Median Spacing

Identify short-term transportation improvements

Reduce motorist delay

Signal Timing

Improve Safety

Assess long-term corridor needs

Bike / Ped

Park & Ride

Intersection Improvements

FM 518

Corridor Access Management Plan

Kimley-Horn and Associates, Inc.

In association with:
Gunda Corporation, Inc.
SR Beard, Inc.
Jacobs Civil, Inc.

Texas Department of Transportation

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FM 518 Corridor Access Management Plan

"Never underestimate the power of a small group of dedicated people to change the world. Indeed it is the only thing that ever has."

— Margaret Mead

"Progress occurs when people cooperate."

— Hal Burton

"Isn't it grand that plans are visionary! Why shouldn't a community have a view, a vision of what it wants to be, and then try to achieve it?"

— Allan Jacobs

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Table of Contents

List of Exhibits

List of Tables

Chapter I
Introduction

This study was commissioned by the H-GAC, a voluntary association of local governments and local elected officials in the 13-county Gulf Coast State Planning Region — an area of 12,500 square miles with more than 4.8 million people (see **Exhibit 1.0-1**). H-GAC works to promote efficient and accountable use of local, state, and federal tax dollars; serves as a problem-solving and information forum for local governments; and helps local governments, businesses, and civic organizations analyze trends and conditions affecting the area in order to respond to their needs.

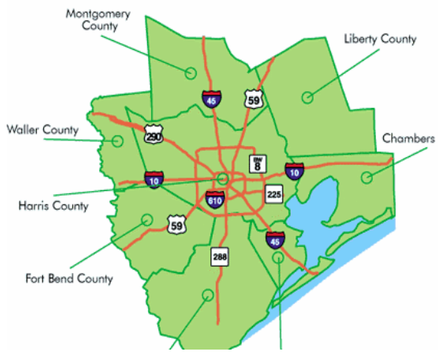


Exhibit 1.0-1: Metropolitan Planning Area

The rate of growth in the Houston region is predicted to be approximately 41% between the years 2003 and 2025. This holds many opportunities for economic growth and diversification of the local economy. Such fantastic growth also presents many challenges to the natural and built environment. The regional transportation network is one such challenge. If it cannot provide an acceptable level of service in the main travel corridors, the economy, community, and environment as a whole will suffer. This regional dilemma is being addressed by H-GAC's Transportation Department.

Given such challenges, H-GAC recognizes developing a viable transportation system not only includes building new roadways and adding transit, but also managing the access and demand for travel on these systems. "access management" is a set of strategies designed to make best use of existing transportation facilities as well as enhancing transportation improvements. Using strategies such as installing raised medians and providing adequately spaced driveways, access management will significantly improve the level of safety, efficiency, and effectiveness of the transportation system.

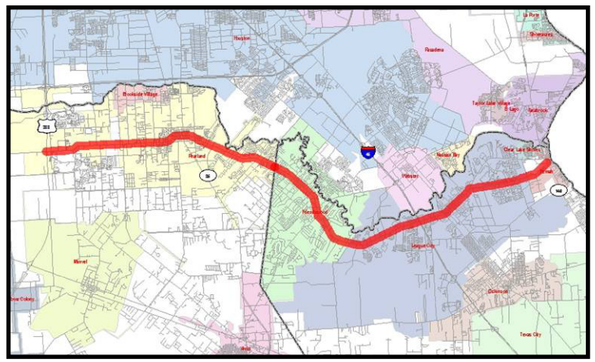
Access management approaches can include:

- Strategies to integrate transportation and land-use planning
- Model ordinances designed to standardize driveway spacing, deceleration lanes, corner clearance, sight distance, and raised median installations

In November 2002, H-GAC announced a call for projects for candidate travel corridors that would benefit from short-term and long-term operational and access management improvements. Municipal officials from Pearland, Friendswood, League City, and Kehma identified the FM 518 corridor from US 288 to SH 146 as an area that was experiencing rapid growth, safety concerns, and traffic congestion. H-GAC determined the entire corridor warranted study.

The purpose of this corridor study is to identify transportation measures that will improve public safety and traffic flow, reduce motorist delay, enhance air quality, and improve bicycle and pedestrian access. The FM 518 corridor defines the term "intergovernmental coordination," bisecting four cities, two counties, being a TxDOT facility, and under the H-GAC umbrella. The Cities involved in this study are Pearland, Friendswood, League City, and Kemah. Also, Brazoria and Galveston Counties have played a major role in providing guidance to the study team.

FM 518 provides east-west mobility and access to many retail, commercial, and residential developments. In addition, this corridor intersects with four major north-south facilities such as US 288, SH 35, IH-45, and SH 146. These north-south routes provide commuters with direct routes to Houston, Galveston, and major attractions such as the Texas Medical Center and the Houston Space Center. As described in greater detail in **Chapter 2,** this corridor has a very high crash history and experiences peak hour delays at many of its major intersections.



Study Area Map

This study will ultimately provide the appropriate agencies with a list of short-term operational and access management improvements. In addition, bicycle and pedestrian improvements will be identified and transit opportunities and funding will be explored. Recommendations for long range improvements will be compiled into what could become an access management overly district for the corridor. These improvements will include driveway spacing guidelines, shared access provisions, and several other access related techniques aimed at increasing safety and reducing traffic congestion.

1.1 Study Team

The project team listed below, along with several local and state agencies were responsible for the development and implementation of FM 518 Corridor Access Management Plan.

- Houston-Galveston Area Council (H-GAC)
- Texas Department of Transportation (TxDOT)
- Kimley-Horn and Associates, Inc.
- Gunda Corporation, Inc.
- SR Beard, Inc.
- Jacobs Civil, Inc.

1.2 Study Process

The study process followed the rational planning approach in which the study team conducted an extensive data collection effort, base map development, data analysis, and development of a final report. At appropriate stages during the process, public meetings and stakeholder meetings were conducted to help the team refine options and give overall guidance. The project steering committee, defined in **Chapter 3,** played a crucial role in providing the team with insightful guidance and review oversight. The graphic (**Exhibit 1.2-1**) depicts the general process that was followed.

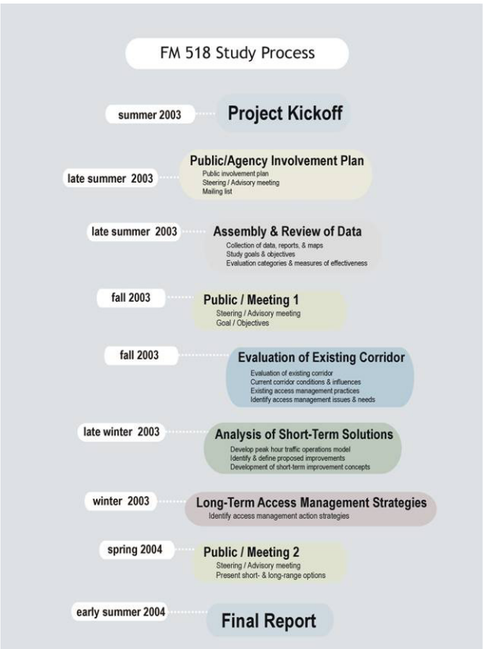


Exhibit 1.2-1: Study Process

Chapter 2
Public Involvement Process

2.1 Introduction

An important element of the FM 518 Corridor Access Management Plan has been the proactive public involvement program, which provided opportunities for the public and various interest groups to participate in the study process and ultimately provided guidance in forming the proposed improvements. Since the local responsibility for compliance with federal regulations for public involvement lies with the H-GAC, the program was designed to comply with the goals of the H-GAC transportation public involvement program, which has a strong emphasis on public education, outreach, and participation. The program provided opportunities for the public and various interest groups to participate in the planning process. FM 518 Corridor Access Management Plan public involvement activities addressed the need to have an ongoing information exchange from the very beginning to the end of the study. Arriving at consensus on the short- and long-range alternatives during the study process will enable the next phase, programming improvements and detail design, to focus on design details rather than bigger-picture issues.

This chapter describes the various public involvement activities and techniques that were used during the development of the FM 518 Corridor Access Management Plan.

2.2 Purpose of Public Involvement Program

The purpose of the public improvement program for the FM 518 Corridor Access Management Plan was to promote open, proactive communication with the public and stakeholders in the corridor in order to develop a meaningful dialogue. As such, the suggested alternatives and other decisions made as a part of the study may be more widely accepted, although there may not be unanimous agreement. The public involvement program provided access to information about the project, an opportunity for the public to give input on needs and solutions, and a mechanism by which decision-makers can value and seriously consider the public input received. It also served as a means to reflect that the input received was considered in the development of the study recommendations.

The program was enhanced by close adherence to the following guiding principles throughout the study:

- Initiation of citizen participation at the onset of the study and continued throughout the process
- Intensified efforts to solicit community views prior to major project-decision points
- Public access to all relevant information
- Regular reports of study findings to the public in layperson terms
- Provision of orientation materials to accommodate new participants entering the process
- Two-way communication between the study team and community participants to freely exchange information, ideas, and values
- Presentation of transportation options in an objective manner
- Use of a variety of techniques and approaches to reach a diverse group of persons potentially affected by the proposed project
- Serious consideration of all suggestions from the community
- Timely response with answers and information to citizen inquiries
- Complete documentation of public involvement activities
- Incorporation of small discussion groups to encourage a casual environment for discussions during public meetings
- Evaluation of the public involvement program's effectiveness

2.3 Information and Education

As part of the public involvement program and to support a cooperative planning process, the project team developed an informational and educational campaign. The campaign described benefits of alternatives and activities in a concise, straightforward manner. The team also developed materials to educate the public on the study process and transportation planning issues. In disseminating information to the public, the team used a variety of methods, including the following, which will be discussed in more detail below:

- Presentation materials
- Website (www.FM518Mobility.com)

Presentation Materials

At each round of public meetings, a series of presentation boards was used to provide information about the study and describe the project. The boards included the study process, a project schedule, an overview of the corridor, the goals of the study, and the technical results at each stage of the study.

Website www.FM518Mobility.com

As part of the effort to educate and inform the public about the study, the project team strived to keep an up-to-date and informative project website. The site contained copies of the various presentation materials and study progress, and was advertised at public meetings.

2.4 Outreach

An outreach program to increase awareness of and interest in transportation plans and the transportation planning process, as well as encourage participation in these efforts, was crucial to the project's success. The FM 518 Corridor has many stakeholders, including residents, businesses, employees, commuters, environmental and historic preservation groups, civic and homeowner organizations, community planning groups and city councils, resource agencies, major land owners, and others who are affected by transportation issues in the corridor.

In addition, the Transportation Equity Act for the 21st Century (TEA-21) guidelines on public involvement require that the following groups be provided a reasonable opportunity to participate in the planning process:

- People traditionally underserved by transportation services
- Special interest groups
- Governmental officials and agencies
- Affected land owners
- Public transit operators
- Community development agencies
- Representatives of transportation agency employees
- Private providers of transportation

The following approaches were used to contact and involve project stakeholders in the study process:

- Direct Mail
- Public Notices
- Media Coverage
- Public Meetings
- Web Site

Direct Mail

To conduct a public involvement process touching as many affected parties as possible, the project team, in cooperation with H-GAC, the Cities of Pearland, Friendswood, and League City identified and assembled a comprehensive list of area residents, property owners and businesses, public officials, civic organizations, resource agencies, community groups, and

media representatives who will likely have interest in this project. Before each public meeting, direct mail notices were delivered within 30 days of each meeting. This provided adequate time to either attend the meeting or provide written comments to the appropriate party.

Public Notices

Timely access to public outreach activities is also achieved via public notices and announcements. To ensure notification of both english- and spanish-speaking stakeholders, public notices were placed in local, community, and bilingual newspapers, including the *Houston Chronicle*, *La Voz de Houston, Houston Defender,* and *The 1960 Sun.* Public notices were published twice — at 30 days and 10 days prior — for each round of meetings.

Notices of public meetings were also provided prior to meetings were posted on the project website.

Media Coverage

One to three weeks prior to all public meetings, press releases were issued throughout the corridor to english- and spanish-language newspapers, radio stations, and television stations. The purpose of the press release was to provide a wide range of coverage concerning upcoming public meetings and key decisions of the study. A number of key media contacts were also included on the general mailing list and received notice of all meetings.

Stakeholder Meetings

The project team was available during the project to meet with stakeholders, general public, or elected officials in order to provide educational information as well as update interested parties on the study progress, alternatives under consideration, and key decision points.

The main function of the meetings was to serve as a method to consider individual issues and possibly incorporate those issues into the study recommendations. These meetings were generally held a few weeks prior to each public meeting.

Public Meetings

Public meetings are the best opportunity for most people to learn about a project and directly interface with the project team. The meetings, which were open to all interested parties, were conducted primarily in an open-house format so that people could arrive at their convenience and review information at their own pace. There were also occasions where brief presentations were made, and questions and comments from the meeting attendees were encouraged.

At the meetings, poster-sized graphic displays providing information about the study were available for review. Displays were staffed by team members who were knowledgeable about the project so that attendees could have questions answered and provide direct input regarding the project.

The public-meeting component of the outreach effort comprised of two series of meetings, each made up of three meetings (one in each City, Pearland, Friendswood, and League City). These meetings intended to relay the purpose, process, and progress of the study, and were held in the evenings at venues within each City. This maximized public convenience and allowed discussions to focus in on sub-areas as well as whole-corridor issues.

The planned meeting dates and locations are as follows:

Series	Location	Date
One:	League City, Johnnie Arolfo Civic Center	October 27, 2003
	Friendswood, City Hall	November 11, 2002
	Pearland, Pearland Junior High School South	November 12, 2002
Two:	Pearland, City Hall	May 19, 2004
	Friendswood, City Hall	May 18, 2004
	League City, City Hall	May 17, 2004

In addition to the various public meetings, local community and business groups were encouraged to invite project team members to make presentations about the study to their respective groups.

Public Input
Members of the public were afforded the following opportunities for providing input into the study:

- Questionnaires with specific questions and open-ended response opportunities.
- Comment forms for general notes, comments, and ideas.
- Flip charts for making general notes, comments and ideas — these were set up at various strategic positions at each public meeting.
- Verbal communication with members of the project team.
- Letters, e-mails, and phone calls to H-GAC and the project team.

All comments received from the public meetings and in response to the questionnaires were documented and analyzed as input into the study as it progressed.

Documentation
All input from the public was carefully documented. After each series of public meetings, the project team prepared detailed summaries in order to provide a permanent record of the material covered and the public comments received. Copies of these summaries, which include the following, are available from the project team or H-GAC.

- *FM 518 Corridor Access Management Plan Public Meeting 1*
- *FM 518 Corridor Access Management Plan Public Meeting 2*

Follow Up Procedures
The purpose of timely follow-through by TxDOT was to demonstrate to the public that decision makers seriously consider the public input received. Citizen inquiries were followed up promptly with answers and information.

2.5 Agency Participation

Access Management Steering Committee

H-GAC established the FM 518 Corridor Access Plan Steering Committee to offer technical and policy decisions and guide the technical development of the study. The committee met at key milestones in the process to receive and assess reports on progress, comment on the schedule, coordinate with their respective agencies, and provide oversight of major activities associated with the study. The Steering Committee was comprised of representatives from TxDOT, H-GAC, Cities of Pearland, Friendswood, and League City, Brazoria County, Galveston County and a host of private contributors. The title page contains a list of Steering Committee members.

Steering Committee meetings were held on the following dates:

- September 10, 2003
- December 11, 2003

2.6 PUBLIC MEETING SUMMARIES

Summary of First Public Meeting

Over 122 people were encouraged to review the information, speak with the consultants and H-GAC staff, and provide their views on the study. At each meeting, the project team asked the public to identify areas with safety and operational issues by placing dots on the specific locations. Many intersections within the corridor were identified for needed improvement. In addition, the public was encouraged to fill out a one page questionnaire.

The following is a summary of the public comments received during the first round of public meetings. These were derived from conversations and replies to questionnaires. The following is a summary of responses to a public questionnaire distributed at public meetings in League City, Friendswood, and Pearland, Texas.

1. When asked, "Which locations in the corridor present safety problems," 37% of respondents thought adding a raised median would improve safety on the roadway (see **Exhibit 2.6-1**).

2. Respondents (37%) found signal timing to be the greatest improvement needed to reduce traffic problems.

3. Respondents indicated bike lanes and sidewalks are the most valuable improvements needed in the corridor to provide alternative modes of transportation.

4. This question asked if there were any general comments on the information at the public meeting. There was a wide range of general comments from re-time traffic lights to provide turn lanes at intersections. Also, several people were happy with the materials presented and the opportunity for input. There were also comments relative to the addition or need for sidewalks and bike lanes.

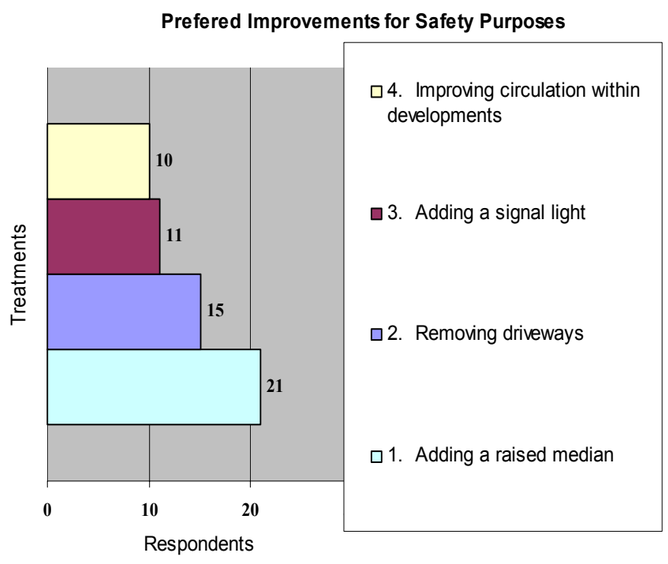


Exhibit 2.6-1: Safety Improvement Questionnaire

Summary of Second Public Meeting

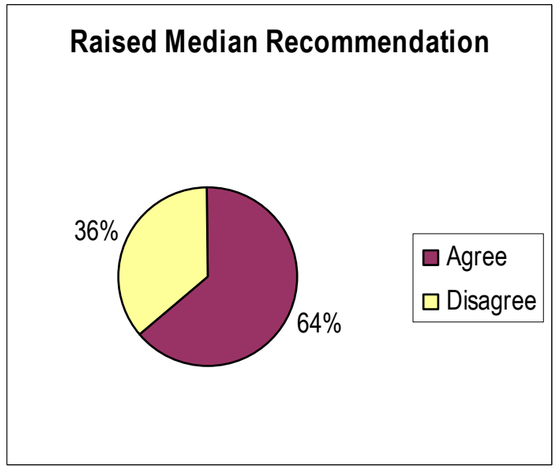
Over 150 people were encouraged to review the information, speak with the consultants and H-GAC staff, and discuss the access management recommendation. At each meeting, the project team provided charts and graphic displays of where and how the access management treatments would be used to improve mobility and safety. The improvements included modifications to nearly half of the signalized intersections in the corridor, a comprehensive signal timing recommendation, consolidation of driveways, addition of raised medians, pedestrian / bicycle improvements, and ideas for building transit ridership. In addition, the public was encouraged to fill out a one page questionnaire.

The following is a summary of the public comments received during the second round of public meetings in League City, Friendswood, and Pearland, Texas. These were derived from conversations and replies to questionnaires.

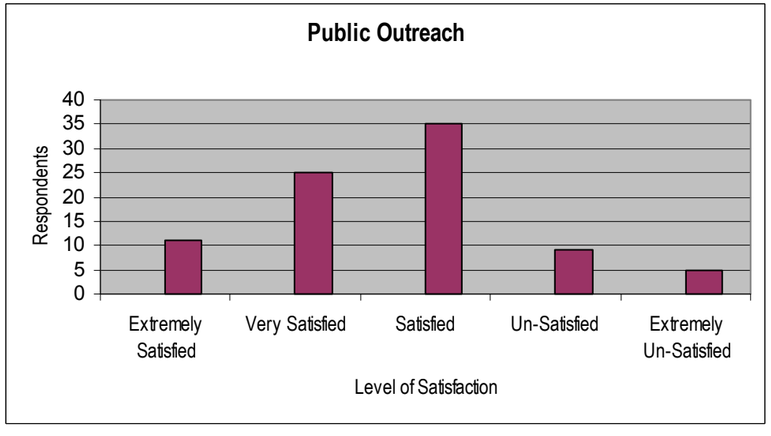
1. At the second meeting when asked, "do you agree with the recommendation to add a raised median," over 60% of citizens agreed.

2. Almost 95% of respondents agreed that signal timing and additional turn lanes would improve safety and congestion.

3. Citizens at the second public meeting agreed that the study teams recommendations would improve the environment for pedestrians and bicyclists.



4. Respondents were asked to indicate their level of satisfaction with the public outreach effort for this study.



Chapter 3
Corridor Goals and Objectives

3.1 Corridor Goals and Objectives

FM 518 Corridor Goals

Through an extensive public outreach program and the recognition of the current and projected deficiencies in the corridor, the study team established five corridor goals, which are later discussed in detail, as follows:

- Improve Safety
- Identify Short-Term Transportation Solutions
- Improve Traffic Flow
- Reduce Motorist Delay
- Assess Long-Term Corridor Needs

The application of this study's access management recommendations and actions will move the involved communities toward the goals listed above. The following section details how these goals will be achieved and measured.

Goal 1: Improve Safety

Access management saves lives and also reduces the frequency of injury and property damage crashes. The American Association of State Highway and Transportation Officials (AASHTO) indicates that 50% to 70% of all accidents are access related and could be relieved with proper access management strategies. **Chapter 4** discusses in detail the exisisting traffic condition on FM 518 that are leading to a high vehicle crash risk.

Measure 1: Driveway Density Ratio

In order to accurately quantify safety improvements the team is measuring the effectiveness of reducing driveways per mile. The team is using 30-driveways per mile as the goal driveway density within the corridor. This density will be measured against the actual driveway density to establish a driveway density ratio. Therefore, the calculation for improving safety is:

$$\frac{\text{Actual Driveway Density (X)}}{\text{Goal Driveway Density (30)}}$$

Strategies to meet this goal include:

- Relocating
- Consolidating or eliminating
- Promoting shared driveways

Measure 2: Conflict Point Reduction

The second measure of effectiveness for Safety Improvements comes from reducing the amount of conflict points at driveways and unsignalized intersections. Intersections without access management considerations typically have 18 potential conflict points. So, a corridor section with 50 driveways per mile and no access management treatments has 900 potential conflict points. The formula for calculating the conflict points per mile is as follows:

Driveways Per Mile x Conflict Points = Total Conflict Points Per Mile

Strategies to meet this goal include:

- Relocating
- Consolidating or eliminating driveways
- Promoting shared driveways
- Increasing corner clearance
- Improving driveway geometrics
- Installing raised medians

This process is one in which face to face meetings were conducted to negotiate the best possible scenario for all effected stakeholders. **Chapter 6,** Safety Improvements, summarizes the measures of effectiveness for the proposed safety improvements.

Goal 2: Identify Short-Term Transportation Solutions

This goal will be achieved by providing a list of projects that establishes project cost, project limits, and benefits of each project. The toolbox displayed in **Chapter 6,** contains a list of improvements. The list will also be used to identify funding sources and implementing agencies.

Goal 3: Improve Traffic Flow

This measure will establish the improved traffic flow and the subsequent level of service (LOS) benefits from each of the improvements established in the above goal.

Measure 1: Level of Service
This measure will be evaluated by using our operations model to estimate the LOS before and after improvements. The LOS will be evaluated at each intersection and on the corridor segments between the intersections.

Measure 2: Median Capacity Adjustments
The increased capacity resulting from conversion of a two way left turn lane to raised medians will be incorporated into our operations model. A percentage of increased capacity will be added to simulate the reduction inside friction and the benefits of each improvement will be measured against the no build alternative.

Goal 4: Reduce Motorist Delay

Reducing the overall corridor delay and the individual intersection delay is a major issue throughout the corridor. The measures described below will allow for the subsequent improvements to be evaluated and the benefits of each improvement documented.

Measure 1: Time Delay Benefits
Similar to the LOS analysis described above, this measure of effectiveness will evaluate the travel time benefits from the improvements. This calculation will be completed using our traffic operations model.

Measure 2: Median and Driveway Speed Adjustment
Additional travel time benefits will be derived from the increased speed realized from introducing raised medians and also from the reduction in driveway density. This speed will be added to the overall corridor speed and the subsequent benefits will be documented.

Chapter 6 summarizes the measures of effectiveness of improvements aimed at improving traffic flow and reducing motorist delay.

Goal 5: Assess Long-Term Corridor Needs

A major goal of the corridor is to establish long-term corridor needs. These could include:

- Developing a corridor overlay describing design standards
- Making thoroughfare plan recommendations
- Recommending changes to local municipal codes
- Pedestrian and bicycle needs
- Investigating the viability and funding opportunities for transit service

Chapter 4
Existing Conditions

The following sections define existing traffic characteristics, roadway and access inventory, and current corridor conditions along FM 518.

4.1 Existing Traffic Characteristics

Daily Traffic Volumes

Average annual daily traffic (AADT) volumes were provided by TxDOT from the 2002 Houston District Highway Traffic map. The 24-hour counts were recorded at multiple locations along the FM 518 corridor. The traffic volumes used to analyze each section of the corridor are shown below in **Table 4.1-1**.

Corridor Section			AADT
SH 288 West Side	to	FM 865 (Cullen)	24,000
CR 89	to	FM 1128	26,000
Harkey / Oday	to	Woody / Corrigan	28,000
Halbert / McLean	to	SH 35 / Main	22,000
SH 35 / Main	to	Sherwood	26,000
Westminster	to	Woodcreek	37,000
Dixie Farm	to	Sunset Meadows / Winding	30,000
Sunset Meadows / Winding	to	Whispering Pines	21,000
Winding Way	to	FM 528 / Parkwood	16,100
FM 528 / Parkwood	to	Country Road	15,200
Country Road	to	Williamsport	11,700
Newport	to	Calder / Devereux	38,000
Interurban	to	SH 3	38,000
Houston	to	FM 270 / FM 2094	31,000
FM 518 Split / Marina	to	South Shore	16,500
FM 1266 / Columbia	to	Lawrence Road	9,100
Kemah Oaks	to	SH 146	10,300

Table 4.1-1: Corridor AADT's

Corridor Origin – Destination Patterns

Origin-destination information attained from the H-GAC reveals that the majority of trips in the corridor are traveling to three main destinations. The Texas Medical Center, the University of Texas Medical Branch in Galveston, and Downtown Houston are the major destinations of commuters in the corridor.

Development strategies are used to characterize the spatial distribution and use of land. These patterns largely determine trip making patterns, volumes, and modal distributions. The potential size of urban areas increased, while densities declined. As jobs and housing areas became further and further apart, average commute distances, and travel times became longer and longer.

Corridor Travel Speeds

Current corridor speeds were recorded throughout the entire corridor. Generally, the speeds were found to be between 30 to 45 miles per hour. Depending on where one is in the corridor, the speeds have dramatic shifts. **Table 4.2-4** depicts speeds throughout the corridor. These speeds will be used in conjunction with the traffic operations model as a baseline to compare before and after travel time savings.

Crash Data

Crash data from the years 1998, 1999, and 2000 provided this study with a significant basis for analysis. The crash data was analyzed to determine the location, severity, and vehicle impacts. During the years 1998, 1999, and 2000 a total of 1,221 crashes occurred along FM 518 including five fatalities and 69 incapacitating incidents. **Table 4.1-2** shows the crash data separated by severity for each City.

Cities	Pearland	Friendswood	League City	Kemah	Total	% of Total
Fatality	2	1	2	0	5	0.4%
Type A - Incapacitating	18	17	32	2	69	5.7%
Type B - Non-Incapacitating	90	50	121	9	270	22.1%
Type C - Possible Injury	188	79	209	1	477	39.1%
No Injury / Not Reported	157	80	157	6	400	32.8%
Total	455	227	521	18	1,221	100%

Table 4.1-2: Crash Data by Severity by City

The movements of the vehicles involved in the crashes were also analyzed. The 1998, 1999, and 2000 crash data provided the direction of the crash along with the individual movements of each vehicle involved in the crash. The crash data were summarized to include the major crashes, categorized by the relative directions of the vehicles at time of impact. The serious impacts were determined to be: head-on, when multiple vehicles moving in a direction towards each other are involved in a crash; left-turn, when at least one of the vehicles involved in the crash was making a left-turn movement; right-turn, when at least one of the vehicles involved in the crash was making a right-turn movement; side impact, when at least one of the vehicles involved in the crash was struck perpendicular to the vehicle; and rear end, when at least one of the vehicles in the crash was struck from behind, either while driving or

stopped, by another vehicle. The crashes that were categorized as "other" involve incidents including side-swipes and other non-major type collisions. The breakdown of these crashes can be seen in **Table 4.1-3.**

Movement Type	1998-2000 Crashes
Head-On	21
Left-Turn	316
Right-Turn	24
Side Impact	165
Rear End	504
Pedestrian	5
Bicyclist	7
Fixed Object	72
Other	107
Total	1221

Table 4.1-3: Crash Summary

Another crash analysis tool the study team used is crash rates. This factor is generated by comparing traffic volumes to the number of crashes. The National Safety Council uses crashes per 100 million vehicle miles of travel (VMT). This common denominator allows for comparisons to be done between roads, areas, cities, and states. **Exhibit 4.1-4** illustrates this comparison for FM 518.

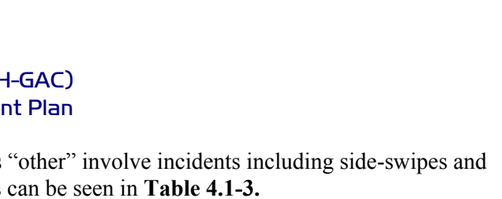


Table 4.1-4: Crash Rate Comparison

The crash rate for the region is high at 197 crashes per 100 million VMT and FM 518 has one of the worst crash rates when compared to other roads, **Table 4.1-5** illustrates this point. Further detail for the FM 518 corridor is documented in **Table 4.1-7** (on the next page), which shows the total breakdown of crashes per analysis zone for severity and the crash rate per 100 million VMT.

The study team further analyzed crashes in the corridor by mapping the actual locations of crashes and the type of movement that caused them. This information maybe reviewed in **Appendix B.** By geographically analyzing the crash date, the study team was able to document crash hot spots, otherwise known as hazardous locations were crashes have continually occurred over the three years worth of data. This information is valuable in determining mitigating strategies for intersections

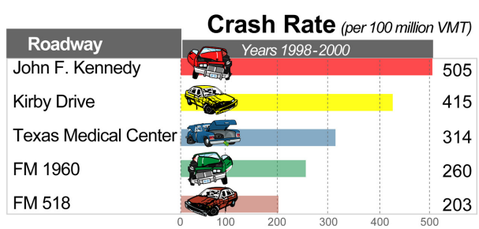


Table 4.1-5: Top Crash Rates in the Houston-Galveston Area

improvements, median separations, and driveway consolidations outlined in **Chapter 6.**

Cost of Crashes

The National Safety Council was recently commissioned by the U.S. Congress to document and estimate the cost of motor vehicle crashes. Their estimates of cost per injury are listed in column two of **Table 4.1-6** below. These figures generate a total of $37,760,000 worth of economic loss to the community over three years (1998, 1999, and 2000).

Severity	Cost per Injury (2000 Dollars)	Total Crashes	Total Cost (2000 Dollars rounded)
Fatality	$3,340,000	5	$17,000,000
Type A - Incapacitating	$165,000	69	$11,000,000
Type B - Non-Incapacitating	$42,500	270	$11,000,000
Type C - Possible Injury	$20,200	477	$9,000,000
No Injury / Not Reported	$1,900	400	$760,000
Total		1,221	$37,760,000

Table 4.1-6: Cost of Crashes

The statistics shown above are appropriate for measuring the ecomnomic loss to the community resulting from past motor-vehicle crashes. They include the value of a person's natural desire to live longer or to protect the qulaity of one's life. That is, the economic loss estimates include what people are willing to pay for improved safety. Nevertheless, these estimates cannot fully represent the losses occurred when a person is involved in a serious motor vehicle crash.

	Pearland										Friendswood					League City											Kemah		Totals
	SH 288 West Side	to	FM 865 (Cullen)	to	Harkey / Oday	to	SH 35 / Main	to	Pearland Parkway	to	Sunset Meadows / Winding	to	Shadow Bend	to	FM 528 / Parkwood	to	League City (West City Limit)	to	Landing Boulevard	to	IH-45	to	SH 3	to	FM 270 / FM 2094	to	Meadow Parkway	to	Lawrence Road	to	SH 146	
Distance (miles)		2.3		2.2		1.8		1.5		2.9		1.2		1.8		2.0		2.6		0.8		1.2		1.5		1.4		1.3		1.1		25.5
Fatality		0		1		1		0		0		0		0		1				0		0		0		0		2		0		5
Type A - Incapacitating		8		4		4		2		9		2		4		2		1		5		10		7		5		4		2		69
Type B - Non-Incapacitating		15		25		29		21		20		11		16		3		10		15		31		38		21		6		9		270
Type C - Possible Injury		29		54		56		49		37		11		29		2		10		22		61		77		27		12		1		477
No Injury / Not Reported		32		45		51		29		36		18		15		11		12		27		37		51		23		7		6		400
Total		84		129		141		101		102		42		64		19		33		69		139		173		76		31		18		1,221
Crashes (per 100 Million-Vehicle-Miles)		136		217		266		227		90		148		158		71		101		505		326		322		188		146		149		203
Sheets per Zone		1, 2		3		4, 5		6		7, 8		9		10, 11		12, 13		14, 15		16		17		18		19		20		21		--

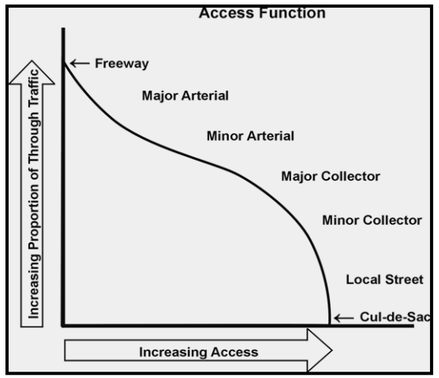
Table 4.1-7: Crash Statistics by Zone

4.2 Roadway and Access Inventory

Functional Classification

A complete functional design system provides a series of distinct travel movements. The six recognizable stages in most trips include main movement, transition, distribution, collection, access, and termination.

For example, the main movement of vehicles is usually uninterrupted, high speed, longer-trip-length flow. When approaching destinations from the freeway, vehicles reduce speed on the ramps, which act as transition roadways. Vehicles then enter a moderate-speed arterial that brings them closer to their destination. Next, they enter collector roads that penetrate the neighborhoods. Finally, the vehicle enters local access roads that provide a direct connection to individual residences or other terminations. Each of the six stages is handled by a separate facility designed specifically for its function. Additionally, functional classifications are generally classified by the surrounding land use form and degree of access. For example, urban and rural areas have fundamentally different characteristics in regard to density and types of land use, density of street and highway networks, nature of travel patterns, and the way each of these elements is related. The exhibit to the right demonstrates the relationship of facility types to access.



The City of Houston classifies their thoroughfares into four major categories: local streets, major collectors, major thoroughfares, and freeways. For planning purposes, the H-GAC has created separate area types, or land uses, that relate roadway capacity to functional class and area type. The relationship of functional class in different area types provides a more detailed method of estimating the true capacity of the facility.

The FM 518 corridor plan, starting at its western terminus with SH 288 in Pearland, is an arterial with a two-way left-turn lane. Traveling eastward, near Shadowbend Road the arterial becomes divided by a median in Friendswood. The area previously shown (**Exhibit 1.0-1**) contains several major and minor arterials that intersect with FM 518 and provide connections to collectors and local streets serving residences and businesses.

Traffic Signals

Signal Sequence:
All 58 of the signalized intersections along FM 518 are currently maintained by TxDOT. At the present time, 40 of them are being operated in a coordinated manner as part of a closed-loop system. The other 18 intersections are currently operated on an isolated, full-actuated basis. **Appendix B** contains a map of the current signal system groupings.

The basic characteristics of a closed-loop system can be described as follows:

- The local controllers at the individual intersections have continuous communications with a field master. In the case of the FM 518 system, copper twisted-pair cable is the medium currently used for this communications. This connection allows the field master to supervise the operation of its local controllers to assure that they are operating in the proper timing plan. Also, system data (e.g. traffic volumes) can be uploaded from the local intersections to the field master.
- By means of a dial-up telephone link, each field master can be connected on an as-needed basis to a central microcomputer at TxDOT's signal shop. This allows several forms of communication to occur on an as-needed basis:
  - In the event it diagnoses a malfunction, the field master can auto-dial the microcomputer to upload an alarm report.
  - On a pre-programmed basis, the microcomputer can autodial each field master to upload system data.
  - Personnel at the microcomputer can manually initiate the connection, either to download timing adjustments or to diagnose a reported a problem.

While closed-loop systems provide a basic means of providing signal coordination, they have several limitations:

- The configuration of control groups is determined by the physical connection of the intersections to a specific field master. In other words, a particular intersection cannot be moved from one control group to another by time of day.
- Since the central computer can communicate with only one field master at a time, an operator at the central facility does not have access to a real-time display of an entire corridor.

Table 4.2-1 shows the phasing pattern now in use at all of the signalized intersections in the FM 518 corridor. Excluding the T-intersections (which have only one cross-street phase), 17 of FM 518's 36 minor signalized intersections currently have a split-phased sequence for the minor street.

		Major Intersections			Minor Intersections			
					Cross Intersections			
	Intersection	Diamond	Quad-Left	Special	Single Cross Street Phase	Quad-Left	Split-Phased	T-Inter-section
1 and 2	SH 288	1						
3	Silverlake / CR 94						1	
4	Wal-Mart (West)						1	
5	Home Depot						1	
6	CR 93 / Miller Ranch				1			
7	CR 90 / Southwyck							1
8	Cullen						1	
9	CR 89 / Kroger						1	
10	FM 1178 / Manvel						1	
11	Harkey / Oday					1		
12	Corrigan				1			
13	McLean / Halbert						1	
14	Mykawa							1

Table 4.2-1: Existing Signal Phase Sequences

	Intersection	Major Intersections			Minor Intersections			
					Cross Intersections			
		Diamond	Quad-Left	Special	Single Cross Street Phase	Quad-Left	Split-Phased	T-Inter-section
15	SH 35		1					
16	Galveston				1			
17	Old Alvin						1	
18	Walnut / Barry Rose						1	
19	Sherwood						1	
20	Westminster						1	
21	Pearland		1					
22	Country Club						1	
23	Yost							1
24	Woodcreek				1			
25	Wal-Mart (East)							1
26	Dixie Farm		1					
27	Winding				1			
28	FM 2351 / Edgewood		1					
29	Shadowbend						1	
30	Spreading Oaks				1			
31	Clearview				1			
32	Castlewood				1			
33	Whispering Pines				1			
34	Winding Way				1			
35	FM 528 / Parkwood		1					
36	Bay Area		1					
37	Palomino				1			
38	Landing				1			
39 and 40	Williamsport / Newport				1			
41	Hobbs / Lafayette						1	
42 and 43	IH-45	1						
44	Calder / Devereau							1
45	Interurban						1	
46	SH 3		1					
47	Houston				1			
48	Park				1			
49	Iowa				1			
50	Texas							1
51a and 51b	FM 270 / FM 2094			1				

Table 4.2-1: Existing Signal Phase Sequences, cont.

	Intersection	Major Intersections			Minor Intersections			
					Cross Intersections			
		Diamond	Quad-	Special	Single Cross Street Phase	Quad-Left	Split-Phased	T-Inter-
52	Clear Creek High School							1
53	Meadow				1			
54	South Shore		1					
55	Columbia Medical							1
56	Lawrence				1			
57	Kemah Oaks							1
58	SH 146*						1	
	TOTAL	2	8	1	18	1	16	9
		11			35			
					44			
		55						
	*At the SH 146 intersection, FM 518 is the minor roadway.							

Table 4.2-1: Existing Signal Phase Sequences, cont.

Right-of-Way

ROW currently varies along FM 518 from as low as 60-feet in League City to as much as 200 feet at locations in Friendswood and League City. The ranges for the existing ROW are shown in **Table 4.2-4.**

Railroad Crossings

Currently, there are two railroad crossings, one in League City and one in Pearland. The League City section of railroad is owned and operated by the Union Pacific Railroad. The Pearland Railroad is owned and operated by the Burlington Northern Santa Fe Corporation.

Transit Operations

Transit Demand

In the year 2000, neither the household population per acre nor the employment development per acre along FM 518, from SH 288 to IH-45, were sufficient to support local transit services. There are scattered pockets of residential development that exhibit strong growth potential and would be candidates for some form of fixed route transit in the future, particularly in the Pearland area. However, currently and in the near-term, it would be difficult to support a fixed route transit network along and within the FM 518 corridor.

Existing Service

Presently, demand responsive transit service is being offered by Brazoria and Galveston Counties. CONNECT Transit does provide a demand responsive service in which anyone in Brazoria County and Galveston County can schedule a ride with a 24-hour reservation. The service is similar to taxi service with point to point pick-up and drop-up and the ride is usually shared with patrons being picked up and dropped along the way. The cost is a dollar a ride.

CONNECT also provides transit services three days a week to the Texas Medical Center. Patrons from Brazoria and Galveston Counties are required to reserve a ride to the medical center. There are three specific locations in the medical center where drop-off and pick-up take place.

In Pearland and other areas within Brazoria County, Action, Inc., provides rides for senior citizens to area health care centers and other social service providers. Approximately 20,000 trips are provided annually to senior citizens. The Bay Area Transportation Management Organization provides a form of circulator service between Clear Lake and League City.

It appears that the existing circulator and demand responsive services take care of the current demand for transit services. However, in some areas along the FM 518 corridor, there is moderate demand for commuter service to both Houston (Texas Medical Center and Downtown) and to Galveston. Previous work conducted by the Metropolitan Transit Authority and Harris County has indicated that there is demand for Park & Ride service from Brazoria County, particularly from Pearland to Houston. Brazoria County already offers Park & Ride service from Angleton to Houston. However, Angleton is much further south and this service is not offered to commuters from the FM 518 area.

The METRO Solutions Transit System Plan includes the development of a South Freeway (SH 288) Park & Ride lot with commuter service being proposed from the vicinity of SH 288 and Airport Boulevard. While this lot may be several miles north of the FM 518 corridor, the commuter service is expected to attract some riders from the Pearland area.

Carpooling and Vanpooling

Carpool and vanpool services are another form of transit that could work quite effectively along the FM 518 Corridor. Ridesharing provides an opportunity for commuters to ride together and reduce the number of single-passenger vehicles that make the same daily trip from home to work. A carpool / vanpool staging lot has been very successful in the Bay Area with commuters traveling the IH-45 corridor to Houston's downtown and medical center areas.

Currently, METRO coordinates 18 vanpools from Pearland, Friendswood, and League City. The commutes are split between trips to Houston and Galveston, as displayed below:

Friendswood area – 5 vanpools
- 2 – Galveston
- 2 – TMC
- 1 – IH-10 / West Belt

League City – 6
- 6 – Galveston

Pearland – 7
- 5 – TMC
- 1 – CBD
- 1 – Woodlands

Park & Ride and Park & Pool

There is a Park & Pool lot located at the southwest corner of FM 518 and SH 288 that provides a pooling place for commuters to park and share rides to regional destinations in the Houston area. The Park & Pool lot was developed and is maintained by TxDOT and provides 50 spaces plus four handicap spaces for area commuters. Currently, the lot is a staging lot for carpoolers and vanpoolers, no commuter bus service is provided from this lot. The average daily occupancy of the lot is between 50% and 60%. TxDOT currently sponsors 10 other Park & Pool lots in Brazoria County where commuters park their cars and carpool to Houston.

METRO operates a Park & Ride lot along Bay Area Boulevard in the Clear Lake area. This Park & Ride lot is north of League City, just east of IH-45 and provides a commute option for Kemah and League City commuters destined to the downtown Houston area. Further east to the Bay Area Park & Ride lot, METRO also has a Park & Pool lot that allows area residents to park their and share a ride to their work destination. Many carpoolers and vanpoolers from this staging lot take advantage of the HOV lane in the IH-45 corridor.

Access

The team reviewed development guidelines and ordinances for the three cities and found access management provisions arbitrarily mentioned in the documents. **Table 4.3-3** summarizes the current state of access management regulations in the corridor. As part of the existing corridor influences, the team has located every access connection within the FM 518 study limits. As such, an inventory of each access connection is presented below. The exhibit includes the total number of access connection within each City and classifies the locations by residential and non-residential. This information is informative in determining potential locations for driveway consolidation and or areas that present safety concern.

		By City (Length in Miles)				
Classification	**Direction**	**Pearland**	**Friendswood**	**League City**	**Kemah**	**Total**
		(16.7 mi)	**(5 mi)**	**(8.7 mi)**	**(1.1 mi)**	**(25.5 mi)**
Non-Residential	Eastbound	175	63	94	6	338
	Westbound	190	54	145	3	392
Residential	Eastbound	10	13	15	2	40
	Westbound	4	16	6	11	37
Public	Eastbound	2	--	--	--	2
	Westbound	5	--	9	--	14
Public Street	Eastbound	28	16	24	3	71
(Unsignalized)	Westbound	23	8	19	1	51
Overall	Signalized	25	8	22	2	57
	Eastbound	215	92	133	11	451
	Westbound	222	78	179	15	494
	Total	**462**	**178**	**334**	**28**	**1,002**

Table 4.2-2: FM 518 Corridor Access by City and Driveway Type

In addition to the summary, **Table 4.2-2** above, a more detailed exhibit is shown below. This exhibit, **Table 4.2-3,** presents the existing access connections with associated driveway densities (per-mile). The per-mile densities will be measure against nationally accepted access spacing densities (per-mile) with the product being performance standards for the corridor.

	Cities	Pearland										Friendswood					League City										Kemah		Totals
	Selected Signalized Crossroads	SH 288 West Side	to	FM 865 (Cullen)	to	Harkey/Oday	to	SH 35 / Main	to	Pearland Parkway	to	Sunset Meadows / Winding	to	Shadow Bend	to	FM 528 / Parkwood	to	*League City (West City Limit)*	to	Landing Blvd	to	IH-45	to	SH 3	to	FM 270 / FM 2094	to	Meadow Pkwy	to	Lawrence Rd	to	SH 146	
ACCESS	Distance		2.3		2.2		1.8		1.5		2.9		1.2		1.8		2.0		2.6		0.8		1.2		1.5		1.4		1.3		1.1		25.5
	Driveways EB per ZONE		16		43		53		46		58		26		47		19		18		20		29		35		16		15		11		452
	Driveways WB per ZONE		21		38		51		51		61		33		36		9		35		26		43		54		16		5		15		494
	Total Driveways		37		81		104		97		119		59		83		28		53		46		72		89		32		20		26		946
	Driveway Density Per Mile EB		7		20		30		31		20		21		25.5		9.6		7		26		25		23		11.5		11		10		18
	Driveway Density Per Mile WB		9		17		29		34		21		27		19.6		4.5		14		33		37		36		11.5		4		14		19
	Total Driveway Density Per Mile		16		37		59		65		41		48		45		14		21		59		62		60		23.0		15		24		37
	Goal Driveway Density		30		30		30		30		30		30		30		30		30		30		30		30		30		30		30		30
	Driveway Density Ratio		0.53		1.24		1.96		2.16		1.38		1.60		1.50		0.47		0.69		1.97		2.07		1.99		0.77		0.51		0.79		1.24

Table 4.2-3: Roadway Access by Zone

Pedestrian and Bicycle Infrastructure

Pedestrian facilities along FM 518 are limited in existence. New sidewalks have been constructed during new developments, however, they rarely connect with existing facilities. The current sidewalks begin and end at new development and there is no connection to existing development. Currently there is an on-street bike lane located in Pearland between Grand Avenue and Westminster Drive. The locations of pedestrian and bicycle facilities are shown in **Table 4.2-4.**

Median and Edge Treatment

An important characteristic of FM 518 is the type of median and edge treatment. The majority of FM 518 is a five-lane section divided by a two-way-left-turn-lane (TWLTL). Within portions of Friendswood FM 518 has a four-lane divided section with a raised, non-traversable median. Within portions of both League City and Kemah, segments of FM 518 have an undivided four-lane cross section. Finally, a segment of FM 518 near the League City-Kemah boundary has a four-lane cross section that is divided by that has a traversable non-raised median. The majority of FM 518 is considered to have a rural cross section with paved shoulders while sections of FM 518 within Pearland, Friendswood, and League City have an urban cross section with curb and gutters. A summary of all of the above information can be found in **Table 4.2-4** at the end of this chapter.

Land Use and Zoning

The study team collected the existing land use and zoning ordinances along FM 518 from the four municipalities. Land use designations vary between the municipalities. Using GIS, the study team identified residential, non-residential, parks, and special districts land uses that abut the corridor. **Exhibit 4.2-1** illustrates the percentages of land use types in the corridor.

The majority of land along the corridor is zoned residential (51%) and is being used for single family dwellings. Nevertheless, a number of multi-family developments are present in Pearland and League City.

“The non-residential classification encompasses land use designations from office, commercial, retail, and industrial (basically any business not operated out of a home).” Thirty-five percent of available land along the corridor carries this designation. These are major destinations for shopping and services in the area.

Special districts are a culmination of land use designations ranging from multi-use purposes to planned unit developments. Basically 8% of the land in the corridor has been examined for land use outside of the normal classification system. Also, parks complete the mix of land uses by occupying 6% of the available land along the corridor. These parcels are made up of recreational parks and public lands. Often this designation represents ROW, drainage basins, and municipal facilities.

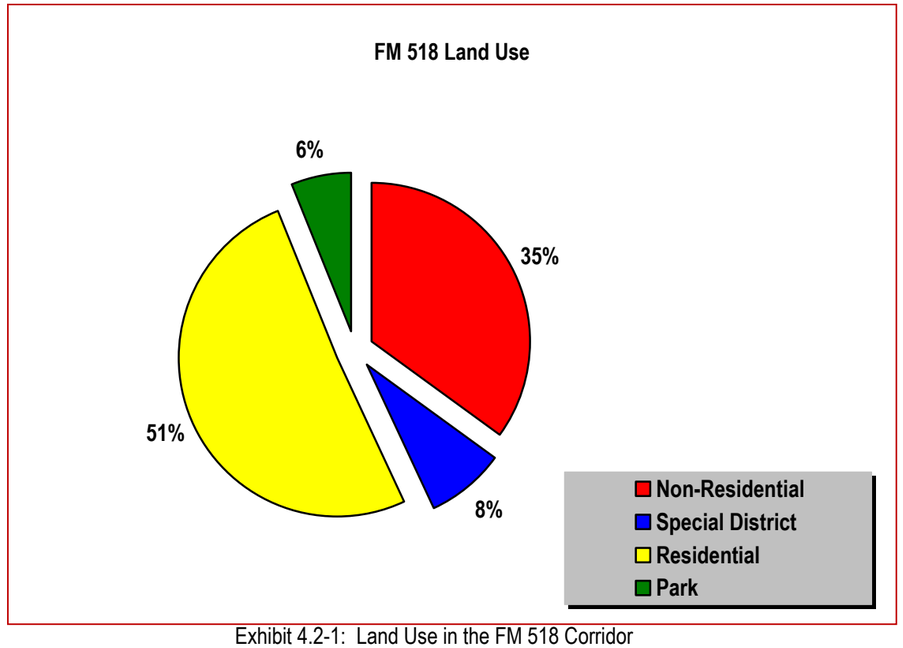


Exhibit 4.2-1: Land Use in the FM 518 Corridor

Summary of Characteristics

Table 4.2-5 shows the existing corridor characteristics. This exhibit shows access inventory, crash data, ROW, pedestrian and bicycle facilities, and median and edge treatments.

		Cities																																		
		Pearland												Friendswood						League City												Kemah				Totals
Selected Signalized Crossroads		SH 288 West Side		to	FM 865 (Cullen)		to	Harkey/Oday		to	SH 35 / Main		to	Pearland Parkway		to	Sunset Meadows / Winding		to	Shadow Bend		to	FM 528 / Parkwood		to	*League City (West City Limit)*		to	Landing Blvd		to	IH-45		to	SH 3		to	FM 270 / FM 2094		to	Meadow Pkwy		to	Lawrence Rd		to	SH 146	
	Distance (miles)			2.3		2.2		1.8		1.5		2.9		1.2		1.8		2.0		2.6		0.8		1.2		1.5		1.4		1.3		1.1		25.5
Access	Total Driveways			37		81		104		97		119		59		83		28		53		46		72		89		32		20		26		946
	Total Driveway Density Per Mile			16		37		59		65		41		48		45		14		21		59		62		60		23.0		15		24		37
	Driveway Density Ratio			0.53		1.24		1.96		2.16		1.38		1.60		1.50		0.47		0.69		1.97		2.07		1.99		0.77		0.5 1		0.79		1.24
Crashes	Total			84		129		141		101		102		42		64		19		33		69		139		173		76		31		18		1221
	Crashes (per 100 million vehicle miles)			136		217		266		227		90		148		158		71		101		505		326		322		188		146		149		203
Roadway Characteristics	Median Type			TWLTL		TWLTL		TWLTL		TWLTL		RM		RM		TWLTL		TWLTL		TWLTL		TWLTL		TWLTL		UNDIV		TWLTL		OTR		UNDIV		--
	Edge Treatment			SH		SH		SH		CURB		CURB		CURB		SH		SH		SH		SH		CURB		CURB		CURB		SH		SH		--
	Sidewalks			NO		NO		NO		NO		NO		YES		YES		NO		NO		NO		YES		YES		NO		NO		NO		
	Bike Lanes			NO		NO		NO		YES		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		--
	Speed (MPH)			39.1		37.3		28.7		27.3		28.5		27.3		28.3		44.0		44.2		38.0		23.2		23.2		39.0		39.6		44.0		32.8
	Right-of-Way (ft)			100		100		100		100		80-150		80-100		80-140		140-200		140-200		100		80-100		60		120-127		120		120		60-200

Table 4.2-4: Summary of Corridor Characteristics

4.3 Current Corridor Conditions

Link Level of Service

Based on geographic location, three levels of capacity have been developed by H-GAC to better reflect travel patterns and roadway design characteristics. These capacities were further differentiated to reflect state standards for four facility types, as is shown in **Table 4.3-1.** These "evaluation" capacities include facility adjustments for signal green times, percent trucks, percent left turns, directional factors, etc. The following are 24-hours, per-lane capacities. For the FM 518 corridor the suburban arterial capacity of 6,250 was used to determine the link LOS. The calculated link LOS should be used for general information only. As with most urban and suburban facilities, the intersection LOS often determines the corridor's overall performance. Therefore, the following section "Intersection LOS / Delay" will play a major role in determining the final performance of the facility.

Facility Type	Urban	Suburban	Rural
Freeways	23,500	23,500	16,500
Tollways	18,000	18,000	--------
Expressways	11,000	11,000	--------
Arterials	7,500	6,250	5,000

Four levels of mobility (LOM), which are used to define congestion, were developed by the H-GAC Travel Modeling Committee in 1997 and approved by the Technical Advisory Committee (TAC). They are shown as follows:

LOM	Volume / Capacity	LOS
Tolerable	< 0.85	A, B, C, D
Moderate	>= 0.85 < 1.00	E
Serious	>= 1.00 < 1.25	F
Severe	>= 1.25	F

Roadways with a LOS of D was assumed to be the minimum acceptable mobility level for FM 518. Roadways with LOS of E or F (moderate, serious, severe) were identified as being congested. Roadways with a LOS of A through D (tolerable) were identified as not congested. **Table 4.3-1,** shown below are sections of the corridor and their associated LOS.

Corridor Sections			LOS	LOM
SH 288 West Side	to	FM 865 (Cullen)	E	Moderate
CR 89	to	Woody / Corrigan	F	Serious
Woody / Corrigan	to	Halbert / McLean	E	Moderate
SH 35 / Main	to	Sherwood	F	Serious
Westminster	to	Woodcreek	F	Severe
Woodcreek	to	Dixie Farm	F	Serious
Sunset Meadows / Winding	to	Williamsport	A - D	Tolerable
Williamsport	to	Newport	F	Serious
Interurban	to	SH 3	F	Severe
Houston	to	FM 270 / FM 2094	F	Serious
FM 518 Split / Marina	to	South Shore	F	Severe
FM 1266 / Columbia	to	SH 146	A - D	Tolerable

Table 4.3-1: Corridor LOS and LOM Results

Intersection Level of Service / Delay

LOS was determined for FM 518 using Synchro™ software, which uses signalized intersection LOS to calculate LOS for sections on arterials. The different values for approach LOS are combined by Synchro™ to give an average LOS for the overall intersection. Listed below in **Table 4.3-2** is a summary of the intersection LOS for each signalized intersection in the corridor for both the AM and PM periods.

Intersection	Existing			
	AM		PM	
	LOS	Cycle Length	LOS	Cycle Length
Pearland				
SH 288 West Side	D	150	F	150
SH 288 East Side	C	150	A	150
Silver Lake Village	B	125	B	130
Wal-Mart	B	125	D	130
CR 94 / Home Depot	D	125	C	130
CR 93 / Miller Ranch	B	125	B	130
CR 90 / Southwyck	C	125	B	130
FM 865 / Cullen	B	125	B	130
CR 89 / Kroger	D	125	E	130
FM 1128	D	100	D	100
Harkey / Oday	C	90	C	90
Woody / Corrigan	A	80	A	80
Halbert / McLean	D	106	F	106
Mykawa	B	80	A	120
SH 35 / Main	E	115	E	90
Galveston	A	115	A	90
Old Alvin	B	115	C	90
Walnut / Berry Rose	D	115	F	90
Sherwood	A	115	B	90
Westminster	B	115	C	90
Pearland Parkway	B	115	C	90
Liberty	D	115	D	90
Yost	B	60	A	60
Woodcreek	A	105	B	105
Wal-Mart at Dixie	A	70	B	70
Dixie Farm	F	100	F	100
Sunset Meadows / Winding	B	60	B	60
Friendswood				
FM 2351 / Edgewood	E	130	E	130

Table 4.3-2: Corridor Intersection LOS

Intersection	Existing			
	AM		PM	
	LOS	Cycle Length	LOS	Cycle Length
Shadow Bend	B	130	B	130
Spreading Oaks	A	105	B	105
Clearview	A	75	A	75
Castlewood	B	100	B	100
Whispering Pines	C	100	D	100
Winding Way	B	100	B	100
League City				
FM 528 / Parkwood	D	100	D	100
Bay Area Boulevard	C	135	C	135
Spring Landing / Palomino	B	105	B	105
Landing Boulevard	A	100	A	100
Williamsport	A	100	A	100
Newport	A	100	A	100
Hobbs / Lafayette	E	70	C	100
IH-45 West Side	E	100	D	100
IH-45 East Side	B	100	B	100
Calder / Devereux	B	100	C	120
Interurban	B	100	C	120
SH 3	E	100	F	120
Houston	A	100	B	120
Park	A	100	A	120
Iowa	A	100	A	120
Texas	B	100	B	120
FM 270	F	150	F	150
FM 2094	F	150	E	150
Clear Creek High School	C	100	B	120
Meadow Parkway	B	100	B	120
South Shore	B	100	C	120
FM 1266 / Columbia	B	100	B	120
Kemah				
Lawrence Road	A	75	A	75
Kemah Oaks	A	75	A	75
SH 146	B	80	B	120

Table 4.3-2: Corridor Intersection LOS, cont.

Current Corridor Standards

A thorough investigation of the City of Pearland, Friendswood, League City, and Kemah development standards have revealed the following information, **Table 4.3-3** details the findings.

4.4 Conclusions

The crash experience hovers over 200 crashes per million VMT, which is higher than the regional average and much higher than the national average. The intersection and link LOS can be improved by making some intersection modifications and by improving the signal system timing and phase sequences. The pedestrian and bicycle facilities can also be improved by filling in some of the missing pieces and encouraging a policy that requires these facilities to be constructed. Finally, transit service in the corridor limited to some dial and ride, and para-transit service will need to be examined for service expansion or available funding opportunities.

Access Management Policy					Cities											
					Pearland			**Friendswood**			**League City**			**Kemah**		
					Residential	Non-Residential	Commercial	Residential	Non-Residential	Commercial	Residential	Non-Residential	Commercial	Residential	Non-Residential	Commercial
	Driveway	Width		Major	Cricular*[1]	35'	35'	25' - 35'	25' - 35'	25' - 35'	n/a	35-45	35-45	n/a	n/a	n/a
				Collector	10'	25' - 35'	25' -35'	25' - 35'	25' - 35'	25' -35'	20-30	35-45	35-45	n/a	n/a	n/a
				Local	10'	25' - 35'	25' - 35'	25' - 35'	25' - 35'	25' - 35'	20-30	n/a	n/a	n/a	n/a	n/a
		Spacing	Driveways and Streets	Major Thoroughfares	n/a	350'	350'	n/a	125'	125'	20	30	30	n/a	n/a	n/a
				Secondary Thoroughfares	n/a	250'	250'	n/a	125'	125'	20	30	30	n/a	n/a	n/a
				Major Collectors	n/a	200'	200'	n/a	75'	75'	20	30	30	n/a	n/a	n/a
				Minor Collectors	n/a	165'	165'	n/a	75'	75'	20	30	30	n/a	n/a	n/a
				Local Streets	n/a	75'	75'	50'	75'	75'	20	n/a	n/a	n/a	n/a	n/a
			Between Driveways	Major Thoroughfares	100'	100'	100'	n/a	n/a	n/a	n/a	500-1000	500-1000	n/a	n/a	n/a
				Collector Streets	60'	60'	60'	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
				Local Streets	30'	30'	30'	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Driveways Per Feet of Frontage			2 per 400' or >			n/a	1 per 150	n/a	1 per 95'			n/a	n/a	n/a
					3 per 401 - 600			n/a	n/a	2 per 150' - 320'	2 per 95-320'			n/a	n/a	n/a
					4 per 600 or <			n/a	n/a	3 per 321' - 600'	3 per 320-600'			n/a	n/a	n/a
		Shared Access Required			n/a	Yes	Yes	No	No	No	No	No	No	n/a	n/a	n/a
		Shared Access Required				Yes										
	Median Openings	Minimum Seperation			350'			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Street Connections	Intersections	Local Streets		right angle, variaton of 10%			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
			Collector Streets		right angle, variaton of 5%			n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Land Use	Lots per access point			n/a	n/a	n/a	75 lots = 1 >75lots=2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		Zoning Ordinance			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	na	n/a	n/a
	Traffic Impact Analysis	Required			Yes	Yes	Yes	No	No	No	No	No	No	n/a	n/a	n/a
	Side walks	Required			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4.3-3: Current Access Practices

Chapter 5
Improvement Options

5.1 Introduction

Improvement options for this corridor plan have several dimensions. For instance, there is short-term and long-term, safety and operational improvement and finally other improvements such as pedestrian and bicycle and policy recommendations. To organize these improvements the team has created four separate categories of improvements:

- Safety
- Operational
- Policy
- Other Improvements

The following sections will detail the available improvements within each option.

Example of a Raised Median

5.2 Safety

As described in **Chapter 5,** safety in the corridor is a major issue. With more than 400 crashes each year some type of safety improvement should be considered. Safety improvements are largely concepts derived from access management techniques. Below are two techniques that can be used for this study.

- Median Installation
- Driveway Consolidation

Raised Median Installation

This technique involves adding a raised median barrier to restrict the movement of traffic and thereby reduce the number of conflicts in the corridor. **Exhibit 5.2-1** illustrates that any full access location (there are 32) creates potential conflict points. With the introduction of a raised median barrier to restrict the left out maneuver the conflict points are reduced by 50%.

Roadways with non-traversable medians are safer at higher speeds and at higher traffic volumes than undivided roadways or those with continuous TWLTL. Numerous studies from across the nation have been conducted relating to undivided, TWLTL, and divided roadways with a non-traversable median. Based on studies, it can be concluded that roadways with a non-traversable median have an average crash rate about 30% less than roadways with a TWLTL.

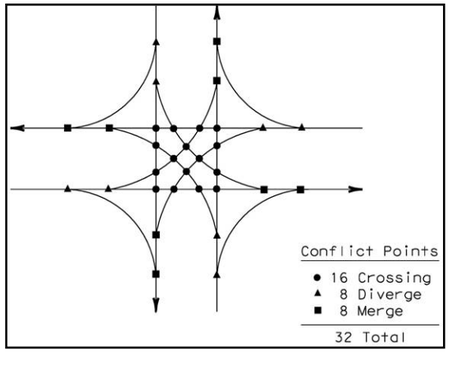


Exhibit 5.2-1: Conflict Points

Additionally, where ADT exceeds 20,000 vehicles per day and the demand for mid-block turns is high, a raised median should be considered. With raised medians additional safety benefits are found for pedestrian and bicycle activity, in terms of having a refuge area when crossing a thoroughfare.

With the addition of a raised median, consideration of the median opening and opening type will need to occur. The placement of the median opening must first consider the thoroughfare system. Priority should be given to those thoroughfares providing mobility and access throughout the community. Then, the opening can consider other traffic generators along the corridor. The median treatment can take on many different forms. **Exhibit 5.2-2** illustrates five variations available for a median opening.

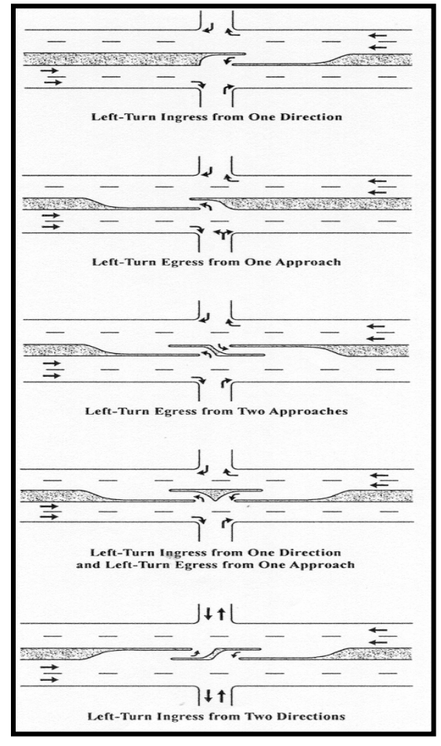


Exhibit 5.2-2: Median Treatments

Driveway Consolidation

This technique involves removing or relocating existing access connections (driveways) for the sole purpose of improving safety. Research has shows that driveways that are closely spaced can have direct impact on safety along a roadway. Moreover, research has found that a nexus exists between access connection density and crash rates, as indicated in **Exhibit 5.2-3.** As you can see as the density of access connections increase the crash rates increase.

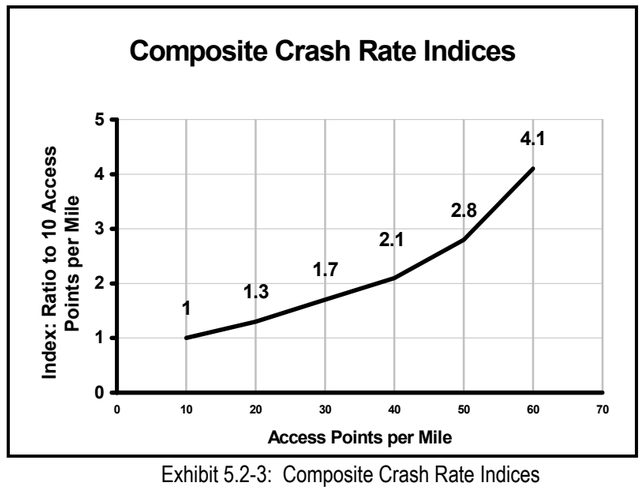


Exhibit 5.2-3: Composite Crash Rate Indices

Driveway consolidation is only possible through a cooperative agreement between the property owner and the agency attempting to consolidate the driveway. Application of this technique will be focused on the greatest need. For instance, those areas in the corridor with very high safety ratio (as described in **Chapter 3**) will be evaluated for

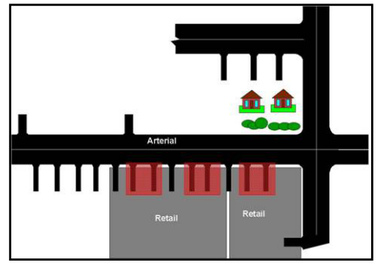


Exhibit 5.2-4: Driveway Consolidation

possible consolidation. Each situation is unique and a great deal of negotiation will need to occur between all parties involves. The spacing between driveways can be found in **Chapter 4.4.**

5.3 OPERTATIONAL

In addition to safety, the operations in the corridor are another vital goal of this overall corridor study. The operational improvements for this corridor can be broken down into several distinct pieces.

- Right-Turn Lane
- Left-Turn Lane
- Signal Timing

Right-Turn Lane

The addition of acceleration and deceleration lanes can provide operational benefits throughout the corridor by allowing turning vehicles to exit the roadway without effecting the through movement of traffic. This allows for a more efficient flow of traffic in the corridor and allows vehicles to form platoons at the signalized intersections, thereby maximizing the flows that the signal can handle.

Lengths of auxiliary lanes are a function of posted speed, but queue lengths are normally established on a case by case basis. The *Highway Capacity Manual and TxDOT's Operations and Procedures Manual* provide guidance on this matter. **Exhibit 5.3-1** illustrates the general layout and design for a right-turn lane. These improvements are not one size fits all. Consideration must be given for posted speed, traffic volume, and development type.

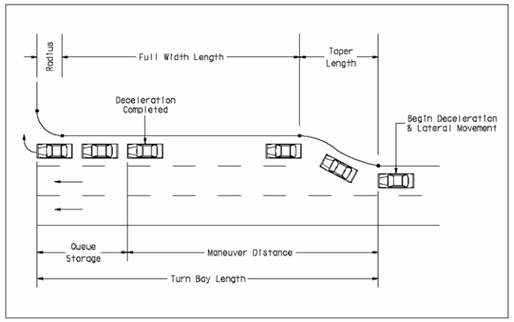


Exhibit 5.3-1: Right-Turn Lane

Left-Turn Lane

Much like right-turn lanes, left-turn lanes also allow the turning vehicles to exit the through lanes without affecting the through traffic. However, these lanes generally provide for more queue storage for left turning vehicles for both signalized and un-signalized intersections. **Exhibit 5.3-2** illustrates the general design elements for a left-turn lane. The length of deceleration should consider the posted speed and the amount of speed differential acceptable for the thoroughfare.

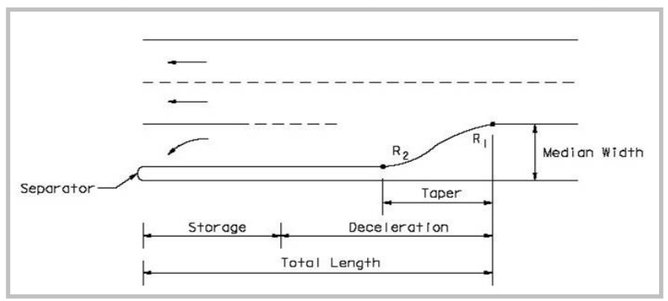


Exhibit 5.3-2: Left-Turn Lane

Signal Timing

Signal timing is a critical technique to improve the overall traffic flow throughout the corridor. The timing of signals often involves coordinating an entire signal system. For the FM 518 corridor, most of the signals are part of a coordinated signal system and any recommendation related to signal timing should consider the ramifications of the system as a whole rather than an isolated signal.

5.4 POLICY

Authority and Purpose

This document will ultimately serve as an overlay for land use and design related issues throughout the corridor. The access policy direction must be established in terms of:

- Coordination with TxDOT
- Shared and Cross Access Provisions
- Thoroughfare Planning
- Design Guidelines

Coordination with TxDOT

On September 25, 2003 the TxDOT Transportation Commission, adopted the State's proposed rules on access management. The newly adopted rules direct TxDOT to apply access management statewide. In addition, the rules activate TxDOT's new manual on access management. The manual includes general policy implications and minimum driveway spacing criteria along state highways. There is a provision in the manual for local agencies to develop corridor access plan in corporation with TxDOT which could become a corridor overlay.

This corridor overlay would then supercede any criteria established by the local agency and / or TxDOT. The benefit of this approach is to allow for a more coordinated effort among all agencies involved. Moreover, it provides an interactive mechanism for developers and landowner to understand the vision for the corridor and gain general confidence of future access decisions in the corridor. If agreed to, all the agencies involved can enter into an inter-local agreement to activate this corridor access plan and provide for a clear delineation of access authority in the corridor.

Shared and Cross Access Provisions

Access management is much more than just spacing of driveways and providing raised medians. In order to fully realize the benefits of access management, certain land use provisions should be provided in the local municipalities subdivision code and zoning ordinance.

Subdivision ordinances can require property owners to dedicate land on their common property lines or develop joint access easements. A parking lot cross access provision assures that a single driveway can serve both properties. The result is greater internal circulation between neighboring properties, which allows vehicles to circulate between businesses without having to re-enter the major roadway and overall fewer driveways (see **Exhibit 5.4-1**).

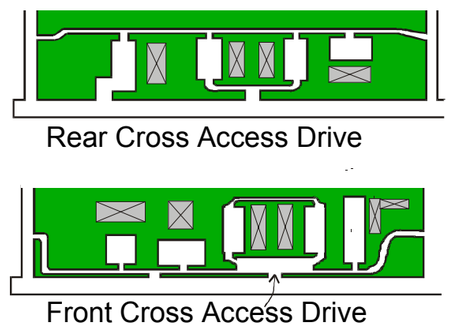


Exhibit 5.4-1: Cross Access

The result of this effort may take on two separate forms. The first, is one which the team identifies in the aerial photos and project list specific locations that would benefit from sharing access. The second, involves providing changes to the local agencies guidelines to initiate a shared access provision.

Thoroughfare Planning

The local government code provides the authority for local agencies to adopt and implement thoroughfare plans. These plans generally describe the alignment and ROW requirements for major thoroughfares through a community. This policy goes a step further and investigates the potential for the use of collector roads and backage roads to serve local developments without adding more turning traffic onto the major thoroughfares. These roads will generally be localized and dependent on site development and property boundaries. **Exhibit 5.4-2** demonstrates these concepts. Recommendations to this end will be documented on the corridor aerial photos found in **Appendix A.**

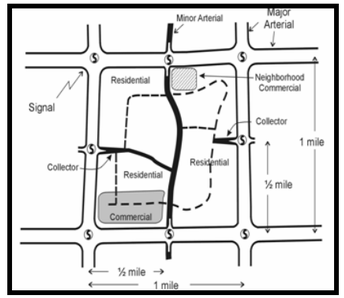


Exhibit 5.4-2: Thoroughfare Planning

Design Guidelines

These guidelines shall form the basis for technical guidance with regard to access decisions along FM 518. Specific guidelines have been developed for access connection (driveway) spacing and median opening spacing.

Access Connections

The access connection distances in the following sections are intended for passenger cars on a level grade. These distances may be increased for downgrades, truck traffic, or where otherwise indicated for the specific circumstances of the site and the roadway. In other cases, shorter distances may be appropriate to provide reasonable access, and such decisions should be based on safety and operational factors supported by an engineering study.

Minimum Connection Spacing	
Posted Speed (MPH)	Distance (FT)
≤ 30	200
35	250
40	305
45	360
≥ 50	425

Exhibit 5.4-3: Minimum Connection Spacing

The distance between access connections, measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection. **Exhibit 5.4-3** provides minimum connection spacing criteria for FM 158.

A lesser connection spacing than set forth in this document may be allowed in the following situations:

- To keep from land-locking a property.
- Replacement or re-establishment of access to the highway under a reconstruction / rehabilitation projects.

Median Installation

Openings should only be provided for street intersections or at intervals for major developed areas. Spacing between median openings must be adequate to allow for introduction of left-turn with proper deceleration and storage lengths. Refer to *TxDOT Design Guidelines* for proper deceleration and storage lengths.

Deceleration Lane Tolerances

When a raised median is present and a left-turn deceleration lane shall be provided for every opening. Right-turn deceleration lanes shall be required when the peak hour turning movement is greater than 60 vehicles.

5.5 Other Improvements

Raised medians, driveway consolidations, signal timing, shared access and cross access, access spacing, and thoroughfare planning all translate into benefits for pedestrians, bicycles, and the rapidity of transit. Several additional techniques that exist to expand the multi-model flavor of this corridor might be the addition of pedestrian pedestrian amenities, bicycle lanes, and transit service.

Transit Service

Developing a set of viable transportation alternative will be centered on building ridership for future high capacity transit service. This not only includes making better use of the existing roadway capacity, but also includes managing the demand for travel in the corridor. Transportation Demand Management (TDM) is a set of strategies designed to make the best use of existing transportation facilities as well as enhancing transportation improvements. Using strategies that promote alternative modes, increase vehicle occupancy, reduce travel distances, and ease peak-hour congestion, TDM increases the efficiency and effectiveness of the transportation system.

Approaches include:

- Strategies to promote alternative modes of travel, such as carpooling, vanpooling, transit, biking, and walking.
- Projects designed to maximize the efficient use of parking resources.
- Efforts to shift travel demand to “nonpeak” periods, by promoting flexible work schedules and variable work hours.
- Attempts to eliminate the demand for some trips through teleworking, teleconferencing, etc.
- Augmentation and coordination of existing demand response transit provisions.

Pedestrian Amenities

One improvement technique involves the possible addition of sidewalks and curb ramps along the corridor. As identified in the existing conditions report many areas throughout the corridor do not have sidewalks, therefore opportunities to fill in the missing pieces are presented.

Bicycle Lanes

The need and feasibility of adding on-road bicycle facilities will be investigated. Additional coordination will occur to connect off-road bicycle facilities with any on-road bike lanes. The minimum width of any on-road bicycle facility will be five-feet and 10-feet for off-road recreational trails.

Chapter 6
Short and Medium-Term Corridor Improvements

6.1 Introduction

One of the primary goals for the FM 518 Corridor Access Management Plan is to identify short-term transportation solutions. This involved evaluating every signalized intersection within the study limits, providing recommendations for medians improvements, and consideration for the consolidation of driveways. The following sections detail the study team's methodology, provide recommendations for intersection improvements, and median and driveway consolidations.

6.2 Methodology

Operational Improvements

Traffic conditions modeling is one of the primary tools that transportation planners and engineers use to evaluate current and future corridor conditions. Using current intersection traffic counts and Synchro™ software, the study team evaluated every signalized intersection. As seen in **Chapter 4,** Current Corridor Conditions, many intersections are operating at an unacceptable level of service. Based on current traffic counts, field observation, and public involvement the study team tested various intersection improvement options with the use of our Synchro™ model in an attempt to optimize both the intersections and the overall corridor mobility. This process involved not only modeling recommended physical improvements such as left turn and right turn lanes but also, included optimizing the intersection phasing, timing, and offsets.

Safety Improvements

Providing for raised medians can greatly improve the overall safety in the corridor. As described in **Chapter 4,** Current Corridor Conditions, there is a high number of crashes that are occurring throughout the corridor. Raised medians minimize the conflict points along a roadway and provide for safe pedestrian refuge. The team's methodology for the location and benefit from raised median was primarily based on areas that experience a high crash history. Relative to the location of full-access median openings was given first to public street connections and then to major private developments. In most cases the study team did not recommend median openings that would be so close to major intersections that they would influence the functional intersection area. **Exhibit 6.2-1** provides an example of how this technique should be applied. In addition to raised medians, the team also looked for opportunities to consolidate driveways that are too close to major intersections and eliminate driveways that were in close proximity to other driveways.

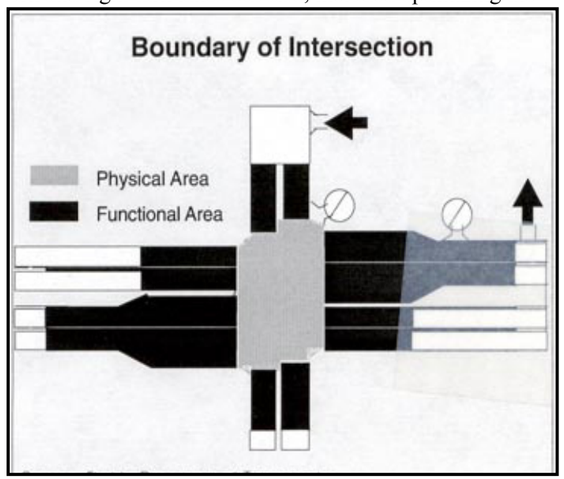


Exhibit 6.2-1: Functional Intersection Area

6.3 Operational Improvements

The following recommendations provide H-GAC, TxDOT, and the Cities with a list of operational improvement to improve the overall corridor level of service.

Traffic Signal Improvements

Signal timing can greatly reduce the overall corridor delay. In order to capitalize on these improvements the signal system as a whole needs to be evaluated (**Appendix C** depicts the limits of the signal systems). In addition to a comprehensive retiming of all intersections and closed-loop systems, the study team recommends the following traffic signal modifications.

Elimination of "Split-Phased" Signal Sequences:
An intersection is said to be "split-phased" if all traffic from one direction moves during one phase followed by all traffic from the opposite direction moving during the next phase. The sequence in which the left-turn phases occur concurrently (if needed) followed the concurrent service of the opposing through movements is referred to as "quad-left" phasing.

Table 4.2-1 showed the phasing pattern now in use at all of the signalized intersections in the FM 518 corridor.

In some cases, such as the East Walnut / Barry Rose intersection in Pearland, split-phasing is appropriate because of the unusual geometry of the intersection. As a general rule, however, split-phasing of the cross street should be avoided because of the following operational disadvantages:

In light traffic, substantially more major street red time is required to service the minor street traffic. As an example, consider the instance of only one vehicle being present on each minor street approach:

If the minor street is split-phased, both cross street phases must be served for a minimum time. Assuming a minimum green of about five seconds plus typical yellow and all-red times, the major street signals must be red for at least 20 seconds to accommodate these two cars.

In comparison, if the minor street has just a single phase, both cars could typically be accommodated during 10 – 12 seconds of major street red time.

An even greater problem stems from the accommodation of pedestrians crossing the major street. To accommodate one pedestrian, the controller must sequentially time the following intervals:

- A "Walk" interval of at least four seconds.
- "Flashing Don't Walk" pedestrian clearance interval, which must be long enough to allow pedestrian who has just started his or her crossing to reach the far side of the street. Assuming a walking speed of four-feet per second, the typical pedestrian clearance time to cross FM 518 is about 17 seconds. Although the vehicular yellow and all-red intervals can be timed concurrently with the last few seconds of the pedestrian clearance, usual practice is to time them following the pedestrian clearance.

Accordingly, about 26 seconds of major street red time is required to accommodate the crossing of just one pedestrian. Along arterial roadways such as FM 518, the pedestrian phases are typically actuated and the pedestrian intervals are timed only in response to a push button actuation.

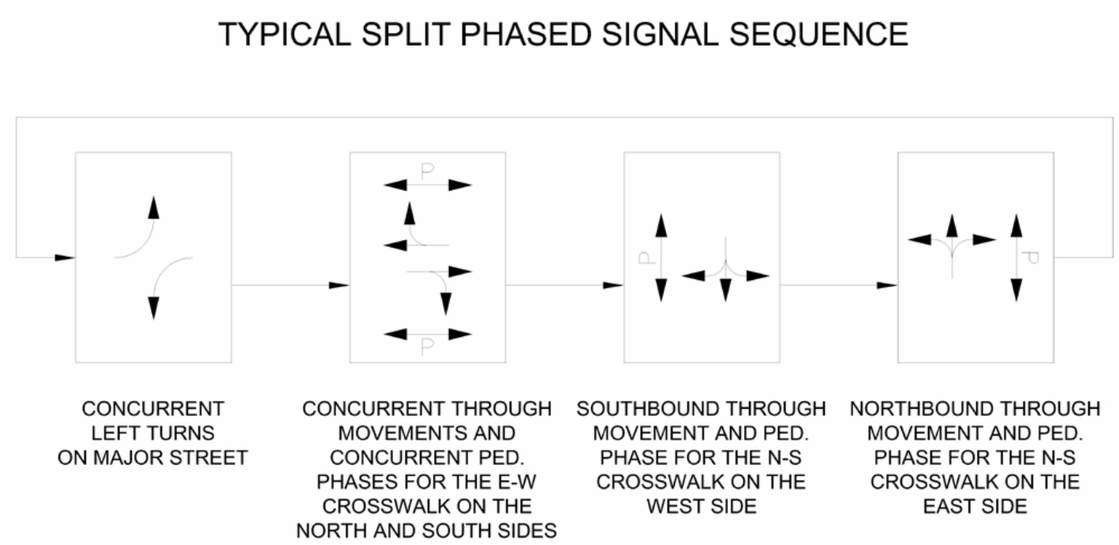


Exhibit 6.3-1: Typical Split Phased Signal Sequence

As illustrated in **Exhibit 6.3-1,** split-phasing creates the following problem if there happens to be need to serve a pedestrian call for crosswalks on both sides of the cross street:

- Since a green arrow cannot be displayed in conflict with a "Walk" or "Flashing Don't Walk" interval, the crosswalk on the west side of the intersection must be associated with the southbound vehicular phase and the crosswalk on the east side of the intersection must be associated with the northbound vehicular phase.
- Accordingly, if the intersection is split-phased, these pedestrian services must occur sequentially and 52-seconds or more of major street red time is required to accommodate the two pedestrians.
- In contrast, virtually any other phasing pattern would allow these two pedestrian services to be accommodated concurrently in only 26-seconds of major street red time.

To avoid these inefficiencies, it is recommended that split-phasing be avoided whenever other intersections are newly signalized. Also, as funding permits, it is recommended that the currently split-phased minor intersections be reconfigured to allow them to operate in a more efficient manner. As an example, **Exhibit 6.3-2** illustrates a typical configuration of a split-phased minor intersection on FM 518. In this example, each minor approach has two lanes — a "left or straight" lane and a right-only lane.

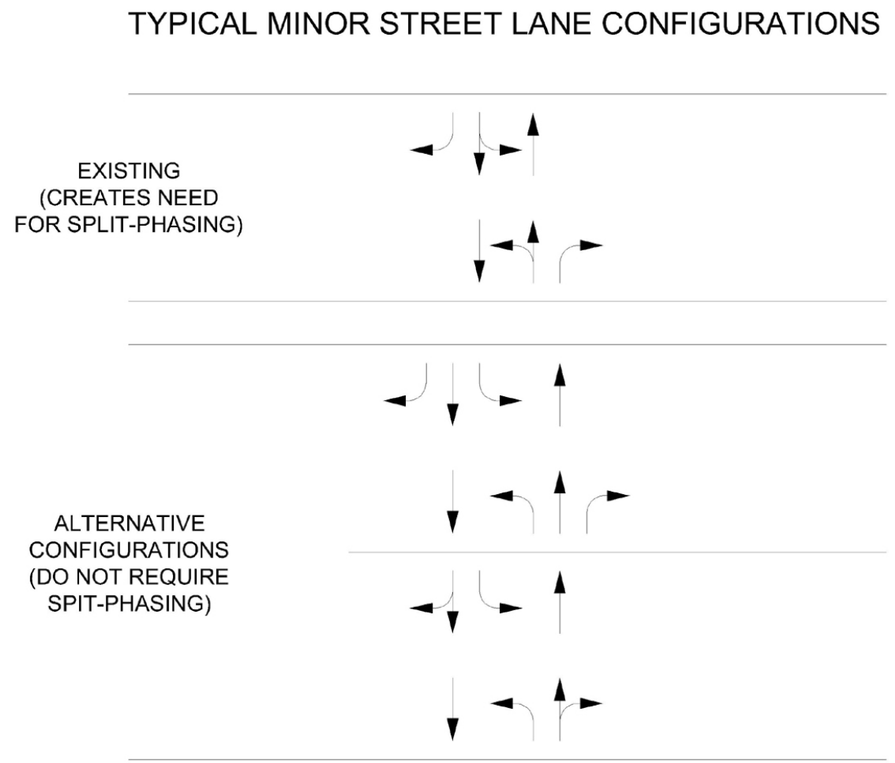


Exhibit 6.3-2: Typical Minor Street Lane Configuration

By adding one lane, each minor approach can be reconfigured to have a left-only lane, a straight-only lane, and a right-only lane, which would allow the following operational efficiencies:

- Pedestrians can be accommodated concurrently on the parallel north-south crosswalks.
- At intersections where the minor approaches have low left-turning volumes, all cross-street vehicular traffic can be accommodated during a single phase.
- Even if the minor approach left-turn volumes are high enough to need a protected phase, protected-permitted mode can normally be used. Accordingly, some of the left-turns can take place during the circular green, thereby minimizing the major street red time. Furthermore, during very light traffic periods, the cross street left turn phases can be omitted entirely, possibly allowing the use of a shorter signal cycle.

Protected-Only versus Protected-Permitted Left Turns:
Many of the signalized intersections along FM 518 currently have protected-only left turns. Especially in light traffic, the down side of this mode of operation is that a left-turning driver must wait for the green arrow even though there maybe many opportunities for left turns to be made safely on a permitted basis during the circular green.

On the other hand, one potential advantage of protected-only mode is that the lead-lag phase sequences can be used to optimize two-way progression without creating "yellow trap" issues. (If a lagging left turn occurs opposite a leading protected-permitted left turn, a "yellow trap" condition is said to occur because the left turning driver is facing a yellow signal even though opposing through traffic still has a green. Accordingly, a left turning driver waiting in the intersection does not have the opportunity to clear safely during the yellow).

Because of speeds and volumes, protected-only operation is probably appropriate at many of the intersections along FM 518. In any event, the progression benefits of being able to use lead-lag sequences should be evaluated prior to any decision to convert a particular location to protected-permitted mode.

Short-Term Signal System Improvements
The following short-term signal system improvements should be made as soon as possible:

- The remaining isolated intersections should be incorporated into closed-loop systems. This could be done by expanding the geographical limits of the existing systems, by installing new closed-loop systems per TxDOT's specification, or some combination thereof.
- The timing of all of the systems should be optimized for current traffic.

Other Signal System Improvements:
The current state-of-the-art for microcomputer-based signal systems is the distributed system, which does not have field masters. Instead, using a continuous communications link, the central computer polls each intersection on a continuous basis.

As compared with a closed-loop system, the distributed system has the following benefits:

- The control groups can easily be reconfigured on a time of day basis.
- An operator at the central facility has access to real-time displays of the status of the entire system (rather than being limited to connection with one field master at a time).

As the FM 518 corridor continues to grow, there will be increasing need for a more capable traffic management system. Therefore, it is recommended that communications infrastructure be upgraded over the next several years to support the eventual implementation of distributed signal systems.

Although twisted-pair cable can fully support signal system data communications, fiber optic cable provides the additional bandwidth needed for closed-circuit television (CCTV) and other intelligent transportation system (ITS) applications. Therefore, all new communication cable should be fiber optic rather than copper. This would include cable installed to connect currently isolate intersections as well as any cable that may be installed to replace the existing copper cable. The freeway management system communications network should evolve to provide the means for linking the signals on specific arterial corridors (e.g. FM 518) with TxDOT's traffic signal management facility.

Whenever the 50,000 population threshold is reached, TxDOT requires that a city take over the operation and maintenance of the signals along non-freeway State-maintained roadways. League City has already reached this threshold and Pearland will soon follow. Accordingly, the geographic deployment of systems should follow City boundaries to facilitate a particular City taking over the operation of all the signals within its boundaries.

Specific Signal and Intersection Improvements

The addition of dedicated right-turn lanes and left-turn lanes reduces platoon disruptions and enhance efficient signal operation. The team identified many capacity improvements that may be accomplished with re-striping or additional pavement. **Table 6.3-1** identifies these improvements and the accompanying signal cycle length changes.

Intersection		Add Capacity	Phase		
ID	Name		Short	Med	Timing Change
Pearland					
1	SH 288 West Side				
2	SH 288 East Side	WB (Right)	X		RT overlap
3	Silverlake Village / CR 94A	NB (Right, Through, Left), SB (Left, Shared Right-Through)	X		~~Split phased~~
		EB (Right) SB (Left, Through, Right)		X	
4	Wal-Mart	NB (Left, Shared Right-Through), SB (Left, Shared Right-Through)	X		~~Split phased~~
5	CR 94 / Home Depot	NB (Dual Left, Shared Right-Through), SB (Left, Shared Right-Through)	X		~~Split phased~~
		SB (Left, Through, Right)		X	
6	CR 93 / Miller Ranch				
7	CR 90 / Southwyck				
8	FM 865 / Cullen Boulevard	SB (Left, Through, Right)	X		~~Split phased~~
		SB (Dual Left, Through, Right)		X	
9	CR 89 / Kroger				~~Split phased~~
10	FM 1128 / Manvel	NB (Dual Left, Shared Right-Through), SB (Left, Through Right)	X		~~Split phased~~
11	Harkey / Oday	NB (Left, Through, Right), SB (Left, Shared Right-Through)	X		
12	Woody / Corrigan				
13	Halbert / McLean / Walnut	Halbert One-way	X		~~Single phase~~
		Halbert Cul-de-sac		X	
14	Mykawa				
15	SH 35 / Main	WB (Right)	X		Add logic plan
		EB (Dual Left, Right), NB and SB (Dual Left, Right)		X	
16	Galveston				
17	Old Alvin	WB (Right)	X		
18	Walnut / Berry Rose		X		Right-turn overlap
19	Sherwood		X		Re-align north leg
20	Westminster		X		Single phase
21	Pearland Parkway	*EB and WB (Right), NB (Dual Left, Through, Right-Through)	X		
22	Liberty / Country Club	*EB (Right), NB and SB (Left, Shared Right-Through)	X		Add quad-left
		NB and SB (Left, Through, Right)		X	
26	Dixie Farm	WB and EB (Dual Left, Right)		X	
26a	Pine Hollow		X		New Signal
* Currently planned by the City of Pearland					

Table 6.3-1: Intersection Improvements

Intersection		Add Capacity	Phase		
ID	Name		Short	Med	Timing Change
Friendswood					
28	FM 2351 / Edgewood	SEB(Right)	X		
		NEB and SWB (Left), SEB (Right)		X	
29	Shadow Bend				
30	Spreading Oaks				
31	Clearview				
32	Castlewood				
33	Whispering Pines	NWB (Left)	X		
34	Winding Way				
35	FM 528 / Parkwood	SWB (Dual left)	X		
		SWB (Right), NEB (Dual left)		X	
League City					
36	Bay Area Boulevard	WB (Right)	X		
37	Spring Landing / Palomino	NB and SB (Left) Restripe Lanes	X		Add quad left
38	Landing Boulevard	WB (Dual Left)		X	
39	Williamsport Boulevard / Newport Boulevard				
40	Newport				
41	Hobbs / Lafayette	WB (Dual Left), NB (Dual Right) Widen Hobbs two SB lanes		X	
42	IH-45 West Side	EB (Dual Right) Begin new right as additional auxiliary lane		X	
43	IH-45 East Side	EB (Dual Left)		X	
44	Calder / Devereux				
45	Interurban	NB (Left)		X	Add single phase
46	SH 3	SB (Right) NB,SB,EB and WB (Left)		X	Optimize
47	Houston				
48	Park				
49	Iowa				
50	Texas	NB (add lane designate as two lefts with a shared right)		X	
51a	FM 270				
51b	FM 2094	WB (Extend inside left lane to accommodate queue)	X		
		Develop new NB roadway (create a partial continuous flow intersection)		X	
Kemah		**Add Capacity**	**Short**	**Med**	**Timing Change**
57	Kemah Oaks				
57a	Wal-Mart	Recommend TxDOT signal warrant be conducted	X		New Signal
58	SH 146				
	As volumes increase prohibit left turn movements during peak hours				

Table 6.3-1: Intersection Improvements, cont.

Recommended Intersection Improvements Explained

These improvements are vital to the reduction of congestion along FM 518. The following section details the improvement by intersection. Please refer to the aerial graphics in **Appendix A** for graphic depiction of the improvements.

1 and 2. SH 288 West Side and East Side:
This interchange currently uses the "TTI 4-phase" signal sequence, which is the standard for diamond interchange signals in the greater Houston area. During the AM peak, the critical movement is the westbound right turn, which currently has just a shared lane even though its volume is extremely high at 1,759 vehicles per hour. The critical movements during the PM peak are the southbound frontage road movement and the westbound right-turn. With standard TTI phasing, these movements are conflicting except for a few seconds of internal advance time.

The westbound external approach currently has two lanes, designated as straight-only and straight-or-right. As an immediate improvement:

Short-Term Recommendations:

- The right-hand lane should be designated as a "right-only" lane.
- The signal sequence should be modified to provide an "overlap" that will allow the westbound right-turn to move concurrently with a portion of the southbound frontage road phase. In the 130-second cycle PM timing scenario (shown in **Exhibit 6.3-3**), the overlap would be in operation for 52 of the 68-seconds allocated to the southbound frontage road.

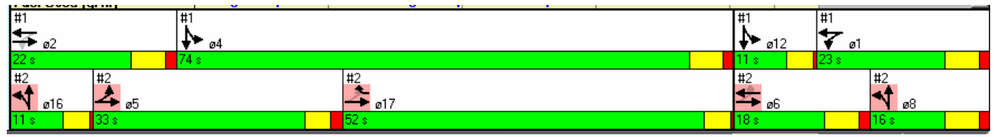


Exhibit 6.3-3: 130-second cycle PM timing scenario

- The westbound approach should be widened on the right to provide one additional lane. This lane should develop as short a distance as practical west of the Silverlake Village / CR 94A intersection.
- The added lane should also be designated as a right-only lane, i.e. there will be two right-only lanes and one straight-only lane (see **Exhibit 6.3-4**). (There is also an existing left-turn lane that develops a short distance in advance of the east intersection for use by the vehicles that will be turning left at the west intersection.)

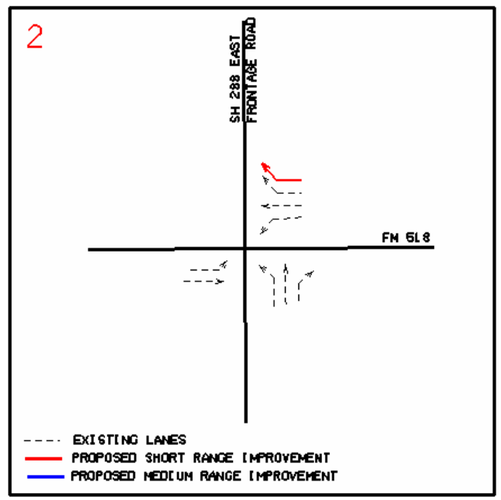


Exhibit 6.3-4: SH 288 East Intersection Recommendation

3. Silverlake Village / CR 94A:
This intersection is currently split-phased for the north-south movement. Based solely on the volumes, this appears to be unnecessary.

Short-Term Recommendations:
- Re-stripe the northbound and southbound approaches from their current configuration (left-only, shared straight-or-left, and right only) to left-only, straight-only, and right-only. This will allow the north-south through movements (and more importantly the pedestrian movements) to operate concurrently.
- Provide the left turns with protected-permitted (rather than protected-only) signalization.

Medium-Term Recommendations:
- Provide southbound left through and right.
- Provide eastbound right.

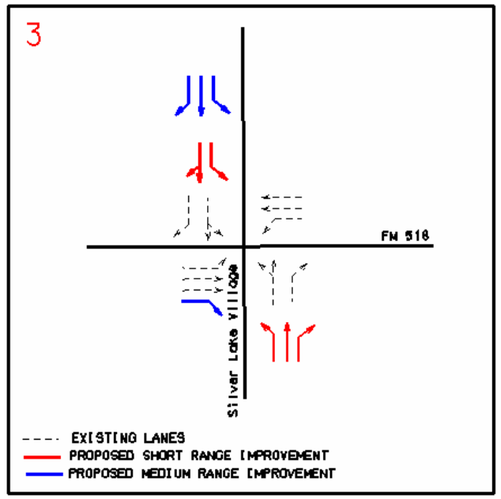


Exhibit 6.3-5: Silverlake Village Recommendation

4. Wal-Mart Driveway:
This intersection is also split-phased for the north-south movements, perhaps because the two-lane approaches are currently designated as straight-or-left and right-only. The one benefit of this configuration is that the right-only lanes facilitate the making of right turns on red.

Short-Term Recommendations:
- Re-designate the northbound and southbound approaches as left-only and straight-or-right.
- This configuration will eliminate the need for split-phasing since the north-south through movements (and more importantly the north-south pedestrian phases) could operate concurrently. Also, if north-south protected left turns are needed, they should be protected-permitted.

Medium-Term Recommendations:
- Widen the northbound and southbound approaches by one-lane and designate as left-only, straight-or-left, and right only, thereby restoring the facility of right turns on red.

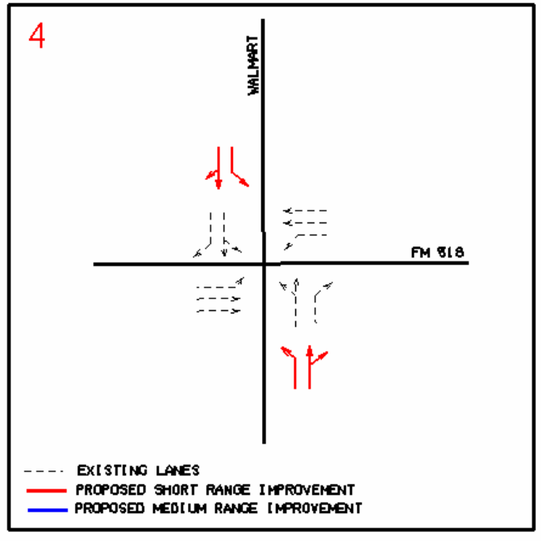


Exhibit 6.3-6: Wal-Mart Driveway Recommendation

5. CR 94A / Home Depot:
This intersection is currently split-phased for the north-south movement. In both directions, the current lane configuration is left-only, left or straight, and right only. In the northbound direction, the left-turning volumes is heavy enough (400+ VPH during the AM peak) to warrant more than one lane.

Short-Term Recommendations:
- Re-stripe the northbound approaches to have two left-only and one straight or right and the southbound to have one left-only, one straight-only, and one right-only.
- This change will eliminate the need for split-phasing by allowing the north-south through movements (and more importantly the pedestrian movements) to operate concurrently. Because of the double left lanes, it may be appropriate for the northbound left turn be protected-only. However, the southbound left should be protected-permitted.

Medium-Term Recommendations:
Widen the northbound approach by one lane, in which case the four approach lanes would be designated as follows: two left-only, one straight-only, and one right-only. This change would facilitate the ability for northbound traffic to make right turns on red.

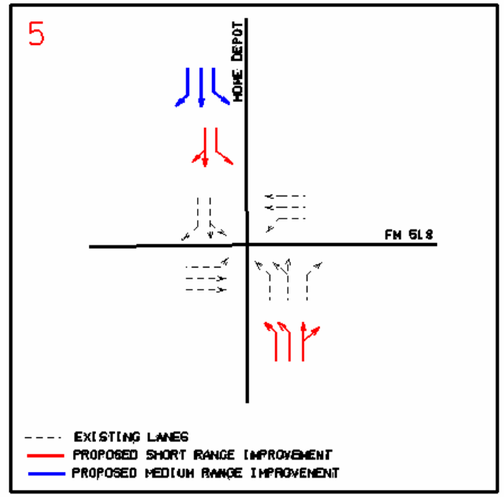


Exhibit 6.3-7: CR 94 / Home Depot

6. CR 93 / Miller Ranch
No changes are recommended.

7. CR 90 / Southwyck:
No changes are recommended.

8. FM 865 / Cullen Boulevard:
This intersection is split-phased for the north-south movement. However, given the volumes, this is probably an appropriate way to operate the intersection at the present time. A planned project will realign CR 89 to enter FM 518 opposite Cullen Boulevard.

Short-Term Recommendations:
- Restripe northbound and southbound to eliminate split phasing.

Medium-Term Recommendations:
- Based on a manual reassignment of the existing volumes, the new intersection's northbound and southbound approaches should have four-lanes (two left-only, one straight-only, and one right-only), aligned such that the split-phasing will not be necessary.

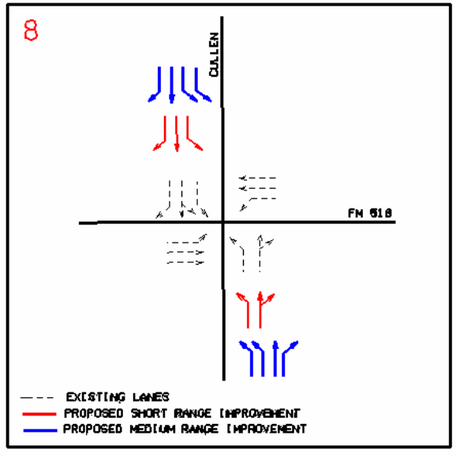


Exhibit 6.3-8: FM 865 / Cullen Boulevard Recommendation

9. CR 89 / Kroger:
This intersection is also split-phased for the north-south movement at the present time.

Medium-Term Recommendations:
- Once CR 89 is realigned, the north-south traffic will be substantially less and this intersection should have a single north-south phase (with permitted-only left turns).

10. FM 1128 / Manvel:
This intersection is split-phased for the north-south movement. The northbound and southbound approaches each have two lanes and the southbound approach is currently striped as left-only and straight-or-right. However, the northbound approach is striped as left-or-straight and right-only.

Short-Term Recommendations:
- Widen the northbound approach to provide for dual left-only lanes and a straight-or-right, thereby eliminating the need for this intersection to be split-phased.

Medium-Term Recommendations:
- Once Manvel to Cullen is completed lane assignments should be modified to for the northbound approach to have designated left-only, straight-only, and right-only lanes.

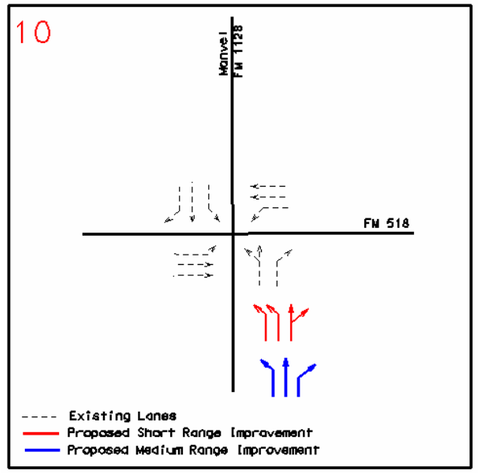


Exhibit 6.3-9: FM 1128 / Manvel Recommendations

11. Harkey / Oday:
This intersection already has a quad-left signal sequence and its LOS of C for the AM peak and B for the PM peak. However, the northbound right-turn lane has relatively high volumes, 225 VPH during the AM peak.

Short-Term Recommendations:
- Widen the northbound approach to provide a right-only lane.

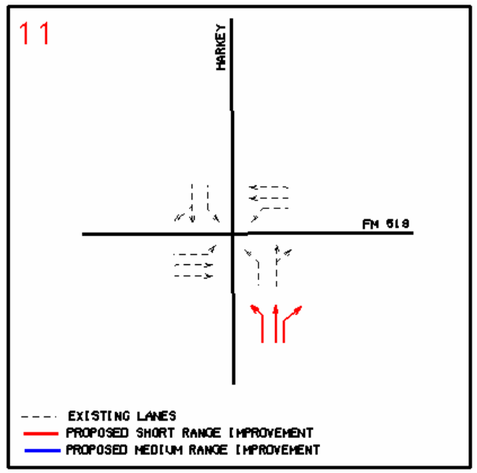


Exhibit 6.3-10: Harkey / Oday Recommendation

12. Woody / Corrigan
No changes are recommended.

13. Halbert / McLean / Walnut:
For signal operations purposes, this complicated pair of intersections has five legs. The eastbound approach of the Walnut / McLean intersection can be served concurrently with the eastbound and westbound legs of the FM 518's intersection with McLean and Halbert. The other three legs (westbound Walnut, northbound McLean, and southbound Halbert) must be served sequentially.

One of the improvement scenarios consisted of closing the eastbound connection from FM 518 to Walnut and installing a median on McLean through its intersection with Walnut. This would convert that intersection into a T-intersection that would allow only the right turn movement from Walnut onto McLean. This scenario would have the side effect or causing considerable traffic to have to find new routes to get to and from Walnut. Some of these routes would possibly involve minor residential streets, resulting in complaints from those residents.

Short-Term Recommendations:
- Make Halbert one-way northbound in the block immediately north of FM 518. The benefit of this change would be the elimination of one of the signal phases that must now be served sequentially. The current southbound volumes on Halbert are low, 14 VPH in the AM and 54 VPH in the PM. Because connections are available to other north-south streets, it is felt that this change would cause minimal inconvenience for the residents and other users of Halbert.

Other Recommendations:
- As discussed below, the possible future extension of Mykawa may afford an opportunity to de-emphasize Walnut between McLean and Mykawa and further improve the efficiency of the FM 518 / Walnut / McLean intersection.

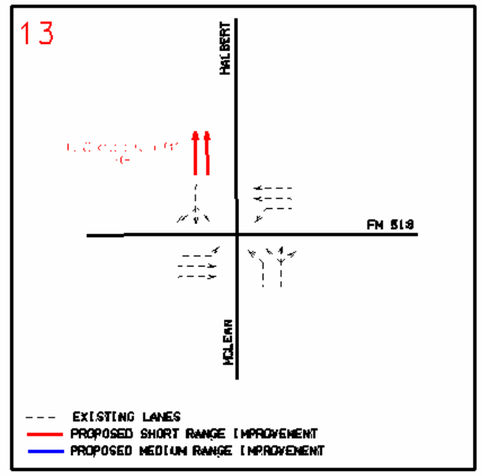


Exhibit 6.3-11: Halbert / McLean / Walnut Recommendation

14. Mykawa:
This is a T-intersection and the minor approach has two lanes (designated as right-only and left-only). No modifications are recommended at this time. It should be noted that the Pearland Thoroughfare Plan calls for Mykawa to be extended to the south.

Other Recommendations:
Whenever that extension is designed, the possible de-emphasis of Walnut west of Mykawa should be considered. The benefits would be the elimination of the signal at McLean and Walnut, which would greatly improve the efficiency of the signal at FM 518 and McLean.

15. SH 35 / Main:
This intersection is essentially at capacity and even with optimized timing would operate at LOS of D during the AM and PM peaks. Widening is restricted by ROW constraints, so the following additional lanes are concentrated in the medium-term.

Short-Term Recommendations:
- Widen the westbound intersection to provide for a right-only lane.

Medium-Term Recommendations:
- Add an additional left-turn lane (i.e., create a double left) for the eastbound, northbound, and southbound approaches.
- Add right-only lanes for the southbound approach.

Also, this intersection is significantly impacted by trains that pass through the grade crossing that's located one block to the west. Specifically, very long queues develop in both directions on FM 518 while a train is blocking this crossing. Then, once the train is gone, it routinely takes multiple signal cycles for the intersection to recover to a normal condition. It is recommended that logic be added to cause a special signal timing plan to operate once a train has cleared the crossing. This plan would provide extended green times for the east-west movements. Also, the number of cycles that the special plan would remain in effect would be a function of amount of time that the crossing had been blocked by the train.

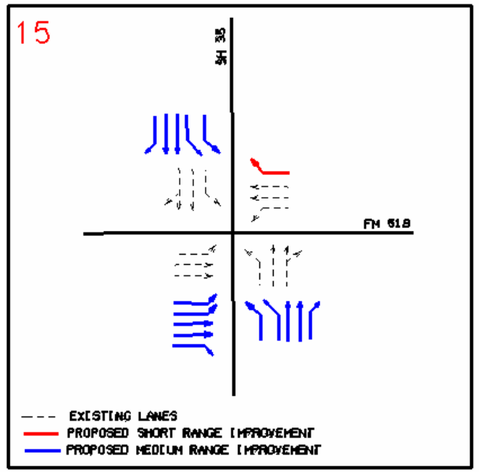


Exhibit 6.3-12: SH 35 Recommendation

16. Galveston:
No changes are recommended.

17. Old Alvin:
The westbound right turn volumes are high, 315 VPH during the AM peak and 266 VPH during the PM peak.

Short-Term Recommendations:
Add a westbound right turn lane.

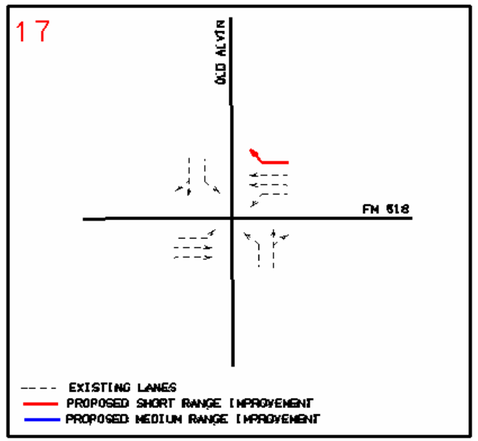


Exhibit 6.3-13: Old Alvin Recommendation

18. Walnut / Barry Rose:
This intersection has highly unusual geometry. The nominally east-west major street, FM 518, is actually in a west-northwest to east-southeast orientation. The Walnut approach is essentially eastbound and the Barry Rose approach is essentially southwest-bound. The Walnut and Barry Rose legs are appropriately split-phased since concurrent operation would probably be unsafe because of the angles.

The pedestrian movement for the east side of the intersection is currently associated with the Walnut phase. However, this may present an unexpected conflict for the drivers on Walnut. Because of the angle, a driver proceeding from Walnut onto eastbound FM 518 may not perceive this movement to be a right turn and therefore may not realize that he or she is obliged to yield to pedestrians in the particular crosswalk.

Short-Term Recommendations:
- Prohibit pedestrian crossings on the east side of the intersection. Instead, all north-south pedestrian crossings would be required to occur on the west side. The west crossing is associated with the Barry Rose phase and drivers from this approach would be much more likely to perceive that they are making a right turn and are therefore obliged to yield to pedestrians.
- Revise the signal phasing to provide a "right-turn overlap" for the eastbound right turn movement from Walnut onto FM 518.

19. Sherwood:
This is an "offset T-intersection." The south leg is Sherwood and the north leg is a driveway that serves a Hollywood Video and a Kroger. These approaches are split-phased, which appears to be a necessary evil because of the offset. Also, there currently is a pedestrian phase associated with both of the split phases.

The *Texas Manual on Uniform Traffic Control Devices* defines eight signal warrants. The full investigation of all of the warrants requires traffic volume data for eight-hours or more, only AM and PM peak hour volumes were collected for this project. Nevertheless, the available data suggests the possibility that none of the warrants are met.

Short-Term Recommendations:
- Complete study to determine if this signal is warranted and remove it if current volumes do not meet one or more of the warrants.

If the signal is retained, the following actions are recommended:

- As an interim improvement, to eliminate the possibility of a pedestrian service having to be timed for both side street phases, the skewed crosswalk on the west side should be removed. Also, signs should be installed to instruct pedestrians that all north-south crossings must be made on the east side.

- In conjunction with the installation of a raised median along FM 518, the possibility of relocating the north leg of this signal should be investigated. If the north leg of this offset T-intersection were moved to a driveway that's about 220-feet farther to the west, both legs of the offset "T"could be served concurrently, thereby reducing the red time for FM 518. At the west leg of the "T," the accompanying median design should provide for an eastbound left turn but should prevent a westbound left turn. Conversely, at the east leg of the "T," the accompanying median design should provide for a westbound left turn but should prevent an eastbound left turn.

20. Westminster:
This intersection is currently split-phased. The south leg, which has very low volumes, has just a single lane. The north leg, which has slightly higher volumes, has two approach lanes, designated as left-or-straight and straight-or-right. Although the south leg does not align directly with the north leg, their orientation is such that left-turning drivers from either side will have clear view of opposing traffic.

Short-Term Recommendations:
Serve all north-south traffic on a single phase, with the left turns being made on a permitted basis. This modification will allow the north-south traffic to be served during less total time, thereby lessening the red time for FM 518.

21. Pearland Parkway:
All four approaches of this intersection currently have three lanes, designated as left-only, straight-only, and straight-or-right. At the current time, volumes are such at the LOS is B during the AM and PM peaks. Based on the City and regional thoroughfare plans, traffic on Pearland Parkway will most likely increase substantially in the future.

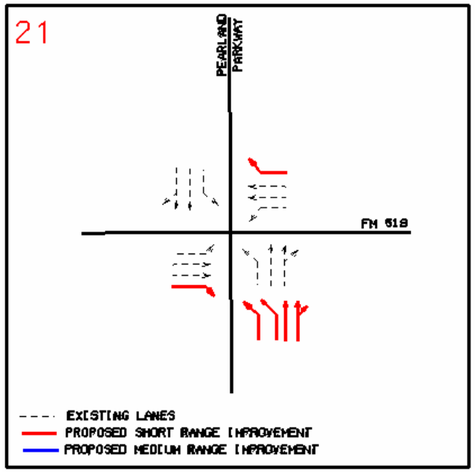


Exhibit 6.3-14: Pearland Parkway Recommendation

Short-Term Recommendations:
Provide for auxiliary lanes when conditions warrant. Based on current volumes, the greatest benefit would be produced by introducing:

- Eastbound right-turn only lane
- Westbound right-turn only lane
- Northbound dual left, through and through right

22. Liberty / Country Club:
This intersection is currently split-phased for the north-south movements. The northbound and southbound approaches each have two lanes, designated as left-or-straight and right-only. The northbound and southbound right turn volumes are both relatively heavy – 178 and 139 VPH respectively during the AM peak.

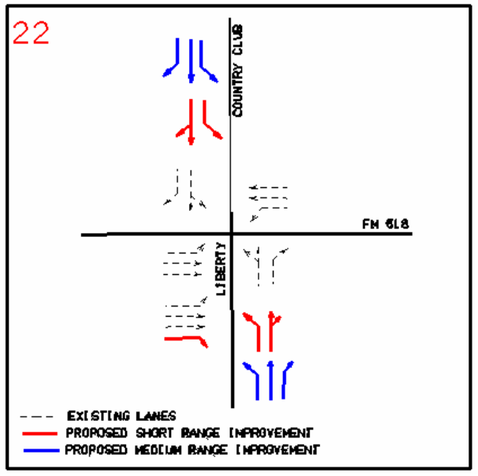


Exhibit 6.3-15: Liberty / Country Club Recommendation

Short-Term Recommendations:
- Add eastbound right-turn lane.
- Re-stripe northbound and southbound approaches to have a dedicated left and a share right-though.
- Remove split-phase signal timing.

Medium-Term Recommendations:
- Add one-lane on the northbound and southbound approaches and stripe to provide a left-only lane, a straight-only lane, and a right-only lane.
- With these changes, the north-south movements can have a quad-left sequence with protected-permitted lefts. Also, right-turn overlap phases can be provided.

23. Yost:
A forthcoming City of Pearland project will realign Yost and Shadycrest as a cross intersection. This improvement is considered a short range option in which along with the realignment of Yost to Shadycrest the signal that currently exists at Yost would be moved to the newly formed intersection. In addition, the median configuration along this section of roadway would also be reconfigured.

24. Woodcreek:
No changes are recommended.

25. Wal-Mart:
No changes are recommended.

26. Dixie Farm:
Dixie Farm currently has just one-lane per direction plus left-only and right-only auxiliary lanes at the FM 518 intersection. The FM 518 approaches currently have three lanes, designated as left-only, straight-only, and straight-or-right. With this geometry, the intersection operates at LOS of F during the AM and PM peaks.

Dixie Farm is currently programmed for widening to four-lanes. However, without auxiliary lanes (i.e. with all approaches designated as left-only, straight-only, and straight-or-right), the FM 518 / Dixie Farm intersection will still be at LOS of E during the AM and PM peaks.

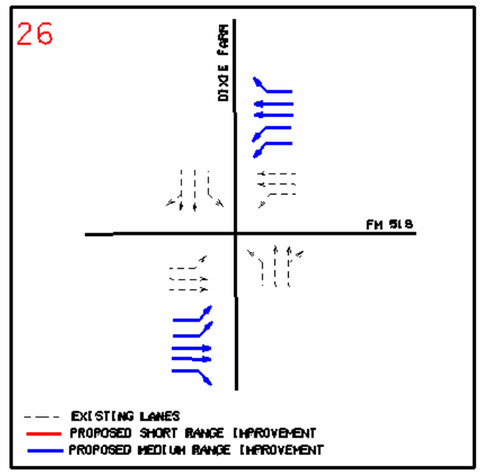


Exhibit 6.3-16: Dixie Farm Recommendation

Medium-Term Recommendations:
The greatest benefit would result from adding the following lanes, which would provide LOS of C during the AM peak and PM peak:

- A second eastbound left-turn lane
- A right-only lane for westbound
- A second westbound left-turn lane
- A right-only lane for eastbound

26a. Pine Hollow:
TxDOT recently completed a signal warrant study for this T-intersection, which indicated the need for a signal. In coordination with the installation of this signal the study team recommends consolidating a number of driveways so that a proper intersection may be formed with Pine Hollow.

27. Winding:
This intersection has a single-lane approach for both directions on the minor street and all minor street traffic operates on a single phase. However, the current LOS is B for the AM and PM peaks and no improvements are recommended.

28. FM 2351 / Edgewood:
At the present time, the southeast-bound, northwest-bound, and southwest-bound approaches have three-lanes, designated as left-only, straight-only, and straight-or-right. Southwest of FM 518, FM 2351 transitions to one-lane per direction plus a TWLTL. About 500-feet in advance of FM 518, a second northbound lane develops (and the TWLTL becomes a northbound left turn lane). There are no right-turn lanes at the present time. With existing geometry, this intersection has a LOS of D during the AM and PM peaks.

This segment of FM 518 is within the City of Friendswood's downtown overlay district, which is promoting pedestrian friendliness. Accordingly, any widening of FM 518 at this intersection would probably not be in harmony with the City's adopted goals for the downtown area. On the other hand, widening on FM 2351 would probably not be in conflict with the goals of the overlay district.

The following package of improvements will achieve LOS of C during the PM peak and provide an improved operation (though still LOS of D) during the AM peak:

Short-Term Recommendations:
- Provide a right-turn only lane on the southwest-bound approach on FM 2351.

Medium-Term Recommendations:
- Provide dual left-turn lanes for both directions on FM 2351 (Edgewood).

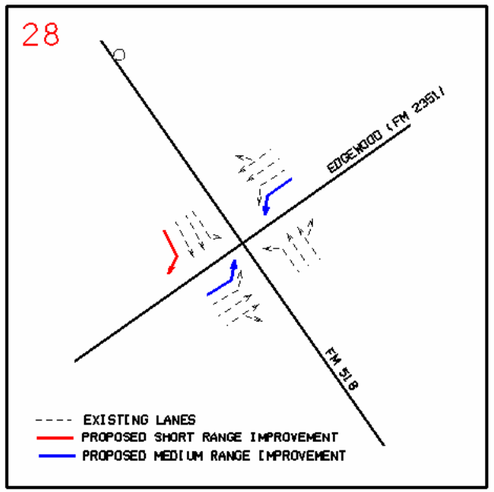


Exhibit 6.3-17: FM 2351 Edgewood Recommendation

29. ShadowBend:
No changes are recommended.

30. Spreading Oaks:
No changes are recommended.

31. Clearview:
No changes are recommended.

32. Castlewood:
No changes are recommended.

33. Whispering Pines:
The northeast-bound approach is the driveway of an office complex. Currently, FM 518's northwest-bound approach does not have a left-turn bay.

Short-Term Recommendations:
- Add a northwest bound left-turn lane.

Also, Whispering Pines / Friendswood Link Road will be redeveloped from FM 518 to the corporate city limits just east of Blackhawk. This project is in expectation of Harris County's plans to extend El Dorado west from IH-45 and will provide Friendswood with another access to the IH-45 corridor when complete. Friendswood Link will be widened into a four-lane curb and gutter roadway and lowered to accept underground storm drainage. The total length of the project is approximately 1.13 miles. As a result, some traffic that now uses FM 2351 may instead use Whispering Pines.

34. Winding Way:
No changes are recommended.

35. FM 528 / Parkwood:
FM 528 has a seven-lane undivided section. Additionally, there is a bike lane in each direction. FM 518 has a five-lane undivided section west of the intersection and a four-lane divided section east of the intersection. In the southeast-bound direction, FM 518 already has a right-turn lane. With existing geometry, this intersection has a LOS of D during the AM and PM peaks.

Short-Term Recommendations:
- Add one-lane in the southwest bound approach to create a dual left.

Medium-Term Recommendations:
- Add one-lane in the northeast bound approach to create a dual left.
- Add one-lane in the southwest bound approach to create a dedicated right-only lane.

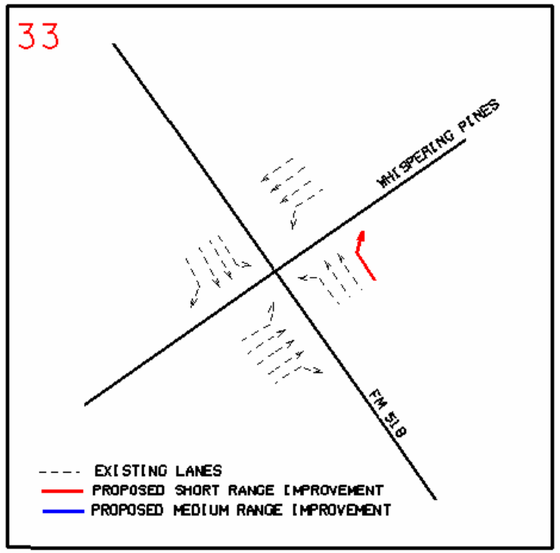


Exhibit 6.3-17A: Whispering Pines Recommendation

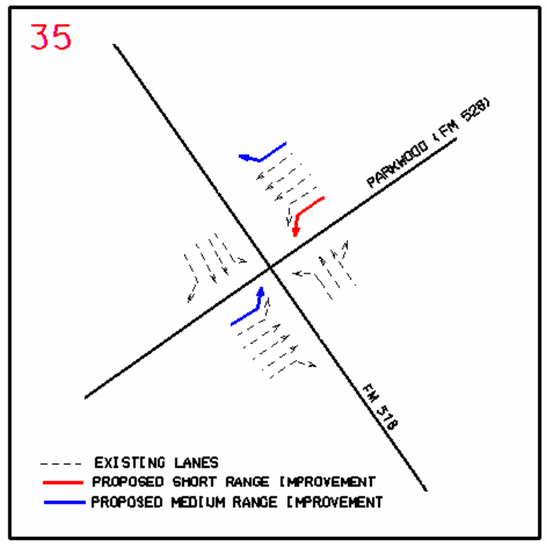


Exhibit 6.3-18: FM 528 / Parkwood Recommendations

36. Bay Area Boulevard:
With existing volumes and geometry, this intersection has a PM peak LOS of C. However, the westbound right turn volume of 206 VPH is high enough to warrant the addition of a separate right-turn lane.

Short-Term Recommendations:
- Add one-lane on the westbound approach to provide for a dedicated right-turn lane.

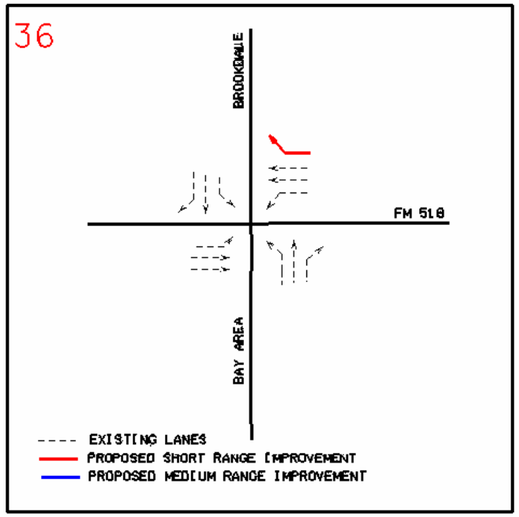


Exhibit 6.3-19: Bay Area Boulevard

37. Spring Landing / Palomino:
This intersection, which currently operates at LOS of B during the AM and PM peaks, has a single phase for the cross street. Also, each cross street approach has two-lanes (designated as left-or-straight and straight-or-right).

A new high school is planned for a tract north of FM 518 on the west side of Palomino. Since the southbound left-turn (from Palomino to go east on FM 518) is already fairly heavy — 162 VPH during the AM peak — the geometry of the intersection should be improved prior to the opening of the new school. To facilitate the use of a quad-left signal sequence, a left-turn bay should be provided for the northbound and southbound approaches.

Short-Term Recommendations:
- Add one-lane to the northbound approach to provide for a dedicated right-turn lane, and stripe lanes to for a left-only, straight-only, and right-only.
- Re-stripe southbound lanes to provide for a left-only lane and shared through-right lane.

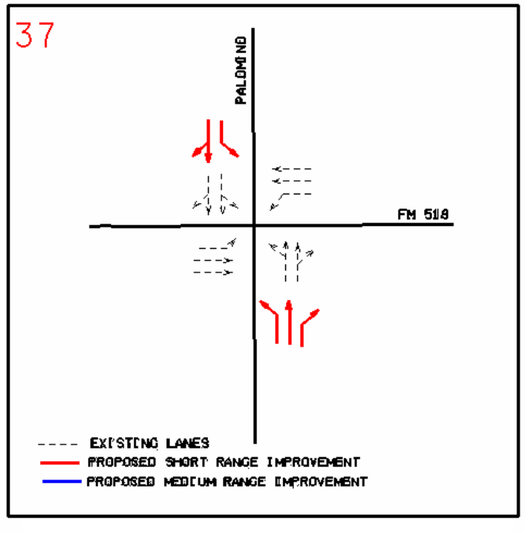


Exhibit 6.3-20: Spring Landing / Palamino Recommendation

38. Landing Boulevard:
This intersection has protected-permitted lefts eastbound and westbound. With existing volumes and geometry, this intersection currently operates at LOS of A during the AM and PM peaks. However, the westbound left-turn volume — 228 VPH during the PM peak — is sufficiently high to warrant planning for the future provision of a dual left-turn.

Medium-Term Recommendations:
- Add westbound left-turn lane.

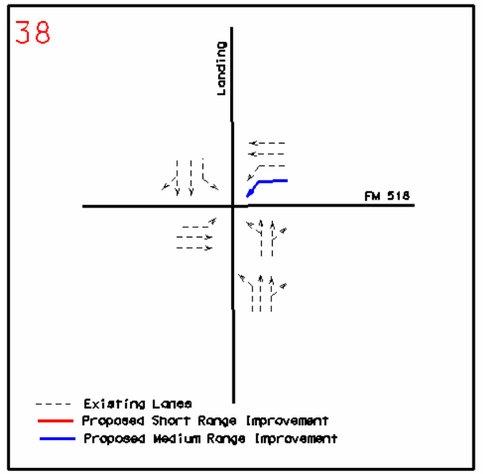


Exhibit 6.3-21: Landing Boulevard Recommendation

39. Williamsport Boulevard / Newport Boulevard:
This is an offset T-intersection, the two legs of which are about 230-feet apart. The west leg (Williamsport) has a driveway on the opposite (south) side. There is no driveway opposite Newport. A protected-permitted left-turn phase is provided for the left turn from FM 518 into each street. However, the westbound left into the driveway is permitted only. The legs of the "T" are far enough apart that both can be served concurrently, thereby minimizing red time for FM 518. This intersection currently operates at LOS of A during the AM and PM peaks and no changes are recommended.

40. Newport
No changes are recommended.

41. Hobbs / Lafayette:
The north leg (Lafayette) provides access to the Clear Creek Village neighborhood. The south leg (Hobbs Road) provides access to an even larger residential area while also providing access to the rear of commercial area that fronts onto IH-45.

The northbound and southbound approaches, which are split-phased, currently have two lanes, designated as left-or-straight and right-only. South of the intersection, Hobbs has one traffic lane per direction plus one bike lane per direction (see **Exhibit 6.3-22**).

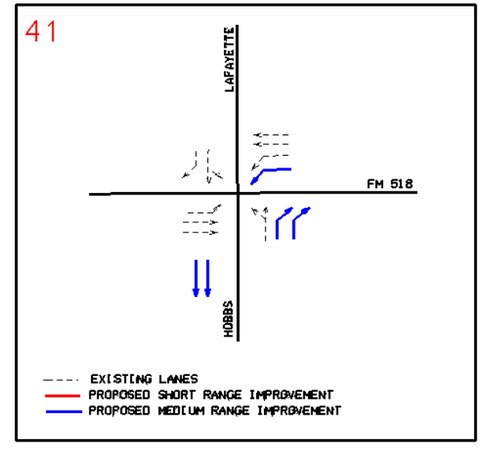


Exhibit 6.3-22: Hobbs / Lafayette Recommendation

With existing volumes and geometry, this intersection operates at LOS of D during the AM and PM peaks. However, the westbound left-turn volume of 377 VPH is sufficiently high to justify the provision of a dual left-turn. However, doing this would also necessitate the widening of at least a short segment of Hobbs.

Short-Term Recommendations:

- Add westbound left-turn lane (dual)
- Add northbound right-turn lane (dual)
- Provide two southbound through lanes

The above improvements to the Hobbs / Lafayette intersection should be implemented in conjunction with the recommended improvements for the FM 518 / IH-45 interchange (see **Exhibits 6.3-23** and **6.3.24**). Below is a further explanation of the short-term recommendations:

- A double left-turn should be provided for the westbound left-turn.
- In order to be able to receive two-lanes turning left from westbound FM 518, Hobbs should be widened to provide two southbound lanes for at least 200-feet (see **Exhibit 6.3-22**). At that point, a taper would begin into the existing cross section.
- Using what appears to be existing ROW, the Hobbs approach should be widened on the right to provide a total of three approach lanes. They should be designated as one left-or-straight lane and two right-only lanes.
- Even though split-phasing will continue to be the most appropriate way to accommodate the vehicular movements, the north-south pedestrian crossings should be restricted to just one side of the intersection. Normally, this would be the side associated with higher vehicular volume (i.e. the northbound direction). In this case, because of the recommended double right-turn for the northbound direction, the north-south pedestrian crossing should be on the west side associated with the southbound phase.

<u>42 and 43. IH-45 West Side and IH-45 East Side</u>:
This interchange currently uses the TTI 4-phase signal sequence, which is the standard for diamond interchange signals in the greater Houston area.

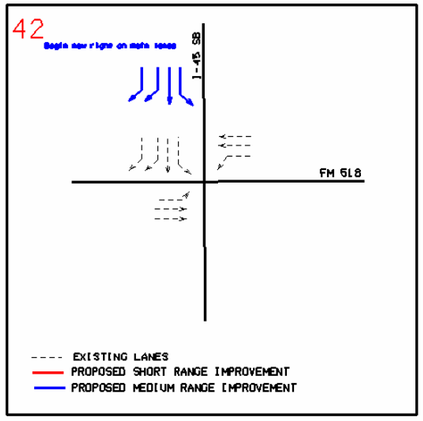


Exhibit 6.3-23: IH-45 South Bound

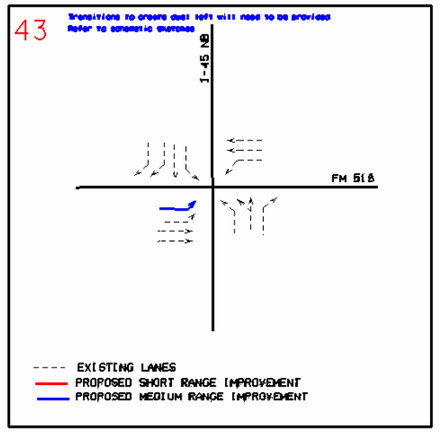


Exhibit 6.3-24: IH-45 North Bound

During the AM peak, the heaviest movements are toward the north on IH-45 with 645 VPH coming from the west and 856 VPH from the east. During the PM peak, the heaviest movements are from the north on IH-45 – 1,021 VPH turn left to go east on FM 518 and 659 turn right to go west on FM 518. Another 496 VPH come from the south on FM 518 and turn left to go west on FM 518.

Medium-Term Recommendations:

- Add eastbound dual right — begin dual right as an additional auxiliary lane
- Add eastbound dual left

Further Explanation of the Recommended Improvements:
Between the Hobbs intersection and the IH-45 east frontage road intersection, FM 518 should be widened by one-lane. A transition would occur at the midpoint between Hobbs and the west frontage road. From the transition to Hobbs, the additional lane will be a second westbound left-turn lane at Hobbs. From the transition to the east, the additional lane will be a second left-turn lane for turns from eastbound FM 518 onto the northbound IH-45 frontage road. This additional lane will develop about halfway between Hobbs / Lafayette and the west (southbound) frontage road.

The southbound frontage road should be widened by one-lane to provide two dedicated lanes for the southbound-to-westbound left-turn. There are currently two right-turn lanes at the intersection itself, but (as shown in **Exhibit 6.3-25**) the left of these two-lanes has restricted capacity because it diverges from a left-or-straight lane just 130-feet from the stop line. The current lane configuration is depicted in **Exhibit 6.3-23** and **6.3-24**.

Exhibit 6.3-25: Existing Southbound Approach on IH-45 at FM 518

The recommended widening is depicted in **Exhibits 6.3-23** and **6.3-24.** In the case of FM 518 west of the frontage road, the widening should be on the north side. Between the frontage roads, the widening should transition such that it will almost entirely on the south at and east of the east frontage road. As depicted in **Exhibit 6.3-26,** this will avoid an existing building on the south side between IH-45 and Hobbs. Also, as depicted in **Exhibit 6.3-27,** on the north side just west of the east frontage road, this will avoid an existing TxDOT communications cabinet and the existing signal controller cabinet (which is immediately to the west of the communications cabinet). On the south side between IH-45 and Hobbs, this will avoid an existing building (**Exhibit 6.3-25**).

On both sides, as can be seen in **Exhibits 6.3-26** and **6.3-27,** the distance between the existing curb and the bridge piers is approximately 18-feet. Therefore, the proposed transition can be accommodated while still leaving adequate width on each side for pedestrian passage.

Exhibit 6.3-26: South Side of FM 518 Looking West through IH-45 (showing building close to ROW)

Exhibit 6.3-27: North Side of FM 518 at IH-45 (showing the existing TxDOT communications cabinet)

44. Calder / Devereux:
No changes are recommended.

45. Interurban:
This intersection has protected-permitted lefts for both directions on FM 518 and the north-south movements are split-phased. The north leg is a driveway which unfortunately is offset about 40-feet to the east of the south leg, which is Interurban, (a public street). Unfortunately, the push-button actuated north-south pedestrian intervals are associated with the very low-volume southbound vehicular phase rather than the northbound vehicular phase.

By acquiring a corner clip on the southeast corner, Interurban can be made to line up with the driveway. In conjunction with this, the northbound approach (which currently has a single lane) can be widened to provide a left-turn bay plus a straight-or-right lane. The major benefit of doing this is that all north-south traffic could then operate on a single phase, thereby reducing the red time for FM 518.

Medium-Term Recommendation:

- Add one northbound left-turn lane

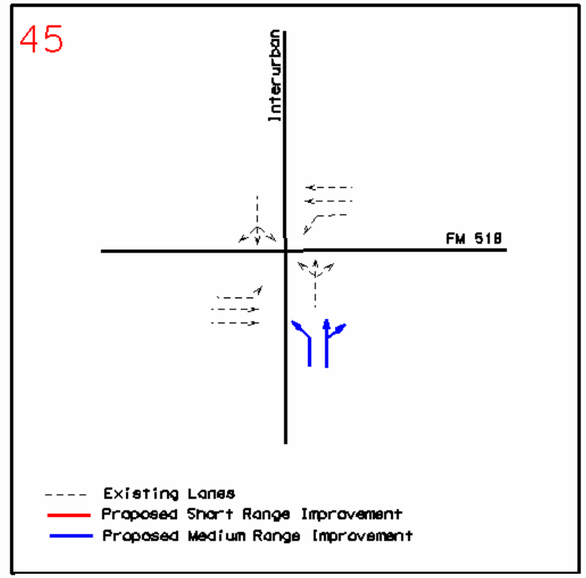


Exhibit 6.3-28: Interurban Recommendations

46. SH 3:
This major intersection has protected-only lefts for all approaches. West of the intersection, FM 518 has a five-lane section. East of the intersection, FM 518 quickly transitions into a four-lane undivided section and the length of the westbound left-turn bay is fairly short (probably 100 feet). North of the intersection, SH 3 is six-lane divided. South of the intersection, SH 3 has a seven-lane section.

With the timing optimized for existing volumes and geometrics, this intersection operates at LOS of E during the AM peak and LOS of F during the PM peak. Based on volumes, it would be highly desirable to have double left-turns for all four approaches. However, due to ROW constraints, this would be particularly difficult for the FM 518 approaches.

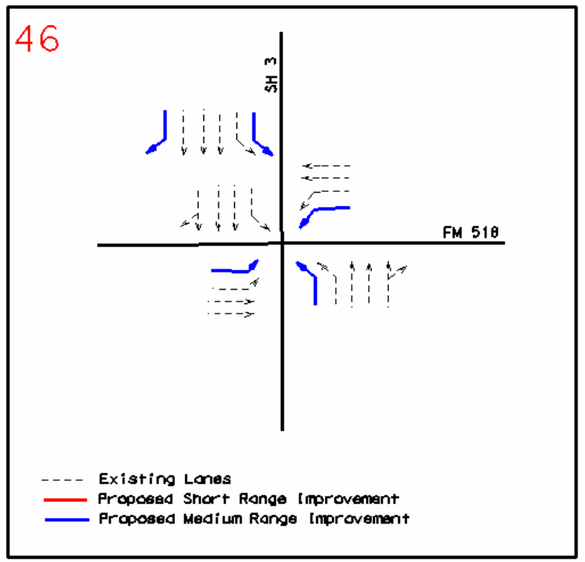


Exhibit 6.3-29: SH 3 Recommendations

Medium-Term Recommendation:

- Add dual left-turns for the northbound and southbound approaches.
- Add a right-only lane for the southbound approach.

47. Houston:
This is a two-phase intersection within the four-lane undivided segment of FM 518. With existing volumes and geometrics, the LOS is A during the AM and PM peaks and no changes are recommended.

48. Park:
This is also a two-phase intersection within the four-lane undivided segment of FM 518. With existing volumes and geometrics, the LOS is A during the AM and PM peaks and no changes are recommended.

49. Iowa:
No changes are recommended.

50. Texas:
This is a T-intersection. Both FM 518 approaches have two lanes and the westbound approach also has a left-turn bay and a protected-only left turn. The northbound approach has a single-lane. With existing volumes and geometrics, the LOS is A during the AM and PM peak and no short-term improvements are recommended.

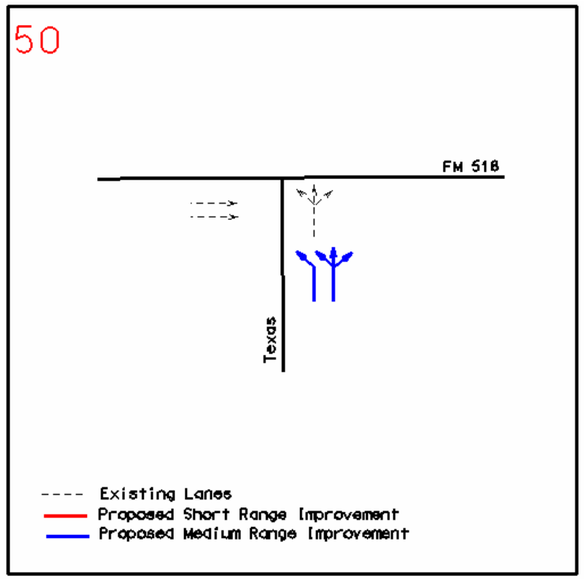


Exhibit 6.3-30: Texas Recommendations

Medium-Term Recommendation:

- Add an additional lane to the northbound approach and designate left-only, left-straight, or right.

51a and 51b. FM 270 / FM 2094:
These two intersections are approximately 320-feet apart and are currently operated by the same signal controller. The FM 270 intersection has protected-only left turns in all four directions. The FM 270 movements (nominally north-south) are split-phased and the very heavy southbound left-turn has two-lanes. The FM 2094 intersection is a "T" at which the nominally west leg of FM 518 aligns with FM 2094. The other leg of FM 518 comprises the stem of the "T."

The existing signal sequence is as follows:

- The leading eastbound protected left-turn at the west intersection begins concurrently with the eastbound and westbound through movements at the east intersection.
- The westbound movement begins at the west intersection, with the other east-west through movements continuing at both intersections.
- The lagging westbound left turn (from FM 2094) occurs at the east intersection, with the east-west through movements continuing at the west intersection.
- The double left turn from the "T" leg of FM 518 occurs, concurrently with the lagging westbound left protected left turn at the west intersection.
- The split-phased FM 270 movement occurs at the west intersection, southbound followed by northbound. During these movements, only the nominally eastbound movement is green at the east intersection.

As further discussed below, the two-lane segment of FM 518 east of FM 2094 will soon be widened. As an interim improvement, the existing pavement should be re-striped to provide additional storage length for double left-turn (from westbound FM 518 toward the FM 270 intersection). Otherwise, considering the extremely heavy traffic volumes, the existing traffic signal sequence appears to work quite well and no other low-cost, quick-to-implement improvements were identified.

Short-Term Recommendations:

- Re-stripe northeast bound left-turn lane to provide additional storage.

Other roadway improvements now being planned by the City of League City will provide an alternate route for some of traffic that now uses these intersections. North and east of these intersections, a generally east-west roadway will be built to connect FM 270 with FM 2094. Also, to the east, Louisiana Street will be extended northward, providing a connection between FM 518 and FM 2094. However, because of the circuitousness of travel, these improvements may not substantially reduce the traffic through these intersections.

Accordingly, the improvement depicted in **Exhibit 6.3-31** is suggested as a means of substantially increasing capacity, especially for the movements between the nominally north leg of FM 270 and FM 2094 and the nominally east leg of FM 518. This alternative can be summarized as follows:

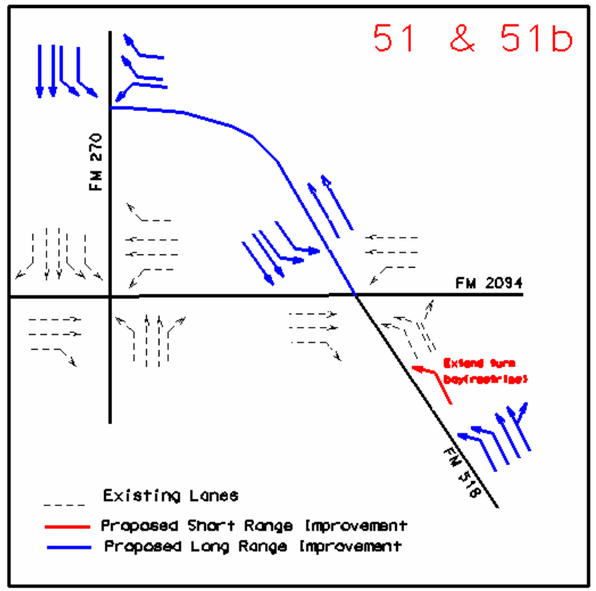


Exhibit 6.3-31: FM 270 / FM 2094 Recommendations

Medium-Term Recommendations:

- A "bypass" would be constructed through currently vacant property to connect the FM 518 / FM 2094 intersection. As depicted in greater detail in **Appendix B**, the intersection of this bypass and FM 270 would also be signalized. However, by widening the existing bridge by one lane, the heavy eastbound-to-northbound movement would be a "free" movement that would merge from two-lanes into one a few hundred feet beyond the bridge.

- With respect to overall capacity, the major (and significant) advantage of this bypass is that the very heavy southbound-to-eastbound left-turn (which has a volume of over 850 VPH during the PM peak) is completely removed from the FM 518 / FM 270 intersection. Instead, this traffic will first turn left at the "new" intersection and then either turn left again (if going to FM 2094) or continue straight through (if going the east leg of FM 518) at the second intersection (FM 518 / FM 2094). In either case, this traffic will be moving through the FM 518 / FM 2094 intersection at the same time both the northbound and southbound FM 270 traffic is moving through the FM 518 / FM 270 intersection.

As shown in the following table, this bypass would enable this complex of intersections to operate at substantially short signal cycles, thereby resulting in substantial reductions in delay:

Comparison of MOEs							
With and Without Bypass Alternative for FM 518 at SH 270 / FM 2994							
		AM Peak Hour			PM Peak Hour		
		Without	With	%	Without	With	%
MOE	Unit	Bypass	Bypass	Change	Bypass	Bypass	Change
Signal Cycle Length	Seconds	180	112	-37.8%	180	94	-47.8%
Signal Delay / Vehicle	Seconds / Vehicle	42	16	-61.9%	37	14	-62.2%
Total Signal Delay	Vehicle-Hours	132	56	-57.6%	126	51	-59.5%
Average Stops / Vehicle	Stops / Vehicle	0.66	0.50	-24.2%	0.54	0.52	-3.7%
Total Vehicle-Stops	Vehicle-Stops	7,444	6,100	-18.1%	6,605	6,809	3.1%
Average Speed	MPH	11	19	72.7%	12	21	75.0%
Total Travel Time	Vehicle-Hours	180	111	-38.3%	185	113	-38.9%
Distance Traveled	Vehicle-Miles	1,942	2,068	6.5%	2,302	2,381	3.4%

Table 6.3-2: Comparison of MOEs

52 through 59. Clear Creek High School to SH 146:
TxDOT will soon be widening this segment to provide two through lanes per direction. No changes are recommended. However, the study team does want to recognize the need for a traffic signal warrant study to be performed on the western most driveway entering the Wal-Mart.

6.4 Safety Improvements

Safety improvements include the addition of several new raised medians and potential locations for driveway consolidation. The following exhibit presents raised medians and opening information to and from major cross streets. In addition, aerials graphics have been developed to graphically represent the recommended median improvements.

Median Improvements

The application of a raised median in the corridor has been a major focus of discussion with business leaders, public officials, and land developers. The discussion began with adding a raised median throughout the entire FM 518 corridor. After further discussion, it was determined that a raised median would best be applied only at intersections that are experiencing a high level of crashes.

Exhibit 6.4-1 illustrates how a raised median will prohibit left turns into and out of driveways that maybe located too close to the functional area of the intersection. The raised median will typically begin on both sides of the intersection and continue for approximately 600-feet in both directions, see **Exhibit 6.4-2.** Also, **Exhibit 6.4-3** demonstrates a typical cross section for the median.

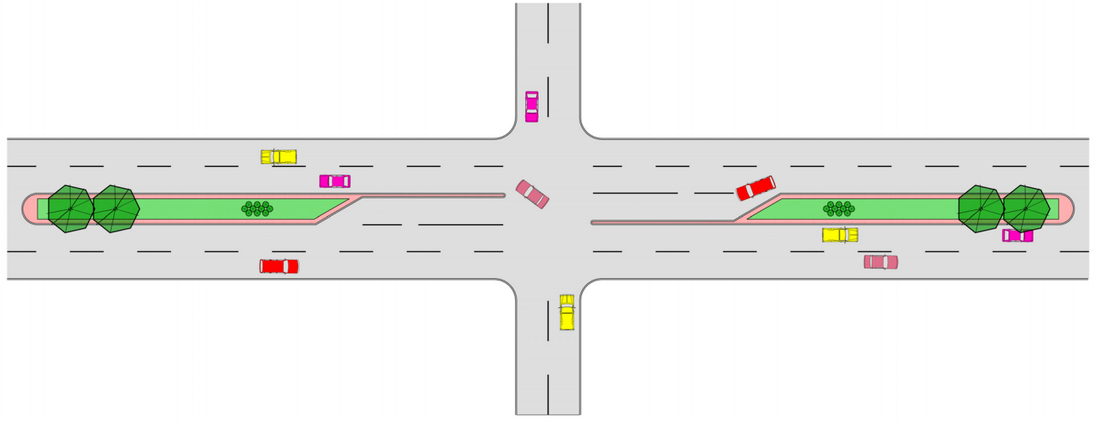


Exhibit 6.4-1: Medians Protect the Functional Intersection Area

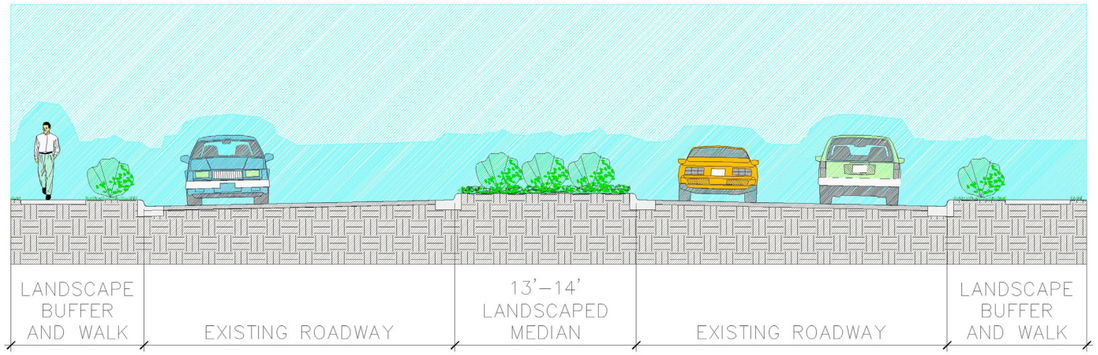


Exhibit 6.4-3: Proposed FM 518 Median

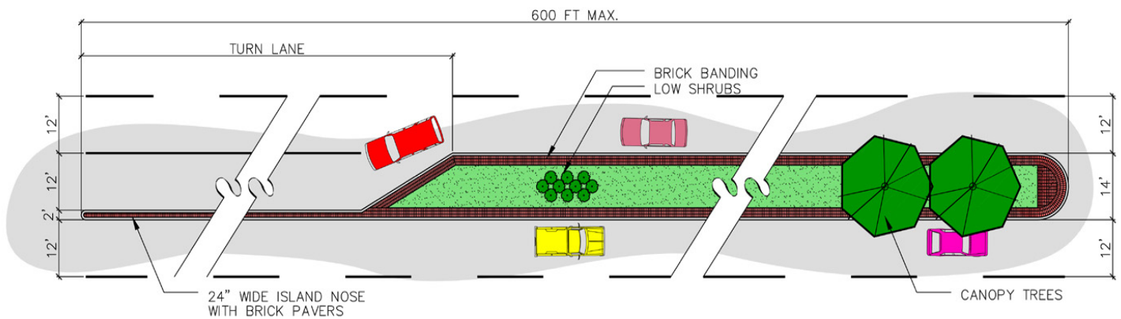


Exhibit 6.4-2: Proposed Median Plan

Below is a description of the methodology used to determine where the raised medians would be most effective.

Short-Term Raised Median Recommendations:
The study team identified areas where turning traffic, both at the street intersection and at commercial driveways located within the functional area of the intersection, were the major reasons for high crash rates. By analyzing the incidents of crashes surrounding each signalized and un-signalized intersection in the corridor the study team was able to prioritize the application of raised medians.

Characteristics of a potential short-term raised median recommendation include:

- Intersection with a high crash rate (>10)
- Adjacent land use has good alternative access ways (driveway on cross street)
- Adjacent land use has adequate internal circulation
- The addition of the raised median has limited safety benefits, but does contribute aesthetically to a gateway feature.

The short-term raised medians will be implemented in the next one to two years. The **Table 6.4-1** indicates the recommended median locations and **Appendix A** depicts these locations on maps.

Intersection #	Map #	Location	Adjacent Land Use		Total Crashes
			Alternative Access	Internal Circulation	
Pearland					
2	1	West of SH 288 Intersection to Silver Lake Drive	Aesthetic gateway feature		_
3,4	1,2	Silver Lake Village Drive / Wal-Mart	Yes	Yes	36
6	2	Miller Ranch CR 93	Yes	Yes	15
7	3	Southwick Road	Yes	Yes	13
9	5	Cullen Road to Old Chocolate Bayou	Yes	Yes	21
10	6	Manvel Road (FM 1128)	Yes	Yes	36
11	8	Harkey / Oday	Yes	Yes	25
11a	9	Hatfield	Yes	Yes	10
12	9	Woody / Corrigan	Yes	Yes	13
13	9	McLean / Halbert	Yes	Yes	16
14	10	Mykawa	Yes	Yes	11
26	16	Dixie Farm	Yes	Yes	17
Friendswood					
35	23	Parkwood FM 528	Yes	Yes	23
League City					
36	28	Brookdale/ Bay Area Boulevard	Partly	Yes	16
41 and 42	32	Royal — Hobbs / Lafayette to West of IH-45	Partly	Partly	44
43 and 43a	32	East of IH-45 to 400 feet East of Wesley	Partly	Partly	46
43a	33	Highland Drive	Yes	Yes	9
44	33	Devereux / Calder to Englewood	Yes	Yes	28
45	33	Interurban	Yes	Yes	23

Table 6.4-1: Short-Term Raised Median Improvements

Medium-Term Raised Median Recommendations:
The second round of raised median improvements are typically related to traffic operations and safety concerns at intersections. These intersections have a less severe safety problem than those in the short-term.

Characteristics of a potential medium-term raised median recommendation include:

- Intersection with a high crash rate (>5).
- Adjacent land use has alternative access ways (multiple driveways).
- Adjacent land use has opportunity to share access with another development.

Medium term raised median improvements will be implemented as funding becomes available. The **Table 6.4-2** indicates the potential locations and **Appendix A** depicts these locations on maps.

Intersection #	Map #	Location	Adjacent Land Use		Total Crashes
			Alternative Access	Internal Circulation	
Pearland					
10a	7	East of Roy Street	No	No	10
10b	7	Garden Road	No	No	10
14a	10	East of Pearland Drive to West of Texas Drive	No	No	26
16	10	Galveston	No	No	11
17	11	Old Alvin	Partly	Partly	14
18	12	Barry Rose	Partly	Partly	7
20	12	Westminster	Partly	Partly	13
21	13	Pearland Parkway	Yes	Yes	8
22	13,14	Liberty Drive	No	No	31
23	14	Yost / Shadycrest	Partly	Partly	14
24	15	Woodcreek	Yes	Yes	7
Friendswood					
43a	24 - 27	Lakeview to Eastern City Limit	Aesthetic Gateway Feature		-
League City					
-	27	Western City Limit	Aesthetic Gateway Feature		-
38	31	Landing Boulevard	Yes	Yes	5

Table 6.4-2: Medium-Term Raised Median Improvements

Long-Term Raised Median Recommendations:
The final set of improvements is limited to areas where development patterns restrict the application of a raised median, traffic operation, and safety levels are satisfactory and / or adjacent land is undeveloped. Therefore, the raised median recommendations are limited to use as a long-range planning tool. During retrofit and / or development of sites this plan should be referenced. Access points to developments should be determined based upon the location of median openings depicted on the maps in **Appendix A.** Most of these median openings in undeveloped areas are placed on shared property lines. In developed areas the median openings are based upon providing adequate stopping sight distances and generating shared access locations.

Characteristics of a potential phase three raised median location:

- Locations with little to no crash experience
- Adjacent land use has access only from FM 518
- Adjacent land use has shallow lot sizes, strip-centers, and / or no internal circulation

Driveway Improvements

As noted in **Chapter 5,** Improvement Options, driveway consolidation is an access management technique that can greatly improve the overall corridor safety and operations. Aerial graphics in **Appendix A** represents potential driveway consolidation candidates that the implementing agencies can consider for driveway consolidation. The timing and implementation of these consolidations can be paired with several of the improvement options presented in this chapter. For instance, if a right-turn lane is being considered at a particular location then an opportunity for driveway consolidation might be appropriate. Also, if a sidewalk addition is being considered there may be an opportunity to discuss driveway access and possible consolidation. In addition, as development or redevelopment occurs the location and design of all driveways should be re-evaluated. Finally, in areas where a raised median is limiting the left-turn maneuver from a private drive then some discussion about relocation or closing and encouraging shared or cross access might be appropriate.

Driveway consolidation recommendations:

- Pearland – 103
- Friendswood – 31
- League City – 23
- Kemah – 0
- Total – 157

When to consider consolidating:

- Addition of right-turn lane
- Redevelopment of property
- Sidewalk drainage and sewer projects

Other Safety Improvements

The ability of persons (vehicles, pedestrians, and bicyclist) to safely maneuver through intersections and other merging sections of FM 518 will be greatly improved by the modification of signage and lighting along the roadway.

Signage

Providing sufficient time to allow motorists to make appropriate turning movements when approaching cross streets can improve safety and reduce congestion. Street-name and number signs placed overhead, give drivers more time to make decisions about where to turn. This translates into a significant benefits in term of vehicle stops, traffic delay, and crash incidents. The following recommendations should be undertaken in the short-term:

1. The use of overhead-mounted street-name signs with street block information is recommended at all major intersections in the FM 518 corridor.

Exhibit 6.4-3: Overhead mounted street name sign

2. The MUTCD (1988) states that the lettering on street-name signs should be at least 100-millimeters (four-inches) high. To accommodate the elderly population along FM 518, a minimum letter height of 150-millimeters (six-inches) should be considered for use on post-mounted street-name signs.

3. The use of redundant street-name signing for major intersections is recommended, with an advance street-name sign placed before the intersection at a midblock location along with overhead-mounted street-name sign posted at the intersection. Wherever practical, the midblock sign should be mounted overhead.

Following these recommendations throughout the entire corridor across political jurisdictions, will provide for an orderly, predictable picture to the corridor's tourist, business people, and residents.

Lighting

One of the main purposes of lighting a roadway at night is to increase the visibility of the roadway and its immediate environment, thereby permitting the driver to maneuver more safely and efficiently. The link between reduced visibility and highway safety, though it may be difficult to quantify in a cost-benefit analysis, is conceptually straightforward. Lighting allows drivers to make better decisions and reduces crashes overall. Pedestrians and bicyclists will also benefit by the uniform addition of lighting in the corridor.

Wherever feasible, fixed lighting installations are recommended (a) where the potential for wrong-way movements is indicated through accident experience or engineering judgment; (b) where pedestrian volumes are high; or (c) where shifting lane alignment, turn-only lane assignment, or a pavement-width transition forces a path-following adjustment at or near the intersection.

Landscape, commercial signage, and general aesthetics

In conjunction with access management improvements such as consolidating driveways, installing raised medians, or adding auxiliary lanes, many aesthetic treatments are possible. These include:

- landscaping the raised median
- adding pavement textures and designs to parking areas
- adding well designed retaining walls where needed to prevent erosion
- planting street trees and other vegetation outside the clear zone
- removing signs from the clear zone and otherwise modifying commercial signs to make them less obtrusive
- adding uniform, well designed street lights and other hardware
- placing utility lines underground to eliminate them from view and reduce the need for utility poles

Such aesthetic treatments can, when combined with access management, create a much more attractive roadway corridor that is also highly functional and safer. See top picture for an example of a roadway that has not been well managed. When access management is applied, aesthetic considerations are improved.

Before signage and aesthetic improvements

After signage and aesthetic improvements

6.5 Improvement Performance

Goals and Objectives

As stated in **Chapter 3,** the corridor goals and objectives were used to determine to overall corridor need and provide focus to the team. The goals of: improve safety, identify short-term transportation solutions, improve traffic flow, reduce motorist delay, and assess long-term corridor needs provide the guiding principles for our evaluation criteria. Please refer to **Chapter 3** for the methodology on the calculation for each performance measure.

Improve Safety

The goal of improving safety along the corridor can best be measured in terms of the number of conflict points and driveway way density ratio. **Table 6.5-1** illustrates how the addition of raised medians and driveway consolidations can positively influence safety.

	Cities	Pearland										Friendswood						League City												Kemah	
	Selected Signalized Crossroads	SH 288 West Side	to	FM 865 (Cullen)	to	Harkey / Oday	to	SH 35 / Main	to	Pearland Parkway	to	Sunset Meadows / Winding	to	Shadow Bend	to	FM 528 / Parkwood	to	League City (West City Limit)	to	Landing Boulevard	to	IH-45	to	SH 3	to	FM 270 / FM 2094	to	Meadow Parkway	to	Lawrence Road	to	SH 146
Access	Distance		2.3		2.2		1.8		1.5		2.9		1.2		1.8		2.0		2.6		0.8		1.2		1.5		1.4		1.3		1.1	
	Existing Driveways		37		81		104		97		119		59		83		28		53		46		72		89		32		20		26	
	Proposed Driveways		37		67		85		59		87		43		68		28		50		39		62		86		32		20		26	
	Driveways Eliminated		0		14		19		38		32		16		15		0		3		7		10		3		0		0		0	
	Existing Driveways per Mile		16		37		59		65		41		48		45		14		21		59		62		60		23		15		24	
	Proposed Driveways per Mile		16		31		48		39		30		35		37		14		20		50		53		58		23		15		24	
	Driveway Density Ratio		0.53		1.24		1.96		2.16		1.38		1.60		1.50		0.47		0.69		1.97		2.07		1.99		0.77		0.51		0.79	
	Proposed Driveway Density Ratio		0.53		1.03		1.60		1.31		1.01		1.17		1.23		0.47		0.65		1.67		1.78		1.92		0.77		0.51		0.79	
	Existing Conflict Points		896		1,342		1,696		1,536		1,936		442		894		496		880		736		1,184		1,456		496		304		416	
	Proposed Conflict Points		228		292		440		200		416		340		682		314		384		190		226		666		244		178		136	
	Crashes Over Three Years		84		129		141		101		102		42		64		19		33		69		139		173		76		31		18	
	Proposed Conflict Point Crash Reduction		21		28		37		13		22		32		49		12		14		18		27		79		37		18		6	

Table 6.5-1: Safety Improvements

Exhibit 6.5-1 represents the existing conflict points throughout the corridor along with the crash data. As you will see there is a direct correlation between the conflict points and crash data. Also, included is the conflict points based on the recommended median improvements. You will notice how much reduction there is for potential conflicts and therefore the crash expectancy will be greatly reduced. Also, notice that there are a few conflict areas that are on the lower end of the curves these represent several different conditions. For instance, in the west end of Pearland the City has been doing a good job of controlling driveway access and therefore the conflicts are lower. Also, in Friendswood where a raised median exists the potential for conflicts is much lower. Finally, in the eastern edge of League City and into Kemah this area is largely undeveloped and driveway density is low. This is planned for a four-lane highway with a raised median and will thereby result in a lower conflict potential.

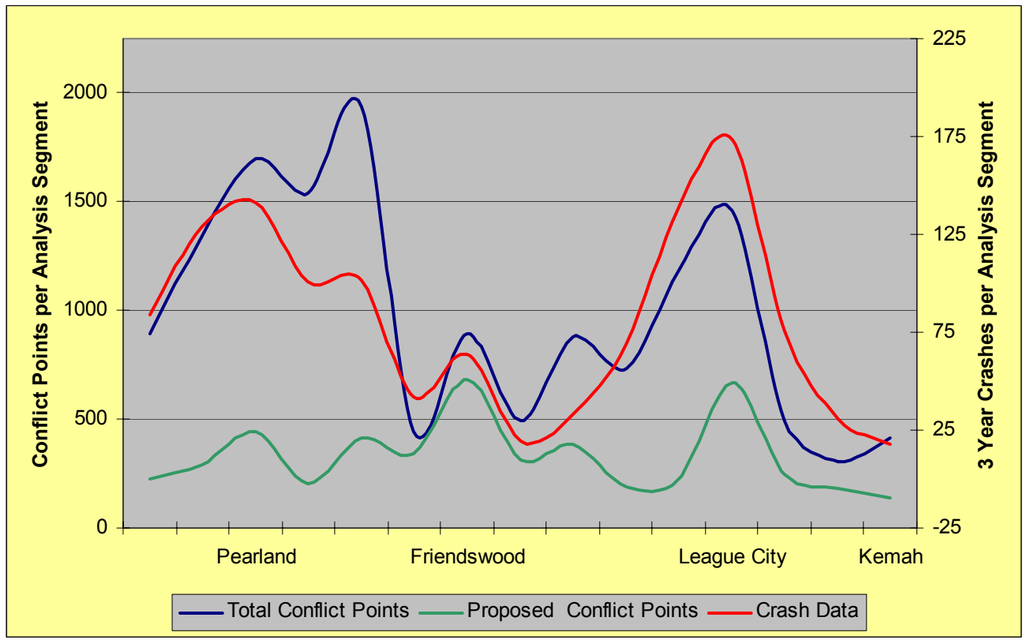


Exhibit 6.5-1: Conflict points and crashes

Identify Short-Term Transportation Improvements

The previous section outlines all the short-term transportation solutions for the corridor both in terms of safety and operations.

Improve Traffic Flow and Reduce Delay

The operational improvements outlined above will translate into improved traffic flow and reduced motorist delay. The improvements can be measured in terms of the entire corridor and by intersection. **Table 6.5-2** represents the improved mobility that will be achieved once the recommended improvements are in place. It shows each intersection's LOS for three different scenarios: existing, future City and TxDOT improvements and the proposed improvements in place.

Level of Service Center							
Intersection		2004 Existing		With City and TxDOT		Proposed	
ID	Name						
Pearland							
1	SH 288 West Side	D	D	C	D	C	C
2	SH 288 East Side	C	B	B	A	B	A
3	Silverlake Village	A	B	A	A	A	A
4	Wal-Mart	C	D			C	C
5	CR 94 / Home Depot	D	D	B	C	B	C
6	CR 93 / Miller Ranch	B	B			B	A
7	CR 90 / Southwyck	C	B			B	B
8	FM 865 / Cullen	B	B	C	C	C	C
9	CR 89 / Kroger	D	E	A	B	A	B
10	FM 1128	D	D			C	C
11	Harkey / Oday	C	C			C	B
12	Woody / Corrigan	A	A			A	A
13	Halbert / McLean	D	F	B	C	B	C
14	Mykawa	B	A			B	A
15	SH 35 / Main	E	E			D	D
16	Galveston	A	A			A	A
17	Old Alvin	B	C			A	B
18	Walnut / Berry Rose	D	F	D	F	C	D
19	Sherwood	A	A			A	B
20	Westminster	B	C			A	B
21	Pearland Parkway	B	C	B	C	B	B
22	Liberty	D	D	D	C	B	C
23	Yost	B	A	B	A	A	B
24	Woodcreek	A	B			A	A
25	Wal-Mart at Dixie	A	B			A	A
26	Dixie Farm	F	F	E	F	C	D
27	Sunset Meadows / Winding	B	B			B	B
Friendswood							
28	FM 2351 / Edgewood	E	E			D	D
29	Shadow Bend	B	B			A	A
30	Spreading Oaks	A	B			A	A
31	Clearview	A	A			A	A
32	Castlewood	A	B			A	A
33	Whispering Pines	C	D			A	A
34	Winding Way	B	B			A	A
35	FM 528 / Parkwood	D	D			C	C

Table 6.5-2: Intersection Improvements

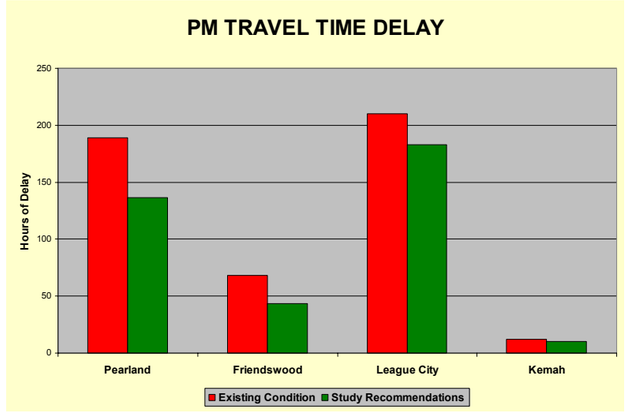
Level of Service Center							
League City							
36	Bay Area Boulevard	C	C			C	C
37	Spring Landing / Palomino	B	B			B	B
38	Landing Boulevard	A	A			A	A
39	Williamsport	A	A			A	A
40	Newport	A	A			A	A
41	Hobbs / Lafayette	D	C			B	C
42	IH-45 West Side	D	E			B	C
43	IH-45 East Side	B	B			B	C
44	Calder / Devereux	A	C			A	B
45	Interurban	B	C			A	C
46	SH 3	E	F			D	E
47	Houston	A	A			A	A
48	Park	A	A			A	A
49	Iowa	A	A			A	A
50	Texas	A	A			C	B
51	FM 270	E	E			D	E
52	FM 2094	D	D	E	D	D	C
53	Clear Creek High School	C	B	A	A	A	A
54	Meadow Parkway	B	B	B	A	B	A
55	South Shore	B	C	A	B	B	B
56	FM 1266 / Columbia	B	B	B	B	B	A
57	Lawrence Road	A	A			A	A
58	Kemah Oaks	A	A			A	A
59	SH 146	B	B			B	B

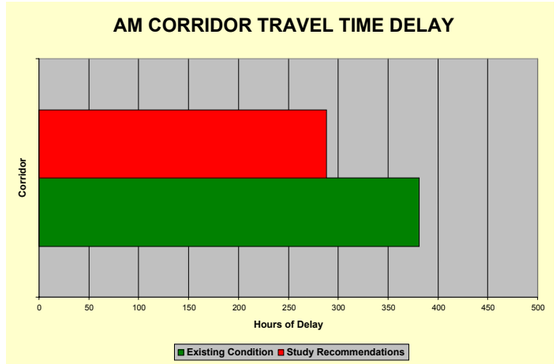
Table 6.5-2: Intersection Improvements, cont.

System Delay

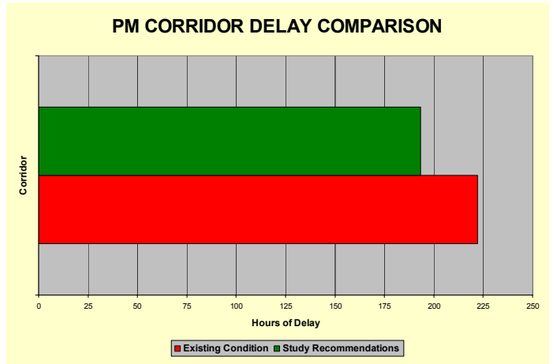
The following graphs represent the system delay by City and for the entire corridor. System delay is measured by the difference between the free flow condition on a roadway and the congested condition. The access management improvements detailed in this report translate into an overall corridor reduction in delay by 30-hours in the PM peak travel time and 100-hours in the AM peak travel time.

Travel time delay benefits are a reflection of the operational improvements made at 29 of 58 intersections in the corridor.



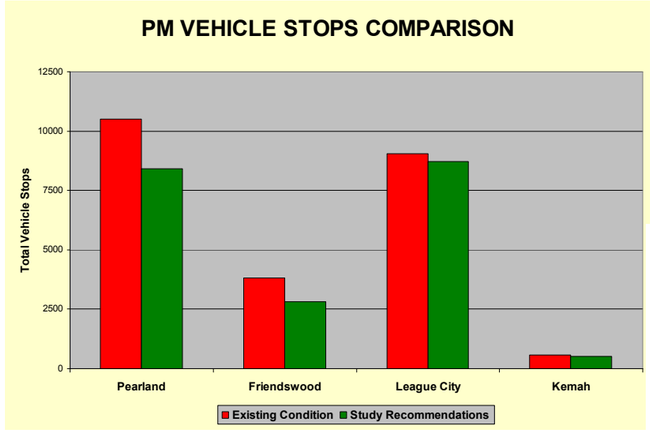


Travel time delay is reduced by 100-hours in the AM peak.

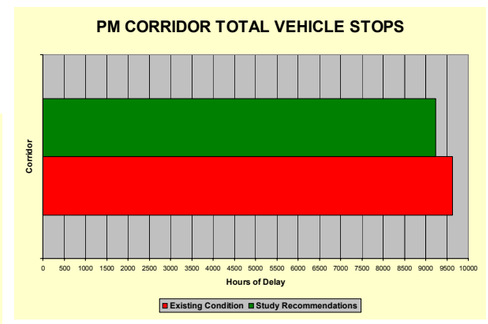


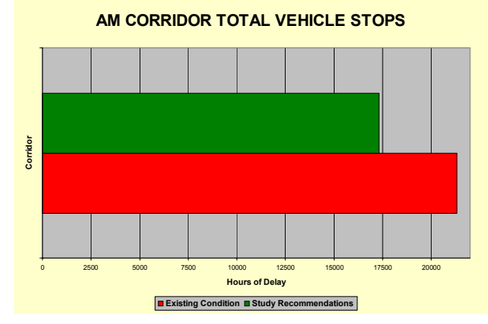
Travel time delay is reduced by 30-hours in the PM peak.

Vehicle stops will be reduced by 20% during the AM peak and 5% in the PM peak.



Vehicle stops are an indicator of traffic flow in the corridor.





Air Quality Results

The access management treatments proposed for the FM 518 corridor will have a direct benefit to the regions air quality. The benefits will come in the form of reduced criteria pollutants (NOx, VOCs, and CO), which are a direct result of improvements in vehicle travel time delay, speeds, and reduction of vehicle stops. Simply, access management reduces unnecessary vehicle idling and allows vehicles to drive at optimal speeds.

The air quality benefits of this project also broaden the potential funding mechanisms. The measures taken to improve traffic flow and reduce delay in the corridor are eligible for Congestion Mitigation and Air Quality (CMAQ) funding. H-GAC prioritizes these projects based upon daily emission reduction estimates.

Air Quality Benefits

Pollutant % Reduced

NOx = 37%

VOC = 34%

CO = 36%

6.6 Transit Improvements

Transit serves a very limited sector of the transportation market in the FM 518 corridor and short-term demographic trends do not indicate any major shifts in modal choice by the population. Nevertheless, there are things that can be done in the short-term to serve the transit market and improve mobility throughout the corridor. The following recommendations build upon the initiatives defined in the Harris County Metropolitan Transit Authority's METRO Solutions Plan, H-GAC's TDM, the Corridor guidebook, and the Regional Transportation Plan.

Bus Service

As stated in **Chapter 4.2,** transit demand in the corridor is very low. This is a function of automobile ownership, urban design, and population and employment density. The current incapability of fixed route transit was demonstrated with the stoppage of Connect Transit's fixed route service in Brazoria County, which operated Monday through Friday for 13-hours each day. The service was provided for nine months operating from the northern end to the southern end of Brazoria County (from Freeport to Pearland). While the service was well received and ridership was steady, it did not appear the number of riders justified the cost of operating the service. The combination of limited funding sources and moderate patronage growth resulted in the cancellation of the fixed route service.
A strong local ridership base currently continues to be an issue in justifying the development of fixed route service along the FM 518 corridor. Therefore, the study team recommends to strengthening the curb-to-curb service by making more busses available for the Connect Transit System and pursuing TDM measures along the FM 518 corridor.

TDM Support Strategies

The METRO Solutions Plan and Regional Transportation Plan calls for major investments in the IH-45 and SH 288 corridors over the next 10 to 25 years. Enhanced travel choices may occur in the form of new general purpose lanes, managed lanes, HOV lanes, or high capacity rail transit in these corridors. The study team looked at ways to provide enhanced travel choices for trip patterns not well served by these major investments.

TDM strategies can augment the major north-south investment with access management strategies to improve traffic flow and TDM programs to provide enhanced travel choices for east-west trips. TDM can also serve as a basis for building a transit market. A number of TDM related programs are already active in the corridor.

Vanpooling and Carpooling

Attracting passengers is the principle concern for vanpools. Convincing employees to leave their cars at home, even a few days a week, means providing an alternative that is reasonably comfortable and convenient. Perhaps most important, is developing an alternative that is also cheaper than driving. Vanpools offer a uniquely cost-effective alternative by carrying six or more people. Dividing commute costs between six people can result in significant savings. The key ingredient, of course, is ensuring the sufficient number of vanpool participants.

Partnerships enable successful vanpool programs. Forging partnerships between local employers, public agencies, and non-profit groups to market vanpool programs and creating public-private partnerships to facilitate ridematching and promotional efforts are both important components in developing a base of vanpool users.

Currently there 18-vanpools, coordinated through the Metropolitan Transit Authority of Harris County vanpool program, these are detailed in **Chapter 4.2.** Vanpools are an attractive alternative to transit. Vanpooling provides the convenience of door-to-door service and the cost-savings associated with splitting commute costs.

Vanpooling strategies in the FM 518 corridor are two-prong:

1. Vanpooling should be used for attracting new and retaining existing businesses in the corridor. Employers can expand their labor market by coordinating vanpools for workers living in nearby towns.
   - During negotiations with potential businesses along the corridor, consider reducing impact fees for companies that offer commuter benefits to their employees. Companies that offer transportation allowances in the form of transit passes, vanpool subsidies, flexible work hours, and teleworking have a higher rate of ridesharing, thus a lower impact on the surrounding transportation network.
   - METRO and H-GAC offer a $50 rider incentive and free guaranteed ride home for all vanpoolers in the eight-county area. This offer, or augment these benefits as part of an incentive package to attract new companies to the corridor.
   - Consider establishing a corridor wide guaranteed ride home program that is available to all carpoolers and pedestrians / bicyclists.
   - Host a ridesharing fair for area businesses to learn about the benefits of vanpooling and carpooling. METRO conducts these for the entire region, scheduling may be done by calling 1-888-606-RIDE.
   - TDM friendly site design (see site design and facility improvements).
2. A home based vanpooling effort can be facilitated during the subdivision process and through existing neighborhood groups.
   - Host a ridesharing fair for area neighborhood groups to learn about the benefits of carpooling and vanpooling. METRO conducts these for the entire region, scheduling may be done by calling 1-888-606-RIDE.
   - TDM friendly site design (see site design and facility improvements).

Park & Ride and Park & Pool Lots

A major constraint to the public's use of Park & Pool and Park & Ride lots in the corridor is the shear time it takes to get to the lots from residential areas. Implementation of the access management strategies in this plan should make the travel times to these lots more manageable, therefore making carpooling and vanpooling a better option. The study team recommends investigating the possibility of forming agreements with underutilized parking lots in the communities to be used as Park & Pool lots.

Site Design and Facility Improvements

A variety of facility improvements can be pursued in the area to support the use of TDM. The study team recommends the following considerations in all new developments:

Building Orientation

- Cluster buildings and avoid campus-type office development which discourages pedestrian and bicycles travel.
- Provide front door access by transit and pedestrians.

Passenger Loading Areas

- Offer a turn-out lane for passenger drop off in front of the building. Be sure to provide adequate space for cars so as to avoid a "lineup" that could block traffic during peak commute hours.
- Provide passenger shelters.

Transit Access and Visibility

- Establish during the plating of new developments where transit access will be granted and orient building entrance toward public transportation facilities.

Amount and Location of Parking

- Explore opportunities for shared parking with neighboring facilities. Large ample parking areas can be an inefficient use of land.
- Parking lots should be screened from adjacent sidewalks and streets by a wall, hedge, or berm. The recommended height for a wall is 30- to 36-inches.
- Consider charging for parking. Where appropriate, paid parking can cut the number of people driving alone by up to 20%.

Garage Height Clearance for Van Vehicles

- Adjust parking structure ceiling heights to allow for vanpool access. The minimum ceiling height for vans is eight-feet two-inches.

Access to Services and Amenities

- For large facilities, create a "village" atmosphere where employees don't have to take their cars out during the day. Some amenities include:
  - Restaurants
  - Convenience Stores
  - Banks or ATMs
  - Child Care Facilities
  - Post Offices or Vending Machine
  - Health Clubs
  - Cappuccino / Coffee Bars
  - Dry Cleaners
  - Bookstores
  - Shoe Repair Shops
  - News and Magazine Stands
- For smaller facilities, provide pedestrian linkages to nearby amenities.

Transportation Information Board or Kiosk

- Provide transportation information on a bulletin board, display rack, or kiosk. Include local bus and rail maps and schedules, carpool matching information, available vanpools to the area, and regional bike routes.
- Place the information in a high-traffic area such as a building lobby or cafeteria.
- For large facilities, consider a transportation office or commuter store that could provide direct assistance to commuters. The center could be incorporated into the building management office or be staffed by a transportation management officer (TMO).

Subdivision Design

- Designate secure areas where residents may Park & Pool. Providing a transportation information board and information about regional TDM programs will aid in the formation of carpools and vanpools.

Parking Management

Parking management includes three strategies: preferential parking, parking pricing, and the transportation allowance.

Preferential Parking

Preferential parking is a means of offering employees that carpool or vanpool a qualitative advantage over those that drive alone. This strategy is one of the most common incentives offered by employers. What makes the preferential arrangement desirable depends upon employees' interests. Typically, this is done by reserving the spaces closest to the door for ridesharers, however, it can be any space or arrangement that the employee chooses as "preferred." Some employers will set aside 10% of all spaces for preferential use and restripe the spaces. Others prefer to make the spaces available as demand increases.

One challenge in administering a preferential parking program is policing the use of the space. Many employers will require employees to register for the preferential spaces and be issued a hang tag. The tag is usually updated every three or six-months. If a vehicle without a tag is parked in a preferential space, the vehicle is ticketed.

Parking Pricing

Charging for parking is a powerful tool in changing travel behavior. The higher the price, the less likely a person will be to use or purchase the space. However, employees often strongly resist any attempt to charge for parking and employers rarely want to risk damaging employee morale by dealing with the parking issue. Many employees feel that free parking at the work place is a right and that any attempt to change that is tantamount to violating the constitution. Pricing may be especially difficult in some corridor given the moderate densities of development and lack of parking controls.

Transportation Allowance

The concept of the transportation allowance has received increasing attention with employers, employees, city planners and regulators as a means of balancing the costs of different travel options and promoting individual choice.

The idea is that when we are allowed to choose how a subsidy is spent in helping us get to work, we may choose something other than a parking space and driving to work alone.

An allowance is not a new concept. It usually takes the form of a regular provision of money, food or other support provided by an organization or employer. When applied to transportation, it is a tool offered by the employer to assist their employees in commuting to work. All employees receive the same dollar amount each month for use in offsetting commute travel expenses including bus passes, vanpool fees, parking passes (the employer must charge for parking) or other expenses associated with carpooling, bicycling, and walking to work. Any surplus can be pocketed. In essence, the transportation allowance is the cafeteria approach to commute travel.

Funding Opportunities

In reviewing the transit improvement needs of the FM 518 corridor, a critical concern is obtaining the appropriate funding to initiate and operate transit services in the community. Currently, the Gulf Coast Center is the recipient of the 5311 Federal / State Grant funds for the non-urbanized areas along FM 518. Lack of funding has been cited as a principal reason for the inability to expand and diversify transit services in the corridor. The following is an overview of the financial resources potentially available to fund transit operating and capital improvements. Included are federal funding programs, as well as potential state funding sources.

Federal Funding Sources

Federal funding for public transportation comes through the U.S. Department of Transportation (USDOT). USDOT programs and funding for public transportation were established under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, which established authorizing levels and programs for transit and highways projects and institutionalized the ability to shift funds from one program to another depending on local priorities. The ISTEA expired in 1997 and was replaced by the TEA-21. TEA-21, which was effective from 1998 to 2003, generally maintained the previously established programs and raised the overall level of funding. TEA-21 provided funding for USDOT and its subsidiary agencies, including the Federal Transit Administration (FTA). The third iteration of the surface transportation program, known as SAFETEA, is currently undergoing reauthorization. TEA-21 has been extended into 2004 until this reauthorization occurs.

Section 5307 Funds

With the expected growth of the Pearland, Friendswood, and League City, the population in each of these communities will soon exceed 50,000 and therefore different funding sources will become available to the area. The Federal Section 5307 formula program is allocated to urbanized areas over 50,000 in population, according to a tiered formula based on size. FTA has traditionally only awarded grants to one recipient per urbanized area, leaving that recipient to then pass funds through to other qualified users. The program is structured to provide total flexibility to end-users regarding use of the funds for operations and capital facilities, except for urbanized areas over 200,000 in population which cannot use funds for operating assistance. A 50% local match for operating assistance and a 20% local match for capital facility assistance is required.

Section 5309 Funds

Section 5309 is the primary federal funding program for capital investment in new transit facilities and equipment. Unlike other FTA funding categories that allocate money on a formula basis, Section 5309 funds are awarded on a discretionary basis for a particular project. In practice, all Section 5309 funds are allocated to projects through earmarks in annual federal appropriations legislation. The eligible federal share is 80%, but FTA encourages applicants to develop a non-federal match to secure Section 5309 funds.

Section 5309 funds are authorized based on the results of alternatives analysis and preliminary engineering that justify the project based on a variety of criteria. Funds are allocated by statute as follows:

- New rail starts and extensions (40%)
- Rail modernization (40%)
- Bus capital projects (20%)

Section 5311 Funds

The non-urbanized area funding program provides transit capital and operating assistance through the states to rural areas (less than 50,000 in population). FTA provides states with an annual appropriation to fund the maintenance, development, improvement, and use of public transportation systems in rural and small urban areas.

Section 5310 Funds

Currently, a number of residents in the FM 518 corridor are elderly or infirmed and have a need for special transportation services. The Gulf Coast Center provides special services for the disabled members of the community. There is a special needs funding program that provides transit capital assistance to the states for allocation to organizations or governmental authorities that offer specialized transportation services to elderly persons and to persons with disabilities. This program allows for the transfer of funds to the non-urbanized area program (Section 5311 Funds), provided that the funds are used for the purpose authorized. A shuttle service for the elderly and disabled to major area destinations such as clinics, medical services, and shopping centers would be a candidate for these funds.

Surface Transportation Program (STP) Flexible Funding

Federal Highway Administration (FHWA) STP funds are flexible funds that may be used by states and localities for transit and highway projects. Under TEA-21, FHWA funds provides a substantial new source of funds for transit projects.

Congestion Mitigation and Air Quality (CMAQ) Funds

CMAQ provides federal transportation funds to support state and local projects that reduce transportation related air pollution. TEA-21 provided for as much as $8.1 billion for the CMAQ program from 1998 through 2003. CMAQ projects are selected for implementation from the approved regional transportation improvement plan (TIP) and are submitted to FTA or FHWA, as appropriate, for final approval and authorization to proceed. The types of projects eligible for CMAQ funds include:

- Travel Demand Management Strategies
- Transit Improvements
- Shared Ride Services
- Traffic Flow Improvements
- Pedestrian and Bicycle Programs

The start-up of new transit services (e.g., new express bus routes or new shuttle service linking major activity centers) is supported under the CMAQ program in an effort to tap new markets for transit. While CMAQ cannot be a permanent source of funding for transit service, the goal is to encourage experimentation to determine what new types of services are viable.

State Funding Sources

- Legislation enacted by the Texas Legislature during the most recent session enhanced the ability of local officials to establish Regional Mobility Authorities (RMA) and to use surplus RMA revenues on

transportation projects in the geographic area of the RMA. Counties within the Houston-Galveston region should consider the possible benefits to transit if considering establishment of a RMA.

- The Texas Legislature has proposed amending the state constitution to enable local governments to levy a Local Option Transportation Tax (LOTT). With voter approval, a LOTT could be collected and used to fund transportation projects, which would include transit. This revenue option could be evaluated based on regional needs. Information regarding the costs and benefits of a LOTT to the region will be required by the state legislators before the tax can be levied.

6.7 Pedestrian and Bicycle Improvements

Almost all the access management improvements (medians, driveways, signals, safety, and operational) positively impact pedestrian and bicycle travel. Too frequent driveways, lack of medians, and poor intersection controls increase safety hazards and decrease mobility to pedestrians and bicyclists in the same way they do for automobiles. In general, pedestrians and bicyclists need to be well protected when they cross major streets and have space reserved for their use in the ROW. The following strategies should be used to promote pedestrian and bicycle travel along the FM 518 corridor:

- Driveway spacing. The minimum connection spacing listed in **Exhibit 5.4-3** will reduce conflicts and hazards for pedestrians and bicyclists.
- Sidewalk location. Requiring that all sidewalks be located along private property lines or one foot from the ROW line and placing sidewalks at the maximum practical distance from the curb provides pedestrians with safety from street traffic and protection from being splashed by passing vehicles.
- Crosswalk location. Locating crosswalks on the side of the intersection that has the best site clearance for drivers will drastically reduce conflicts.
- Medians. Medians offer areas of safe refuge to pedestrians. Pedestrian crash rates are lower on roads with raised medians than on undivided highways or those with continuous TWLTLs. Medians also reduce delay which is a major disincentive to walking.
- Right-turn lanes. Right-turn lanes reduce conflicts and confusion for the pedestrian and bicyclist. Right-turn lanes provide a dedicated space for vehicles to decelerate and turn using a defined turn radius. This allows for narrower crossings for pedestrians and a more defined intersection for bicyclist. Bike lanes should be aligned on the left side of a right-turn lane.
- Signal timing. Associating the pedestrian movement with the highest volume traffic movement will provide a longer interval for pedestrians to cross the roadway.

Improvements

The study team identified seven intersections in the FM 518 corridor that represent a serious hazard to pedestrian travel. Section three of this chapter details the hazards of split-phased signals that have a pedestrian movement associated with them. These signal phases occur quite frequently throughout the FM 518 corridor and in some cases have created hazardous pedestrian situations. **Table 6.7-1** outlines these seven locations, but more detailed information can be found in **Chapter 6.3.**

Intersection	Issue	Mitigation Measure
Pearland		
3 – Silver Lake Drive	Split-phased north south pedestrian movements	Re-stripe lanes will allow concurrent north-south pedestrian movement
4 – Wal-Mart Driveway	Split-phased north-south pedestrian movements	Re-stripe lanes will allow concurrent north-south pedestrian movement
5 – CR 94A / Home Depot	Split-phasing is causing long delays for pedestrian movements	New lanes and re-striping of lanes will eliminate split-phasing and decrease pedestrian wait time
18 – Walnut / Barry Rose	Unusual intersection geometry makes pedestrian crossing movements hazardous	Prohibit pedestrian movement on the east side of the intersection and associate new crossing with Barry Rose phase
19 – Sherwood	Offset T-intersection and split-phasing present barriers to safe pedestrian north-south crossings	Prohibit pedestrian crossings on the west side of the intersection and instruct to cross on east side
League City		
41 – Hobbs / Lafayette	High traffic volume and split-phasing creates a hazardous pedestrian environment	Retain split-phasing, but restrict pedestrian crossings on the east side.
45 – Interurban	Pedestrian movement is associated with the very low volume southbound movement.	Associate pedestrian signal interval with higher volume northbound movement.

Table 6.7-1: Short-Term Pedestrian / Bicycle Improvements

In the medium-term, the highest priority for sidewalks and bike facilities along FM 518 should be given to locations that are in the vicinity of schools, parks, public buildings, and other areas with high concentrations of pedestrians and bicyclists. Sections of FM 518 present a clear danger to children walking and bicycling to school. **Appendix D** contains a map of schools that are within walking distance of the FM 518 corridor. **Table 6.7-2** details the needed improvements to make some of the most critical sections of the roadway more pedestrian and bicycle friendly.

City	Corridor Segments	Improvement
Pearland	Hatfield to McLean south side of FM 518 with crosswalk at Anthony (midblock)	8-foot Multi-use trail
Pearland	Anthony to Woody north side of FM 518	5-foot Sidewalk
League City	Landing Boulevard to IH-45 Frontage Road	8-foot Multi-use trail
League City	FM 2094 / FM 270 to SH 146	12-14-foot Multi-use trail

Table 6.7-2: Medium-Term Bicycle / Pedestrian Improvements

Funding Opportunities

Prior to the 1990s only a few million dollars a year of federal funds were being invested in pedestrian or bicycle facilities. While the energy crisis of the early 1970s had spawned new interest and some modest government

initiatives to make improvements for bicycling, very little money from the government at any level was invested in pedestrian and bicycle facilities. Likewise, the outdoor recreation industry and business community in general provided very little funding for facilities, planning, programs, or organizational development. Throughout the late 1970s and 1980s the largest amounts of funds for bicycling and walking were invested by state and local parks agencies building multi-use trails, however even these levels of investment were very small compared to what is happening today.

Transportation Enhancements (TE) activities are federally funded community-based projects that expand travel choices and enhance the transportation experience by improving the cultural, historic, aesthetic, and environmental aspects of our transportation infrastructure. Pedestrian and bicycle facilities, such as new or reconstructed sidewalks, walkways, or curb ramps; bike lane striping, wide paved shoulders, bike parking, and bus racks; off-road trails; bike and pedestrian bridges and underpasses are eligible under the program. In January and February 2002, the Texas Transportation Commission selected 217 projects with an amount exceeding $155 million. The next call for projects will occur after the reauthorization of the federal transportation bill. To obtain additional information regarding the Transportation Enhancement Program, please contact the TxDOT District Enhancement Coordinators in the Houston District.

The Texas Legislature passed the “Matthew Brown Act” into law in 2001. The Act includes the Safe Routes to School Program, which is designed to create safe ways for children to reach school. The program adds new crosswalks, trails, and bike lanes to the existing infrastructure as well as promotes traffic calming measures. The FM 518 corridor is uniquely qualified for these funds. Projects located on the State system forgo the 20% match normally required for projects. Project proposal applications can be submitted by any political subdivision. If the Pearland, Friendswood, or Clear Creek ISDs are interested in sponsoring a project they should contact their city or county offices to develop a project proposal. The proposal must be submitted to the District Engineer in the Houston TxDOT District Office.

The following guidelines determine what projects can be submitted:

- Projects may be located on or off the state highway system, but must be located on public property.
- Projects must be located within a two mile radius of a school.
- Federal funds requested will be limited to $500,000.
- Projects can cover multiple school sites if similar work is performed at each site.
- Local project funding match of 20% is required unless the project is located on the state highway system in which case TxDOT will provide the match.
- A project on the state highway system will not be eligible if the district finds that the project interferes or disrupts any planned improvements or existing infrastructure.

In considering project proposals under this section TxDOT shall consider:

- The demonstrated need of the applicant.
- The potential of the proposal to reduce child injuries and fatalities.
- The potential of the proposal to encourage walking and bicycling among students.
- Identification of safety hazards.
- Identification of current and potential walking and bicycling routes to school.
- Support for the projects proposed by local school-based associations, traffic engineers, elected officials, law enforcement agencies, and school officials.

Chapter 7
Future Corridor Needs / Improvements

7.1 INTRODUCTION

The population surrounding FM 518 will increase from 135,000 in 2003 to well over 325,000 in 2025. For FM 518 to remain a vital residential and commercial corridor it must be properly planned for and maintained. **Exhibit 7.1-1** introduces how the roles that municipal plans and codes may apply to access management strategies. This chapter contains recommendations on how the comprehensive plans, thoroughfare plans, and ultimately the local municipal codes of the four cities can direct future growth in a manner that supports access management strategies.

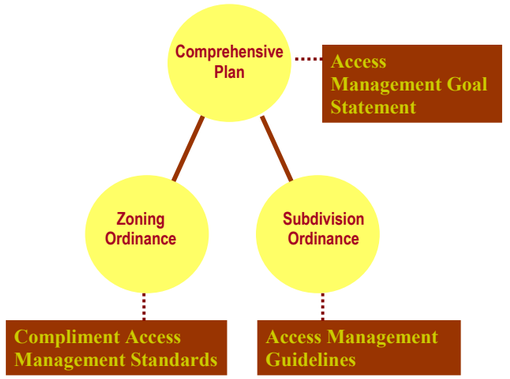


Exhibit 7.1-1: Access Management in Municipal Policy

7.2 POLICY RECOMMENDATIONS

There are many ways in which planning documents and municipal codes can address access management issues and set the stage for an effective corridor access management program. Two of the most widely accepted methods are to reference the corridor access management plan or make broad policy statements concerning access management in their comprehensive plans, thoroughfare plans, and local municipal codes. Both options are explained in further detail in the following sections.

Authority

Responsibilities granted by Chapter 213.001 of the Texas Municipal Code are for the purpose of promoting sound development of municipalities and promoting public health, safety, and welfare. Local Comprehensive Plans are the policy and decision making guide for future development and capital improvements in the municipality. It is also the correct document to identify the desired access management approach.

Municipalities also have the authority to practice access management through the rules and definitions of the State of Texas Local Government Code Chapter 212 “Municipal Regulation of Subdivision and Property Development.” There in, the Cities of Pearland, Friendswood, League City, and Kemah may adopt the FM518 Corridor Access Management Plan as a part of the existing subdivision and zoning regulations or tailor sections of the ordinances to advance access management strategies.

Comprehensive Plan

The FM 518 Corridor Access Management Plan seeks to improve safety, traffic flow, and reduce motorist delay through the cities of Pearland, Friendswood, and League City. Therefore, the plan contributes to the public health, safety, and welfare of the communities.

The cities may validate this plan or demonstrate an overall public commitment to managing access by:

Reference this plan as a policy statement in the comprehensive plan:
The FM 518 corridor within the City limits of Pearland, Friendswood, League City, and Kemah is to be planned, designed, and managed in accordance with the FM 518 Corridor Access Management Plan.

Including policy statements in the transportation and land use element of the comprehensive plan:

Transportation Element

- A nontraversable, landscaped median will be provided on all new multi-lane major arterials. Undivided roadways and roadways with a continuous TWLTL will be considered for reconstruction when the volume exceeds 20,000 VPD.
- Consider median barrier techniques for all unsignalized median openings.
- The Thoroughfare Plan should designate public ROW to mitigate impacts to the functional integrity of FM 518 and other major arterials.
- New driveway connections should not be located within the functional distance of an intersection.

Land Use Element

- Access to land development along FM 518 shall be preserved through the use of parallel roads, side streets, and cross access easements connecting adjacent developments.
- Properties under the same ownership, consolidated for development, or part of phased development plans shall be considered one property for the purposes of access management. Access points to such developments shall be the minimum necessary to provide reasonable access, and not the maximum available, for that property frontage.
- New residential subdivisions should include an internal street layout that connects to the streets of surrounding developments to accommodate travel demand between adjacent neighborhoods, without the need to use the major thoroughfare system.
- Residential subdivisions abutting arterial roadways should be designed so that street connections conform to the access connection spacing standards for those roadways.
- Commercial development should be encouraged to share common access connections as well as to provide a convenient system of interparcel circulation so that customers as well as delivery and service vehicles can move between the sites.
- Zoning and subdivision actions shall discourage shallow commercial strip development where most, or all, access is directed to the abutting major public roadway.
- Commercial office and retail should be encouraged to develop activity centers, schematically illustrated as the preferred pattern in **Exhibit 7.2-1.** This land use arrangement facilitates pedestrian circulation between businesses and eliminates the need for vehicles to use the public street when moving from one establishment to another. Also, the corner clearance increases between driveways and the intersection, this improves safety and intersection operations by reducing the occurrence of conflicts within close proximity of the intersection.

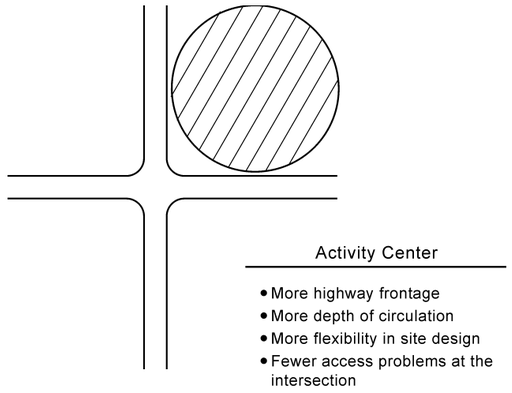


Exhibit 7.2-1: Placement of Commercial Activity Centers (CUTR)

Subdivision and Zoning Ordinance

The City Councils' finding and determining that promoting the safe flow of traffic along FM 518 is necessary to protect the health, safety, and welfare of citizens. Therefore, ordaining the FM 518 Corridor Access Management as a chapter in the Code of Ordinances.

The purpose of this section is to coordinate land use and transportation planning by establishing access management strategies within existing engineering design guidelines. The first step for local agencies is to coordinate with their local TxDOT district or area office early in the development process. Having an understanding of TxDOT's access management policy and issues in the area are critical to a successful partnership. Requiring property owners to dedicate land on their common property lines for parking lot cross access or develop joint access easements between property owners.

Cross and Shared Access
Refer to the **Section 7.2** for land use element requirements.

Auxiliary Lanes
On urban arterial streets, speed change lanes generally provide space for the deceleration and storage of turning vehicles. At major developments right turn deceleration lanes should be considered when the peak hour volume (VPH) exceeds 60. The length of speed change lanes should be designed to comply with the *TxDOT Roadway Design Manual.*

Driveway Design
Driveways provide the physical transition between the public highway and the abutting property. Driveways should be located and designed to minimize negative impacts on traffic while providing safe entry and exit from the development served. The *TxDOT Roadway Design Manual* provides standards for driveway design that promote access management strategies.

The following objectives should be kept in mind in the location and design of all access connections — public streets and private driveways alike.

- Minimize the difference in speed between vehicles turning off the roadway and following through traffic.
- Avoid encroachment of turning vehicles upon the adjacent traffic lane.
- Provide adequate intersection sight distance.
- Provide sight distance to enable drivers on the roadway to locate the access connection and to determine its geometrics so as to be able to safely decelerate and complete the entry maneuver.
- Provide sufficient throat length and on-site circulation to prevent traffic problems from "spilling" back onto the highway.
- Provide the number of lanes and throat width to produce efficient traffic flow for traffic entering and leaving the site.
- Provide a safe environment for all users, including pedestrians (including the disabled), bicyclists, bus patrons, and motor vehicles.

Access Connection Spacing
The access connection distances in the following sections are intended for passenger cars on a level grade. These distances may be increased for downgrades, truck traffic, or where otherwise indicated for the specific circumstances of the site and the roadway. In other cases, shorter distances may be appropriate to provide reasonable access, and such decisions should be based on safety and operational factors supported by an engineering study.

The distance between access connections, measured along the edge of the traveled way from the closest edge of pavement of the first access connection to the closest edge of pavement of the second access connection. **Exhibit 7.2-2** provides minimum connection spacing criteria for FM 518. A lesser connection spacing than set forth in this document may be allowed in the following situations:

- To keep from land-locking a property
- Replacement or re-establishment of access to the highway under a reconstruction / rehabilitation projects

Posted Speed (mph)	Distance (ft)
≤ 30	200
35	250
40	305
45	360
≥ 50	425

Table 7.2-2: FM 518 Minimum Connection Spacing

7.3 Future Thoroughfare Planning

As communities grow and change, roads originally intended to provide access to homes or businesses maybe needed to serve through traffic. In addition, some of the access problems we now see on FM 518 are the result of poor subdivision and zoning practices in the past. **Section 7.2** addresses a few ways to mitigate this problem. Consequently, when land development and thoroughfare planning are not coordinated, problems include limits to the ROW, development in close proximity to the ROW, and opposition by owners of adjacent properties and affected businesses. Land for access improvements may not be available, making it difficult to implement certain access

management techniques. Also, rights for access to property must be respected. Therefore, landowners and business participation in the thoroughfare planning process is critical for the process to be a success. The public involvement program and subsequent meetings with landowners and concerned citizens utilized in this project represents the type of partnerships that are needed to promote access management and thoroughfare planning. **Table 7.3-3** contains the recommendations for additional thoroughfare planning devised through this process. The team took into account current city thoroughfare plans (**Table 7.3-2**) and H-GAC's 2022 (**Table 7.3-1**) planned improvements that will have a direct impact on FM 518.

City	Roadway	Limits
Pearland	SH 288 Frontage	CR 59 to Beltway 8
Pearland	SH288 Frontage	Beltway 8 to CR 59
Pearland	Smith Ranch Road (CR94)	South Fork Road to McHard
Pearland	Cullen / Old Choclate Bayou Boulevard	Beltway 8 to McKeever Road (CR 100)
Pearland	Manvel / Reid Road (FM 1128)	Brookside Village to McKeever Road (CR100)
Pearland	Bailey Road	SH 288 Overpass to CR 129
Pearland	McHard Road	SH 288 Overpass to Beltway 8
Pearland	Harkey Road	Brookside Village to Hastings Cannon (Alvin)
Pearland	Veterans	FM 518 to Hastings Cannon (Alvin)
Pearland	SH 35 Main Street	Beltway 8 to Hastings Cannon
Pearland	Barry Rose Road	FM 518 to Blackhawk Boulevard
Pearland	Airline-Fort Bend / South Fork / Magnolia / John Lizer / Liberty Road	SH 288 Overpass to FM 518
Friendswood	Melody Road	Edgewood Road to Longwood Road
Friendswood	Edgewood / Hastings Road (FM 2351)	SH 35 to Beaner Road
Friendswood	FM 528 (Parkwood Drive)	County Line to Beltway 8 Frontage
Friendswood	CR 129 (Pearland Parkway)	FM 518 to FM 528
Friendswood	Blackhawk Boulevard	Edgewood Road to FM 528 (Parkwood Drive)
Friendswood	East Loop	FM 518 to Brittany Bay Boulevard
League City	SH 96	Overpass on IH-45
League City	SH 96 (Britney Bay Boulevard)	East of IH-45 to CR 129 (Pearland Pkwy / Peyson Road)
League City	New Arterial (16th Street alignment)	SH 3 to Western City Limit
League City	Grand Parkway	SH 146 to Western City Limit
League City	Parkwood Road (New Road)	West of IH-45 loop around Nasa 1 and reconnect at to Nasa 1 east of FM 270
League City	New Arterial	FM 518 South to City Limits (Grand Parkway)
League City	New Bypass	FM 518 north to FM 270

Table 7.3-1: HGAC's 2022 MTP Corridor Improvements

City	Roadway	Limits
Pearland	FM 865	Harris County Line to FM 518
Pearland	SH 35	Harris County Line to FM 518
Pearland	Scarsdale Boulevard	Sageking to Yost
Pearland	Yost	Scarsdale to FM 518
Pearland	Dixie Farm	Harris County Line to SH 35
Friendswood	Friendswood Link	City Limits to FM 518
Friendswood / League	Algoa-Friendswood Road	FM 518 to SH 35
League City	Bay Area Boulevard	FM 518 to Candlewood
League City	IH-45	N of FM 517 to North of FM 518
League City	FM 270	FM 518 to FM 646
League City	SH 146	3rd Street (Kemah) to FM 1765 / FM 348
League City	FM 518 Bypass	FM 518 to FM 270

Table 7.3-2: Pearland, Friendswood, and League City's Planned Thoroughfares

The final product is a list of improvements that will support the short-term access management strategies, while preparing the area for the outstanding growth projections (**Table 7.3-2**).

City	Roadway	Limits
Pearland	FM 518	SH 288 to McLean
Pearland	FM 518	Walnut / Berry to Dixie Farm
Pearland	New east-west Collector	CR 94A to SH 288 Frontage
League City	FM 518	FM 528 to SH 3
League City / Kemah	FM 518	FM 2094 to SH 146

Table 7.3-3: Thoroughfare Recommendations

Appendix E may be referenced for locations of the aforementioned thoroughfares.

Extension and Widening Recommendations

While, the operational and management techniques recommended in this study will greatly enhance the performance and safety of the roadway, FM 518 has the potential to play a greater role in regional mobility and engage H-GAC's *Smart Street* concept by extending FM 518 to the west. The extension will provide greater connectivity to neighboring communities and decrease the demand on nearby collector streets and toll facilities. The extension should be at least to FM 521 and perhaps farther. Using the existing ROW segments, FM 518 could be widened to six-lanes, thus bringing its functional characteristics closer to those of a *Smart Street*. The most critical segments (based on recent traffic growth trends) include the following:

- In western Pearland, from SH 288 on the west to McLean on the east.
- In eastern Pearland, from Walnut / Barry Rose on the west to Dixie Farm on the east.
- In League City, between Bay Area Boulevard on the west to IH-45.
- In League City, between IH-45 and SH 3.
- In League City, between (intersection that's the east terminus of the 4-lane undivided segment) to FM 2094.

Based on current traffic volumes, it would also be desirable for the League City segment between SH 3 and (intersection that's the east terminus of the four-lane undivided segment) to have six-lanes. However, because of the historic nature of this area and the large trees on each side, it is recognized that widening of this segment will most likely not be practical.

7.4 Pedestrian and Bicycle Needs

TxDOT has committed to consider pedestrian and bicycle facilities in all stages of planning, design, and construction of roadway and enhancement projects. The State Bicycle and Pedestrian Coordinator is tasked with integrating walking and bicycling into the operational policies, plans, and programs of the department, MPOs, and local government entities by providing encouragement, supplying expertise, and promoting training. Therefore, it is imperative that all bicycle and pedestrian improvements on and adjacent to FM 518 are coordinated with TxDOT.

In the long-term pedestrian and bicycle facilities should be considered on FM 518 during roadway reconstruction and rehabilitation, pavement marking elimination and application and installation of highway traffic signals. Future facility improvements are recommended below.

Bicycle Improvements

Future bicycle facilities along FM 518 will most likely come in the following forms:

W= wide lane — 14 to 15 feet wide, a shared lane or wide curb lane that is not marked as an exclusive bike facility. Consider when AADT is below 20,000 and speeds between 30 to 40 mph.

B= bike lane — six-feet wide and striped (marked) lane for the exclusive use of bikes. Consider when AADT are above 20,000 and speeds between 35 to 45 mph.

S= separated lane — anything wider than a six-feet on-street bike lane. This includes seven and eight-feet wide bike lanes, bike lanes with separation striping and markings and bike lanes on the sidewalk (multi-use path). Consider when AADT exceeds 30,000 and speeds between 40 to 50 mph.

Traffic volumes and speeds were used to analyze each section of the corridor are shown below in **Table 7.4-1.** These recommendations are considered to be the minimum facility to be considered during future roadway construction projects. ROW considerations, local pedestrian / bicycle plans, funding, and other factors will ultimately determine the type of facility.

Corridor Section			AADT	Facility to Consider
SH 288 West Side	to	FM 865 Cullen	24,000	B
CR 89	to	FM 1128	26,000	B
Harkey / Oday	to	Woody / Corrigan	28,000	B
Halbert / McLean	to	SH 35 / Main	22,000	B
SH 35 / Main	to	Sherwood	26,000	B
Westminster	to	Woodcreek	37,000	S
Dixie Farm	to	Sunset Meadows / Winding	30,000	S
Sunset Meadows / Winding	to	Whispering Pines	21,000	B
Winding Way	to	FM 528 / Parkwood	16,100	W
FM 528 / Parkwood	to	Country Road	15,200	W
Country Road	to	Williamsport	11,700	W
Newport	to	Calder / Devereux	38,000	S
Interurban	to	SH 3	38,000	S
Houston	to	FM 270 / FM 2094	31,000	S
FM 518 Split / Marina	to	South Shore	16,500	W
FM 1266 / Columbia	to	Lawrence Road	9,100	W
Kemah Oaks	to	SH 146	10,300	W

Table 7.4-1: Possible Bicycle Facility Types

Pedestrian Improvements

While continuous sidewalks are the goal, retrofitting areas without them will usually occur in phases. Lack of a seamless system is no excuse not to provide parts of the system. Improvements to the pedestrian infrastructure should be considered during:

- Roadway reconstruction or resurfacing projects
- Driveway reconsolidation projects
- Major redevelopments
- Water and sewer projects
- Traffic signal replacement projects

Other recommendations that will ensure the safety and sustainability of sidewalk projects:

- Street furniture placement should not restrict pedestrian flow.
- Ensure that there is enough room for wider sidewalks, bike lanes, and planting strips before proceeding with construction.
- Landscaping in medians should not obstruct the visibility between pedestrians and approaching motorists.
- Median crossings at midblock and intersection locations must be fully accessible by means of ramps or cut-throughs, with detectable warnings.

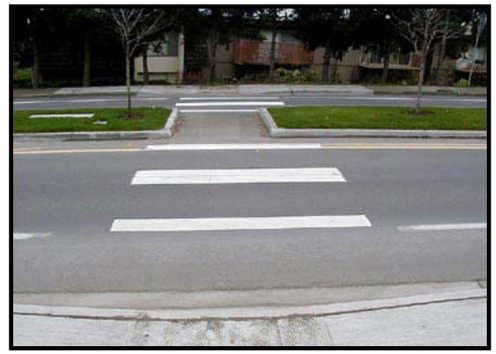


Exhibit 7.4.1: Raised median with pedestrian crossing

7.5 Future Transit Opportunities

The FM 518 corridor in the future will play a very important role in regional mobility. While the access management recommendation outlined in this plan will provide for greater mobility, more will need to be done to sustain the corridor. FM 518 will be the major east-west connection to high capacity transit along SH 288, IH-45, and SH 146 in the future. The short-term recommendation in **Chapter 6** will provide for a base of riders that will make future transit programs more viable. The study team recommends pursuing a limited fixed route service, teleworking, and flexi-van operations in the long-term.

Bus Service

Flexi-Van

Flexi-van service is a demand responsive, curb-to-curb service with paid drivers, that utilizes leased 15-passenger vans. This service will provide rides from residential pockets to Park & Ride lots and major area destinations, such as shopping centers and medical complexes within the corridor. The flexi-vans can run on a limited basis, either four to five-hours everyday during peak periods of travel. The flexi-van service could provide a fixed trip to the major destinations being served by the demand responsive service. The flexi-van service could be the catalyst for developing a daily fixed route service and would meet the current demand for more local service without making a reservation.

Fixed Route Transit

In coordination with the establishment of high capacity transit service along SH 288, IH-45, and SH 146, fixed route service that serves the Pearland / Friendswood area, League City area, and Kemah / FM 146 corridor should be explored. The service could be provided by two or three-routes with a transit center serving as the hub for connectivity. The transit center could be located at a junction where commuter service is also provided. With the development of fixed route service, appropriate signage and transit amenities (e.g. bus stop shelters, benches, lighting, etc.) would be required. The service would mostly be weekday service, but future demand potential suggests that limited weekend and evening service also be provided.

Initially more commuter service provided by express bus will be required to accommodate the increased demand for trips to the Houston area. An additional Park & Ride lot will be warranted on the eastern portion of the FM 518 corridor to meet anticipated growth in the area. More buses will be required to service the existing and new lots with some of the buses destined to locations south of the corridor.

Commuter rail service will also be a viable option in future years, beyond 2025. Extensions from the METRO Rail service in the southeast corridor could service the FM 518 area. Either the FM 865 or SH 35 corridors rail transit could be developed to provide a direct connection to METRO regional transit system.

Shuttle service from the FM 518 to the Clear Lake City and the space and aeronautics related developments should also be part of the fixed route transit service, given a coordinated plan and funding program between METRO and the transit entity servicing Brazoria and Galveston counties.

Provide commuter bus service from the Park & Ride lot located near the intersection of FM 518 and SH 288. Service would be to the Texas Medical Center area. From the Texas Medical Center, the buses would turn back to return to the FM 518 corridor, requiring that commuters not destined to the Texas Medical Center transfer to the METRO transit system to reach their final destination. A minimum of two buses would be required to operate the commuter service with approximately four AM trips and four PM trips daily. In the off peak period, the buses could be used to supplement the demand responsive service or for the initiation of an area shuttle service.

Teleworking

Simply defined, teleworking is working at home or another off site location, full- or part-time. While employees may be hooked up to the main office via a sophisticated computer network, it is possible to telework, with as little as a pen, paper, and phone. Teleworking increases options. Perhaps the main reason people are teleworking now is simply because they can. In the United States, 15.7 million people telework (AT&T Survey, 1998), consisting of company employees working at home or another off site location, on a full- or part-time basis.

Jobs are more portable than they once were. The United States used to be largely an industrial nation. In fact, in 1950 only 17% of workers were in information or service business like sales, public relations, personnel, banking, health-care, and publishing. By 1980, that number grew more than half. Teleworking is a viable option for large and small companies in today's economy. In fact, more than 65% of teleworkers are employed by firms with less than 100 employees.

Teleworking is appropriate for use in this corridor for these reasons and it can mitigate disruptions caused by a natural disaster. Employees' home offices become a community's hidden asset when an emergency occurs. Teleworkers are able to maintain productivity during major disasters and this attribute could make employees from your community more attractive to companies. To facilitate teleworkers, the municipalities should consider the following facilities.

At Satellite Work Centers — Often confused with "branch offices," satellite work centers differ in one important respect: all the people who work at them also live near them. For example, if an employer in Katy had many employees living in Galveston, the employer could lease office space in Galveston for the occasional use of employees. The employees' managers would continue to work from the main office.

At Neighborhood Work Centers — Similarly, neighborhood work centers provide an opportunity for employees to work closer to home — in this case, in office facilities with employees of other firms. Tenants in a neighborhood work center usually share support services, such as clerical help, telecommunications equipment, photocopying machines, and office supplies.

- Offer implementation assistance to employers including development of policies and procedures, employee orientation, and program evaluation.
- Promote benefits to management.
- Promote teleworking at the home-end.
- Create telecenters throughout the area.

Chapter 8
Study Recommendations and Action Plan

8.1 Overview

The study team utilized traffic modeling software, crash analysis techniques, and field verifications to examine the current situation along FM 518. The FM 518 Corridor Stakeholder Committee approved a menu of access management treatments based upon their ability to the reduce traffic delay and improve traffic flow and safety for motorist, pedestrians, and bicyclists. The study team then applied these access management techniques to the roadways most hazardous and congested sections. The improvements were then presented to the public for review. Based upon these comments the study team made modifications to the plan, estimated costs, and generated an action plan. The following study recommendations and action plan is the product of an comprehensive public involvement process, coordinated effort amongst all interested parties, and continuation of the partnerships needed for success.

City	Phase	Improvement Type	Cost Estimate
Pearland	Short-Term	Intersections	$244, 500
Pearland	Short-Term	Medians	$517,950
Pearland	Medium-Term	Intersections	$207,000
Pearland	Medium-Term	Medians	$410,570
Pearland	Medium-Term	Pedestrian / Bicycle	$310,200
Pearland Total			$1,690,220
Friendswood	Short-Term	Intersections	$46,000
Friendswood	Short-Term	Medians	$51,600
Friendswood	Medium-Term	Intersections	$100,000
Friendswood	Medium-Term	Medians	$283,800
Friendswood Total			$481,400
League City / Kemah	Short-Term	Intersections	$46,500
League City / Kemah	Short-Term	Medians	$236,500
League City / Kemah	Medium-Term	Intersections	$1,020,000
League City / Kemah	Medium-Term	Medians	$215,000
League City / Kemah	Medium-Term	Pedestrian / Bicycle	$3,370,400
League City / Kemah Total			$4,888,400
Total Short-Term			$1,143,050
Total Medium-Term			$5,916,970
Grand Total			**$7,060,020**

Table 8.2-1: Cost Summary of All Short- and Medium-Term Recommendations

8.2 Study Recommendations

Short-Term Recommendations

The short-term recommendations concentrate on improvements that do not require major purchases of ROW, have a short construction period and need only minor coordination with property owners. **Tables 8.2-2, 8.2-3,** and **8.2-4** detail the short-term median and pedestrian / bicycle intersection improvements for the corridor. The study team also identified corridor wide short-term improvements:

- Incorporating isolated traffic signals into a closed loop system and then optimizing all signals for current traffic.
- Addition of block numbers to overhead street signs.
- Early warning signage of approaching major intersections.
- Continuous street lighting of similar strength and spacing.
- Identifying agencies or groups to landscape new medians and ROW.
- Adding back panels to signal heads to reduce glare.

Intersection #	Map #	Location	Feet of Median	Cost Estimate
Pearland				
2	1	West of SH 288 Intersection to Silver Lake	700	$30,000
3,4	1,2	Silver Lake Village Drive / Wal-Mart	700	$30,000
6	2	Miller Ranch CR 93	1,200	$51,600
7	3	Southwick Road	1,250	$53,750
9	5	Old Chocolate Bayou CR 89	1,100	$47,300
10	6	Manvel Road (FM 1128)	1,050	$45,150
11	8	Harkey / Oday	900	$38,700
11a	9	Hatfield	650	$27,950
12	9	Woody / Corrigan	1,200	$51,600
13	9	McLean / Halbert	700	$30,100
14	10	Mykawa	450	$19,350
26	16	Dixie Farm	1,400	$60,200
Friendswood				
35	23	FM 528 Parkwood	1,200	$51,600
League City				
36	28	Brookdale/ Bay Area Boulevard	2,400	$103,200
41 and 42	32	Royal — Hobbs / Lafayette to west of IH-45	1,000	$43,000
43 and 43a	32	East of IH-45 to 40-feet east of Wesley	1,300	55,900
43a	33	Highland Drive	600	$25,800
44	33	Devereux / Calder to Englewood	1,300	$55,900
45	33	Interurban	1,200	$51,600
Short-Term Median Improvement Total				**$872,700**

Table 8.2-2: Short-Term Raised Median Recommendations

Intersection		Add Capacity	Timing Change	Cost Estimate
ID	Name			
Pearland				
2	SH 288 East Side	WB (Right)	RT Overlap	$28,000
3	Silverlake Village	NB (Right, Through, Left), SB (Left, Shared Right-Through)	~~Split-phased~~	$8,500
4	Wal-Mart	NB (Left, Shared Right-Through), SB (Left, Shared Right-Through)	~~Split-phased~~	$8,000
5	CR 94/Home Depot	NB (Dual Left, Shared Right-Through), SB (Left, Shared Right-Through)	~~Split-phased~~	$8,500
8	FM 865 / Cullen	SB (Left, Through, Right)	~~Split-phased~~	$8,000
9	CR 89 / Kroger		~~Split-phased~~	$5,000
10	FM 1128	NB (Dual Left, Shared Right-Through), SB (Left, Through Right)	~~Split-phased~~	$19,000
11	Harkey / Oday	NB (Left, Through, Right), SB (Left, Shared Right-Through)		$20,500
13	Halbert / McLean	Halbert one-way	~~Single phase~~	$8,000
15	SH 35 / Main	WB (Right)	Add logic plan	$20,000
17	Old Alvin	WB (Right)		$11,000
18	Walnut / Berry Rose		Right-turn overlap	$8,000
20	Westminster		Single phase	$5,000
21	Pearland Parkway	*EB&WB (Right), NB (Dual Left, Through, Right-Through)		$55,000
22	Liberty	*EB (Right), NB&SB (Left, Shared Right-Through)	Add quad-left	$32,000
Friendswood				
28	FM 2351 / Edgewood	SEB(Right)		$24,000
33	Whispering Pines	NWB (Left)		$8,000
35	FM 528 / Parkwood	SWB (Dual left)		$14,000
League City				
36	Bay Area Boulevard	WB (Right)		$23,000
37	Spring Landing / Palomino	NB&SB (Left) Restripe Lanes	Add quad left	$18,500
51b	FM 2094	WB (Extend inside left lane to accommodate queue)		$5,000
Kemah				
57a	Wal-Mart	Recommend TxDOT signal warrant be conducted	New Signal	$0
Short-Term Intersection Improvement Total				**$337,000**

Table 8.2-3: Short-Term Intersection Recommendations

Intersection	Mitigation Measure	Cost Estimate
Pearland		The cost of these improvements are reflected within the short-term intersection improvements.
3 – Silver Lake Drive	Re-stripe lanes will allow concurrent north-south pedestrian movement	
4 – Wal-Mart Driveway	Re-stripe lanes will allow concurrent north-south pedestrian movement	
5 – CR 94A / Home Depot	New lanes and re-striping of lanes will eliminate split-phasing and decrease pedestrian wait time	
18 – Walnut / Barry Rose	Prohibit pedestrian movement on east side of intersection and associate new crossing with Barry Rose phase	
19 – Sherwood	Prohibit pedestrian crossings on west side of intersection and instruct to cross on east side	
League City		
41 – Hobbs / Lafayette	Retain split-phasing, but restrict pedestrian crossings on the east side	
45 – Interurban	Associate pedestrian signal interval with higher volume northbound movement	

Table 8.2-4: Short-Term Pedestrian and Bicycle Improvements

Medium-Term Recommendations

The medium-term recommendations were prioritized based upon their ability to improve mobility, reduce hazardous roadway conditions, and reduce traffic delay. These improvements attract a greater level of funding, typically are beyond the ROW line and may require extensive coordination with property owners. The improvements listed in **Tables 8.2-4, 8.2-5,** and **8.2-6** are the major modifications called for to make FM 518 a safer and more accessible roadway. The plan also calls for driveway consolidations, increased cross, and shared access between developments, new traffic signals, pedestrian / bicycle accommodations, and programs to increase transit potential. Driveway consolidation recommendations are detailed on the corridor maps in **Appendix A.** These consolidations should be considered when there is:

- Addition of right-turn lane
- Redevelopment of property
- Sidewalk, drainage, and sewer projects are planned

Intersection #	Map #	Location	Feet of Median	Cost Estimate
Pearland				
10a	7	East of Roy Street	360	$15,400
10b	7	Garden Road	750	$32,250
14a	10	East of Pearland Drive to west of Texas Drive	1,000	$43,000
16	10	Galveston Road	700	$30,100
17	11	Old Alvin	900	$38,700
18	12	Barry Rose	1,200	$51,600
20	12	Westminster	900	$38,700
21	13	Pearland Parkway	1,500	$64,500
22	13 and 14	Liberty Drive	1,250	$53,750
23	14	Yost / Shadycrest	740	$31,820
24	15	Woodcreek	1,000	$43,000
Friendswood				
43a	24 - 27	Lakeview to Eastern City Limit	6,600	$283,800
League City				
-	27	Western City Limit	2,100	$90,300
38	31	Landing Boulevard	600	$25,800
Medium-Term Improvement Total				**$842,720**

Table 8.2-4: Medium-Term Raised Median Recommendations

Intersection ID	Intersection Name	Add Capacity	Cost Estimate
Pearland			
3	Silverlake Village	*EB (Right) SB (Left, Through, Right)	$30,000
8	FM 865 / Cullen	SB (Dual Left, Through, Right)	$20,000
13	Halbert / McLean	Halbert Cul-de-sac	$7,000
15	SH 35 / Main	EB (Dual Left, Right), NB and SB (Dual Left, Right)	$60,000
22	Liberty	NB and SB (Left, Through, Right)	$40,000
26	Dixie Farm	WB and EB (Dual Left, Right)	$50,000
Friendswood		**Add Capacity**	
28	FM 2351 / Edgewood	NEB and SWB (Left), SEB(Right)	$55,000
35	FM 528 / Parkwood	SWB (Right), NEB (Dual left)	$45,000
League City		**Add Capacity**	
38	Landing Boulevard	WB (Dual Left)	$25,000
41	Hobbs / Lafayette	WB (Dual Left), NB (Dual Right) Widen Hobbs 2 SB lanes	$55,000
42	IH-45 West Side	EB (Dual Right), begin new right as additional auxiliary lane	$140,000
43	IH-45 East Side	EB (Dual Left)	
45	Interurban	NB (Left)	$25,000
46	SH 3	SB (Right) NB, SB, EB, and WB (Left)	$95,000
50	Texas	NB (Dual left, shared right)	$20,000
5b	FM 2094	Develop new NB roadway (create a partial continuous flow intersection)	$680,000
Medium-Term Intersection Improvement Total			**$1,327,000***
* Estimate does not include ROW cost, which could total 20% to 40% of project cost.			

Table 8.2-5: Medium-Term Intersection Recommendations

Location	Map #	Improvement Type	Square Feet of Concrete	Cost Estimate
Pearland				
Hatfield to McLean South Side of FM 518 with crosswalk at Anthony (midblock)	9	8-foot Multi-use trail	2,900	$255,200
Anthony to Woody North Side of FM 518	9	5-door Sidewalk	1,000	$55,000
League City – Kemah				
Spring Landing Boulevard to Landing	29, 30, and 31	8-foot Multi-use Trail	9,200	$809,600
FM 2920 to SH 146		12-14 foot Multi-use trail	232,800	$2,560,800
Medium-Term Improvement Total				**$3,680,600***
* Estimate does not include ROW cost, which could total 20% to 40% of project cost.				

Table 8.2-6: Medium-Term Pedestrian and Bicycle Recommendations

8.3 Action Plan

The success of the FM 518 Corridor Access Management Plan is dependant on the formation or strengthening of partnerships among the variety of involved entities. This section seeks to clearly identify the roles and responsibilities of each agency in meeting the goals of this study.

Steps	Agency
1. Policy board approval of study	H-GAC
2. Secure funding for short-term intersection improvements	H-GAC and TxDOT
3. Implement intersection improvements	TxDOT
4. Implement system-wide signal retiming	TxDOT and Cities
5. Secure funding for median improvements	H-GAC and TxDOT
6. Implement median improvements	TxDOT
7. Coordinate with TxDOT for median aesthetics	Cities
8. Identify funding and implement pedestrian / bike improvements	H-GAC, TxDOT, and Cities
9. Adopt FM 518 Corridor Access Plan by ordinance	Cities
10. Program long range thoroughfare improvements	Cities
11. Update comprehensive plans and subdivision standards	Cities

This corridor plan attempted to gain the input and concurrence of local business leaders, stakeholders, city officials, regional leaders, and the general public. It is clear from the technical analysis and public process that implementing the short-term intersection improvements, and system-wide signal retiming will provide the greatest relief in terms of operations. Additionally, installing raised medians at high crash locations in the short-term will provide safety benefits to the traveling public. The medium- and long-term improvements that are contained herein can be implemented as funding and need arises. With that said, in order to begin to develop the remainder of the corridor it is critical that the policy recommendations contained in **Chapter 7** be incorporated into each city's suite of development regulations. This will allow for the corridor to develop in a more stained manor. The fact is that incremental improvements will provide relief but long lasting stainable corridor success will only be achieved if some level of discipline is exercised to control access to developments.