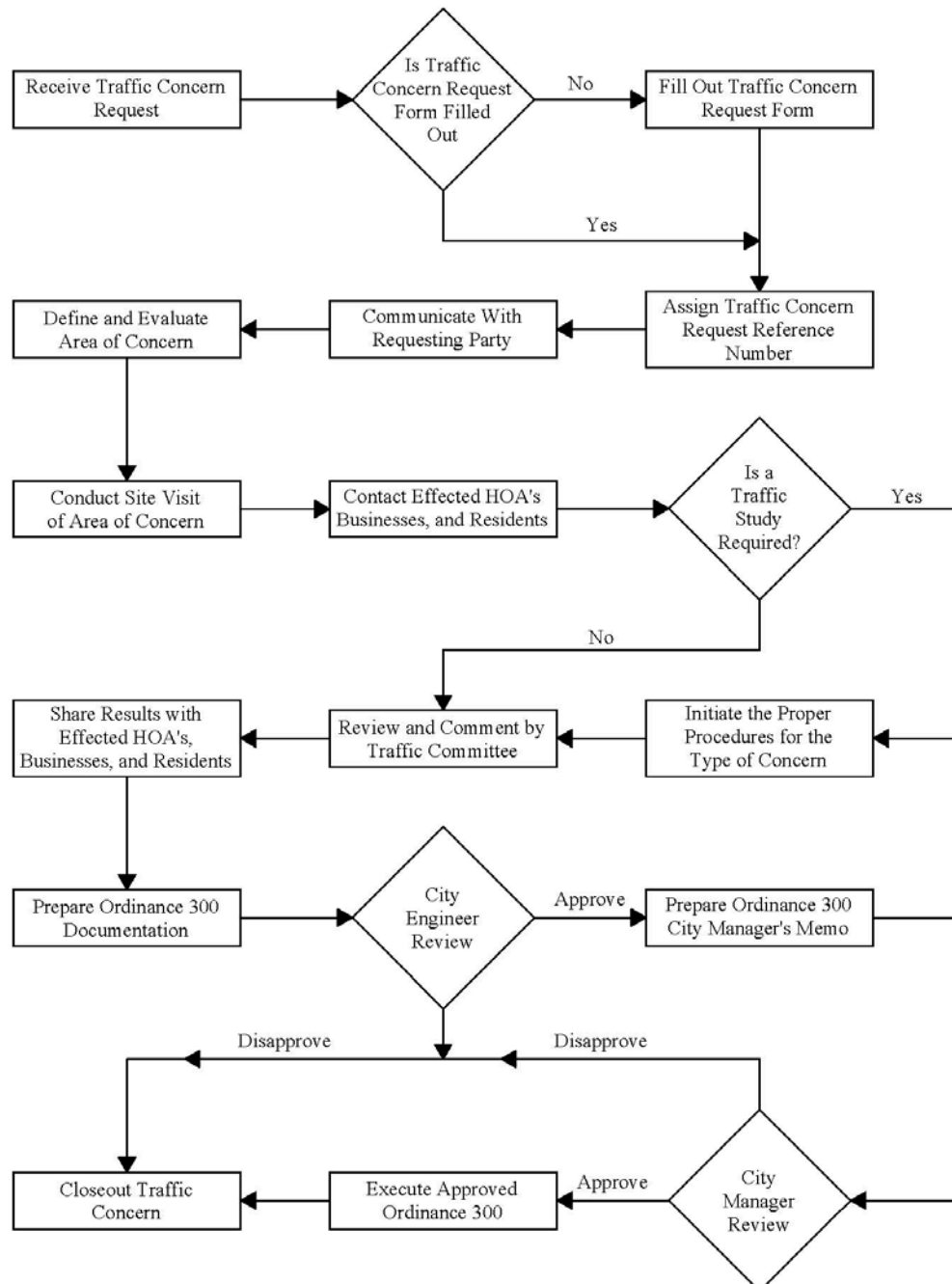
Warrant – a warrant describes the threshold condition based upon average or normal conditions that, if found to be satisfied as part of an engineering study, shall result in analysis of other traffic conditions or factors to determine whether a traffic control device or improvement is justified. Warrants are not a substitute for engineering judgement. The fact that a warrant for a particular traffic control devices is met is not conclusive justification for the installation of the device.

PROCEDURES

1. Residents, homeowners associations, or similar type groups may make a written request to Engineering requesting that a traffic concern be addressed. Traffic Concern request forms may be obtained from the City of Friendswood Engineering or downloaded at www.friendswood.com/publications.
2. The requesting party's issue will be entered in the Public Works Traffic database to search for similar requests in the subject area.
3. Staff will communicate with the requesting party to fully understand their request and thoroughly define the area of concern.
4. Engineering will identify the area of concern and define the area affected.
5. Engineering staff will evaluate the request, collect data if necessary to confirm the magnitude of the problem, and determine if further study is necessary.
6. If the Engineering staff determines that further study is necessary, procedures to address the specific traffic issue will be implemented. These procedures are detailed in the following portion of this policy, "Specific Traffic Concerns."
7. Should changes be warranted, Engineering will share the proposed changes with the impacted residents before any improvements are implemented.

A flow chart that graphically illustrates the above listed procedures is illustrated on the following page.

Traffic Concern Request Flow Chart



SPECIFIC TRAFFIC CONCERNS

Specific types of traffic requests in the City of Friendswood are addressed in this section of the policy.

No Parking/Parking Zone Implementation Requests

As with all requests to review traffic concerns in the City of Friendswood, requests for “No Parking”/“Parking” zone implementation will be addressed with the same measures outlined in the *Procedures* section of this policy.

- Engineering and the originator of the request will define a study area for property owners that may be impacted by a proposed “No Parking”/“Parking” zone.
- An engineering study will determine if a “No Parking”/“Parking” zone is appropriate for the requested area for twenty-four (24) hours per day or for specific days and/or time periods.
- In order to implement a “No Parking”/“Parking” zone, 100% of the property owners that are projected to be affected adjacent to their property must agree in writing to the “No Parking”/“Parking” zone implementation. The requestor will be required to obtain signatures from the owners.
- If deemed appropriate by an engineering study and agreed to by the property owners that will be affected adjacent to their property, “No Parking”/“Parking” signs will be posted by the entire street, block, or logical termination point as determined by Engineering. Other advisory or advanced warning signs will be placed as dictated by sound common engineering practices or the Texas Manual on Uniform Traffic Control devices, latest edition.
- All “No-Parking”/“Parking” zone applications shall be thoroughly reviewed by Engineering after a period of two (2) full years from the date of implementation. The “No-Parking”/“Parking” zone shall remain in effect unless a compelling safety reason is discovered.

As with all requests to review traffic concerns in the City of Friendswood, should the implementation of a “No Parking”/“Parking” zone in the study area be warranted, Traffic Engineering and Operations will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning no parking/parking zones is included in the **Attachment A** under the title *No Parking and Parking Zones*.

No Parking/“Parking” Zone Removal Requests

As with all requests to review traffic concerns in the City of Friendswood, requests for “No Parking”/“Parking” zone removal will be addressed with the same measures outlined in the *Procedures* section of this policy.

- An engineering study will determine if the removal of a “No Parking”/“Parking” zone is appropriate for the requested area. If appropriate, “No Parking”/“Parking” signs will be removed by the entire street, block, or logical termination point as determined by Engineering and the requesting party. Other advisory or advanced warning signs will be placed, or removed, as dictated by sound common engineering practice or the Texas Manual on Uniform Traffic Control devices, latest edition.

As with all requests to review traffic concerns in the City of Friendswood, should the removal of a “No Parking”/“Parking” zone in the study area be warranted, Engineering will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning no parking/parking zones is included in the **Attachment A** under the title *No Parking and Parking Zones*.

Commercial Truck Cut-Through Traffic Mitigation Requests:

As with all requests to review traffic concerns in the City of Friendswood, requests for commercial truck cut-through traffic mitigation control will be addressed with the same measures outlined in the *Procedures* section of this policy.

- An engineering study will determine the measures that are appropriate to address the specific commercial truck cut-through traffic mitigation concerns that may exist for the given the study area. In order to be considered a candidate for measures to reduce commercial truck cut-through traffic, a roadway must be a local roadway or a minor collector roadway with residential characteristics with a peak hour volume of over 375 vehicles in one direction with over 40% cut-through vehicles.
- To implement a plan which limits commercial truck cut-through traffic, 100% of the affected property owners must sign a petition as implemented through these policy guidelines.

As with all requests to review traffic concerns in the City of Friendswood, should changes to the study area to control commercial truck cut-through traffic in the study area be warranted, Engineering will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning commercial truck cut-through traffic is included in the **Attachment B** under the title *Commercial Truck Cut-Through Traffic Mitigation*.

Pedestrian Facility Requests:

As with all other requests to review traffic issues in the City of Friendswood, requests for pedestrian improvements will be addressed with the same measures outlined in the *Procedures* section of this policy.

- Engineering will study the requested location and perform a crosswalk analysis which includes volume of pedestrian traffic, proximity of the subject location to schools, parks, swimming pools, retail centers, hike and bike facilities, vehicular traffic volume, etc.
- The placement of a crosswalk at an uncontrolled intersection or in the middle of a block shall be considered only in rare cases. In general, the placement of a crosswalk at an uncontrolled intersection may create a false sense of security for pedestrians that could increase the likelihood of a vehicle-pedestrian incident.

As with all other requests to review traffic issues in the City of Friendswood, should pedestrian improvements be warranted, Engineering will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning pedestrian facilities is included in the **Attachment C** under the titles *Pedestrian Safety*, *Pedestrian Signals*, and *Installation of Marked Crosswalks*.

School Zone Safety Requests.

As with all other requests to review traffic issues in the City of Friendswood, requests for school zone safety will be addressed with the same measures outlined in the *Procedures* section of this policy. School zone safety requests encompass a broad range of requests in the vicinity of a school. Common requests in the City of Friendswood are addressed specifically below. Other requests will be addressed on a case per case basis.

- The traffic policy is not intended to replace or alter the existing provisions and ordinances established by the City of Friendswood.
- Reduced speed school zones are areas in which the speed limit is reduced for certain periods of the day that may be requested by individual citizens, communities, or schools. A traffic engineering study will determine if a reduced speed school zone is warranted based on the proximity of the roadway to the school, the type of school (elementary, junior high, senior high, etc.), vehicular volumes, pedestrian volumes, vehicular speeds, availability of sidewalks, alternative routes between the school residential areas served by the school, and other factors.
- Requests for a crosswalk in the vicinity of a school will be treated with the same procedures as outlined in the “Pedestrian Facility Requests” section of this policy. Proximity to schools and type of vehicular control are major factors in the consideration of crosswalks.
- Parking restrictions in the vicinity of a school will be treated with the same procedures as outlined in the “No Parking Zone Implementation” section of this policy. Proximity of schools is a major factor in the consideration of parking restrictions.
- No right-turn on red at signalized intersections in a school zone is a means to reduce the likelihood of conflicts between right-turn vehicles and school aged children in crosswalks. If appropriate, a traffic engineering study will determine the need for no right-turn on red restrictions based on vehicular volumes, pedestrian volumes, traffic signal timing, and other factors.
- The Texas Manual of Uniform Traffic Control Devices (latest edition) does not require the installation of flashing beacons to alert motorists to school zones. The City of Friendswood will consider the installation of school flashing beacons on arterial and collector roadways, but not on local streets.

As with all other requests to review traffic issues in the City of Friendswood, should changes to the conditions within a school zone be warranted, Traffic Engineering and Operations will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning school zone safety is included in the **Attachment D** under the titles *School Zones* and *School Traffic Safety*

Speed Control Requests.

As with all other requests to review traffic issues in the City of Friendswood, requests for speed control will be addressed with the same measures outlined in the *Procedures* section of this policy.

- Engineering will maintain a database of locations at which excessive vehicular speeds have been reported that will be shared with the Police Department for enforcement purposes.
- The Texas Manual of Uniform Traffic Control Devices (latest edition) states that a speed limit should be posted within 5 mph of the 85th percentile speed of the free-flowing traffic. Engineering Judgement is the overriding determination for all speed limit postings.
- The following alternatives are available to address speed control requests.
 - The Neighborhood Speed Watch Program is a public awareness program through which concerned citizens can take an active role in making neighborhood streets safer by observing and recording traffic speeds in their neighborhood. Additional information and application forms to participate in the Neighborhood Speed Watch Program may be obtained from Traffic Engineering and Operations, the Appendix of this policy, or downloaded at www.friendswood.com.
 - A speed feedback sign may be installed to alert motorists to their actual speed and the posted speed limit on a roadway. Additional information concerning the speed feedback sign is included in the Appendix of this policy.
 - A speed study may be conducted at the site. The speed study will determine the 85th percentile speed and consider other issues in the site vicinity including pedestrian traffic volume, roadway curvature, the frequency of traffic accidents, sight distance restrictions, and other issues specific to the study site. The speed study may determine that the posted speed limit at the study site is too low/high and may recommend that the posted speed be adjusted to within 5 mph of the 85th percentile speed.

As with all other requests to review traffic issues in the City of Friendswood, should changes to the speed control in the study area be warranted, Traffic Engineering and Operations will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning speed control is included in the **Attachment E** under the title *Speed Limits*.

Intersection Control Requests (Multi-way Stops, Traffic Signals, and Roundabouts):

As with all other requests to review traffic issues in the City of Friendswood, requests for intersection control will be addressed with the same measures outlined in the *Procedures* section of this policy.

- Multi-way stop signs or traffic signals shall not be installed within the corporate City limits of the City of Friendswood unless approved by an authorized warrant analysis and by the City Traffic Engineer.
- Multi-way stops and traffic signals are warranted based on vehicular traffic volumes, pedestrian traffic volumes, vehicular speeds, traffic accident data, and other traffic data in accordance with guidelines defined in the Texas Manual of Uniform Traffic Control Devices (TMUTCD).
- According to the TMUTCD, “regulatory and warning signs should be used conservatively because these signs, if used to excess, tend to lose their effectiveness.” If confirmed by a traffic engineering study, existing multi-way stop locations that are not warranted will be removed by the City of Friendswood.
- According to the TMUTCD, stop signs or traffic signals shall not be installed for the purpose of controlling the speed of a roadway as they have been shown to become a hazard at times when installed without warrant.
- Implementation of multi-way stop signs, traffic signal, and roundabouts will be in accordance with necessary budget considerations.

As with all other requests to review traffic issues in the City of Friendswood, should changes to the intersection control in the study area be warranted, Traffic Engineering and Operations will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

Additional information concerning intersection control is included in the **Attachment F** under the titles *Stop Signs*, *Signal Installation*, and *Roundabouts*.

“Children at Play” and “Deaf Child Area” Sign Requests:

“Children at Play” and “Deaf Child Area” signs are not recognized by the State of Texas or by the Federal Highway Administration as official traffic control devices. These signs may create a false sense of security for parents of children and typically do not achieve the desired safety benefits.

The city does not recommend installing “Children at Play” signs within its boundaries. Existing “Children at Play” signs will be removed by the city that have previously been placed without proper authorization and are not in compliance with this sign policy.

“Deaf Child Area” signs may only be installed in school zones if deaf children attend the school. If installed, these signs will be removed when the deaf child no longer attends the school.

Additional information concerning children at play signs and deaf child area signs is included in the **Attachment G** under the title *Children at Play Signs*.

Other Advisory or Advanced Warning Sign Requests:

As with all other requests to review traffic issues in the City of Friendswood, requests for advisory or advanced warning signs will be addressed with the same measures outlined in the *Procedures* section of this policy.

- Traffic Engineering and Operations will study the requested location and perform an advisory/advanced warning sign analysis which includes volume of pedestrian traffic, proximity of the subject location to schools, parks, swimming pools, retail centers, hike and bike facilities, vehicular traffic volume, etc.
- The requesting party will be informed that it is City policy to only install advisory or advanced warning signs that are in accordance with the Texas Manual on Uniform Traffic Control devices, latest edition.

Other Public Safety and Traffic Issue Requests:

Other requests to review traffic issues in the City of Friendswood will be addressed with the same measures outlined in the *Procedures* section of this policy.

Traffic Engineering and Operations will share the proposed changes with the impacted residents before any modifications or improvements are implemented.

ATTACHMENT A No Parking and Parking Zones

Parking Zones:

Commercial Zones are designated for commercial vehicles to load and unload merchandise for up to 20 minutes. Yellow zones are usually found in commercial areas for the use of adjacent commercial areas.



Green Zones are used for limited term parking, usually 20 minutes as indicated on a sign. In any limited parking you can receive a citation if you exceed the maximum limit by 1 minute or more. To avoid a citation, you must vacate the parking space within the time limit specified and let other members of the public use these high demand spaces.



Red Zones indicate no parking at any time and are reserved for fire and emergency vehicles. Any other vehicle parked or encroaching on or in the red zone is considered a violation of the parking restriction and may receive a ticket and/or be towed.



Blue Zones are reserved parking spaces for vehicles used by disabled persons and displaying the appropriate disabled parking placard or license plate.



Where is it illegal to park?

- No Parking Zones marked by No Parking, No Stopping, or No Standing signs.
- In front of a private or public driveway.
- In front of or within 15 feet of a Fire Hydrant.
- Within marked or unmarked crosswalks. An unmarked crosswalk is considered to be an extension of sidewalk boundary lines across a street or driveway.
- On sidewalks.
- In public rights-of-way for the purpose of advertising or selling without proper authorization.
- In handicapped parking spaces without a legally obtained handicap placard or license plate.
- Where a vehicle will obstruct or block a handicapped parking space.
- Within 30' on the approach to a flashing signal, stop sign, yield sign, or traffic control signal located at the side of the roadway.
- Within 3' of a handicap access ramp.
- In stripped loading zones next to handicapped parking spaces.
- Straddling the markings or lines designating a parking stall.
- Along the curb return within 10' of an intersection.
- Within marked hatched no parking areas.
- Within 15' of the entrance to a fire or ambulance station.
- Within 500' of fire trucks or emergency equipment when these are stopped answering a fire alarm or emergency call.
- Other areas as designated in the Texas State Transportation Code section 545.302 which restricts parking even if no signs are posted.

Parking areas for persons with disabilities

Parking areas for persons with disabilities, also known as handicapped parking spaces are established for the exclusive use of vehicles transporting persons with disabilities. Any vehicle parked in a marked handicapped space or tow away zone parking space that does not display a placard or license plate with the international symbol of access can be given a ticket, towed, and impounded. Handicap spaces can be established on public or private property if the property owner and the City Engineer determine the need for such space/spaces.



A citizen with a valid handicap placard or license plate is allowed to park in a regular metered space without paying provided there are no other restrictions by signage. For example: *No Parking 7 – 9 AM or 4 – 6 PM*. However no one can park at meters in commercial loading/unloading zones unless they possess and have visibly displayed in the vehicle a commercial loading/unloading parking permit.

How close to the curb must I park?

All vehicles parking parallel to the curb must park within 18 inches. All vehicles parking at an angle must have 1 front tire within 6 inches of the curb. All parallel parking must have passenger side to curb, unless parked on a one-way street.

What is the maximum length of time I can park my vehicle on the street without moving it?

- Passenger vehicles cannot be parked on public streets for more than 48 hours.
- Trailer/Semi-Trailer cannot be parked on a public street for more than 2 hours.

ATTACHMENT B

Commercial Truck Cut-Through

Truck cut-through traffic trying to avoid congestion on major streets is a growing concern to city residents. Local and residential streets were not typically designed to carry high volume or heavy loaded through traffic. This unnecessary through traffic generates noise, air pollution, and creates other issues, including safety, for residents. Some trucks also try to park on narrow residential streets, which also causes concerns for the residents and emergency vehicles.

Residents concerned with high volumes of truck traffic traveling through, or parking in, their neighborhood have several remedies available. The City will evaluate the specific problems of your street and implement the most effective solution if the conditions warrant action.

Definitions of “Commercial Vehicle” and “Commercial Truck”

A commercial vehicle can be defined as any vehicle that is used and maintained for commercial purposes. A commercial truck is a commercial vehicle with more than 2 axles.

Cut-Through Traffic

Cut-through traffic can be defined as commercial vehicles passing through a neighborhood without at least 1 trip end (origin or destination) in that neighborhood. Cut-through traffic causes unwanted noise, dust, pollution, and safety issues for residents. Cut-traffic can be passenger vehicles, commercial vehicles, and/or commercial trucks. A cut-through commercial vehicle or truck is one that passes through a street/neighborhood without a scheduled stop in that neighborhood.

In additions to pollution and safety issues, cut-through commercial traffic cause pavement deterioration of the neighborhood roads since most neighborhood roads are not designed for heavy commercial traffic.

Cut-through traffic is also defined as motorized vehicles cutting through a parking lot and/or business to avoid heavy traffic or traffic control devices such as Stop/Yield Signs or traffic signals.

Possible Solutions

If your neighborhood has a high volume of cut-through traffic, you can request a traffic study by filling out the Traffic Concern form and sending it to the Engineering Division. Upon receiving a completed request form, the Engineering Division will make an initial determination of the need for a study as in outlined in the procedures of this policy. Counteractive measures such as signage and enforcement, or traffic calming measures may be instituted.

Parking in Residential Neighborhoods

Residential neighborhoods, which are in close proximity to busy commercial areas with limited parking facilities or near a truck parking facility/compound, may find unwanted vehicles parked in the neighborhood. Commercial Vehicles cannot be parked on a public street overnight and trailer/semi-trailer cannot be parked on a public street for more than 2 hours.



ATTACHMENT C **Pedestrian Facilities**

I. PEDESTRIAN SAFETY

The need for Pedestrian Safety:

Whether for school, work, or recreation, most of us walk every day. However, some people have to walk as their primary means of transportation or choose to walk to improve their health. Whatever our reasons may be for walking, pedestrians have a legitimate right to walk without feeling unsafe or uncomfortable. Since most of our roads were designed for vehicular traffic, we need to improve walkability in our communities and make them safer for walking.

Typical Issues with Pedestrian Safety

The first step in improving pedestrian safety involves identifying the problem. Residents can help identify the pedestrian safety concerns in their neighborhoods. The following lists some of the typical problems associated with pedestrian safety and can be used as a guide in identifying problems in a neighborhood.

Poor or Inadequate Walking Facilities

- Existing sidewalks and trails are insufficient and do not connect to schools, parks, churches, etc. Dirt paths or desire lines show that more sidewalks or paths are needed.
- Existing sidewalks are not wide enough for people to walk comfortably or pass each other.
- Sidewalk surfaces are uneven, broken, or covered with debris.
- Sidewalks and paths are blocked by barriers such as vehicles, trash cans, vegetation, utility poles, mail boxes, benches, or other obstructions.
- There is not enough space between the sidewalk and the roadway to make pedestrians feel comfortable.
- The intersections are wide and crossing distances are long. Turning radii at the intersections allow cars to turn at higher speeds.
- Bicyclists riding on the sidewalk (possibly because they do not feel safe in the street) cause conflicts with people walking.

Unsafe Driver Behaviors or Traffic Characteristics

- Drivers do not stop or yield to pedestrians crossing the roadway.
- Drivers drive too fast through neighborhoods, around schools, or near other places where people are walking.
- Drivers take short cuts through neighborhoods to avoid traffic on major roads.
- Red light or stop sign runners endanger pedestrians and bicyclists.
- Drivers pass other vehicles stopped at crosswalks for pedestrians or pass stopped school

buses.

- Drivers are more distracted than ever by cell phones, electronic media, passengers, and other activities.

Unsafe Pedestrian Behaviors

- Pedestrians do not look both ways before crossing the street.
- Pedestrians attempt to cross the street when traffic is approaching.
- Pedestrians cross against pedestrian signals.
- Pedestrians crossing midblock where there are no crosswalks.
- Pedestrians, like drivers, can be distracted by cell phones and other electronic devices.

Typical Solutions

Once the problem or problems have been identified, the next step is developing an appropriate solution. Pedestrian transportation improvements or potential solutions for pedestrian safety are described in terms of the “Four E’s”:

1. **Engineering** – Physical changes to infrastructure (i.e., sidewalks, traffic signals, signs, etc.) that affect the operation and movement of traffic and pedestrians.
2. **Education** – Includes strategies that aim to educate pedestrians, drivers, or other groups in order to motivate a change in behavior.
3. **Enforcement** – Community-based or law-agency-based measures to enforce laws and regulations related to pedestrians.
4. **Encouragement** – Efforts to promote walking and increase the level of walking in a community.

II. Pedestrian Crosswalks

Crosswalks

A crosswalk is typically defined as a designated portion of the roadway that pedestrians use to cross the street. A crosswalk may be marked or unmarked. There is no legal difference between marked and unmarked crosswalks at controlled intersections (those with stop signs or traffic signals). However, marked crosswalks at mid-block locations provide a designated and legal crossing zone for pedestrians.

1. Unmarked Crosswalks – most every intersection is considered to represent a crosswalk, even if it is not marked as such. An unmarked crosswalk is basically the extension of a sidewalk that extends across intersecting roads.
2. Marked Crosswalks – are those crosswalks marked with pavement markings,

usually 12' wide white pavement markings on 6' centers, either plain, perpendicular crosshatched, or 45 degree crosshatched.

3. Enhancements – are traffic control devices or signals that enhance and aids the safe movement of pedestrian traffic in the roadways.



Benefits of Marked Crosswalks

Marked crosswalks guide pedestrians to a proper crossing location and alert motorists of a pedestrian crossing point. However, at uncontrolled locations, marked crosswalks may create a false sense of security for pedestrians resulting in a greater number of pedestrian crashes (if additional safety treatments are not provided).

City Policy on Marked Crosswalks

The City's current policy is to install marked crosswalks at controlled intersections where there is a demonstrated need. Crosswalks are also marked at established school crossings. At other locations, an engineering study must be conducted to ensure that marked crosswalks are installed only where there is significant pedestrian activity and/or based on engineering judgment. The need for, and potential use of, a proposed crossing varies with each location, each should be considered individually, and with an effort to maintain consistency in the decision making process. Approval of marked intersection on state highways, or an intersection of a state highway and city road, within the City Limits shall be coordinated with TxDOT.

Categories of Marked Crosswalks

Marked crosswalk locations fit into 1 of 3 categories:

1. Marked crosswalks are **Standard** on signalized approaches at intersections.
2. Marked crosswalks alone (without other enhancements or treatments) are **Permitted** on roadways with posted or 85th percentile speeds less than or equal to 35 mph, if recommended as part of an engineering study and approved by the City Engineer.
3. Marked crosswalks with enhancements or active devices are installed on roadways with posted or 85th percentile speeds greater than 35 mph, if recommended as part of an engineering study and approved by the City Engineer. Such enhancements might include traffic calming features (i.e. median refuge

islands, curb extensions, narrowed travel lanes, traffic diverters, chicanes), illumination, or enhanced devices (i.e. advance signage), or active devices (i.e. pedestrian-activated signals).

III. Pedestrian Signals

Why do some traffic signals have push button and signal indications for pedestrians and others do not?

Pedestrian signals are primarily installed for 2 reasons:

1. A high volume of pedestrian traffic present; or
2. The green time given for vehicles in a particular direction is not sufficient for pedestrians to cross the roadway in that direction.

When signal indications for vehicles are easy to see and provide plenty of green time for pedestrians to cross safely, push buttons and pedestrian signal indications are often not needed. Push buttons are sometimes provided at intersections where the signal timing is typically controlled by the volume of vehicular traffic. If traffic volumes are low at these intersections, pedestrians will not have enough time to cross the street without push buttons. If pedestrian crossing times were factored into every signal cycle, many intersections would become inefficient and delay vehicles more than necessary. The use of pedestrian push button allows extra time to be provided only when a pedestrian is present.

What do pedestrian signals mean, and why isn't there enough time to cross the street during the walk indication on a pedestrian signal?

The City has in use the pedestrian signals that indicate illuminated symbols of a walking person and an upraised hand, along with a countdown timer of how many seconds of time until the pedestrian signal indicates "Do Not Cross". The signals are timed for an average walking distance of 4 feet per second.

- The steadily illuminated upraised hand indication means that a person should not enter the roadway in the direction of the signal.
- The walk symbol (the white colored walking person) means that a pedestrian may start crossing the road toward the signal.
- The flashing orange upraised hand means you can continue to cross, but there is not adequate time to begin crossing. The purpose of the flashing indication is to keep pedestrians from entering an intersection too late and to let pedestrians already in an intersection know that their time to finish crossing is becoming shorter, which is now indicated by the countdown timer.

Will pushing the pedestrian walk button several times make the signal change faster?

No, the walk button will send a message to the controller requesting a walk indication be granted to the requested direction in the next available signal cycle. Continuously pressing the pedestrian button does not send additional messages to the controller since the controller has already acknowledged the pressing of the walk button with the first push.

Why do vehicles keep turning even when the pedestrian signal indicates that pedestrians have the right to cross?

Pedestrian signals assign the right-of-way for pedestrians to cross the street. However, since right turns on red are allowed, some drivers may make right turns without yielding to pedestrians or do not see the pedestrian signals. This is why it is important to always be cautious when crossing busy intersections. The following suggestions are offered in the interest of safety:

- Always cross intersections defensively.
- When crossing the street, regardless of the availability of signals, cross as quickly as possible. Minimize your time in the roadway.
- Always watch for turning vehicles. You have the legal right to be there, but that does not protect you from the carelessness of some motorists.
- Whether marked or unmarked, or signalized **ALWAYS** look both ways before crossing the roadway.

ATTACHMENT D **School Traffic Safety**

School Traffic Safety Statistics

On average, each year 23 school-age children die in school related traffic accidents in the United States. Out of these, 6 are occupants of school transportation and 17 are pedestrians. Based on these statistics, the City would like to stress the importance of pedestrian safety around schools and school buses. However, pedestrian safety is not solely dependent upon the pedestrians themselves but is very much dependent upon the driving practices of motorists near and around schools and school buses.

I. AROUND SCHOOLS

Pedestrian Safety Tips for Children

Most people, and especially young children, cannot judge the speed, distance, and size of oncoming vehicles. Parents should walk the route to school (or other destinations) with children and point out safe and unsafe practices. This includes locations where children may go to catch a bus.

- At a traffic signal, the green light or walk signal (the white walking person) means that children should stop at the curb or edge of the road, look both ways for oncoming traffic, and then if it is safe, cross the street. Having the walk indication or green light does not guarantee that cars will stop. Pedestrians must always look for oncoming and turning traffic even when they have the right of way.
- Before crossing the street, children may want to wait for a “fresh green light.” This means that they wait for the next new walk indication if the “don’t walk” indication (upright orange hand) is flashing and the countdown timer is nearing zero. Doing this gives them the most time to cross.
- If children are in the middle of the street and the “don’t walk” indication begins flashing, they should not stop or return to the curb or edge, but continue on to walk at their maximum comfortable pace until they reach the other side. They should not run as they might fall.
- And Remember;
 - Children crossing the street should be accompanied by an adult whenever possible.
 - Avoid crossing streets at mid-block, especially when parked vehicles may obstruct vision. Use stop signs, traffic signals, and crossing guards when available.
 - Children should not follow others or run to others when the call until a safe crossing is available.

Vehicle Safety Around Schools

Parents and other adults can do much to improve traffic safety around schools by driving cautiously, teaching children safe practices, and limiting vehicle trips. Drivers should obey all traffic laws and apply the following practices:

- Carpooling can reduce the number of vehicles near the school, especially during inclement weather.
- Avoid parking on the opposite side of the street from the school. When it is necessary, instruct children on how to safely reach the vehicle.
- Make sure that children are careful when opening vehicle doors and that they enter and exit on the curbside of the vehicle. Children should not be allowed to cross in the middle of the block to reach the vehicle.
- Drivers should not double park or block traffic. Waiting or parking in red zones is also not allowed.
- Do not block buses or use areas designated for buses only. If an emergency vehicle requires access, the area should be cleared.
- Never leave a vehicle unattended in a loading zone.
- Do not park in a crosswalk or pass a stopped vehicle allowing pedestrians to cross.
- Do not violate the law by using the excuse “I will just be here a minute” when picking up or dropping off children. Violations still present a danger and cause congestion during the time of day when it is most important to provide safety for children and avoid congestion.
- Learn the traffic patterns at and near a school to avoid being a disruption.
- Pay attention to children getting in and out of vehicles. Children sometimes forget to use the curb side door and exit suddenly.

Crossing Guards

The City is responsible for the assignment and designation of crossing guards for the schools within the City Limits. Crossing Guards are employees under the Police Department and have the force of law for traffic movements in school zones. Children and motorists should follow their directions when directing traffic and helping children crossing the street.

II. AROUND SCHOOL BUSES

School Bus Safety – Children

When waiting for, riding, and exiting the school bus, children should follow these rules:

Getting on the School Bus

- When waiting for the school bus, stay away from traffic and avoid roughhousing or other behavior that can lead to carelessness. Do not stray into streets, alleys, or private property.

- Line up away from the street or road as the school bus approaches.
- Wait until the bus has stopped and the door opens before stepping into the roadway.
- Use the handrail when stepping onto the bus.

Behavior on the Bus

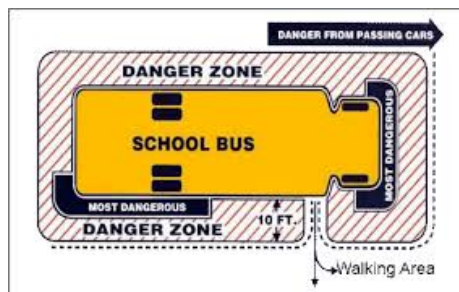
- When on the bus, find a seat and sit down. Loud talking or other noise can distract the bus driver and is not allowed.
- Never put head, arms, or hands out of the window, nor throw anything out of the window.
- Keep aisles clear. Books and bags are tripping hazards and can block the way in an emergency.
- Before you reach your stop, get ready to leave by getting your books and belongings together.
- At your stop, wait for the bus to come to a complete stop before getting up from your seat. Then, walk to the front door and exit using the hand rail.

Getting off the School Bus

- If you have to cross the street in front of the bus, walk at least 10 feet ahead of the bus along the side of the road, until you can turn around and see the bus driver.
- Make sure the bus driver can see you.
- Wait for a signal from the bus driver before beginning to cross.
- When the bus driver signals, walk across the road, keep an eye out for sudden traffic changes.
- Stay away from the bus's rear wheels at all times.

School Bus Safety – Parents

- If possible, accompany children to school bus stop and help them get in and out.
- Teach children to follow common sense practices and **ALWAYS STAY OUT OF THE DANGER ZONE OF THE BUS.**



School Bus Safety - Motorists

- When backing out of a driveway or leaving a garage, always watch out for children walking or bicycling to school.

- When driving in neighborhoods with school zones, watch out for young people who may be thinking about getting to school, but may not be thinking about getting there safely.
- Slow Down! Watch for children walking in the street, especially if there are no sidewalks in the neighborhood.
- Slow down! Watch for children playing in and congregating near bus stops.
- Be Alert! Children arriving late for the bus may dart into the street without looking for traffic.
- Learn to obey the school bus laws. Learn the “flashing signal light system” that school bus drivers use to alert motorists of pending actions:
 - **Yellow Flashing Lights** indicates that the bus is preparing to stop to load or unload children. Motorists should slow down and prepare to stop their vehicles. It also means that the motorist should NOT speed up to pass the bus before the red flashing lights are on.
 - **Red Flashing Lights** and extended stop arms and stop signs indicate that the bus has stopped, and that children are getting on or off. Motorists must adhere to the driving law below and only proceed when the red lights stop flashing and the extended stop sign and bar is withdrawn, and the bus begins moving before they can start driving again.
 - Two Lane roadways, with traffic in both directions, both traffic lanes shall stop.
 - Multi-lane roadways with or without center turn lanes, traffic shall stop in both directions.
 - Roadways divided by raised medians, the traffic traveling in the same directions as the bus shall stop. The traffic in oncoming direction on the other side of the median shall slow and proceed with caution, but it is also suggested that motorist stop for the ultimate safety.

School Zone Signs and Operations

School zones may be installed on streets that border school property line and where students cross a roadway. The signs can be static or include flashers. The flashers are usually installed on roadways with more than 5,000 vehicles per day. The signs conform to the standards and specifications in the Texas Manual on Uniform Traffic Control Devices.



School zone times shall be established and installed according to the following general guidelines:

- **Morning Times** – 45 minutes before start to 15 minutes after the start of school.
- **Midday** – beginning to end of lunch period.
- **Afternoon Times** – 15 minutes before dismissal to 30 minutes after dismissal of school.

These times may be adjusted at each school based on individual campus requirements.

Parking Regulations

In order to promote safe and efficient traffic circulation around a school, it may be necessary to regulate, restrict, or prohibit parking, stopping, or standing adjacent to the school grounds or at an established school crossing. The Department of Public Works will determine if the street needs parking restrictions.

Crosswalk Location and Installation

Crosswalks are located to enhance the utilization of sidewalks, to serve school routes and to define the appropriate crossing area in the street at high pedestrian volume intersections. When reviewing an area for installation of a crosswalk, the proximity to a school is one factor. Other factors include: volume of vehicular and pedestrian traffic, average vehicular speed, visibility available to motorist and pedestrians, type of traffic controls present, width of street to be crossed, and location of adjacent crosswalks.

ATTACHMENT E

Speed Limits

Authority

Speed limits are set by statute by the Texas Transportation Code § 545.352. The statute specifies the following speed limits:

- Streets in Urban Districts – 30 mph
- Alley in Urban Districts – 15 mph
- State or Federal numbered highways outside of Urban Districts – 70 mph. Any other highway outside of the Urban District – 60 mph.

These are known as “prima facie” limits and do not require signs for enforcement. For example, in the absence of any other speed limits sign, the speed limit is 30 mph in residential districts within the City Limits. The City Council may alter the maximum or prima facie speed limits based on an engineering and traffic study on any street or portion thereof within the City. The altered speed limits are posted regulatory speed limit signs (signs with black text on white background) and are considered prima facie (or legal) for enforcement.

Speed Zoning

When an engineering study determines that statutory speed limits are not appropriate for the existing road and traffic conditions, altered speed limits are established using speed zoning. The types of speed zones are:

- **Regulatory Speed Zones** impose a restriction on a particular roadway and indicators of the speed limitations imposed by physical and traffic conditions of the roadway. Regulatory speed limits are posted using regulatory speed limit signs which has black lettering on white background as shown in the Texas Manual on Uniform Traffic Control Devices for Streets and Highways (TMUTCD).
- **Construction Speed Zones** may be regulatory or advisory speed zones through a construction project depending on the importance of speed control in the construction zone. Construction advisory signs are typically black lettering on an orange background.
- **School Speed Zones** are established in accordance with city policy on School Zone Installation and Removal and in accordance with State Law. Maximum speed reduction allowed is 15 mph under the posted speed limit.
- **Advisory or Warning Speeds** are desirable speeds for curves, intersections, or other locations where design standards or physical conditions of the roadway restrict safe operating speeds to value less than the maximum legal speeds or posted regulatory speed limit. Advisory speed signs supplement other warning signs (such as for a curve) and have a black message on a yellow background.

What is the Law?

All drivers are required to obey the posted speed limits. These limits are designed to provide for the orderly flow of traffic under normal driving conditions. During periods of heavy traffic, inclement weather, low visibility, or other poor driving conditions, speed must be adjusted so that accidents will be avoided. In the absence of posted speed limits, prima facie speed limits are in effect. Any speed in excess of the legal speed limit on that roadway will be considered prima facie (or “on the face of it”) evidence that the speed is unreasonable, non-prudent, and unlawful.

How are Speed Limits Established?

Regulatory speed zones are established in accordance with the procedures described in the TxDOT manual “Procedures for Establishing Speed Zones”. Posted speed limits are set by the 85th percentile method, which represents the speed of the majority of drivers will be traveling at or below. Speed checks are conducted to determine the 85th percentile speed. The observed free-flowing speed for vehicles is tallied and the 85th percentile speed is calculated using collected data. To ensure a true reflection of normal traffic situation, speed checks are made on average weekdays during off-peak hours, under favorable weather conditions.

The speed limit is normally set at the nearest value to the 85th percentile speed ending in 5 or 0. The posted speed limit may be adjusted downwards of the 85th percentile speed based on the following factors:

- Roadway pavement width of 20 feet or less.
- Curves and hills.
- Hidden driveways and other developments.
- High number of driveways.
- Crash history.
- School crossings and characteristics of sites that generate traffic.
- Lack of striped, improved shoulders.

Once a speed limit is determined, the speed zone is added to the Ordinance 300 identifying the limits and speed of the speed limit zone. After approval by the City Manager, or their designee, the sign shop is instructed to install the necessary signs at the locations approved and shown in the Ordinance 300 memo.

Speed Limit Misconceptions

Studies have shown that there is no significant change in speeds following the posting of a revised speed limit. This is true whether the speed limit is increased or decreased. Safety is also not improved by establishing unreasonably low speeds limits. Some misconceptions about speed limits include:

- Reducing the speed limit will not slow the speed of traffic;
- Reducing speed limits will necessarily decrease the number of crashes and increase safety;
- Having a posted speed limit is not necessarily safer than an unposted speed limit; and
- Drivers always go 5 to 10 mph over the posted speed limit.

Why Do We Need Speed Limits?

Speed limits which are realistic and reasonable:

- Encourage compliance from a majority of the drivers;
- Give a clear reminder of reasonable and prudent speeds;
- Provide an effective enforcement tool to the police; and
- Encourage drivers to travel at the speed where the risk of crash involvement is the lowest.

Studies have shown crash rates are lowest at around the 85th percentile speed. Drivers traveling significantly faster OR slower than this speed are at greater risk for being in a crash. It is not high speeds alone that relate to crash risk; it is variation of speed within the traffic stream. In fact, on a per mile driven basis, high speed roadways, like interstates, have a lower speed-related fatality rate than low speed roadways because large variations in speed within the traffic stream create more conflicts and passing maneuvers (and opportunities for driver error and collisions).

However, unrealistic speed limits:

- Discourage voluntary compliance;
- Create perception of “speed traps;”
- Cause public antagonism toward the police;
- Create a bad image for a community in the eyes of non-residents; and
- May increase the potential for crashes.

ATTACHMENT F **Intersection Controls**

I. STOP SIGNS

Stop Signs

A STOP sign is a sign used to direct motorists to stop at the spot where the STOP sign is located. STOP signs are a method for controlling traffic at intersections where the normal application of the right-of-way rule is insufficient to ensure safety and provide reasonable compliance with the law. These signs are found on the right side of the roadway (and in some cases in the median to increase visibility). When more than two directions are controlled by STOP signs, then a supplemental ALL WAY plaque shall be used to inform motorists of the type of traffic control that exists at the intersection. If a STOP sign is in its correct location and it cannot be seen very well due to hills or curves, a STOP AHEAD warning sign may be used in advance on the approach to the STOP sign.

Installation Policy

STOP sign installations will be addressed according to the City of Friendswood Sign Policy, current edition. STOP signs at an intersection are installed only upon the approval of the City Engineer and reflected in the Ordinance 300, after a careful investigation has been made of existing conditions. The investigation is conducted using the guidelines for installing STOP signs provided in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

Should STOP Signs Be Used to Control Speeding in Neighborhoods?

This is a question that is frequently asked or requested from citizens concerned about speeding in their neighborhood. Although the City does share the concerns of the citizens about speeding and safety in residential neighborhoods, the installation of STOP signs is not the appropriate way to solve the problem of speeding. STOP signs are traffic control devices intended for assigning rights-of-way, not controlling speed. Traffic calming devices (as stated in the City's Traffic Calming Policy) and police enforcement have been found to be much more effective in controlling speeding.

STOP signs result in speed reduction only near the sign, and drivers tend to speed up between STOP sign controlled intersections to make up for perceived lost time. According to National Engineering Transportation Study, when required to stop by cross street traffic, 5% to 20% of all drivers come to a complete stop, 40% to 60% will come to a rolling stop below 5 mph, and 20% to 40% will pass through at higher speeds.

Often, unjustified STOP signs are ignored by motorists, which can be more dangerous than speeding. Therefore, it is the City's policy not to install STOP signs to control speeding.

Adverse Impacts of Unjustified STOP Signs:

- Unjustified STOP signs cause motorists frustration when they are forced to stop for no

apparent reason. Unwarranted STOP signs result in disrespect for all signs and reduce the effectiveness of STOP signs at other intersections where they are essential for safety.

- Vehicle emissions account for much pollution in the air. These emissions increase when vehicles are accelerated and decelerated. It is important to minimize unnecessary stops since steady speeds increase fuel economy and reduce vehicle emissions. Unwarranted STOP signs increase the number of unnecessary stops and reduce the efficiency of our transportation system which results in increased air pollution.

II. YIELD SIGNS

Yield Signs

At intersections where a full stop is not necessary at all times, consideration should be first given to less restrictive measures such as a YIELD. A YIELD sign is used to assign rights-of-ways on certain approaches to an intersection. Vehicle controlled by a YIELD sign need to slow down to a speed that is reasonable for the existing conditions or stop when necessary to avoid interfering with conflicting traffic.

Installation Policy

YIELD sign installations will be addressed according to the City of Friendswood Sign Policy, current edition. YIELD signs at an intersection are installed only upon the approval of the City Engineer and reflected in the Ordinance 300, after a careful investigation has been made of existing conditions. The investigation is conducted using the guidelines for installing YIELD signs provided in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

III. TRAFFIC SIGNAL INSTALLATION

Purpose

When warranted, properly designed, located, and operated, traffic control signals can provide orderly movement of vehicular and pedestrian traffic, can reduce the frequency and severity of certain types of crashes, and can increase the traffic handling capacity of the intersection. These benefits have perpetuated a common belief that traffic signals provide the solution to all traffic problems at intersections.

However, when unwarranted and improperly designed, traffic signals cause excessive delays, driver frustration, disobedience, overuse of less adequate routes, and increased collisions. This is why the City of Friendswood looks at every intersection being considered for signalization very carefully to determine that a signal is indeed needed.

Signal installation requests, like all other requests for signage, starts with a traffic concern report to the Engineering Division of the Department of Public Works. There will be an initial review and determination as stated in the procedures in the City of Friendswood's Sign Policy. As is true with all warrant justifications, the same is true of Traffic Signals having to meet the analysis and standards in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

Construction, Operation, and Maintenance

Once the signal is approved for placement, plans are created for construction. Depending on the conditions at the intersection, it may require up to two years to recommend design, and construct a traffic signal. Once constructed, the traffic signal is maintained by either Texas Department of Transportation (TxDOT) for signals on highways and Farm-To-Market Roads, Harris County in Harris County or the City in Galveston County. If a traffic signal is malfunctioning, please notify the Police Department.

ATTACHMENT G **Children At Play Signs**

We Have a Lot of Small Children in Our Neighborhood; can we get a “Children at Play” sign?

The City of Friendswood often receives a lot of requests to install signs warning drivers of the possible presence of “Children at Play.” However, these signs may give a false sense of security and have been proven to be ineffective. In residential areas within the City, drivers should expect children to be present. Studies have shown that signs attempting to warn motorists of normal conditions do not achieve the desired safety benefits.

The City of Friendswood does not want to endorse that children can or should be allowed to play safely on or near streets. These signs are not warranted or part of the Texas Manual on Uniform Traffic Devices (TMUTCD). Current Children at Play signs exist in the city in residential areas, but will not be replaced if faded, stolen, or destroyed. However, the City does have in place a process wherein the HOA can petition for these types of signs to be put in their neighborhood in the rights-of-way. These will still need to follow the typical procedures for all other signage with the addition of the following:

- The HOA will have to submit minutes that this was approved at a general HOA meeting with advanced notification relayed to residents of the proposal to install these signs.
- There will need to be a plan establishing the locations of the signs to be installed.
- If approved by the HOA and the Traffic Committee, the HOA would have to purchase the signs, sign bases, and poles and bring them to the Department of Public Works. The Department of Public Works will install the signs at the agreed upon locations that have been approved.
- The signs would have to be added to the insurance policy of the HOA.
- As stated previously, stolen, damaged, or faded signs will not be replaced by the City.



ATTACHMENT H

Speed Bumps, Humps, and Lumps

Speed Bumps, Humps, and Lumps are traffic calming devices that use vertical deflection to slow vehicular traffic in order to improve safety conditions. Although their uses are effective in keeping vehicle speeds down, Engineering Studies have shown that drivers will increase their speed in between vertical speed traffic calming devices to make up for perceived lost time due to slowing down to negotiate the vertical device.

Speed Bumps

Speed Bumps are an abrupt raised area in the pavement surface, effective at controlling speeds on low volume private driveways and parking lots and have the following characteristics:

- Typically they are 3 to 6 inches in height with a travel lane width of 6 to 12 inches.
- Cause significant driver discomfort at typical residential speeds.
- Cause vehicles to slow at 5 mph or less at the bump.
- Considered an increased liability risk on public roads.
- Truck, Emergency Response, cargo, and bus passengers more likely to be affected.
- Maintenance headache.

Speed Humps

Speed Humps are a gradual raised area in the pavement surface and are typically for use in residential and low speed roadways, and have the following characteristics:

- They are typically 3 ½ inches in height with a travel length of 4 to 6 feet.
- Create a gentle rocking motion slowing most vehicles down to 15 to 20 mph, and 25 to 30 mph when properly spaced.
- They are typically painted to identify vertical change in the roadway.
- Need to be properly designed, marked, and signed according to standards in the TMUTCD.
- Effective at controlling speeds without creating accidents or imposing unreasonable or unacceptable safety risks.
- Either permanent bituminous ones or portable ones can be installed; there are pros and cons to each type.
- Can be utilized as a raised crosswalk as well.

Speed Lumps

Speed Lumps are relatively new and have the effect of slowing vehicles down as does a speed hump, but the main problem is that speed humps still cause ALL traffic to slow down. Speed lumps are a hybrid combination of speed bumps and humps. Speed lumps are in a nominal size and placed with a gap between them. This gap is spaced (normally 2 feet) so that emergency

vehicles, such as fire trucks and ambulances, which have a wider wheel base width, can easily transverse the gaps where normal vehicles cannot. Added to the safety issue is that the edges near the gaps are either parabolic or flat.

APPENDIX H

Streetlight Policy

I. SUMMARY:

The goal of this policy is to provide for effective procedures for review, approval, and installation of streetlighting throughout the City of Friendswood. This Policy will enforce requirements specifically targeting areas where existing lighting conditions are deemed to be insufficient for public safety and areas of new residential, commercial, and industrial development.

II. GENERAL:

Streetlight installation is intended as the basis for fixed lighting on all roadways. Careful considerations shall be taken in the making streets and roadways safe during hours of darkness. Certain criteria as shown in the Warranting section of this policy shall be a part of the evaluation process for the need of street lights. Streetlights are to be installed on City owned streets to illuminate the roadway. They are not to be installed on private streets, parking lots, or for security lighting. A street segment shall be in the City Limits in order to be eligible for street lights. All street lights are installed, owned, and maintained by Texas New Mexico Power Company (in Galveston County) or CenterPoint Energy (in Harris County). Once a street light is installed, the City shall pay the monthly operating and maintenance cost of the streetlight.

III. WARRANTING:

The Warranting Process that is used is based on the Transportation Association of Canada (TAC) Guide for Roadway Lighting (27) which was based on the Roadway Lighting Handbook published by the U.S. Department of Transportation. This Streetlight Warrant system is a conditional based and not observed based system. Factors that are taken into consideration are divided into four sections; 1) Geometric, 2) Operational, 3) Environmental, and 4) Collision. Each individual factor is rated from 1 to 5 in accordance with the parameters listed in the warranting worksheet. Each individual factor is weighted as a percentage of the whole, and on a point system of 0 to 100, the warranting condition must achieve a minimum of 60 points to warrant the installation of a streetlight, yet the City Engineer is the final authority of approval for a streetlight.

a. GEOMETRIC SECTION:

There are eight factors that are considered under the Geometric Section of the Streetlight Warrant Process:

- Total number of lanes including center turn lanes.

- Width of the lanes.
- Number of median openings per mile.
- Number of driveways and entrances per mile.
- Horizontal curve radius.
- Vertical grade.
- Sight distance.
- Parking.

b. OPERATIONAL SECTION:

There are five factors that are considered under the Operational Section of the Streetlight Warrant Process:

- Signalized intersections.
- Left turn lanes.
- Median width.
- Posted speed.
- Pedestrian activity.

c. ENVIRONMENTAL SECTION:

There are five factors that are considered under the Environmental Section of the Streetlight Warrant Process:

- Percentage of development adjacent to roadway.
- Area classification
- Distance from development to roadway.
- Ambient lighting.
- Raised median curb.

d. COLLISION SECTION:

There is only one factor in the Collision Section of the Streetlight Warrant Process. This is a Night-to-Day ration of accidents occurring on the street that is being reviewed.

Lighting is warranted where a total point-score of 60 or more is achieved. Lighting of equal scores may be prioritized by also using the different sections in the Warrant Worksheet.

IV. NEW SUBDIVISION INSTALLATION

As per the approved Streetlight Policy for New Development approved by Friendswood City Council Action, the following shall apply:

- a. All subdivision plats shall include a provision for streetlighting using concrete poles.
- b. Streetlights shall be provided at all corners and intersections and, in addition, at two hundred fifty (250) foot intervals along residential streets. Additional lights may be required at the option of the City Engineer.
- c. Each streetlight shall be at least one hundred (100) watts on local and collector streets and two hundred fifty (250) on major thoroughfares.
- d. All necessary easements for streetlighting shall be shown on the final plat prior to final approval by the City of Friendswood and the Planning and Zoning Commission.
- e. The City shall authorize the installation of public streetlights after acceptance of the subdivision by the City for the contractor's one-year maintenance period.

V. PRIVATE SUBDIVISION INSTALLATION

- a. The Developer/Owner may install a private streetlight system in accordance with the standards outlined above, except that ornamental poles other than concrete may be used. Wood poles shall not be used in any new streetlighting system.
- b. The Developer/Owner shall be required to provide for the installation of this private streetlight system and also provide for its perpetual operation and maintenance,
- c. The Final Plat shall indicate that streetlighting is private and this shall also be labeled on all construction plans.

VI. EXISTING SUBDIVISION INSTALLATION

The City's franchise utilities Texas-New Mexico Power (in Galveston County) and CenterPoint Energy (in Harris County) have established programs for installing streetlights in the City. The City will evaluate all requests for streetlights within the guidelines of this policy and the warranting system.

a. STREETLIGHT POLE TYPES

In all cases, any pole to be installed shall match any existing poles already installed inside the subdivision.

- Wooden Poles – lights shall only be installed on existing wooden utility poles served by overhead distribution. The light shall be installed on the existing wooden pole. An additional wooden pole may be installed to

serve a specific need. Other than state previously, no wooden shall be used in areas where the power is distributed underground.

- Concrete Poles – shall be installed on other areas such as commercial/industrial/collector roads within the City Limits.
- Metal Poles – shall be used on all thoroughfare roads inside the City Limits.
- The exception to the above mentioned poles would be the streetlights required in the downtown district by the Design Criteria Manual.

b. STREETLIGHT SPACING AND PATTERN

- All intersections shall have a minimum of one (1) streetlight.
- Undivided roadways less than sixty (60) foot width from back of curb to back of curb shall stagger the streetlighting along both sides of the roadway.
- Undivided roadways greater than sixty (60) foot width from back of curb to back of curb shall pair the streetlighting along both sides of the roadway.
- Divided roadways shall be pair the streetlighting along both sides of the roadway or as an option approved by the City Engineer, substitute one (1) streetlight in the middle of the median/dividing device in lieu of two (2) along both inside lanes of the divided roadway.
- Spacing in rural areas that have large acreage lots may be extended to five hundred (500) foot spacing and staggered along both sides of the roadway.

c. STREETLIGHT COST

The cost of installing new or additional streetlighting would be absorbed by the City of Friendswood, however in the event that there is not available power on the roadway (either overhead or underground), the City would partner with the Homeowners Association or other responsible entity.

- In either case, the City would need to have a letter from the HOA or other entity approving the installation and location of the new streetlight.

- The HOA or other entity approving the installation would be required, if power is not available in the Right-Of-Way of the roadway, to purchase, provide, have surveyed, and recorded all necessary easements for the installation of said pole.

VII. STREETLIGHT REQUEST PROCEDURE

- a. Applicant completes a request form (Exhibit “A”) and submits to the Department of Public Works Engineering Division.
- b. Engineering Division informs approving authority of the request, and steps needed to complete the process.
- c. Engineering Division gathers information for Warranting Worksheet.
- d. Engineering draws Exhibits and forwards information to the City Engineer for review.
- e. After City Engineer Approves, Engineering Division requests that City Manager approve the installation of the streetlight and gives authorization to the appropriate franchise utility to install.
- f. The appropriate franchise utility reviews the streetlight request and conducts the installation (if approved) of the proposed streetlight within a designated time period.
- g. Engineering Division distributes confirmation letter to the applicant and approving authority giving an approximate date of installation.

VIII. LIGHTING PROBLEMS

All streetlights, poles, and wiring remain the property of the franchise utility. If the streetlight is not working properly, or are damaged please contact the appropriate franchise utility.

- a. Galveston County would be Texas New Mexico Power at (281) 996-0453.
- b. Harris County would be CenterPoint Energy at (713) 307-2222.

Please give the franchise utility the pole number (approximately six (6) feet above ground) facing the roadway. If one is not visible, get the address or distance from the nearest intersection.

If tree limbs are blocking the light, please call the Department of Public Works at (281) 996-3380.



City of Friendswood

Engineering Department

15355 Blackhawk Boulevard
Friendswood, Texas 77546

STREETLIGHT REQUEST FORM

(FOR NEW STREETLIGHT INSTALLATION)

NOTE TO APPLICANT:

The City of Friendswood will consider approving the placement of a streetlight in a specific location if certain guidelines, conditions, and warrants are met.

Contact Information (to be completed by applicant)

Name: _____ Email: _____

Phone: _____ FAX: _____

Street Address: _____

City: _____ State: _____ Zip Code: _____

Request Information (to be completed by applicant)

Location of Streetlight Request (i.e. pole #, intersection, address, other): _____

Reason and Nature of Request: _____

Please indicate how you prefer to be notified of the results of your application:

Email _____ Phone _____ FAX _____ Mail _____

Signature of Applicant

Date of Submittal

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/19/2020

Prepared by: Katina Hampton, Director of Administrative Services

Subject: Resolution No. R2020-08: A resolution of the City of Friendswood, Texas, Galveston/Harris Counties, approving capital equipment leasing financing terms for the purchase of an ambulance.

Originating Department: Administrative Services

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

On April 22, 2019, Council approved the purchase of a new ambulance to replace unit 47.

The 2019 - 2020 adopted budget includes the purchase of the replacement vehicle and estimated debt service payments of \$43,900 for the ambulance, with Fire/EMS donations as the funding source for the debt service payments.

The ambulance is scheduled for delivery by the end of February 2020.

Staff requested financing proposals, and a summary of those proposals is included as an attachment.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Paying for the large equipment purchases over a period of time lessen the financial burden for the City.

RECOMMENDATIONS

Government Capital Corporation offered 2.77% interest rate on a 5-year lease financing of the ambulance with annual lease payments of \$44,475.65.

Branch Banking & Trust (now Truist) offered 1.98% interest rate on 5-year lease financing of the ambulance with annual lease payments of \$43,043.16.

Staff recommends that Council accept the financing proposal from BB&T (Truist) for a term of 5 annual payments of \$43,043.16 for the ambulance and authorize the Mayor to sign the financing terms agreement resolution.

ATTACHMENTS

1. R2020-08 FVFD Ambulance Financing Terms
2. Government Finance Capital Lease Proposal

3. BB&T (Truist) Capital Lease Proposal

RESOLUTION NO. R2020-08

**A RESOLUTION OF THE CITY OF FRIENDSWOOD,
TEXAS, GALVESTON/HARRIS COUNTIES, APPROVING
CAPITAL EQUIPMENT LEASING FINANCING TERMS
FOR THE PURCHASE OF AN AMBULANCE.**

* * * * *

WHEREAS, the City of Friendswood, Texas (the “Borrower”) has previously determined to undertake a project for the financing of the purchase of an ambulance (the “Project”), and the finance officer (“Finance Officer”) has now presented a proposal for the financing of such Project.

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD,
STATE OF TEXAS:**

Section 1. That the Borrower hereby determines to finance the Project through Truist Bank (“Lender”) in accordance with the proposal dated February 14, 2020. The amount financed shall not exceed \$203,000.00, the annual interest rate (in the absence of default or change in tax status) shall not exceed 1.98%, and the financing term shall not exceed five (5) years from closing.

Section 2. That all financing contracts and all related documents for the closing of the financing (the “Financing Documents”) shall be consistent with the foregoing terms. All officers and employees of the Borrower are hereby authorized and directed to execute and deliver any Financing Documents, and to take all such further action as they may consider necessary or desirable, to carry out the financing of the Project as contemplated by the proposal and this resolution.

Section 3. That the Finance Officer is hereby authorized and directed to hold executed copies of the Financing Documents until the conditions for the delivery of the Financing Documents have been completed to such officer's satisfaction. The Finance Officer is authorized to approve changes to any Financing Documents previously signed by Borrower officers or employees, provided that such changes shall not substantially alter the intent of such documents or certificates from the intent expressed in the forms executed by such officers. The Financing Documents shall be in such final forms as the Finance Officer shall approve, with the Finance

Officer's release of any Financing Document for delivery constituting conclusive evidence of such officer's final approval of the Document's final form.

Section 4. That the Borrower shall not take or omit to take any action the taking or omission of which shall cause its interest payments on this financing to be includable in the gross income for federal income tax purposes of the registered owners of the interest payment obligations. The Borrower hereby designates its obligations to make principal and interest payments under the Financing Documents as "qualified tax-exempt obligations" for the purpose of Internal Revenue Code Section 265(b)(3).

Section 5. That the Borrower intends that the adoption of this resolution will be a declaration of the Borrower's official intent to reimburse expenditures for the Project that are to be financed from the proceeds of the Lender financing described above. The Borrower intends that funds that have been advanced, or that may be advanced, from the Borrower's general fund or any other Borrower fund related to the Project, for project costs may be reimbursed from the financing proceeds.

Section 6. That all prior actions of Borrower officers in furtherance of the purposes of this resolution are hereby ratified, approved and confirmed. All other resolutions (or parts thereof) in conflict with this resolution are hereby repealed, to the extent of the conflict. This resolution shall take effect immediately.

Passed, approved and adopted this 2nd day of March, 2020.

Mike Foreman
Mayor

Attest:

Melinda Welsh, TRMC
City Secretary



February 14, 2020

Mrs. Katina Hampton
Friendswood City Hall
(281) 996-3221
khampton@ci.friendswood.tx.us

Dear Mrs. Hampton,

Thank you for the opportunity to present proposed financing for Friendswood City Hall. I am submitting for your review the following proposed structure:

ISSUER:	City of Friendswood City Hall, TX	
FINANCING STRUCTURE:	Tax Exempt Structure w/ \$1.00 purchase	
EQUIPMENT COST:	\$ 580,000	
TERM:	5 Annual Payments	7 Annual Payments
INTEREST RATE:	2.77%	2.79%
PAYMENT AMOUNT:	\$ 127,073.28	\$ 93,281.88
PAYMENTS BEGINNING:	One year from signing, annually thereafter	
EQUIPMENT COST:	\$ 203,000	
TERM:	5 Annual Payments	7 Annual Payments
INTEREST RATE:	2.77%	2.79%
PAYMENT AMOUNT:	\$ 44,475.65	\$ 32,648.66
PAYMENTS BEGINNING:	One year from signing, annually thereafter	

Financing for these projects would be simple, fast and easy due to the fact that:

- ✓ We have an existing relationship with you and have your financial statements on file, expediting the process. Please keep in mind we may also need current year statements.
- ✓ We can provide familiar documentation for your legal counsel.

Government Capital is registered with Texas Ethics Commission to be HB 1295 compliant. The above proposal is subject to audit analysis, assumes non-bank qualification and mutually acceptable documentation. The terms outlined herein are subject to change and rates are valid for fourteen (14) days from the date of this proposal. If funding does not occur within this time period, rates will be indexed to markets at such time. The above payment amount includes all applicable fees expressed as 1%. These costs can include documentation fees, legal fees, issuance expenses, etc.

Our finance programs are flexible and my goal is customer delight. If you have any questions regarding other payment terms, frequencies or conditions, please do not hesitate to call.

With Best Regards,

Stephanie Cates

Stephanie Cates
Client Services
CC: Landon Newton
Main: 817-421-5400

The transaction described herein is an arm's length, commercial transaction between you and Government Capital Corporation ("GCC"), in which GCC: (i) is acting solely for its own financial and other interests that may differ from yours; (ii) is not acting as your municipal advisor or financial advisor, and has no fiduciary duty to you with respect to this transaction; and (iii) is not recommending that you take an action with respect to this transaction.



Branch Banking & Trust Company

Governmental Finance
5130 Parkway Plaza Boulevard
Charlotte, North Carolina 28217
Phone (704) 954-1700
Fax (704) 954-1799

February 14, 2020

Ms. Katina Hampton, MBA, CGFO
Director of Administrative Services
City of Friendswood Texas

Via Electronic Mail: KHampton@friendswood.com;

Dear Ms.Hampton:

Truist Bank ("Lender") is pleased to offer this proposal for the financing requested by the City of Friendswood, Texas ("Borrower").

PROJECT:	Lease Purchases for A. Fire Engine B. Ambulance
AMOUNT:	A. \$580,000.00 B. \$203,000.00
TERM:	A. 7 Years B. 5 Years
INTEREST RATE:	A. 2.05% (Fire Truck/7 Years) B. 1.98% (Ambulance/5 Years)
TAX STATUS:	Tax Exempt-BQ
PAYMENTS:	<u>Interest:</u> Annual <u>Principal:</u> Annual
INTEREST RATE CALCULATION:	30/360
SECURITY:	First lien security interest in vehicles and equipment purchased with proceeds
PREPAYMENT TERMS:	Callable in whole at par at any time
RATE EXPIRATION:	3/28/2020
DOCUMENTATION/ LEGAL REVIEW FEE:	\$0

FUNDING: Proceeds will be deposited into an account held at Lender pending disbursement unless equipment is delivered prior to closing.

DOCUMENTATION: Lender proposes to use its standard form financing contracts and related documents for this installment financing. We shall provide a sample of those documents to you should Lender be the successful proposer.

REPORTING

REQUIREMENTS: Lender will require financial statements to be delivered within 270 days after the conclusion of each fiscal year end throughout the term of the financing.

Should we become the successful proposer, we have attached the form of a resolution that your governing board can use to award the financing to Lender. If your board adopts this resolution, then Lender shall not require any further board action prior to closing the transaction.

Lender shall have the right to cancel this offer by notifying the Borrower of its election to do so (whether this offer has previously been accepted by the Borrower) if at any time prior to the closing there is a material adverse change in the Borrower's financial condition, if we discover adverse circumstances of which we are currently unaware, if we are unable to agree on acceptable documentation with the Borrower or if there is a change in law (or proposed change in law) that changes the economic effect of this financing to Lender.

Costs of counsel for the Borrower and any other costs will be the responsibility of the Borrower.

The stated interest rate assumes that the Borrower expects to borrow less than \$10,000,000 in the current calendar year and that the financing will be bank qualified and tax exempt under the Internal Revenue Code. Lender reserves the right to terminate this bid or to negotiate a mutually acceptable interest rate if the financing is not bank qualified and tax exempt.

Truist appreciates the opportunity to offer this financing proposal. Please call me at (704) 954-1706 with your questions and comments. We look forward to hearing from you.

Sincerely,

Truist Bank



Mary Parrish Coley
Senior Vice President

City of Friendswood, Texas
Lease Purchase for Engine Fire Truck
Sample Payment Schedule
Seven (7) Years; Annual Payments in Arrears

Nominal Annual Rate: 2.050%

TValue Amortization Schedule - Normal, 360 Day Year

	Date	Payment	Interest	Principal	Balance
Loan	02/14/2020				580,000.00
2020 Totals		0.00	0.00	0.00	
1	02/14/2021	89,789.25	11,890.00	77,899.25	502,100.75
2021 Totals		89,789.25	11,890.00	77,899.25	
2	02/14/2022	89,789.25	10,293.07	79,496.18	422,604.57
2022 Totals		89,789.25	10,293.07	79,496.18	
3	02/14/2023	89,789.25	8,663.39	81,125.86	341,478.71
2023 Totals		89,789.25	8,663.39	81,125.86	
4	02/14/2024	89,789.25	7,000.31	82,788.94	258,689.77
2024 Totals		89,789.25	7,000.31	82,788.94	
5	02/14/2025	89,789.25	5,303.14	84,486.11	174,203.66
2025 Totals		89,789.25	5,303.14	84,486.11	
6	02/14/2026	89,789.25	3,571.18	86,218.07	87,985.59
2026 Totals		89,789.25	3,571.18	86,218.07	
7	02/14/2027	89,789.25	1,803.66	87,985.59	0.00
2027 Totals		89,789.25	1,803.66	87,985.59	
Grand Totals		628,524.75	48,524.75	580,000.00	

ANNUAL PERCENTAGE RATE	FINANCE CHARGE	Amount Financed	Total of Payments
The cost of your credit as a yearly rate.	The dollar amount the credit will cost you.	The amount of credit provided to you or on your behalf.	The amount you will have paid after you have made all payments as scheduled.

2.050%	\$48,524.75	\$580,000.00	\$628,524.75
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City of Friendswood, Texas
Lease Purchase for Ambulance
Sample Payment Schedule
Five (5) Years; Annual Payments in Arrears

Nominal Annual Rate: 1.980%

TValue Amortization Schedule - Normal, 360 Day Year

	Date	Payment	Interest	Principal	Balance
Loan	02/14/2020				203,000.00
2020 Totals		0.00	0.00	0.00	
1	02/14/2021	43,043.16	4,019.40	39,023.76	163,976.24
2021 Totals		43,043.16	4,019.40	39,023.76	
2	02/14/2022	43,043.16	3,246.73	39,796.43	124,179.81
2022 Totals		43,043.16	3,246.73	39,796.43	
3	02/14/2023	43,043.16	2,458.76	40,584.40	83,595.41
2023 Totals		43,043.16	2,458.76	40,584.40	
4	02/14/2024	43,043.16	1,655.19	41,387.97	42,207.44
2024 Totals		43,043.16	1,655.19	41,387.97	
5	02/14/2025	43,043.16	835.72	42,207.44	0.00
2025 Totals		43,043.16	835.72	42,207.44	
Grand Totals		215,215.80	12,215.80	203,000.00	

ANNUAL PERCENTAGE RATE	FINANCE CHARGE	Amount Financed	Total of Payments
The cost of your credit as a yearly rate.	The dollar amount the credit will cost you.	The amount of credit provided to you or on your behalf.	The amount you will have paid after you have made all payments as scheduled.
1.980%	\$12,215.80	\$203,000.00	\$215,215.80

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/23/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-08: Second and Final reading of an ordinance granting to CenterPoint Energy Resources Corp., DBA CenterPoint Energy Texas Gas Operations, the right, privilege and franchise to construct, install, extend, remove, replace, abandon, operate and maintain its facilities within the public rights-of-way of the City of Friendswood, Texas, for the transportation, delivery, sale and distribution of natural gas; providing for a term of 30 years; containing other provisions relating to the foregoing subject; providing for severability and providing an effective date.

Originating Department: City Attorney

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

Within 7 days after the first reading of this Ordinance, the full text of this ordinance was published in the official newspaper on Wednesday, February 5, 2020, as required by Charter, with CenterPoint paying for publication fees.

The last Gas Franchise expired in 2011 and CenterPoint Energy Resources Corp., dba CenterPoint Energy Texas Gas Operations has continued to pay the City a sum equal to two percent (2%) of the Company's gross receipts for the preceding calendar quarter received by the Company from the sale of gas within the corporate limits of the City plus seven cents per Mcf for natural gas transported by the Company for its Transport Customers during such quarter.

This Ordinance continues to allow the Company to operate and maintain its facilities within the public rights-of-way of the City for a 30 year period, in consideration of payment to the City a sum equal to four percent (4%) of the Company's gross receipts for the preceding calendar quarter received by the Company from the sale of gas within the corporate limits of the City plus seven cents per Mcf for natural gas transported by the Company for its Transport Customers during such quarter.

If this Ordinance is adopted, the annual payment from the Company to the City will change from \$116,080.71 to \$232,843.58, amounting to a total increase of \$116,762.87 a year. The first payment is anticipated to be on or about May 1, 2020.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Adopting this Ordinance will provide for an updated and current Gas Franchise within the City with an increased revenue of four percent (4%) of the Company's gross receipts for the preceding quarter received by the Company for the sale of gas within the City.
For the first year of this new franchise, the City will receive \$232,843.58, which is \$116,762.87 a year greater than the old franchise.

RECOMMENDATIONS

Recommend approval of this Ordinance authorizing a 30 year gas franchise.

ATTACHMENTS

1. Ord 2020-08 CenterPoint Energy Gas

ORDINANCE NO. T2020-08

AN ORDINANCE GRANTING TO CENTERPOINT ENERGY RESOURCES CORP., DBA CENTERPOINT ENERGY TEXAS GAS OPERATIONS, THE RIGHT, PRIVILEGE AND FRANCHISE TO CONSTRUCT, INSTALL, EXTEND, REMOVE, REPLACE, ABANDON, OPERATE AND MAINTAIN ITS FACILITIES WITHIN THE PUBLIC RIGHTS-OF-WAY OF THE CITY OF FRIENDSWOOD, TEXAS, FOR THE TRANSPORTATION, DELIVERY, SALE AND DISTRIBUTION OF NATURAL GAS; PROVIDING FOR A TERM OF 30 YEARS; CONTAINING OTHER PROVISIONS RELATING TO THE FOREGOING SUBJECT; PROVIDING FOR SEVERABILITY AND PROVIDING AN EFFECTIVE DATE.

* * * * *

WHEREAS, the City Council of the City of Friendswood, Texas, finds it is in the best interest of the City of Friendswood (the "City") to enter into a new franchise agreement with CenterPoint Energy Resources Corp., dba CenterPoint Energy Texas Gas Operations ("Company") Company to furnish and supply natural gas to the general public in the City of Friendswood;

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, TEXAS:

Section 1. *Grant of Authority.* Subject to the terms, conditions and provisions of this ordinance, the right, privilege and franchise is hereby granted to CenterPoint Energy Resources Corp., dba CenterPoint Energy Texas Gas Operations, hereinafter called "Company", to construct, install, extend, remove, replace, abandon, operate and maintain its facilities within the Public Rights-of-Way of the City of Friendswood, Texas, for the transportation, delivery, sale and distribution of natural gas within the corporate limits of the City of Friendswood, as the same are now and as the same may from time to time be extended. The right, privilege and franchise granted hereunder is granted subject to the existing City of Friendswood Charter and Ordinances.

Section 2. *Definitions.* The following words, terms and phrases, when used in this ordinance, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

- A. "City" shall mean the City of Friendswood, Texas, a home-rule municipal corporation.
- B. "Company" shall mean CenterPoint Energy Resources Corp., dba CenterPoint Energy Texas Gas Operations, a Delaware Corporation, and shall not mean any of its affiliates and subsidiaries who shall have no right, privilege or franchise granted hereunder.

- C. "Facilities" shall mean pipes, pipelines, natural gas mains, laterals, feeders, regulators, meters, fixtures, connections and attachments and other instrumentalities and appurtenances, used in or incident to providing transportation, distribution, supply and sales of natural gas for heating, lighting, power and any other purposes for which natural gas may now or hereafter be used.
- D. "Public Rights-of-Way" shall mean the areas in, under, upon, over, across, and along any and all of the present and future Streets or streams now or hereafter owned or controlled by City.
- E. "Street" shall mean the surface and the space above and below any public street, road, highway, alley, bridge, sidewalk, or other public place or way.

Section 3. *Term of Franchise.* Upon the filing with the City by the Company of the acceptance required hereunder, this franchise shall be in full force and effect for a term and period of thirty (30) years, unless terminated in accordance with the terms hereof.

Section 4. *Construction and Maintenance of Natural Gas Distribution System.* All Facilities installed by Company shall be of sound material and good quality, and shall be laid so that they will not interfere with the artificial drainage of the City or its underground fixtures, or with navigation in or the natural drainage of any stream. All Facilities shall be installed in accordance with Section 23 and applicable federal and state regulations and, in the absence of such regulations, in accordance with accepted industry practice. Within the Public Rights-of- Way, the location and route of the Facilities by the Company shall be subject to the reasonable and proper regulation, direction and control of the City or the City official to whom such duties have been delegated. Such regulation shall include, but not be limited to, the right to require in writing to the extent provided in Section 14 the relocation of Company's Facilities at Company's cost within the Public Rights-of-Way whenever such relocation shall be reasonably necessary to accommodate public works improvement projects within the Public Rights-of-Way that are being made by or for the benefit of the City, provided such benefit is evidenced by an executed agreement by the City and the entity responsible for the project. Upon request of the City, the Company shall make available at no cost to the City during working hours, maps showing the location of Company's Facilities within the corporate limits of the City.

Section 5. *Streets to be Restored to Good Condition.* The Company and its contractors shall give the City reasonable notice of the dates, location and nature of all work to be performed on its Facilities within the Public Rights-of-Way. Following completion of work in the Public Rights-of-Way, Company shall repair the affected Public Rights-of-Way as soon as possible, but in all cases, Company shall comply with all City ordinances governing time periods and standards relating to excavating in the

Public Rights-of-Way. No street, alley, highway or public place shall be encumbered for a longer period than shall be necessary to execute the work.

Section 6. *Permits.* Company and its contractors shall obtain a permit in accordance with Friendswood City Code Section 26-292, Permits, as it currently exists or as hereinafter amended. Company expressly agrees that the City may rely on the information Company provides regarding its own Facilities in its permit application and Company shall hold the City harmless and indemnify the City in accordance with Section 13 of this Agreement. All work shall be preceded by an 811 call and be subject to the Texas One-Call Statute (Texas Utilities Code, Chapter 251, and any successor statutes). Company shall give the City telephone notice of the initiation of emergency repairs involving breaks in the paved surface of the Public Rights-of- Way, including sidewalks and curbs, as soon as practicable under the circumstances and shall submit a permit promptly following completion of the work. Company and contractors performing work for the Company shall not be required to obtain any permits for relocations of Facilities requested by the City, provided that the relocated Facilities are placed in the location designated by the City and relocation is otherwise in accordance with the City's request to relocate. This Franchise shall constitute a permit to park vehicles in the Streets and other Public Rights-of-Way when necessary for the installation, replacement, abandonment, operation or maintenance of Company's Facilities; provided that such parking does not impair or impede traffic and Company pays for all damages to the Public Rights-of-Way. Company and contractors performing work for Company shall not be required to pay any fee in addition to the franchise fee in order to obtain a permit to perform work on Company's Facilities, or park within the Streets and other Public Rights-of-Way.

Section 7. *Quality of Service.* The service furnished hereunder to the City and its inhabitants shall be in accordance with the quality of service rules of the Railroad Commission of Texas, state and federal regulations. Company shall furnish the grade of service to its customers as provided by its rate schedules and shall maintain its system in reasonable operating condition during the continuance of this Franchise. An exception to this requirement is automatically in effect, but only for so long as is necessary, when caused by a shortage in materials, supplies and equipment beyond the control of the Company as a result of fires, strikes, riots, storms, floods and other casualties, governmental regulations, limitations and restrictions as to the use and availability of materials, supplies and equipment and as to the use of the services, and unforeseeable and unusual demands for service. In any of such events, the Company shall do all things reasonably within its power to restore normal service as quickly as practicable.

Section 8. *Payment to the City.* In consideration of the rights and privileges herein granted, the

administration of the Franchise by the City, the temporary interference with the use of Public Rights-of-Way and cost and obligations undertaken by the City in relation thereto and in lieu of any license, charge, fee, Street or alley rental or other character of charge for use and occupancy of the Streets, alleys, and public places of the City, and in lieu of any inspection fee, the Company agrees to pay to the City franchise fees in the amount and manner described herein.

Company agrees to pay to the City quarterly during the continuance of this Franchise a sum of money equal to four (4%) of the Company's gross receipts for the preceding calendar quarter received by the Company from the sale of gas within the corporate limits of the City plus seven cents (7¢) per Mcf for natural gas transported by Company for its Transport Customers during such quarter. "Transport Customer" means any person or entity for whom Company transports gas through the distribution system of Company within the corporate limits of City for consumption within the corporate limits of City. The franchise fees hereunder shall be calculated for the calendar quarters ending March 31, June 30, September 30, and December 31 and shall be payable on or before the fifteenth day of May, August, November, and February following the quarter for which payment is made, beginning with the first such date following the Effective Date of this Franchise and each August 15th, November 15th, February 15th, and May 15th thereafter; provided, however, the first such payment shall be prorated as necessary to reflect only those gross receipts received and transportation volumes delivered by Company after the Effective Date of this Franchise. In no event shall the Company be required to remit to the City franchise fee amounts that for any reason whatsoever are not fully recoverable from its customers. Upon receipt of the above amount of money, the City shall deliver to the Company a receipt for such amount. If any payment due date required herein falls on a weekend or bank holiday, payment shall be made on or before the close of business of the first working day after the payment due date.

Section 9. *Annexations by City.* This Franchise shall extend to and include any and all territory that is annexed by the City during the term of this Franchise. Within sixty (60) days from the receipt of notice from the City of any such annexation, the Company shall assure that any and all customers within such annexed territory are included and shown on its accounting system as being within the corporate limits of the City of Friendswood. After such sixty (60) day period, the payment provisions specified in Section 8 of this Franchise shall apply to gross receipts and transport fees received by the Company from customers located within such annexed territory. Company shall true-up its map of City boundaries to the City's map on an annual basis.

Section 10. *Non-Exclusive Franchise.* Nothing contained in this Franchise shall ever be

construed as conferring upon the Company any exclusive or privileges of any nature whatsoever.

Section 11. *Compliance and Remedies.*

(a) In the event the Company by act or omission violates any material term, condition or provision of this Franchise, the City shall notify the Company in writing of such violation. Should the Company fail or refuse to correct any such violation within thirty (30) days from the date of City's notice, the City shall, upon written notification to the Company, have the right to terminate this agreement. Any such termination and cancellation shall be by ordinance adopted by City Council; provided, however, before any such ordinance is adopted, the Company must be given at least sixty (60) days' advance written notice. Such notice shall set forth the causes and reasons for the proposed termination and cancellation, shall advise the Company that it will be provided an opportunity to be heard by City Council regarding such proposed action before any such action is taken and shall set forth the time, date and place of the hearing.

(b) Other than its failure, refusal or inability to pay its debts and obligations, including, specifically, the payments to the City required by this Franchise, the Company shall not be declared in default or be subject to any sanction under any provision of this Franchise in those cases in which performance of such provision is prevented by reasons beyond its control.

(c) The rights and remedies of City and Company set forth herein shall be in addition to, and not in limitation of, any other rights and remedies provided at law or in equity; and City's exercise of any particular remedy shall not constitute a waiver of its rights to exercise any other remedy.

Section 12. *Reserve of Powers.* The City by the granting of this Franchise does not surrender or to any extent lose, waive, impair or lessen the lawful powers, claims and rights, now or hereafter vested in the City under the Constitution and statutes of the State of Texas and under the Charter and Ordinances of the City of Friendswood or other applicable law, to regulate public utilities within the City, to regulate rates of public utilities within the City, and to regulate the use of the Public Rights-of-Way by the Company; and the Company, by its acceptance of this Franchise, agrees that all lawful powers and rights, whether regulatory or otherwise, as are or as may be from time to time vested in or reserved to the City, shall be in full force and effect and subject to the exercise thereof by the City at any time and from time to time.

Section 13. INDEMNITY. THE COMPANY, ITS SUCCESSORS AND ASSIGNS, SHALL PROTECT AND HOLD THE CITY AND ITS OFFICERS, AGENTS, AND EMPLOYEES (COLLECTIVELY REFERRED TO IN THIS SECTION AS "THE CITY") HARMLESS AGAINST ANY AND ALL CLAIMS OR DEMANDS FOR DAMAGES TO ANY PERSON OR PROPERTY BY REASON OF THE CONSTRUCTION AND MAINTENANCE OF THE COMPANY'S NATURAL GAS DISTRIBUTION SYSTEM, OR IN ANY WAY GROWING OUT OF THE RIGHTS GRANTED BY THIS FRANCHISE, EITHER DIRECTLY OR INDIRECTLY, OR BY

REASON OF ANY ACT, NEGLIGENCE OR NONFEASANCE OF THE COMPANY OR THE CONTRACTORS, AGENTS OR EMPLOYEES OF THE COMPANY OR ITS SUCCESSORS AND ASSIGNS, AND SHALL REFUND TO THE CITY ALL SUMS WHICH THE CITY MAY BE ADJUDGED TO PAY ON ANY SUCH CLAIM, OR WHICH MAY ARISE OR GROW OUT OF THE EXERCISE OF THE RIGHTS AND PRIVILEGES HEREBY GRANTED OR BY THE ABUSE THEREOF, AND THE COMPANY OR ITS SUCCESSORS AND ASSIGNS SHALL INDEMNIFY, DEFEND, AND HOLD THE CITY HARMLESS FROM AND ON ACCOUNT OF ALL DAMAGES, COSTS, EXPENSES, ACTIONS, AND CAUSES OF ACTION THAT MAY ACCRUE TO OR BE BROUGHT BY, A PERSON, PERSONS, COMPANY OR COMPANIES AT ANY TIME HEREAFTER BY REASON OF THE EXERCISE OF THE RIGHTS AND PRIVILEGES HEREBY GRANTED, OR OF THE ABUSE THEREOF.

Section 14. *Relocation of Facilities.* The Company shall, upon written request of the City, relocate its Facilities within Public Rights-of-Way at Company's own expense, exclusive of Facilities installed for service directly to City, to accommodate public works or improvement projects that are being made by or for the benefit of the City, provided such benefit is evidenced by an executed agreement by the City and the entity responsible for the project. Public works or improvement projects may include, but are not limited to, street widening, changes of grade, water, sewer, or drainage upgrades, construction or reconstruction projects and relocation of traffic lanes. City shall bear the costs of all relocations of Facilities requested by the City for reasons other than the aforementioned public works improvement projects.

Section 15. *Governmental Function.* All of the regulations and activities required by this Franchise are hereby declared to be governmental and for the health, safety and welfare of the general public.

Section 16. *Records and Reports.*

(a) **Books of Account.** The Company shall keep complete and accurate books of accounts and records of its business and operations under and in connection with this Franchise. All such books of accounts and records shall be kept at the Company's principal office in Houston, Texas.

(b) **Access by City.** The City may conduct an audit or other inquiry or may pursue a cause of action in relation to the payment of the franchise fee only if such audit, inquiry, or pursuit of a cause of action concerns a payment made less than three (3) years before the commencement of such audit, inquiry, or pursuit of a cause of action. Each party shall bear its own costs of any such audit or inquiry. Upon receipt of a written request from the City, all books and records related to Company's operations under this Franchise shall be made available for inspection and copying no later than thirty (30) days from receipt of such

request.

(c) Interest on Underpayments and Overpayments.

(1) Amounts due to City for late payments shall include interest, compounded daily equal to the return on equity plus three percent (3%) granted to the Company in its most recent proceeding fixing rates applicable to customers within the corporate limits of the City.

(2) If the City identifies, as a result of a franchise fee compliance review, amounts owed by the Company from prior periods or prior underpayments, then the Company shall pay simple interest on such amounts equal to the return on equity granted to the Company in its most recent proceeding fixing rates applicable to customers within the corporate limits of the City. Said interest shall be payable on such sums from the date the initial payment was due until it is paid and shall not be billed to customers.

(3) Amounts due Company for past overpayments shall include simple interest equal to the return on equity granted to the Company in its most recent proceeding fixing rates applicable to customers within the corporate limits of the City; provided, however, if there is a change in the approved return on equity during the time period subject to the City's audit or inquiry, then for each time period during which there was an overpayment, the approved return on equity in effect during such time period shall be used in calculating interest under this subparagraph (c). Interest payable on such sums shall be credited to customers.

Section 17. Easement. In consideration for the compensation set forth in Section 8, City agrees that if City sells, conveys, or surrenders possession of any portion of the Public Right-of-Way that is being used by Company pursuant to this Franchise, City, to the maximum extent of its right to do so, shall first grant Company an easement for such use and the sale, conveyance, or surrender of possession of the Public Right-of-Way shall be subject to the right and continued use of Company.

Section 18. Acceptance. The Company shall, within thirty (30) days following the final passage and approval of this Franchise, file with the City Secretary of the City of Friendswood, a written statement signed in its name and behalf in the following form:

"To the Honorable Mayor: and City Council of the City of Friendswood:

CenterPoint Energy Resources Corp., dba CenterPoint Energy Texas Gas Operations, its successors and assigns hereby accepts the attached Franchise Ordinance and agrees to be bound by all of its terms and provisions."

CENTERPOINT ENERGY
RESOURCES CORP., DBA
CENTERPOINT ENERGY
TEXAS GAS OPERATIONS

By:

Tal R. Centers Jr., Division Vice President,
Regional Operations

Dated this ____ day of _____ 2020.

Section 19. *Severability.* If any provision, section, subsection, sentence, clause or phrase of this Franchise is for any reason held to be unconstitutional, void, or invalid or for any reason unenforceable, the validity of the remaining portions of this Franchise shall not be affected thereby, it being the intent the City of Friendswood in adopting this Franchise that no portion hereof or provision hereof shall become inoperative or fail by reason of any unconstitutionality or invalidity of any other portion, provision or regulation and, to this end, all provisions of this ordinance are declared to be severable.

Section 20. *Notices.* Every notice, order, petition, document, or other direction or communication to be served upon the City or the Company shall be deemed sufficiently given if sent by registered or certified mail, return receipt requested. Every such communication to the Company shall be sent to:

CenterPoint Energy
Resources Corp. Vice
President Regulatory
Relations P. O. Box
4567
Houston, TX 77210-4567

With a copy to:
General Counsel, Gas
Division
P. O. Box 2628
Houston, TX 77252-2628

Every such communication to the City or the City Council shall be sent to the:

City of Friendswood, Attn:
City Manager
910 South Friendswood

Drive
Friendswood, TX 77546

With a Copy to: City of Friendswood Attn:
City Attorney
910 South Friendswood Drive
Friendswood, TX 77546

Section 21. *Publication, Passage and Effective Date.* Pursuant to the Home Rule Charter of the City of Friendswood, Texas, Sec. 9.03, this Ordinance shall be read at two (2) regular meetings of the City Council. Within seven (7) days following the first reading of this Ordinance, the full text of this Ordinance shall be published one (1) time in the official newspaper of the City, and the expense of such publication shall be borne by the prospective Company. This Ordinance shall take effect and be in force from and after the first day of the month following thirty days after receipt of Company's acceptance filed pursuant to Section 18 ("Effective Date").

Section 22. *Repeal of Previous Ordinances.* On and after the Effective Date, this Franchise replaces all Previous Franchise agreements with the Company, which Previous Franchise Agreement shall be hereby repealed as of the Effective Date of this Franchise.

Section 23. *Compliance with Charter and Ordinances.* This Franchise, the rights granted hereby and the operations and activities performed by Company pursuant hereto shall be subject to applicable provisions of the Charter of the City of Friendswood, Texas. The Franchise and rights granted hereby and the operations and activities performed by Company pursuant hereto shall be subject to all valid ordinances and regulations of the City insofar as such ordinances and regulation (a) do not shorten the term hereof or terminate, abrogate, or materially and adversely affect the Franchise and right granted to Company hereby, (b) do not conflict with or are not inconsistent with the terms and provisions contained in this ordinance, with or are not inconsistent with the terms and provisions contained in this Ordinance, (c) prevent or interfere with Company's Federal and State regulatory obligations or (d) do not unreasonably regulate the Company's operations and activities in the City Right-of-Way. If Company believes a future Ordinance unreasonably regulates its operations and activities in the City Right-of-Way, City and Company shall meet and reach a mutually agreeable solution prior to its application to the Company. All such conflicting or inconsistent ordinances are hereby repealed to the extent of such conflict or inconsistency.

Section 24. *Adoption.* Passed and adopted with all necessary procedural formalities by the City Council of the City of Friendswood, Texas, at a regular meeting held at the regular place, at which a quorum was present throughout.

PASSED AND APPROVED on the first reading the 3rd day of February, 2020.

PASSED AND APPROVED on the second reading the 2nd day of March, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

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§

§

1. _____
2. _____
3. _____
4. _____
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6. _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

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with the City Secretary and recorded by the City Secretary in full in the books for the purpose of recording the ordinances of the City of _____, Texas.

EXECUTED under my hand and the official seal of the City of _____, Texas at said City, this _____ day of _____, 2020.

Melinda Welsh, City Secretary, TRMC
City of Friendswood, Texas

[SEAL]

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/4/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-10: First reading of an ordinance amending the Code of Ordinances, Chapter 54, Offenses and Miscellaneous Provisions, Article III., Protection of Citizens, Employees, Municipal Property by amending Section 54-48 entitled "Interfering with City Officers and Employees"; providing a penalty of an amount not to exceed \$500.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.

Originating Department: City Attorney

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

This ordinance was originally adopted in July, 2000, and it is being updated to include "interns" since the City has recently entered into an agreement with Friendswood Independent School District to participate in their High School Intern Program to include members of the IT and the Fire Marshal's Office. There are also interns that assist Jeff Newpher during City Council and Planning and Zoning Commission meetings and other media productions.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Recommend approval of this Ordinance.

ATTACHMENTS

1. Ord 2020-10 Amending Sec. 54-48

ORDINANCE NO. T2020-10

AN ORDINANCE AMENDING THE CODE OF ORDINANCES, CHAPTER 54, OFFENSES AND MISCELLANEOUS PROVISIONS, ARTICLE III., PROTECTION OF CITIZENS, EMPLOYEES, MUNICIPAL PROPERTY BY AMENDING SECTION 54-48 ENTITLED “INTERFERING WITH CITY OFFICERS AND EMPLOYEES”; PROVIDING A PENALTY OF AN AMOUNT NOT TO EXCEED \$500.00 FOR EACH VIOLATION; REPEALING ALL OTHER ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HERewith; PROVIDING FOR SEVERABILITY; PUBLICATION AND AN EFFECTIVE DATE.

* * * * *

WHEREAS, the City Council of the City of Friendswood, Texas (the “City”) is desirous of protecting its employees, visitors to the City, its citizens and municipal property; and

WHEREAS, the City expects certain standards of conduct from its employees, and it has similar expectations that visitors and citizens will treat City employees in a like manner; and

WHEREAS, the City Council wishes to make clear its intention to protect employees, finds and determines that the following amendment will promote the public health, safety and welfare of the employees and citizens of the City.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That Chapter 54 of the Code of Ordinances entitled “Offenses and Miscellaneous Provisions”, Article III., Protection of Citizens, Employees, Municipal Property, is hereby amended by amending Section 54-48, to read as follows:

“Sec. 54-48.- Interfering with city officers and employees.

- (a) For the purposes of this section, an officer or employee includes any permanent or temporary employee of the City, interns, any work-study or educational program hires, the mayor, city council members and the members and alternate members of the boards, commissions and committees of the City.
- (b) No person shall carelessly or willfully interfere with, hinder or obstruct any officer or employee of the City who is engaged in, en route to or returning from the performance of official duties, whether such interference, hindrance or obstruction is by threat, assault, harassment or other behavior.”

Section 2. That a person who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed \$500.00. Each day of violation shall constitute a separate offense.

Section 3. That all other ordinances or parts of ordinances inconsistent or in conflict herewith are, to the extent of such inconsistency or conflict, hereby repealed.

Section 4. That in the event any clause phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 5. That this Ordinance shall become effective upon publication as required by the City Charter.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, and ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/4/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-11: First reading of an ordinance amending the Code of Ordinances, Chapter 14, Building and Building Regulations, Article VIII., Swimming Pools by amending Section 14-356 entitled "Barrier Requirements"; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.

Originating Department: Community Development

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

When the 2018 International Code for One-and Two-Family Dwellings was adopted in Ordinance No. 2019-44, it no longer included the barrier requirements for swimming pools to be completely surrounded with a fence, wall or other solid structure. Instead of adopting a separate code for swimming pools, this Ordinance is being presented for adoption to reaffirm that these barrier requirements comply with the requirements of Appendix G of the 2012 International Residential Code for One-and Two-Family Dwellings.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Recommend this Ordinance be adopted.

ATTACHMENTS

1. Ord 2020-11 Amending Sec. 14-356 Pool Barrier requirements

ORDINANCE NO. T2020-11

AN ORDINANCE AMENDING THE CODE OF ORDINANCES, CHAPTER 14, BUILDING AND BUILDING REGULATIONS, ARTICLE VIII., SWIMMING POOLS BY AMENDING SECTION 14-356 ENTITLED “BARRIER REQUIREMENTS”; PROVIDING A PENALTY OF AN AMOUNT NOT TO EXCEED \$2,000.00 FOR EACH VIOLATION; REPEALING ALL OTHER ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HERewith; PROVIDING FOR SEVERABILITY; PUBLICATION AND AN EFFECTIVE DATE.

* * * * *

WHEREAS, the City Council of the City of Friendswood, Texas (the “City”) is continually reviewing the provisions of the Code of Ordinances relating to eliminating hazards, nuisances and other circumstances which negatively impact the health, safety and well-being of residents, citizens and habitants; and

WHEREAS, the City Council finds and determines that the following amendment will promote the public health, safety and welfare of the citizens of the City.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That Chapter 14 of the Code of Ordinances entitled “Building and Building Regulations”, Article VIII., Swimming Pools, is hereby amended by amending Section 14-356, to read as follows:

“Sec. 14-356.- Barrier requirements.

Every person in possession of land within the city, either as owner, purchaser under contract, lessee, tenant or licensee, upon which is situated a swimming pool, shall at all times maintain upon the lot or premises on which the swimming pool is located, and completely surrounding the swimming pool, lot or premises, a fence, wall or other solid structure designed to

comply with the requirements of Appendix G of the 2012 International Residential Code for One- and Two-Family Dwellings.”

Section 2. That a person who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.

Section 3. That all other ordinances or parts of ordinances inconsistent or in conflict herewith are, to the extent of such inconsistency or conflict, hereby repealed.

Section 4. That in the event any clause phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 5. That this Ordinance shall become effective upon publication as required by the City Charter.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, and ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/5/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-12: First reading of an ordinance amending the Code of Ordinances, Chapter 82, Traffic and Vehicles, Article II., Fire lanes by amending Sections 82-62 through 82-71 regarding Fire Lane Requirements, Enforcement and Penalties for violation of division; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.

Originating Department: Fire Marshal

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

While reviewing the Code of Ordinance provisions relating to health, safety and the welfare of our citizens, it was time to update and amend the fire lane provisions relating to when a fire lane is required, their specifications, markings, offense clauses relating to destruction of fire lane or tow-away signs, abandonment or closing, parking prohibited, enforcement provisions, and the penalty for violations.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Recommend this Ordinance be adopted.

ATTACHMENTS

1. Ord 2020-12 Amending Sec. 82-62-82-71. Fire Lanes

ORDINANCE NO. T2020-12

AN ORDINANCE AMENDING THE CODE OF ORDINANCES, CHAPTER 82, TRAFFIC AND VEHICLES, ARTICLE II., FIRE LANES BY AMENDING SECTIONS 82-62 THROUGH 82-71 REGARDING FIRE LANE REQUIREMENTS, ENFORCEMENT AND PENALTIES FOR VIOLATION OF DIVISION; PROVIDING A PENALTY OF AN AMOUNT NOT TO EXCEED \$2,000.00 FOR EACH VIOLATION; REPEALING ALL OTHER ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HERewith; PROVIDING FOR SEVERABILITY; PUBLICATION AND AN EFFECTIVE DATE.

* * * * *

WHEREAS, the City Council of the City of Friendswood, Texas (the “City”) is continually reviewing the provisions of the Code of Ordinances addressing the health, safety and well-being of residents, citizens and habitants; and

WHEREAS, the City Council finds and determines that the following amendment will promote the public health, safety and welfare of the citizens of the City.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That Chapter 82 of the Code of Ordinances entitled “Traffic and Vehicles”, Article II., Fire Lanes, is hereby amended by amending Sections 82-62 through 82-71, to read as follows:

“DIVISION 2. – FIRE LANES

Sec. 82-62. When required.

No building or any type of construction for occupancy shall be constructed in such a manner that any part of the structure is more than 150 feet from a public street or highway; provided, however, that such structure may be erected at a greater distance if the owner designates, constructs and maintains a fire lane or access easement having a minimum width of 20 feet and a minimum height clearance of 20 feet terminating within

100 feet of the furthest point of such structure; provided, further, however, that no fire lane shall be required for any single-family or duplex building.

Sec. 82-63. - Specifications.

Any fire lane more than 100 feet in length shall either connect at each end to a dedicated street or be provided with a turnaround having a minimum radius of 50 feet, excluding cul-de-sac medians, when measured from curb to curb. All fire lanes shall be maintained and kept in a state of good repair at all times by the owner, manager or person in charge of the premises, and the city shall never be responsible for the maintenance thereof. The fire marshal or his authorized representative is hereby authorized to designate adequate fire lanes and/or turnarounds to any building when deemed necessary for fire department access in the event of fire in such building.

Sec. 82-64. - Markings.

(a) Signs.

- (1) The owner, manager, or person in charge of any building, for which fire lanes have been approved by the fire marshal or his authorized representative, shall post and maintain appropriate signs in conspicuous places along such fire lanes stating: "No Parking-Fire Lane." Such signs shall be 12 inches wide and 18 inches high, with a companion sign 12 inches wide and six inches high stating: "Tow-Away Zone."
- (2) Any "No Parking-Fire Lane" or "Tow-Away Zone" sign shall be painted on a white background with symbols, letters and borders in red, using not less than two-inch lettering. Signs shall be permanently affixed to a stationary post and the bottom of the sign shall be six feet, six inches above finished grade. Signs shall be spaced no more than 30 feet apart. Signs may be installed on buildings, walls or fences, as approved by the fire marshal.
- (3) Where the placement of such signs is not applicable or when, in the opinion of the fire marshal or his representative, such signs would cause a burden on the management, curb markings or striping may be used.

- (b) *Curb markings/striping.* Any "No Parking-Fire Lane" or "Tow-Away Zone" curb markings or striping shall be painted on a red background, with symbols and letters in white. Such lettering shall be a minimum of four inches in height at 30- foot intervals on the red background markings along both sides of the fire lanes. Such lettering shall state: "No Parking-Fire Lane-Tow-Away Zone." Fire lanes marked on pavement surfaces shall be marked by lines of red traffic paint 12 inches in width to show the boundaries of the lane. Where a curb is available, the striping shall be in the vertical face of the curb.

Sec. 82-65. - Destruction of fire lane or tow-away sign.

It is hereby declared unlawful for any person, without lawful authority, to attempt to or in fact alter, destroy, deface, injure, knock down, or remove any sign designating a fire lane or tow-away zone erected under the terms of this division.

Sec. 82-66. - Abandonment or closing.

No owner, manager or person in charge of any premises served by a required fire lane shall abandon or close such fire lane without written permission of the city fire marshal.

Sec. 82-67. - Parking prohibited.

- (a) No person shall park, place, allow, permit, or cause to be parked, placed or remain unattended, any motor vehicle, trailer, boat or similar obstruction within or upon an area designated as a fire lane and marked by an appropriate marking.
- (b) Any motor vehicle, trailer, boat or similar obstruction found parked or unoccupied within an area designated as a fire lane as required by this division is hereby declared a nuisance per se and any such motor vehicle, trailer, boat, or similar obstruction parked or unoccupied in such manner as to obstruct, in whole or in part, any such fire lane shall be prima facie evidence that the registered owner unlawfully parked, placed or permitted to be parked or placed such obstruction within a fire lane.

- (c) The records of the state highway department or the county highway license department showing the name of the person to whom the state highway license or boat or trailer license is issued shall constitute prima facie evidence of ownership by the named person.

Sec. 82-68. - Modifications to requirements of division.

The fire marshal shall have the power to modify any of the provisions of this division upon application in writing by the owner or lessee, or his duly authorized agent, when there are practical difficulties in the way of carrying out the strict letter of this division, provided that the spirit of this division shall be observed, public safety secured, and substantial justice done. The particulars of such modification when granted or allowed and the decision of the fire marshal thereon shall be entered upon the records of the city and a signed copy shall be furnished to the applicant.

Sec. 82-69. - Enforcement; issuance of citations; impoundment of obstructions.

- (a) The fire marshal or any member of the fire marshal's office designated by the fire marshal, or the chief of police or any member of the police department designated by the chief of police, is hereby authorized to issue parking citations for any motor vehicle, trailer, boat or similar obstruction found parked or unattended in or upon a designated fire lane and may have such obstruction removed by towing it away. Such vehicle or obstruction may be redeemed by payment of the towing and storage charges.
- (b) No parking citation shall be voided nor shall the violator be relieved of any penalty assessed by a judge of the municipal court for any provision of this division by the redemption of the obstruction from the storage facility.

Sec. 82-70. - Submission of plats; duties of contractors.

- (a) Prior to the issuance of a building permit, plats with designated fire lanes shall be submitted to the building inspection department for review by the fire marshal, who then will approve or disapprove the designated fire lanes and indicate the needed signs and pavement markings. One of these plats shall be

retained by the fire marshal.

- (b) The contractor or person in charge of any construction site for commercial, industrial, mercantile, educational, institutional, assembly, hotel, multifamily dwelling, or mobile home park occupancies shall provide and maintain during construction an approved all-weather fire lane, not less than 20 feet in width, as shown on approved plats. Final paving of such fire lane shall be completed prior to the issuance of any certificate of occupancy.

Sec. 82-71. - Penalties for violation of division.

That a person who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.”

Section 2. That all other ordinances or parts of ordinances inconsistent or in conflict herewith are, to the extent of such inconsistency or conflict, hereby repealed.

Section 3. That in the event any clause phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 4. That this Ordinance shall become effective upon publication as required by the City Charter.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, and ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/12/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-13: First reading of an ordinance of the City of Friendswood, Texas, granting an electrical franchise to CenterPoint Energy pursuant to Texas Utilities Code §§ 33.008, 181.042, and 181.043; stating a purpose; providing for a term of 30 years; providing for the location of facilities; providing for repair of excavations and obstructions; providing for indemnity to the City of Friendswood providing for street rental; repealing the former franchise, which is Ordinance No. 84-16A of the City of Friendswood; providing a severability clause; providing an open meetings clause; providing for publication and an effective date.

Originating Department: City Attorney

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

The last electric franchise expired in 2014 and Centerpoint Energy has continued to pay the City a sum of 2% of gross receipts for each year excluding receipts for street lighting. This Ordinance continues to grant Centerpoint Energy a non-exclusive right to erect, maintain, operate and remove electric lines and pertinent facilities over, under, across and along the streets and other public property in the City for a 30 year period. This franchise allows Centerpoint Energy to provide electric service within the City of Friendswood and adjacent areas and transporting electric energy to, from and beyond the City.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

If this Ordinance is adopted, the annual payment from Centerpoint Energy to the City will change from the current annual payment of \$132,083 to \$139,238. The annual payment shall never get less than the \$139,238, and is calculated using an equation multiplying \$139,238.78 by the Annual Adjustment Factor, which is a fraction, with the numerator being the kilowatt hours (k Wh) delivered by Centerpoint Energy within the City, inclusive of street lighting, in the previous calendar year and the denominator being the 89,685,949 k Wh which the amount delivered in 2018. The annual amount may increase, based on the amount of k Wh delivered within the City each year.

RECOMMENDATIONS

Recommend adoption of this Ordinance for an electric franchise with CenterPoint Energy.

ATTACHMENTS

1. Ord 2020-13 Friendswood Electric

ORDINANCE NO. T2020-13

AN ORDINANCE OF THE CITY OF FRIENDSWOOD, TEXAS, GRANTING AN ELECTRICAL FRANCHISE TO CENTERPOINT ENERGY PURSUANT TO TEXAS UTILITIES CODE §§ 33.008, 181.042, AND 181.043; STATING A PURPOSE; PROVIDING FOR A TERM OF 30 YEARS; PROVIDING FOR THE LOCATION OF FACILITIES; PROVIDING FOR REPAIR OF EXCAVATIONS AND OBSTRUCTIONS; PROVIDING FOR INDEMNITY TO THE CITY OF FRIENDSWOOD PROVIDING FOR STREET RENTAL; REPEALING THE FORMER FRANCHISE, WHICH IS ORDINANCE NO. 84-16A OF THE CITY OF FRIENDSWOOD; PROVIDING A SEVERABILITY CLAUSE; PROVIDING AN OPEN MEETINGS CLAUSE; PROVIDING FOR PUBLICATION AND AN EFFECTIVE DATE.

* * * * *

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, TEXAS:

Section 1. Parties. The City of Friendswood, Texas, herein called the City, a municipal corporation created under Title 28 of the Texas Revised Civil Statutes, hereby grants the nonexclusive right, privilege, and franchise herein stated to CenterPoint Energy, a corporation, its successors and assigns, herein called Grantee or Company.

Section 2. Power to Grant Franchise. Pursuant to the Home Rule Charter of the City of Friendswood, Texas, Sec. 9.02, the City Council shall have the power by ordinance to grant, renew, extend and amend all franchises of all public utilities of every character operating within the City. No franchises shall be for an indeterminate period, and no franchise shall be granted for a term of more than 30 years from the date of grant, renewal or extension.

Section 3. Grant not to be Exclusive. Pursuant to the Home Rule Charter of the City of Friendswood, Texas, Sec. 9.04, no grant or franchise to construct, maintain, or operate a public utility and no renewal or extension of any such grant shall be exclusive.

Section 4. Right to Regulate. To the extent permitted by state law and pursuant to Home Rule Charter of the City of Friendswood, Texas, Sec. 9.07, “All grants, renewals, extensions or amendments of public utility franchises, whether it be so provided in the ordinance or not, shall be subject to the right of the City: (a) to repeal the same by ordinance at any time for failure to

begin construction or operation within the time prescribed or otherwise to comply with the terms of the franchise, such power to be exercised only after due notice and hearing; (b) to require an adequate extension of plant and service as is necessary to provide adequate service to the public, and maintenance of the plant and fixtures at the highest reasonable standard of efficiency; (c) to establish reasonable standards of service and quality of products and prevent unjust discrimination in service or rates; (d) to prescribe the form of accounts kept by each utility franchise; (e) to impose reasonable regulations to insure safe, efficient and continuous service to the public. The franchise holder in opening and refilling of all earth openings shall relay the pavement and to all other work necessary to complete restoration of streets, sidewalks or grounds to a condition equally as good or better as when disturbed.”

Section 5. **Nature of Grant.** The City, acting pursuant to Title 28 of the Texas Revised Civil Statutes and Articles 1436 and 1436a of said Statutes, and Texas Utilities Code Sections 33.008 and 181.043, hereby grants to Grantee a nonexclusive right, privilege, and franchise to erect, maintain, operate, and remove electric lines and pertinent facilities over, under, across, upon, and along the streets, alleys, and other public property in the City.

Section 6. **Purpose.** This franchise is granted for the purpose of providing electric service within the City and adjacent areas and transporting electric energy to, from, and beyond the City.

Section 7. **Term.** This franchise shall exist for the term of 30 years from date of passage.

Section 8. **Location of Facilities.** All poles erected by Grantee pursuant to the authority herein granted shall be of sound material and reasonably straight, and shall not be set in any gutter or drain or drainage ditch. Grantee’s poles and other facilities shall be placed and erected in such a manner as not to interfere with traffic, and the location, relocation, construction, and manner of erection of such poles and facilities shall at all times be subject to the reasonable and lawful exercise of the police power of the City. No paving cuts of City property shall be made by Grantee without first obtaining the permission of the City or the City official to whom this responsibility is delegated. However, such paving cuts on City property may be made in order to make emergency repairs to Grantee’s lines or equipment provided that Grantee notify the City official of such paving cuts as promptly as possible after beginning the work but not later than the close of business on the next business day after the repairs are made. Grantee, whenever ordered

to do so by the governing body of the City, shall at its own expense, relocate, alter or remove its facilities placed or maintained by Grantee under this franchise when the relocation, altering or removal thereof may be reasonably necessary in the reconstruction or construction of any public work project undertaken or directed by the City. The City acknowledges that any modifications to the Grantee's facilities may affect the safety and reliability of electric transmission and delivery within the City and the City hereby agrees to consult with Grantee on any such rearrangement, relocation, alteration or removal before ordering Grantee to do so. Notwithstanding the foregoing, Grantee shall not be responsible for relocation costs:

- a. where by City application, specific monies can be and are obtained from federal and state sources for relocation costs, provided that no City matching funds would be required, the scope of the City project would not be diminished, and the City would not be required to spend additional monies;
- b. the facilities to be moved were originally installed at the City's request (*i.e.*, street lights);
- c. if the specific excavation, construction or relocation is done to accommodate the actions or plans of private individuals or entities, then such private individuals or entities shall be responsible for the relocation costs, provided that in no event shall the City be liable for such relocation costs; or
- d. state or federal law requires the City to pay for such relocation.

Section 9. Permits. Prior to its commencement of any new construction work within the Streets or Public Rights-of-Way, Grantee and its contractors shall obtain a permit at no cost to Grantee, except as otherwise provided below. All work shall be performed in compliance with the City ordinances and regulations. City and Grantee agree that routine maintenance, emergency repairs of existing facilities, and vegetation management would not constitute new construction, therefore; such work is not subject to obtaining a permit. Grantee shall give the City telephone notice per Paragraph 8 above of emergency repairs involving cuts in the paved surface of the Public Rights-of-Way, including sidewalks and curbs, and shall request a permit promptly following completion of the new emergency construction work. Grantee and contractors performing work for the Grantee shall not be required to obtain any permits for relocations of Facilities requested by the City, provided that the relocated facilities are placed in the location designated by the City and relocation is otherwise in accordance with the City's request to relocate. This Franchise shall constitute a permit to park vehicles in the Streets and other Public Rights-of-Way when necessary

for the installation, replacement, abandonment, operation or maintenance of Grantee's Facilities. Grantee and contractors performing work for Company shall not be required to pay any fee in addition to the franchise street rents fee in order to obtain a permit to perform work on Grantee's facilities, or park within the Streets and other Public Rights-of-Way. Following completion of work in the Public Rights-of-Way, Grantee shall repair the affected Public Rights-of-Way as soon as reasonably possible, but in all cases, no street, alley, highway or public place shall be encumbered for a longer period than shall be reasonably necessary to execute the work.

Section 10. Quality of Service. The service furnished hereunder to City and its inhabitants shall be, considering all circumstances, consistent with the Tariff issued to CenterPoint Energy by the Public Utility Commission of Texas as well as applicable state and federal regulations. Grantee will maintain its facilities in reasonable operating condition in accordance with the foregoing Tariff and applicable state and federal regulations during the continuance of this Franchise.

Section 11. Excavations and Obstructions. Any and all excavations and obstructions in and upon the streets, alleys and other public places in the City caused by Grantee's operations under this Ordinance shall be repaired and removed by Grantee as quickly as is reasonably possible, under the circumstances. City agrees to give Grantee 72 hours' notice when City or City's contractors request the bracing of Grantees poles.

Section 12. Indemnity. Grantee shall fully indemnify and save harmless the City from any and all damage, loss, action or loss, action or cause of action arising in whole or in part from Grantee's exercise of any of its rights, privileges, franchises and obligations hereunder, except to the extent arising out of the City's sole negligence or willful misconduct. In the event of joint and concurrent negligence or fault of both Grantee and the City, responsibility and indemnity, to the extent allowed by law, if any, shall be apportioned comparatively in accordance with the laws of the State of Texas without, however, waiving any governmental immunity available to the City under Texas law and without waiving any of the defenses of the parties under Texas law. It is understood that it is not the intention of the parties hereto to create liability for the benefit of third parties, but that this section shall be solely for the benefit of the parties hereto and shall not create or grant any rights, contractual or otherwise, to any person or entity.

Section 13. Street Rents.

a. In consideration for the rights and privileges herein granted, Grantee agrees to pay to City, an annual franchise fee (referred to herein as “Annual Franchise Fee”), subject to an Annual Adjustment Factor as set forth below. Payment of the Annual Franchise Fee shall be the total compensation payable to City in consideration for the right, privilege and franchise herein conferred for Grantee’s use of the Public Rights-of-Way to construct, operate, use and maintain its facilities for the provision of electric transmission and distribution service and its right to use, license, or exploit its facilities as permitted, herein.

The Annual Franchise Fee shall be calculated as follows:

1. The “Annual Franchise Fee” shall be one hundred thirty-nine thousand two hundred thirty-eight Dollars and seventy-eight cents Dollars (\$ 139,238.78).
2. The Annual Franchise Fee for each twelve-month period beginning July 1, 2019 (each a “Franchise Year”) shall be adjusted by multiplying \$139,238.78 by the Annual Adjustment Factor. The “Annual Adjustment Factor” for any given year shall be a fraction, the numerator of which shall be the kWh delivered by Grantee within the City (inclusive of street lighting) in the previous calendar year and the denominator of which shall be the kWh delivered by Grantee within the City (inclusive of street lighting) in 2018, said amount being 89,685,949 kWh. (Example: The Annual Franchise Fee for the Franchise Year beginning July 1, 2020 = \$139,238.78) x 2019 kWh / 89,685,949kWh).

In no case, however, shall the Annual Franchise Fee be less than the Annual Franchise Fee established in 1. above.

b. In calculating the amount to be paid each year, Grantee shall offset its Annual Franchise Fee payments with the amount of the Municipal Account Franchise Credits and Municipal Franchise Fee Credits provided in Grantee’s tariffs and applicable to City in the prior calendar year.

c. The Annual Franchise Fee shall be payable in equal monthly installments due the first day of each calendar month. Grantee shall calculate the new franchise fee to be payable for each Franchise Year beginning July 1, 2020 and shall provide the same along with the basis for such calculation to City for its review no later than April 1st of each year. If Grantee does not receive an objection from City by May 31st, Grantee shall implement the adjusted Annual Franchise Fee payment on July 1st. If the term of this Franchise provided for in Section 7, above, ends on any day other than the last day of the last Franchise Year, then the Annual Franchise Fee for the final Franchise Year shall first be calculated pursuant to this Section 13 and then prorated accordingly. Grantee shall begin paying the Annual Franchise Fee on the later of (a) the expiration of the prior franchise or (b) the first day of the month that is three (3) months prior to the Effective

Date (the later of (a) or (b) being the “Payment Start Date”). (Example: If the Effective Date is July 15th, the Payment Start Date would be the later of (a) the expiration of the prior franchise or (b) the preceding April 1st.) If the Payment Start Date is any day other than July 1st, then the Annual Franchise Fee for the period between the Payment Start Date and the following July 1st shall first be calculated pursuant to this Section 13 and then prorated accordingly and net of any amounts previously paid for such period.

d. The Franchise Fee payable hereunder shall be the total compensation payable by the Grantee to the City for Grantee’s use of the Public Rights-of-Way for the conduct of its business under this franchise. City shall not charge any additional license, charge, fee, street or alley rental, permit fee or other character of charge or levy for the use or occupancy of the Public Rights-of-Way in City, or any pole tax or inspection fee tax. If the City does charge Grantee any additional license, charge, fee, street or alley rental, or other character of charge or levy, then Grantee may deduct the amount charged from the next succeeding Franchise Fee payment or payments until fully reimbursed.

e. If, as the result of a final and non-appealable order issued by the PUCT, all or a portion of the then-effective Annual Franchise Fee is expressly found to be unreasonable or is otherwise expressly rejected or disallowed by the PUCT, then Grantee shall be permitted to reduce the Annual Franchise Fee by such amount; provided, however, that Grantee shall be obligated to support the reasonableness of the Annual Franchise Fee and shall not voluntarily agree to any reduction thereof.

f. The parties agree to meet to discuss adjustments to franchise fee either upon the request of one of the parties or on a periodic basis as the parties may agree. The franchise fee shall be adjusted provided that (a) the parties agree to a reasonable increase in the fee; (b) Grantee obtains all necessary and final approvals for the recovery of any proposed increase of the franchise fee; and (c) the increased fee or its recovery is not otherwise prohibited or disallowed by a regulatory body or court having jurisdiction.

Section 14. Records and Reports.

a. Franchise Data. Grantee shall keep complete and accurate records of its business and operations under and in connection with this Franchise. All such data shall be kept within Grantee’s computer and data systems at Grantee’s appropriate business locations.

b. Access by City. The City may conduct an audit or other inquiry or may pursue a cause of action in relation to the payment of the franchise fee only if such audit, inquiry, or pursuit of a cause of action concerns a payment made less than two (2) years before the commencement of such audit, inquiry, or pursuit of a cause of action. Each party shall bear its own costs of any such audit or inquiry. Upon receipt of a written request from the City, all records related to Grantee’s operations under this Franchise and belonging to Grantee shall, to the extent permitted by law, be made available for inspection and copying no later than thirty (30) days from receipt of such request unless the parties mutually agree to a different time frame. Nothing herein obligates Grantee to disclose third-party confidential or proprietary information. Amounts due to City for past underpayments or amounts due Grantee for past overpayments shall include interest calculated using the annual interest rates for overcharges as set by the Texas Public Utility

Commission. Said interest shall be payable on such sum from the date the initial payment was due until it is paid.

Section 15. Reservation of Powers. In granting this Franchise, the City does not surrender or to any extent lose, waive, impair or lessen the lawful powers, claims and rights, now or hereafter vested in the City under the Constitution and statutes of the State of Texas and under the Charter and valid Ordinances of the City of Friendswood or other applicable law, to regulate public utilities within the City and to regulate the use of the Streets by the Grantee.

Section 16. Notice to Parties. Any notice or communication required or desired to be served upon the City or Company shall be deemed sufficiently given if sent by registered or certified mail, return receipt requested. Any such communication to the Company shall be sent to:

General Counsel
CenterPoint Energy
P.O. Box 61867
Houston, TX 77208-1867

Any such communication to the City or the City Council shall be sent to:

City Manager
910 South Friendswood Drive
Friendswood, Texas 775546

Section 17. Prior Franchise Repealed. This franchise ordinance, upon acceptance by the Grantee, shall replace and supersede that certain Electric Franchise Ordinance No. 84-16A heretofore granted by the City to the Grantee, and its successors adopted on August 20, 1984.

Section 18. Severability Clause. Should any article, section, part, paragraph, sentence, phrase, clause, or word of this ordinance, for any reason be held illegal, inoperative, or invalid, or if any exception to or limitation upon any general provision herein contained be held to be unconstitutional or invalid or ineffective, the remainder shall, nevertheless, stand effective and valid as if it had been enacted and ordained without the portion held to be illegal, inoperative, unconstitutional, invalid, or ineffective.

Section 19. Open Meetings Clause. That the City Council has found and determined that the meeting at which this Ordinance is considered is open to the public and that notice thereof

was given in accordance with the provisions of the Texas Open Meetings Act, Texas Government Code, Chapter 551, as amended, and that a quorum of the City Council was present.

Section 20. Publication, Passage and Effective date. Pursuant to Home Rule Charter of the City of Friendswood, Texas, Sec. 9.03, this Ordinance shall be read at two (2) regular meetings of the City Council. Within seven (7) days following the first reading of this Ordinance, the full text of this Ordinance shall be published one (1) time in the official newspaper of the City, and the expense of such publication shall be borne by the prospective Company. This Ordinance shall take effect and be in force from and after its passage and approval, and upon acceptance by the Company, the term of this franchise shall begin and continue in accordance with Section 7.

Section 21. Acceptance by Company. The Company shall, within thirty (30) days from the date of this Ordinance is passed and approved, file with the City Secretary, a written statement signed in its name and behalf, in the following form:

To the City of Friendswood, Texas:

“The Company for itself, its successors and assigns, hereby accepts the above and foregoing Ordinance and agrees to be bound by all of its terms and provisions.”

CenterPoint Energy

By: _____

Dated the _____ day of _____, 2020.

Section 22. Adoption. Passed and adopted with all necessary procedural formalities by the City Council of the City of Friendswood, Texas, at a regular meeting held at the regular place, at which meeting a quorum was present throughout. This Ordinance shall take effect and be in force from and after its passage and approval, and upon acceptance by the Company, the term of this franchise shall begin and continue in accordance with Section 7 hereof.

PASSED AND APPROVED on first reading the 2nd day of March, 2020.

PASSED AND APPROVED on second and final reading the 6th day of April,
2020.

ATTEST:

Mike Foreman, Mayor

Melinda Welsh, City Secretary, TRMC

APPROVED AS TO FORM:

Mary Kay Fischer, City Attorney

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/13/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-14: First reading of an ordinance amending the Code of Ordinances, Chapter 14, Buildings and Building Regulations, Article II., Building Code by amending Sections 14-25 through 14-28 regarding trash on construction sites, site drainage, restoration of property to original condition and housekeeping practices on construction sites; providing a penalty of an amount not to exceed \$2,000.00 for each violation; repealing all other ordinances or parts of ordinances inconsistent or in conflict herewith; providing for severability; publication and an effective date.

Originating Department: City Attorney

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

As an Ordinance originally adopted almost 20 years ago dealing with the health, safety and well-being of our residents and citizens, this Ordinance is being brought forward for review and to clarify that any person that fails to contain trash and/or discarded construction materials on a construction site, fails to get a site drainage plan approved in accordance with the city's flood damage prevention regulations, fails to restore property to original condition or fails to maintain the construction site in a way that no mud or dirt will leave the site in in violation of this Ordinance and upon conviction, shall be fined in an amount not to exceed \$2,000.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Recommend adoption of this Ordinance.

ATTACHMENTS

1. Ord 2020-14 Amending Sec. 14-25-14-28

ORDINANCE NO. T2020-14

AN ORDINANCE AMENDING THE CODE OF ORDINANCES, CHAPTER 14, BUILDINGS AND BUILDING REGULATIONS, ARTICLE II., BUILDING CODE BY AMENDING SECTIONS 14-25 THROUGH 14-28 REGARDING TRASH ON CONSTRUCTION SITES, SITE DRAINAGE, RESTORATION OF PROPERTY TO ORIGINAL CONDITION AND HOUSEKEEPING PRACTICES ON CONSTRUCTION SITES; PROVIDING A PENALTY OF AN AMOUNT NOT TO EXCEED \$2,000.00 FOR EACH VIOLATION; REPEALING ALL OTHER ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HEREWITH; PROVIDING FOR SEVERABILITY; PUBLICATION AND AN EFFECTIVE DATE.

* * * * *

WHEREAS, the City Council of the City of Friendswood, Texas (the “City”) is continually reviewing the provisions of the Code of Ordinances addressing the health, safety and well-being of residents, citizens and habitants; and

WHEREAS, the City Council finds and determines that the following amendment will promote the public health, safety and welfare of the citizens of the City.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That Chapter 14 of the Code of Ordinances entitled “Buildings and Building Regulations”, Article II., Building Code, is hereby amended by amending Sections 14-25 through 14-28, to read as follows:

“Sec. 14-25. - Trash on construction sites.

Trash and/or discarded construction materials for all construction sites shall be contained in an enclosure designed to prevent redistribution of the contents thereof (construction debris) by action of the wind, rain or other natural force.

Sec. 14-26. - Site drainage.

No improvement to any lot, tract or parcel of land within the city shall be authorized until a site drainage plan for surface water drainage is submitted and approved in accordance with this section and the applicable provisions of the city's flood damage prevention regulations contained in chapter 34. No drainage plan shall be approved that provides for the drainage of surface waters onto or through adjacent properties, or which impounds or otherwise restricts natural flows, to the detriment to any adjacent or upstream property owner.

Sec. 14-27. - Restoration of property to original condition.

If construction work on any lot, tract or parcel of land within the city is stopped or abandoned for a period of 180 days, and the extension of applicable permits are not obtained in accordance with applicable codes of the city, such construction site shall be returned to its original natural state. All partially constructed buildings, foundations, temporary utility facilities, and other associated partially constructed improvements shall be completely removed and the site shall be cleaned of all materials, properly graded and revegetated.

Sec. 14-28. - Housekeeping practices.

All construction sites within the city shall be maintained in such a way that no mud or dirt will leave the site. Every effort shall be made to ensure that all streets and storm inlets are protected, as well as all streams, creeks and other waterways. All disturbed areas in front and side yards shall be sodded on lots less than one acre. Lots one acre and larger may provide sodding throughout any ditch areas located in city rights-of-way and onto the property adjacent to the ditches at least ten feet. Additionally, another form of revegetation

acceptable to the city may be provided on the remainder of the site as long as silt fencing or other approved methods are installed to keep soils eroded from the site from entering the city's storm sewer system.”

Section 2. That a person who violates any provision of this Ordinance shall be deemed guilty of a misdemeanor and upon conviction, shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.”

Section 3. That all other ordinances or parts of ordinances inconsistent or in conflict herewith are, to the extent of such inconsistency or conflict, hereby repealed.

Section 4. That in the event any clause phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 5. That this Ordinance shall become effective upon publication as required by the City Charter.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, and ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/19/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-15: First and Final reading of an ordinance of the City of Friendswood, Texas, declaring the unopposed candidates for City Council Position 2, Sally Branson and City Council Position 5, John Scott, elected; cancelling the May 02, 2020, General Election, and a Runoff Election on June 13, 2020, for such positions; providing for severability; and repealing all ordinances or parts of ordinances inconsistent or in conflict herewith.

Originating Department: City Secretary

Degree of importance: Critical

SUMMARY / ORIGINATING CAUSE

This request is to approve Ordinance No. 2020-15 which calls for canceling the General Election that was to be held on May 02, 2020, for the purpose of electing a Council member to Position No. 2 and to Position No. 5.

There were no contested races for the positions of Council Position No. 2 and Council Position No. 5. Only the incumbents, Council members Sally Branson and John Scott, filed for the positions. No others filed during the regular filing period or for the write-in period. The City Secretary has provided a certification that there are no contested races, which is an exhibit to this ordinance and an earlier item on the Council agenda. As a result of the uncontested races, Council can authorize canceling the General Election.

This cancelation does NOT apply to the Special Election that was ordered at the same February 03, 2020, Council meeting as the General Election. The Special Election for reauthorization of the local sales and use tax providing revenue for maintenance and repair of municipal streets will take place on May 02, 2020.

Sally Branson and John Scott's names will still appear on the ballot but as "Unopposed Candidates Declared Elected".

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

Approve the ordinance canceling the General Election.

ATTACHMENTS

1. Ord 2020-15 Election of Unopposed Candidates Positions 2 and 5
2. Ord 2020-15 Exhibit A

ORDINANCE NO. T2020-15

AN ORDINANCE OF THE CITY OF FRIENDSWOOD, TEXAS, DECLARING THE UNOPPOSED CANDIDATES FOR CITY COUNCIL POSITION 2, SALLY BRANSON AND CITY COUNCIL POSITION 5, JOHN SCOTT, ELECTED; CANCELLING THE MAY 02, 2020, GENERAL ELECTION, AND A RUNOFF ELECTION ON JUNE 13, 2020, FOR SUCH POSITIONS; PROVIDING FOR SEVERABILITY; AND REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HEREWITH.

* * * * *

WHEREAS, pursuant to City of Friendswood, Texas, Ordinance 2020-06, passed, approved, and adopted on February 3, 2020, a general municipal election was ordered to be held on May 02, 2020, and a runoff election on June 13, 2020, for the purpose of electing two officials of the City, to wit: City Council Position 2 and City Council Position 5; and

WHEREAS, pursuant to said Ordinance and Sections 143.007 and 146.054 of the TEXAS ELECTION CODE, the deadline for filing applications for a place on the ballot and declaration of write-in candidacy for the City's municipal officers election has expired, the same being 5:00 p.m. February 18, 2020; and

WHEREAS, the City Secretary, in accordance with Section 2.052, TEXAS ELECTION CODE, has certified to the City Council in writing that Sally Branson, City Council Position 2 and John Scott, City Council Position 5 are unopposed for election to the subject offices; a copy of such Certification of Unopposed Candidates labeled Exhibit "A" which is attached hereto and made a part hereof; and

WHEREAS, the City Council has received and accepted the Certification of Unopposed Candidates from the City Secretary; and

WHEREAS, the City Council hereby finds and determines that the candidates for City Council Position 2, Sally Branson, and City Council Position 5, John Scott, whose names are to appear on the ballot in said general election are unopposed; and no opposed at-large elections are to appear on the ballot for such general election with respect to such candidates;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, TEXAS:

Section 1. The facts and matters set forth in the preamble of this ordinance are hereby found to be true and correct.

Section 2. In accordance with Section 2.053(a), TEXAS ELECTION CODE, the following candidates have been certified as unopposed and are hereby declared duly elected to the respective offices shown and shall be issued a certificate of election following the date the general election was to have been held in accordance with the TEXAS ELECTION CODE:

**Sally Branson – City Council Position 2
John Scott – City Council Position 5**

Section 3. Pursuant to Section 2.053(b), TEXAS ELECTION CODE, the general municipal election heretofore called and ordered pursuant to City of Friendswood, Texas, Ordinance 2020-06, for the 2nd day of May, 2020, and a runoff election on June 13, 2020, shall not be held for the office of City Council Position 2, and City Council Position 5 and said general election is hereby cancelled.

Section 4. The City Secretary is hereby directed to cause a copy of this ordinance to be posted on election day, the same being May 02, 2020, at the polling places that would have been used in such election.

Section 5. In the event any clause, phrase, provision, sentence, or part of this ordinance or the application of same to any person or circumstance shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this ordinance as a whole or any part or provision hereof other than the part declared to be invalid

or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there by one or more parts.

Section 6. All ordinances or parts of ordinances inconsistent or in conflict herewith are, to the extent of such inconsistency or conflict, hereby repealed.

Section 7. The City Council officially finds, determines, recites, and declares that a sufficient written notice of the date, hour, place and subject of this meeting of the City Council was posted at a place convenient to the public at the City Hall of the City for the time required by law preceding this meeting, as required by the Open Meetings Law, Chapter 551, Texas Government Code; and that this meeting has been open to the public as required by law at all times during which this ordinance and the subject matter thereof has been discussed, considered and formally acted upon. The City Council further ratifies, approves and confirms such written notice and the contents and posting thereof.

PASSED AND APPROVED on first and final reading this 2nd day of March, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

EXHIBIT “A”
CERTIFICATION OF UNOPPOSED CANDIDATES



**CITY OF FRIENDSWOOD
OFFICE OF THE CITY SECRETARY**

Melinda K. Welsh, TRMC
910 S. Friendswood Drive
Friendswood, Texas 77546
mwelsh@friendswood.com
Phone: 281-996-3270

**CERTIFICATION OF UNOPPOSED CANDIDATES
CERTIFICACIÓN DE CANDIDATOS ÚNICOS**

To: Presiding Officer of Governing Body
Al: Presidente de la entidad gobernante

As the authority responsible for having the official ballot prepared, I hereby certify that the following candidates are unopposed for election to office for the General Election scheduled to be held on May 02, 2020.

Como autoridad a cargo de la preparación de la boleta de votación oficial, por la presente certifico que los siguientes candidatos son candidatos únicos para elección general para un cargo en la elección que se llevará a cabo el 02 de Mayo, 2020.

List offices and names of candidates:
Lista de cargos y nombres de los candidatos:

Office(s) Cargo(s)

Candidate(s) Candidato(s)

Councilperson Position 2

Sally Branson

Miembros de Concilio Posicione numero 2

Councilperson Position 5

John Scott

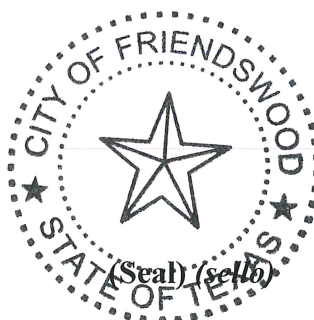
Miembros de Concilio Posicione numero 5


Signature (Firma)

Melinda K. Welsh
Printed name (Nombre en letra de molde)

City Secretary
Title (Puesto)

February 18, 2020 @ 7:20 PM
Date of signing (Fecha de firma)



FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 12/27/2019

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-16: First reading of an ordinance amending Appendix C "Zoning Ordinance," "Section 10. Board of Adjustment-Establishment and Procedure," "Section 11. Same-Powers and Duties," "Section 12. Appeals from the Board of Adjustment," and "Section 20. Definitions-Variance"; providing a penalty for violation in an amount not to exceed \$2000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.

Originating Department: Community Development

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

These proposed amendments are regarding the authority of the Zoning Board of Adjustment. Discussion started at the senior staff level, and then discussion was had with City Council in a work session setting. Council members were agreeable to considering amendments to our local ordinance to allow ZBOA the full flexibility and authority that state law allows. In October 2019, the suggestion was also brought up to the Zoning Board Of Adjustments (ZBOA), and they too were in agreement of the changes.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Adopting a simpler ordinance will remove some of the restrictions the current ordinance places upon the board.

RECOMMENDATIONS

The ordinance subcommittee recommends a positive recommendation to update zoning ordinance sections 10-12. Following the Planning and Zoning public hearing and consideration, the Planning and Zoning recommendation will be forwarded to Council for their consideration.

ATTACHMENTS

1. Ord 2020-16 Zoning Ord ZBOA Secs 10-12 and Sec 20

ORDINANCE NO. T2020-16

AN ORDINANCE AMENDING APPENDIX C “ZONING ORDINANCE,” “SECTION 10. BOARD OF ADJUSTMENT-ESTABLISHMENT AND PROCEDURE,” “SECTION 11. SAME-POWERS AND DUTIES,” “SECTION 12. APPEALS FROM THE BOARD OF ADJUSTMENT,” AND “SECTION 20. DEFINITIONS-VARIANCE”; PROVIDING A PENALTY FOR VIOLATION IN AN AMOUNT NOT TO EXCEED \$2000, OR AS OTHERWISE PROVIDED BY LAW; REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HERewith; AND PROVIDING FOR SEVERABILITY.

* * * * *

WHEREAS, the City Council of the City of Friendswood is continually monitoring and reviewing ordinances; and

WHEREAS, the City Council of the City of Friendswood deems it necessary for the City of Friendswood local ordinances accurately reflect State law; and

WHEREAS, the Planning and Zoning Commission and the City Council have conducted, in the time and manner required by law and the City Code of Ordinances, public hearings on the proposed ordinance changes, allowing all persons attending to be heard on the question of whether the changes being requested would affect the public health, safety, or general welfare of the citizens of Friendswood; and

WHEREAS, the Planning and Zoning Commission has filed its written report with City Council, which recommends approval of the amendments; and

WHEREAS, City Council has determined that all public notices have been posted and published, all required hearings on this matter have been held, and that this Ordinance complies with the applicable provisions of the City Charter, City Code and all other applicable laws;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That the facts and matters set forth in the preamble of this Ordinance are hereby found to be true and correct.

Section 2. That the City of Friendswood Code of Ordinances, Appendix C, “Zoning”, “Section 10. Board of Adjustment – Establishment and Procedure” is hereby amended to read as follows:

Section 10. – Board of Adjustment – Establishment and procedure.

Section 10. - Board of adjustment—Establishment and procedure.

A board of adjustment is hereby established, which shall consist of five members and four alternates to be appointed by the city council, each for a term of two years. Members and alternates of the board of adjustment may be removed from office by the city council when absent from two consecutive meetings without an excuse or for cause upon written charges and after public hearing. Vacancies shall be filled by the city council for the unexpired term of the member affected.

A. *Proceedings of the board of adjustment.*

- (1) The board of adjustment shall adopt rules necessary to the conduct of its affairs, elect a chairperson and an acting chairperson, and act in keeping with the provisions of this appendix. Meetings shall be held at the call of the chairperson and at such other times as the board may determine. The chairperson, or in his absence the acting chairperson, may administer oaths and compel the attendance of witnesses. All meetings shall be open to the public.
- (2) The board of adjustment shall keep minutes of its proceedings, showing the vote of each member upon each question, or if absent or failing to vote indicating such fact, and shall keep records of its examinations and all of which shall be immediately filed in the office of the board and shall be public record.

- B. ~~Hearings, appeals and notices~~**Application**. Appeals to the board of adjustment concerning interpretation or administration of this appendix may be taken by any person aggrieved **by the decision** or by any officer, department, board, or bureau of the city affected by the decision of the administrative official. Such appeals shall be ~~taken within a reasonable time, not to exceed 45 days~~ **filed not later than the 20th day after the date the decision is made**, by filing with the **official** ~~officer~~ from whom the appeal is taken and with the board of adjustment a notice of appeal specifying the grounds thereof. **On receiving the notice, t**~~The official officer~~ from whom the appeal is taken shall ~~forthwith~~ **immediately** transmit to the board all the papers constituting the record **of the action that is appealed**. ~~upon which the action appealed from was taken.~~

A member of the governing body of the municipality who serves on the board of adjustment may not bring an appeal under this section.

- C. ~~Notification-and-hearing-process.~~ Any request for an appeal, variance or special exception shall require a public hearing before the board. A written notice of the hearing shall be sent to owners of property situated within 200 feet of the exterior boundary of the property with respect to which such appeal, variance or exception is requested ten days prior to public hearing. It shall be sufficient that such written notice is addressed to the owner appearing on the most current tax roll of the city and addressed to such owner at the address stated on said roll. If no owner is stated on the tax roll, or no address appears thereon, the written notice to such property owner shall not be required.

The city council and planning and zoning commission shall be informed of any hearing for an appeal, variance or special exception of the zoning or sign ordinance.

- D. **Fee.** A processing fee as described in subsection 14 shall be paid to the city in advance of the hearing. In the event the application is withdrawn prior to the mailing of the required written notification or publication in the official newspaper, the fee shall be refunded.

- E. **Hearings.** **The board shall set a reasonable time for the appeal hearing. A party may appear at the hearing in person or by agent or by attorney. The board shall decide the appeal at the next meeting for which notice can be provided following the hearing and not later than the 60th day after the date the appeal is filed.**

- ~~FD.~~ *Stay of proceedings.* An appeal stays all proceedings in furtherance of the action **that is** appealed from, unless the **official** officer from whom the appeal is taken certifies **in writing** to the board of adjustment after the notice of appeal shall have been filed with him that, by reason of facts stated in the certificate, a stay would, in his opinion, cause imminent peril to life or property **facts supporting the official's opinion that a stay would cause imminent peril to life or property.** In such **that** case, **the** proceedings shall not **may** be stayed other than **only** by a restraining order which may be granted by the board of adjustment or by a court of record on application, on **after** notice to the **official** officer from whom the appeal is taken and on **if** due cause **is** shown.

Section 3. That the City of Friendswood Code of Ordinances, Appendix C, "Zoning", "Section 11. Same – Powers and duties" is hereby amended to read as follows:
Section 11. - Same—Powers and duties.

- A.** The board of adjustment shall have the following powers and duties:

- (1)A.** ~~Administrative review~~**Appeals.** To hear and decide appeals where it is alleged there is error in any order, requirement, decision, or determination made by an administrative official in the

enforcement of this appendix. The board shall apply the following standards in deciding the appeal:

1. That there is a reasonable difference of interpretation as to the specific intent of the zoning regulations or zoning map.
2. That the resulting interpretation will not grant a special privilege to one property inconsistent with other properties or uses similarly situated.
3. The decision of the board must be such as will be in the best interest of the community and consistent with the spirit and interest of the city's zoning laws.

(2)B. ~~Variance; conditions governing applications; authority and limitations.~~ To authorize upon appeal in specific cases, such ~~a~~ variance from the terms of this appendix **the zoning ordinance** as will not be **if the variance is not** contrary to the public interest **and, due** where, owing to special conditions, a literal enforcement of the provisions of this appendix **ordinance** would result in unnecessary hardship, and so that the spirit of the appendix **ordinance is** shall be observed and substantial justice **is** done. In exercising such powers of variance, the board may, in conformity with the provisions of this appendix, reverse or affirm, wholly or partly, or may modify the order, requirement, decision, or determination appealed from and make such order, requirement, decision, or determination as ought to be made, and to that end the board shall have all the powers of the officer from whom the appeal is taken.

1. In granting any variance, the board of adjustment may describe appropriate conditions and safeguards in conformity with this appendix. Violations of such conditions and safeguards, when made a part of the terms under which the variance is granted, shall be deemed a violation of this appendix.

(a)2. **Exceptions.** Under no circumstances shall the board of adjustment grant a variance to allow a use not permissible under the terms of this appendix **a zoning ordinance** in the district involved, or any use, expressly or impliedly, prohibited by the terms of this appendix in said district.

(3)C. **Special exceptions.** To hear and decide special exceptions to the terms of this appendix **a zoning ordinance** upon which **when this appendix requires** the board is required to pass under this appendix **do so**.

1. **Authority and scope.** The board shall have the power to grant temporary and permanent special exceptions from the city's zoning ordinance.
2. **Permanent special exceptions.** A permanent special exception may be granted only for the following reasons:

- a. ~~Interpretive authority. If a definition or term of the city's zoning ordinance is ambiguous or contrary to common understanding, the board would clarify the definition or term based on the common definition or understanding of the term. (Example: An attached garage is normally understood to mean one where there are one or more common walls and a roof structure between the garage and the main property building. A board determination may be that roof structures alone are not considered walls so one or more buildings with a breezeway between them may not be considered as "attached.") No additional special exception shall be granted based on the board's initially interpreted definition.~~
 - b. ~~De minimus exception. The board may grant a special exception for very small exceptions to the zoning ordinance, where the spirit of the Code is met and there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city. (An example would be where a 9½-foot setback for building would be allowed where a ten-foot setback is required, to allow the property owner to save an oak tree.)~~
 - c. ~~Medical necessity. The board may grant a special exception to the above cited portions of the zoning ordinance if a medical necessity is proven, or to meet the requirements of the Americans with Disabilities Act. For medical reasons or necessity, the reason for the special exception must be related to the medical condition and be supported by a letter from the applicant's physician defining the physical limitations of the applicant.~~
 - d. ~~No other permanent special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.~~
 - e. ~~A permanent special exception shall have no expiration date.~~
3. ~~*Temporary special exceptions.* A temporary special exception, not to exceed 90 days in term, may be granted by the board to allow for the construction of noncomplying structures for reasons in addition to ambiguous definitions or terms, medical reasons/necessity, or de minimus circumstances. In order for a request for a temporary special exception to be brought before the board, there needs to be:~~
- 1) ~~A finding by the city's building official that an issue of noncompliance with the city's zoning ordinance would exist by virtue of applicant's construction; and~~

- ~~2) There are demonstrated significant reasons why immediate action cannot reasonably be taken by the applicant to achieve compliance with the city's zoning ordinance.~~

~~No other temporary special exception based on the board's decision or determination in one case regarding structures may be granted for other cases without the proper board determination on the subsequent cases.~~

- ~~4. *Requirements.* Temporary or permanent special exceptions may be granted only after the following items have been addressed:~~
- ~~a. The city's building official has denied the applicant a permit or permits based on noncompliance with the city's zoning ordinance;~~
 - ~~b. The applicant has made a written request for a special exception in accordance with V.T.C.A., Local Government Code § 211.010, and section 10.B;~~
 - ~~c. The applicant's request is based on ambiguous definitions or terms, medical reasons or necessity or ADA compliance, or other special de minimis circumstances, and that there are demonstrated significant economic reasons why action cannot be taken by the applicant to achieve compliance with the city's zoning ordinance;~~
 - ~~d. There has been notice and a public hearing as required section 10.C;~~
 - ~~e. The applicant agrees to accept reasonable conditions or actions that the board may suggest to mitigate potential issues with or objections to the applicant's request; however, the board cannot require such conditions or actions to be accepted in return for a favorable decision by the board, rather the case must be otherwise decided on its merits. (An example is installing additional property drainage as a condition for side setback relief);~~
 - ~~f. In no case shall the board be authorized to grant permanent special exceptions or temporary special exceptions that would in effect allow a violation of the city's health code, life safety code or fire safety code; and~~
 - ~~g. Under no circumstances shall the board grant a request for a special exception that would have the effect of allowing a use not permissible under the terms of the zoning ordinance in the district involved, or any use, expressly or impliedly, prohibited by the terms of the zoning ordinance in the subject district.~~

5. ~~*Finding.* A special exception shall not be granted unless the board shall make a determination that the granting of the special exception will not adversely affect the public interest. In making its determination, the board shall duly consider, where applicable, the following:~~
- a. ~~The most appropriate use of the land and conservation and stabilization of property values;~~
 - b. ~~Adequate open spaces for light and air and required yards and other open spaces;~~
 - c. ~~Congestion of public streets, including ingress and egress to property with particular reference to automotive and pedestrian safety and convenience, traffic flow and control, and access in case of fire or catastrophe;~~
 - d. ~~Off-street parking, loading and service areas where required;~~
 - e. ~~Economic, noise, dust, heat, glare or odor effects of the special exception on surrounding properties or the city;~~
 - f. ~~Utilities, with reference to locations, availability, adequacy and compatibility;~~
 - g. ~~Screens and buffers with reference to type, dimensions, character and adequacy;~~
 - h. ~~General compatibility with surrounding properties and general welfare of the persons residing and working in the area;~~
 - i. ~~Whether, at the public hearing, there are objections from the surrounding and affected property owners and whether the objections, if any, can be or have been resolved;~~
 - j. ~~For the medical necessity exception, whether the medical condition is proven and the requested exception reasonably relates to the medical condition;~~
 - k. ~~For the de minimis exception, whether there is an overriding benefit to the applicant with no detriment to the surrounding neighbors or the city; and~~
 - l. ~~The spirit of this Code is met.~~

(4) To hear and decide other matters authorized by a zoning ordinance.

(5) In exercising its authority, the board may reverse or affirm, in whole or in part, or modify the administrative official's order, requirement, decision, or determination from which an appeal is taken and make the correct order, requirement, decision, or determination, and for that purpose, the board has the same authority as the administrative official.

DB. ~~*Vote required: appeals; variances; special exceptions.*~~ The concurring vote of four members of the board shall be necessary to reverse any order, requirements, decision, or determination of an administrative official, ~~or to effect any variation in the application of this appendix, or to decide in favor~~

of ~~an~~ the applicant on any matter or ~~special exception upon which it~~ **the board** is required to pass or decide under this appendix **a zoning ordinance**.

Section 4. That the City of Friendswood Code of Ordinances, Appendix C, “Zoning”, “Section 12. Appeals from the board of adjustment.” is hereby amended to read as follows:

Section 12. - Appeals from the board of adjustment.

- A. Any person or ~~persons, jointly or severally,~~ aggrieved by any decision of the board of adjustment, or any taxpayer, or officer, department, board, or bureau of the city may **present to a district court, county court, or county court at law a verified petition stating that the decision of the board of adjustment is illegal in whole or in part and specify the grounds of illegality** ~~seek review by a court of record of such decision~~ **within 10 days after the date the decision is filed in the board's office and** in the manner provided by the laws of the state, particularly V.T.C.A., Local Government Code §§ 211.008—211.011.
- B. *Reapplication.* No application for a variance, special exception, or appeal, which has been denied, shall be again filed earlier than one year from date of original denial, unless there has been a material change. For the purposes of this section, material change shall mean a substantial change in conditions or circumstances as it relates to the property in question.

Section 5. That the City of Friendswood Code of Ordinances, Appendix C, “Zoning”, “Section 20. Definitions.” is hereby amended to read as follows:

Section 10. Definitions

...

Variance means a relaxation of the terms of this appendix **a zoning ordinance** where such ~~if the~~ variance ~~will not be~~ **is not** contrary to the public interest and, **due to special conditions,** as the result of the actions of the applicant, a literal enforcement of the regulations of this appendix **ordinance** would result in unnecessary and undue hardship, **so that the spirit of the ordinance is observed and substantial justice is done**. As used in this appendix, a variance is authorized only for height, area and size of structure or size of yards and open spaces. Establishment or expansion of a use otherwise prohibited shall not be allowed by a variance, nor shall a variance be granted because of the presence of nonconformities in the zoning district or uses in an adjoining zoning district.

...

Section 6. That this Ordinance is hereby incorporated and made a part of the Friendswood City Code of Ordinances. Violation of this Ordinance is subject to the penalty provisions contained in such Code under Section 1-14 “General penalty for violations of Code; continuing violations”, and as otherwise provided by law. Any person who shall willfully, intentionally, or with criminal negligence violate any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.

Section 7. That all ordinances or parts of ordinances in conflict or inconsistent with this Ordinance are hereby expressly repealed.

Section 8. That in the event any clause, phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 9. That after final passage, the City Secretary shall give notice of the enactment of this Ordinance by promptly publishing the information required by the City Charter in the official newspaper of the City; the Ordinance to take effect upon publication.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, AND ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/23/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-17: First reading of an ordinance amending Appendix C "Zoning Ordinance," Section 7. "Schedule of District Regulations," Subsection 7.P.6., "Permitted Use Table," amending the following NAICS Uses: #447 Gasoline Stations, #511 Publishing Industries, and #713940 Fitness and Recreational Sports Centers; providing a penalty for violation in an amount not to exceed \$2000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.

Originating Department: Community Development

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

As a result of the annual review of the Permitted Use Table (Zoning Ord. Section 7.P.6.), staff and the Planning and Zoning Commission are proposing amendments in three categories.

The proposed amendments include...

447 - Gasoline Stations - change S in DD to blank, which would not allow gasoline stations in the Downtown District (DD)

511 - Publishing Industries - add P in CSC to allow; change S in DD to P to allow by right in the Downtown District (DD)

Publishing is classified in the Information Sector; whereas Printing remains under Manufacturing. The classification of book and newspaper publishing is intended to portray their roles in a modern economy, in which they do not resemble manufacturing activities.

713940 - Fitness and Recreational Sports Centers - change S to P in DD to allow gyms and fitness centers by right in Downtown District (DD)

This would allow uses such as aerobic dance or exercise centers, ice or roller skating rinks, gymnasiums, swimming or wave pools, physical fitness centers, handball, racquetball, or tennis club facilities in DD. Previous concerns for these types of uses was parking, however, square footage will regulate the number of parking spaces. Parking requirements for fitness and recreational sports is 7 parking spaces per 1,000

square feet of gross floor area.

Full NAICS descriptions of each use are included in the backup materials.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Any existing uses that would become non-conforming with these changes would be allowed to remain. The business could change owners and business name, as long as the use remained. If the structure that the non-conforming use occupies was damaged more than 50%, the owner would be allowed to rebuild a new structure (in conformance with current zoning regulations) and continue the use. If a non-conforming use is abandoned for 12 months or more or voluntarily changed to a conforming use, the non-conforming use is no longer allowed.

RECOMMENDATIONS

Following a public hearing on Thursday, February 13, 2020, the Planning and Zoning Commission voted unanimously (6 to 0; Clark was absent) in favor of the proposed amendments.

ATTACHMENTS

1. Ord 2020-17 Zoning Ord PUT Amendments 02-19-2020
2. Ord 2020-17 Exhibit A

ORDINANCE NO. T2020-17

AN ORDINANCE AMENDING APPENDIX C “ZONING ORDINANCE,” “SECTION 7. “SCHEDULE OF DISTRICT REGULATIONS,” SUBSECTION 7.P.6., “PERMITTED USE TABLE,” AMENDING THE FOLLOWING NAICS USES: #447 GASOLINE STATIONS, #511 PUBLISHING INDUSTRIES, AND #713940 FITNESS AND RECREATIONAL SPORTS CENTERS; PROVIDING A PENALTY FOR VIOLATION IN AN AMOUNT NOT TO EXCEED \$2000, OR AS OTHERWISE PROVIDED BY LAW; REPEALING ALL ORDINANCES OR PARTS OF ORDINANCES INCONSISTENT OR IN CONFLICT HERewith; AND PROVIDING FOR SEVERABILITY.

* * * * *

WHEREAS, the City Council of the City of Friendswood is continually reviewing the provisions of the City Code of Ordinances, specifically including Appendix C of the Friendswood City Code, “Zoning Ordinance” relating to land use and other circumstances which generally impact the health, safety and well-being of residents, citizens and inhabitants; and

WHEREAS, the City Council and the Planning and Zoning Commission of the City of Friendswood have studied the present provisions of the Zoning Ordinance and have determined the need to revise and update the provisions related to uses by changing NAICS Use #447, Gasoline Stations, to change from requiring a Specific Use Permit (S) in Downtown District (DD) to “blank,” which would not allow gasoline stations in the Downtown District (DD); to change NAICS Use #511, Publishing Industries, by adding a Permitted (P) to allow the use by right in Community Shopping Center (CSC) and to change from requiring a Specific Use Permit (S) in Downtown District (DD) to Permitted (P) to allow the use by right; and to change NACIS Use #713940, Fitness and Recreational Sports Centers, to change from requiring a Specific Use Permit (S) to Permitted (P) in Downtown District (DD) to allow the use by right as reflected in the

“Permitted Use Table” and to facilitate orderly growth of the City and the protection of health, safety and welfare of the inhabitants of the City of Friendswood; and

WHEREAS, the Planning and Zoning Commission and the City Council have conducted, in the time and manner required by law and the City Code of Ordinances, public hearings on the proposed ordinance changes, allowing all persons attending to be heard on the question of whether the changes being requested would affect the public health, safety, or general welfare of the citizens of Friendswood; and

WHEREAS, the Planning and Zoning Commission has filed its written report with City Council, which recommends approval of the amendments referenced hereafter; and

WHEREAS, City Council has determined that all public notices have been posted and published, all required hearings on this matter have been held, and that this Ordinance complies with the applicable provisions of the City Charter, City Code and all other applicable laws;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. That the facts and matters set forth in the preamble of this Ordinance are hereby found to be true and correct.

Section 2. That the City of Friendswood Code of Ordinances, Appendix C, “Zoning”, “Section 7. “Schedule of District Regulations,” Subsection 7.P.6., “Permitted Use Table,” is hereby amended by changing NAICS Use #447, Gasoline Stations, to change from requiring a Specific Use Permit (S) in Downtown District (DD) to “Blank” which would not allow gasoline stations in the Downtown District (DD); to change NAICS Use #511, Publishing Industries, by adding Permitted (P) to allow the use by right in Community Shopping Center (CSC) and to change from requiring a Specific Use Permit (S) in Downtown District (DD) to Permitted (P) to allow the use by right; and to change NACIS Use #713940, Fitness and Recreational Sports Centers, to change from requiring a Specific Use Permit (S)

to Permitted (P) in Downtown District (DD) to allow the use by right as reflected in the “Permitted Use Table,” as depicted in Exhibit “A” which is hereby made a part of this Ordinance.

Section 3. That this Ordinance is hereby incorporated and made a part of the Friendswood City Code of Ordinances. Violation of this Ordinance is subject to the penalty provisions contained in such Code under Section 1-14 “General penalty for violations of Code; continuing violations”, and as otherwise provided by law. Any person who shall willfully, intentionally, or with criminal negligence violate any provision of this Ordinance shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be fined in an amount not to exceed \$2,000.00. Each day of violation shall constitute a separate offense.

Section 4. That all ordinances or parts of ordinances in conflict or inconsistent with this Ordinance are hereby expressly repealed.

Section 5. That in the event any clause, phrase, provision, sentence, or part of this Ordinance or the application of the same to any person or circumstances shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this Ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

Section 6. That after final passage, the City Secretary shall give notice of the enactment of this Ordinance by promptly publishing the information required by the City Charter in the official newspaper of the City; the Ordinance to take effect upon publication.

PASSED AND APPROVED on first reading this 2nd day of March, 2020.

PASSED, APPROVED, AND ADOPTED on second and final reading this 6th day of April, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

EXHIBIT “A”

	2017 NAICS Industry Descriptions	SFR and SFR-E	MFR- GHD	MFR-L	MFR- M	MFR-H	MHR	CSC	NC	LNC	OPD	DD	A-1	L1	I	BP
44—45	<i>Retail Trade</i>															
447	Gasoline stations							P	P		O	S		P	P	
51	<i>Information</i>															
511	Publishing industries							<u>P</u>			O	<u>PS</u>		P	P	P
71	<i>Arts, Entertainment and Recreation</i>															
713940	Fitness and recreational sports centers							P	S			<u>PS</u>		P	P	

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/23/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Ordinance No. T2020-18: First and Final reading of an ordinance amending City of Friendswood, Texas, Ordinance No. 2019-38, passed and approved October 7, 2019, same being an ordinance approving and adopting the City's General Budget for Fiscal Year 2019-2020 by approving "Budget Amendment IV" to the "Original General Budget of the City of Friendswood, Texas, for the Fiscal Year 2019-2020"; providing for supplemental appropriation and/or transfer of certain funds; providing for severability; and providing other matters related to the subject.

Originating Department: Administrative Services

Degree of importance: Approval of this budget amendment will allow for timely procurement of program supplies and limit delays in the progress of capital improvement projects.

Recommend approval of the ordinance and exhibits covering Budget Amendment IV 2019–2020.

SUMMARY / ORIGINATING CAUSE

By its nature, our budget is an estimate of the revenues and expenditures needed to accomplish the City Council and Staff goals for the year. Throughout the year events occur that require adjustments to the budget. These adjustments may be needed for various reasons, such as the recognition of extraordinary revenues or expenditures, new projects that are authorized by Council or providing funding for expenditures resulting from extraordinary events like natural disasters. As the need arises, items for budget appropriations are accumulated and then submitted for approval at the City Council meeting each month. The budget adjustments covered by this ordinance comprise the fourth set for fiscal year 2019-2020.

We have attempted to provide as much explanation of the adjustments as possible through two sets of exhibits. Exhibit A provides a narrative explanation of each budget amendment. Exhibit B provides the detail of each accounting transaction.

Ordinance and exhibits are reviewed and approved by the City Attorney prior to inclusion on a City Council meeting agenda.

Expenditure required \$3,055,969.04

Amount Budgeted \$2,099

Appropriation Required \$3,053,870.04

Source of Funds:

Unassigned General Fund,
Assigned General Fund Balance, General Fund Revenue, Hazard Acquisition &
Demolition Project, Water & Sewer Working Capital, 2018 Water & Sewer Bond Proceeds

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Approval of this budget amendment will allow for timely procurement of program supplies and limit delays in the progress of capital improvement projects.

RECOMMENDATIONS

Recommend approval of the ordinance and exhibits covering Budget Amendment IV 2019–20.

ATTACHMENTS

1. Ord 2020-18 BA IV 2019-20
2. Ord 2020-18 Exhibit A
3. FY20 BA IV Exhibit B 03-02-2020

ORDINANCE NO. T2020-18

AN ORDINANCE AMENDING CITY OF FRIENDSWOOD, TEXAS, ORDINANCE NO. 2019-38, PASSED AND APPROVED OCTOBER 7, 2019, SAME BEING AN ORDINANCE APPROVING AND ADOPTING THE CITY'S GENERAL BUDGET FOR FISCAL YEAR 2019-2020 BY APPROVING "BUDGET AMENDMENT IV" TO THE "ORIGINAL GENERAL BUDGET OF THE CITY OF FRIENDSWOOD, TEXAS, FOR THE FISCAL YEAR 2019-2020"; PROVIDING FOR SUPPLEMENTAL APPROPRIATION AND/OR TRANSFER OF CERTAIN FUNDS; PROVIDING FOR SEVERABILITY; AND PROVIDING OTHER MATTERS RELATED TO THE SUBJECT.

* * * * *

WHEREAS, by Ordinance No. 2019-38, the City Council of the City of Friendswood, Texas, adopted its "Original General Budget for Fiscal Year 2019-2020"; and

WHEREAS, the City Council has determined that revenues and/or reserves are available for supplemental appropriation, and/or that the transfer of certain funds interdepartmentally is economically feasible and in the best interest of prudent budgeting and for municipal purposes; and

WHEREAS, Section 8.04 of The City Charter provides for amendments after adoption of the budget; and

WHEREAS, the City Council desires to amend said Original General Budget to reflect such supplemental appropriation and/or transfer in the fiscal year 2019-2020;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF FRIENDSWOOD, STATE OF TEXAS:

Section 1. The facts and matters set forth in the preamble of this Ordinance are hereby found to be true and correct.

Section 2. The “Original General Budget of the City of Friendswood, Texas, for the Fiscal Year 2019-2020,” is hereby amended for municipal purposes as shown on “Budget Amendment IV” to the “Original Budget of the City of Friendswood, Texas, for the Fiscal year 2019-2020” attached hereto. Said Budget Amendment IV shall be attached to and made a part of such Original General Budget by the City Secretary and shall be filed as required by state law, a true and correct copy of which is attached hereto as Exhibits “A” and “B” and made a part hereof for all purposes.

Section 3. In the event any clause, phrase, provision, sentence, or part of this ordinance or the application of the same to any person or circumstance shall for any reason be adjudged invalid or held unconstitutional by a court of competent jurisdiction, it shall not affect, impair, or invalidate this ordinance as a whole or any part or provision hereof other than the part declared to be invalid or unconstitutional; and the City Council of the City of Friendswood, Texas, declares that it would have passed each and every part of the same notwithstanding the omission of any such part thus declared to be invalid or unconstitutional, whether there be one or more parts.

PASSED AND APPROVED this 2nd day of March, 2020.

Mike Foreman
Mayor

ATTEST:

Melinda Welsh, TRMC
City Secretary

**City of Friendswood
Budget Amendment Summary
Fiscal Year 2019 – 2020
Budget Amendment IV
March 2, 2020**

1. **Hurricane Harvey Buyout Lots, \$479,065.** Appropriate funding in advance to purchase another home and lot through the Hazard Mitigation Grant Program. The City applied for and was awarded a federal grant through the Texas Division of Emergency Management for the buyout and demolition of homes flooded during Hurricane Harvey. A fourth property has agreed to the terms of the buyout is 13 Haverford Lane. Also, an additional lot located at 16614 Oxnard Lane will be purchased with the terms of the buyout. The funding source will be unassigned general fund balance and will be reimbursed once grant funding has been received from the State agency.
2. **Lift Station Repairs, \$293,859.04.** Appropriate working capital from the Water & Sewer Fund for lift station repairs. The city received funds from FEMA to make permanent repairs to lift stations 2, 4, 5, 13, 22, 24, 25, and 27 due to damages caused by Hurricane Harvey. The amount received from FEMA was \$264,473.14, about 90% of the estimated costs to repair the specific lift stations. The City is responsible for the remaining 10% of the repair costs. The funding source will be funds received in 2019 from FEMA and from the water and sewer working capital for the City's portion of lift station repairs.
3. **Beamer Road Waterline, \$123,621.** Appropriate funds for an Economic Development Agreement that Council approved at the February 3, 2020 council meeting with Coastal Bend Property Development, LP. The City will participate in the construction of public improvements along the southeast side of Beamer Road. The funding source has been identified as Water & Sewer working capital.
4. **Friendswood Lakes Boulevard Survey, \$2,200.** Appropriate funds to have The Wilson Survey Group perform a survey and mapping services in connection with the Right-of-Way Acquisition Tract for the proposed Friendswood Lake Boulevard. The Friendswood Lakes Boulevard is a joint project with the Galveston County Bond Program. The funding source will be assigned general fund balance.
5. **Parks & Recreation Keep Friendswood Beautiful Donations, \$908.** Appropriate revenue collected by the Keep Friendswood Beautiful (KFB) at the Fall Haul Garage Sale held on November 9, 2019. Funds will be appropriated to the KFB operating supplies account to maintain the Stevenson Park pollinator garden during Fiscal Year 2020.
6. **Parks & Recreation KFB Fairy Trail, \$5,000.** Appropriate funds donated to the Parks and Recreation Department Keep Friendswood Beautiful division. A donation was received from H-E-B Tournament of Champions on February 3, 2020. The donor requested that the funds help support the Friendswood Fairy Trail in Stevenson Park.
7. **PEG Channel Equipment, \$5,454.** Appropriate PEG Channel funds for equipment to be used for city wide media productions. The funding source will be restricted general fund balance reserves from PEG Channel revenue.
8. **Fire Marshal Office Vehicle Replacement Addition \$2,099.** Transfer funds from the Fire Marshal operating budget to the Vehicle Replacement Fund. Additional funds are needed to cover the equipment costs associated with outfitting Unit FM13. Funds will be transferred to the Vehicle Replacement Fund from the Fire Marshal vehicle maintenance account.
9. **City of Houston Southeast Transmission Water Line Project, \$2,143,763.** Appropriate funds for the cost sharing agreement with the City of Houston and co-participants for the 42-inch Water Main Replacement project. Council included this as part of the 2018 Water and Sewer Revenue Bonds for utility capital improvements. The funding source will be from the 2018 Water and Sewer Bond Proceeds.

City of Friendswood

March 2, 2020

2019-2020 Budget Amendment IV - Exhibit B

BA Number	Account Number	Project Number	Description	Amount
1	001-14018		Appropriate funds to purchase properties in the HMGP for buyout and demolition.	479,065
1	001-10199		Appropriate funds to purchase properties in the HMGP for buyout and demolition.	(479,065)
1	120-10199		Appropriate funds to purchase properties in the HMGP for buyout and demolition.	479,065
1	120-26010		Appropriate funds to purchase properties in the HMGP for buyout and demolition.	(479,065)
2	401-0000-30600		Appropriate Working Capital funds to repair Lift Stations #2, 4, 5, 13, 22, 24, 25, 27	(293,859.04)
2	401-7001-433.8552		Appropriate Working Capital funds to repair Lift Stations #2, 4, 5, 13, 22, 24, 25, 27 (FEMA reimbursement for Lift Stations)	264,473.14
2	401-7001-433.8552		Appropriate Working Capital funds to repair Lift Stations #2, 4, 5, 13, 22, 24, 25, 27 (City's portion of repairs for Lift Stations)	29,385.90
3	401-0000-30600		Appropriate Water & Sewer Working Capital funds for Economic Development Agreement regarding Beamer Road Waterline	(123,621)
3	401-7001-434.8541		Appropriate Water & Sewer Working Capital funds for Economic Development Agreement regarding Beamer Road Waterline	123,621
4	001-0000-30500		Appropriate assigned General Fund Balance for surveying and mapping services with The Wilson Group for Friendswood Lakes Boulevard	(2,200)
4	001-7001-431.8596	FLB2020	Appropriate assigned General Fund Balance for surveying and mapping services with The Wilson Group for Friendswood Lakes Boulevard	2,200
5	001-0000-38600		Appropriate donation received from KFB Annual Fall Haul Event to KFB operating supplies account	(908)
5	001-6424-458.5400		Appropriate donation received from KFB Annual Fall Haul Event to KFB operating supplies account	908
6	001-0000-38600	DN0018	Appropriate donation received from HEB Tournament of Champions to KFB Operating Services account	(5,000)
6	001-6424-458.7400	DN0018	Appropriate donation received from HEB Tournament of Champions to KFB Operating Services account	5,000
7	001-0000-30500		Appropriate PEG Fund Reserves for equipment purchase for media production	(5,454)
7	001-0416-419.5800		Appropriate PEG Fund Reserves for equipment purchase for media production	5,454
8	001-2501-422.6300		Transfer funds to VRP to purchase equipment to outfit Unit FM13	(2,099)
8	001-9001-491.9130		Transfer funds to VRP to purchase equipment to outfit Unit FM13	2,099
8	301-0000-39137		Receive transferred funds from GF FMO vehicle maintenance to purchase equipment to outfit Unit FM 13	(2,099)
8	301-0501-422.8300		Receive transferred funds from GF FMO vehicle maintenance to purchase equipment to outfit Unit FM 13	2,099
9	421-0000-30600		Appropriate 2018 Water & Sewer Bond Proceeds for the 42-inch water main replacement project with City of Houston	(2,143,763)
9	421-7001-434.8541		Appropriate 2018 Water & Sewer Bond Proceeds for the 42-inch water main replacement project with City of Houston	2,143,763

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 1/29/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Approving a Business Associate Agreement between Gabriel, Roeder, Smith & Company and the City of Friendswood Retiree Health Care Plan and authorize the Mayor to execute said document.

Originating Department: Administrative Services

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

The City of Friendswood, Tx Retiree Health Care Plan (the "Plan") is a "covered entity" within the Health Insurance Portability and Accountability Act of 1996 and its implementing regulations (45 CFR Parts 160-164) ("HIPAA") and the requirements of the Health Information Technology for Economic and Clinical Health Act (HITECH Act), as incorporated in the American Recovery and Reinvestment Act of 2009.

Gabriel, Roeder, Smith & Company (GRS), a business associate, has entered into an agreement with the City of Friendswood acting on behalf of the Plan to provide certain consulting, and/or actuarial services, in connection with the Plan. The Plan is required by HIPAA/HITECH to obtain and document satisfactory assurances from the business associate regarding appropriate safeguarding of certain "protected health information" received or created by the business associate.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Authorizing the Business Associate agreement puts the Plan in compliance with privacy laws. It allows the City to disclose protected health information with its business associate to use in actuarial calculations while the same time obtains assurances from GRS that they will appropriately safeguard the protected health information it receives or creates on behalf of the Plan.

RECOMMENDATIONS

Staff is recommending Council approve the Business Associate Agreement with GRS.

ATTACHMENTS

1. Business Associate Agreement

BUSINESS ASSOCIATE AGREEMENT

This BUSINESS ASSOCIATE AGREEMENT (this "Agreement") is entered into by and between GABRIEL, ROEDER, SMITH & COMPANY, a Michigan corporation ("GRS") and the City of Friendswood, TX Retiree Health Care Plan (the "Plan") (together, the "Parties", effective as provided below.

RECITALS

WHEREAS, the Plan is a "covered entity" within the meaning of the Health Insurance Portability and Accountability Act of 1996 and its implementing regulations (45 CFR Parts 160-164) ("HIPAA") and the requirements of the Health Information Technology for Economic and Clinical Health Act, as incorporated in the American Recovery and Reinvestment Act of 2009 (the "HITECH Act"; HIPAA and the HITECH Act are collectively referred to in this Agreement as "HIPAA/HITECH"); and

WHEREAS, GRS has entered into an agreement with the City of Friendswood, TX acting on behalf of the Plan, to provide certain consulting and/or actuarial services in connection with the Plan (the "Service Agreement"); and

WHEREAS, HIPAA/HITECH requires covered entities such as the Plan to obtain and document satisfactory assurances from "business associates" (as defined therein) regarding appropriate safeguarding of certain "protected health information" (as defined therein) received or created by the business associate (a "BA Agreement"); and

WHEREAS, GRS, in the performance of its services in connection with the Plan, is a "business associate" within the meaning of HIPAA/HITECH; and

WHEREAS, the Parties desire to enter into an agreement intended to satisfy the BA Agreement requirement as and to the extent such requirement may be applicable.

NOW, THEREFORE, in consideration of the premises and the respective covenants and agreements herein contained, the Parties agree as follows:

AGREEMENT

1. **Definitions**

Capitalized terms not expressly defined in this Agreement shall have the meanings as defined in HIPAA/HITECH. For purposes of this Agreement:

- (a) "**Data Aggregation**" shall have the same meaning as the term "data aggregation" in 45 CFR 164.501.
- (b) "**Designated Record Set**" shall have the same meaning as the term "designated record set" in 45 CFR 164.501 in respect of the Plan.
- (c) "**Effective Date**" shall have the meaning as set forth in Section 5(a) of this Agreement.
- (d) "**Individual**" shall have the same meaning as the term "individual" in 45 CFR 160.103 and shall include a person who qualifies as a personal representative in accordance with 45 CFR 164.502(g).

- (e) **"Plan Administrator"** shall mean the person(s) or office(s) with the discretionary authority to act on behalf of the Plan on matters relating to HIPAA/HITECH and this Agreement.
- (f) **"HIPAA/HITECH"** shall have the meaning as set forth in the RECITALS portion of this Agreement.
- (g) **"Protected Health Information"** shall have the same meaning as the term "protected health information" in 45 CFR 160.103, but limited to the information received or created by GRS from or on behalf of the Plan.
- (h) **"Required by Law"** shall have the same meaning as the term "required by law" in 45 CFR 164.103, to the extent not preempted by Federal law.
- (i) **"Secretary"** shall mean the Secretary of the Department of Health and Human Services or his designee.
- (j) **"Service Agreement"** shall have the meaning as set forth in the RECITALS portion of this Agreement.
- (k) **"Significant Breach"** shall mean a pattern of activity or practice that constitutes a material breach or violation of this Agreement in the written opinion of legal counsel for the Plan. For purposes hereof, a "pattern of activity or practice" shall consist of at least three (3) discrete acts and/or omissions within a period of not more than 180 consecutive days.

2. **Obligations of GRS**

GRS agrees to:

- (a) not use or disclose Protected Health Information other than as permitted or required by this Agreement or as Required By Law;
- (b) use appropriate safeguards and comply, where applicable, with the Security Standards for the Protection of Electronic Protected Health Information set forth in 45 CFR Part 164, Subpart C with respect to electronic protected health information, to prevent use or disclosure of the Protected Health Information other than as provided for by this Agreement;
- (c) report to the Plan Administrator any use or disclosure of Protected Health Information not provided for by this Agreement of which it becomes aware, including breaches of unsecured Protected Health Information as required by 45 CFR 164.410;
- (d) in accordance with 45 CFR 164.502(e)(1)(ii), ensure that any subcontractors that create, receive, maintain, or transmit Protected Health Information on behalf of GRS agrees to the same restrictions and conditions that apply through this Agreement to GRS with respect to such information; provided that the Plan shall not have any right to disapprove any subcontractors of GRS or to review any agreements with such subcontractors, except to the extent specifically provided herein or in the Service Agreement;

- (e) provide, in a commercially reasonable time and manner, access to Protected Health Information to the Plan Administrator to the extent necessary to meet the requirements under 45 CFR 164.524, provided that (i) such access shall be provided only to the extent such Protected Health Information is in the possession of GRS and maintained in a Designated Record Set and (ii) the Plan shall reimburse to GRS any of the following costs incurred in providing such access:
 - (i) copying (including the cost of supplies and labor);
 - (ii) postage; and
 - (iii) preparation of an explanation or summary of the Protected Health Information;
- (f) make, in a commercially reasonable time and manner, any amendment(s) to Protected Health Information that the Plan Administrator directs or agrees to pursuant to 45 CFR 164.526, provided that such amendment(s) shall be made only to the extent such Protected Health Information is in the possession of GRS and maintained in a Designated Record Set;
- (g) make available to the Plan Administrator, in a commercially reasonable time and manner, information in the possession of GRS as and to the extent required for the Plan to respond to a request by an Individual for an accounting of disclosures of Protected Health Information in accordance with 45 CFR 164.528;
- (h) to the extent GRS is to carry out the Plan's obligations regarding Privacy of Individual Identifiable Health Information set forth in 45 CFR Part 164, Subpart E (the "Privacy Requirements"), comply with the Privacy Requirements that apply to the Plan in GRS' performance of such obligations; and
- (i) make internal practices, books, and records relating to the use and disclosure of Protected Health Information received from the Plan, or created or received by GRS on behalf of the Plan, available to the Secretary for purposes of the Secretary determining the Plan's compliance with the Privacy Requirements.

3. *Permitted Uses and Disclosures by GRS*

- (a) General Use and Disclosure Provisions. Except as otherwise limited in this Agreement, GRS may use or disclose Protected Health Information to perform its duties, functions, activities, or services for, or on behalf of, the Plan, provided that such use or disclosure would not violate (i) HIPAA/HITECH if done by the Plan or (ii) the minimum necessary policies and procedures of the Plan as and to the extent intended to comply with HIPAA/HITECH and communicated by the Plan Administrator to GRS.
- (b) Specific Use and Disclosure Provisions.
 - (i) GRS may use Protected Health Information for the proper management and administration of GRS or to carry out the legal responsibilities of GRS.
 - (ii) Except as otherwise restricted by this Agreement, GRS may disclose Protected Health Information for the proper management and administration of GRS or to carry out the legal responsibilities of GRS, provided that:
 - (A) disclosures are Required By Law, or

- (B) GRS obtains reasonable assurances from the person to whom the information is disclosed that it will be held confidentially and used or further disclosed only as Required By Law or for the purpose for which it was disclosed to the person, and the person notifies GRS of any instances of which it is aware in which the confidentiality of the information has been breached.
- (iii) Except as otherwise limited in this Agreement, GRS may use Protected Health Information to provide Data Aggregation services as permitted by 45 CFR 164.504(e)(2)(i)(B).
- (iv) GRS may use or disclose Protected Health Information to report violations of law to appropriate Federal and/or State authorities, consistent with 45 CFR 164.502(j).
- (v) Except as otherwise limited in this Agreement, GRS may disclose Protected Health Information to other “business associates” (within the meaning of HIPAA/HITECH) of the Plan (i) as directed by the Plan Administrator or (ii) to perform its duties under the Service Agreement. Notwithstanding any provision hereof or any other prior agreement by the Parties, it shall be the Plan’s sole responsibility (and not GRS’s responsibility) to ensure that the Plan has entered into appropriate business associate agreements with (or has obtained similar written assurances from) its business associates.
- (vi) Except as otherwise limited in this Agreement, GRS may disclose Protected Health Information to the Plan’s sponsoring employer(s) as directed by the Plan Administrator; provided that the Plan Administrator shall include in such direction the specific person(s) or official(s) to whom such disclosure shall be made. Notwithstanding any provision hereof or any other prior agreement by the Parties, it shall be the Plan’s sole responsibility (and not GRS’s responsibility) to ensure that the Plan has, in its official plan document, an appropriate provision regarding disclosures of Protected Health Information to any sponsoring employer of the Plan.

4. *Obligations of the Plan and Plan Administrator*

- (a) General. Except as otherwise specifically provided under this Agreement, the Plan shall not request or permit GRS to (and shall not cause the Plan Administrator to request or permit GRS to) use or disclose Protected Health Information in any manner that may not be permissible under HIPAA/HITECH if done by the Plan.
- (b) Notification of Privacy Practices and Restrictions. The Plan shall cause the Plan Administrator to promptly notify GRS of:
 - (i) the name or office of each person authorized to act as the Plan Administrator for purposes of this Agreement, and any changes thereto;
 - (ii) any limitation(s) in the Plan’s notice of privacy practices in accordance with 45 CFR 164.520, to the extent that such limitation may affect GRS’s use or disclosure of Protected Health Information;

- (iii) any changes in, or revocation of, permission by an Individual regarding use or disclosure of Protected Health Information relating to that Individual, to the extent that such changes may affect GRS's use or disclosure of Protected Health Information;
- (iv) any restriction to the use or disclosure of Protected Health Information that the Plan has agreed to in accordance with 45 CFR 164.522, to the extent that such restriction may affect GRS's use or disclosure of Protected Health Information; and
- (v) any policies and procedures of the Plan to the extent that such policies or procedures may affect GRS' use or disclosure of Protected Health Information.

5. ***Term and Termination***

- (a) Term. The term of this Agreement shall be for a period commencing as of the later of (i) January 20, 2020 or (ii) the first date as of which HIPAA/HITECH applies to the Plan (the "Effective Date"), and ending when all of the Protected Health Information provided by the Plan to GRS, or created or received by GRS on behalf of the Plan, is destroyed, returned to the Plan or further protected in accordance with the termination provisions in this Section 5.
- (b) Termination for Cause. Upon the Plan Administrator's knowledge of a Significant Breach of GRS's obligation under this Agreement and subject to Section 5(c) hereof, the Plan Administrator may commence termination of this Agreement by providing a notice of termination to GRS. Notwithstanding the foregoing, this Agreement shall be considered to have been terminated pursuant to this Section 5(b) only if, prior to such notice of termination:
 - (i) the Plan Administrator shall have given to GRS written notice describing with specificity the Significant Breach;
 - (ii) a period of 60 days from and after the giving of such notice shall have elapsed without GRS's having substantially cured or remedied such reason for termination during such 60-day period, unless such reason for termination cannot be substantially cured or remedied within 60 days, in which case the period for remedy or cure shall be extended for a reasonable time (not to exceed 60 days), provided that GRS has made and continues to make a diligent effort to effect such remedy or cure; and
 - (iii) a final determination shall have been made by the Plan Administrator that the Significant Breach persists, following a meeting at which GRS shall be entitled to appear and contest the determination.
- (c) Condition Precedent. Upon receipt of a notice of termination pursuant to Section 5(b) hereof, or for termination of this Agreement for any other reason, GRS shall return or destroy all Protected Health Information received from the Plan, or created or received by GRS on behalf of the Plan, that GRS still maintains in any form, and shall retain no copies of such information, except that if GRS determines that such return or destruction is not feasible, GRS shall extend the protections of this Agreement to such Protected Health Information and limit further uses and disclosures of such Protected Health Information to those purposes that make the return or destruction infeasible.

- (d) Report to Secretary of HHS. If, in the reasonable determination of the Plan Administrator, termination of the Agreement pursuant to Section 5(b) hereof is not feasible, the Plan Administrator shall report the Significant Breach to the Secretary.

6. Other Provisions

- (a) Separate from Service Agreement. Notwithstanding anything herein to the contrary, this Agreement shall not be construed, and is not intended, to be a part of any Service Agreement or to otherwise impose on GRS any duties, responsibilities, obligation whatsoever in respect of the administration of the Plan, including any duties, responsibilities or obligation of the Plan pursuant to HIPAA/HITECH.
- (b) No Liability. To the fullest extent permitted by law, GRS shall be under no liability for any use or disclosure made in accordance with the directions of the Plan Administrator or other Plan representatives.
- (c) No Duty to Question. Notwithstanding anything herein to the contrary, GRS shall not be under any duty to question any directions received from the Plan Administrator, nor to review in any respect the manner in which any fiduciary of the Plan exercises its authority and discharges its duties with respect to the Plan.
- (d) Amendment. The Parties agree to take such action to amend this Agreement from time to time as is necessary for the Plan to comply with the requirements of HIPAA/HITECH.
- (e) Ambiguities. Any ambiguity in this Agreement shall be resolved in a manner that is consistent with the applicable requirements under HIPAA/HITECH.
- (f) Notice. Any notice required to be given hereunder shall be in writing and delivered by hand or sent by facsimile, registered or certified mail, return receipt requested, or by air courier, to the address (or fax number) cited in the signature block of this Agreement or to such other address (or fax number) as shall be specified by like notice by either Party, and shall be deemed given only when received.
- (g) Headings. The title, headings, and subheadings of this Agreement are solely for the convenience of the Parties and do not affect the meaning or interpretation of any provision of this Agreement.
- (h) Governing Law. Except to the extent preempted by Federal law, this Agreement shall be governed by and enforceable in accordance with the laws of the State of Texas without giving effect to the principles of conflict of laws thereof.
- (i) Arbitration. Any controversy or claim arising out of this Agreement, or the breach or violation thereof, shall be settled by binding arbitration in the City of Dallas, Texas, in accordance with the rules then obtaining of the American Arbitration Association, and the arbitrator's decision shall be binding and final, and judgment upon the award rendered may be entered in any court having jurisdiction thereof.
- (j) Entire Agreement. This Agreement contains the entire understanding between the Plan and GRS with respect to the subject matter hereof and, except as specifically provided herein, cancels and supersedes any and all other agreements between the Plan and GRS with respect to the subject matter hereof. Any amendment or modification of this Agreement shall not be binding unless in writing and signed by both the Plan and GRS.

- (k) Severability. In the event that any provision of this Agreement is determined to be invalid or unenforceable, the remaining terms and conditions of this Agreement shall be unaffected and shall remain in full force and effect, and any such determination of invalidity or unenforceability shall not affect the validity or enforceability of any other provision of this Agreement.
- (l) No Benefit to Others. The representations, covenants and agreements contained in this Agreement are for the sole benefit of the Parties, and they shall not be construed as conferring, and are not intended to confer, any rights on any other persons.
- (m) Counterparts. This Agreement may be signed in counterparts, each of which shall be an original, with the same effect as if the signatures thereto and hereto were upon the same instrument.

IN WITNESS WHEREOF, the Parties have entered into this Business Associate Agreement, effective as of the Effective Date.

CITY OF FRIENDSWOOD, TX RETIREE HEALTH CARE
PLAN

Date: _____

By: _____

Name: _____

Title: _____

Address: _____

GABRIEL, ROEDER, SMITH & COMPANY

Date: January 20, 2020

By: 

Name: Christine Scheer

Title: Corporate Secretary

Address: One Towne Square, Suite 800

Southfield, Michigan 48076

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/3/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Approving the January 2020 Tax Report.

Originating Department: City Manager

Degree of importance: Choose an Option

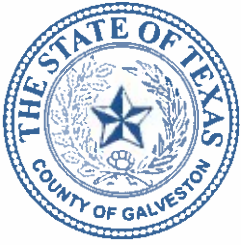
SUMMARY / ORIGINATING CAUSE

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

RECOMMENDATIONS

ATTACHMENTS

1. GalCo Tax Jan 2020



Cheryl E. Johnson, PCC
Assessor and Collector of Taxes
County of Galveston
722 Moody Avenue, Galveston, Texas 77550
Toll Free (877) 766-2284 Fax: (409) 766-2479
Email: galcotax@co.galveston.tx.us



February 10, 2020

The Governmental Entities of the Galveston County Tax Assessor/Collector's Office:

I, Cheryl E. Johnson, Tax Assessor and Collector of the County of Galveston do solemnly swear that this statement of collections made by me and the disposition thereof during the month of January, 2020 is true and correct.

Under my hand and seal this 10th day of February, 2020.

Cheryl E. Johnson, PCC
Galveston County Tax Assessor/Collector

cc: Randall Rice, County Auditor
Linebarger, Goggan, Blair, & Simpson
Perdue, Brandon, Fielder, Collins, & Mott
Assessment & Collection Partners:

City of Bayou Vista
City of Clear Lake Shores (delinquent)
City of Dickinson
City of Friendswood
City of Galveston
City of Hitchcock
City of Jamaica Beach
City of Kemah
City La Marque
City of League City
City of Santa Fe
City of Texas City
City of Tiki Island
Dickinson Independent School District
Galveston Independent School District
High Island Independent School District
Hitchcock Independent School District
College of the Mainland

Galveston Community College
GC Drainage District No. 1
GC Drainage District No. 2
GC Emergency Services Dist. No. 1
GC Emergency Services Dist. No. 2
GC Fresh Water Supply Dist. No. 6
Bacliff MUD
Bayview MUD
Galveston County MUD No. 12
Galveston County MUD No. 13
San Leon MUD
Tara Glen MUD
GC Navigation District No. 1
WCID No. 1
WCID No. 12
WCID No. 19
Westwood Management District

02/07/2020 13:46:04 3406371
TC298-D SELECTION: DEPOSIT
RECEIPT DATE: ALL
LOCATION: ALL

TAX COLLECTION SYSTEM
DEPOSIT DISTRIBUTION
FROM: 01/01/2020 THRU 01/31/2020
JURISDICTION: 0337 FRIENDWD CITY

PAGE: 34
INCLUDES AG ROLLBACK

YEAR	FUND	TAX RATE	LEVY PAID	DISCOUNT GIVEN	PENALTY INTEREST	TIF AMOUNT	DISBURSE TOTAL	ATTORNEY	OTHER FEES	REFUND AMOUNT	PAYMENT AMOUNT
2019	M & O	.432160	4,791,044.59	.00	.00	.00	4,791,044.59	.00	.00	.00	4,791,044.59
	I & S	.089279	989,771.99	.00	.00	.00	989,771.99	.00	.00	.00	989,771.99
	TOTAL	.521439	5,780,816.58	.00	.00	.00	5,780,816.58	.00	.00	.00	5,780,816.58
2018	M & O	.437173	5,092.56	.00	1,010.01	.00	6,102.57	1,100.38	.00	.00	7,202.95
	I & S	.095218	1,109.43	.00	219.96	.00	1,329.09	.00	.00	.00	1,329.09
	TOTAL	.532391	6,201.99	.00	1,229.97	.00	7,431.66	1,100.38	.00	.00	8,532.04
2017	M & O	.432349	714.16	.00	82.60	.00	796.76	53.75	.00	.00	850.51
	I & S	.095000	156.91	.00	18.15	.00	175.06	.00	.00	.00	175.06
	TOTAL	.527349	871.07	.00	100.75	.00	971.82	53.75	.00	.00	1,025.57
2016	M & O	.462000	820.03	.00	265.95	.00	1,085.98	156.79	.00	.00	1,242.77
	I & S	.084000	149.08	.00	48.35	.00	197.43	.00	.00	.00	197.43
	TOTAL	.546000	969.11	.00	314.30	.00	1,283.41	156.79	.00	.00	1,440.20
2015	M & O	.497200	394.61	.00	84.01	.00	478.62	.00	.00	.00	478.62
	I & S	.071500	56.75	.00	12.08	.00	68.83	.00	.00	.00	68.83
	TOTAL	.568700	451.36	.00	96.09	.00	547.45	.00	.00	.00	547.45
2014	M & O	.530300	360.62	.00	136.09	.00	496.71	23.57	.00	.00	520.28
	I & S	.061100	41.55	.00	15.67	.00	57.22	.00	.00	.00	57.22
	TOTAL	.591400	402.17	.00	151.76	.00	553.93	23.57	.00	.00	577.50
2013	M & O	.530300	271.41	.00	119.31	.00	390.72	.00	.00	.00	390.72
	I & S	.061100	31.28	.00	13.76	.00	45.04	.00	.00	.00	45.04
	TOTAL	.591400	302.69	.00	133.07	.00	435.76	.00	.00	.00	435.76
2012	M & O	.530700	340.04	.00	157.81	.00	497.85	.00	.00	.00	497.85
	I & S	.066300	42.19	.00	19.71	.00	62.20	.00	.00	.00	62.20
	TOTAL	.597000	382.53	.00	177.52	.00	560.05	.00	.00	.00	560.05
2011	M & O	.521800	372.25	.00	211.88	.00	584.13	.00	.00	.00	584.13
	I & S	.068400	48.80	.00	27.77	.00	76.57	.00	.00	.00	76.57
	TOTAL	.590200	421.05	.00	239.65	.00	660.70	.00	.00	.00	660.70
2010	M & O	.519800	374.06	.00	266.51	.00	640.57	.00	.00	.00	640.57
	I & S	.065300	46.99	.00	33.48	.00	80.47	.00	.00	.00	80.47
	TOTAL	.585100	421.05	.00	299.99	.00	721.04	.00	.00	.00	721.04
2009	M & O	.499700	478.87	.00	427.40	.00	906.27	138.89	.00	.00	1,045.16
	I & S	.080000	76.67	.00	68.43	.00	145.10	.00	.00	.00	145.10
	TOTAL	.579700	555.54	.00	495.83	.00	1,051.37	138.89	.00	.00	1,190.26
2008	M & O	.509700	444.05	.00	449.59	.00	893.64	138.38	.00	.00	1,032.02
	I & S	.070000	60.98	.00	61.75	.00	122.73	.00	.00	.00	122.73
	TOTAL	.579700	505.03	.00	511.34	.00	1,016.37	138.38	.00	.00	1,154.75

02/07/2020 13:46:04 3406371
 TC298-D SELECTION: DEPOSIT
 RECEIPT DATE: ALL
 LOCATION: ALL

TAX COLLECTION SYSTEM
 DEPOSIT DISTRIBUTION
 FROM: 01/01/2020 THRU 01/31/2020
 JURISDICTION: 0337 FRIENDMD CITY

PAGE: 35
 INCLUDES AG ROLLBACK

YEAR	FUND	TAX RATE	LEVY PAID	DISCOUNT GIVEN	PENALTY INTEREST	TIF AMOUNT	DISBURSE TOTAL	ATTORNEY	OTHER FEES	REFUND AMOUNT	PAYMENT AMOUNT
2007	M & O	.501600	325.45	.00	368.58	.00	694.03	111.45	.00	.00	805.48
	I & S	.074800	48.54	.00	54.97	.00	103.51	.00	.00	.00	103.51
	TOTAL	.576400	373.99	.00	423.55	.00	797.54	111.45	.00	.00	908.99
ALL	M & O		4,801,032.70	.00	3,579.74	.00	4,804,612.44	1,723.21	.00	.00	4,806,335.65
ALL	I & S		991,641.16	.00	594.08	.00	992,235.24	.00	.00	.00	992,235.24
ALL	TOTAL		5,792,673.86	.00	4,173.82	.00	5,796,847.68	1,723.21	.00	.00	5,798,570.89
DLQ	M & O		9,988.11	.00	3,579.74	.00	13,567.85	1,723.21	.00	.00	15,291.06
DLQ	I & S		1,869.17	.00	594.08	.00	2,463.25	.00	.00	.00	2,463.25
DLQ	TOTAL		11,857.28	.00	4,173.82	.00	16,031.10	1,723.21	.00	.00	17,754.31
CURR	M & O		4,791,044.59	.00	.00	.00	4,791,044.59	.00	.00	.00	4,791,044.59
CURR	I & S		989,771.99	.00	.00	.00	989,771.99	.00	.00	.00	989,771.99
CURR	TOTAL		5,780,816.58	.00	.00	.00	5,780,816.58	.00	.00	.00	5,780,816.58

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TC298-M SELECTION: DEPOSIT

3406371

TAX COLLECTION SYSTEM
DEPOSIT DISTRIBUTION
REVERSALS DETAIL SCHEDULE
FROM: 01/01/2020 THRU 01/31/2020
JURISDICTION: 337 FRIENDMD CITY

PAGE: 46
INCLUDES AG ROLLBACK

YEAR	DEPOSIT	ACCOUNT NUMBER	EFF YR/MO	LEVY PAID	DISCOUNT GIVEN	PENALTY INTEREST	ATTORNEY CAUSE /REV	REFUND AMOUNT	PAYMENT AMOUNT CAT
2018	78601312020T	1022310000016	202001	167.43-	0.00	0.00	0.00 HK15	0.00	167.43-TR
2018	78601312020T	1022310000016	202001	167.44-	0.00	0.00	0.00 HK15	0.00	167.44-TR
2018	78601312020T	1022310000016	202001	29.33-	0.00	0.00	0.00 HK15	0.00	29.33-TR
2018	RF200123	1043990010056	201903	295.60-	0.00	26.60-	0.00 HK16	322.20-	0.00 RF
2018	RF200123	1043990010056	201903	0.00	0.00	0.00	0.00 HK16	322.20-	322.20-RF
2018	RF200123	1043990010056	201908	8.87-	0.00	1.69-	0.00 HK16	10.56	0.00 RF
2018	RF200123	1043990010056	201908	0.00	0.00	0.00	0.00 HK16	10.56-	10.56-RF

2018 TOTAL

668.67-

0.00

28.29-

0.00

0.00

696.96-

2019	78601152020T	1000450000001	201912	1,095.02-	0.00	0.00	0.00 HS3	0.00	1,095.02-TR
2019	RF200123	1043990010056	201910	352.37-	0.00	0.00	0.00 HK05	352.37	0.00 RF
2019	RF200123	1043990010056	201910	0.00	0.00	0.00	0.00 HK05	352.37-	352.37-RF
2019	78601152020T	1050070000048	201912	655.32-	0.00	0.00	0.00 CERT	0.00	655.32-TR
2019	78601152020T	1050110000014	201912	337.07-	0.00	0.00	0.00 CERT	0.00	337.07-TR
2019	78601152020T	1055770000053	201911	346.17-	0.00	0.00	0.00 CERT	0.00	346.17-TR
2019	864012220PHC	1063170000009	202001	605.51-	0.00	0.00	0.00 HS3	0.00	605.51-RI
2019	864011020CHC	1098320000034	201912	8,547.01-	0.00	0.00	0.00 CERT	0.00	8,547.01-TR
2019	864012320CHC	1098320000034	202001	8,547.01-	0.00	0.00	0.00 CERT	0.00	8,547.01-TR
2019	78601152020T	1204000010032	201911	175.40-	0.00	0.00	0.00 CERT	0.00	175.40-TR
2019	864012820PHC	1227720030003	202001	1,036.98-	0.00	0.00	0.00 CERT	0.00	1,036.98-RI
2019	RF200123	1254280020002	202001	506.48-	0.00	0.00	0.00 HK05	506.48	0.00 RF
2019	RF200123	1254280020002	202001	0.00	0.00	0.00	0.00 HK05	506.48-	506.48-RF
2019	CP200127	200392	201912	162.36-	0.00	0.00	0.00 CERT	0.00	162.36-TR
2019	864011020CHC	202721	201912	1,896.95-	0.00	0.00	0.00 CERT	0.00	1,896.95-TR
2019	864010720PHC	202798	201912	2,002.33-	0.00	0.00	0.00 CERT	0.00	2,002.33-RI
2019	832869013020	219105	202001	698.44-	0.00	0.00	0.00 CERT	0.00	698.44-TR
2019	78601152020T	233455	201912	2,948.34-	0.00	0.00	0.00 CERT	0.00	2,948.34-TR
2019	CP200127	288785	201912	795.98-	0.00	0.00	0.00 CERT	0.00	795.98-TR
2019	864012820PHC	377203	202001	5,422.97-	0.00	0.00	0.00 CERT	0.00	5,422.97-RI
2019	864010720PHC	400937	201912	2,722.41-	0.00	0.00	0.00 CERT	0.00	2,722.41-RI
2019	864011020CHC	401093	201912	1,918.90-	0.00	0.00	0.00 CERT	0.00	1,918.90-TR
2019	864011020CHC	424503	201912	2,322.91-	0.00	0.00	0.00 CERT	0.00	2,322.91-TR
2019	864011420CHC	424623	201912	2,205.37-	0.00	0.00	0.00 CERT	0.00	2,205.37-TR
2019	864013120PHC	720780	202001	2,931.84-	0.00	0.00	0.00 CERT	0.00	2,931.84-RI

2019 TOTAL

48,233.14-

0.00

0.00

0.00

0.00

48,233.14-

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TC298-M SELECTION: DEPOSIT

3406371

TAX COLLECTION SYSTEM
DEPOSIT DISTRIBUTION
REVERSALS DETAIL SCHEDULE
FROM: 01/01/2020 THRU 01/31/2020
JURISDICTION: 337 FRIENDWD CITY

PAGE: 47
INCLUDES AG ROLLBACK

YEAR DEPOSIT	ACCOUNT NUMBER	EFF YR/MO	LEVY PAID	DISCOUNT GIVEN	PENALTY INTEREST	ATTORNEY CAUSE /REV	REFUND AMOUNT	PAYMENT AMOUNT CAT
	TOTAL REVERSALS		48,901.81-	0.00	28.29-	0.00	0.00	48,930.10-

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TC298-N SELECTION: DEPOSIT

3406371

TAX COLLECTION SYSTEM
DEPOSIT DISTRIBUTION
SUMMARY OF PAYMENTS AND REVERSALS
FROM: 01/01/2020 THRU 01/31/2020
JURISDICTION: 337 FRIENDWD CITY

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INCLUDES AG ROLLBACK

YEAR DEPOSIT	ACCOUNT NUMBER	EFF YR/MO	LEVY PAID	DISCOUNT GIVEN	PENALTY INTEREST	ATTORNEY CAUSE /REV	REFUND AMOUNT	PAYMENT AMOUNT
2007 TOTAL			373.99	0.00	423.55	111.45	0.00	908.99
2008 TOTAL			505.03	0.00	511.34	138.38	0.00	1,154.75
2009 TOTAL			555.54	0.00	495.83	138.89	0.00	1,190.26
2010 TOTAL			421.05	0.00	299.99	0.00	0.00	721.04
2011 TOTAL			421.05	0.00	239.65	0.00	0.00	660.70
2012 TOTAL			382.53	0.00	177.52	0.00	0.00	560.05
2013 TOTAL			302.69	0.00	133.07	0.00	0.00	435.76
2014 TOTAL			402.17	0.00	151.76	23.57	0.00	577.50
2015 TOTAL			451.36	0.00	96.09	0.00	0.00	547.45
2016 TOTAL			969.11	0.00	314.30	156.79	0.00	1,440.20
2017 TOTAL			871.07	0.00	100.75	53.75	0.00	1,025.57
2018 TOTAL			6,870.36	0.00	1,258.26	1,100.38	0.00	9,229.00
2019 TOTAL			5,829,049.72	0.00	0.00	0.00	0.00	5,829,049.72
TOTAL PAYMENTS			5,841,575.67	0.00	4,202.11	1,723.21	0.00	5,847,500.99
2018 TOTAL			668.67-	0.00	28.29-	0.00	0.00	696.96-
2019 TOTAL			48,233.14-	0.00	0.00	0.00	0.00	48,233.14-
TOTAL REVERSALS			48,901.81-	0.00	28.29-	0.00	0.00	48,930.10-
TOTAL FOR UNIT			5,792,673.86	0.00	4,173.82	1,723.21	0.00	5,798,570.89

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TC168

TAX COLLECTION SYSTEM
TAX COLLECTOR MONTHLY REPORT
FROM 08/01/2019 TO 01/31/2020

PAGE: 20
INCLUDES AG ROLLBACK

FISCAL START: 08/01/2019 END: 07/31/2020 JURISDICTION: 0337 FRIENDWD CITY

	CERT TAXABLE VALUE	ADJUSTMENTS	ADJ TAX VALUE	TAX RATE	TAX LEVY	PAID ACCTS
CURRENT YEAR	3,494,315,010	184,274,177	3,678,589,187	00.521439	18,732,789.43	13,810

YEAR	TAXES DUE	MONTH ADJ	ADJUSTMENT YTD	LEVY PAID	PAID YTD	BALANCE	COLL %	YTD UNCOLL
2019	17,783,517.63	949,271.80	949,271.80	15,765,300.21	15,765,300.21	2,967,489.22	84.16	0.00
2018	207,273.10	23,287.48	23,287.48	93,019.31	93,019.31	90,966.31	50.56	0.00
2017	45,549.62	3,368.33	3,368.33	10,327.71	10,327.71	31,853.58	24.48	0.00
2016	24,040.73	211.93	211.93	3,415.80	3,415.80	20,413.00	14.33	0.00
2015	18,497.82	381.51	381.51	1,654.94	1,654.94	16,461.37	9.14	0.00
2014	18,649.85	132.42	132.42	1,918.01	1,918.01	16,599.42	10.36	0.00
2013	13,872.95	.00	.00	967.18	967.18	12,905.77	6.97	0.00
2012	12,039.45	.00	.00	1,053.87	1,053.87	10,985.58	8.75	0.00
2011	11,426.47	.00	.00	1,090.21	1,090.21	10,336.26	9.54	0.00
2010	10,591.35	.00	.00	1,046.41	1,046.41	9,544.94	9.88	0.00
2009	12,161.61	.00	.00	979.14	979.14	11,182.47	8.05	0.00
2008	6,351.51	.00	.00	505.61	505.61	5,845.90	7.96	0.00
2007	2,435.78	.00	.00	374.57	374.57	2,061.21	15.38	0.00
2006	2,787.78	.00	.00	.00	.00	2,787.78		0.00
2005	1,428.40	.00	.00	.00	.00	1,428.40		0.00
2004	650.49	.00	.00	.00	.00	650.49		0.00
2003	647.12	.00	.00	.00	.00	647.12		0.00
2002	924.85	.00	.00	.00	.00	924.85		0.00
2001	941.66	.00	.00	.00	.00	941.66		0.00
2000	996.69	.00	.00	.00	.00	996.69		0.00
1999	481.49	.00	.00	.00	.00	481.49		0.00
1998	0.00	.00	.00	.00	.00	0.00		0.00
****	18,175,266.35	921,890.13	921,890.13	15,881,652.97	15,881,652.97	3,215,503.51		0.00

ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2019
JURISDICTION: 0337 FRIENDMD CITY

PAGE: 217
INCLUDES AG ROLLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	4,537,437,822	3,891,505,950	52,390,629	3,840	52,394,469	3,943,900,419
AG EXCLUSION	24,683,691	24,683,691	613,872	0	613,872	25,297,563
IMPROVEMENTS	645,931,872	645,931,872	176,618,073	375,939-	176,242,134	822,174,006
APPRAISED VALUE	4,537,437,822	4,537,437,822	229,008,702	372,099-	228,636,603	4,766,074,425
EXEMPTIONS	1,018,439,121	1,018,439,121	37,421,137	6,327,417	44,362,426	1,062,801,547
TAXABLE VALUE	3,494,315,010	3,494,315,010	190,973,693	6,699,516-	184,274,177	3,678,589,187
LEVY	17,783,517.63	17,783,517.63	1,152,418.82	203,147.02-	949,271.80	18,732,789.43
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE					.00	
EXEMPTION COUNTS:						
HOMESTEADS	10,000	10,000	477	52	54	10,054
OVER 65	2,975	2,975	129	40	42	3,017
DISABLED	181	181	5	8	8	189
VETERAN	205	205	12	2	2	207
TOTAL EXEMPT	74	74	0	0	0	74

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ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2018
JURISDICTION: 0337 FRIENDWD CITY

PAGE: 218
INCLUDES AG ROLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	4,207,374.518	3,589,474,109	0	616,407-	616,407-	3,588,857,702
AG EXCLUSION	23,842,910	23,842,910	0	0	0	23,842,910
IMPROVEMENTS	617,900,409	617,900,409	0	2,148,027-	2,148,027-	615,752,382
APPRAISED VALUE	4,207,374,518	4,207,374,518	0	2,764,434-	2,764,434-	4,204,610,084
EXEMPTIONS	891,117,422	891,117,422	0	2,092,812	2,092,812	893,210,234
TAXABLE VALUE	3,292,414,186	3,292,414,186	0	4,857,246-	4,857,246-	3,287,556,940
LEVY	207,273.10	207,273.10	.00	23,287.48-	23,287.48-	183,985.62
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE						
EXEMPTION COUNTS:						
HOMESTEADS	10,001	10,001	0	25	25	10,026
OVER 65	2,897	2,897	0	13	13	2,910
DISABLED	0	0	0	5	5	5
VETERAN	204	204	0	1	1	205
TOTAL EXEMPT	0	0	0	0	0	0

ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2017
JURISDICTION: 0337 FRIENDMD CITY

PAGE: 219
INCLUDES AG ROLLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	4,271,816,787	3,655,904,976	0	0	0	3,655,904,976
AG EXCLUSION	18,989,755	18,989,755	0	0	0	18,989,755
IMPROVEMENTS	615,911,811	615,911,811	603,304	43,070-	560,234	616,472,045
APPRAISED VALUE	4,271,816,787	4,271,816,787	603,304	43,070-	560,234	4,272,377,021
EXEMPTIONS	988,826,434	988,826,434	603,304	593,261	1,196,565	990,022,999
TAXABLE VALUE	3,264,000,598	3,264,000,598	0	636,331-	636,331-	3,263,364,267
LEVY	45,549.62	45,549.62	.00	3,368.33-	3,368.33-	42,181.29
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE					.00	
EXEMPTION COUNTS:						
HOMESTEADS	10,005	10,005	0	11	11	10,016
OVER 65	2,854	2,854	0	1	1	2,855
DISABLED	0	0	0	0	0	0
VETERAN	207	207	0	1	1	208
TOTAL EXEMPT	647	647	0	0	0	647

ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2016
JURISDICTION: 0337 FRIENDMD CITY

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INCLUDES AG ROLLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	3,999,127,118	3,429,239,107	0	0	0	3,429,239,107
AG EXCLUSION	13,436,213	13,436,213	0	0	0	13,436,213
IMPROVEMENTS	569,888,011	569,888,011	0	32,540-	32,540-	569,855,471
APPRAISED VALUE	3,999,127,118	3,999,127,118	0	32,540-	32,540-	3,999,094,578
EXEMPTIONS	968,850,710	968,850,710	0	5,143	5,143	968,855,853
TAXABLE VALUE	3,016,840,195	3,016,840,195	0	37,683-	37,683-	3,016,802,512
LEVY	24,040.73	24,040.73	.00	211.93-	211.93-	23,828.80
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE					.00	
EXEMPTION COUNTS:						
HOMESTEADS	9,913	9,913	0	0	0	9,913
OVER 65	2,721	2,721	0	0	0	2,721
DISABLED	0	0	0	0	0	0
VETERAN	242	242	0	1	1	243
TOTAL EXEMPT	642	642	0	0	0	642

ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2015
JURISDICTION: 0337 FRIENDWD CITY

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INCLUDES AG ROLLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	3,624,772,568	3,125,559,710	0	0	0	3,125,559,710
AG EXCLUSION	17,997,504	17,997,504	0	0	0	17,997,504
IMPROVEMENTS	499,212,858	499,212,858	0	23,010-	23,010-	499,189,848
APPRAISED VALUE	3,624,772,568	3,624,772,568	0	23,010-	23,010-	3,624,749,558
EXEMPTIONS	906,250,004	906,250,004	0	44,075	44,075	906,294,079
TAXABLE VALUE	2,700,525,060	2,700,525,060	0	67,085-	67,085-	2,700,457,975
LEVY	18,497.82	18,497.82	.00	381.51-	381.51-	18,116.31
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE					.00	
EXEMPTION COUNTS:						
HOMESTEADS	9,425	9,425	0	1	1	9,426
OVER 65	2,517	2,517	0	0	0	2,517
DISABLED	170	170	0	0	0	170
VETERAN	231	231	0	1	1	232
TOTAL EXEMPT	632	632	0	0	0	632

ALL PROPERTY

TAX COLLECTION SYSTEM
SUPPLEMENTAL / ADJUSTMENT CONTROL TOTALS
FOR TAX YEAR: 2014
JURISDICTION: 0337 FRIENDMD CITY

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INCLUDES AG ROLLBACK

	CERTIFIED ROLL	ROLL AS OF 08/01/2019	SUPPLEMENTALS THIS PERIOD	ADJUSTMENTS THIS PERIOD	NET CHANGE THIS PERIOD	ROLL AS OF 01/31/2020
LAND VALUE	3,220,611,338	2,761,917,896	0	0	0	2,761,917,896
AG EXCLUSION	22,656,763	22,656,763	0	0	0	22,656,763
IMPROVEMENTS	458,693,442	458,693,442	0	0	0	458,693,442
APPRAISED VALUE	3,220,611,338	3,220,611,338	0	0	0	3,220,611,338
EXEMPTIONS	739,118,459	739,118,459	0	22,392	22,392	739,140,851
TAXABLE VALUE	2,458,836,116	2,458,836,116	0	22,392-	22,392-	2,458,813,724
LEVY	18,649.85	18,649.85	.00	132.42-	132.42-	18,517.43
UNCOLLECTIBLE	.00	.00	.00	.00	.00	.00
RECEIVABLE					.00	
EXEMPTION COUNTS:						
HOMESTEADS	9,648	9,648	0	1	1	9,649
OVER 65	2,524	2,524	0	0	0	2,524
DISABLED	176	176	0	0	0	176
VETERAN	220	220	0	0	0	220
TOTAL EXEMPT	624	624	0	0	0	624

Summary of Jurisdiction Remittances Processed

Report run on: February 10, 2020 10:49 AM

For Remitted Deposit Dates 01/01/2020 thru 01/31/2020 as of 02/10/2020

Version 1.50

Tax Unit		M & O Total	I & S Total	TIF Levy	TIF Interest	Fee Total	Total
337 FRIENDWD CITY							
ACH 54654	Print Date:01/07/2020						
	Current	538,049.87	111,154.64	0.00	0.00	0.00	649,204.51
	Delq	933.88	203.18	0.00	0.00	0.00	1,137.06
Last Deposit Date	01/02/2020	\$538,983.75	\$111,357.82	\$0.00	\$0.00	\$0.00	\$650,341.57
ACH 54699	Print Date:01/09/2020						
	Current	321,759.77	66,471.65	0.00	0.00	0.00	388,231.42
	Delq	6,352.44	939.51	0.00	0.00	0.00	7,291.95
Last Deposit Date	01/03/2020	\$328,112.21	\$67,411.16	\$0.00	\$0.00	\$0.00	\$395,523.37
ACH 54744	Print Date:01/10/2020						
	Current	131,339.25	27,133.10	0.00	0.00	0.00	158,472.35
	Delq	693.45	150.82	0.00	0.00	0.00	844.27
Last Deposit Date	01/06/2020	\$132,032.70	\$27,283.92	\$0.00	\$0.00	\$0.00	\$159,316.62
ACH 54785	Print Date:01/10/2020						
	Current	28,333.72	5,853.41	0.00	0.00	0.00	34,187.13
	Delq	21.37	4.44	0.00	0.00	0.00	25.81
Last Deposit Date	01/07/2020	\$28,355.09	\$5,857.85	\$0.00	\$0.00	\$0.00	\$34,212.94
ACH 54825	Print Date:01/13/2020						
	Current	161,982.24	33,463.58	0.00	0.00	0.00	195,445.82
	Delq	166.55	26.55	0.00	0.00	0.00	193.10
Last Deposit Date	01/08/2020	\$162,148.79	\$33,490.13	\$0.00	\$0.00	\$0.00	\$195,638.92
ACH 54867	Print Date:01/13/2020						
	Current	315,703.16	65,220.42	0.00	0.00	0.00	380,923.58
	Delq	596.31	129.88	0.00	0.00	0.00	726.19
Last Deposit Date	01/09/2020	\$316,299.47	\$65,350.30	\$0.00	\$0.00	\$0.00	\$381,649.77
ACH 54912	Print Date:01/14/2020						
	Current	458,858.63	94,794.58	0.00	0.00	0.00	553,653.21
	Delq	1,298.97	248.11	0.00	0.00	0.00	1,547.08
Last Deposit Date	01/10/2020	\$460,157.60	\$95,042.69	\$0.00	\$0.00	\$0.00	\$555,200.29
ACH 54957	Print Date:01/15/2020						
	Current	192,277.96	39,722.30	0.00	0.00	0.00	232,000.26
	Delq	44.60	9.79	0.00	0.00	0.00	54.39
Last Deposit Date	01/13/2020	\$192,322.56	\$39,732.09	\$0.00	\$0.00	\$0.00	\$232,054.65
ACH 55002	Print Date:01/16/2020						
	Current	98,011.56	20,248.01	0.00	0.00	0.00	118,259.57
	Delq	748.89	160.68	0.00	0.00	0.00	909.57
Last Deposit Date	01/14/2020	\$98,760.45	\$20,408.69	\$0.00	\$0.00	\$0.00	\$119,169.14
ACH 55046	Print Date:01/17/2020						
	Current	37,062.09	7,656.60	0.00	0.00	0.00	44,718.69
Last Deposit Date	01/15/2020	\$37,062.09	\$7,656.60	\$0.00	\$0.00	\$0.00	\$44,718.69
ACH 55091	Print Date:01/21/2020						
	Current	249,390.01	51,520.86	0.00	0.00	0.00	300,910.87
	Delq	145.73	31.82	0.00	0.00	0.00	177.55
Last Deposit Date	01/16/2020	\$249,535.74	\$51,552.68	\$0.00	\$0.00	\$0.00	\$301,088.42

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Summary of Jurisdiction Remittances Processed

Report run on: February 10, 2020 10:49 AM

For Remitted Deposit Dates 01/01/2020 thru 01/31/2020 as of 02/10/2020

Version 1.50

Tax Unit		M & O Total	I & S Total	TIF Levy	TIF Interest	Fee Total	Total
337 FRIENDWD CITY							
ACH 55136	Print Date:01/22/2020						
	Current	153,936.28	31,801.42	0.00	0.00	0.00	185,737.70
	Delq	2.63	0.57	0.00	0.00	0.00	3.20
Last Deposit Date	01/17/2020	\$153,938.91	\$31,801.99	\$0.00	\$0.00	\$0.00	\$185,740.90
ACH 55180	Print Date:01/23/2020						
	Current	71,328.75	14,735.72	0.00	0.00	0.00	86,064.47
	Delq	56.64	12.44	0.00	0.00	0.00	69.08
Last Deposit Date	01/21/2020	\$71,385.39	\$14,748.16	\$0.00	\$0.00	\$0.00	\$86,133.55
ACH 55225	Print Date:01/24/2020						
	Current	194,548.39	40,191.36	0.00	0.00	0.00	234,739.75
	Delq	47.98	10.52	0.00	0.00	0.00	58.50
Last Deposit Date	01/22/2020	\$194,596.37	\$40,201.88	\$0.00	\$0.00	\$0.00	\$234,798.25
ACH 55271	Print Date:01/27/2020						
	Current	125,530.56	25,933.15	0.00	0.00	0.00	151,463.71
	Delq	244.90	53.33	0.00	0.00	0.00	298.23
Last Deposit Date	01/23/2020	\$125,775.46	\$25,986.48	\$0.00	\$0.00	\$0.00	\$151,761.94
ACH 55315	Print Date:01/27/2020						
	Current	307,634.77	63,553.67	0.00	0.00	0.00	371,188.44
Last Deposit Date	01/24/2020	\$307,634.77	\$63,553.67	\$0.00	\$0.00	\$0.00	\$371,188.44
ACH 55359	Print Date:01/29/2020						
	Current	212,678.80	43,936.94	0.00	0.00	0.00	256,615.74
	Delq	46.67	10.17	0.00	0.00	0.00	56.84
Last Deposit Date	01/27/2020	\$212,725.47	\$43,947.11	\$0.00	\$0.00	\$0.00	\$256,672.58
ACH 55403	Print Date:01/29/2020						
	Current	141,222.84	29,174.93	0.00	0.00	0.00	170,397.77
	Delq	648.16	140.98	0.00	0.00	0.00	789.14
Last Deposit Date	01/28/2020	\$141,871.00	\$29,315.91	\$0.00	\$0.00	\$0.00	\$171,186.91
ACH 55447	Print Date:01/31/2020						
	Current	241,202.71	49,829.57	0.00	0.00	0.00	291,032.28
	Delq	512.94	111.71	0.00	0.00	0.00	624.65
Last Deposit Date	01/29/2020	\$241,715.65	\$49,941.28	\$0.00	\$0.00	\$0.00	\$291,656.93
ACH 55492	Print Date:02/03/2020						
	Current	324,300.27	66,996.46	0.00	0.00	0.00	391,296.73
	Delq	320.32	69.09	0.00	0.00	0.00	389.41
Last Deposit Date	01/30/2020	\$324,620.59	\$67,065.55	\$0.00	\$0.00	\$0.00	\$391,686.14
ACH 55537	Print Date:02/10/2020						
	Current	485,892.96	100,379.62	0.00	0.00	0.00	586,272.58
	Delq	685.42	149.66	0.00	0.00	0.00	835.08
Last Deposit Date	01/31/2020	\$486,578.38	\$100,529.28	\$0.00	\$0.00	\$0.00	\$587,107.66
Total:		\$1,804,612.44	\$992,235.24	\$0.00	\$0.00	\$0.00	\$5,796,847.68

ACTGL_TU_REMIT_SP

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/10/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Approving the disposal of a decommissioned police vehicle through Houston Auto Auction.

Originating Department: Police Department

Degree of importance: Elective

SUMMARY / ORIGINATING CAUSE

The police department has one decommissioned police vehicle (P282, 2013 Chevrolet Tahoe) that it presents for disposal. The department will dispose of the vehicle through services provided by Houston Auto Auction. The vehicle has been in service since 2013. Costs associated with keeping the vehicle suitable for service are high, making the most cost effective solution to auction the vehicle. P282 was replaced in 2018. The vehicle will be decommissioned per the standards set by Local Government Code, Section 272.006 Sale or Transfer of Law Enforcement Vehicle, which includes the removal of any equipment or insignia that could mislead a reasonable person to believe that the vehicle is a law enforcement motor vehicle.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Proceeds from the sale of this vehicle will be deposited into the Vehicle Replacement Fund (VRF).

RECOMMENDATIONS

Staff recommends Mayor and Council consent to disposal of this asset in the manner described above.

ATTACHMENTS

FRIENDSWOOD CITY COUNCIL AGENDA ITEM FORM

This form should be completed and forwarded to the City Manager's Office as soon as possible prior to the first date that the item is expected to be placed on the Friendswood City Council agenda.

Date requested for City Council consideration: March 2, 2020

Date submitted: 2/18/2020

Prepared by: Glenda Faulkner, Executive Secretary

Subject: Approving the minutes of the February 3 and February 8, 2020, Council Meetings.

Originating Department: City Secretary

Degree of importance: Significant

SUMMARY / ORIGINATING CAUSE

The Council Meeting minutes of February 03 and February 8, 2020, are submitted for Council's review and consideration.

IMMINENT CONSEQUENCES / BENEFIT TO COMMUNITY

Approval of the Council Meeting minutes provides a historical document of actions taken by City Council as provided for in the Local Government Code and in the City Charter.

RECOMMENDATIONS

The City Secretary recommends that Council approve the Council meeting minutes as presented.

ATTACHMENTS

1. 02-03-20 Minutes
2. 02-08-20 Minutes

STATE OF TEXAS
CITY OF FRIENDSWOOD
COUNTIES OF GALVESTON/HARRIS
FEBRUARY 3, 2020

6 PM – REGULAR MEETING

MINUTES OF A REGULAR MEETING OF THE FRIENDSWOOD CITY COUNCIL THAT WAS HELD ON MONDAY, FEBRUARY 3, 2020, AT 06:00 PM AT FRIENDSWOOD CITY HALL COUNCIL CHAMBERS, 910 S. FRIENDSWOOD DRIVE, FRIENDSWOOD, TEXAS, WITH THE FOLLOWING PRESENT CONSTITUTING A QUORUM:

MAYOR PRO-TEM SALLY BRANSON
COUNCILMEMBER STEVE ROCKEY
COUNCILMEMBER TRISH HANKS
COUNCILMEMBER ROBERT J. GRIFFON
COUNCILMEMBER JOHN SCOTT
COUNCILMEMBER BRENT ERENWERT
CITY ATTORNEY MARY KAY FISCHER
CITY MANAGER MORAD KABIRI
CITY SECRETARY MELINDA WELSH

Mayor Mike Foreman was absent from the meeting.

1. Call to order

Mayor Pro-Tem Branson called the meeting to order.

2. Invocation – Pastor Mike Cervantes, New Hope Church

The invocation was given by Pastor Mike Cervantes with New Hope Church.

3. Pledge of Allegiance to the United States and Texas Flags – Makayla Dicely and Logan Kleinpeter with Girl Scout Daisy Troop #143155

(HONOR THE TEXAS FLAG; I PLEDGE ALLEGIANCE TO THEE, TEXAS, ONE STATE UNDER GOD, ONE AND INDIVISIBLE)

Daisy Scouts Makayla Dicely and Logan Kleinpeter with Girl Scout Troop #143155 led the Pledge of Allegiance to the United States and to the State of Texas.

4. Communications from the Public

Communications from the Public (To comply with provisions of the Open Meetings Act, the City Council may not deliberate on items discussed under this agenda item. The Council may refer this item to the City Manager or direct this item to be placed on the next regular Council agenda. Out of respect for those speaking during public comment, please refrain from any outbursts or interjections to include, but not limited to, applause

and/or disparaging noises from the audience. Doing so discourages others from voicing their thoughts and opinions, and disrupts the meeting. Furthermore, any personnel complaints against a City employee aside from the City Manager, City Secretary, City Attorney or Municipal Judge cannot be discussed under this section. Please contact the City Manager's office for concerns involving a City employee.)

Mayor Pro-Tem Branson asked if anyone would like to speak. No one spoke.

5. WORK SESSION

A. Capital Improvement Projects and Drainage Update

Mayor Pro-Tem Branson opened the discussion regarding Capital Improvement Projects and drainage update. Director of Engineering/City Engineer Jildardo Arias and Deputy Director of Engineering Samantha Haritos presented a PowerPoint presentation regarding progress made on Capital Improvement Projects and drainage since October 2019. Mr. Arias reported on Capital Improvement Projects, 2018-2019 street maintenance program, 2019-2020 street maintenance program, Blackhawk Boulevard Phase II, city-wide traffic study, Lift Station No. 23, current Harris County projects, and current Texas Department of Transportation (TxDOT) projects. Ms. Haritos gave the drainage update regarding the coordination of partnering with other entities including Harris County Flood Control District, Galveston County Consolidated Drainage District, Rice University Study, Galveston County, Houston-Galveston Area Council, and Lower Clear Creek and Dickinson Bayou Federal Study (League City study). Staff's agenda is to continue identifying partnership opportunities, procure up-to-date hydraulic and hydrology models, and currently working with other departments to improve in-house mapping capabilities using Geographical Information Systems (Arc-GIS). Short-term drainage projects include a project the city is partnering with Galveston County Drainage District at Imperial Estates, Forest Bend Detention project funded by a Community Development Block Grant – Disaster Recovery Grant for \$3.5 Million, and the Clear Creek Community Church (Whitcomb Property) terracing project. State Proposition No. 8 passed in November 2018 providing \$793 Million for a Flood Infrastructure Fund, and a possible opportunity for the city to obtain free grant money for a large planning study such as a Master Drainage Plan.

Discussion took place between Mayor-Pro Tem, Council, and Staff regarding the \$4 Million for street repair projects are funded with sales tax dollars, Staff is investigating a pilot program for pavement preservation, and Staff would like the city to have a representative on Houston-Galveston Area Council's Flood Mitigation and Flood Control Committee.

With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 8, Special Recognition and Acknowledgements.

6. CLOSED EXECUTIVE SESSION

A. Communications from the Public regarding Executive Session topics.

Mayor Pro-Tem Branson asked if anyone would like to speak regarding the Executive Session. No one spoke.

- B. Council may convene into Executive Session in accordance with Texas Government Code, pursuant to Section 551.087: Deliberation regarding economic development negotiations; to deliberate the offer of a financial or other incentive to a business prospect with possible discussion and action related thereto in open session.

Council convened into Executive Session in accordance with Texas Government Code, pursuant to Section 551.087 – Deliberation regarding economic development negotiations; to deliberate the offer of a financial or other incentive to a business prospect.

7. RECONVENE INTO OPEN SESSION

Council reconvened into Open Session with no action taken later in the meeting.

With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 18, Adjournment.

8. Special Recognition and Acknowledgements

- A. Platinum Scenic City Designation presented by Scenic Houston Finance Chair Derrick Mitchell

Scenic Houston Finance Chair Derrick Mitchell stated it is his pleasure to present the Platinum Scenic City Designation certificate to the City of Friendswood. The city has been recognized as one of twenty-two Texas cities awarded as recipients through the City Certification Program. The city made an impressive jump from the previous bronze status. Following the award, the city has installed new “Certified Scenic City Platinum” signage at some of the main entrances into the city. With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 12, Communications from Committees and Special Reports.

9. Public Hearing

To receive comments from the public, both oral and written, regarding:

- A. To review the City of Friendswood Infrastructure application for the Community Development Block Grant - Disaster Recovery (CDBG-DR) funds for Hurricane Harvey and the allocation of \$2,691,517 to the city for infrastructure projects. The U.S. Department of Housing and Urban Development (HUD) allocated the State of Texas \$5.024 Billion in CDBG-DR funding through the Texas General Land Office (GLO). Of which, the HGAC has developed a MOD to allocate more than \$240 million of funding to local cities.

Mayor Pro-Tem Branson called a Public Hearing to order to receive comments from the public both oral and written, regarding to review the City of Friendswood Infrastructure application for the Community Development Block Grant - Disaster Recovery (CDBG-DR) funds for Hurricane Harvey and the allocation of \$2,691,517 to the city for infrastructure projects. The United States Department of Housing and Urban Development (HUD) allocated the State of Texas \$5.024 Billion in CDBG-DR funding through the Texas General Land Office (GLO). Of which, the Houston-Galveston Area Council has developed a Method of Distribution to allocate more than \$240 Million of funding to local cities.

Fire Marshal Brian Mansfield explained that due to further assessment done on one of the infrastructure projects, due to flood maps and other items, the city's application had to be changed. The reason for another Public Hearing is the Texas General Land Office was gracious enough to allow the city to make the requested change. Houston-Galveston Area Council (excluding Harris County) has developed a Method of Distribution to distribute \$240 Million in Community Development Block Grant – Disaster Recovery funds for Galveston County cities devastated by Hurricane Harvey. The City of Friendswood has been allocated \$2,691,517 in infrastructure projects. Staff is awaiting notice from Galveston County that the county has met the Low to Moderate Income (LMI) requirement before proceeding. Projects would include flood control, restoration of publicly owned infrastructure, demo or construction of public homes and commercial buildings, and code enforcement.

Mayor Pro-Tem Branson asked if anyone would like to speak.

Phil Ratisseau, Friendswood resident, stated the Citizen Advisory Team has stayed together and continues to be involved, this is an excellent opportunity for the city, and citizens should fully support.

Mayor Pro-Tem Branson adjourned the Public Hearing.

10. Communications from the Public

Communications from the Public (To comply with provisions of the Open Meetings Act, the City Council may not deliberate on items discussed under this agenda item. The Council may refer this item to the City Manager or direct this item to be placed on the next regular Council agenda. PowerPoint presentations are not conducted during the citizen comment period. Out of respect for those speaking during public comment, please refrain from any outbursts or interjections to include, but not limited to, applause and/or disparaging noises from the audience. Doing so discourages others from voicing their thoughts and opinions, and disrupts the meeting. Furthermore, any personnel complaints against a City employee aside from the City Manager, City Secretary, City Attorney or Municipal Judge cannot be discussed under this section. Please contact the City Manager's office for concerns involving a City employee.)

David Allen, Friendswood resident, addressed Council and stated he knows there is a lot of heavy rollers in the room, provided a handout about the virus spreading in China, origin of the virus is in Wuhan which has a biolab, is an engineered virus, can find info on www.newswars.com, there is a biolab in Galveston, and read an article from 2005 regarding the opening of the University of Texas Medical Branch Galveston Biolab.

11. City Manager's Report

A. Keep Friendswood Beautiful Tree Giveaway Results

City Manager Morad Kabiri reported that the Annual Tree Giveaway sponsored by Keep Friendswood Beautiful (KFB) was held at City Hall, on January 18, 2020. A total of 200 trees were given away to Friendswood residents within 30 minutes and residents were lined up as early as 6:00 AM. The city appreciates the efforts of KFB and the city's Parks and Recreation Department towards making this event a huge success.

B. Hurricane Harvey Update

The City Manager reported that Staff continues to move forward with the Hazard Mitigation Grant Program buyout program. Since the January Council meeting, the city has partially closed on three properties of the fourteen remaining in the program. Staff recently received word that Federal Emergency Management Agency (FEMA) has obligated funding for the Texas Water Development Board Flood Mitigation Assistance grant project to acquire four Severe Repetitive Loss Properties along Clear Creek and Cowards Creek. Conditional approvals have been granted from the Community Development Block Grant – Disaster Recovery Program for both the Blackhawk Facility and the Forest Bend flood mitigation project. Staff is working toward the procurement of professional services for architectural, engineering, and environmental activities associated with these projects once Harris County Commissioners Court authorizes the city to proceed. Applications through the Texas General Land Office on property acquisition/critical infrastructure are still awaiting approval. United States Congressman Pete Olson and Randy Weber have been contacted to enlist help with FEMA on all projects and initiatives.

The City Manager reported that the City of Friendswood was recently recognized by Friendswood Chamber of Commerce as the Business of the Year to recognize the City of Friendswood's 125th Anniversary. The city appreciates the Chamber of Commerce and everyone involved in making Friendswood what it is.

With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 13, Discussion and Possible Action.

12. Communications from Committees and Special Reports

A. Annual Report from the Animal Shelter Advisory Committee

Animal Shelter Advisory Committee Chair Dr. Donald Stran presented the annual report from the Animal Shelter Advisory Committee.

Mayor Pro-Tem Branson recessed the meeting at 6:58 PM, and reconvened the meeting at 7:05 PM.

With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 9, Public Hearing.

13. Discussion and Possible Action

A. Discussion and possible action regarding approving an Economic Development Agreement with Coastal Bend Property Development, LP. and Contractor.

******Councilmember Scott moved to approve an Economic Development Agreement with Coastal Bend Property Development, LP. and contractor.
The motion was seconded and approved 6-0.

B. Discussion and possible action regarding approving an inter-local cooperation contract with Texas Department of Public Safety Galveston County for Failure to Appear (FTA) Program of the Friendswood Municipal Court.

****Councilmember Scott moved to approve an inter-local cooperation contract with Texas Department of Public Safety Galveston County for Failure to Appear (FTA) Program of the Friendswood Municipal Court.**

The motion was seconded and approved 6-0.

14. Resolutions

Consideration and possible action regarding the following:

A. Resolution No. R2020-01: A resolution of the City Council of the City of Friendswood, Texas, designating the Mayor as the City's representative in seeking eligible grant funds under General Victim Assistance Direct Services Program; and authorizing the submission of such grant application to the Criminal Justice Division of the Office of Governor.

****Councilmember Scott moved to approve Resolution No. R2020-01 – A resolution of the City Council of the City of Friendswood, Texas, designating the Mayor as the City's representative in seeking eligible grant funds under General Victim Assistance Direct Services Program; and authorizing the submission of such grant application to the Criminal Justice Division of the Office of Governor.**

The motion was seconded and approved 6-0.

B. Resolution No. R2020-02: A resolution of the City of Friendswood, Texas, authorizing aerial spraying over Friendswood by the Galveston County Mosquito Control District for the County-Wide Mosquito Control Program.

****Councilmember Griffon moved to approve Resolution No. R2020-02 – A resolution of the City of Friendswood, Texas, authorizing aerial spraying over Friendswood by the Galveston County Mosquito Control District for the County-Wide Mosquito Control Program.**

The motion was seconded and approved 6-0.

C. Resolution No. R2020-03: A resolution of the City Council of the City of Friendswood, Texas, amending and replacing Resolution No. R2019-24 with this resolution; authorizing and approving the 2018 Community Development Block Grant – Disaster Recovery (CDBG-DR); designating authorized officials and approving and implementing a citizen participation plan.

****Councilmember Scott moved to approve Resolution No. R2020-03 – A resolution of the City Council of the City of Friendswood, Texas, amending and replacing Resolution No. R2019-24 with this resolution; authorizing and approving the 2018 Community Development Block Grant – Disaster Recovery (CDBG-DR); designating authorized officials and approving and implementing a citizen participation plan.**

The motion was seconded and approved 6-0.

15. Ordinances

Consideration and possible action regarding the following:

A. Ordinance No. T2020-01: Second and Final reading of an ordinance repealing Ordinance

No. 97-20, Ordinance No. 2000-06, Ordinance No. 2003-17, that adopted and amended the Municipal Court Building Security Fund and the Municipal Court Building Technology Fund.

****Councilmember Griffon moved to approve the Second and Final reading of Ordinance No. 2020-01 – An ordinance repealing Ordinance No. 97-20, Ordinance No. 2000-06, Ordinance No. 2003-17, that adopted and amended the Municipal Court Building Security Fund and the Municipal Court Building Technology Fund.**

The motion was seconded and approved 6-0.

B. Ordinance No. T2020-03: Second and Final reading of an ordinance amending Appendix B, "Subdivision Ordinance," "Section III.k.3 – Sidewalks" to add exceptions to sidewalk requirements for existing residential subdivisions; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.

****Councilmember Rockey moved to approve the Second and Final reading of Ordinance No. 2020-03 – An ordinance amending Appendix B, "Subdivision Ordinance," "Section III.k.3 – Sidewalks" to add exceptions to sidewalk requirements for existing residential subdivisions; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.**
The motion was seconded and approved 6-0.

C. Ordinance No. T2020-04: Second and Final reading of an ordinance amending Appendix C "Zoning Ordinance," "Sections 7. Schedule of District Regulations," "Section 7.5. Community Overlay District," and "Section 8. N. Downtown District Supplemental Requirements" to change building material requirements per House Bill 2439; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.

****Councilmember Hanks moved to approve the Second and Final reading of Ordinance No. 2020-04 – An ordinance amending Appendix C "Zoning Ordinance," "Sections 7. Schedule of District Regulations," "Section 7.5. Community Overlay District," and "Section 8. North Downtown District Supplemental Requirements" to change building material requirements per House Bill 2439; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances inconsistent or in conflict herewith; and providing for severability.**

The motion was seconded and approved 6-0.

D. Ordinance No. T2020-05: Second and Final reading of an ordinance amending Appendix C, "Zoning," Section 3. "Provision for Official Zoning Map," to update and adopt the Official Zoning Map of the city, incorporating approved changes in district boundaries and other matters portrayed on the Official Zoning Map; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances in conflict herewith; and providing for severability.

****Councilmember Griffon moved to approve the Second and Final reading of Ordinance No. 2020-05 – an ordinance amending Appendix C, “Zoning,” Section 3. “Provision for Official Zoning Map,” to update and adopt the Official Zoning Map of the city, incorporating approved changes in district boundaries and other matters portrayed on the Official Zoning Map; providing a penalty for violation in an amount not to exceed \$2,000, or as otherwise provided by law; repealing all ordinances or parts of ordinances in conflict herewith; and providing for severability.**
The motion was seconded and approved 6-0.

E. Ordinance No. T2020-06: First and Final reading of an ordinance of the City Council of the City of Friendswood, Texas, calling for the holding of a General Election on May 02, 2020, for the purpose of electing two (2) Councilmembers (Position Numbers 2 and 5); ordering a Runoff Election on June 13, 2020, if necessary; and making other provisions related to the subject.

****Councilmember Hanks moved to approve the First and Final reading of Ordinance No. 2020-06 – an ordinance of the City Council of the City of Friendswood, Texas, calling for the holding of a General Election on May 02, 2020, for the purpose of electing two (2) Councilmembers (Position Numbers 2 and 5); ordering a Runoff Election on June 13, 2020, if necessary; and making other provisions related to the subject.**
The motion was seconded and approved 6-0.

F. Ordinance No. T2020-07: First and Final reading an ordinance of the City Council of the City of Friendswood, Texas, calling for the holding of a Special Election on May 02, 2020, for the purpose of reauthorizing the local sales and use tax at the rate of three-eighths (3/8) of one percent (1%) to continue providing revenue for maintenance and repair of municipal streets; and making other provisions related to the subject.

****Councilmember Rockey moved to approve the First and Final reading of Ordinance No. 2020-07 – an ordinance of the City Council of the City of Friendswood, Texas, calling for the holding of a Special Election on May 02, 2020, for the purpose of reauthorizing the local sales and use tax at the rate of three-eighths (3/8) of one percent (1%) to continue providing revenue for maintenance and repair of municipal streets; and making other provisions related to the subject.**
The motion was seconded and approved 6-0.

G. Ordinance No. T2020-08: First reading of an ordinance granting to CenterPoint Energy Resources Corp., DBA CenterPoint Energy Texas Gas Operations, the right, privilege and franchise to construct, install, extend, remove, replace, abandon, operate and maintain its facilities within the public rights-of-way of the City of Friendswood, Texas, for the transportation, delivery, sale and distribution of natural gas; providing for a term of 30 years; containing other provisions relating to the foregoing subject; providing for severability and providing an effective date.

****Councilmember Griffon moved to approve the First reading of Ordinance No. T2020-08 – An ordinance granting to CenterPoint Energy Resources Corp., DBA CenterPoint Energy Texas Gas Operations, the right, privilege and franchise to construct, install, extend, remove, replace, abandon,**

operate and maintain its facilities within the public rights-of-way of the City of Friendswood, Texas, for the transportation, delivery, sale and distribution of natural gas; providing for a term of 30 years; containing other provisions relating to the foregoing subject; providing for severability and providing an effective date.

The motion was seconded and approved 6-0.

H. Ordinance No. T2020-09: First and Final reading of an ordinance amending City of Friendswood, Texas, Ordinance No. 2019-38, passed and approved October 7, 2019, same being an ordinance approving and adopting the City's General Budget for Fiscal Year 2019-2020 by approving "Budget Amendment III" to the "Original General Budget of the City of Friendswood, Texas, for the Fiscal Year 2019-2020"; providing for supplemental appropriation and/or transfer of certain funds; providing for severability; and providing other matters related to the subject.

******Councilmember Hanks moved to approve the First and Final reading of Ordinance No. **2020-09** – an ordinance amending City of Friendswood, Texas, Ordinance No. 2019-38, passed and approved October 7, 2019, same being an ordinance approving and adopting the City's General Budget for Fiscal Year 2019-2020 by approving "Budget Amendment III" to the "Original General Budget of the City of Friendswood, Texas, for the Fiscal Year 2019-2020"; providing for supplemental appropriation and/or transfer of certain funds; providing for severability; and providing other matters related to the subject.

The motion was seconded and approved 6-0.

16. Communications from the Mayor and Councilmembers

Councilmember Erenwert thanked the Engineering Department for the reports given to Council during the work session. The reports provided were very informative.

Councilmember Hanks stated she recently attended a Keep Friendswood Beautiful committee meeting, great group of volunteers that work hard for the city, recently received a grant from HEB Grocery (HEB), \$6,500 awarded from HEB's corporate office to enhance Stevenson Park with a fairy trail, will be educational, people are building the fairy houses, each will have a different theme, adults and children will be able to stop and look at them, will be unveiled and open to the public the first part of June 2020. Councilmember Hanks congratulated Staff on the recognition of Friendswood Chamber Commerce Business of the Year, nice start to the celebration of 125 years.

Councilmember Rockey stated Friendswood Historical Society President Ann Whittaker is retiring from the board, and a reception will be held in honor of Mrs. Whitaker on February 11, 2020, at 6:00 PM at the Friendswood Public Library. At the January Council meeting he mentioned a tripping hazard in the parking lot at Stevenson Park, and noticed today it is being fixed. He has been cast in another play called "August Osage County", plays a drunk poet, cast is outstanding, an adult play with adult language, and encourages everyone to come see the play at the Purple Box Theater.

Mayor Pro-Tem Branson thanked her fellow councilmembers and city Staff for their support during the meeting, stated the Mayor will be back in town tomorrow, and she is excited.

Councilmembers Griffon and Scott stated they had nothing to report.

17. Consent Agenda

Consideration and possible action regarding the following:

- A. Ratify the Mayor's signature on a contract transferring ownership of retired K-9 Officer Ajay from the Friendswood Police Department to Officer Brandon Blair
- B. Approve the purchase of a vac-truck and skid steer for the Public Works Department
- C. Approving a Memorandum of Understanding (MOU) with Clear Creek Community Church to define limits and perform drainage modeling of possible drainage project
- D. Approving water line, sewer line, lift station, and drainage easements on FM 528 from Clear Creek Community Church
- E. Approving the disposal of two decommissioned police vehicles through Houston Auto Auction
- F. Approve the December 2019 Tax Report
- G. Approving the minutes of the January 6, 2020, Council Meeting

******Councilmember Scott moved to approve all items on the Consent Agenda as presented: A. Ratify the Mayor's signature on a contract transferring ownership of retired K-9 Officer Ajay from the Friendswood Police Department to Officer Brandon Blair. B. Approve the purchase of a vac-truck and skid steer for the Public Works Department. C. Approving a Memorandum of Understanding (MOU) with Clear Creek Community Church to define limits and perform drainage modeling of possible drainage project. D. Approving water line, sewer line, lift station, and drainage easements on FM 528 from Clear Creek Community Church. E. Approving the disposal of two decommissioned police vehicles through Houston Auto Auction. F. Approve the December 2019 Tax Report. G. Approving the minutes of the January 6, 2020, Council Meeting. The motion was seconded.

Councilmember Griffon asked to remove Consent Agenda Item C. Approving a Memorandum of Understanding (MOU) with Clear Creek Community Church to define limits and perform drainage modeling of possible drainage project.

*******Councilmember Scott moved to **amend** the main motion to approve all items on the Consent Agenda as presented **with the exception of Agenda Item C**, A. Ratify the Mayor's signature on a contract transferring ownership of retired K-9 Officer Ajay from the Friendswood Police Department to Officer Brandon Blair. B. Approve the purchase of a vac-truck and skid steer for the Public Works Department. D. Approving water line, sewer line, lift station, and drainage easements on FM 528 from Clear Creek Community Church. E. Approving the disposal of two decommissioned police vehicles through Houston Auto Auction. F. Approve the December 2019 Tax Report. G. Approving the minutes of the January 6, 2020, Council Meeting. The **amended** motion was seconded and approved 6-0.

******Councilmember Hanks moved to approve Consent Agenda Item C. Approving a Memorandum of Understanding (MOU) with Clear Creek Community Church to define limits and perform drainage modeling of possible drainage project. The motion was seconded and approved 6-0.

With concurrence of Council, Mayor Pro-Tem Branson moved to Agenda Item 6, Closed Executive Session.

18. Adjournment

The meeting was adjourned at 07:58 PM.

Attest:

Mayor Mike Foreman

Melinda Welsh, TRMC
City Secretary

STATE OF TEXAS
CITY OF FRIENDSWOOD
COUNTIES OF GALVESTON/HARRIS
FEBRUARY 8, 2020

7:00 AM – COUNCIL RETREAT

MINUTES OF A SPECIAL MEETING OF THE FRIENDSWOOD CITY COUNCIL THAT WAS HELD ON SATURDAY, FEBRUARY 8, 2020, AT 07:00 AM AT FRIENDSWOOD LIBRARY, MEETING ROOM, 416 S. FRIENDSWOOD, TEXAS, WITH THE FOLLOWING PRESENT CONSTITUTING A QUORUM:

MAYOR MIKE FOREMAN
MAYOR PRO-TEM SALLY BRANSON
COUNCILMEMBER STEVE ROCKEY
COUNCILMEMBER TRISH HANKS
COUNCILMEMBER ROBERT J. GRIFFON
COUNCILMEMBER JOHN SCOTT
COUNCILMEMBER BRENT ERENWERT (Arrived at 7:06 AM)
CITY ATTORNEY MARY KAY FISCHER
CITY MANAGER MORAD KABIRI
CITY SECRETARY MELINDA WELSH

1. Call to order

Mayor Foreman called the meeting to order.

2. Pledge of Allegiance – United States and Texas

(HONOR THE TEXAS FLAG; I PLEDGE ALLEGIANCE TO THEE, TEXAS, ONE STATE UNDER GOD, ONE AND INDIVISIBLE)

Mayor Foreman led the Pledge of Allegiance to the United States and to the State of Texas.

3. Invocation

The invocation was given by City Manager Morad Kabiri.

4. Communications from the Public

Communications from the Public (To comply with provisions of the Open Meetings Act, the City Council may not deliberate on items discussed under this agenda item. The Council may refer this item to the City Manager or direct this item to be placed on the next regular Council agenda. PowerPoint presentations are not conducted during the citizen comment period. Out of respect for those speaking during public comment, please refrain from any outbursts or interjections to include, but not limited to, applause and/or disparaging noises from the audience. Doing so discourages others from voicing their thoughts and opinions, and disrupts the meeting. Furthermore, any personnel complaints against a City employee aside from the City Manager, City Secretary, City Attorney or Municipal Judge cannot be discussed under this section. Please contact the City Manager's office for concerns involving a City employee.)

Ron Lovely, Friendswood resident, addressed Council and stated a lot of work has been done on drainage, follow the data, use Rice University Hydrology Lab design for larger past storms, stay true to terracing methodology, project management, do not skip steps, planning, fit measurements into the plan, excavate Forest Bend only where you need to do terracing such as Oxnard Park, hire best proposal manager for Community Development Block Grant funding and others, big opportunity and should be done right.

5. Discussion and Possible Action

- A. Discussion and possible action regarding City operations, planning, and goal setting for the City of Friendswood.

A lengthy discussion was held between Mayor, City Council, and Staff regarding long-term planning and goal setting for the City of Friendswood. An update to the Comprehensive Plan including goals/objectives, baselines studies, Major Thoroughfare Plan, Parks and Open Space Plan, Communities Facilities Plan, Utility Systems, Master Drainage Plan, and Future Land Use Map. 2019 bond project identification includes Blackhawk Public Works facility, Public Safety Building expansion, and Fire Station No. 2 and training field. City flood control projects include Master Drainage Plan – Flood Control, Master Drainage Plan – Street Flooding, partnering opportunities with Galveston County Master Drainage Plan, Imperial Estates terracing/in-line detention, lower Clear Creek and Dickinson Bayou partnered studies, Whitcomb/Clear Creek Community Church property, Shadwell Lane in-line detention, upper Oxnard Park shelving/in-line detention, lower Oxnard Park shelving/in-line, Minglewood Lane terracing, Frenchman's Creek terracing/in-line detention, Forest Bend offline detention, Blackhawk Waste Water Treatment Plant terracing/in-line detention, Dixie Farm Road offline detention, and additional storm drainage and flood control projects including Deepwood shelving.

6. Adjournment

The meeting was adjourned 9:43 AM.

Attest:

Mayor Mike Foreman

Melinda Welsh, TRMC
City Secretary