PAVING AND DRAINAGE IMPROVEMENTS
NEED AREA N-2013T-C01: WESTHEIMER ROAD SHEPHERD DRIVE TO MONTROSE BOULEVARD
NEED AREA N-2013T-0012: WESTHEIMER ROAD MONTROSE BOULEVARD TO MAIN STEET

FINAL PRE-ENGINEERING REPORT

January 2018

Prepared by:

GUNDA CORPORATION
Engineers, Planners & Managers
6161 Savoy, Suite 550
Houston, Texas 77036
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TBPE Registration Number: F-3531

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PRE-ENGINEERING NEED AREA N-2013T-C01, N-2013T-0012
WESTHEIMER ROAD
FROM SHEPHERD DRIVE TO MAIN STREET
PRE-ENGINEERING REPORT

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Executive Summary

PROJECT LOCATION

The study area, Westheimer Road from Montrose Boulevard to Bagby Street and Elgin Street from Bagby Street Main Street, is located in Council Districts C and D approximately 1.4 miles southwest of downtown Houston in Harris County, Texas. The study area lies within the Super Neighborhoods of Neartown-Montrose and Midtown and lies partially within the Midtown Tax Improvement Reinvestment Zone (TIRZ #2) and Midtown Management District.

STATEMENT OF PROBLEM

Westheimer Road was chosen for pre-engineering due to existing pavement condition and mobility challenges within the corridor. The existing pavement is concrete and is generally in fair to poor condition. There are cracks in the pavement, pavement settlement, large asphalt patches, missing or damaged curbs, and missing or damaged sidewalks along the corridor at various locations. Some of the pedestrian facilities are non-ADA compliant. GUNDA completed Phase I – Problem Identification and reviewed the findings with the City of Houston in 2013. This study was initiated by the Public Works and Engineering Department (PWE), and the Planning and Development Department (P&D) to further study the Lower Westheimer Corridor study from Shepherd to Main as a whole following the enhanced pre-engineering process due to the historical, cultural, and social sensitivity of the corridor.

PROJECT BASE SOLUTION

The base solution for this project includes construction of street paving that complies with the City of Houston Major Thoroughfare Plan and improving the drainage system within the project drainage area. Drainage improvements include replacement of inadequate and substandard storm sewers with new storm sewers based on the City of Houston requirements primarily based on the 2015 pre-engineering study completed by COH. The additional solutions include as part of the enhanced pre-engineering process include lane configuration changes and improved pedestrian amenities, and further coordination with METRO as the entire Lower Westheimer corridor. The Lower Westheimer Corridor Study is the City's first enhanced pre-engineering study, which involved a progressive public engagement process in defining the vision, scenario development and alternative selection. The study was a real success in engaging the stakeholders and the community with three stakeholder meetings and three public meetings. **Appendix B** goes in detail how the enhanced pre-engineering process was utilized for this segment of Westheimer Road which is historically and culturally sensitive corridor.

The information provided in this report is the best available information at this time and is provided without the benefit of topographic survey for roadway design, although MOBILE LIDAR survey was performed to build a simulation model of proposed conditions at the third public meeting. The information is taken from existing record drawings, the City of Houston GIMS database, and City-provided information. All cost data is in FY18 dollars and is based on unit pricing provided by the City as an update.

SCOPE OF THE PROJECT

The scope of this pre-engineering design service is to provide a summary of the existing conditions and challenges within the project limits and provide recommendations on paving improvements in the project area by compiling two previous reports and the findings of the additional enhanced pre-engineering study performed as part of the Lower Westheimer Corridor Study. The two previous study findings are from:

1. Paving and Drainage Improvements Need Area N-2013T-0012: Westheimer Road Montrose Boulevard to Main Street, Phase 2: Alternative Analysis Report, June 2015, and
2. Paving and Drainage Improvements Need Area N-2013T-C01: Westheimer Road from South Shepherd Drive to Montrose Boulevard, Draft Pre-Engineering Report, July 2015.

TRAFFIC IMPROVEMENTS

GUNDA recommends replacing the traffic signals and adding the intersection approaching left turn lanes at major intersections, potential permanent parking spaces, and provided at the intersections of Westheimer Road and Hazard Street, Woodhead Street, Dunlavy Street, Mandell Street, Commonwealth Street, Waugh Drive, Montrose Boulevard, Taft Street, Bagby Street, Brazos Street, Smith Street, Louisiana Street, Milam Street, and Travis Street.

PAVEMENT ALTERNATIVES

GUNDA recommends reconstruction of Westheimer Road to support use of multiple modes of transportation and improve safety along the corridor for all users. Since expanding ROW is not desirable, 3 lanes pavement are proposed in order to expand the sidewalk width in ROW smaller than 70'. There are dedicated Turn lanes near the signalized intersections. A minimum of two (2) lanes will be constructed along Westheimer Road between South Shepherd Drive and Bagby Street and a minimum of four (4) lanes along Elgin Street between Bagby Street and Main Street to meet the requirements of the major thoroughfare plan.

RECOMMENDED PROJECT

GUNDA recommends reconstruction of Westheimer Road to support use of multiple modes of transportation and improve safety along the corridor for all users. Since expanding ROW is not desirable, 2 to 4 lane cross section as shown in the recommended concept drawing with dedicated turn lanes at critical intersections is proposed in order to improve the pedestrian realm within a constrained ROW (i.e., minimum 60 feet). See Exhibit E3 for typical cross sections and Exhibit E4 for the proposed layout.

Per the City Infrastructure Design Manual (dated July 1, 2016), the minimum pavement section includes 11-inch reinforced concrete pavement with 8-inch minimum lime stabilized subgrade.

The pavement design must be verified during Final Design after the geotechnical investigation is completed.

GUNDA recommends the construction of 8-foot minimum pedestrian realm along both sides of the roadway for the project length. As described in Appendices B and C the primary feedback from the Stakeholder Advisory Committee (SAC) and the public at the three public meetings was that the top priority for the Lower Westheimer corridor was improving pedestrian experience by increasing the pedestrian realm. As such the recommended concepts balance improving the top desired outcome (improved pedestrian experience by increasing the pedestrian realm) and at the same time maintaining acceptable vehicular and transit operation throughout the corridor.

The existing storm sewers will be replaced with new 24-inch to 12-foot by 12-foot storm sewers to accommodate the anticipated runoff volumes, and to meet the current City of Houston standards. All storm inlets and inlet leads will be 24-inch pipe minimum to meet the current City of Houston standards. These improvements provide inline detention and meet the City of Houston 2-year and 100-year events.

The City of Houston has recommended replacing the existing water lines along Westheimer Road with 16-inch lines and along Elgin Street with 16-inch lines as part of the improvement project.

The City of Houston has recommended replacement of the existing sanitary sewers between Hazard Street and Mandell Street with 12-inch sewers, and between Yupon Street and Waugh Drive with 8-inch sewers. The City has also recommended eliminating existing parallel 8-inch sewer line and diverting flow to proposed 12-inch line along Elgin Street between Smith Street and Louisiana Street.

PROBABLE CONSTRUCTION COSTS

The probable construction cost of the recommended improvements is $49,679,128.33.

PROJECT SEQUENCING

GUNDA recommends breaking the project into the following subprojects:

1. Sub-Project 1: Montrose Boulevard to Main Street (Existing CIP project under design)
2. Sub-Project 2: Kuester Street to Montrose Boulevard
3. Sub-Project 3: Shepherd Drive to Kuester Street

Candidate Project N-2013T-C01, N-2013T-0012: Westheimer Road

1.0 SUMMARY OF CANDIDATE PROJECT

Name of the Project:	N-2013T-C0, N-2013T-0012: Westheimer Road
Project Limits:	Shepherd Drive to Main Street
Description and Scope:	Reconstruct Westheimer Road between Shepherd Drive and Main Street with a 2-lane and 4-lane through lane configurations with dedicated turn lanes to primarily improve pedestrian realm along the Lower Westheimer corridor. Construct a minimum 8-foot sidewalk up to a 15.5-foot to substantially improve the pedestrian realm on each side of the roadway. Upgrade storm sewers between Shepherd Drive and Main Street to meet current City of Houston requirements. Replace existing with a new 16-inch water line between Shepherd Drive and Main Street. Replace the existing sanitary sewers between Hazard Street and Mandell Street with 12-inch sewers, and between Yupon Street and Waugh Drive with 8-inch sewers. Remove existing parallel 8-inch sewer line and diverting flow to proposed 12-inch line along Elgin Street between Smith Street and Louisiana Street.
Type:	Major Thoroughfare (T-4-70, T-4-80)
Council District:	Council Districts C and D
Key Map Number:	492 U, V and 493 S, T
Super Neighborhood:	Montrose and Midtown
Project Cost:	$49,679,128
Number of Sub-Projects:	3
Sub-Project 1 Cost	$18,512,937 (Montrose Boulevard to Main Street)
Sub-Project 2 Cost	$20,513,067 (Kuester Street to Montrose Boulevard)
Sub-Project 3 Cost	$10,653,039 (Shepherd Drive to Kuester Street)

2.0 SUMMARY OF THE NEED AREA

The study area, Westheimer Road from Shepherd Drive to Main Street, is located in Council District C and D west of downtown Houston in Harris County, Texas. The relevant Key Map numbers are 492 U, V and 493 S, T. GIMS block map number are 5256b, 5356a, and 5356b. The corridor length is approximately 11,300 feet (2.14 miles) and classified as a major thoroughfare with four (4) lanes varies from 60-foot to 75-foot right-of-way between Shepherd Drive and Commonwealth Street, a 5-lane major thoroughfare in a 70-foot right-of-way between Commonwealth Street and Montrose Boulevard, a 4-lane major thoroughfare in right-of-way that varies from 65-foot to 75-foot between Montrose Boulevard and Bagby Street, and a 5-lane major thoroughfare in a 80-foot right-of-way between Bagby Street and Main Street. Exhibit E1 shows the location of the project, and Exhibit E2 shows the Overall Layout of the project. The study area lies within the Super Neighborhoods of Montrose and Midtown.

3.0 ENHANCED PRE-ENGINEERING PROCESS

The Lower Westheimer Corridor Study is the City's first enhanced pre-engineering study, which involved a progressive public engagement process in defining the vision, scenario development and alternative selection. The study was a real success in engaging the stakeholders and the community with three stakeholder meetings and three public meetings. **Appendix B** goes in detail how the enhanced pre-engineering process was utilized for this segment of Westheimer Road which is historically and culturally sensitive corridor. The intent of this report is so that particular methodologies and tools outlined in **Appendix B** to be a great platform for the City to showcase the success of the enhanced pre-engineering process to a broader audience, and also set the bar for future studies like this.

4.0 STATEMENT OF PROBLEM

Westheimer Road was chosen for pre-engineering as a council-identified project. The existing pavement is composed of asphalt pavement with concrete curb and gutter. The asphalt pavement is generally in fair to poor condition with numerous areas with cracking. The curb and gutter is damaged within the corridor at various locations. An area of base failure was noted between Whitney Street and Taft Street. Most of the pedestrian facilities are non-ADA compliant.

GUNDA completed Phase I – Problem Identification and reviewed the findings with the City of Houston in 2013. As such, the COH proposed to follow the enhanced pre-engineering process with a substantially more than typical public participation and engagement effort. This study was initiated by the Public Works and Engineering Department (PWE), and the Planning and Development Department (P&D) to further study the Lower Westheimer Corridor study from Shepherd to Main as a whole following the enhanced pre-engineering process due to the historical, cultural, and social sensitivity of the corridor.

Gunda Corporation, LLC (GUNDA) gathered information on utilities, paving, right-of-way, and property ownership for the project area after reviewing the existing information from public and private utility sectors.

The information provided in this report is the best available information at this time and is provided without the benefit of a boundary and topographic survey. The information is taken from existing record drawings, the City of Houston GIMS database, Harris County Appraisal District (HCAD), and City-provided information. All cost data is in FY18 dollars and is based on unit pricing provided by the City.

A. Right-of-Way

The existing right-of-way along Westheimer Road between Shepherd Drive and Main Street ranges from 60 to 80 feet.

Development within the corridor is primarily commercial with some residential and multi-family uses. Other land uses in and around the study area include schools and a religious

establishment. There are well established trees and landscaping on either side of the road for the majority of the corridor.

B. Traffic

Westheimer Road is a designated major thoroughfare in east-west direction between South Shepherd Drive and Bagby Street. Westheimer Road, between South Shepherd Drive and Yupon Street, has relatively narrow undivided four (4) lanes. Midway between Yupon Street and Graustark Street, Westheimer Road changes to five (5) lanes and includes a continuous center left-turn to Montrose Boulevard in the study area. Westheimer Road, between Montrose Boulevard and Bagby Street, is undivided four (4) lanes (2 lanes each direction) again with very narrow lanes sometime as low as 9 to 10 feet. At Bagby Street, Westheimer Road becomes Elgin Street, which is also designated as a major thoroughfare. Between Bagby Street and Main Street, the cross section of Elgin Street increases to five (5) lanes (2 lanes each direction with a center-turn lane). The speed limit is 30 miles per hour for Westheimer Road.

C. Drainage

The existing storm sewers along Westheimer Road within the project limits include 18-inch to 114-inch diameter storm sewer lines. These storm sewers have inadequate capacity for the 2-year and 100-year events. The drainage system was built in 1915. Inlets and trunk lines do not meet the current City of Houston minimum design criteria. The project area is located within unshaded FEMA Zone X outside the 100-year and 500-year floodplain of Brays Bayou, HCFCD Unit D100-00-00 and Buffalo Bayou, HCFCD Unit W100-00-00.

D. Public Utilities

Existing water lines are primarily 8-inch lines. Between Huldy Street and Mandell Street, 8-inch, 24-inch and 27-inch sanitary sewers are present. Between Bagby Street and Main Street, 8-inch and 12-inch sanitary sewers are present.

E. Private Utilities

CenterPoint Energy (gas) owns and maintains gas lines within the project area. CenterPoint Energy (electric) owns and maintains street light poles with underground cable. AT&T owns and maintains underground and aerial facilities within the project limits. Zayo Communications owns and maintains buried fiber optic lines. MCI, the City of Houston, Wavevision, Phonoscope, Teleport, and Comcast all maintain aerial facilities. Coordination with respective private utilities has been started and will be needed through the design and construction phases of the project.

F. Interagency Coordination

GUNDA coordinated with the City's Inter-Agency Coordination Group (IACG) to identify other City, METRO, TxDOT, or Railroad facility projects that could impact the final design of the proposed roadway and utility improvements.

G. Tree Impacts

The project has several established trees within the existing ROW whose canopies extend over the roadway and pedestrian area. There are established trees between curb and sidewalk from Waugh Drive to Commonwealth Street and from Hazard Street to Brun Street. Between Bagby Street and Main Street, trees with tree grates are set in the sidewalk on each side of Elgin Street as part of improvements made by the Midtown TIRZ and Management District. The trees will be impacted by any street widening through the corridor.

5.0 CANDIDATE PROJECT

GUNDA recommends reconstruction of Westheimer Road between Shepherd Drive and Main Street as follows.

A. Recommended Traffic Improvements

GUNDA recommends replacement of the existing traffic signals within the project area at the intersections of Westheimer Road and Hazard Street, Woodhead Street, Dunlavy Street, Mandell Street, Commonwealth Street, Waugh Drive, Montrose Boulevard, Taft Street, Bagby Street, Brazos Street, Smith Street, Louisiana Street, Milam Street, and Travis Street.

B. Recommended Paving

GUNDA recommends reconstruction of Westheimer Road to support use of multiple modes of transportation and improve safety along the corridor for all users. Since expanding ROW is not desirable, 2 to 4 lane cross section as shown in the recommended concept drawing with dedicated turn lanes at critical intersections is proposed in order to improve the pedestrian realm within a constrained ROW (i.e., minimum 60 feet). See Exhibit E3 for typical cross sections and Exhibit E4 for the proposed layout.

Per the City Infrastructure Design Manual (dated July 1, 2016), the minimum pavement section includes 11-inch reinforced concrete pavement with 8-inch minimum lime stabilized subgrade. The pavement design must be verified during Final Design after the geotechnical investigation is completed.

C. Recommended Pedestrian Improvements

GUNDA recommends the construction of 8-foot minimum pedestrian realm along both sides of the roadway for the project length. As described in Appendices B and C the primary feedback from the Stakeholder Advisory Committee (SAC) and the public at the three public meetings was that the top priority for the Lower Westheimer corridor was improving pedestrian experience by increasing the pedestrian realm. As such the recommended concept balances improving the top desired outcome (improved pedestrian experience by increasing the pedestrian realm) and at the same time maintaining acceptable vehicular and transit operation throughout the corridor.

D. Recommended Drainage Improvements

GUNDA recommends replacing the existing sewers to accommodate the anticipated runoff volumes and to meet the current City of Houston Standards. The existing storm sewer pipes for W0679 and W 0680 systems were upsized to meet the current City of Houston Design requirements for the 100-year criteria. There is a requirement of 12 acre-feet of mitigation for the W0680 drainage system. In-line detention is recommended. The West System of N-2013T-0012 was designed to contain 100-year rainfall HGL below the ROW elevation. The proposed storm sewer layouts are presented in Table 1.

Table 1: Proposed Storm Sewer System Design Summary

Drainage System ID	MH From	MH To	Reach Length (ft)	Number of Pipes	Span (ft)	Rise (in/ft)
W0679	W1	OUT	132	1	7	4
	W2	W1	53	1	-	36
	W3	W2	330	1	-	36
	W4	W3	314	1	-	30
	W5	W4	269	1	-	24
W0680	W6	W7	249	1	-	24
	W7	W8	290	1	-	30
	W8	W9	266	1	-	36
	W9	W10	275	1	-	36
	W10	W11	271	1	-	36
	W11	W12	260	1	-	42
	W12	W13	259	1	-	96
	W13	W14	244	1	12	11
	W14	W15	353	1	12	11
	W15	W16	379	1	12	11
	W16	W17	200	1	12	11
	W17	W18	193	1	12	12
	W18	W19	394	1	12	12
	W19	W20	547	2	12	12

Drainage System ID	MH From	MH To	Reach Length (ft)	Number of Pipes	Span (ft)	Rise (in/ft)
W0680	W20	W21	439	2	12	12
	W21	OUT	183	1	-	144
	W22	W21	101	1	-	78
	W23	W22	311	1	-	24
	W24	W23	181	1	-	24
West System of N-2013T-0012	W100NA	W100NB	17	1	-	24
	W100NB	W100NC	223	1	-	24
	W100NC	W100ND	18	1	-	24
	W100ND	W100NE	216	1	-	24
	W100NE	W100NF	38	1	-	24
	W100NF	W100NG	453	1	-	36
	W100NG	W100NH	41	1	-	36
	W100NH	W100NI	410	1	-	48
	W100NI	W100NJ	373	1	-	54
	W100NJ	W100NK	553	1	-	60
	W100NK	W100NL	397	1	-	60
	W100NL	W100NM	52	1	-	60
	W100NM	W100NN	90	1	-	66
	W100NN	W100NO	87	1	-	66
	W100NO	W100NP	280	1	-	66
	W100NP	W100NQ	54	1	-	66
	W100NQ	W100NR	47	1	-	66
	W100NR	W100NS-1	236	1	-	66
	W100NS-1	W100NS-2	56	1	-	66
	W100NS-2	W100NT	55	1	-	66
	W100NT	W100NU	208	1	-	72
	W100NU	OUT	57	1	-	72

E. Recommended Water Improvements

The City of Houston has recommended replacing the existing water lines along Westheimer Road with 16-inch lines and along Elgin Street with 16-inch lines.

F. Recommended Wastewater Improvements

The City of Houston has recommended replacement of the existing sanitary sewers between Hazard Street and Mandell Street with 12-inch sewers, and between Yupon Street and Waugh Drive with 8-inch sewers. The City has also recommended eliminating existing parallel 8-inch sewer line and diverting flow to proposed 12-inch line along Elgin Street between Smith Street and Louisiana Street.

G. Total Project Costs for the Recommended Project

Table 2 summarizes the total project costs of construction for the recommended improvements:

Table 2
Total Probable Construction Costs Divided by Recommended Sub-Projects

Item	Montrose to Main	Kuester to Montrose	Shepherd to Kuester
Paving	$6,015,977.22	$3,638,549.86	$3,018,749.14
Storm	$2,553,538.02	$6,845,710.52	$1,414,620.68
Water	$1,378,535.40	$848,588.40	$878,763.60
Wastewater	$389,083.20	$227,304.00	$715,968.00
Contingencies (30%)	$3,101,140.15	$3,468,045.83	$1,808,430.43
Construction Management	$1,550,570.08	$1,734,022.92	$904,215.21
Engineering Fee Estimate	$2,687,654.80	$3,005,639.72	$1,567,306.37
Design Management	$403,148.22	$450,845.96	$235,095.96
Land Acquisition	$433,290.00	$294,360.00	$109,890.00
Grand Total	**$18,512,937.09**	**$20,513,067.21**	**$10,653,039.38**

The CPPS for the recommended sub-projects are 163.28, 119.92 and 256.28 with a benefitted population of 50,021. Layouts of the proposed improvements are included in Exhibit E4.

H. Recommended Project Phasing

GUNDA recommends constructing the improvements in the following three (3) sub-projects:

1. Sub-Project 1: Montrose Boulevard to Main Street (Existing CIP project under design)
2. Sub-Project 2: Kuester Street to Montrose Boulevard
3. Sub-Project 3: Shepherd Drive to Kuester Street

FORMS

GUNDA CORPORATION
Engineers, Planners & Managers

FY 2016 Candidate Projects ($ Thousands)
Street & Traffic Control Program - Thoroughfares

Candidate Project Summary Information			
Need Area:	*N-2013T-C01, N-2013T-0012*	**Alternative No.:**	**N/A**
Name:	*Westheimer Road*	**Council District:**	**C&D**
Limits:	*South Shepherd Drive to Main Street*	**Key Map No.:**	**492 U, V; 493 S, T**
Type:	Major Thoroughfare	**Super Neighborhood:**	**Montrose and Midtown**
WBS No.:	(To be assigned by the City)	**Total No. of Sub-projects:**	**3**
Description:	*Reconstruct Westheimer Road between Shepherd Drive and Main Street with a 2-lane to 5-lane configuration with improved pedestrian facilities. The project addresses improving traffic flow and capacity by providing new mobility options for pedestrians, cyclists, transit users, and drivers without sacrificing quality of life which reflects special character of the community.*		
Justification:	*Project will replace (and widen) a street that has been deteriorated beyond economical repair and normal maintenance. It will improve traffic circulation, mobility and drainage in service area.*		

Implementation - Estimated Cost and Duration				
	City Funds	**Other Entities Funds**	**Total**	**Duration**
Total Project Cost	$ 49,679	$ -	$ 49,679	
Acquisition	$ 838	$ -	$ 838	12 Months
Design	$ 8,350	$ -	$ 8,350	24 Months
Construction	$ 32,114	$ -	$ 32,114	36 Months
Contingency	$ 8,378	$ -	$ 8,378	NA
Private Utility Reloc.	$ -	$ -	$ -	Months
Warranty	$ -	$ -	$ -	12 Months

Candidate Project Priority Scores		
Infrastructure Categories	**Benefit Scores (Total Maximum 100)**	
	Maximum	**Actual**
Streets	**75**	22.71
Drainage System	**15**	15.00
Water	**5**	4.82
Wastewater	**5**	2.00
Total	**100**	**44.53**
Service Area Benefit score:		44.53
Benefitted Population:		50,021
Rebuild Houston Funds:		$ 41,917
Candidate Project Priority Score:		**112.66**
Candidate Project Priority Rank No.:		(To be assigned by the City)

Other Entities & Jurisdictions Coordination		
Entities		**Coordination For**
TxDOT	■	Crossing Spur 527
Metro	■	
HCFCD	■	
Gulf Coast Railroad District	☐	
Union Pacific Rail Road	☐	
Harris County	☐	
Fort Bend County	☐	
Private Utilities	☐	
(Name of Private Utility)		
(Name of Private Utility)		
Municipalities	☐	
(Name of municipality)		
(Name of municipality)		
Other	☐	
Other	☐	

Sequencing Requirements (SR) and Other Considerations	
SR:	
Permits:	
Other:	

Maintenance - Estimated Cost and Frequency (By the City)				
Asset Categories	**Estimated Asset Life**	**Maintenance Items**	**Cost**	**Schedule/Frequency**
Streets	40-years	Street Sweeping	$ -	4 Times Annually
		Overlay	$ -	N/A
		Pot Hole Patch	$ -	As needed - typically starts year 25
		Panel Repair	$ -	As needed
Storm Drainage	50-years	Point Repair	$ -	
			$ -	
Water	50-years	Point Repair	$ -	
			$ -	
Wastewater	50-years	Point Repair	$ -	
			$ -	

Major Thoroughfare and Collectors (No Change in Classification) Candidate
Project Priority Score Determination

N-2013T-C01; N-2013T-0012- Westheimer Road: Shepherd Drive to Main Street; 3 to 5-Lane roadway with concrete curb and gutter, left turn lanes at signalized intersections, parking, sidewalks, traffic signals, and underground utilities (water, wastewater, and stormwater improvements).

Infrastructure Category	Weight	Criteria	Project Parameter	Point Range	Measurement or Calculation	Points
Streets	75%	Pavement Condition	Avg. PCI = 70.49	0-60	0.6x(100-PCI)	17.71
		Intersection Level of Service	Existing LOS: D-F; Proposed LOS C-D	0-15	F to C or better = 15; E to C or better = 10; D to C or better = 5	5.00
Drainage System	15%	Extreme Event Level of Service	Improve to convey extreme event	0-5	No improvements = 0; Partial Improvements = 3; Conveys extreme event = 5	5.00
		Design Level of Service	Improve to convey design event	0-10	No improvements = 0; Partial Improvements = 5; Conveys extreme event = 10	10.00
Water	5%	WIRP Rank (1045 total Area)	110	0-5	Replace since 2000 = 0; ((Total WIRP Areas-WIRP Rank)/Total WIRP Areas) x 5	4.82
Wastewater	5%	SSO	3 SSO	0-2	No SSO = 0; SSO = 1; Repeat SSO = 2	1.00
		Point Repairs	PR = 1	0-2	PR<5 = 0; PR 5-10 = 1; PR >10 = 2	0.00
		Age of Pipe	30+ years	0-1	30 years or less = 0; More than 30 years = 1; Agreed order = 1	1.00
					Service Area Benefit Factor	44.52

Benefitted Population 35% Current ADT + 65 Future ADT = Current METRO Ridership 50,020.55

Current ADT	36,746	35% Current ADT	12,861.10
Future ADT	39,533	65% Future ADT	25,696.45
Current METRO	11,463	Current METRO	11,463.00

Candidate Project Priority Score = Service Benefit Factor x2.12 miles $\frac{\text{Benefitted Population}}{\text{City Rebuild Houston Funds}}$

= 44.52 x2.12 miles $\frac{50{,}021}{\$41{,}916.64}$

Candidate Project Priority Score = **112.66**

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY18 Dollars)

Need No.: N-2013T-C01; N-2013T-0012 - Westheimer Road (Shepherd Drive and Main Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$27,925,436.44
	1.1	Total Unit Price, Paving Items	$12,673,324.62
	1.2	Total Unit Price, Storm Sewer Items	$10,813,869.22
	1.3	Total Unit Price, Water Items	$3,105,887.40
	1.4	Total Unit Price, Wastewater Items	$1,332,355.20
2	**Contingency (30% of 410)**		**$8,377,630.93**
3	**Construction Management (15% of 410)**		**$4,188,815.47**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$7,260,613.47**
5	**Design Management (15% of Engineering Fee Estimate)**		**$1,089,092.02**
6	**Land Acquisition (Engineer's Best Estimate)**		**$837,540.00**
	Total Project Cost		**$49,679,128.33**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Need No.: N-2013T-C01; N-2013T-0012- Westheimer Road (Shepherd Drive and Main Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$23,487,193.84
	1.1	Total Unit Price, Paving Items	$12,673,324.62
	1.2	Total Unit Price, Storm Sewer Items	$10,813,869.22
2	**Contingency (30% of 410)**		**$7,046,158.15**
3	**Construction Management (15% of 410)**		**$3,523,079.08**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$6,106,670.40**
5	**Design Management (15% of Engineering Fee Estimate)**		**$916,000.56**
6	**Land Acquisition (Engineer's Best Estimate)**		**$837,540.00**
	Total Project Cost		**$41,916,642.03**

Note: General Items are prorated in Paving & Storm items.

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01; N-2013T-0012: Westheimer Road between Shepherd Drive and Main Street **BID FORM PART B**

Document 00410B [Note 1]

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND PROCESS (PRINT OR TYPE NUMERICAL AMOUNTS

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	02221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	55,430	$6.00	$332,580.00
2	222102	02221	Remove and Dispose of Existing Driveways and Sidewalks	SY	19,100	$5.00	$95,500.00
3	275106	02751	11” Reinforced Concrete Pavement (Complete in Place)	SY	42,650	$70.00	$2,985,500.00
4	233601	02336	Lime stabilized subgrade (6" thick)	SY	4,170	$3.00	$12,510.00
5	233602	02336	Lime stabilized subgrade (8" thick)	SY	46,920	$4.00	$187,680.00
6	233603	02336	Lime (6, 7% By Weight)	Ton	1,000	$164.00	$164,000.00
7	277101	02771	6” Concrete Curb	LF	22,390	$4.00	$89,560.00
8	275201	02752	Expansion Joint	LF	4,800	$8.00	$38,400.00
9	275401	02754	6” Concrete for Driveways	SF	37,550	$8.00	$300,400.00
10	277501	02775	4-1/2” Concrete for Sidewalks	SF	134,350	$7.00	$940,450.00
11	292201	02922	Sodding	SY	3,730	$5.00	$18,650.00
12	289301	02893	Traffic Signal/Intersection	EA	14	$325,000.00	$4,550,000.00
13	231501	02315	Roadway Excavation	CY	25,020	$16.00	$400,320.00
14	1601002		Street Light Installation (includes conduit and Temporary Lighting during Construction)	LF	11,196	$32.00	$358,272.00
			Ancillary items (10%)				$1,047,382.20
			SubTotal of Paving				$11,521,204.20
			General Items (10% of Paving Subtotal)				$1,152,120.42
TOTAL - PAVING ITEMS							**$12,673,324.62**

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222103	02221	Remove Storm Sewer Pipe (All Types)	LF	10,810	$20.00	$216,200.00
2	222105	02221	Remove Inlets (All Types)	EA	124	$370.00	$45,880.00
3	222106	02221	Remove Manholes (All Types, All Depths)	EA	54	$390.00	$21,060.00
4	263301	02633	Type B-B Inlet, Precast, All Depths, Complete in Place	EA	128	$2,910.00	$372,480.00
5	208201	02082	Type C Storm Manhole (42" and smaller), all Depths, Complete in Place	EA	42	$3,470.00	$145,740.00

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01; N-2013T-0012: Westheimer Road between Shepherd Drive and Main Street **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
6	208202	02082	Type C Storm Manhole (48" to 72"), all Depths, Complete in Place	EA	16	$6,340.00	$101,440.00
7	208203	02082	Type C Storm Manhole (78" and Larger), all Depths, Complete in Place	EA	11	$16,500.00	$181,500.00
8	263100	02631	24-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	4,610	$115.00	$530,150.00
9	263100	02631	30-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	314	$150.00	$47,100.00
10	263101	02631	36-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	1,745	$180.00	$314,100.00
11	263102	02631	42-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	260	$215.00	$55,900.00
12	263103	02631	48-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	501	$250.00	$125,250.00
13	263104	02631	54-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	425	$270.00	$114,750.00
14	263105	02631	60-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	1,110	$350.00	$388,500.00
15	263106	02631	66-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	925	$360.00	$333,000.00
16	263107	02631	72-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	300	$485.00	$145,500.00
17	263106	02631	78-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	101	$550.00	$55,550.00
18	263107	02631	96-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	259	$730.00	$189,070.00
19	263117	02631	144-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	183	$1,350.00	$247,050.00
20	263108	02631	7-foot by 4-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	132	$520.00	$68,640.00
21	263109	02631	8-foot by 8-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$920.00	$0.00
22	263111	02631	12-foot by 11-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	1,176	$1,385.00	$1,628,760.00
23	263112	02631	12-foot by 12-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	2,559	$1,400.00	$3,582,600.00
24	263114	02631	14-foot by 10-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$14,500.00	$0.00
25	226001	02260	Trench Safety System	LF	13,431	$2.00	$26,862.00
			Ancillary items (10%)				$893,708.20
			SubTotal of Storm Sewer				$9,830,790.20
			General Items (10% of Storm Sewer Subtotal)				$983,079.02
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$10,813,869.22**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	02221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	0	$800.00	$0.00
2	222109	02221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	0	$20.00	$0.00
3	222202	02222	Abandon and Fill Existing Sanitary Sewer Pipe (All Sizes)	LF	0	$20.00	$0.00

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01; N-2013T-0012: Westheimer Road between Shepherd Drive and Main Street **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
4	253101	02531	8-inch Diameter Sanitary Sewer, all materials and depths	LF	860	$120.00	$103,200.00
5	253102	02531	12-inch Diameter Sanitary Sewer, all materials and depths	LF	4482	$180.00	$806,760.00
6	208204	02082	Sanitary Sewer Manholes (4' diameter)	EA	17	$4,200.00	$71,400.00
7	253401	02534	Sanitary Sewer Service Leads 8-inch leads	LF	240	$140.00	$33,600.00
			Ancillary Items (20%)				$196,272.00
			SubTotal of Wastewater				$1,211,232.00
			General Items (10% of Wastewater Subtotal)				$121,123.20
TOTAL UNIT PRICES - WASTEWATER							**$1,332,355.20**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	252001	02520	Remove and Salvage Fire Hydrants	EA	22	$400.00	$8,800.00
2	251601	02516	Cut, Plug, and Abandon Existing Water Line (All Types)	EA	2	$910.00	$1,820.00
3	251102	02511	4" Water Line	LF	30	$90.00	$2,700.00
4	251103	02511	6" Water Line	LF	61	$95.00	$5,795.00
5	251104	02511	16" Water Line	LF	11537	$190.00	$2,192,030.00
6	251105	02511	24" Water Line	LF		$300.00	$0.00
7	251201	02512	1-1/2-inch short side service lead, complete in place	EA	10	$1,800.00	$18,000.00
8	251202	02512	1-1/2-inch long side service lead, complete in place	EA	2	$2,500.00	$5,000.00
9	252002	02520	Fire Hydrant Assembly	EA	22	$5,400.00	$118,800.00
		-	Ancillary items (20%)				$470,589.00
			SubTotal				$2,823,534.00
		-	General Items (10% of Water SubTotal)				$282,353.40
TOTAL UNIT PRICES - WATER							**$3,105,887.40**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1		-	Excavation (Detention Pond) (Dry)	AC-FT			$0.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$0.00**

TOTAL BASE UNIT PRICE: **$27,925,436.44**

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.

2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.

Bidders Initials [ ]

Major Thoroughfare and Collectors (No Change in Classification) Candidate
Project Priority Score Determination

N-2013T-0012- Westheimer Road: Montrose Boulevard to Main Street; 3 to 5-Lane roadway with concrete curb and gutter, left turn lanes at signalized intersections, parking, sidewalks, traffic signals, and underground utilities (water, wastewater, and stormwater improvements).

Infrastructure Category	Weight	Criteria	Project Parameter	Point Range	Measurement or Calculation	Points
Streets	75%	Pavement Condition	Avg. PCI = 60.80	0-60	0.6x(100-PCI)	23.52
		Intersection Level of Service	Existing LOS: D-F; Proposed LOS C-D	0-15	F to C or better = 15; E to C or better = 10; D to C or better = 5	5.00
Drainage System	15%	Extreme Event Level of Service	Improve to convey extreme event	0-5	No improvements = 0; Partial Improvements = 3; Conveys extreme event = 5	5.00
		Design Level of Service	Improve to convey design event	0-10	No improvements = 0; Partial Improvements = 5; Conveys extreme event = 10	10.00
Water	5%	WIRP Rank (1045 total Area)	110	0-5	Replace since 2000 = 0; ((Total WIRP Areas-WIRP Rank)/Total WIRP Areas) x 5	4.82
Wastewater	5%	SSO	3 SSO	0-2	No SSO = 0; SSO = 1; Repeat SSO = 2	1.00
		Point Repairs	PR = 1	0-2	PR<5 = 0; PR 5-10 = 1; PR >10 = 2	0.00
		Age of Pipe	30+ years	0-1	30 years or less = 0; More than 30 years = 1; Agreed order = 1	1.00
					Service Area Benefit Factor	50.34

Benefitted Population — 35% Current ADT + 65 Future ADT = Current METRO Ridership — 50,020.55

Current ADT	36,746	35% Current ADT	12,861.10
Future ADT	39,533	65% Future ADT	25,696.45
Current METRO	11,463	Current METRO	11,463.00

Candidate Project Priority Score = Service Benefit Factor

= 50.34

Candidate Project Priority Score =	**163.28**

Benefitted Population

City Rebuild Houston Funds

50,021

$15,421.37

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY18 Dollars)

Need No.: N-2013T-0012 - Westheimer Road Sub-Project 1 (Montrose Boulevard and Main Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$10,337,133.84
	1.1	Total Unit Price, Paving Items	$6,015,977.22
	1.2	Total Unit Price, Storm Sewer Items	$2,553,538.02
	1.3	Total Unit Price, Water Items	$1,378,535.40
	1.4	Total Unit Price, Wastewater Items	$389,083.20
2	**Contingency (30% of 410)**		**$3,101,140.15**
3	**Construction Management (15% of 410)**		**$1,550,570.08**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$2,687,654.80**
5	**Design Management (15% of Engineering Fee Estimate)**		**$403,148.22**
6	**Land Acquisition (Engineer's Best Estimate)**		**$433,290.00**
	Total Project Cost		**$18,512,937.09**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Need No.: N-2013T-0012- Westheimer Road Sub-Project 1
(Montrose Boulevard and Main Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$8,569,515.24
	1.1	Total Unit Price, Paving Items	$6,015,977.22
	1.2	Total Unit Price, Storm Sewer Items	$2,553,538.02
2	**Contingency (30% of 410)**		**$2,570,854.57**
3	**Construction Management (15% of 410)**		**$1,285,427.29**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$2,228,073.96**
5	**Design Management (15% of Engineering Fee Estimate)**		**$334,211.09**
6	**Land Acquisition (Engineer's Best Estimate)**		**$433,290.00**
	Total Project Cost		**$15,421,372.15**

Note: General Items are prorated in Paving & Storm items.

Document 00410B [Note 1]

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	02221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	24,890	$6.00	$149,340.00
2	222102	02221	Remove and Dispose of Existing Driveways and Sidewalks	SY	7,800	$5.00	$39,000.00
3	275106	02751	11” Reinforced Concrete Pavement (Complete in Place)	SY	20,340	$70.00	$1,423,800.00
4	233601	02336	Lime stabilized subgrade (6" thick)	SY	1,350	$3.00	$4,050.00
5	233602	02336	Lime stabilized subgrade (8" thick)	SY	22,380	$4.00	$89,520.00
6	233603	02336	Lime (6, 7% By Weight)	Ton	470	$164.00	$77,080.00
7	277101	02771	6” Concrete Curb	LF	9,670	$4.00	$38,680.00
8	275201	02752	Expansion Joint	LF	2,290	$8.00	$18,320.00
9	275401	02754	6” Concrete for Driveways	SF	12,150	$8.00	$97,200.00
10	277501	02775	4-1/2” Concrete for Sidewalks	SF	58,030	$7.00	$406,210.00
11	292201	02922	Sodding	SY	1,610	$5.00	$8,050.00
12	289301	02893	Traffic Signal/Intersection	EA	7	$325,000.00	$2,275,000.00
13	231501	02315	Roadway Excavation	CY	11,930	$16.00	$190,880.00
14	1601002		Street Light Installation (includes conduit and Temporary Lighting during Construction)	LF	4,836	$32.00	$154,752.00
			Ancillary items (10%)				$497,188.20
			SubTotal of Paving				$5,469,070.20
			General Items (10% of Paving Subtotal)				$546,907.02
TOTAL - PAVING ITEMS							**$6,015,977.22**

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222103	02221	Remove Storm Sewer Pipe (All Types)	LF	4,450	$20.00	$89,000.00
2	222105	02221	Remove Inlets (All Types)	EA	50	$370.00	$18,500.00
3	222106	02221	Remove Manholes (All Types, All Depths)	EA	30	$390.00	$11,700.00
4	263301	02633	Type B-B Inlet, Precast, All Depths, Complete in Place	EA	54	$2,910.00	$157,140.00
5	208201	02082	Type C Storm Manhole (42" and smaller), all Depths, Complete in Place	EA	30	$3,470.00	$104,100.00
6	208202	02082	Type C Storm Manhole (48" to 72"), all Depths, Complete in Place	EA	15	$6,340.00	$95,100.00

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0012: Westheimer Road between Montrose Boulevard and Main Street, Sub-Project 1 **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
7	263100	02631	24-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	3,600	$115.00	$414,000.00
8	263101	02631	36-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	550	$180.00	$99,000.00
9	263103	02631	48-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	501	$250.00	$125,250.00
10	263104	02631	54-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	425	$270.00	$114,750.00
11	263105	02631	60-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	1,110	$350.00	$388,500.00
12	263106	02631	66-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	925	$360.00	$333,000.00
13	263107	02631	72-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	300	$485.00	$145,500.00
14	226001	02260	Trench Safety System	LF	7,411	$2.00	$14,822.00
			Ancillary items (10%)				$211,036.20
			SubTotal of Storm Sewer				$2,321,398.20
			General Items (10% of Storm Sewer Subtotal)				$232,139.82
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$2,553,538.02**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	02221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	0	$800.00	$0.00
2	222109	02221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	0	$20.00	$0.00
3	222202	02222	Abandon and Fill Existing Sanitary Sewer Pipe (All Sizes)	LF	0	$20.00	$0.00
4	253101	02531	8-inch Diameter Sanitary Sewer, all materials and depths	LF	100	$120.00	$12,000.00
5	253102	02531	12-inch Diameter Sanitary Sewer, all materials and depths	LF	1182	$180.00	$212,760.00
6	208204	02082	Sanitary Sewer Manholes (4' diameter)	EA	10	$4,200.00	$42,000.00
7	253401	02534	Sanitary Sewer Service Leads 8-inch leads	LF	240	$140.00	$33,600.00
			Ancillary Items (20%)				$53,352.00
			SubTotal of Wastewater				$353,712.00
			General Items (10% of Wastewater Subtotal)				$35,371.20
TOTAL UNIT PRICES - WASTEWATER							**$389,083.20**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	252001	02520	Remove and Salvage Fire Hydrants	EA	10	$400.00	$4,000.00
2	251601	02516	Cut, Plug, and Abandon Existing Water Line (All Types)	EA	2	$910.00	$1,820.00
3	251102	02511	4" Water Line	LF	30	$90.00	$2,700.00
4	251103	02511	6" Water Line	LF	61	$95.00	$5,795.00
5	251104	02511	16" Water Line	LF	5137	$190.00	$976,030.00

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-0012: Westheimer Road between Montrose Boulevard and Main Street, Sub-Project 1 **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
6	251201	02512	1-1/2-inch short side service lead, complete in place	EA	0	$1,800.00	$0.00
6	251202	02512	1-1/2-inch long side service lead, complete in place	EA	0	$2,500.00	$0.00
6	252002	02520	Fire Hydrant Assembly	EA	10	$5,400.00	$54,000.00
		-	Ancillary items (20%)				$208,869.00
			SubTotal				$1,253,214.00
		-	General Items (10% of Water SubTotal)				$125,321.40
TOTAL UNIT PRICES - WATER							**$1,378,535.40**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1		-	Excavation (Detention Pond) (Dry)	AC-FT			$0.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$0.00**

TOTAL BASE UNIT PRICE: **$10,337,133.84**

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.

Bidders Initials [ ]

Major Thoroughfare and Collectors (No Change in Classification) Candidate
Project Priority Score Determination

N-2013T-C01- Westheimer Road: Kuester Street to Montrose Boulevard; 3 to 5-Lane roadway with concrete curb and gutter, left turn lanes at signalized intersections, parking, sidewalks, traffic signals, and underground utilities (water, wastewater, and stormwater improvements).

Infrastructure Category	Weight	Criteria	Project Parameter	Point Range	Measurement or Calculation	Points
Streets	75%	Pavement Condition	Avg. PCI = 70.25	0-60	0.6x(100-PCI)	17.85
		Intersection Level of Service	Existing LOS: D-F; Proposed LOS C-D	0-15	F to C or better = 15; E to C or better = 10; D to C or better = 5	5.00
Drainage System	15%	Extreme Event Level of Service	Improve to convey extreme event	0-5	No improvements = 0; Partial Improvements = 3; Conveys extreme event = 5	5.00
		Design Level of Service	Improve to convey design event	0-10	No improvements = 0; Partial Improvements = 5; Conveys extreme event = 10	10.00
Water	5%	WIRP Rank (1045 total Area)	110	0-5	Replace since 2000 = 0; ((Total WIRP Areas-WIRP Rank)/Total WIRP Areas) x 5	4.82
Wastewater	5%	SSO	3 SSO	0-2	No SSO = 0; SSO = 1; Repeat SSO = 2	1.00
		Point Repairs	PR = 1	0-2	PR<5 = 0; PR 5-10 = 1; PR >10 = 2	0.00
		Age of Pipe	30+ years	0-1	30 years or less = 0; More than 30 years = 1; Agreed order = 1	1.00
					Service Area Benefit Factor	44.67

Benefitted Population — 35% Current ADT + 65 Future ADT = Current METRO Ridership — 50,020.55

Current ADT	36,746	35% Current ADT	12,861.10
Future ADT	39,533	65% Future ADT	25,696.45
Current METRO	11,463	Current METRO	11,463.00

Candidate Project Priority Score = Service Benefit Factor

= 44.67

Candidate Project Priority Score = **119.92**

Benefitted Population

City Rebuild Houston Funds

50,021

$18,631.33

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY18 Dollars)

Need No.: N-2013T-C01 - Westheimer Road Sub-Project 2 (Kuester Street and Montrose Boulevard)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$11,560,152.78
	1.1	Total Unit Price, Paving Items	$3,638,549.86
	1.2	Total Unit Price, Storm Sewer Items	$6,845,710.52
	1.3	Total Unit Price, Water Items	$848,588.40
	1.4	Total Unit Price, Wastewater Items	$227,304.00
2	**Contingency (30% of 410)**		**$3,468,045.83**
3	**Construction Management (15% of 410)**		**$1,734,022.92**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$3,005,639.72**
5	**Design Management (15% of Engineering Fee Estimate)**		**$450,845.96**
6	**Land Acquisition (Engineer's Best Estimate)**		**$294,360.00**
	Total Project Cost		**$20,513,067.21**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Need No.: N-2013T-C01- Westheimer Road Sub-Project 2 (Kuester Street and Montrose Boulevard)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$10,484,260.38
	1.1	Total Unit Price, Paving Items	$3,638,549.86
	1.2	Total Unit Price, Storm Sewer Items	$6,845,710.52
2	**Contingency (30% of 410)**		**$3,145,278.11**
3	**Construction Management (15% of 410)**		**$1,572,639.06**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$2,725,907.70**
5	**Design Management (15% of Engineering Fee Estimate)**		**$408,886.15**
6	**Land Acquisition (Engineer's Best Estimate)**		**$294,360.00**
	Total Project Cost		**$18,631,331.40**

Note: General Items are prorated in Paving & Storm items.

Document 00410B [Note 1]

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	02221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	15,100	$6.00	$90,600.00
2	222102	02221	Remove and Dispose of Existing Driveways and Sidewalks	SY	5,310	$5.00	$26,550.00
3	275106	02751	11” Reinforced Concrete Pavement (Complete in Place)	SY	12,570	$70.00	$879,900.00
4	233601	02336	Lime stabilized subgrade (6" thick)	SY	1,160	$3.00	$3,480.00
5	233602	02336	Lime stabilized subgrade (8" thick)	SY	13,830	$4.00	$55,320.00
6	233603	02336	Lime (6, 7% By Weight)	Ton	290	$164.00	$47,560.00
7	277101	02771	6” Concrete Curb	LF	6,230	$4.00	$24,920.00
8	275201	02752	Expansion Joint	LF	1,410	$8.00	$11,280.00
9	275401	02754	6” Concrete for Driveways	SF	10,400	$8.00	$83,200.00
10	277501	02775	4-1/2” Concrete for Sidewalks	SF	37,360	$7.00	$261,520.00
11	292201	02922	Sodding	SY	1,040	$5.00	$5,200.00
12	289301	02893	Traffic Signal/Intersection	EA	4	$325,000.00	$1,300,000.00
13	231501	02315	Roadway Excavation	CY	7,370	$16.00	$117,920.00
14	1601002		Street Light Installation (includes conduit and Temporary Lighting during Construction)	LF	3,113	$32.00	$99,616.00
			Ancillary items (10%)				$300,706.60
			SubTotal of Paving				$3,307,772.60
			General Items (10% of Paving Subtotal)				$330,777.26
TOTAL - PAVING ITEMS							**$3,638,549.86**

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222103	02221	Remove Storm Sewer Pipe (All Types)	LF	3,113	$20.00	$62,260.00
2	222105	02221	Remove Inlets (All Types)	EA	43	$370.00	$15,910.00
3	222106	02221	Remove Manholes (All Types, All Depths)	EA	15	$390.00	$5,850.00
4	263301	02633	Type B-B Inlet, Precast, All Depths, Complete in Place	EA	43	$2,910.00	$125,130.00
5	208201	02082	Type C Storm Manhole (42" and smaller), all Depths, Complete in Place	EA	6	$3,470.00	$20,820.00
6	208202	02082	Type C Storm Manhole (48" to 72"), all Depths, Complete in Place	EA	1	$6,340.00	$6,340.00

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
7	208203	02082	Type C Storm Manhole (78" and Larger), all Depths, Complete in Place	EA	11	$16,500.00	$181,500.00
8	263100	02631	24-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	492	$115.00	$56,580.00
9	263100	02631	30-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$150.00	$0.00
10	263101	02631	36-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$180.00	$0.00
11	263102	02631	42-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$215.00	$0.00
12	263106	02631	78-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	101	$550.00	$55,550.00
13	263107	02631	96-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$730.00	$0.00
14	263117	02631	144-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	183	$1,350.00	$247,050.00
15	263108	02631	7-foot by 4-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$520.00	$0.00
16	263109	02631	8-foot by 8-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$920.00	$0.00
17	263111	02631	12-foot by 11-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	932	$1,385.00	$1,290,820.00
18	263112	02631	12-foot by 12-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	2,559	$1,400.00	$3,582,600.00
19	263114	02631	14-foot by 10-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$1,450.00	$0.00
20	226001	02260	Trench Safety System	LF	3,601	$2.00	$7,202.00
			Ancillary items (10%)				$565,761.20
			SubTotal of Storm Sewer				$6,223,373.20
			General Items (10% of Storm Sewer Subtotal)				$622,337.32
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$6,845,710.52**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	02221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	0	$800.00	$0.00
2	222109	02221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	0	$20.00	$0.00
3	222202	02222	Abandon and Fill Existing Sanitary Sewer Pipe (All Sizes)	LF	0	$20.00	$0.00
4	253101	02531	8-inch Diameter Sanitary Sewer, all materials and depths	LF	760	$120.00	$91,200.00
5	253102	02531	12-inch Diameter Sanitary Sewer, all materials and depths	LF	380	$180.00	$68,400.00
6	208204	02082	Sanitary Sewer Manholes (4' diameter)	EA	3	$4,200.00	$12,600.00
7	253401	02534	Sanitary Sewer Service Leads 8-inch leads	LF	0	$140.00	$0.00
			Ancillary Items (20%)				$34,440.00
			SubTotal of Wastewater				$206,640.00
			General Items (10% of Wastewater Subtotal)				$20,664.00
TOTAL UNIT PRICES - WASTEWATER							**$227,304.00**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01: Westheimer Road between Kuester Street and Montrose Boulevard, Sub-Project 2 **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	252001	02520	Remove and Salvage Fire Hydrants	EA	6	$400.00	$2,400.00
2	251601	02516	Cut, Plug, and Abandon Existing Water Line (All Types)	EA	0	$910.00	$0.00
3	251102	02511	4" Water Line	LF	0	$90.00	$0.00
4	251103	02511	6" Water Line	LF	0	$95.00	$0.00
5	251104	02511	16" Water Line	LF	3153	$190.00	$599,070.00
6	251105	02511	24" Water Line	LF	0	$300.00	$0.00
7	251201	02512	1-1/2-inch short side service lead, complete in place	EA	5	$1,800.00	$9,000.00
8	252002	02520	Fire Hydrant Assembly	EA	6	$5,400.00	$32,400.00
		-	Ancillary items (20%)				$128,574.00
			SubTotal				$771,444.00
		-	General Items (10% of Water SubTotal)				$77,144.40
TOTAL UNIT PRICES - WATER							**$848,588.40**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1		-	Excavation (Detention Pond) (Dry)	AC-FT			$0.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$0.00**

TOTAL BASE UNIT PRICE: **$11,560,152.78**

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.

Bidders Initials [ ]

Major Thoroughfare and Collectors (No Change in Classification) Candidate
Project Priority Score Determination

N-2013T-C01- Westheimer Road: Shepherd Drive to Kuester Street; 3 to 5-Lane roadway with concrete curb and gutter, left turn lanes at signalized intersections, parking, sidewalks, traffic signals, and underground utilities (water, wastewater, and stormwater improvements).

Infrastructure Category	Weight	Criteria	Project Parameter	Point Range	Measurement or Calculation	Points
Streets	75%	Pavement Condition	Avg. PCI = 76.94	0-60	0.6x(100-PCI)	13.84
		Intersection Level of Service	Existing LOS: D-F; Proposed LOS C-D	0-15	F to C or better = 15; E to C or better = 10; D to C or better = 5	5.00
Drainage System	15%	Extreme Event Level of Service	Improve to convey extreme event	0-5	No improvements = 0; Partial Improvements = 3; Conveys extreme event = 5	5.00
		Design Level of Service	Improve to convey design event	0-10	No improvements = 0; Partial Improvements = 5; Conveys extreme event = 10	10.00
Water	5%	WIRP Rank (1045 total Area)	110	0-5	Replace since 2000 = 0; ((Total WIRP Areas-WIRP Rank)/Total WIRP Areas) x 5	4.45
Wastewater	5%	SSO	3 SSO	0-2	No SSO = 0; SSO = 1; Repeat SSO = 2	1.00
		Point Repairs	PR = 1	0-2	PR<5 = 0; PR 5-10 = 1; PR >10 = 2	0.00
		Age of Pipe	30+ years	0-1	30 years or less = 0; More than 30 years = 1; Agreed order = 1	1.00
					Service Area Benefit Factor	40.29

Benefitted Population — 35% Current ADT + 65 Future ADT = Current METRO Ridership — 50,020.55

Current ADT	36,746	35% Current ADT	12,861.10
Future ADT	39,533	65% Future ADT	25,696.45
Current METRO	11,463	Current METRO	11,463.00

Candidate Project Priority Score = Service Benefit Factor

= 40.29

Candidate Project Priority Score = **256.28**

Benefitted Population / City Rebuild Houston Funds

50,021 / $7,863.85

Pre-Engineering Services Contracts

Total Project Cost Estimate Breakdown (FY18 Dollars)

Need No.: N-2013T-C01 - Westheimer Road Sub-Project 3 (Shepherd Drive and Kuester Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$6,028,101.42
	1.1	Total Unit Price, Paving Items	$3,018,749.14
	1.2	Total Unit Price, Storm Sewer Items	$1,414,620.68
	1.3	Total Unit Price, Water Items	$878,763.60
	1.4	Total Unit Price, Wastewater Items	$715,968.00
2	**Contingency (30% of 410)**		**$1,808,430.43**
3	**Construction Management (15% of 410)**		**$904,215.21**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$1,567,306.37**
5	**Design Management (15% of Engineering Fee Estimate)**		**$235,095.96**
6	**Land Acquisition (Engineer's Best Estimate)**		**$109,890.00**
	Total Project Cost		**$10,653,039.38**

Note: General Items are prorated in Paving, Storm, Water & Wastewater items.

Pre-Engineering Services Contracts

COH Rebuild Funds

Need No.: N-2013T-C01- Westheimer Road -Sub-Project 3 (Shepherd Drive and Kuester Street)

1	**410 (Summarized based on FY 18 List of Unit Prices)**		$4,433,369.82
	1.1	Total Unit Price, Paving Items	$3,018,749.14
	1.2	Total Unit Price, Storm Sewer Items	$1,414,620.68
2	**Contingency (30% of 410)**		**$1,330,010.95**
3	**Construction Management (15% of 410)**		**$665,005.47**
4	**Engineering Fee Estimate (20% of Sum of 410 and Contingency)**		**$1,152,676.15**
5	**Design Management (15% of Engineering Fee Estimate)**		**$172,901.42**
6	**Land Acquisition (Engineer's Best Estimate)**		**$109,890.00**
	Total Project Cost		**$7,863,853.82**

Note: General Items are prorated in Paving & Storm items.

Document 00410B [Note 1]

BID FORM - PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND

A. STIPULATED PRICE **$ N/A**

(Total Bid Price; minus Base Unit Prices, Extra Unit Process, Cash Allowance and All Alternates, if any)

B. BASE UNIT PRICE TABLE:

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - PAVING ITEMS							
1	222101	02221	Remove and Dispose of Existing Pavement and Curb -Assumes all concrete pavement thicknesses with or without asphalt overlay	SY	15,440	$6.00	$92,640.00
2	222102	02221	Remove and Dispose of Existing Driveways and Sidewalks	SY	6,000	$5.00	$30,000.00
3	275106	02751	11” Reinforced Concrete Pavement (Complete in Place)	SY	9,740	$70.00	$681,800.00
4	233601	02336	Lime stabilized subgrade (6" thick)	SY	1,670	$3.00	$5,010.00
5	233602	02336	Lime stabilized subgrade (8" thick)	SY	10,720	$4.00	$42,880.00
6	233603	02336	Lime (6, 7% By Weight)	Ton	240	$164.00	$39,360.00
7	277101	02771	6” Concrete Curb	LF	6,490	$4.00	$25,960.00
8	275201	02752	Expansion Joint	LF	1,100	$8.00	$8,800.00
9	275401	02754	6” Concrete for Driveways	SF	15,000	$8.00	$120,000.00
10	277501	02775	4-1/2” Concrete for Sidewalks	SF	38,960	$7.00	$272,720.00
11	292201	02922	Sodding	SY	1,080	$5.00	$5,400.00
12	289301	02893	Traffic Signal/Intersection	EA	3	$325,000.00	$975,000.00
13	231501	02315	Roadway Excavation	CY	5,710	$16.00	$91,360.00
14	1601002		Street Light Installation (includes conduit and Temporary Lighting during Construction)	LF	3,247	$32.00	$103,904.00
			Ancillary items (10%)				$249,483.40
			SubTotal of Paving				$2,744,317.40
			General Items (10% of Paving Subtotal)				$274,431.74
TOTAL - PAVING ITEMS							**$3,018,749.14**

Item No.	Item Reference No. [Note 2]	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - STORM SEWER ITEMS							
1	222103	02221	Remove Storm Sewer Pipe (All Types)	LF	3,247	$20.00	$64,940.00
2	222105	02221	Remove Inlets (All Types)	EA	31	$370.00	$11,470.00
3	222106	02221	Remove Manholes (All Types, All Depths)	EA	9	$390.00	$3,510.00
4	263301	02633	Type B-B Inlet, Precast, All Depths, Complete in Place	EA	31	$2,910.00	$90,210.00
5	208201	02082	Type C Storm Manhole (42" and smaller), all Depths, Complete in Place	EA	6	$3,470.00	$20,820.00
6	208202	02082	Type C Storm Manhole (48" to 72"), all Depths, Complete in Place	EA	0	$6,340.00	$0.00

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01: Westheimer Road between Shepherd Drive and Kuester Street, Sub-Project 3 **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
7	208203	02082	Type C Storm Manhole (78" and Larger), all Depths, Complete in Place	EA	0	$16,500.00	$0.00
8	263100	02631	24-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	518	$115.00	$59,570.00
9	263100	02631	30-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	314	$150.00	$47,100.00
10	263101	02631	36-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	1,195	$180.00	$215,100.00
11	263102	02631	42-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	260	$215.00	$55,900.00
12	263106	02631	78-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$550.00	$0.00
13	263107	02631	96-Inch RCP Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	259	$730.00	$189,070.00
14	263108	02631	7-foot by 4-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	132	$520.00	$68,640.00
15	263109	02631	8-foot by 8-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$920.00	$0.00
16	263111	02631	12-foot by 11-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	244	$1,385.00	$337,940.00
17	263112	02631	12-foot by 12-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$1,400.00	$0.00
18	263114	02631	14-foot by 10-foot RCB Storm Sewers by Open-Cut, All Depths, Complete in Place	LF	0	$1,450.00	$0.00
19	226001	02260	Trench Safety System	LF	2,419	$2.00	$4,838.00
			Ancillary items (10%)				$116,910.80
			SubTotal of Storm Sewer				$1,286,018.80
			General Items (10% of Storm Sewer Subtotal)				$128,601.88
TOTAL UNIT PRICES - STORM SEWER ITEMS							**$1,414,620.68**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WASTEWATER							
1	222108	02221	Remove Existing Sanitary Sewer Manhole (All Types)	EA	0	$800.00	$0.00
2	222109	02221	Remove Existing Sanitary Sewer Pipe (All Types)	LF	0	$20.00	$0.00
3	222202	02222	Abandon and Fill Existing Sanitary Sewer Pipe (All Sizes)	LF	0	$20.00	$0.00
4	253101	02531	8-inch Diameter Sanitary Sewer, all materials and depths	LF		$120.00	$0.00
5	253102	02531	12-inch Diameter Sanitary Sewer, all materials and depths	LF	2920	$180.00	$525,600.00
6	208204	02082	Sanitary Sewer Manholes (4' diameter)	EA	4	$4,200.00	$16,800.00
7	253401	02534	Sanitary Sewer Service Leads 8-inch leads	LF	0	$140.00	$0.00
			Ancillary Items (20%)				$108,480.00
			SubTotal of Wastewater				$650,880.00
			General Items (10% of Wastewater Subtotal)				$65,088.00
TOTAL UNIT PRICES - WASTEWATER							**$715,968.00**

Bidders Initials [ ]

MODIFIED SAMPLE 410

NEED AREA: N-2013T-C01: Westheimer Road between Shepherd Drive and Kuester Street, Sub-Project 3 **BID FORM PART B**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - WATER							
1	252001	02520	Remove and Salvage Fire Hydrants	EA	6	$400.00	$2,400.00
2	251601	02516	Cut, Plug, and Abandon Existing Water Line (All Types)	EA	0	$910.00	$0.00
3	251102	02511	4" Water Line	LF	0	$90.00	$0.00
4	251103	02511	6" Water Line	LF	0	$95.00	$0.00
5	251104	02511	16" Water Line	LF	3247	$190.00	$616,930.00
6	251105	02511	24" Water Line	LF	0	$300.00	$0.00
6	251201	02512	1-1/2-inch short side service lead, complete in place	EA	5	$1,800.00	$9,000.00
6	251202	02512	1-1/2-inch long side service lead, complete in place	EA	2	$2,500.00	$5,000.00
6	252002	02520	Fire Hydrant Assembly	EA	6	$5,400.00	$32,400.00
		-	Ancillary items (20%)				$133,146.00
			SubTotal				$798,876.00
		-	General Items (10% of Water SubTotal)				$79,887.60
TOTAL UNIT PRICES - WATER							**$878,763.60**

Item No.	Item Reference No. Note 2	Spec No.	Item Description	Unit Measure	Unit Quantity	Unit Price (this column controls)	Total in Figures
UNIT PRICES - DETENTION							
1		-	Excavation (Detention Pond) (Dry)	AC-FT			$0.00
2		-	Excavation (Detention Pond) (Wet)	AC-FT			$0.00
TOTAL UNIT PRICES - DETENTION							**$0.00**

TOTAL BASE UNIT PRICE: **$6,028,101.42**

Note:

1. This is not a Standard Document 00410B (Form 410). The Form 410 was modified for the purpose of planning level cost estimates for Pre-Engineering Studies.
2. The "Item Reference No." shall be designated for each item listed. The numbers serve as reference and will be used for the future cost updates.

Bidders Initials [ ]

EXHIBITS

GUNDA CORPORATION
Engineers, Planners & Managers

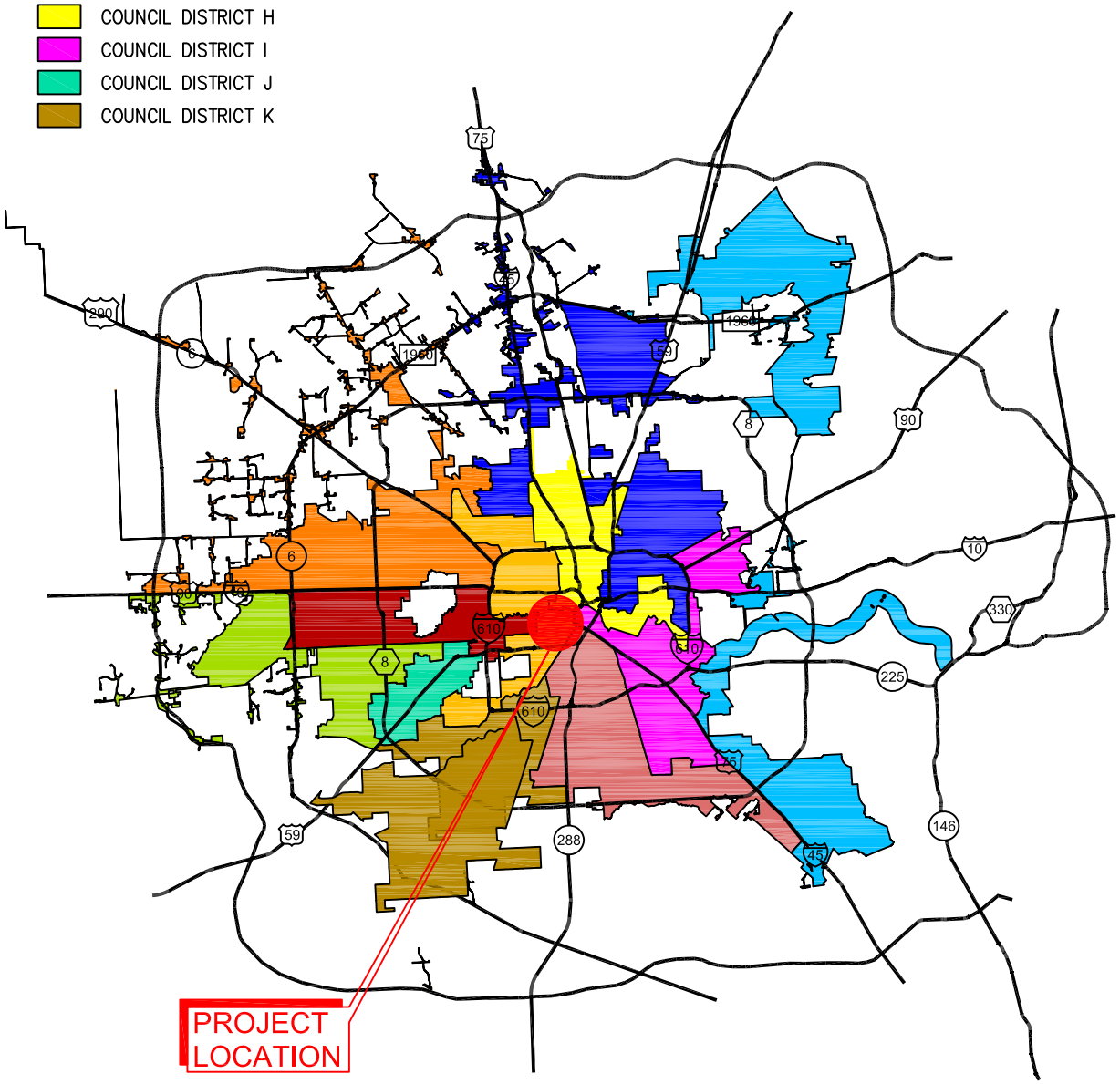
Exhibit E1
Project Vicinity Map

GUNDA CORPORATION
Engineers, Planners & Managers

LEGEND

- COUNCIL DISTRICT A
- COUNCIL DISTRICT B
- COUNCIL DISTRICT C
- COUNCIL DISTRICT D
- COUNCIL DISTRICT E
- COUNCIL DISTRICT F
- COUNCIL DISTRICT G
- COUNCIL DISTRICT H
- COUNCIL DISTRICT I
- COUNCIL DISTRICT J
- COUNCIL DISTRICT K

N.T.S.



KEY MAP: 492 U,V ; 493 S,T
GIMS BLOCK: 5256 B; 5356 A,B

CITY OF HOUSTON TEXAS

GUNDA CORPORATION
Engineers, Planners & Managers
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Houston, Texas 77036
713.541.3530 • www.gundacorp.com
TBPE Registration Number: F-3531

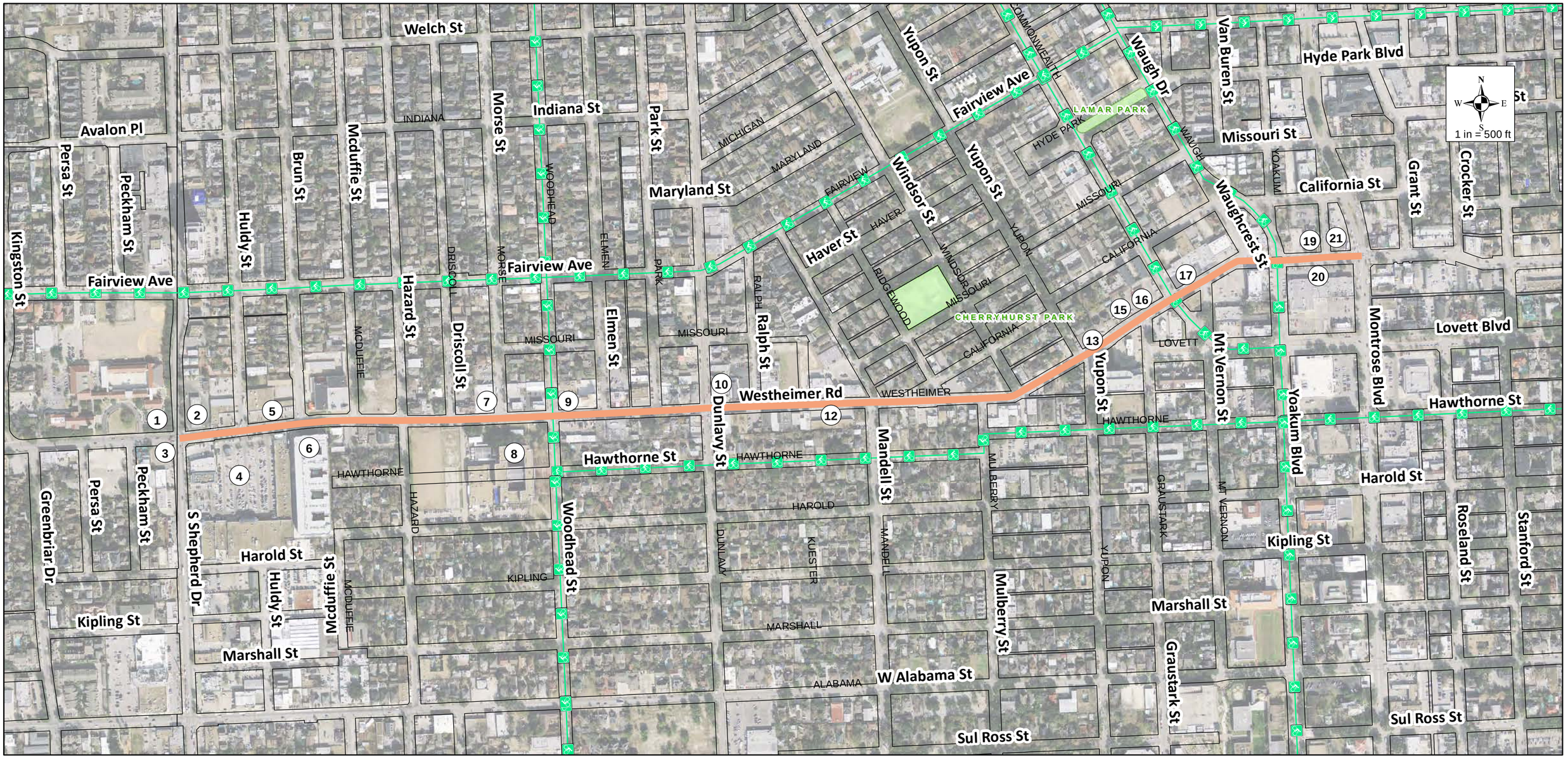
PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO MAIN STREET

SHEET TITLE:
PROJECT VICINITY MAP

GUNDA PROJ NO: 14013-17
DATE: SEP, 2017
SHEET NO: EXHIBIT E1

Exhibit E2
Overall Layout

GUNDA CORPORATION
Engineers, Planners & Managers



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CITY OF HOUSTON TEXAS

Legend

- Study Area
- Railroad
- Bikeway
- Park

Places of Interest

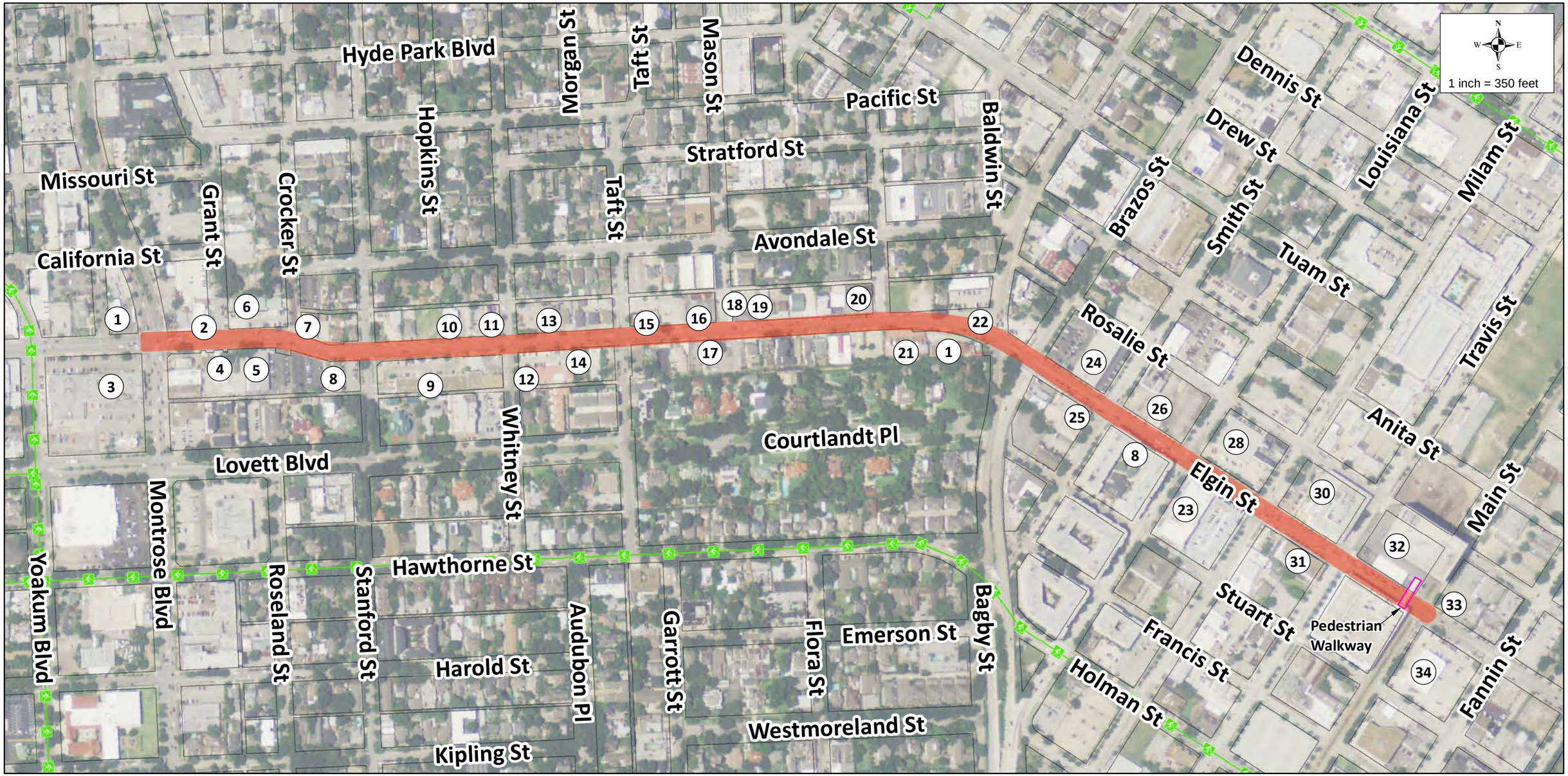
1 - Saint Anne Catholic School/Church
2 - Exxon Gas Station
3 - CITGO Gas Station
4 - Shepherd Square Shopping Plaza
5 - Goodwill
6 - The Westheimer Apartments
7 - Southland Hardware
8 - Lanier Middle School
9 - Eagle Express Dry Cleaners
10 - Hollywood Food and Cigars
11 - Buffalo Exchange
12 - D&S Coin Laundry Wash
13 - Cherryhurst Shopping Center
14 - Tremont Tower Condominium
15 - Royal Oak Bar and Grill
16 - McDonald's
17 - Westheimer Shopping Center
18 - Hay Merchant
19 - Burger King
20 - Spec's
21 - Valero Gas Station

N-2013T-C01 Westheimer Road (South Shepherd Drive to Montrose Boulevard)

Overall Layout (EXHIBIT E2)

Sheet 1 of 2

SEP, 2017



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CITY OF HOUSTON TEXAS

Legend

- Study Area
- Bikeway
- Park

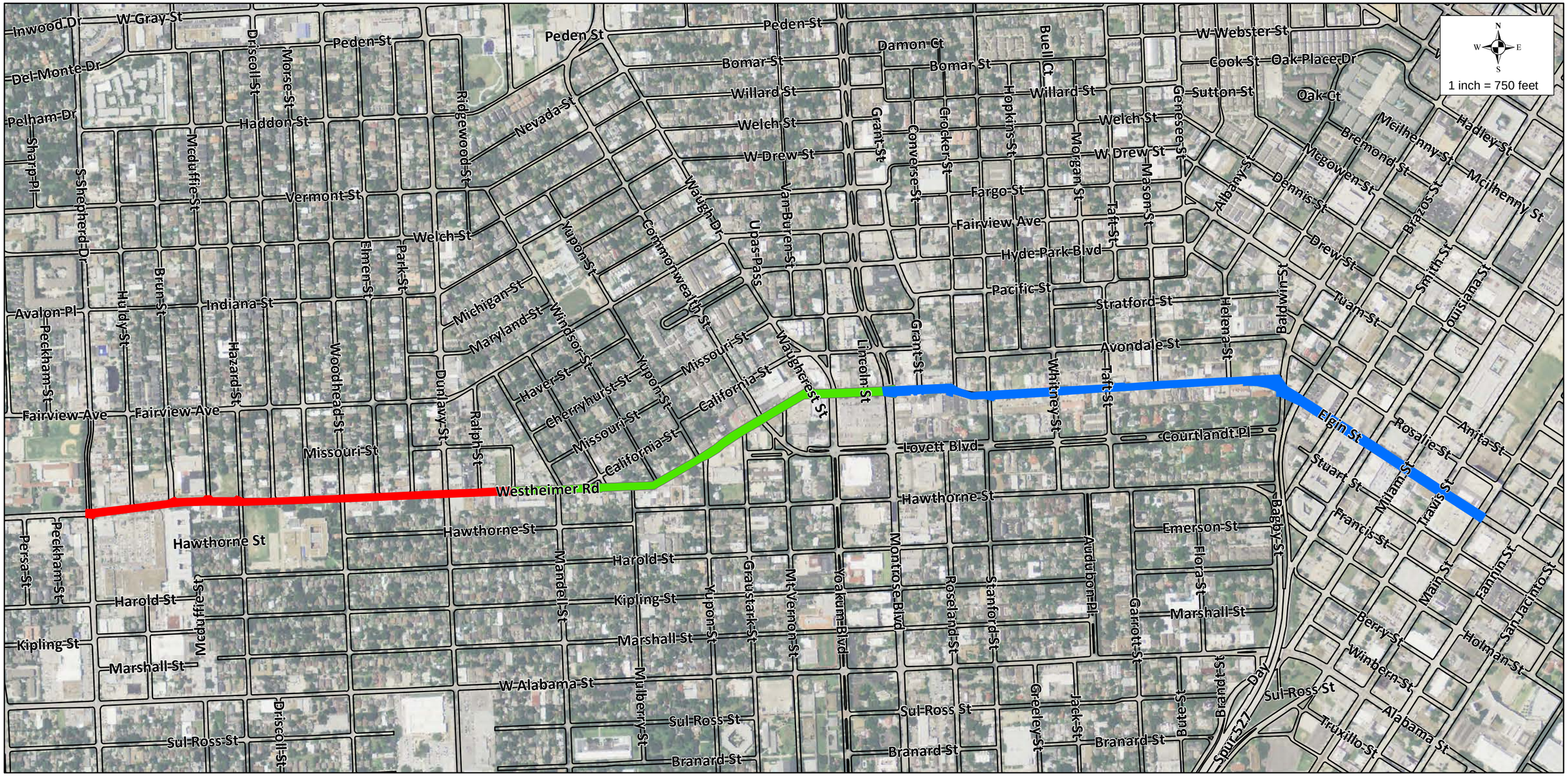
Places of Interest

1 - Valero Gas Station
2 - Historical Marker
3 - Strip Center
4 - Vacant
5 - Thrift Shop
6 - Houston Police Department
7 - Katz's Deli & Bar
8 - Women's Home
9 - Strip Center
10 - Indika Restaurant
11 - Dolce Vita Pizzeria
12 - Sorrento Ristorante
13 - Apartments
14 - Avant Garden
15 - La Casa del Caballo Restaurant
16 - Numbers Night Club
17 - Michelangelo's Restaurant
18 - L'Olivier Restaurant
19 - Chalet
20 - Vacant Strip
21 - Brownstone Apartments
22 - Courtlandt Place Apartments
23 - Museum District Neartown Gateway Monument
24 - Social Security Administration
25 - Maple Leaf Pub
26 - Pearl Downtown - Mixed use
27 - The Calais Apartments
28 - High Fashion Fabrics
29 - Mix - Retail
30 - High Fashion Home
31 - Hagans Burdine Law Firm
32 - Houston Comunity College
33 - Gas Station
34 - CVS Pharmacy

N-2013T-0012 Westheimer Road (Montrose Boulevard to Main Street)

Overall Layout (EXHIBIT E2) Sheet 2 of 2

SEP, 2017



GUNDA CORPORATION
Engineers, Planners & Managers

CITY OF HOUSTON TEXAS

Legend

- Sub-Project 1
- Sub-Project 2
- Sub-Project 3

N-2013T-C01
N-2013T-0012
Westheimer Road
(South Shepherd Drive to Main Street)
SUB-PROJECTS DIVISION

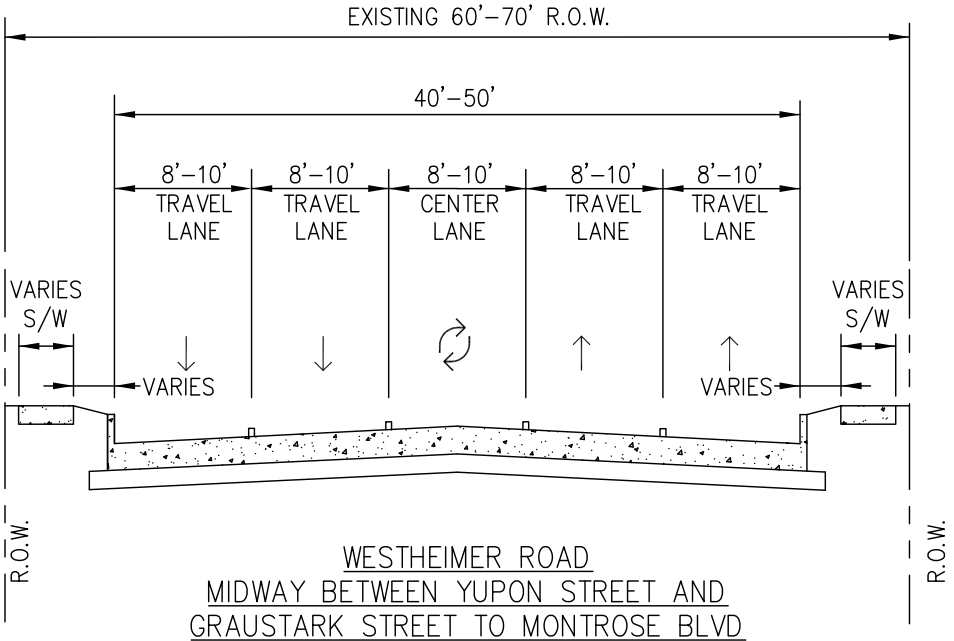
SEP, 2017

Exhibit E3
Typical Cross Sections

GUNDA CORPORATION
Engineers, Planners & Managers

Existing Cross Sections

GUNDA CORPORATION
Engineers, Planners & Managers



WESTHEIMER ROAD
MIDWAY BETWEEN YUPON STREET AND
GRAUSTARK STREET TO MONTROSE BLVD
N.T.S.

CITY OF HOUSTON TEXAS

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TBPE Registration Number: F-3531

PROJECT NAME:
CITY OF HOUSTON

WESTHEIMER ROAD

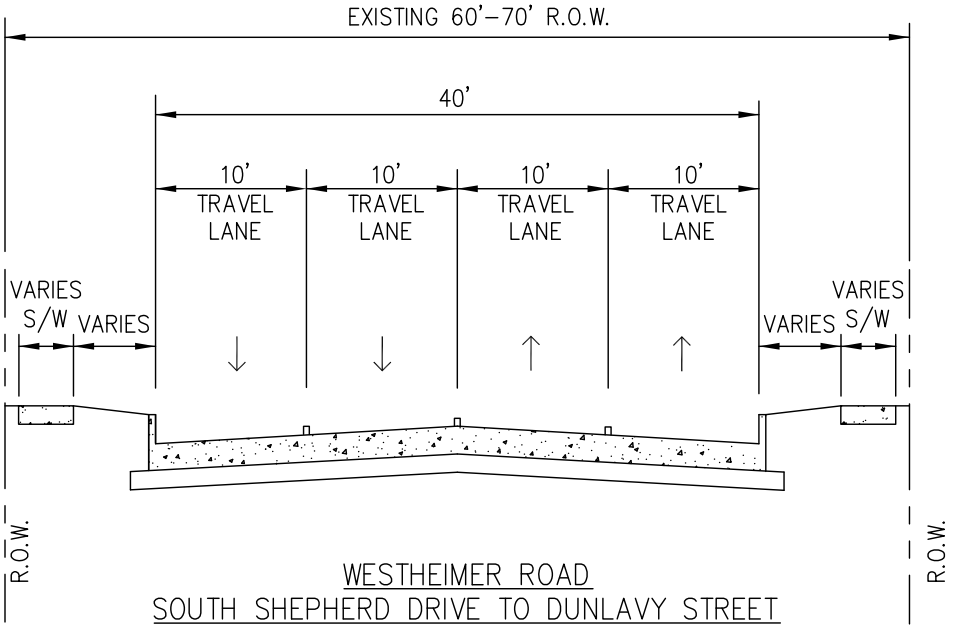
SHEET TITLE:
EXISTING CROSS SECTION

GUNDA PROJ NO: 14013-17

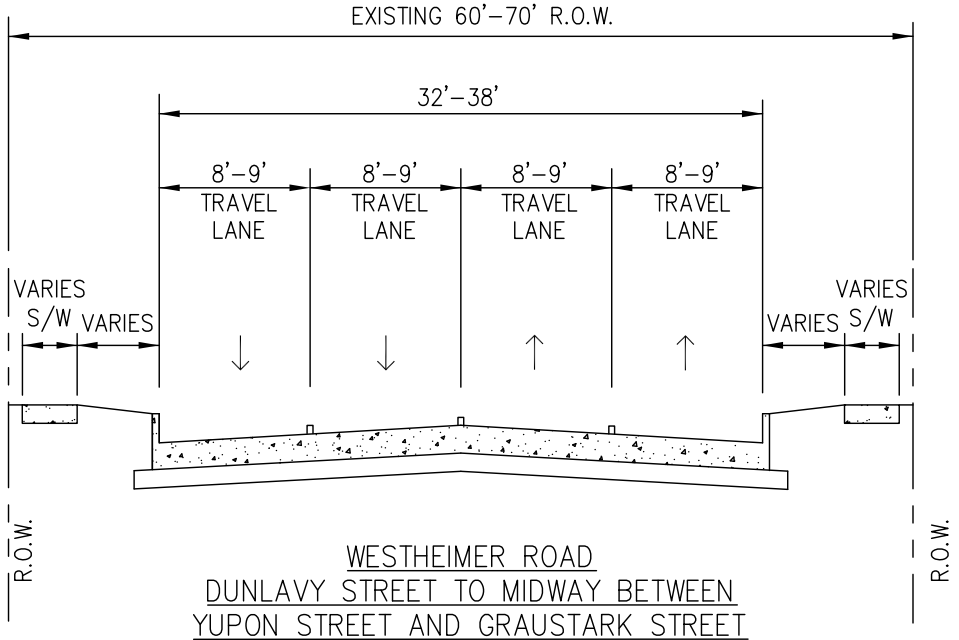
DATE: SEP, 2017

SHEET NO: EXHIBIT E3

SHEET 1



WESTHEIMER ROAD
SOUTH SHEPHERD DRIVE TO DUNLAVY STREET
N.T.S.



WESTHEIMER ROAD
DUNLAVY STREET TO MIDWAY BETWEEN
YUPON STREET AND GRAUSTARK STREET
N.T.S.

CITY OF HOUSTON TEXAS

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TBPE Registration Number: F-3531

PROJECT NAME:
CITY OF HOUSTON

WESTHEIMER ROAD

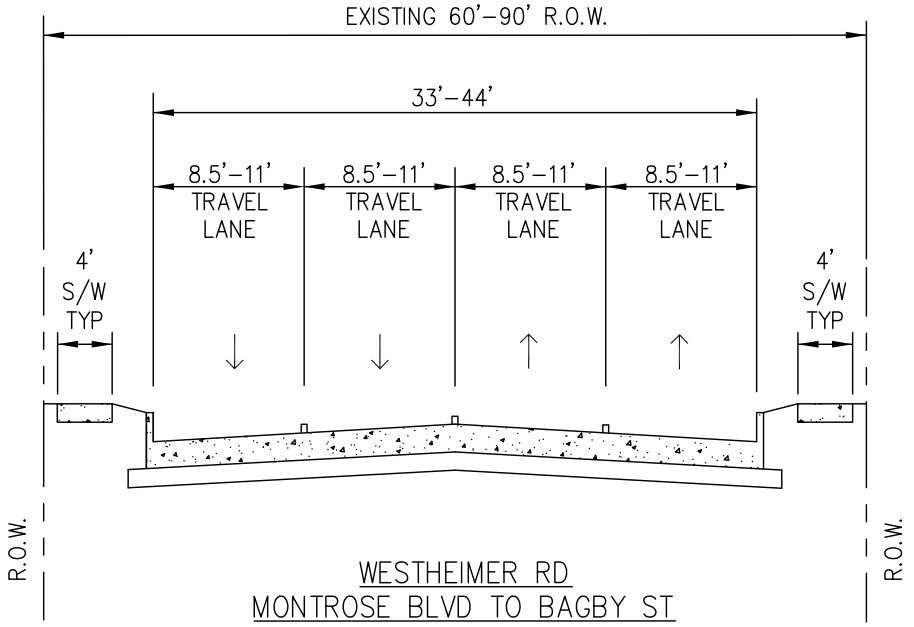
SHEET TITLE:
EXISTING CROSS SECTION

GUNDA PROJ NO: 14013-17

DATE: SEP, 2017

SHEET NO: EXHIBIT E3

SHEET 2



WESTHEIMER RD
MONTROSE BLVD TO BAGBY ST
N.T.S.

*EXISTING ROW IS 70' FROM MONTROSE BLVD TO CROCKER ST
EXISTING ROW IS 60'–90' FROM CROCKER ST TO STANFORD ST
EXISTING ROW IS 70' FROM STANFORD ST TO TAFT ST
EXISTING ROW IS 60' FROM TAFT ST TO BAGBY ST

*AT MONTROSE BLVD INTERSECTION,
1 LEFT TURN ONLY EASTBOUND

*EXISTING LANE WIDTH IS 11' FROM MONTROSE BLVD TO STANFORD ST
EXISTING LANE WIDTH IS 8.5' FROM STANFORD ST TO BAGBY ST

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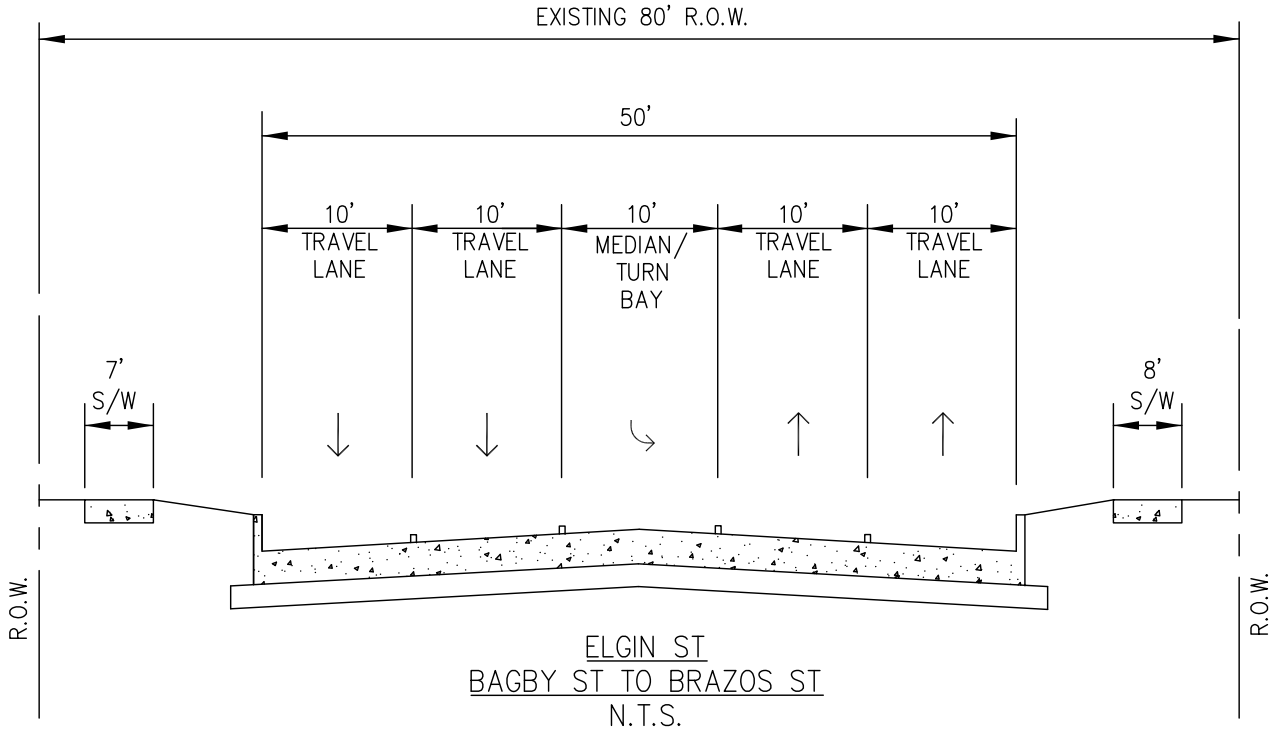
PROJECT NAME:
CITY OF HOUSTON

WESTHEIMER ROAD

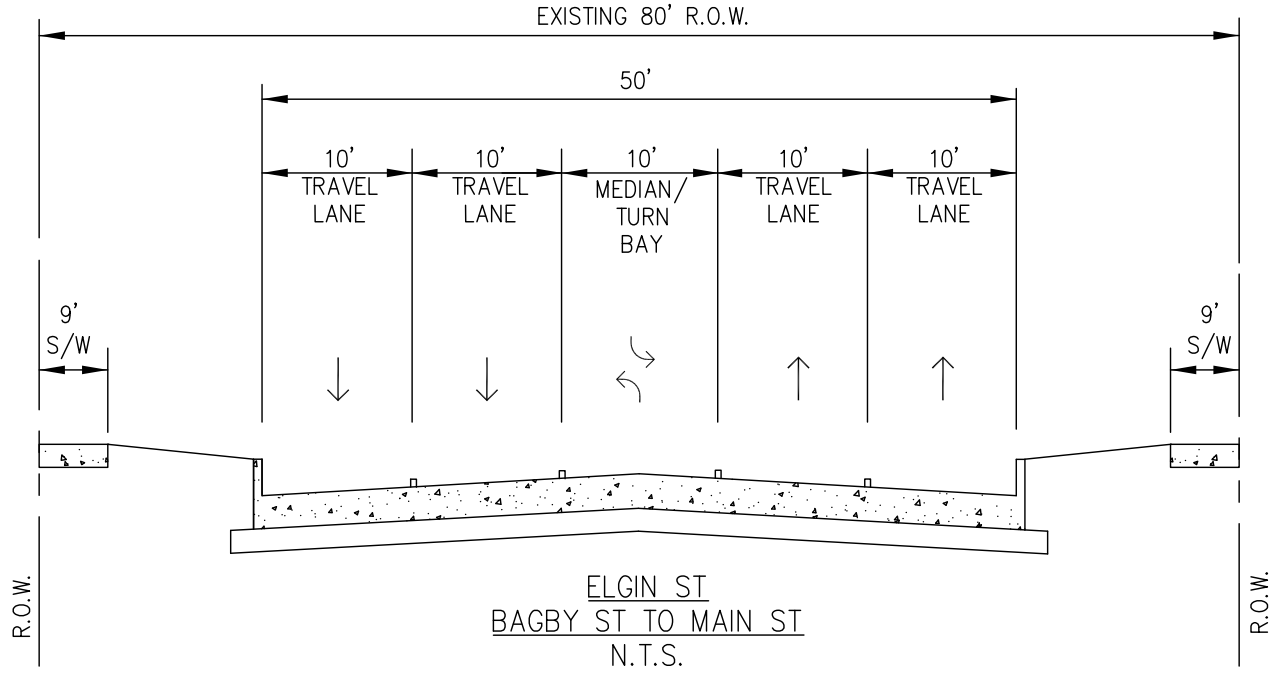
SHEET TITLE:
EXISTING CROSS SECTION

GUNDA PROJ NO: 14013-17
DATE: SEP, 2017
SHEET NO: EXHIBIT E3
SHEET 3



ELGIN ST
BAGBY ST TO BRAZOS ST
N.T.S.

* TURN LANE PROVIDED FOR SOUTHBOUND TRAFFIC ONLY AT BAGBY STREET



ELGIN ST
BAGBY ST TO MAIN ST
N.T.S.

*MEDIAN IS PAINTED ONLY

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PROJECT NAME:
CITY OF HOUSTON

ELGIN STREET

SHEET TITLE:
EXISTING CROSS SECTION

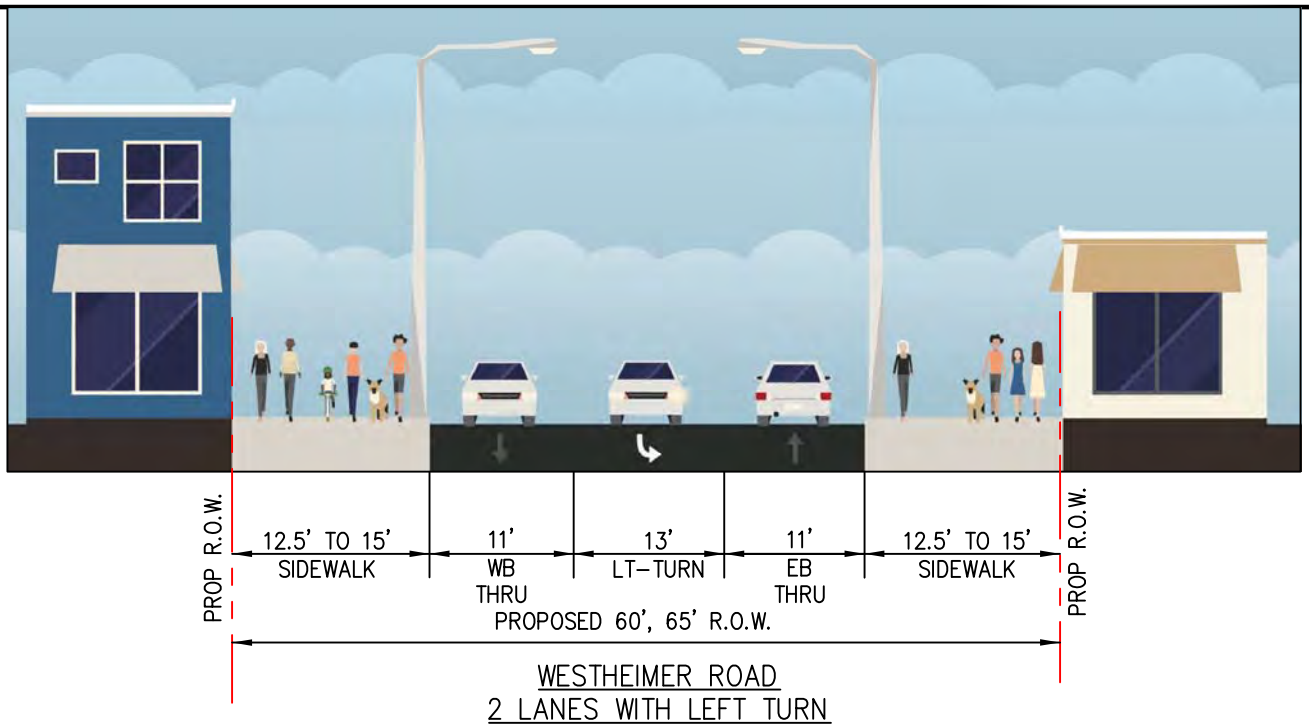
GUNDA PROJ NO: 14013-17

DATE: SEP, 2017

SHEET NO:
EXHIBIT E3
SHEET 4

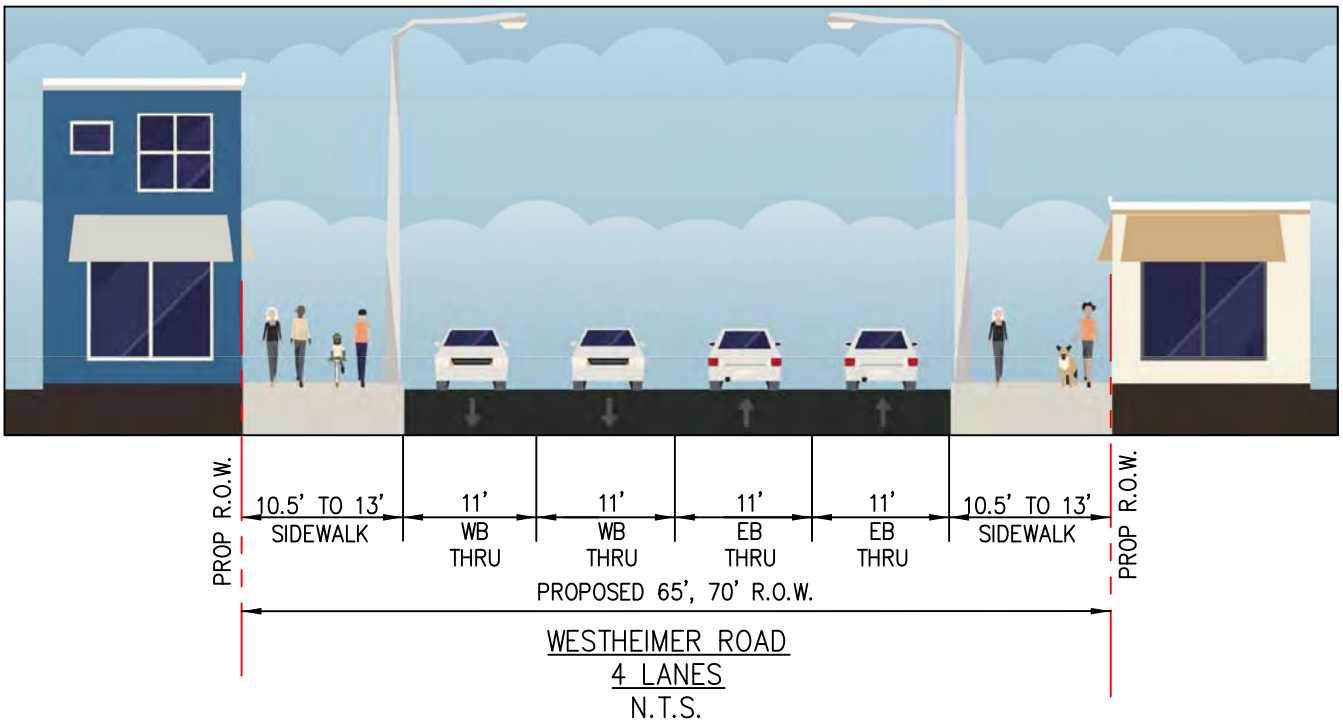
Proposed Cross Section

GUNDA CORPORATION
Engineers, Planners & Managers



WESTHEIMER ROAD
2 LANES WITH LEFT TURN
N.T.S.

TYPICAL SECTION FOR HUDLDY ST TO DISCOLL ST, WOODHEAD ST TO ELMEN ST, DUNLAVY ST TO RALPH ST, KUESTER ST TO MANDALL ST, CROCKER ST TO STANFORD ST



WESTHEIMER ROAD
4 LANES
N.T.S.

TYPICAL SECTION FOR YUPON ST TO WAUGHCREST DR, GRANT ST TO CROCKER ST, HELENA ST TO BAGBY ST

CITY OF HOUSTON TEXAS

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PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER ROAD

SOUTH SHEPHERD TO MONTROSE BOULEVARD

SHEET TITLE:
PROPSED CROSS SECTION

GUNDA PROJ NO: 14013-17

DATE: SEP, 2017

SHEET NO:
EXHIBIT E3
SHEET 5

WESTHEIMER ROAD
2 LANES WITH PARKING
N.T.S.

TYPICAL SECTION FOR DISCOLL ST TO WOODHEAD ST, ELMEN ST TO DUNLAVY ST, RALPH ST TO KUESTER ST, MANDELL ST TO YUPON ST, STANFORD ST TO HELENA ST

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PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER ROAD

SOUTH SHEPHERD TO
MONTROSE BOULEVARD

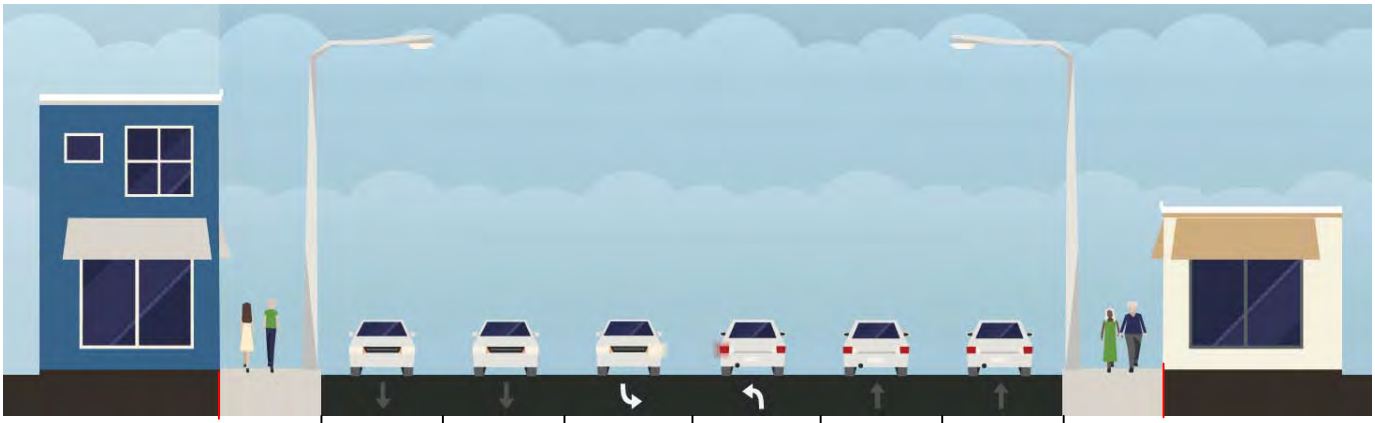
SHEET TITLE:
PROPSED CROSS SECTION

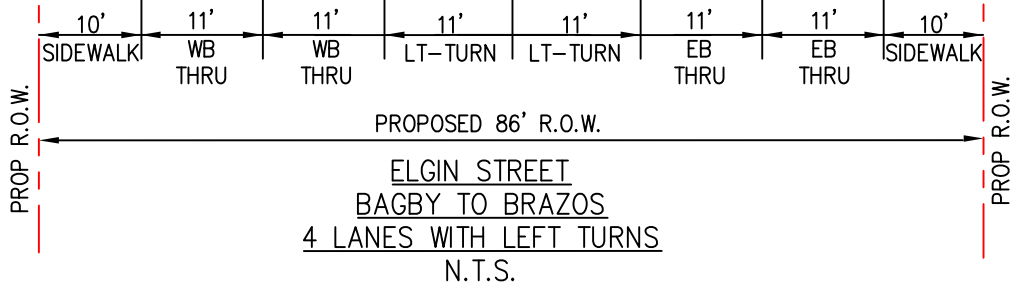
GUNDA PROJ NO: 14013-17

DATE: SEP, 2017

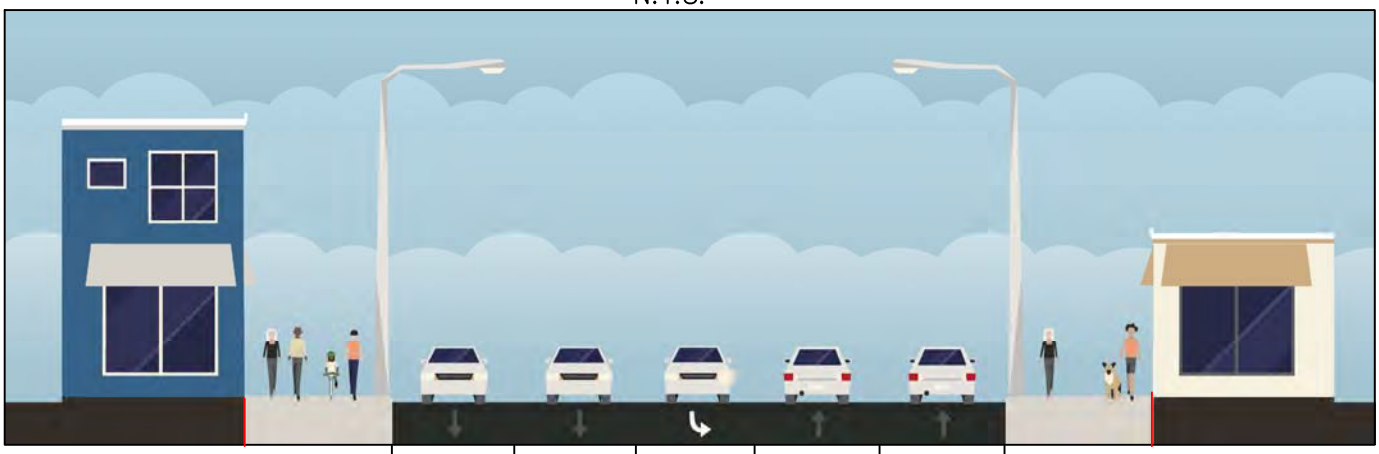
SHEET NO: EXHIBIT E3

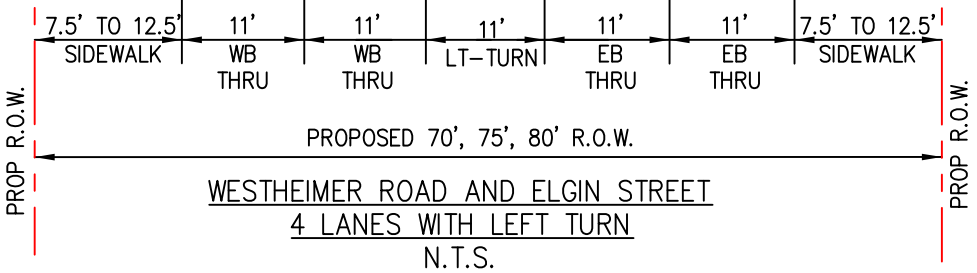
SHEET 6





ELGIN STREET
BAGBY TO BRAZOS
4 LANES WITH LEFT TURNS
N.T.S.





WESTHEIMER ROAD AND ELGIN STREET
4 LANES WITH LEFT TURN
N.T.S.

TYPICAL SECTION FOR WAUGHCREST DR TO GRANT ST, BRAZOS TO MAIN ST

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PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER ROAD

SOUTH SHEPHERD TO
MONTROSE BOULEVARD

SHEET TITLE:
PROPSED CROSS SECTION

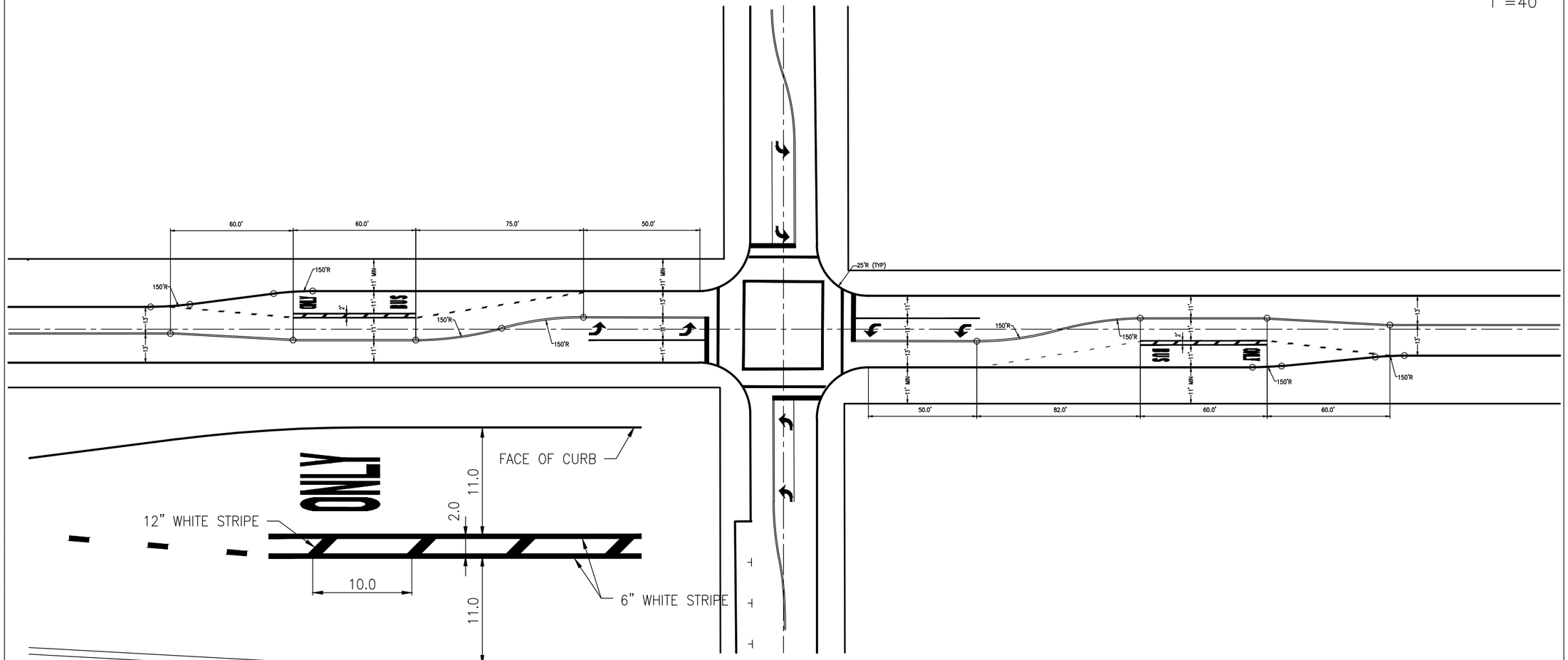
GUNDA PROJ NO: 14013-17

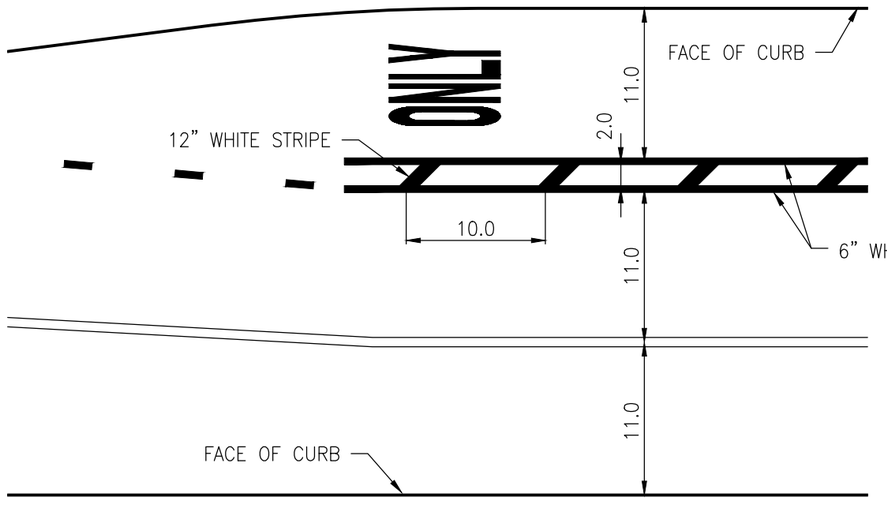
DATE: SEP, 2017

SHEET NO: EXHIBIT E3

SHEET 7

1"=40'





DETAIL

TYPICAL BUS LANE CONFIGURATION WITH LEFT TURN AT MAJOR INTERSECTIONS

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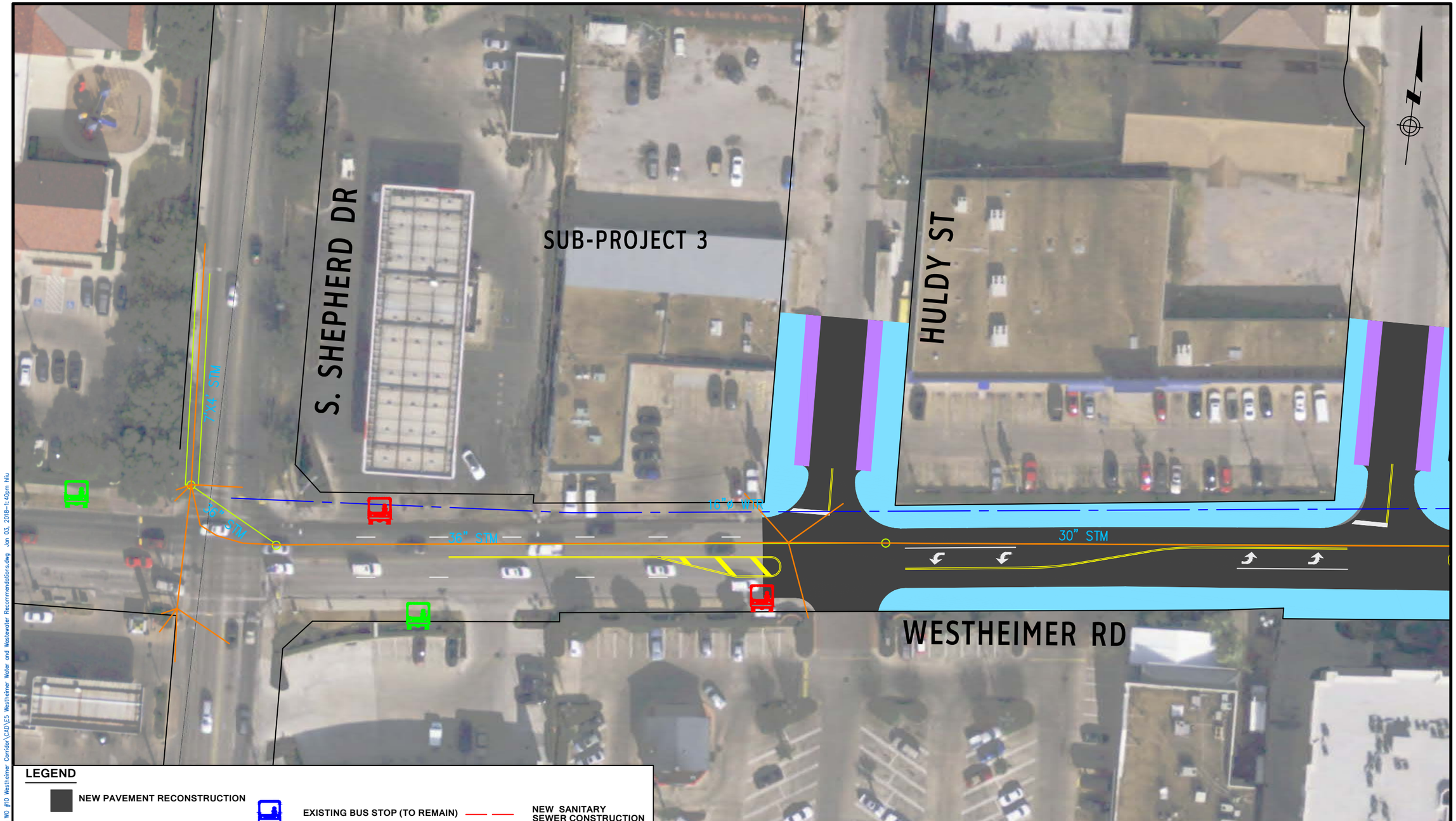
LOWER WESTHEIMER

05/01/17

SHEET 1 OF 1

Exhibit E4
Candidate Project Layout

GUNDA CORPORATION
Engineers, Planners & Managers



LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
- EXISTING ROW
- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
- NEW WATER LINE CONSTRUCTION
- EXIST STORM LINE

50 0 50
GRAPHIC SCALE IN FEET

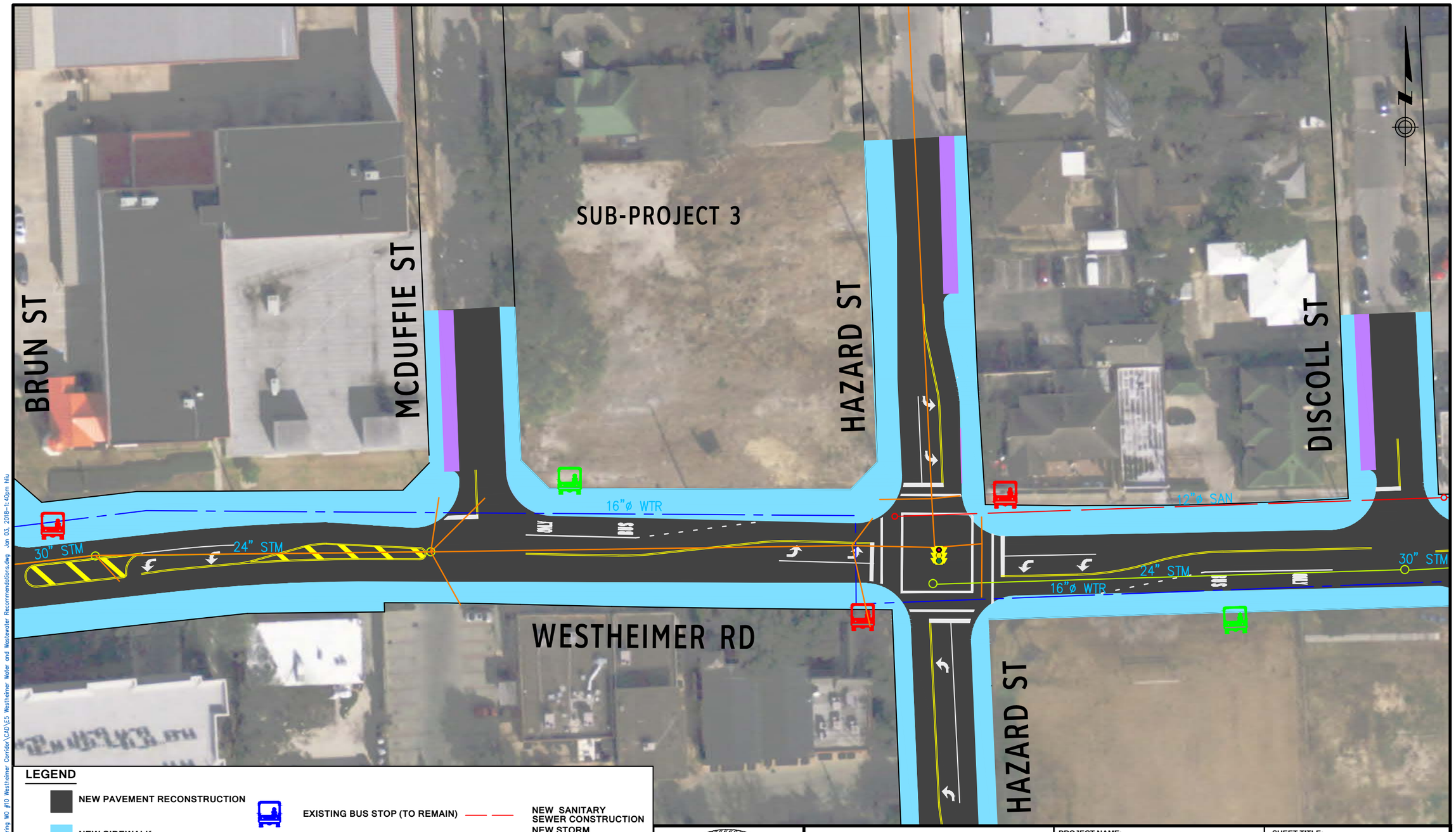
CITY OF HOUSTON TEXAS

GUNDA CORPORATION
Engineers, Planners & Managers
6161 Savoy, Suite 550
Houston, Texas 77036
713.541.3530 • www.gundacorp.com
TBPE Registration Number: F-3531

PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO MAIN STREET

SHEET TITLE:
CANDIDATE PROJECT LAYOUT

GUNDA PROJ NO: 14013-17
DATE: DEC 2017
SHEET NO: EXHIBIT E4
SHEET 1 OF 15



LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
- EXISTING ROW
- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
- NEW WATER LINE CONSTRUCTION
- EXIST STORM LINE

50 0 50
GRAPHIC SCALE IN FEET

CITY OF HOUSTON TEXAS

GUNDA CORPORATION
Engineers, Planners & Managers
6161 Savoy, Suite 550
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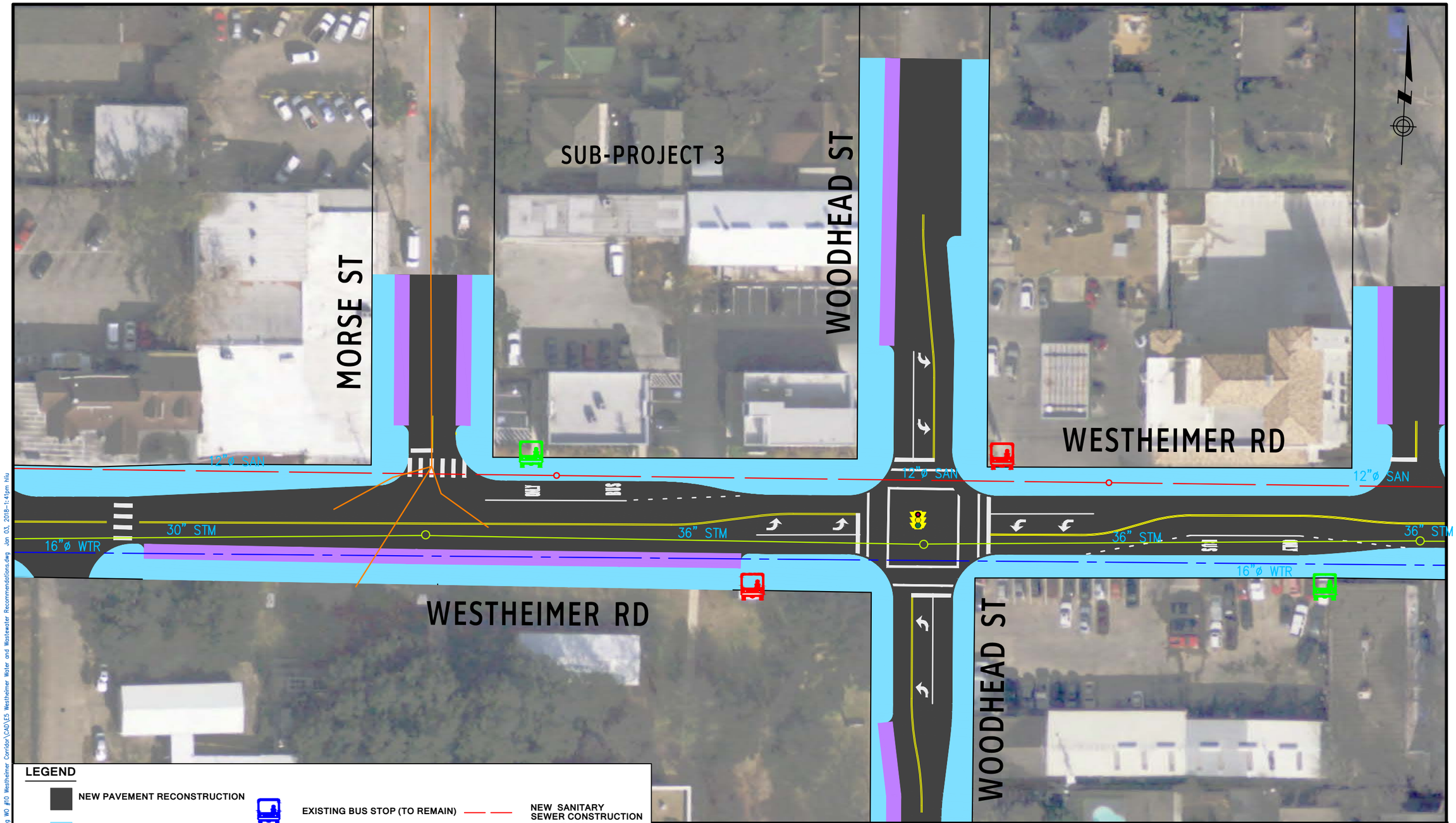
713.541.3530 • www.gundacorp.com
TBPE Registration Number: F-3531

PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO
MAIN STREET

SHEET TITLE:
CANDIDATE PROJECT LAYOUT

GUNDA PROJ NO: 14013-17
DATE: DEC 2017
SHEET NO: EXHIBIT E4
SHEET 2 OF 15



LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
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- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
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- EXIST STORM LINE

50 0 50
GRAPHIC SCALE IN FEET

CITY OF HOUSTON TEXAS

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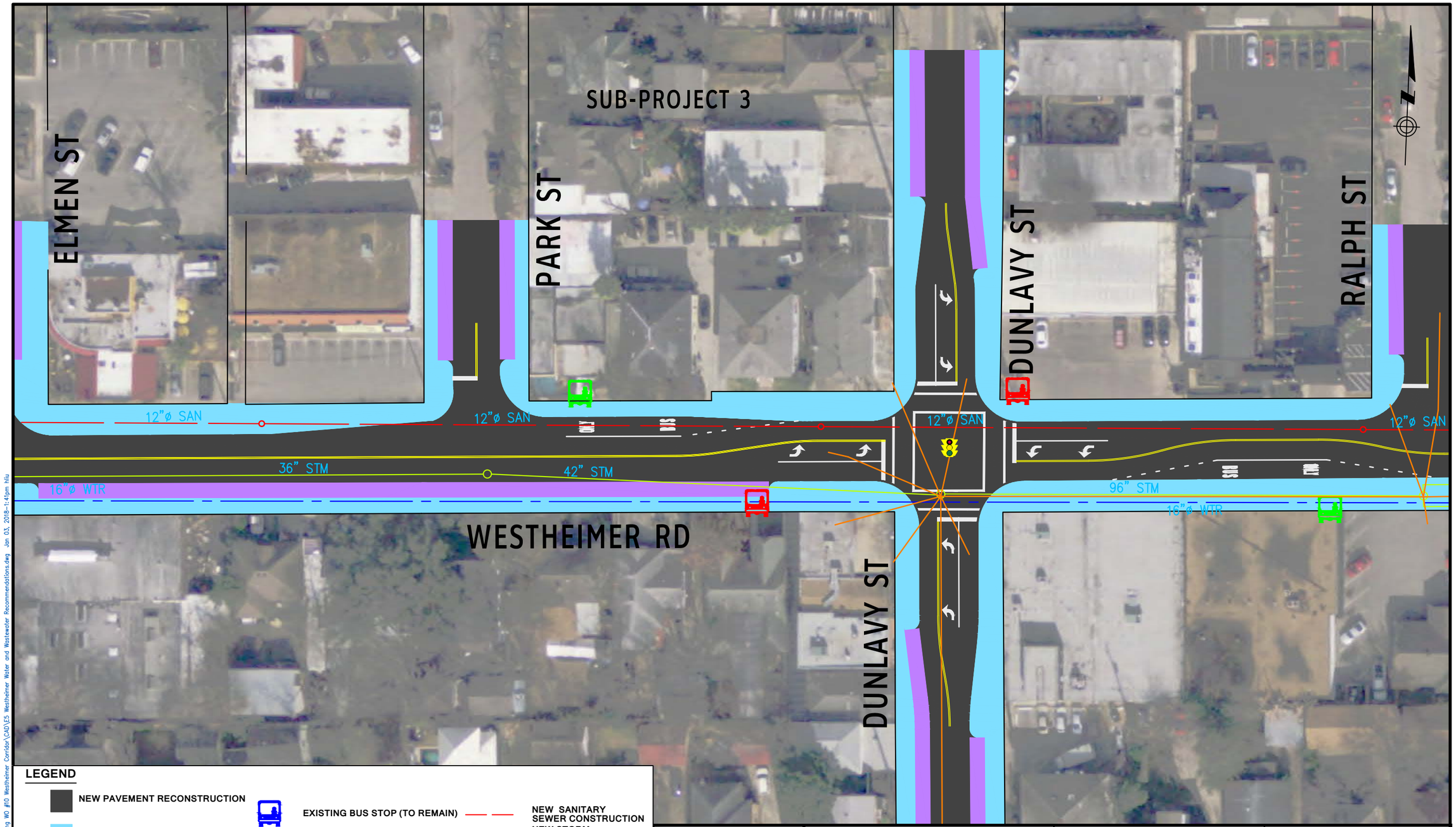
WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO MAIN STREET

SHEET TITLE:
CANDIDATE PROJECT LAYOUT

GUNDA PROJ NO: 14013-17
DATE: DEC 2017
SHEET NO: EXHIBIT E4
SHEET 3 OF 15



LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
- EXISTING ROW
- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
- NEW WATER LINE CONSTRUCTION
- EXIST STORM LINE

50 0 50
GRAPHIC SCALE IN FEET

CITY OF HOUSTON TEXAS

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WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO
MAIN STREET

SHEET TITLE:
CANDIDATE PROJECT LAYOUT

GUNDA PROJ NO: 14013-17
DATE: DEC 2017
SHEET NO: EXHIBIT E4
SHEET 4 OF 15

SUB-PROJECT 3 | SUB-PROJECT 2

KUESTER ST

MANDELL ST

MANDELL ST

WESTHEIMER RD

12"ø SAN

12'x11' STM

12"ø SAN

12'x11' STM

12'x11' STM

16"ø WTR

16"ø WTR

LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
- EXISTING ROW
- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
- NEW WATER LINE CONSTRUCTION
- EXIST STORM LINE

50 0 50

GRAPHIC SCALE IN FEET

CITY OF HOUSTON TEXAS

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PROJECT NAME:
CITY OF HOUSTON
N-2013T-C01
N-2013T-0012
WESTHEIMER RD
SOUTH SHEPHERD DRIVE TO MAIN STREET

SHEET TITLE:
CANDIDATE PROJECT LAYOUT

GUNDA PROJ NO: 14013-17

SHEET NO: EXHIBIT E4

DATE: DEC 2017

SHEET 5 OF 15

GUNDA CORPORATION
P:\2014 Projects\14013-17 COH Pre-Engineering WO #10 Westheimer Corridor\CADD\E5 Westheimer Water and Wastewater Recommendations.dwg Jan 03, 2018 - 1:41pm hlu

CALIFORNIA ST

RIDGEWOOD ST

SUB-PROJECT 2

WESTHEIMER RD

MULBERRY ST

WINDSOR ST

WESTHEIMER RD

12'x11' STM

16"ø WTR

12'x11' STM

12'x12' STM

12'x12' STM

16"ø WTR

LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
- PROPOSED MEDIAN
- POTENTIAL PARKING
- EXISTING BUS STOP (TO REMAIN)
- EXISTING BUS STOP TO BE CONSOLIDATED / RELOCATED
- PROPOSED BUS STOP
- PROPOSED TRAFFIC SIGNAL TO BE REPLACED
- EXISTING ROW
- PROPOSED ROW
- NEW SANITARY SEWER CONSTRUCTION
- NEW STORM SEWER CONSTRUCTION
- NEW WATER LINE CONSTRUCTION
- EXIST STORM LINE

50 0 50

GRAPHIC SCALE IN FEET

CITY OF HOUSTON TEXAS

GUNDA CORPORATION
Engineers, Planners & Managers
6161 Savoy, Suite 550
Houston, Texas 77036
713.541.3530 • www.gundacorp.com
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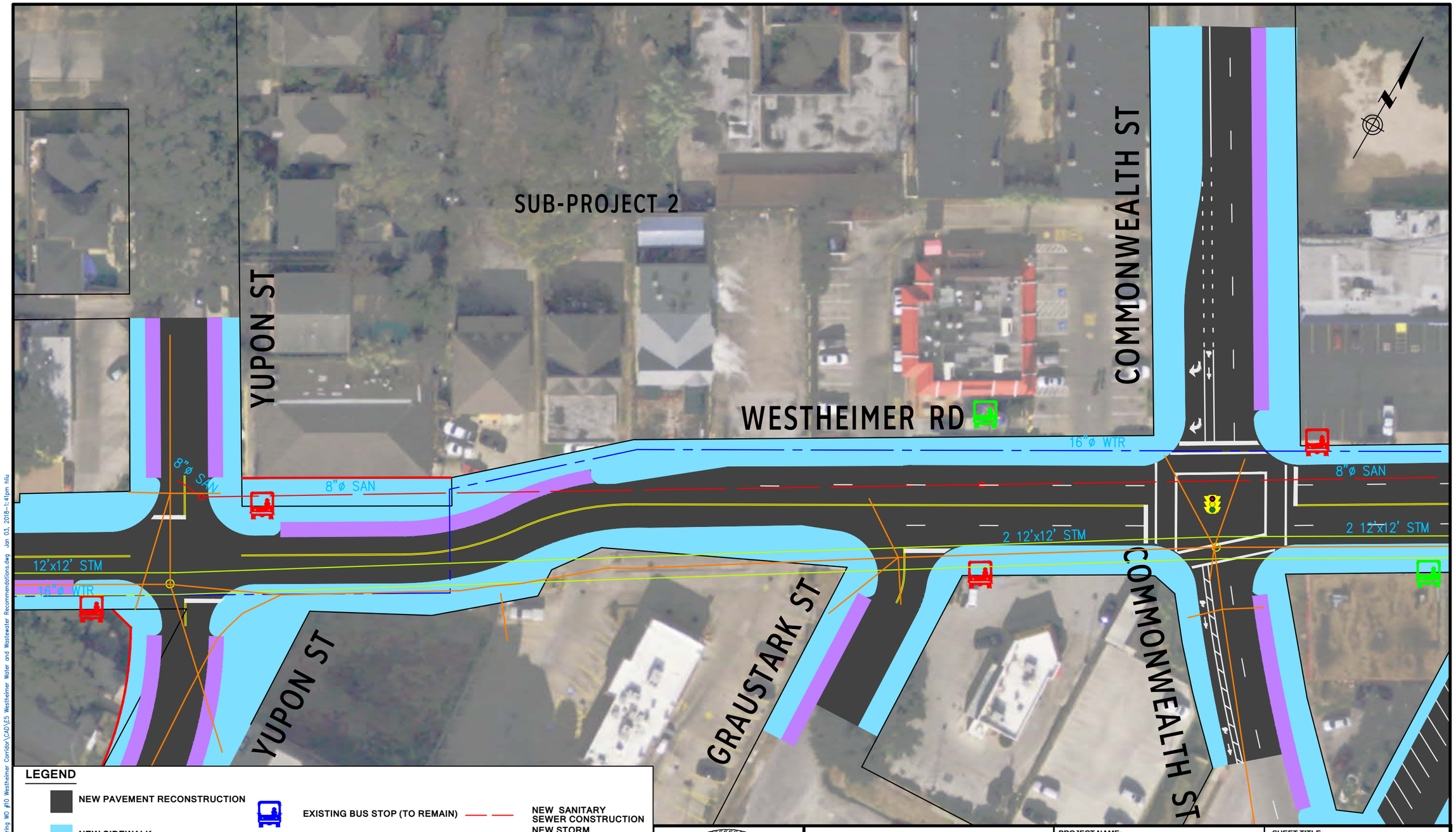

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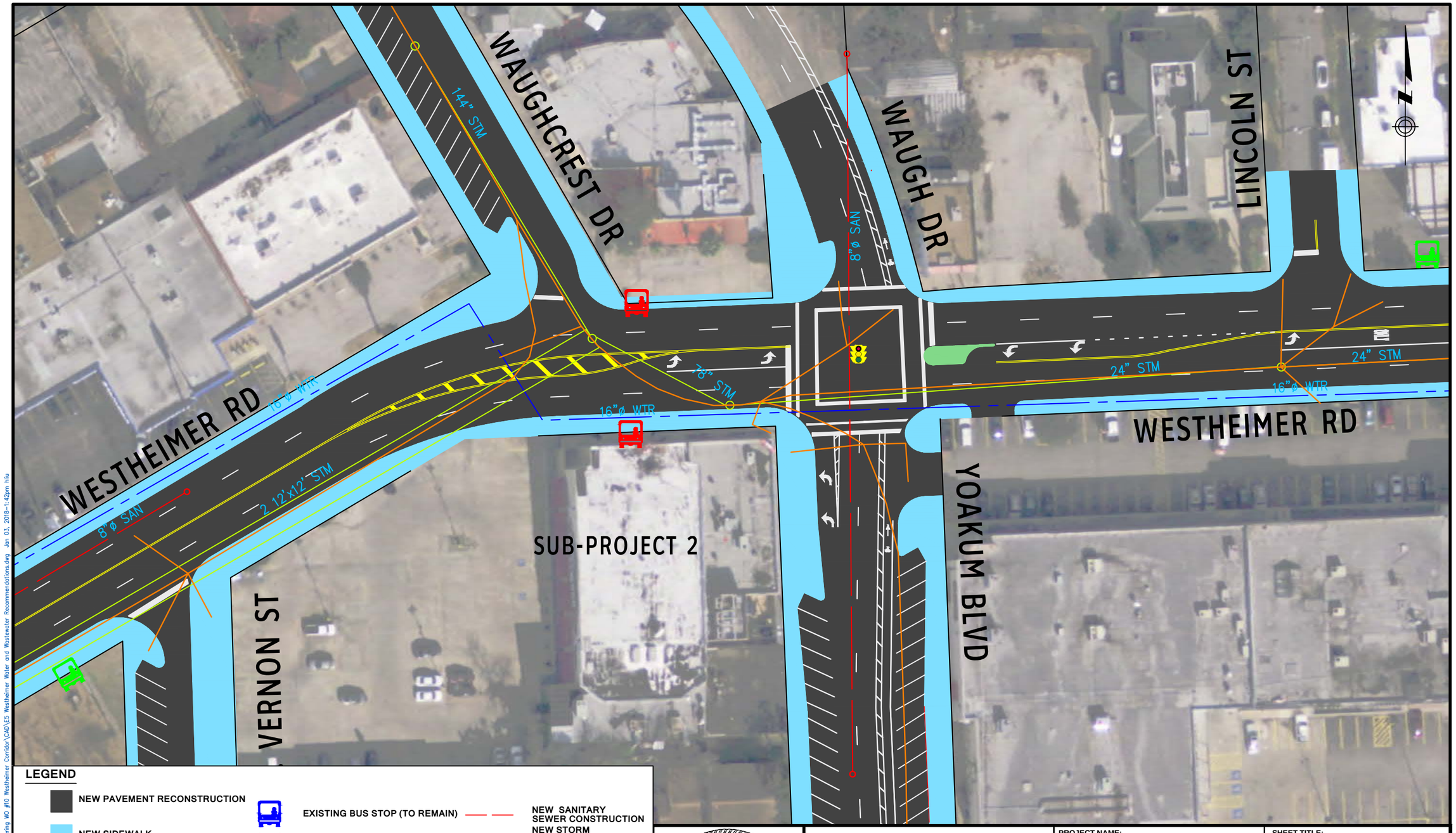

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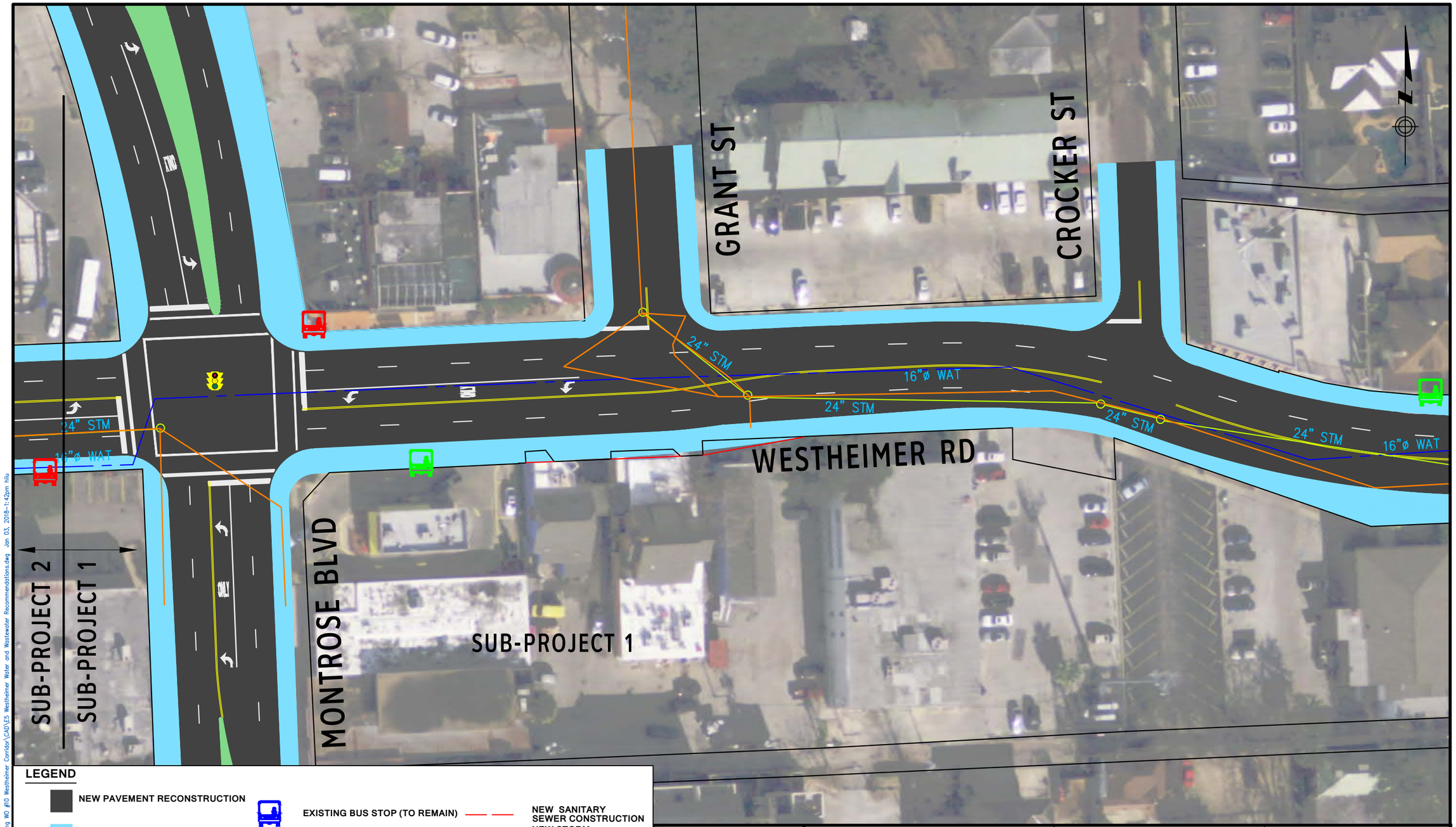

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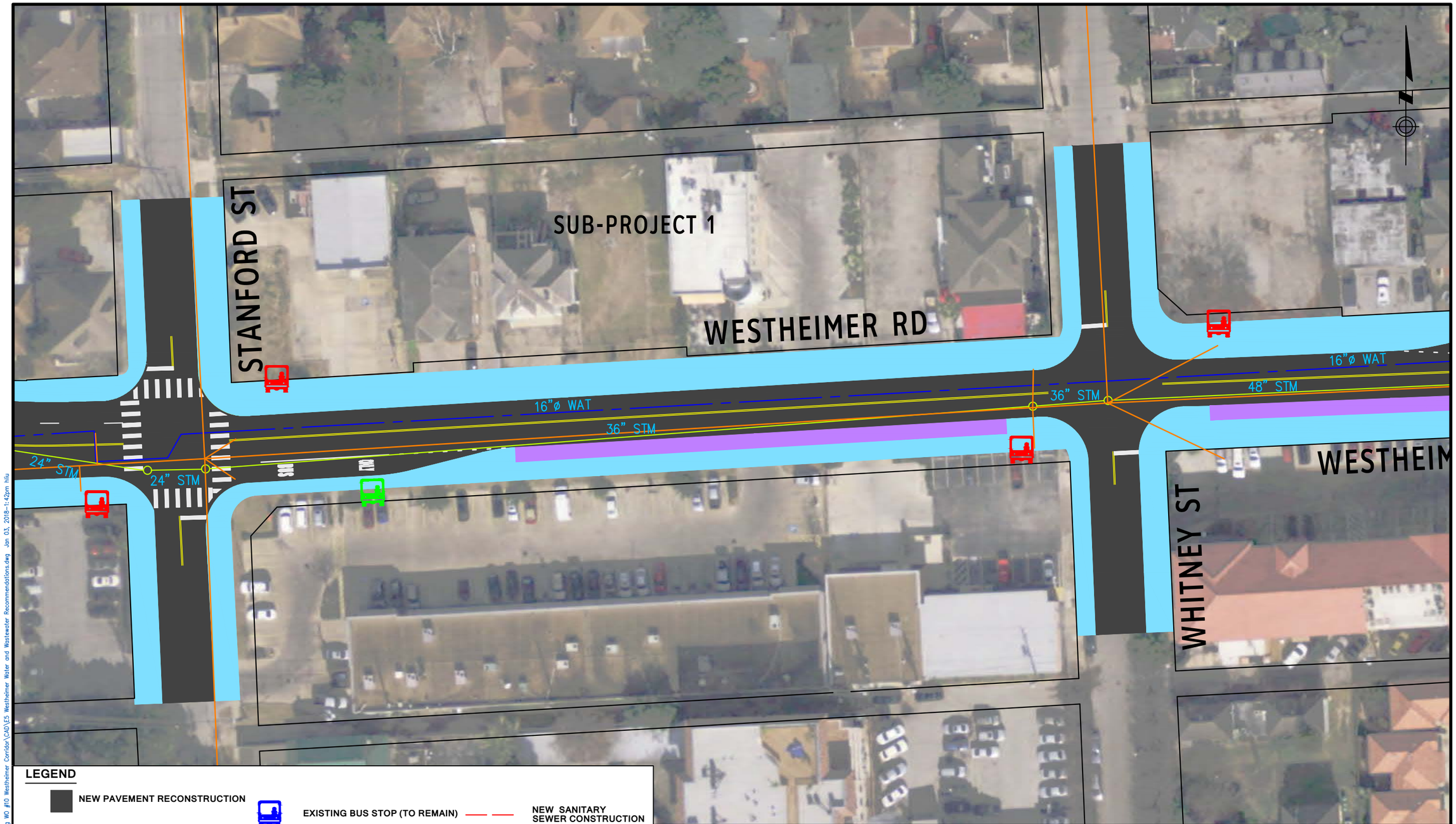

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SHEET NO: EXHIBIT E4

SUB-PROJECT 1

MASON ST

ER RD

TAFT ST

16"ø WAT

16"ø WAT

16"ø WAT

48" STM

54" STM

60" STM

LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
- EXISTING SIDEWALK TO REMAIN
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SHEET NO: EXHIBIT E4

HELENA ST

WESTHEIMER RD

WESTHEIMER RD

16"ø WAT

60" STM

60" STM

60" STM

60" STM

16"ø WAT

SUB-PROJECT 1

N

LEGEND

- NEW PAVEMENT RECONSTRUCTION
- NEW SIDEWALK
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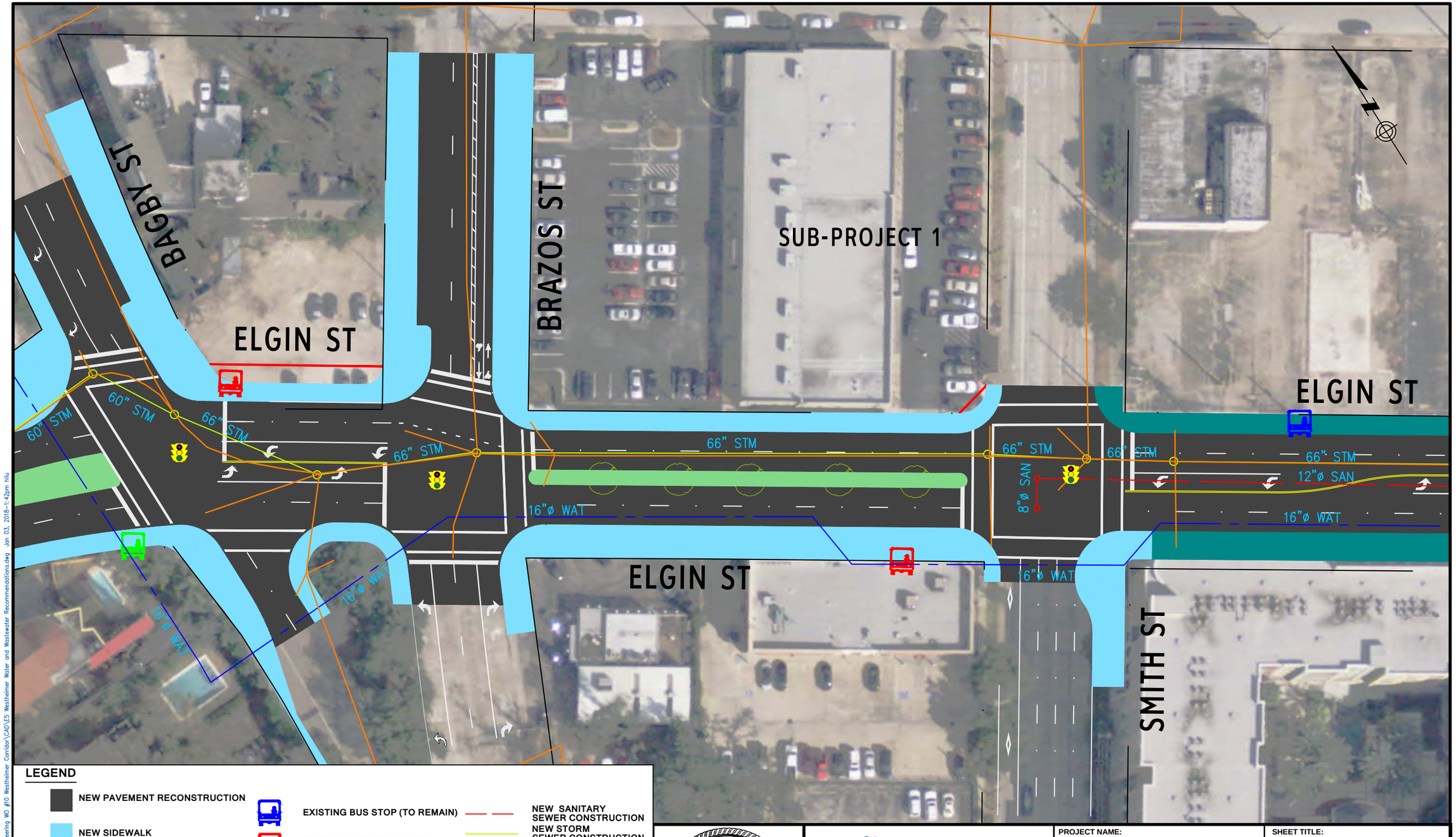
SHEET 12 OF 15



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SHEET 13 OF 15

LOUISIANA ST

SUB-PROJECT 1

ELGIN ST

66" STM

66" STM

72" STM

72" STM

12" ø SAN

16"ø WAT

ELGIN ST

MILAM ST

TRAVIS ST

LEGEND

- NEW PAVEMENT RECONSTRUCTION
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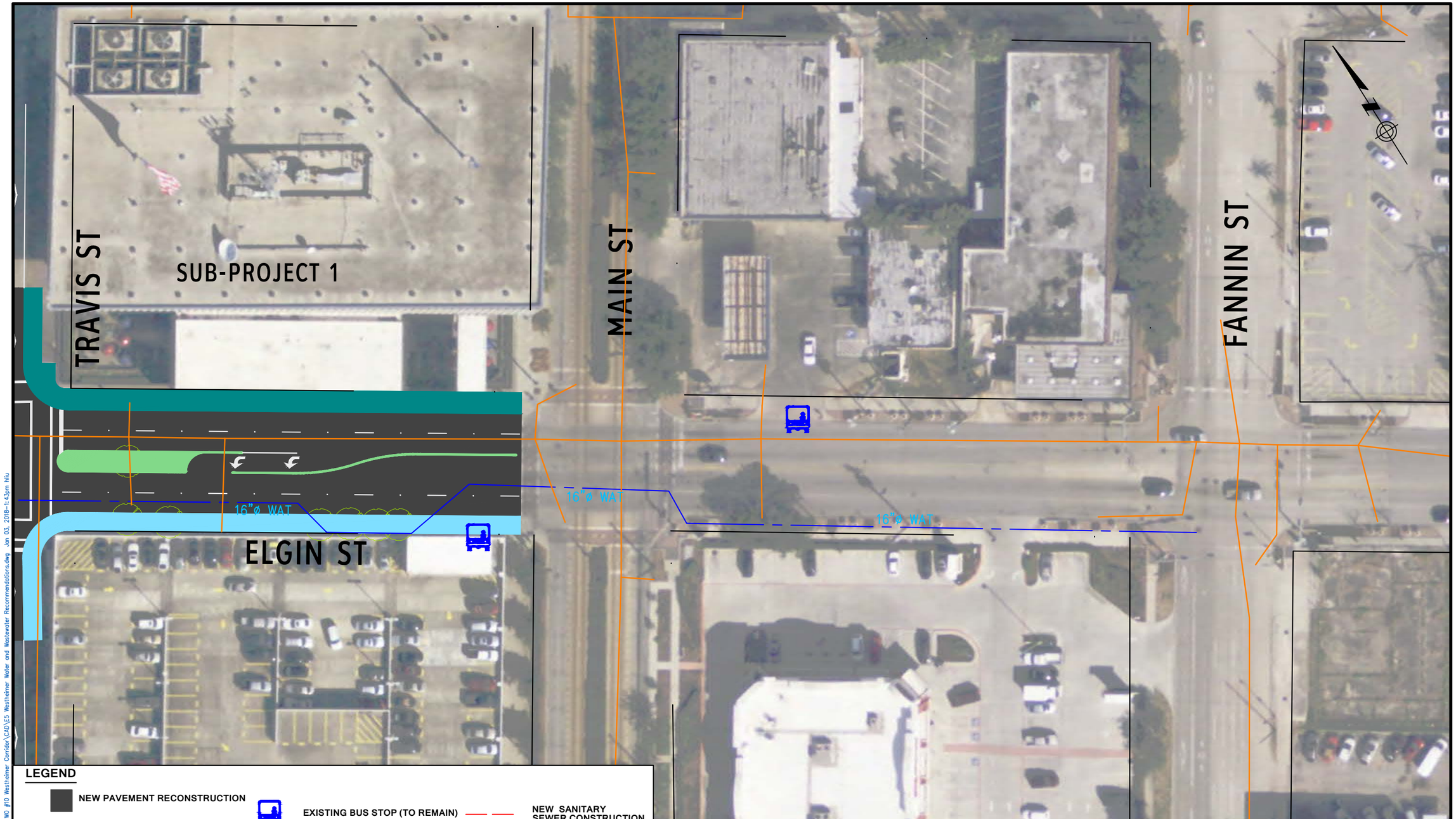

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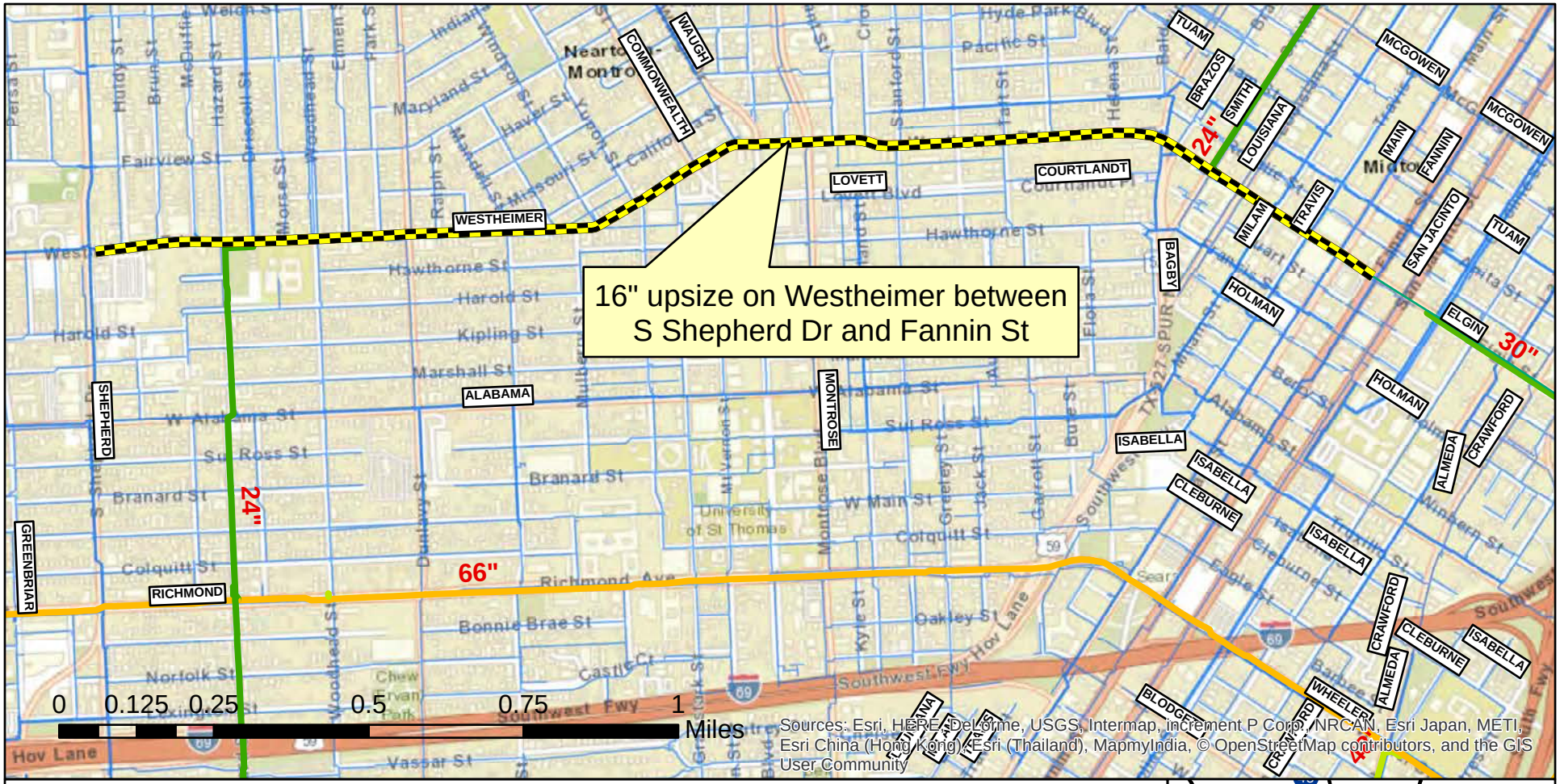
Exhibit E5
City of Houston Water and Wastewater Recommendations

GUNDA CORPORATION
Engineers, Planners & Managers



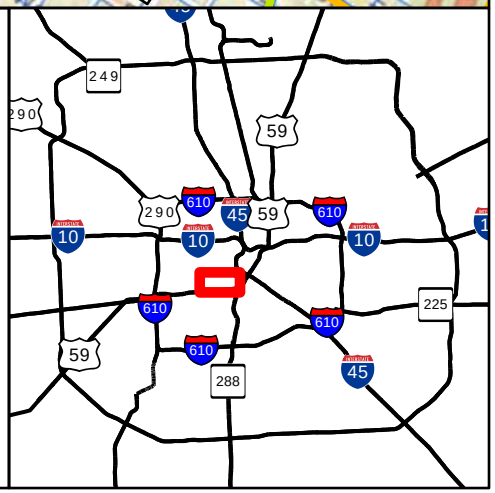
HWP Waterline Recommendations

N

Need Area N-2013T-C01: Westheimer Rd (Shepherd Dr to Montrose Blvd)
Need Area N-2013T-0012: Westheimer Rd (Montrose Blvd to Main St)

Proposed 16" waterline replacement

12/18/2017



Conceptual Sanitary Sewer System that will connect to proposed 12 inch line

12"@ 0.26%

8"@0.44%

8"%0.44%

Gunda
N-2013T-C01

- Existing ww mh
- Lift Station
- Treatment Plant
- Proposed waste water lines
- Existing Wastewater lines
- Boundary
- Edge of Pavement
- Existing Force Main
- Water Line 12" and above
- Flood Zone Boundary
- SSO
- Odor Service Request
- Work Order Stopppages

Notes

The information provided in this layout is for planning purpose only and not for construction.

WESTHEIMER
BAGBY
BRAZOS
COURTLANDT
SMITH
STUART
HAWTHORNE
FRANCIS
LOUISIANA
ROSALIE
ANITA
ELGIN
MILAM
8"@ 0.44%
12"@0.26%
Eliminate existing parallel 8 inch sewer line and divert flow to proposed 12 inch line

N-2013T-0012

- Existing ww mh
- Lift Station
- Treatment Plant
- Proposed waste water lines
- Existing Wastewater lines
- Boundary
- Edge of Pavement
- Existing Force Main
- Water Line 12" and above
- Flood Zone Boundary
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Exhibit E6
Land Acquisition

GUNDA CORPORATION
Engineers, Planners & Managers

GUNDA CORPORATION
Engineers, Planners & Managers

CITY OF HOUSTON
TEXAS

Legend

- Study Area
- Proposed Land Acquisition
- Edge of Pavement

N-2013T-C01
N-2013T-0012
Westheimer Road
(South Shepherd Drive to Main Street)
Land Acquisition Map
(EXHIBIT E6)

SEP, 2017

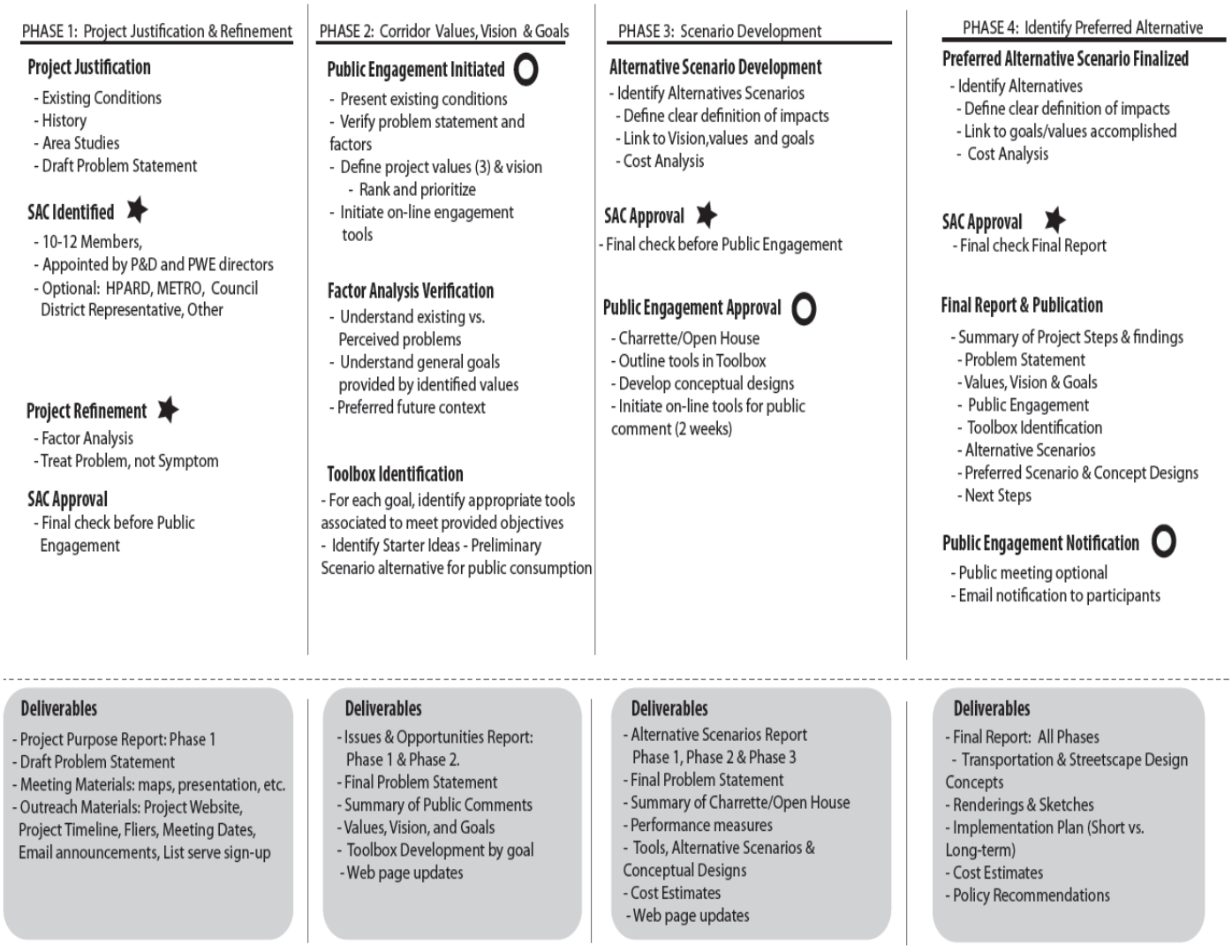
Appendix B
Enhanced Pre-Engineering Process and Results

GUNDA CORPORATION
Engineers, Planners & Managers

Appendix B: Enhanced Pre-Engineering Process and Results

The Lower Westheimer Corridor Study is the first pre-engineering effort that followed the enhanced pre-engineering study for Westheimer Road between Shepherd and Main. The enhanced pre-engineering process is applied to unique streets that merit an enhanced level of design sensitivity due to their historic, cultural, or community significance. Constructive collaboration between city departments, elected officials, community stakeholders, property owners and related interest groups is key in developing a preferred design approach that enhances the character of the corridor, improves mobility and that also engages the community. Exhibit B-1 illustrates the basic framework used to assemble the study team and scope of work.

Exhibit B-1 – Basic Framework of the Enhanced Pre-Engineering Process



GUNDA CORPORATION
Engineers, Planners & Managers

Using the above framework as the following consulting team members were contracted to assist in the Lower Westheimer Corridor Study which was led by the City's Public Works and Engineering (PWE) and Planning and Development (P&D) Departments, and advised by a stakeholder advisory committee. In addition, the GUNDA team included necessary staff allocation from GUNDA, LANGRAND Company, At-Link Communications Inc., Gorrondona & Associates, Inc., SWCA, and SWA to meet the goals and objectives of the project. The Stakeholder Advisory Committee (SAC) is representative of adjoining neighborhoods, local businesses, various government entities, non-profits, and other representatives. The more than one-year corridor study was completed in April 2017, and provided several opportunities for community engagement, including two public meetings and a public workshop (summary of public engagement is included in Appendix C). The intent of the pre-engineering study for Lower Westheimer was to recommend a preferred design approach that considers the needs of the City and the community, meets the goals of Re-Build Houston, enhances the overall character of the street, and provide opportunity for a broad community engagement.

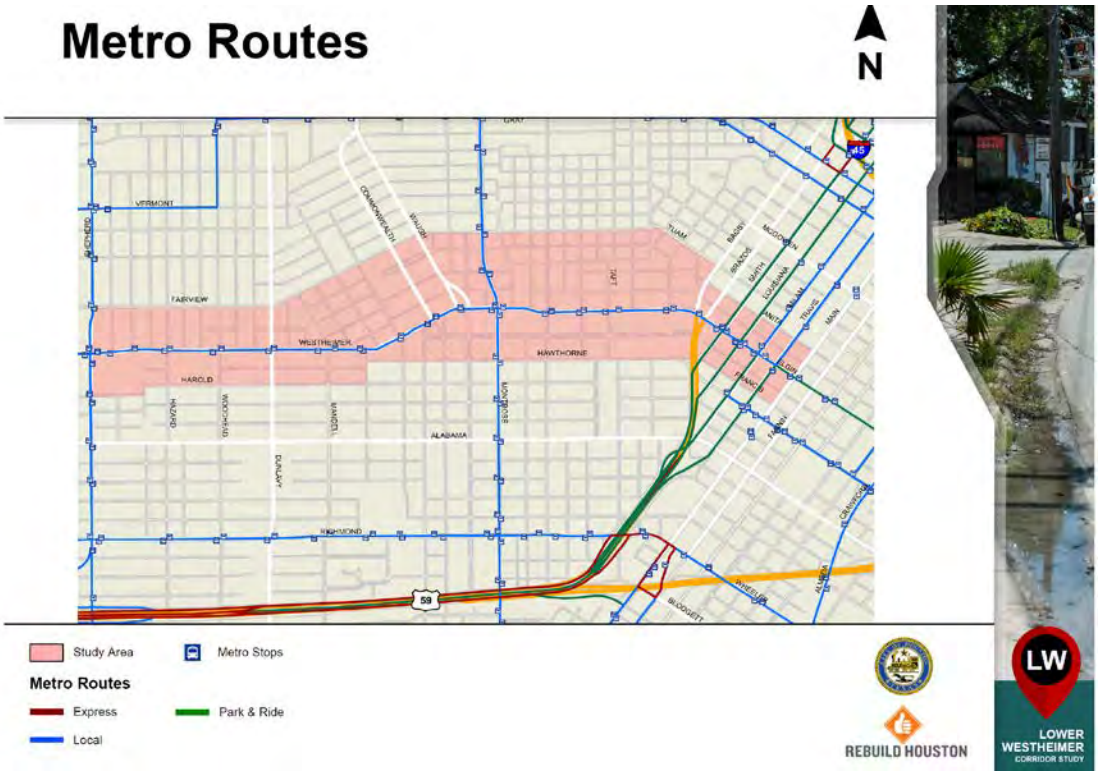
Westheimer Road in the Montrose area is an important multi-modal corridor for vehicular traffic, public transportation, pedestrians, and other users. It also provides parking and services primarily commercial adjacent land uses, and fulfills a variety of economic and social needs for area residents, property owners, business patrons, and others. The street alignment itself, including the 'Curves', the scale of the street and the surrounding buildings, and the eclectic development pattern are important aspects of the character of the corridor. It is both important and challenging to balance these sometimes competing functions, while also ensuring and promoting public safety, health, and welfare.

B.1 EXISTING CONDITIONS

As part of the enhanced pre-engineering effort extensive existing conditions inventory analysis was conducted and are summarized below. The detailed land use map of the study area is presented in Exhibit B-2. Exhibit B-3 depicts all the METRO bus routes and existing bus stops in the study area. Most of Westheimer and Elgin segments have restriction for parking, but in some segments parking is allowed with certain time periods restricted as shown in Exhibit B-4. Exhibit B-4 also shows head-in parking along the study segment. City of Houston Bike Plan recommendations in the vicinity of the study area are presented in Exhibit B-5 with critical crossings identified even though Westheimer and Elgin are not designated as a bicycle route. And finally, Exhibit B-6 illustrates the classification of the study area roadways per City of Houston Major Thoroughfare and Freeway Plan. All these information were utilized to perform the analysis and recommendations included in this study.

Exhibit B-2 – Land Use

Exhibit B-3 – METRO Routes and Bus Stop



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Engineers, Planners & Managers

Exhibit B-4 – On-Street Parking and Head-In Parking

Exhibit B-5 – Houston Bike Plan

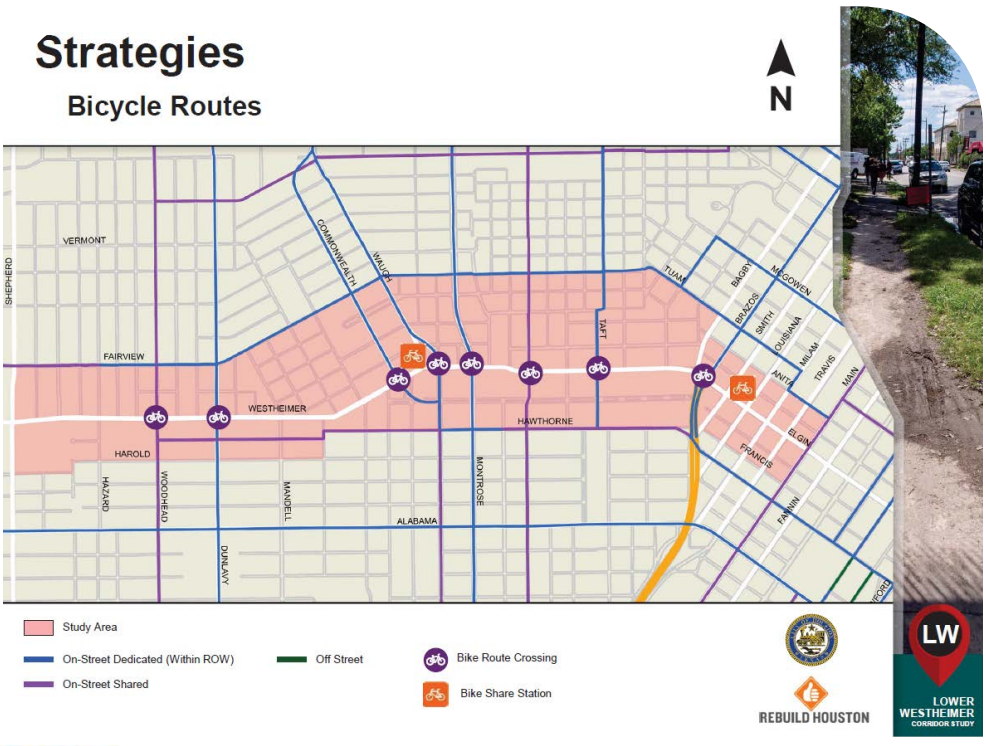

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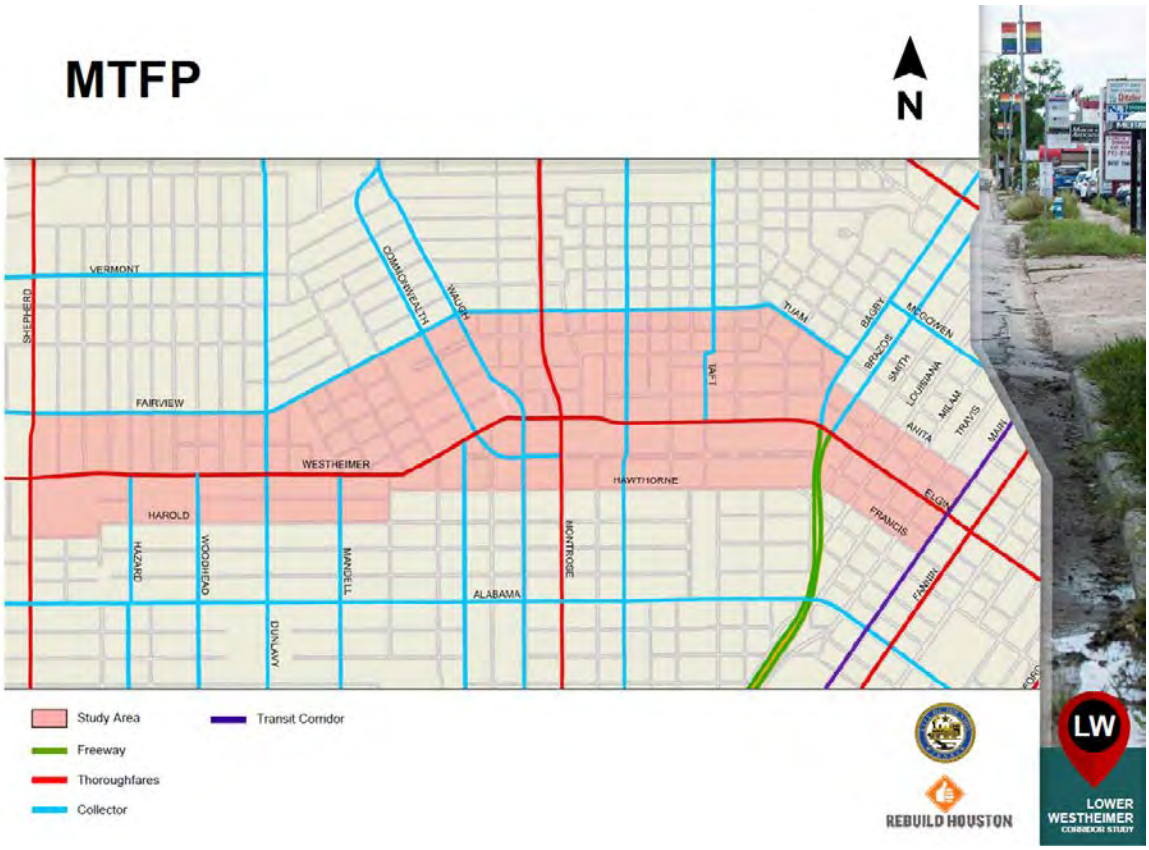
Exhibit B-6 – Major Thoroughfare and Freeway Plan



In the study area, Westheimer Road between South Shepherd Drive and Yupon Street is a 4-lane east-west thoroughfare, and between Yupon Street to Montrose Boulevard, Westheimer Road is a 5-lane east-west thoroughfare road that includes a continuous center left-turn lane. The posted speed limit is 30 miles per hour. There are eight (8) signalized intersections and 17 unsignalized intersections in this segment. Westheimer Road, between Taft Street and Bagby Street, is a 4-lane (2 lanes each direction) asphalt roadway with concrete curb and gutter. The pavement is in fair to poor condition. Between Bagby Street and Main Street, Elgin Street is a 5-lane (2 lanes each direction with a center-turn lane) concrete roadway with curb and gutter. The pavement in Elgin Street is in good to fair condition.

Within the study area limits, the City of Houston Major Thoroughfare Plan designates Westheimer Road as a major thoroughfare with four (4) lanes within a 70-foot ROW (T-4-70) between South Shepherd Drive and Montrose Boulevard and Westheimer Road as a major thoroughfare with four (4) lanes within a 70-foot right-of-way (T-4-70) between Taft Street and Bagby Street. East of Bagby Street, Westheimer Road becomes Elgin Street, and is designated as a major thoroughfare with four (4) lanes within an 80-foot right-of-way (T-4-80).

B.2 CULTURAL AND HISTORICAL SIGNIFICANCE

Westheimer Road between Bagby Street and S. Shepherd Drive is a unique Houston street in the Montrose neighborhood. It represents an evolution of use and building types over a period of 100 years. Historically, the street was primarily residential and many of the one-story bungalow houses remain and many are now in commercial use. Other residential forms on the street include two-story wood frame and brick single family and multi-family residential buildings. The multi-family buildings on the street tend to be duplexes or quadruplexes. Larger scale multifamily apartments and/or condo units were not introduced until the 1980s, 1990s or 2000s and are concentrated to the far eastern and western ends of the study corridor. **Appendix J** includes the survey conducted along this corridor to set the stage for the enhanced pre-engineering process.

In addition, installation of the special crosswalk markings at the intersection of Westheimer Road and Taft Road was completed as part of the Houston's 39th annual Pride Celebration, with events taking place in late June, including the 2017 Houston Pride Parade on Saturday, June 24. The parade drew over 700,000 attendees this year. The crosswalk installation was funded by Pride Houston ($15,000) to help fund the project's design and construction.

One of the more active groups for nearly forty years along the Lower Westheimer Corridor is the Pride Houston which as a group has been a central part of the Houston's LGBT community. The organization's core mission is to strengthen equality and increase awareness of issues important to the LGBT community including health, safety, and marriage equality. Pride Houston celebrates the individuality and diversity of every person. From the festive Pride Celebration to charity events and aiding LGBT support and counseling networks, Pride Houston's activities promote social awareness and enrich the diversity that helps the Houston community thrive. Pride Houston is a registered 501(c)3 organization incorporated in the state of Texas and is run solely by volunteers.

B.3 PUBLIC ENGAGEMENT

PWE and P&D at the outset of this effort in following through the higher level of an enhanced pre-engineering study established a project website to communicate to the public and SAC member.

http://www.houstontx.gov/planning/transportation/CMP/LowerWestheimer/project.html.

There were three official SAC meetings and three public meetings with various levels of attendance and above average participation levels for a pre-engineering study. Appendix C contains all the materials and subjects discussed at the six meetings. In addition, the project team conducted targeted survey to understand priorities of the Lower Westheimer corridor. If there was a common theme, it will be the primary desire to improve the pedestrian realm and improve the pedestrian experience along the corridor. As an example two questions were asked at the June 6th, 2016 and the first SAC meeting. The following world clouds summarized graphic representation of the two questions the attendees told the project team.

What do you LOVE about Westheimer Road?

What would make Lower Westheimer BETTER?

B.4 PROJECT OBJECTIVE, PRINCIPLES, AND STRATEGIES

After several iterations studying existing conditions and working with COH personnel, SAC members, and extensive survey from the public at large; the following set of guiding principles were established to perform further analysis and recommendations.

The project objective for the Lower Westheimer Corridor Study is:

Lower Westheimer serves as an urban "main street" that creates an enhanced pedestrian experience. Lower Westheimer should support transit, improve access to local businesses, be aesthetically pleasing, and preserve the local culture and character while managing traffic flow effectively and safely.

The project objective for the Lower Westheimer Study is supported by the following guiding principles:

1. Strongly support use of multiple modes of transportation along the corridor, with pedestrian and transit uses as top priorities.

2. Support local businesses and surrounding neighborhoods by providing convenient and safe access, including parking, for people to destinations using multiple modes of transportation.
3. Improve safety along the corridor for all users, with the goal of eliminating serious crashes along the corridor for all users (Vision Zero).
4. Balance adequate capacity for safe vehicular movement with safe access for people who walk, bike, and ride transit throughout the corridor.
5. Maintain and enhance cultural and historical heritage, improve aesthetics, and contribute to the community's greater "sense of place".

In order to achieve the above guiding principles specific strategies to consider and utilize are:

1. Provide wider pedestrian pathways and other pedestrian realm features that integrate well with adjacent existing businesses and accommodate future pedestrian-oriented redevelopment.
2. Promote efficient and effective movement of people and goods by integrating and linking various modes of transportation with particular attention to major intersections.
3. Consider safety as the primary component of all infrastructure design decisions with an end objective of reducing fatalities and crashes.
4. Utilize access management to remove conflict points and improve safety.
5. Employ intersection designs that function as character-defining nodes.
6. Ensure transit stops are well-placed and allow for adequate vehicular flow wherever possible, that offer comfortable, accessible waiting areas for all riders, including individuals with disabilities, and that street design supports reliable, frequent, high-ridership transit service.
7. Incorporate on-street parking to support local businesses where feasible.
8. Maintain and enhance cultural and historical features along the corridor, including existing trees where possible.
9. Consider aesthetically pleasing features including street trees.
10. Utilize design elements that recognize and support the character of Lower Westheimer Road and its diverse built form.
11. Facilitate safe connectivity between neighborhoods, including for pedestrians as well as for bicycles crossing Westheimer, with a focus on intersection design.
12. Employ design features that allow balance between traffic speeds, access, and parking for adjacent land uses, but do not interfere with area aesthetics.
13. Consider burial of above-ground power lines due to limited right-of-way, subject to funding considerations.
14. Recognize the regional importance of the corridor, especially for transit use, and provide appropriate access opportunities that will help shape the path of future land use.
15. Shorten pedestrian crossing distances where possible.

16. Strategically consolidate and relocate bus stops (for example, far side stops) and incorporate signal technology (such as transit signal priority) to improve transit travel times and reliability.
17. Recognize the importance of lighting, landscaping, and other design features in improving the streetscape and enhancing safety for pedestrians and other users.

B.5 TRAFFIC SAFETY AND OPERATIONAL ANALYSES AND IMPROVEMENTS

Understanding roadway safety performance is critical in developing effective solutions that provide safety, mobility, and maintain quality of life. One of the key components in understanding safety performance is recognized in any pre-existing safety issues and concerns. GUNDA obtained detailed crash history data for three years, 2013-2015, in order to determine whether the existing roadway conditions have negative implications on the number and severity of crashes along the study corridor. In order to identify any safety concerns, crashes were categorized by type of crash, intersection- or segment-related, and severity in order to determine the Crash Rate and Severity Index. The intersections at Dunlavy, Montrose, Bagby, and Smith had relatively high crash rates. This is normal trend at major intersections with relatively higher demand as compared to others.

The segment of Westheimer Road between Dunlavy and Bagby has relatively high crash rate. This can be attributed directly to the narrow lanes and the lack of exclusive left-turn lanes. Exhibits B-7 and B-8 summarize crash rates in graphical format. In addition, Exhibit B-9 illustrates crash distribution along the corridor. As expected, intersection distribution are higher at the major intersections.

Exhibit B-7 Westheimer Road - Roadway Segment Crash Rates

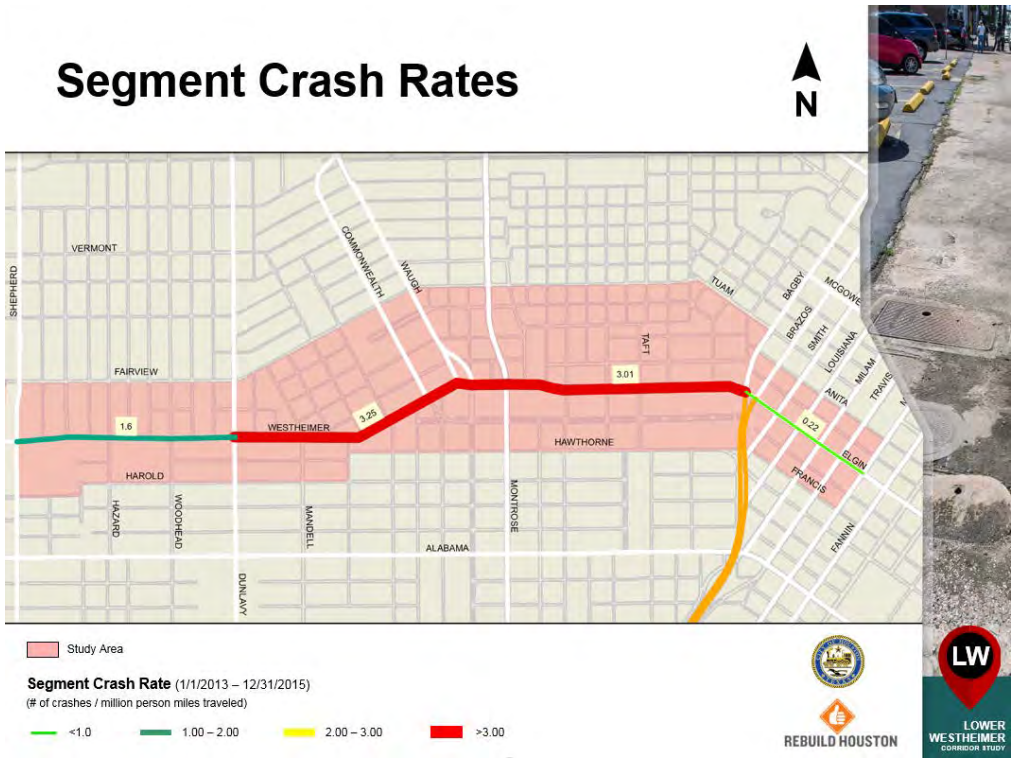
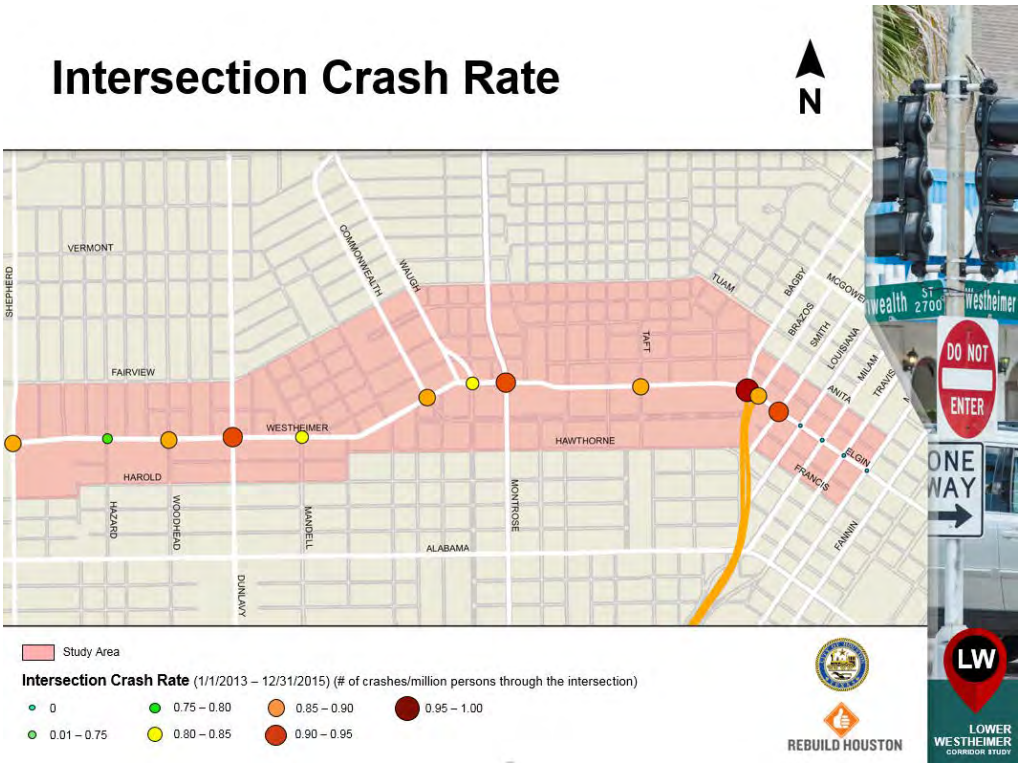
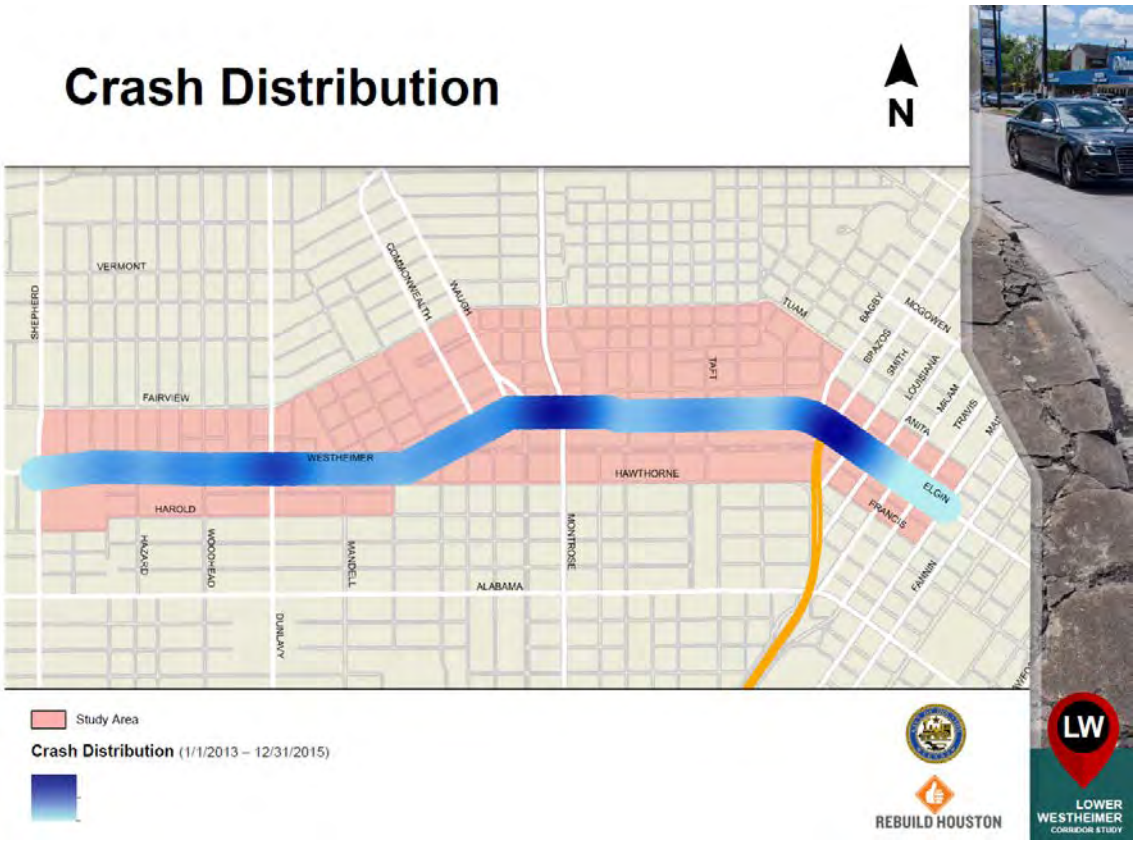


Exhibit B-8 Westheimer Road - Intersection Crash Rates



GUNDA CORPORATION
Engineers, Planners & Managers

Exhibit B-9 Westheimer Road – Crash Distribution



Understanding roadway safety performance is critical in developing effective solutions that provide safety, mobility, and maintain quality of life. One of the key components in understanding safety performance is recognized in any pre-existing safety issues and concerns. GUNDA obtained detailed crash history data for three years, 2013-2015, in order to determine whether the existing roadway conditions have negative implications on the number and severity of crashes along the study corridor. In order to identify any safety concerns, crashes were categorized by type of crash, intersection- or segment-related, and severity in order to determine the Crash Rate and Severity Index. The analysis showed no unusual crash trend along the roadway segment, indicating that the roadway segment geometry and/or roadside objects are not a contributing factor to crashes. The intersections of Westheimer at Dunlavy and Montrose with 43 and 61 crashes, respectively have relatively high intersection related crashes. The segment of Westheimer Road between Shepherd has relatively high crashes whereas the crash rate for the segment of Westheimer Road between Dunlavy Street and Montrose Street has relatively high. Majority of the crash experience within the study area are at the major intersections as is common throughout the Houston area. Exhibits B-10 and B-11 summarize crash types, rates, and severity indexes.

Exhibit B-10 - Westheimer Road - Roadway Segment Crash Summary Table
(January 01, 2013 - December 31, 2015)

	Shepherd to Dunlavy	Dunlavy to Montrose	Montrose to Bagby	Bagby to Main
Crash Type				
Rear End	6	6	4	1
Turning	4	11	9	0
Angle	6	16	15	0
Miscellaneous	3	21	14	1
Fixed Object	6	3	3	0
Backing	0	0	0	0
Head On	0	3	2	0
Side Swipe	1	19	6	0
Pedestrian/Bicycle	0	0	0	0
Total	26	79	53	2
Severity				
Fatal	0	1	0	0
Bodily Injury	12	17	15	0
Property Damage	14	61	38	2
Crash History				
01/2013-12/2013	11	28	14	1
01/2014-01/2014	10	21	23	0
01/2015-01/2015	5	30	16	1
Crash Rate and Severity Index				
Crash Rate	2.40	4.88	4.52	0.33
24 Hour Volume	19770	18495	17864	18591
Severity Index	1.46	1.27	1.28	1.00

1. Crash rate on a roadway segment is expressed as the number of crashes per million vehicle miles traveled along the segment. The traffic volumes collected for this study were used for this calculation.
2. Severity Index (SI) is calculated based on crash severity parameters developed by the National Safety Council. The SI is calculated using the following formula.

$$SI = \frac{5.8\ (\text{Fatality}) + 2\ (\text{Bodily Injury}) + \text{Property Damage}}{\text{Total No. of Crashes}}$$

Exhibit B-11 – Westheimer Road – Intersection Crash Summary Table
(January 01, 2013 – December 31, 2015)

	Westheimer & Main Street	Westheimer & Travis Street	Westheimer & Milam Street	Westheimer & Louisiana Street	Westheimer & Smith Street	Westheimer & Brazos Street	Westheimer & Bagby Street	Westheimer & Taft Street	Westheimer & Montrose Blvd	Westheimer & Yoakum Blvd	Westheimer & Commonwealth	Westheimer & Mandell Street	Westheimer & Dunlavy Street	Westheimer & Woodhead Street	Westheimer & Hazard Street	Westheimer & S Shepherd Dr
Crash Type																
Rear End	0	0	0	0	2	0	3	1	5	4	0	5	8	4	1	5
Turning	0	0	0	0	9	10	2	6	26	7	2	5	18	11	6	9
Angle	0	0	0	0	27	13	14	6	6	4	5	3	12	9	10	15
Miscellaneous	0	0	0	0	3	2	3	2	4	2	1	5	5	7	3	5
Fixed Object	0	0	0	0	4	2	3	2	9	0	1	1	3	2	1	4
Backing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Head On	0	0	0	0	0	0	0	0	0	4	0	1	1	0	0	1
Side Swipe	0	0	0	0	0	2	0	3	6	4	1	1	6	2	1	2
Pedestrian/Bicycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	45	29	25	20	56	25	10	21	53	35	22	41
Severity																
Fatal	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Bodily Injury	0	0	0	0	17	9	11	7	19	6	3	5	21	11	3	9
Property Damage	0	0	0	0	28	20	14	13	36	19	7	16	32	24	19	31
Crash History																
01/2013-12/2013	0	0	0	0	20	9	7	4	15	9	4	8	13	18	6	16
01/2014-01/2014	0	0	0	0	12	7	9	7	17	6	2	8	28	11	7	10
01/2015-01/2015	0	0	0	0	13	13	9	9	24	10	4	5	12	6	9	15
Crash Rate and Severity Index																
Crash Rate	0.00	0.00	0.00	0.00	1.13	1.12	1.25	0.89	1.25	0.95	0.30	1.09	1.96	1.65	1.09	0.80
Total Entering Volume	23890	31520	31930	25900	36290	23620	18220	20440	40880	23920	30140	17540	24700	19360	18420	46760
Severity Index	0.00	0.00	0.00	0.00	1.38	1.31	1.44	1.35	1.41	1.24	1.30	1.24	1.40	1.31	1.14	1.32

1. Crash rate in an intersection is expressed as the number of crashes per million vehicles entering the intersection.
2. Severity Index (SI) is calculated based on crash severity parameters developed by the National Safety Council. The SI is calculated using the following formula.

$$SI = \frac{5.8\ (\text{Fatality}) + 2\ (\text{Bodily Injury}) + \text{Property Damage}}{\text{Total No. of Crashes}}$$

As the crash summaries indicate there are not significant pedestrian and bicycle related crashes along the corridor, as there are not much accessible pedestrian and bicycle facility; it can be concluded that there are not substantial pedestrian and bicycle demand currently, even though majority of public comment is geared towards making the Lower Westheimer corridor pedestrian friendly. The most identifiable trend is the relatively higher roadway segment crash rates between Dunlavy and Montrose. This relatively higher rate can be attributed to the following factors.

- The lack of defined turn lanes at the major intersections create several lane change maneuvers.
- Most of the segment has very narrow lanes that create situation for higher side-swipe and lane change crashes.
- The four-lane undivided cross section with buses stopping in the right-most lane create several lane change maneuvers that increase potential conflict points in the roadway segment.
- One of the negative impacts of four-lane undivided cross section is differential in vehicular speeds along the segment which creates increased potential conflicts.

Intersection levels of service (LOS) analyses were performed in accordance with the procedures set forth and recommended by the Highway Capacity Manual (HCM) LOS methodologies for evaluation of signalized intersections. Traffic analysis software SYNCHRO was used to evaluate the operation of the study intersections. The Level of Service criteria for intersections are listed below in Exhibit B-12. LOS 'A' is considered best, free-flow traffic conditions and LOS 'F' would be failing traffic conditions.

Exhibit B-12
Level of Service (LOS) Criteria for Intersections

	Signalized Intersection
LOS	Delay (sec/veh)
A	0-10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

The existing conditions analysis was conducted by coding the existing roadway geometry. The results of the LOS analysis for Year 2017 existing traffic conditions are presented in Exhibit B-13 and all analysis outputs are included in Appendix G.

As the results show in Exhibit B-13, total intersection delays and LOS are within acceptable range of "D" or better. Existing and historical ADT along the study corridor are summarized in Exhibit

Exhibit B-13
Intersection Level of Service – Year 2017 Existing Traffic Conditions
Westheimer Road Traffic Analysis

Intersection		AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay
1	Westheimer Road at Shepherd Drive	C	21.2	D	37.4
2	Westheimer Road at Hazard Street	C	21.1	B	12.4
3	Westheimer Road at Woodhead Street	B	12.6	B	13.4
4	Westheimer Road at Dunlavy Street	C	27.4	C	26.7
5	Westheimer Road at Mandell Street	B	15.6	B	13.5
6	Westheimer Road at Commonwealth Street	B	17.7	B	10.9
7	Westheimer Road at Yoakum Boulevard	A	6.4	B	15.8
8	Westheimer Road at Montrose Boulevard	C	27.1	D	40.0
9	Westheimer Road at Taft Street	B	13.6	B	13.1
10	Elgin Street at Bagby Street	B	15.7	B	12.1
11	Elgin Street at Brazos Street	B	15.9	C	28.9
12	Elgin Street at Smith Street	B	16.6	B	18.9
13	Elgin Street at Louisiana Street	B	12.6	B	12.7
14	Elgin Street at Milam Street	A	9.5	B	11.3
15	Elgin Street at Travis Street	C	20.4	C	21.3
16	Elgin Street at Main Street	B	19.0	C	26.5

B-14. Based on existing ADT over the past 15 years; the Lower Westheimer corridor has been stable consistently. This can be attributed to the overall density of the area having been built out for a long time which is very indicative that Lower Westheimer will remain consistent in terms of traffic demand growth. As such, as shown in Exhibit B-15 the HGAC travel demand model as well shows relatively minor growth rate in 2040. Due to the sensitivity of the recommendations as part of this study; the COH and the project team chose to utilize higher growth rate 14% between 2017 and 2040 to analyze and size the roadway and intersections. Therefore, it can be assumed that the recommendations in this study will handle more vehicular traffic with acceptable operation than was presented below.

Exhibit B-14 Historical and Existing ADT

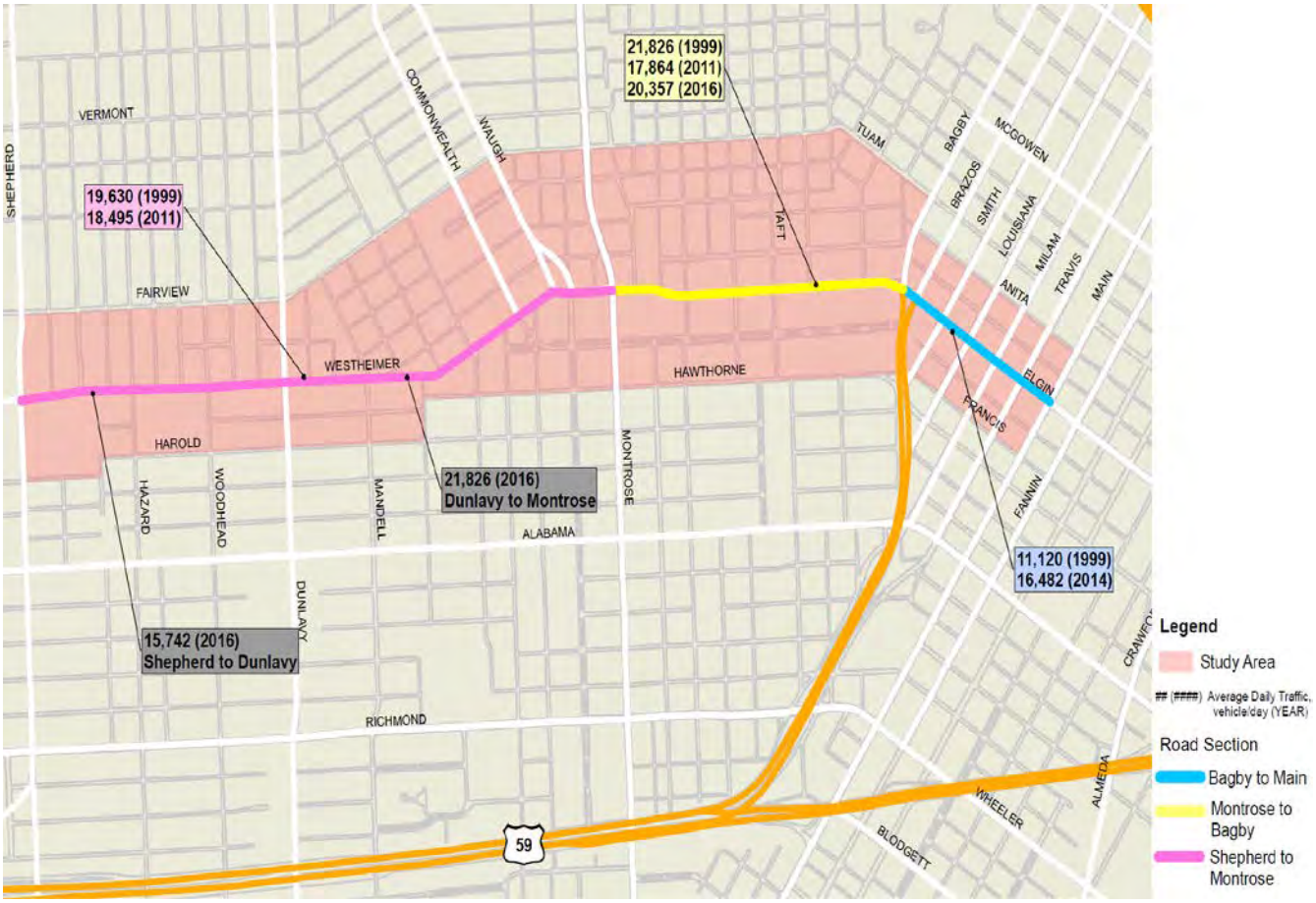
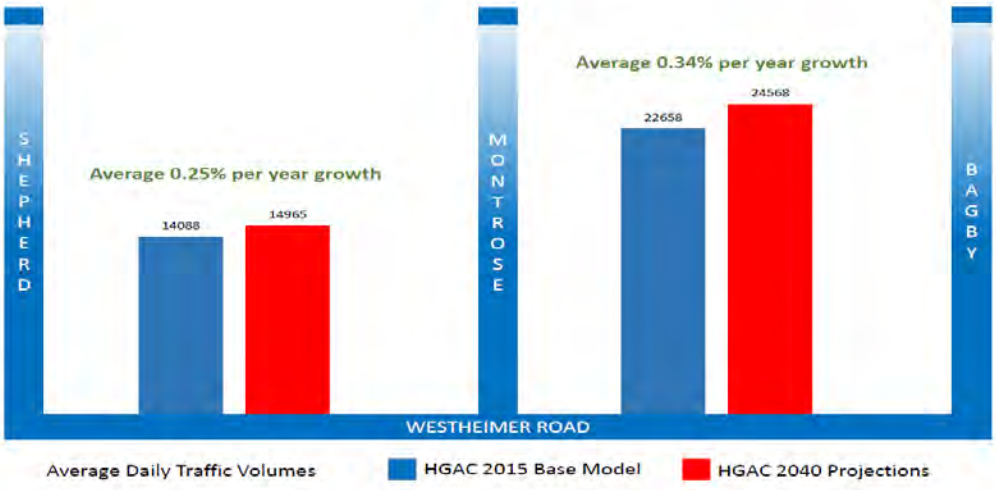


Exhibit B-15 HGAC 2040 Travel Demand Projection



Based on the comparison of Year 2014 and Year 2040 traffic data, it has been determined that the annual traffic growth rate along Westheimer Road in the study limits would be 14% by Year 2040. The results of the LOS analysis for Year 2040 future traffic conditions are presented in Exhibit B-16 comparing no-build and build conditions. All associated operational analysis of the intersections are provided in Appendix G.

Exhibit B-16
Intersection Level of Service – Year 2040 Future Traffic Conditions

Intersection		NO BUILD				BUILD			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1	Westheimer Road at Shepherd Drive	C	21.9	D	42.5	C	23.3	D	41.7
2	Westheimer Road at Hazard Street	C	23.0	B	13.3	C	21.5	B	19.9
3	Westheimer Road at Woodhead Street	B	15.0	B	13.6	C	20.1	C	20.3
4	Westheimer Road at Dunlavy Street	C	30.1	C	30.5	C	32.8	D	38.4
5	Westheimer Road at Mandell Street	B	18.1	B	16.2	B	13.6	B	18.0
6	Westheimer Road at Commonwealth Street	B	18.1	B	12.4	B	17.0	B	12.1
7	Westheimer Road at Yoakum Boulevard	A	6.5	B	16.4	A	6.3	B	16.3
8	Westheimer Road at Montrose Boulevard	C	33.3	D	53.7	C	32.8	D	49.3
9	Westheimer Road at Taft Street	B	14.7	B	14.5	B	17.6	C	32.4
10	Elgin Street at Bagby Street	B	16.7	B	12.9	B	16.7	B	13.5
11	Elgin Street at Brazos Street	B	16.8	D	41.3	B	16.3	D	38.4
12	Elgin Street at Smith Street	C	20.8	C	22.6	C	20.9	C	22.7
13	Elgin Street at Louisiana Street	B	15.4	C	20.6	B	15.2	C	20.5
14	Elgin Street at Milam Street	B	10.2	B	13.9	B	10.1	B	13.2
15	Elgin Street at Travis Street	C	21.7	C	32.9	C	21.3	C	32.6
16	Elgin Street at Main Street	B	19.0	D	40.3	B	19.0	D	39.6

As the results show in Exhibit B-16, total intersection delays and LOS are within acceptable range of "D" or better even with a conservative 14% growth rate of vehicular traffic along the Lower Westheimer corridor. Exhibit B-17 shows the recommended storage length based on the 50th percentile queue length on every intersection. These recommended storage lengths will be critical in establishing lane markings with the proposed 35 feet roadway pavement segments.

Exhibit B-17 -Westheimer/Elgin Year 2040 Projections 50th Percentile Queue Length (ft)				
Intersection	**Direction**	**AM**	**PM**	**Recommended Storage Length**
Westheimer at Hazard	EBL	3	11	50
	WBL	17	7	50
	NBL	86	17	100
	SBL	30	2	50
Westheimer at Woodhead	EBL	8	7	50
	WBL	14	8	50
	NBL	25	23	50
	SBL	12	30	50
Westheimer at Dunlavy	EBL	18	12	50
	WBL	0	25	50
	NBL	20	8	50
	SBL	20	23	50
Westheimer at Mandell	EBL	2	5	50
	WBL	12	6	50
	NBL	23	42	50
Westheimer at Commonwealth	SBR	0	45	50
Westheimer at Montrose	EBL	45	114	150
	WBL	89	98	150
	NBL	83	91	100
	SBL	26	136	150
Westheimer at Waugh Dr	EBL	6	29	50
	NBL	22	37	50
Westheimer at Taft	EBL	6	23	50
	WBL	5	7	50
	NBL	6	9	50
	SBL	41	16	50
Westheimer at Bagby	WBL	6	5	100[1]
	SBR	-	-	50
Elgin at Brazos	EBL	2	2	100[1]
	NBL	66	44	100
Elgin at Smith	WBL	19	28	80[1]
	SBL	47	70	100
Elgin at Louisiana	EBL	22	~89	80[1]
	NBL	11	22	50
Elgin at Milam	WBL	8	11	100
	SBL	60	42	75

Exhibit B-17 -Westheimer/Elgin Year 2040 Projections 50th Percentile Queue Length (ft)				
Intersection	**Direction**	**AM**	**PM**	**Recommended Storage Length**
	SBR	-	-	-
Elgin at Travis	EBL	17	18	100
	NBL	19	44	50

[1]Existing Length

[2]Minimum Length Required

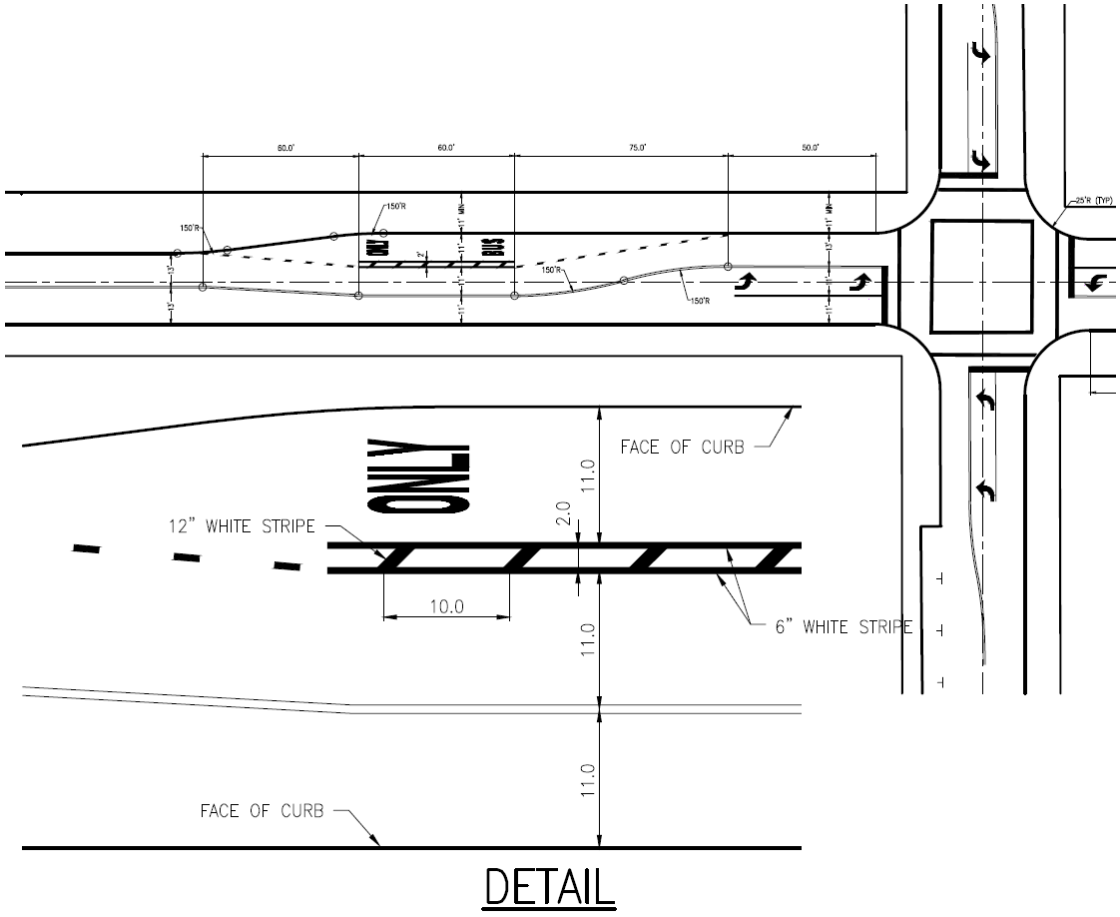
Since METRO Route #82 is the highest ridership bus service in the region; METRO performed further analysis of the recommended improvements by building a VISSIM model of the corridor. The COH took this opportunity to obtain the VISSIM model and built upon by performing unsignalized intersection turning movement counts on the segment of Westheimer Road between Montrose Boulevard and Bagby Street. The VISSIM model output of travel times comparing No Build and Build conditions are summarized in Exhibit B-18. As shown in the exhibit in terms of travel time along the corridor; there will be relatively minor increase in travel time to achieve the primary objective of this effort which is to improve pedestrian experience by improving the pedestrian realm and to improve safety of vehicular traffic. Appendix K includes coordination with METRO to consolidate bus stops and design detail review of the recommended bus lanes as shown in Exhibit B-19. The design team actually reviewed the bus lane concept using articulated bus to scale so that METRO has the chance to refine the design feature of the detail shown in Exhibit B-19. In addition, METRO has included additional comments to be considered during the design phase which is included in Appendix K.

Exhibit B-18 - VISSIM Model Travel Time Estimates

	Existing		No Build 2040		Build 2040	
	EB	WB	EB	WB	EB	WB
Entire Corridor	618	500.17	762.6	514.8	814.18	533.25
Commonwealth to Brazos	222.15	246.1	305.2	218.3	355.7	235.64

Estimated Travel Time are in seconds.

Exhibit B-19 – Bus Lane Detail Coordinated with METRO



B.6 ACCESS MANAGEMENT

The purpose of access management study is to identify transportation improvements that reduce crashes, improve traffic flow, reduce motorist delay, and to address multi-model/land use context.

As part of access management solutions, driveway density analysis is performed to determine if driveway consolidation is required in order to reduce the crash rates and improve safety along the corridor. Driveway density is defined as the number of driveways per mile. Roadway segments with more than 30 driveways per mile are considered unacceptable, and an access management solution, such as driveway consolidation, should be considered.

In the study area of Westheimer Road from Shepherd to Montrose, the average driveway density for the north side of the corridor is 39 driveways per mile and for the south side of the corridor, 36 driveways per mile. Hence, driveway consolidation should be considered and actively pursued during the design stage.

In the study area of Westheimer Road/Elgin Street from Montrose Boulevard to Main Street, the average driveway density for the north side of the corridor is 30 driveways per mile and for the south side of the corridor is 35 driveways per mile. Hence, driveway consolidation should be considered and actively pursued during the design stage.

B.7 PAVEMENT IMPROVEMENTS

Based on field observation, the pavement is generally in a fair to poor condition with numerous areas with cracking. The lane widths are less than 10 feet wide throughout the corridor. Exhibit E3 provides typical cross sections of the alternatives discussed below.

GUNDA reviewed alternatives for reconstruction of the existing pavement to bring it to current COH standards and to meet traffic needs.

In the proposed concept layout, a minimum of two (2) lanes will be constructed along Westheimer Road between South Shepherd Drive and Bagby Street and a minimum of four (4) lanes along Elgin Street between Bagby Street and Main Street to meet the requirements of the major thoroughfare plan. The lane widths will be a minimum of 11 feet. On-street parking or Bus Lanes will be provided as shown in the concept layout in Exhibit E4. The existing roadway will be removed and the proposed roadway will be concrete with concrete curbs and gutter. Minimum 7.5-foot sidewalks should be provided, but utilizing the concept layout presented in Exhibit E4 greater width of sidewalk (pedestrian realm) should be provided. Additional right-of-way, approximately 5,076 square feet, will be required. Although utility undergrounding cannot be accomplished with COH funding; it should be noted that utility undergrounding is critical item in improving the pedestrian experience in addition to providing wider sidewalks. In addition, additional guidance to the designer is included in Appendix L with sample layouts to improve the pedestrian experience by improving the pedestrian realm.

B.8 DRAINAGE IMPROVEMENTS

N-2013T-C01

C01-A. ANALYSIS APPROACH

The City of Houston HouStorm software was used to analyze the proposed system. The proposed system was designed for 2-year and analyzed for 100-year rainfall events. The time of concentration (Tc) for each drainage area was calculated using City of Houston methodology. Manning's runoff coefficients were determined based on land use. The tailwater conditions were established per the criteria set in TP 100. Two (2) different approaches were considered for designing the proposed improvements along the project corridor.

Under Approach 1, the proposed system was sized to contain the 2-year rainfall event's HGL below the gutter line and the 100-year rainfall HGL within the right-of-way. The 100-

year rainfall event was analyzed by considering the City of Houston recommended Method 2 which considers flow in the storm sewer as well as street conveyance. Roadway capacity was calculated based on Manning's equation for channel design with proposed roadway width and a depth of six (6) inches (curb depth).

Under Approach 2, the proposed system was sized to contain the 2-year rainfall event HGL below the gutter elevation. The proposed storm sewer was further analyzed for the 100-year rainfall event using City of Houston recommended Method 3. Roadway capacity was added to storm sewer capacity to determine the total capacity of drainage system. An approach similar to the one discussed in Alternative 1 was used to account for roadway capacity. Flow in excess of the drainage system capacity was considered as storage required within project area.

For increase in imperious area, detention volume was computed based the City of Houston's minimum detention rate of 0.5 acre-feet/acre of increase in imperious area.

C01-B. PROPOSED DRAINAGE CONDITIONS

In the proposed condition, the W0679 and W0680 drainage systems along Westheimer Road between Shepherd Drive and Montrose Boulevard were designed to meet the City of Houston current design criteria and continue to outfall into the existing storm sewer trunks along Shepherd Drive and Yoakum Boulevard. The proposed drainage areas and land use will remain same as the existing conditions. The proposed improvements and the HouStorm output are attached in Appendix F. The proposed pipe sizes, lengths, and analysis approaches are presented in Exhibit B-20.

C01-C. ADDITIONAL DETENTION VOLUME REQUIREMENTS

The existing storm sewer pipes for W0697 and W0680 system were upsized to meet the current City of Houston design requirements for the 100-year criteria. There is a peak flow impact of 46.5 cubic feet per second (cfs) for the W0680 drainage system requiring 12 acre-feet of mitigation.

For the mitigation volume, three (3) drainage options were analyzed: inline detention, local detention, and regional detention.

For inline detention, the additional run-off volume to be detained within the project limits results in an increase in pipe sizes for the proposed 66-inch to 96-inch pipe to single and dual 12-foot by 11-foot RCB pipe between Ralph Street and Yoakum Boulevard to provide detention of 12 ac-ft for drainage system W0680. A restrictor will have to be designed at the outfall during the design phase to utilize the detention volume and restrict the peak outflow to the existing condition, and placed during construction.

For local detention within the project limits, three (3) parcels were identified. Area 1 (D1) is located at the southwest corner of West Alabama Street and Yorktown Street and is approximately 5.77 acres of land. This parcel is owned by the Houston Independent School District (HISD). Area 2 (D2) is located west of the CVS Pharmacy store located at the northwest intersection of Yorktown Street and Westheimer Road, and is approximately 4.0 acres. The detention identified for the area needed is 2.93 acres however the most likely result would be purchase of the entire due to land negotiations. D2 property value is approximately $80.00 per square-foot per HCAD. The purchase of the property for detention purposes would require the purchase of the entire 4.0 acres totaling approximately $41,802,960 (HCAD value times 3). The other area of land, identified as a proposed location for a detention is at Grady Park which is located on the southeast corner of Yorktown Street and San Felipe Street. Grady Park is part of Grady Middle School and is not feasible for acquisition.

There are no regional detention options.

Exhibit B-20
Proposed Storm Sewer System
Design Summary

Drainage Area ID	MH From	MH To	Reach Length (ft)	Number of Manholes	Number of Inlets	2-Year Design Event			100-Year Extreme Event		
						Number of Pipes	Span (ft)	Rise (in/ft)	Number of Pipes	Span (ft)	Rise (in/ft)
	W1	OUT	132	1	4	1	-	42	1	7	4
	W2	W1	53	1	-	1	-	36	1	-	36
W0679	W3	W2	330	1	2	1	-	36	1	-	36
	W4	W3	314	1	3	1	-	30	1	-	30
	W5	W4	269	1	3	1	-	24	1	-	24
	W6	W7	249	1	4	1	-	24	1	-	24
	W7	W8	290	1	3	1	-	24	1	-	30
	W8	W9	266	1	3	1	-	30	1	-	36
	W9	W10	275	1	4	1	-	30	1	-	36
	W10	W11	271	1	3	1	-	36	1	-	36
	W11	W12	260	1	3	1	-	36	1	-	42
	W12	W13	259	1	4	1	-	66	1	-	96
	W13	W14	244	1	3	1	12	11	1	12	11
	W14	W15	353	1	3	1	12	11	1	12	11
W0680	W15	W16	379	1	4	1	12	11	1	12	11
	W16	W17	200	1	3	1	12	11	1	12	11
	W17	W18	193	1	3	1	12	12	1	12	12
	W18	W19	394	1	3	1	12	12	1	12	12
	W19	W20	547	1	4	1	12	12	2	12	12
	W20	W21	439	1	4	1	12	12	2	12	12
	W21	OUT	183	1	-	1	-	108	1	-	144
	W22	W21	101	1	4	1	-	66	1	-	78
	W23	W22	311	1	3	1	-	24	1	-	24
	W24	W23	181	1	4	1	-	24	1	-	24

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0012-A. ANALYSIS APPROACH

The City of Houston HouStorm software was used to analyze the proposed system. The proposed system was designed for 2-year and analyzed for 100-year rainfall events. The time of concentration (Tc) for each drainage area was calculated using City of Houston methodology. Manning's runoff coefficients were determined based on land use. The tailwater conditions were established per the criteria set in TP 100. Three (3) different approaches were considered for designing the proposed improvements along the project corridor.

Approach 1 sized the proposed storm sewers to convey the 2-year storm with the HGL under the proposed gutter elevation and the 100-year storm with the HGL within the ROW utilizing inline detention only.

Under Approach 2, the proposed system was sized to contain the 2-year rainfall event's HGL below the gutter line and the 100-year rainfall HGL within the right-of-way. The 100-

year rainfall event was analyzed by considering the City of Houston recommended Method 2 which considers flow in the storm sewer as well as street conveyance. Roadway capacity was calculated based on Manning's equation for channel design with proposed roadway width and a depth of six (6) inches (curb depth).

Under Approach 3, the proposed system was sized to contain the 2-year rainfall event HGL below the gutter elevation. The proposed storm sewer was further analyzed for the 100-year rainfall event using City of Houston recommended Method 3. Roadway capacity was added to storm sewer capacity to determine the total capacity of drainage system. An approach similar to the one discussed in Approach 2 was used to account for roadway capacity. Flow in excess of the drainage system capacity was considered as storage required within project area.

For increase in imperious area, detention volume was computed based the City of Houston's minimum detention rate of 0.5 acre-feet/acre of increase in imperious area.

0012-B. PROPOSED DRAINAGE CONDITIONS

West System

In the proposed condition, the West system of Westheimer Road was designed for the three (3) approaches as discussed above. For each approach, the storm sewers were designed to meet the City of Houston current design criteria and continue to outfall into the existing storm at Milam Street ultimately into Buffalo Bayou. The proposed drainage areas and land use will remain same as the existing conditions. The proposed improvements are shown on Exhibit C4 and the HouStorm output is attached as Appendix F.

Under Approach 1, the proposed storm sewer system was designed to convey and contain the 100-year HGL below the ROW elevation with inline detention. The proposed pipe sizes vary between 30-inch and 72-inch pipe along the corridor. The proposed pipe sizes and lengths are presented in Exhibit B-21.

Under Approach 2, the proposed storm sewer system was designed to contain 100-year rainfall HGL below the right-of-way elevation. This approach accounts for extreme event flow in the storm sewer and street conveyance. The proposed roadway can store approximately 88 cubic feet per second (cfs). This flow was divided by number of manholes within the system corresponding flow was deducted from each manhole (approximately 4 cfs). The new storm sewer was designed to accommodate the remaining flow. The proposed pipe sizes for this approach vary from 24-inch to 72-inch along the corridor. The proposed pipe sizes and lengths are presented in Exhibit B-21.

Under Approach 3, the proposed storm sewer improvements were designed for the design storm (2-year). Roadway capacity was added to storm sewer capacity to determine the total capacity of the drainage system. Approximately 20.50 acre-feet of flow has to be detained on-site to accommodate 100-year rainfall event flow without raising the HGL beyond the right-of-way elevation. The project corridor is built out, and vacant parcels are not readily

available for acquisition for detention without significant cost. The proposed pipe sizes and lengths are presented in Exhibit B-21.

East System

The East system was constructed to the latest City of Houston design standards and the existing system analysis shows that the system has adequate capacity to accommodate 2-year and 100-year rainfall events. So no improvements to the existing system are recommended.

0012-C. ADDITIONAL DETENTION VOLUME REQUIREMENTS

The proposed roadway for Westheimer Road/ Elgin Street will be reconstructed to meet the current lane width and configurations per the City of Houston design criteria. The proposed impervious area will increase slightly (5 to 11 feet) from the existing condition. The proposed storm sewers were sized to provide inline detention and will, therefore, not cause an impact downstream. No additional detention will be required.

Exhibit B-21 – Proposed Drainage System

Drainage System ID	Drainage Area ID	MH From	MH To	Reach Length (ft)	Approach 1 Diameter (in)	Alternative 2 Diameter (in)	Alternative 3 Diameter (in)
West System	W100NA	W100NA	W100NB	17	30	24	24
	W100NB	W100NB	W100NC	223	36	24	24
	W100NC	W100NC	W100ND	18	48	24	24
	W100ND	W100ND	W100NE	216	48	24	24
	W100NE	W100NE	W100NF	38	48	24	24
	W100NF	W100NF	W100NG	453	48	36	36
	W100NG	W100NG	W100NH	41	48	36	36
	W100NH	W100NH	W100NI	410	60	48	48
	W100NI	W100NI	W100NJ	373	60	54	54
	W100NJ	W100NJ	W100NK	553	66	60	54
	W100NK	W100NK	W100NL	397	66	60	54
	W100NL	W100NL	W100NM	52	66	60	54
	W100NM	W100NM	W100NN	90	66	66	54
	W100NN	W100NN	W100NO	87	66	66	54
	W100NO	W100NO	W100NP	280	66	66	54
	W100NP	W100NP	W100NQ	54	66	66	54
	W100NQ	W100NQ	W100NR	47	72	66	54
	W100NR	W100NR	W100NS-1	236	72	66	54
	W100NS-1	W100NS-1	W100NS-2	56	72	66	54
	W100NS-2	W100NS-2	W100NT	55	72	66	54
	W100NT	W100NT	W100NU	208	72	72	54
	W100NU	W100NU	OUT	57	72	72	54
East System	W100NW	W100NW	W100NX	47	-	-	-
	W100NX	W100NX	W100NY	169	-	-	-
	W100NY	W100NY	W100NZ	52	-	-	-
	W100NZ	W100NZ	W100NAA	49	-	-	-
	W100NAA	W100NAA	W100NAB	54	-	-	-
	W100NAB	W100NAB	W100NAC	241	-	-	-
	W100NAC	W100NAC	OUT	41	-	-	-

B.9 PUBLIC UTILITIES

The City of Houston has developed rankings for the water infrastructure facilities throughout the City, by Key Map grid number, called Water Infrastructure Replacement Prioritization (WIRP). The WIRP rankings within the project area are listed in Exhibit B-22 below.

Exhibit B-22
Water Infrastructure Replacement Prioritization (WIRP)

Key Map Grid	WIRP
492U	114
492V	218
493S	38
493T	131

The City of Houston recommends replacing the existing water lines between Shepherd Drive and Montrose Boulevard with 16-inch water line and replacing the existing water lines along Westheimer Road with 16-inch lines and along Elgin Street with 16-inch lines. Exhibit E5 shows recommendations provided by COH.

The City of Houston also recommends replacement of the existing sanitary between Hazard Street and Mandell Street with 12-inch sewers, and between Yupon Street and Waugh Drive with 8-inch sewers, and replacing the existing the dual 8-inch sanitary sewers along Elgin Street between Smith Street and Louisiana Street with 12-inch sewers. Exhibit E5 shows recommendations provided by COH.

B.10 ESTIMATED PROBABLE CONSTRUCTION COSTS

The total construction cost for the alternative is included in Appendix H. Exhibit B-23 summarizes the total probable construction costs for each alternative.

Exhibit B-23
Total Probable Construction Costs Divided by Recommended Sub-Projects

Item	Montrose to Main	Kuester to Montrose	Shepherd to Kuester
Paving	$6,015,977.22	$3,638,549.86	$3,018,749.14
Storm	$2,553,538.02	$6,845,710.52	$1,414,620.68
Water	$1,378,535.40	$848,588.40	$878,763.60
Wastewater	$389,083.20	$227,304.00	$715,968.00
Contingencies (30%)	$3,101,140.15	$3,468,045.83	$1,808,430.43
Construction Management	$1,550,570.08	$1,734,022.92	$904,215.21
Engineering Fee Estimate	$2,687,654.80	$3,005,639.72	$1,567,306.37
Design Management	$403,148.22	$450,845.96	$235,095.96
Land Acquisition	$433,290.00	$294,360.00	$109,890.00
Grand Total	**$18,512,937.09**	**$20,513,067.21**	**$10,653,039.38**

Pre-Engineering Record Drawing Log

N-2013T-0012: Westheimer Road from Montrose to Main Street

Plan # (P)	Plan Type	Title	Limits
356	Water	-	at Louisiana
1250	Storm Sewer	-	Main to Milam
1251	Storm Sewer	-	Grant to Milam
3584	Water	-	on Bagby
4205	Storm Sewer	-	on Brazos
5169	Wastewater	Elgin Ave. from Main Street to Hathaway	Louisiana to Milam
5317	Water	8" Water Main on Westheimer Road	Stanford to Taft
5535	Water	Water Mains - 8" on Westheimer, Grant, Lovett, Hawthorne, Yoakum & West Main	Montrose to Stanford
10153	Storm Sewer	-	on Grant
14261	Wastewater	-	on Whitney
15468	Storm Sewer/ Wastewater	-	on Bagby
29909	Wastewater	Proposed 48 & 42 Inch Sewer Line	on Taft
31121	Wastewater	-	Bagby to East
32536	Wastewater	Sanitary Sewers in CBD and Midtown Contract No. 3	Milam to Main
33286	Water	Improvement of Milam Street from Spur 527 to Pierce	at Milam
33287	Water	Improvement of Travis Street from Spur 527 to Pierce	at Travis
33290	Water/ Storm Sewer	Downtown/ Midtown Transist Streets Project - Smith Street Spur 527 to Franklin	at Smith
36635	Water/ Wastewater	Light Rail Transit Project Line Section 4 - US 59 (Wheeler Station to West Gray)	on Main (METRO)

Appendix G
Traffic Models

GUNDA CORPORATION
Engineers, Planners & Managers

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	576	51	0	543	60	0	680	148	0	1143	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3434	0	0	3451	0	0	3423	0	0	3455	0
Flt Permitted												
Satd. Flow (perm)	0	3434	0	0	3451	0	0	3423	0	0	3455	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			10			37			21	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			1181			1479			2366	
Travel Time (s)		87.1			40.3			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	681	0	0	655	0	0	899	0	0	1405	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		45.0			45.0			75.0			75.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		48.7			48.7			61.3			61.3	
Actuated g/C Ratio		0.41			0.41			0.51			0.51	
v/c Ratio		0.49			0.47			0.51			0.79	
Control Delay		37.2			13.7			18.6			18.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		37.2			13.7			18.6			18.6	
LOS		D			B			B			B	
Approach Delay		37.2			13.7			18.6			18.6	
Approach LOS		D			B			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 5 (4%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 21.2		Intersection LOS: C	
Intersection Capacity Utilization 62.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	500	48	36	377	19	22	185	51	21	198	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3483	0	0	3388	0	0	3423	0	0	3433	0
Flt Permitted		0.877			0.856			0.813			0.831	
Satd. Flow (perm)	0	3067	0	0	2912	0	0	2794	0	0	2865	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			7			26			21	
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		783			1063			294			3799	
Travel Time (s)		15.3			24.2			6.7			86.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	644	0	0	469	0	0	280	0	0	288	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	79.0	79.0		79.0	79.0		41.0	41.0		41.0	41.0	
Total Lost Time (s)		5.0			5.0			4.7			4.7	
Act Effct Green (s)		95.6			95.6			14.7			14.7	
Actuated g/C Ratio		0.80			0.80			0.12			0.12	
v/c Ratio		0.26			0.20			0.77			0.78	
Control Delay		5.9			7.4			69.4			67.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		5.9			7.4			69.4			67.4	
LOS		A			A			E			E	
Approach Delay		5.9			7.4			69.4			67.4	
Approach LOS		A			A			E			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 27.4		Intersection LOS: C	
Intersection Capacity Utilization 60.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 65: Dunlavy & Westheimer

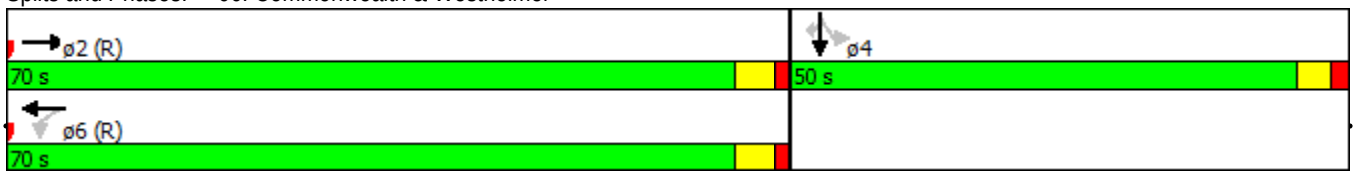
66: Commonwealth & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	611	56	1	329	0	0	0	0	108	305	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3430	0	1770	3497	0	0	0	0	0	3493	1583
Flt Permitted				0.362							0.987	
Satd. Flow (perm)	0	3430	0	674	3497	0	0	0	0	0	3493	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12										207
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		988			340			246			2907	
Travel Time (s)		22.5			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	725	0	1	357	0	0	0	0	0	448	207
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		70.0		70.0	70.0					50.0	50.0	50.0
Total Lost Time (s)		5.0		5.0	5.0						4.9	4.9
Act Effct Green (s)		89.3		89.3	89.3						20.8	20.8
Actuated g/C Ratio		0.74		0.74	0.74						0.17	0.17
v/c Ratio		0.28		0.00	0.14						0.74	0.47
Control Delay		5.3		3.0	2.2						54.4	8.8
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		5.3		3.0	2.2						54.4	8.8
LOS		A		A	A						D	A
Approach Delay		5.3			2.2						40.0	
Approach LOS		A			A						D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 25 (21%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 17.7 Intersection LOS: B
Intersection Capacity Utilization 38.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer



67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	604	20	37	329	97	26	86	36	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3522	0	1770	3419	0	0	3378	0	0	0	0
Flt Permitted	0.486			0.388				0.991				
Satd. Flow (perm)	905	3522	0	723	3419	0	0	3378	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			65			35				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			184			607	
Travel Time (s)		5.3			10.4			4.2			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	678	0	40	462	0	0	160	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2			6			8					
Total Split (s)	83.0	83.0		83.0	83.0		37.0	37.0				
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0				
Act Effct Green (s)	94.0	94.0		94.0	94.0			16.0				
Actuated g/C Ratio	0.78	0.78		0.78	0.78			0.13				
v/c Ratio	0.06	0.25		0.07	0.17			0.33				
Control Delay	2.1	2.6		1.9	1.7			38.8				
Queue Delay	0.0	0.0		0.0	0.0			0.0				
Total Delay	2.1	2.6		1.9	1.7			38.8				
LOS	A	A		A	A			D				
Approach Delay		2.6			1.7			38.8				
Approach LOS		A			A			D				

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 25 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.33			
Intersection Signal Delay: 6.4		Intersection LOS: A	
Intersection Capacity Utilization 46.7%		ICU Level of Service A	
Analysis Period (min) 15			

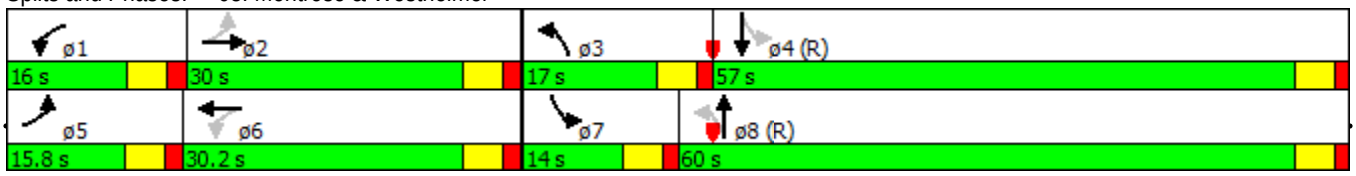
Splits and Phases: 67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	370	97	111	262	69	123	619	95	122	938	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	50		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3327	0	1770	3375	0	1770	3451	0	1770	3399	0
Flt Permitted	0.404			0.212			0.076			0.249		
Satd. Flow (perm)	753	3327	0	395	3375	0	142	3451	0	464	3399	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			25			20			6	
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		456			1676			2158			1109	
Travel Time (s)		10.4			38.1			42.0			21.6	
Peak Hour Factor	0.86	0.86	0.87	0.82	0.91	0.91	0.85	0.86	0.82	0.92	0.81	0.75
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	2	0	0	16	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	548	0	137	368	0	146	844	0	134	1235	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	15.8	30.0		16.0	30.2		17.0	60.0		14.0	57.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		5.0	5.0		5.0	5.0	
Act Effct Green (s)	35.2	24.7		35.6	24.9		67.0	55.0		61.0	52.0	
Actuated g/C Ratio	0.29	0.21		0.30	0.21		0.56	0.46		0.51	0.43	
v/c Ratio	0.43	0.78		0.57	0.51		0.60	0.53		0.40	0.84	
Control Delay	22.5	37.1		31.1	34.9		24.0	22.0		11.1	26.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.5	37.1		31.1	34.9		24.0	22.0		11.1	26.0	
LOS	C	D		C	C		C	C		B	C	
Approach Delay		34.3			33.9			22.3			24.6	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 27.1 Intersection LOS: C
Intersection Capacity Utilization 71.4% ICU Level of Service C
Analysis Period (min) 15

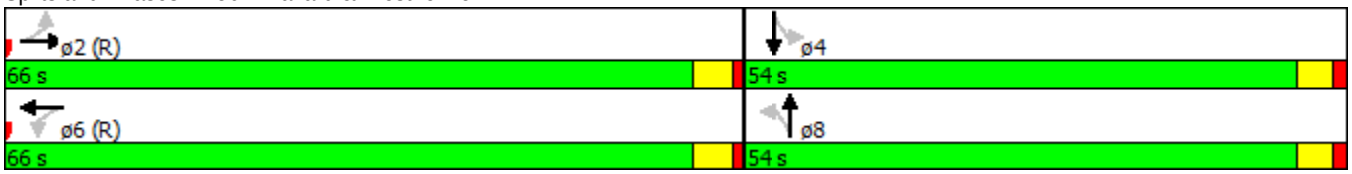
Splits and Phases: 68: Montrose & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	586	44	37	412	4	64	60	59	18	30	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Satd. Flow (prot)	0	3500	0	0	3511	0	0	1873	0	0	1916	0
Flt Permitted		0.945			0.758			0.829			0.761	
Satd. Flow (perm)	0	3311	0	0	2677	0	0	1578	0	0	1482	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			2			23			9	
Link Speed (mph)		35			20			30			30	
Link Distance (ft)		1181			784			907			993	
Travel Time (s)		23.0			26.7			20.6			22.6	
Peak Hour Factor	0.75	0.79	0.79	0.54	0.83	0.50	0.62	0.54	0.62	0.50	0.54	0.63
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	817	0	0	578	0	0	312	0	0	108	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	66.0	66.0		66.0	66.0		54.0	54.0		54.0	54.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		83.2			83.2			27.6			27.6	
Actuated g/C Ratio		0.69			0.69			0.23			0.23	
v/c Ratio		0.36			0.31			0.82			0.31	
Control Delay		8.2			17.1			57.4			35.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.2			17.1			57.4			35.4	
LOS		A			B			E			D	
Approach Delay		8.2			17.1			57.4			35.4	
Approach LOS		A			B			E			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 21.1		Intersection LOS: C	
Intersection Capacity Utilization 56.6%		ICU Level of Service B	
Analysis Period (min) 15			

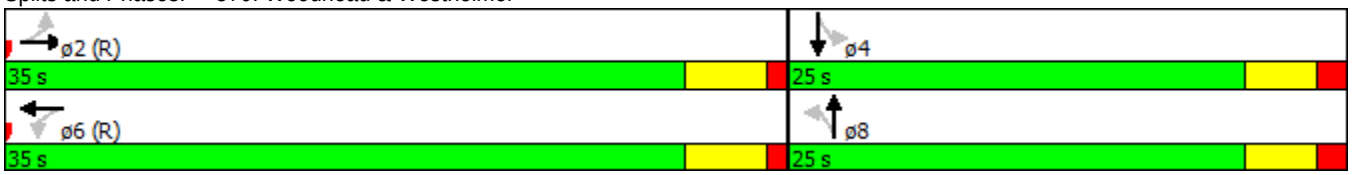
Splits and Phases: 567: Hazard & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	462	143	50	372	2	44	72	49	15	113	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3405	0	0	3511	0	0	1756	0	0	1783	0
Flt Permitted		0.925			0.770			0.858			0.933	
Satd. Flow (perm)	0	3156	0	0	2722	0	0	1528	0	0	1675	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		103			2			43			33	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.72	0.71	0.66	0.73	0.83	0.50	0.61	0.69	0.58	0.42	0.69	0.46
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	908	0	0	526	0	0	263	0	0	273	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	35.0	35.0		35.0	35.0		25.0	25.0		25.0	25.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		30.4			30.4			20.4			20.4	
Actuated g/C Ratio		0.51			0.51			0.34			0.34	
v/c Ratio		0.55			0.38			0.48			0.46	
Control Delay		12.9			8.1			16.5			16.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		12.9			8.1			16.5			16.6	
LOS		B			A			B			B	
Approach Delay		12.9			8.1			16.5			16.6	
Approach LOS		B			A			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 25 (42%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 12.6		Intersection LOS: B	
Intersection Capacity Utilization 61.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 570: Woodhead & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	672	12	17	502	32	8	67	60	35	38	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3522	0	0	3497	0	0	1772	0	0	1763	0
Flt Permitted		0.896			0.908			0.989			0.824	
Satd. Flow (perm)	0	3162	0	0	3181	0	0	1756	0	0	1481	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			12			22			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1676			1143			877			953	
Travel Time (s)		38.1			26.0			19.9			21.7	
Peak Hour Factor	0.50	0.80	0.75	0.85	0.91	0.80	1.00	0.60	0.94	0.67	0.79	0.53
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	904	0	0	617	0	0	185	0	0	138	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	81.0	81.0		81.0	81.0		39.0	39.0		39.0	39.0	
Total Lost Time (s)		4.7			4.7			4.5			4.5	
Act Effct Green (s)		76.3			76.3			34.5			34.5	
Actuated g/C Ratio		0.64			0.64			0.29			0.29	
v/c Ratio		0.45			0.30			0.36			0.32	
Control Delay		9.3			10.1			32.1			32.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		9.3			10.1			32.1			32.1	
LOS		A			B			C			C	
Approach Delay		9.3			10.1			32.1			32.1	
Approach LOS		A			B			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 75 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.45			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 58.0%		ICU Level of Service B	
Analysis Period (min) 15			

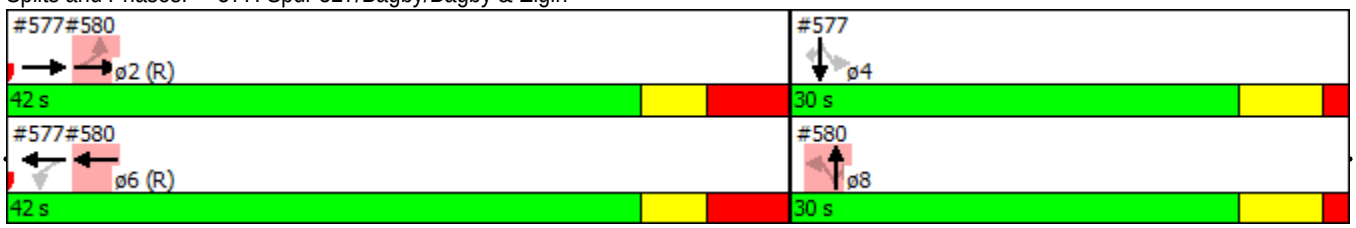
Splits and Phases: 573: Taft & Westheimer

577: Spur 527/Bagby/Bagby & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	589	143	24	485	0	0	0	0	88	814	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3433	0	1770	3539	0	0	0	0	0	5055	1583
Flt Permitted				0.275							0.994	
Satd. Flow (perm)	0	3433	0	512	3539	0	0	0	0	0	5055	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		38										76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.85	0.81	0.75	0.91	0.93	0.93	0.93	0.93	0.73	0.99	0.25
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	878	0	32	538	0	0	0	0	0	952	8
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		42.0		42.0	42.0					30.0	30.0	30.0
Total Lost Time (s)		8.0		8.0	8.0						6.0	6.0
Act Effct Green (s)		34.0		34.0	34.0						24.0	24.0
Actuated g/C Ratio		0.47		0.47	0.47						0.33	0.33
v/c Ratio		0.54		0.13	0.32						0.56	0.01
Control Delay		14.3		8.2	8.1						21.3	0.0
Queue Delay		0.0		0.0	0.7						0.0	0.0
Total Delay		14.3		8.2	8.8						21.3	0.0
LOS		B		A	A						C	A
Approach Delay		14.3			8.8						21.1	
Approach LOS		B			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 50.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

580: Spur 527/Brazos/Brazos & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	668	0	0	367	51	140	659	16	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3536	0	0	3465	0	1770	3539	1583	0	0	0
Flt Permitted		0.940					0.950					
Satd. Flow (perm)	0	3327	0	0	3465	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					33				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.44	0.83	0.93	0.93	0.92	0.80	0.78	0.93	0.80	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	829	0	0	467	0	181	716	20	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	42.0	42.0			42.0		30.0	30.0	30.0			
Total Lost Time (s)		8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)		34.0			34.0		24.0	24.0	24.0			
Actuated g/C Ratio		0.47			0.47		0.33	0.33	0.33			
v/c Ratio		0.53			0.28		0.31	0.61	0.03			
Control Delay		6.2			21.3		19.6	22.7	0.1			
Queue Delay		0.2			0.0		0.0	0.0	0.0			
Total Delay		6.5			21.3		19.6	22.7	0.1			
LOS		A			C		B	C	A			
Approach Delay		6.5			21.3			21.6				
Approach LOS		A			C			C				

Intersection Summary

Area Type: Other

Cycle Length: 72

Actuated Cycle Length: 72

Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

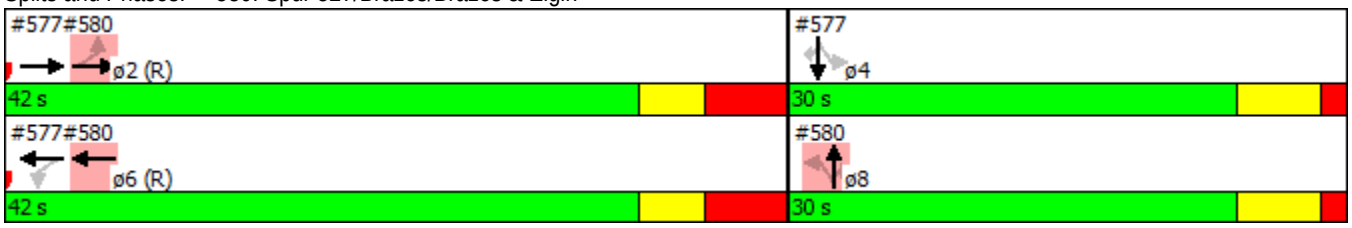
Maximum v/c Ratio: 0.61

Intersection Signal Delay: 15.9 Intersection LOS: B

Intersection Capacity Utilization 53.7% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

583: Main & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	640	31	0	773	5	2	147	23	0	100	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3507	0	0	3536	0	0	1822	0	0	1816	0
Flt Permitted		0.947						0.993				
Satd. Flow (perm)	0	3321	0	0	3536	0	0	1811	0	0	1816	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			2			12			14	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.50	0.88	0.65	0.93	0.94	0.63	0.50	0.88	0.72	0.93	0.71	0.81
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	787	0	0	839	0	0	205	0	0	174	0
Turn Type	Perm	NA			NA		Perm	NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2						8					
Total Split (s)	47.0	47.0			47.0		25.0	25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		24.4			24.4			26.9			26.9	
Actuated g/C Ratio		0.34			0.34			0.37			0.37	
v/c Ratio		0.70			0.70			0.30			0.25	
Control Delay		14.8			23.5			18.1			17.2	
Queue Delay		0.1			0.0			0.0			0.0	
Total Delay		14.9			23.5			18.1			17.2	
LOS		B			C			B			B	
Approach Delay		14.9			23.5			18.1			17.2	
Approach LOS		B			C			B			B	

Intersection Summary

Area Type: Other

Cycle Length: 72

Actuated Cycle Length: 72

Offset: 30 (42%), Referenced to phase 4:SBT and 8:NBTL, Start of Green

Control Type: Actuated-Coordinated

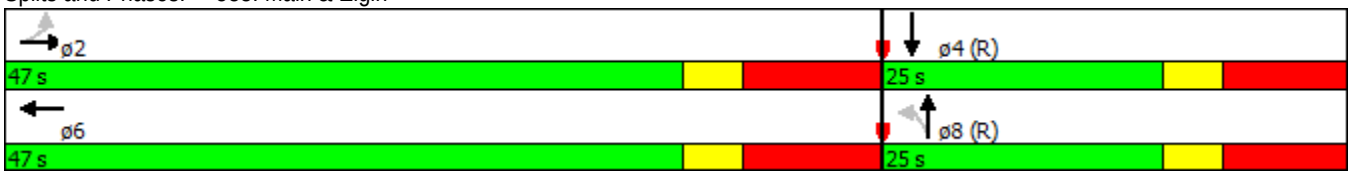
Maximum v/c Ratio: 0.70

Intersection Signal Delay: 19.0 Intersection LOS: B

Intersection Capacity Utilization 49.9% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 583: Main & Elgin

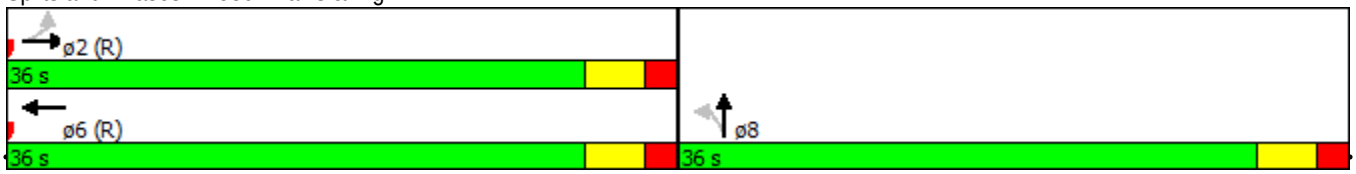


586: Travis & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	746	0	0	491	93	51	1590	116	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3447	0	0	6325	0	0	0	0
Flt Permitted	0.315							0.998				
Satd. Flow (perm)	587	3539	0	0	3447	0	0	6325	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					5			31				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.78	0.90	0.93	0.93	0.85	0.78	0.80	0.95	0.81	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	69	837	0	0	703	0	0	1899	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.27	0.55			0.47			0.69				
Control Delay	16.2	15.5			32.3			18.0				
Queue Delay	0.0	0.1			0.5			0.0				
Total Delay	16.2	15.6			32.8			18.0				
LOS	B	B			C			B				
Approach Delay		15.6			32.8			18.0				
Approach LOS		B			C			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 20.4		Intersection LOS: C	
Intersection Capacity Utilization 59.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 586: Travis & Elgin

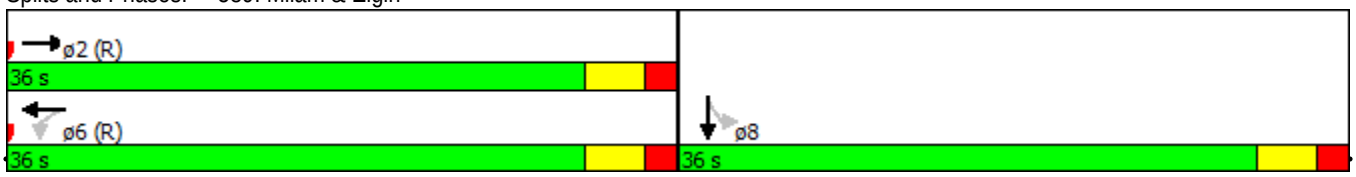


589: Milam & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	652	29	48	512	0	0	0	0	147	528	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3514	0	1770	3539	0	0	0	0	0	6255	0
Flt Permitted				0.281							0.989	
Satd. Flow (perm)	0	3514	0	523	3539	0	0	0	0	0	6255	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9									38	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.90	0.81	0.80	0.88	0.93	0.93	0.93	0.93	0.78	0.95	0.82
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	768	0	61	588	0	0	0	0	0	824	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0						5.0	
Act Effct Green (s)		31.0		31.0	31.0						31.0	
Actuated g/C Ratio		0.43		0.43	0.43						0.43	
v/c Ratio		0.51		0.27	0.39						0.30	
Control Delay		6.6		9.4	8.1						13.1	
Queue Delay		0.0		0.0	0.1						0.0	
Total Delay		6.6		9.4	8.2						13.1	
LOS		A		A	A						B	
Approach Delay		6.6			8.3						13.1	
Approach LOS		A			A						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 9.5		Intersection LOS: A	
Intersection Capacity Utilization 59.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

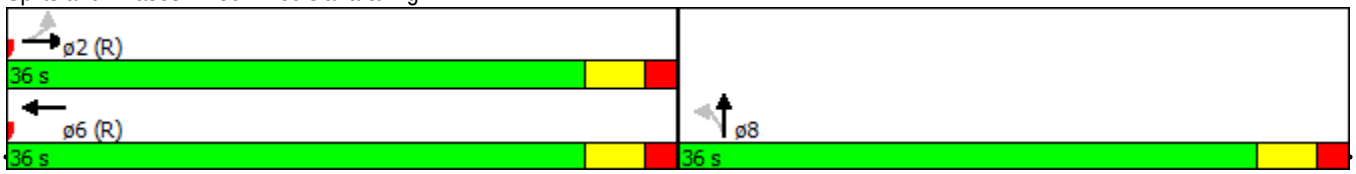


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	636	0	0	375	157	31	1898	66	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3359	0	0	7484	0	0	0	0
Flt Permitted	0.353							0.999				
Satd. Flow (perm)	658	3539	0	0	3359	0	0	7484	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					2			19				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.82	0.90	0.93	0.93	0.90	0.74	0.78	0.98	0.72	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	203	714	0	0	635	0	0	2089	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.72	0.47			0.44			0.65				
Control Delay	21.8	4.7			3.7			17.2				
Queue Delay	0.0	0.1			0.0			0.0				
Total Delay	21.8	4.8			3.7			17.2				
LOS	C	A			A			B				
Approach Delay		8.5			3.7			17.2				
Approach LOS		A			A			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 12.6		Intersection LOS: B	
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 592: Louisiana & Elgin

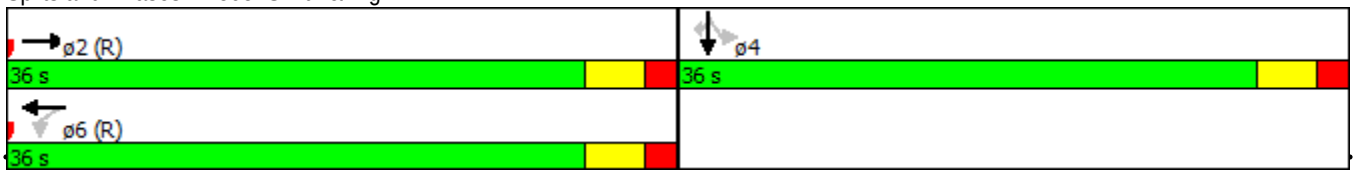


N2013T-C01;0012: Westheimer Road from Shepherd Drive to Main Street 2017 Existing AM
595: Smith & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	673	12	77	342	0	0	0	0	128	733	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3525	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.264						0.950		
Satd. Flow (perm)	0	3525	0	492	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4										97
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.87	0.60	0.80	0.87	0.93	0.93	0.93	0.93	0.84	0.92	0.79
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	801	0	97	397	0	0	0	0	154	805	97
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.53		0.46	0.26					0.20	0.37	0.13
Control Delay		20.4		18.3	10.1					13.7	14.5	3.6
Queue Delay		3.4		0.0	0.0					0.0	0.0	0.0
Total Delay		23.8		18.3	10.1					13.7	14.5	3.6
LOS		C		B	B					B	B	A
Approach Delay		23.8			11.7						13.4	
Approach LOS		C			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 16.6		Intersection LOS: B	
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	499	18	69	374	6	29	45	54	4	54	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3522	0	0	3504	0	0	1737	0	0	1826	0
Flt Permitted		0.953			0.775			0.932			0.989	
Satd. Flow (perm)	0	3356	0	0	2737	0	0	1637	0	0	1811	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			2			33			6	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	566	0	0	488	0	0	139	0	0	72	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)		4.9			4.9			4.7			4.7	
Act Effct Green (s)		70.1			70.1			40.3			40.3	
Actuated g/C Ratio		0.58			0.58			0.34			0.34	
v/c Ratio		0.29			0.31			0.24			0.12	
Control Delay		15.9			11.7			23.1			25.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.9			11.7			23.1			25.9	
LOS		B			B			C			C	
Approach Delay		15.9			11.7			23.1			25.9	
Approach LOS		B			B			C			C	

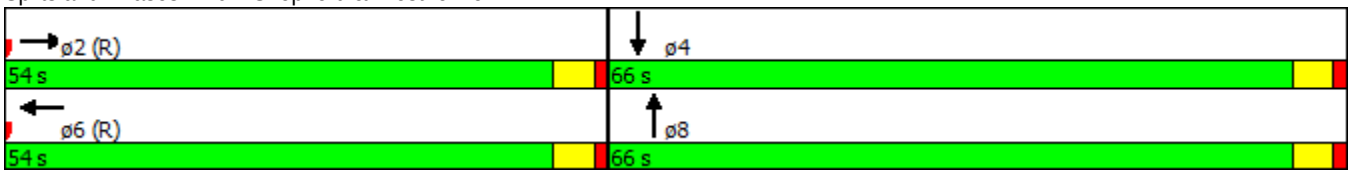
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.31			
Intersection Signal Delay: 15.6		Intersection LOS: B	
Intersection Capacity Utilization 53.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	954	52	0	741	90	0	1221	101	0	1137	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Flt Permitted												
Satd. Flow (perm)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			13			10			24	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			1181			1479			2366	
Travel Time (s)		87.1			40.3			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1092	0	0	903	0	0	1436	0	0	1452	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		54.0			54.0			66.0			66.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		52.4			52.4			57.6			57.6	
Actuated g/C Ratio		0.44			0.44			0.48			0.48	
v/c Ratio		0.72			0.60			0.86			0.87	
Control Delay		31.8			34.6			35.7			45.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		31.8			34.6			35.7			45.0	
LOS		C			C			D			D	
Approach Delay		31.8			34.6			35.7			45.0	
Approach LOS		C			C			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 55 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 37.4		Intersection LOS: D	
Intersection Capacity Utilization 74.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	669	41	42	739	41	11	318	55	25	319	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1844	0	0	3388	0	0	3458	0	0	3440	0
Flt Permitted		0.904			0.864			0.907			0.815	
Satd. Flow (perm)	0	1672	0	0	2936	0	0	3139	0	0	2812	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			11			14			18	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		783			1063			294			3799	
Travel Time (s)		17.8			24.2			6.7			86.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	820	0	0	894	0	0	417	0	0	448	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	89.0	89.0		89.0	89.0		31.0	31.0		31.0	31.0	
Total Lost Time (s)		5.0			5.0			4.7			4.7	
Act Effct Green (s)		88.8			88.8			21.5			21.5	
Actuated g/C Ratio		0.74			0.74			0.18			0.18	
v/c Ratio		0.66			0.41			0.73			0.86	
Control Delay		23.9			5.7			49.7			51.9	
Queue Delay		0.2			0.0			0.0			0.0	
Total Delay		24.1			5.7			49.7			51.9	
LOS		C			A			D			D	
Approach Delay		24.1			5.7			49.7			51.9	
Approach LOS		C			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 26.7		Intersection LOS: C	
Intersection Capacity Utilization 102.7%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 65: Dunlavy & Westheimer

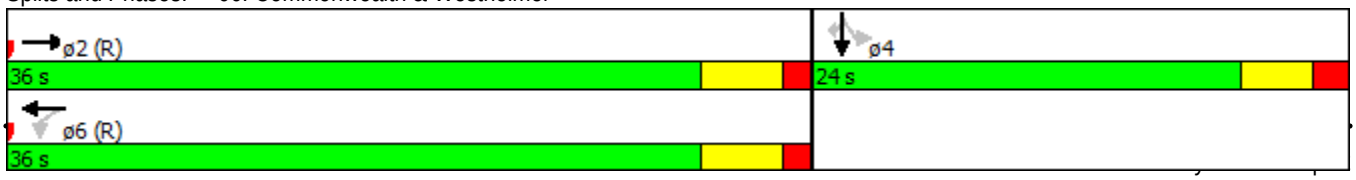
66: Commonwealth & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	934	38	3	701	0	0	0	0	118	292	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3455	0	1770	3497	0	0	0	0	0	3490	1583
Flt Permitted				0.234							0.986	
Satd. Flow (perm)	0	3455	0	436	3497	0	0	0	0	0	3490	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10										157
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		988			340			246			2907	
Travel Time (s)		22.5			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1055	0	3	761	0	0	0	0	0	445	255
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					24.0	24.0	24.0
Total Lost Time (s)		5.0		5.0	5.0						4.9	4.9
Act Effct Green (s)		37.2		37.2	37.2						12.9	12.9
Actuated g/C Ratio		0.62		0.62	0.62						0.22	0.22
v/c Ratio		0.49		0.01	0.35						0.59	0.55
Control Delay		7.8		7.3	6.9						23.9	12.8
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		7.8		7.3	6.9						23.9	12.8
LOS		A		A	A						C	B
Approach Delay		7.8			6.9						19.8	
Approach LOS		A			A						B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 30 (50%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 47.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer



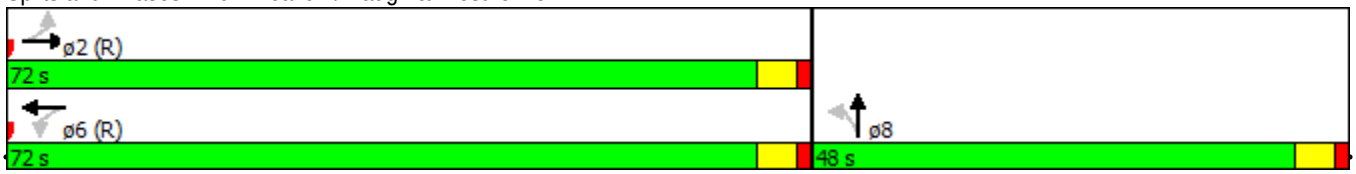
67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	795	58	34	665	106	49	423	86	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3504	0	1770	3465	0	0	3444	0	0	0	0
Flt Permitted	0.308			0.275				0.996				
Satd. Flow (perm)	574	3504	0	512	3465	0	0	3444	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			24			19				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			356			607	
Travel Time (s)		5.3			10.4			8.1			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	926	0	37	837	0	0	605	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2			6			8					
Total Split (s)	72.0	72.0		72.0	72.0		48.0	48.0				
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0				
Act Effct Green (s)	82.7	82.7		82.7	82.7			27.3				
Actuated g/C Ratio	0.69	0.69		0.69	0.69			0.23				
v/c Ratio	0.23	0.38		0.10	0.35			0.76				
Control Delay	7.2	6.1		4.7	4.2			48.0				
Queue Delay	0.0	0.1		0.0	0.2			0.0				
Total Delay	7.2	6.3		4.7	4.5			48.0				
LOS	A	A		A	A			D				
Approach Delay		6.4			4.5			48.0				
Approach LOS		A			A			D				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 15.8 Intersection LOS: B
Intersection Capacity Utilization 60.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 67: Yoakum/Waugh & Westheimer



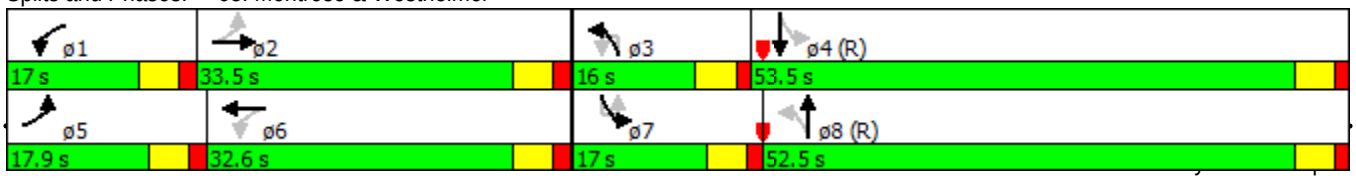
68: Montrose & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Volume (vph)	165	496	86	148	487	96	2	152	1068	85	1	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	50		0		150		0		150
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	25			25				25				25
Satd. Flow (prot)	1770	3347	0	1770	3399	0	0	1770	3479	0	0	1770
Flt Permitted	0.142			0.165				0.126				0.082
Satd. Flow (perm)	265	3347	0	307	3399	0	0	235	3479	0	0	153
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		18			17				10			
Link Speed (mph)		30			30				35			
Link Distance (ft)		456			1676				2158			
Travel Time (s)		10.4			38.1				42.0			
Peak Hour Factor	0.94	0.90	0.80	0.88	0.85	0.90	0.50	0.88	0.96	0.79	0.25	0.84
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	0	2	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	666	0	170	687	0	0	178	1233	0	0	199
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		custom	pm+pt
Protected Phases	5	2		1	6			3	8			7
Permitted Phases	2			6			3	8			7	4
Total Split (s)	17.9	33.5		17.0	32.6		16.0	16.0	52.5		17.0	17.0
Total Lost Time (s)	5.3	5.3		5.3	5.3			5.0	5.0			5.0
Act Effct Green (s)	40.8	28.2		39.0	27.3			58.5	47.5			60.5
Actuated g/C Ratio	0.34	0.24		0.32	0.23			0.49	0.40			0.50
v/c Ratio	0.71	0.83		0.70	0.87			0.70	0.89			0.84
Control Delay	56.5	54.1		42.0	52.9			27.2	37.9			68.6
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	56.5	54.1		42.0	52.9			27.2	37.9			68.6
LOS	E	D		D	D			C	D			E
Approach Delay		54.6			50.7				36.6			
Approach LOS		D			D				D			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 40.0 Intersection LOS: D
Intersection Capacity Utilization 84.8% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 68: Montrose & Westheimer



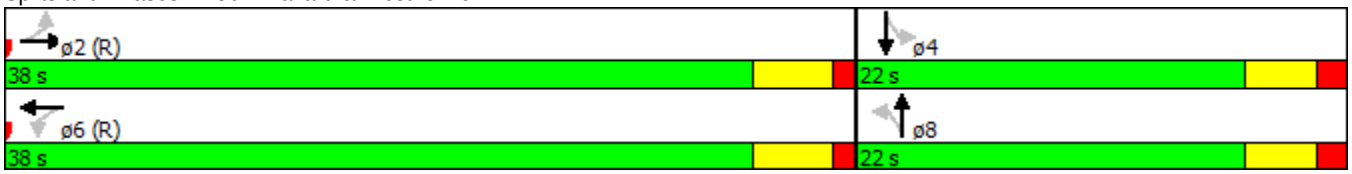
Lane Group	SBT	SBR
Lane Configurations		
Volume (vph)	877	110
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Satd. Flow (prot)	3361	0
Flt Permitted		
Satd. Flow (perm)	3361	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	16	
Link Speed (mph)	35	
Link Distance (ft)	1109	
Travel Time (s)	21.6	
Peak Hour Factor	0.97	0.83
Growth Factor	101%	101%
Bus Blockages (#/hr)	16	0
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1047	0
Turn Type	NA	
Protected Phases	4	
Permitted Phases		
Total Split (s)	53.5	
Total Lost Time (s)	5.0	
Act Effct Green (s)	48.5	
Actuated g/C Ratio	0.40	
v/c Ratio	0.77	
Control Delay	18.7	
Queue Delay	0.0	
Total Delay	18.7	
LOS	B	
Approach Delay	26.7	
Approach LOS	C	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	768	39	33	682	4	40	82	48	3	32	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Satd. Flow (prot)	0	3500	0	0	3522	0	0	1886	0	0	1896	0
Flt Permitted		0.905			0.881			0.913			0.984	
Satd. Flow (perm)	0	3174	0	0	3112	0	0	1742	0	0	1871	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			4			35			24	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		1181			784			907			993	
Travel Time (s)		40.3			26.7			20.6			22.6	
Peak Hour Factor	0.69	0.95	0.75	0.83	0.95	0.33	0.83	0.73	0.71	0.75	0.67	0.63
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	907	0	0	777	0	0	230	0	0	76	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	38.0	38.0		38.0	38.0		22.0	22.0		22.0	22.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		38.9			38.9			11.9			11.9	
Actuated g/C Ratio		0.65			0.65			0.20			0.20	
v/c Ratio		0.44			0.39			0.61			0.19	
Control Delay		12.2			8.8			25.0			14.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		12.2			8.8			25.0			14.7	
LOS		B			A			C			B	
Approach Delay		12.2			8.8			25.0			14.7	
Approach LOS		B			A			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 10 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 12.4		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 567: Hazard & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	669	93	45	656	14	22	148	31	22	107	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3465	0	0	3507	0	0	1802	0	0	1804	0
Flt Permitted		0.893			0.796			0.940			0.913	
Satd. Flow (perm)	0	3100	0	0	2803	0	0	1704	0	0	1662	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			4			11			10	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.59	0.93	0.83	0.75	0.93	0.58	0.69	0.86	0.60	0.55	0.72	0.88
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	873	0	0	797	0	0	258	0	0	230	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		70.4			70.4			40.4			40.4	
Actuated g/C Ratio		0.59			0.59			0.34			0.34	
v/c Ratio		0.48			0.48			0.44			0.41	
Control Delay		3.9			12.2			32.6			31.8	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		3.9			12.2			32.6			31.8	
LOS		A			B			C			C	
Approach Delay		3.9			12.2			32.6			31.8	
Approach LOS		A			B			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 13.4		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	675	14	36	858	29	16	122	59	25	69	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3514	0	0	3504	0	0	1779	0	0	1783	0
Flt Permitted		0.855			0.896			0.948			0.882	
Satd. Flow (perm)	0	3014	0	0	3146	0	0	1697	0	0	1595	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			16			34			23	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1676			1143			877			953	
Travel Time (s)		38.1			26.0			19.9			21.7	
Peak Hour Factor	0.75	0.93	0.58	0.82	0.90	0.52	0.57	0.95	0.92	0.52	0.82	0.83
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	801	0	0	1063	0	0	223	0	0	171	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	39.0	39.0		39.0	39.0		21.0	21.0		21.0	21.0	
Total Lost Time (s)		4.7			4.7			4.5			4.5	
Act Effct Green (s)		34.3			34.3			16.5			16.5	
Actuated g/C Ratio		0.57			0.57			0.28			0.28	
v/c Ratio		0.46			0.59			0.45			0.38	
Control Delay		14.8			9.8			18.7			18.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.8			9.8			18.7			18.0	
LOS		B			A			B			B	
Approach Delay		14.8			9.8			18.7			18.0	
Approach LOS		B			A			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 30 (50%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 13.1		Intersection LOS: B	
Intersection Capacity Utilization 70.8%		ICU Level of Service C	
Analysis Period (min) 15			

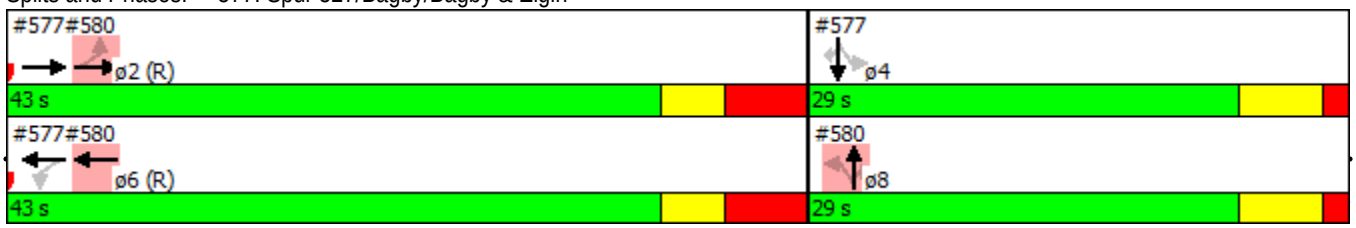
Splits and Phases: 573: Taft & Westheimer

577: Spur 527/Bagby/Bagby & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	136	31	47	833	0	0	0	0	104	594	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3440	0	1770	3539	0	0	0	0	0	5050	1583
Flt Permitted				0.633							0.993	
Satd. Flow (perm)	0	3440	0	1179	3539	0	0	0	0	0	5050	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		35										76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.90	0.90	0.73	0.92	0.93	0.93	0.93	0.93	0.90	0.80	0.67
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	188	0	65	914	0	0	0	0	0	867	12
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		43.0		43.0	43.0					29.0	29.0	29.0
Total Lost Time (s)		8.0		8.0	8.0						6.0	6.0
Act Effct Green (s)		35.0		35.0	35.0						23.0	23.0
Actuated g/C Ratio		0.49		0.49	0.49						0.32	0.32
v/c Ratio		0.11		0.11	0.53						0.54	0.02
Control Delay		8.3		3.2	4.1						21.6	0.1
Queue Delay		0.0		0.7	0.3						0.2	0.0
Total Delay		8.3		3.9	4.4						21.9	0.1
LOS		A		A	A						C	A
Approach Delay		8.3			4.3						21.6	
Approach LOS		A			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 12.1		Intersection LOS: B	
Intersection Capacity Utilization 57.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



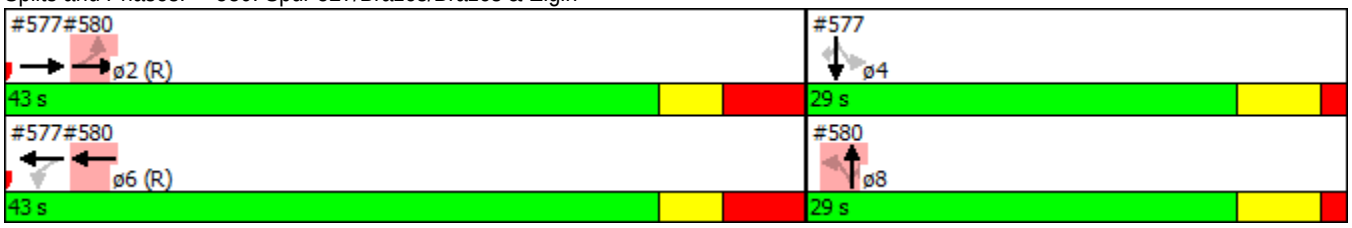
Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	29.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	670	0	0	779	107	103	601	10	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3536	0	0	3472	0	1770	3539	1583	0	0	0
Flt Permitted		0.940					0.950					
Satd. Flow (perm)	0	3327	0	0	3472	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.25	0.93	0.93	0.93	0.91	0.84	0.88	0.95	0.63	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	736	0	0	994	0	118	639	16	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	43.0	43.0			43.0		29.0	29.0	29.0			
Total Lost Time (s)		8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)		35.0			35.0		23.0	23.0	23.0			
Actuated g/C Ratio		0.49			0.49		0.32	0.32	0.32			
v/c Ratio		0.46			0.58		0.21	0.57	0.03			
Control Delay		13.8			27.4		19.1	22.7	0.1			
Queue Delay		17.6			5.4		0.0	0.0	0.0			
Total Delay		31.4			32.7		19.1	22.7	0.1			
LOS		C			C		B	C	A			
Approach Delay		31.4			32.7			21.7				
Approach LOS		C			C			C				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 28.9		Intersection LOS: C	
Intersection Capacity Utilization 53.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



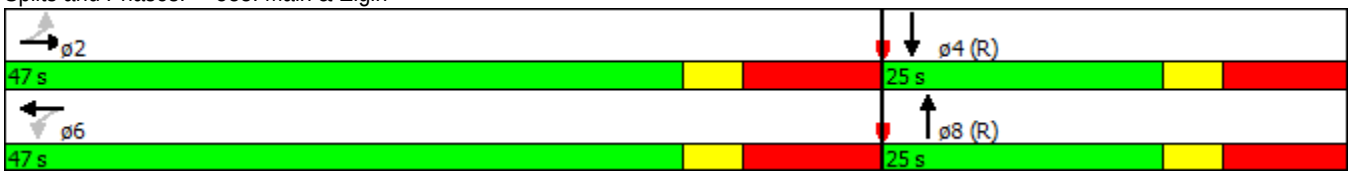
Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	29.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	906	51	1	931	14	0	173	36	0	168	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3504	0	0	3532	0	0	1825	0	0	1840	0
Flt Permitted		0.949			0.948							
Satd. Flow (perm)	0	3325	0	0	3348	0	0	1825	0	0	1840	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			3			11			6	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.25	0.94	0.71	0.25	0.95	0.88	0.50	0.75	0.90	0.93	0.84	0.80
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1050	0	0	1010	0	0	273	0	0	222	0
Turn Type	Perm	NA		Perm	NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6								
Total Split (s)	47.0	47.0		47.0	47.0			25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		30.3			30.3			21.0			21.0	
Actuated g/C Ratio		0.42			0.42			0.29			0.29	
v/c Ratio		0.75			0.72			0.51			0.41	
Control Delay		31.1			19.9			26.6			24.6	
Queue Delay		1.1			1.1			0.0			0.0	
Total Delay		32.2			21.0			26.6			24.6	
LOS		C			C			C			C	
Approach Delay		32.2			21.0			26.6			24.6	
Approach LOS		C			C			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 57 (79%), Referenced to phase 4:SBT and 8:NBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 26.5		Intersection LOS: C	
Intersection Capacity Utilization 56.3%		ICU Level of Service B	
Analysis Period (min) 15			

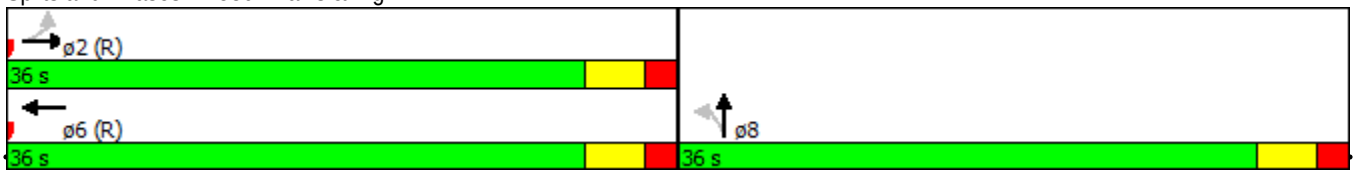
Splits and Phases: 583: Main & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	680	0	0	851	104	116	1075	134	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3483	0	0	6267	0	0	0	0
Flt Permitted	0.162							0.995				
Satd. Flow (perm)	302	3539	0	0	3483	0	0	6267	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					23			55				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.93	0.86	0.93	0.93	0.93	0.93	0.81	0.93	0.82	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	799	0	0	1037	0	0	1477	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.59	0.52			0.69			0.54				
Control Delay	33.5	13.2			17.8			15.5				
Queue Delay	0.0	0.1			17.0			0.1				
Total Delay	33.5	13.3			34.8			15.6				
LOS	C	B			C			B				
Approach Delay		15.1			34.8			15.6				
Approach LOS		B			C			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 63.6%		ICU Level of Service B	
Analysis Period (min) 15			

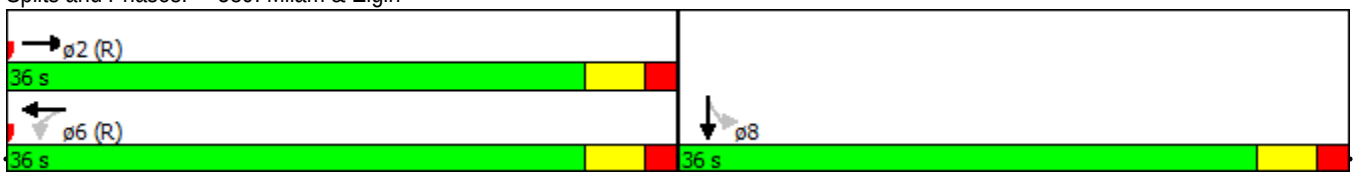
Splits and Phases: 586: Travis & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	634	68	123	828	0	0	0	0	123	1294	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3483	0	1770	3539	0	0	0	0	0	6382	0
Flt Permitted				0.274							0.996	
Satd. Flow (perm)	0	3483	0	510	3539	0	0	0	0	0	6382	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12										
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.92	0.81	0.88	0.90	0.93	0.93	0.93	0.93	0.90	0.92	0.74
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	781	0	141	929	0	0	0	0	0	1559	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0						5.0	
Act Effct Green (s)		31.0		31.0	31.0						31.0	
Actuated g/C Ratio		0.43		0.43	0.43						0.43	
v/c Ratio		0.52		0.64	0.61						0.57	
Control Delay		6.1		17.4	5.7						16.5	
Queue Delay		0.0		0.0	0.3						0.0	
Total Delay		6.2		17.4	6.0						16.5	
LOS		A		B	A						B	
Approach Delay		6.2			7.5						16.5	
Approach LOS		A			A						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 11.3		Intersection LOS: B	
Intersection Capacity Utilization 63.6%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

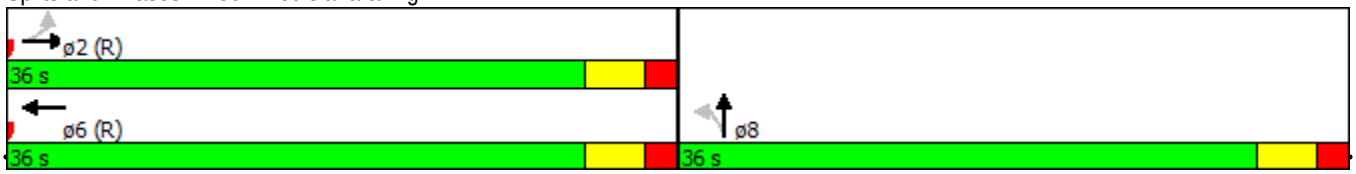


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	668	0	0	763	154	55	657	78	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3444	0	0	7364	0	0	0	0
Flt Permitted	0.169							0.996				
Satd. Flow (perm)	315	3539	0	0	3444	0	0	7364	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					45			67				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.93	0.91	0.93	0.93	0.92	0.86	0.72	0.93	0.65	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	125	741	0	0	1019	0	0	912	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.93	0.49			0.68			0.28				
Control Delay	74.2	6.4			9.7			12.5				
Queue Delay	0.0	0.1			0.0			0.0				
Total Delay	74.2	6.5			9.7			12.5				
LOS	E	A			A			B				
Approach Delay		16.3			9.7			12.5				
Approach LOS		B			A			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 69.8%		ICU Level of Service C	
Analysis Period (min) 15			

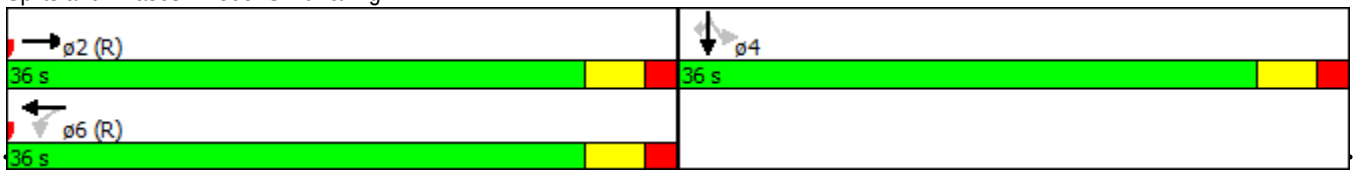
Splits and Phases: 592: Louisiana & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	618	43	118	705	0	0	0	0	181	1644	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3500	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.294						0.950		
Satd. Flow (perm)	0	3500	0	548	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4										92
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.91	0.77	0.84	0.89	0.93	0.93	0.93	0.93	0.84	0.96	0.94
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	742	0	142	800	0	0	0	0	218	1730	193
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.49		0.60	0.53					0.29	0.79	0.26
Control Delay		20.6		22.5	13.6					14.6	21.0	8.1
Queue Delay		2.1		0.0	0.2					0.0	0.0	1.0
Total Delay		22.8		22.5	13.8					14.6	21.0	9.1
LOS		C		C	B					B	C	A
Approach Delay		22.8			15.1						19.3	
Approach LOS		C			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 18.9		Intersection LOS: B	
Intersection Capacity Utilization 69.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	673	25	34	651	16	52	90	66	4	57	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1852	0	0	3522	0	0	1761	0	0	1827	0
Flt Permitted		0.984			0.882			0.905			0.986	
Satd. Flow (perm)	0	1824	0	0	3112	0	0	1613	0	0	1807	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			4			19			5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%	101%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	771	0	0	761	0	0	226	0	0	75	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	86.0	86.0		86.0	86.0		34.0	34.0		34.0	34.0	
Total Lost Time (s)		4.9			4.9			4.7			4.7	
Act Effct Green (s)		81.1			81.1			29.3			29.3	
Actuated g/C Ratio		0.68			0.68			0.24			0.24	
v/c Ratio		0.63			0.36			0.55			0.17	
Control Delay		11.2			5.2			42.2			34.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		11.2			5.2			42.2			34.6	
LOS		B			A			D			C	
Approach Delay		11.2			5.2			42.2			34.6	
Approach LOS		B			A			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 73.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	576	51	0	543	60	0	680	148	0	1143	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3434	0	0	3451	0	0	3423	0	0	3458	0
Flt Permitted												
Satd. Flow (perm)	0	3434	0	0	3451	0	0	3423	0	0	3458	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			11			37			20	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			1181			1479			2366	
Travel Time (s)		87.1			40.3			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	769	0	0	740	0	0	1015	0	0	1586	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		45.0			45.0			75.0			75.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		44.0			44.0			66.0			66.0	
Actuated g/C Ratio		0.37			0.37			0.55			0.55	
v/c Ratio		0.61			0.58			0.53			0.83	
Control Delay		40.8			21.1			19.7			14.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		40.8			21.1			19.7			14.5	
LOS		D			C			B			B	
Approach Delay		40.8			21.1			19.7			14.5	
Approach LOS		D			C			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 5 (4%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 21.9		Intersection LOS: C	
Intersection Capacity Utilization 69.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	500	48	36	377	19	22	185	51	21	198	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3483	0	0	3388	0	0	3419	0	0	3433	0
Flt Permitted		0.864			0.838			0.791			0.808	
Satd. Flow (perm)	0	3021	0	0	2851	0	0	2716	0	0	2785	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			7			26			21	
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		783			1063			294			3799	
Travel Time (s)		15.3			24.2			6.7			86.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	727	0	0	529	0	0	317	0	0	325	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	79.0	79.0		79.0	79.0		41.0	41.0		41.0	41.0	
Total Lost Time (s)		5.0			5.0			4.7			4.7	
Act Effct Green (s)		94.0			94.0			16.3			16.3	
Actuated g/C Ratio		0.78			0.78			0.14			0.14	
v/c Ratio		0.31			0.24			0.81			0.82	
Control Delay		8.0			10.1			72.3			71.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		8.0			10.1			72.3			71.1	
LOS		A			B			E			E	
Approach Delay		8.0			10.1			72.3			71.1	
Approach LOS		A			B			E			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 30.1		Intersection LOS: C	
Intersection Capacity Utilization 65.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 65: Dunlavy & Westheimer

66: Commonwealth & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	611	56	1	329	0	0	0	0	108	305	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3430	0	1770	3497	0	0	0	0	0	3493	1583
Flt Permitted				0.322							0.987	
Satd. Flow (perm)	0	3430	0	600	3497	0	0	0	0	0	3493	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12										234
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		988			340			246			2907	
Travel Time (s)		22.5			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	818	0	1	403	0	0	0	0	0	506	234
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		70.0		70.0	70.0					50.0	50.0	50.0
Total Lost Time (s)		5.0		5.0	5.0						4.9	4.9
Act Effct Green (s)		86.7		86.7	86.7						23.4	23.4
Actuated g/C Ratio		0.72		0.72	0.72						0.20	0.20
v/c Ratio		0.33		0.00	0.16						0.74	0.47
Control Delay		7.5		5.0	2.8						52.1	8.0
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		7.5		5.0	2.8						52.1	8.0
LOS		A		A	A						D	A
Approach Delay		7.5			2.8						38.2	
Approach LOS		A			A						D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 25 (21%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 18.1 Intersection LOS: B
Intersection Capacity Utilization 42.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer

67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	604	20	37	329	97	26	86	36	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3522	0	1770	3419	0	0	3381	0	0	0	0
Flt Permitted	0.459			0.352				0.991				
Satd. Flow (perm)	855	3522	0	656	3419	0	0	3381	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			65			35				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			184			607	
Travel Time (s)		5.3			10.4			4.2			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	765	0	45	522	0	0	181	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2			6			8					
Total Split (s)	83.0	83.0		83.0	83.0		37.0	37.0				
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0				
Act Effct Green (s)	94.0	94.0		94.0	94.0			16.0				
Actuated g/C Ratio	0.78	0.78		0.78	0.78			0.13				
v/c Ratio	0.07	0.28		0.09	0.19			0.38				
Control Delay	2.0	2.4		1.9	1.6			40.6				
Queue Delay	0.0	0.0		0.0	0.0			0.0				
Total Delay	2.0	2.4		1.9	1.6			40.6				
LOS	A	A		A	A			D				
Approach Delay		2.4			1.6			40.6				
Approach LOS		A			A			D				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 25 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.38
Intersection Signal Delay: 6.5 Intersection LOS: A
Intersection Capacity Utilization 48.9% ICU Level of Service A
Analysis Period (min) 15

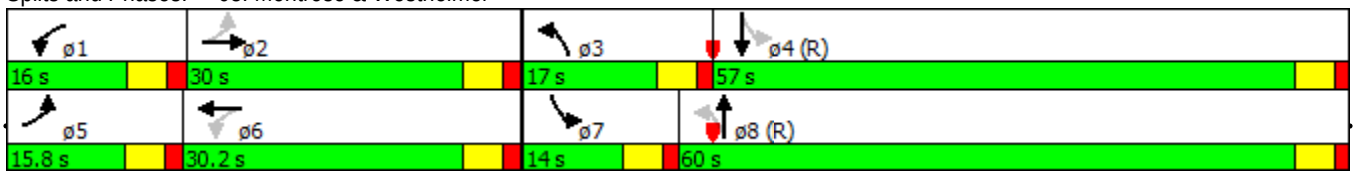
Splits and Phases: 67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	370	97	111	262	69	123	619	95	122	938	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	50		0	150		0	150		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3327	0	1770	3375	0	1770	3451	0	1770	3399	0
Flt Permitted	0.353			0.161			0.073			0.201		
Satd. Flow (perm)	658	3327	0	300	3375	0	136	3451	0	374	3399	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			25			20			6	
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		456			1676			2158			1109	
Travel Time (s)		10.4			38.1			42.0			21.6	
Peak Hour Factor	0.86	0.86	0.87	0.82	0.91	0.91	0.85	0.86	0.82	0.92	0.81	0.75
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	2	0	0	16	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	150	617	0	154	414	0	165	953	0	151	1393	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	15.8	30.0		16.0	30.2		17.0	60.0		14.0	57.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		5.0	5.0		5.0	5.0	
Act Effct Green (s)	35.2	24.7		35.6	24.9		67.0	55.0		61.0	52.0	
Actuated g/C Ratio	0.29	0.21		0.30	0.21		0.56	0.46		0.51	0.43	
v/c Ratio	0.52	0.88		0.70	0.57		0.69	0.60		0.51	0.94	
Control Delay	26.6	45.4		39.1	36.1		31.9	23.6		18.3	35.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.6	45.4		39.1	36.1		31.9	23.6		18.3	35.7	
LOS	C	D		D	D		C	C		B	D	
Approach Delay		41.7			36.9			24.9			34.0	
Approach LOS		D			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 33.3 Intersection LOS: C
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 68: Montrose & Westheimer

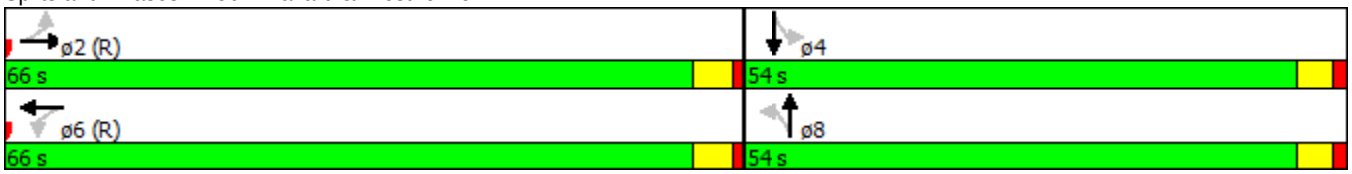


567: Hazard & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	586	44	37	412	4	64	60	59	18	30	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Satd. Flow (prot)	0	3500	0	0	3511	0	0	1875	0	0	1914	0
Flt Permitted		0.942			0.723			0.820			0.750	
Satd. Flow (perm)	0	3301	0	0	2554	0	0	1562	0	0	1460	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			2			22			9	
Link Speed (mph)		35			20			30			30	
Link Distance (ft)		1181			784			907			993	
Travel Time (s)		23.0			26.7			20.6			22.6	
Peak Hour Factor	0.75	0.79	0.79	0.54	0.83	0.50	0.62	0.54	0.62	0.50	0.54	0.63
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	923	0	0	653	0	0	353	0	0	122	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	66.0	66.0		66.0	66.0		54.0	54.0		54.0	54.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		80.0			80.0			30.8			30.8	
Actuated g/C Ratio		0.67			0.67			0.26			0.26	
v/c Ratio		0.42			0.38			0.85			0.32	
Control Delay		10.4			20.2			57.4			33.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		10.4			20.2			57.4			33.7	
LOS		B			C			E			C	
Approach Delay		10.4			20.2			57.4			33.7	
Approach LOS		B			C			E			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 23.0		Intersection LOS: C	
Intersection Capacity Utilization 62.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 567: Hazard & Westheimer



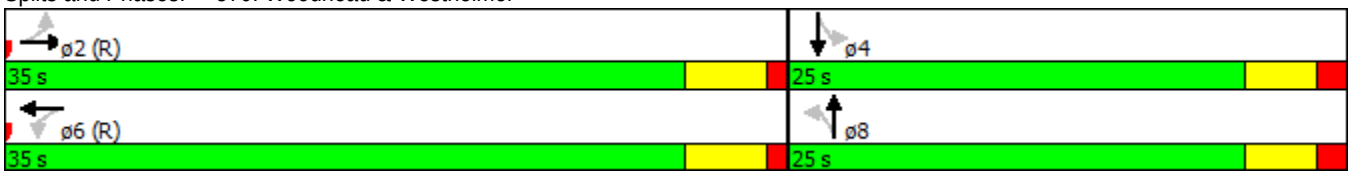
570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	462	143	50	372	2	44	72	49	15	113	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3405	0	0	3511	0	0	1756	0	0	1783	0
Flt Permitted		0.920			0.721			0.828			0.930	
Satd. Flow (perm)	0	3139	0	0	2549	0	0	1474	0	0	1670	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		103			2			43			33	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.72	0.71	0.66	0.73	0.83	0.50	0.61	0.69	0.58	0.42	0.69	0.46
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1025	0	0	594	0	0	297	0	0	310	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	35.0	35.0		35.0	35.0		25.0	25.0		25.0	25.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		30.4			30.4			20.4			20.4	
Actuated g/C Ratio		0.51			0.51			0.34			0.34	
v/c Ratio		0.62			0.46			0.56			0.53	
Control Delay		17.0			8.4			18.6			18.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		17.0			8.4			18.6			18.0	
LOS		B			A			B			B	
Approach Delay		17.0			8.4			18.6			18.0	
Approach LOS		B			A			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 25 (42%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 15.0 Intersection LOS: B
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 570: Woodhead & Westheimer



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	672	12	17	502	32	8	67	60	35	38	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3522	0	0	3497	0	0	1772	0	0	1763	0
Flt Permitted		0.882			0.895			0.988			0.778	
Satd. Flow (perm)	0	3112	0	0	3136	0	0	1754	0	0	1398	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			12			23			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1676			1143			877			953	
Travel Time (s)		38.1			26.0			19.9			21.7	
Peak Hour Factor	0.50	0.80	0.75	0.85	0.91	0.80	1.00	0.60	0.94	0.67	0.79	0.53
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1022	0	0	698	0	0	209	0	0	156	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	81.0	81.0		81.0	81.0		39.0	39.0		39.0	39.0	
Total Lost Time (s)		4.7			4.7			4.5			4.5	
Act Effct Green (s)		76.3			76.3			34.5			34.5	
Actuated g/C Ratio		0.64			0.64			0.29			0.29	
v/c Ratio		0.52			0.35			0.40			0.38	
Control Delay		10.7			10.6			33.2			34.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		10.7			10.6			33.2			34.0	
LOS		B			B			C			C	
Approach Delay		10.7			10.6			33.2			34.0	
Approach LOS		B			B			C			C	

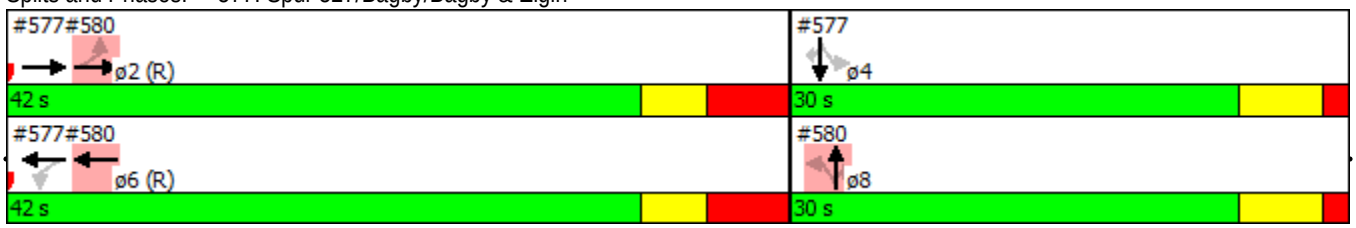
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 75 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 14.7		Intersection LOS: B	
Intersection Capacity Utilization 64.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 573: Taft & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	589	143	24	485	0	0	0	0	88	814	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3433	0	1770	3539	0	0	0	0	0	5055	1583
Flt Permitted				0.225							0.994	
Satd. Flow (perm)	0	3433	0	419	3539	0	0	0	0	0	5055	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24										76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.85	0.81	0.75	0.91	0.93	0.93	0.93	0.93	0.73	0.99	0.25
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	991	0	36	608	0	0	0	0	0	1074	9
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		42.0		42.0	42.0					30.0	30.0	30.0
Total Lost Time (s)		8.0		8.0	8.0						6.0	6.0
Act Effct Green (s)		34.0		34.0	34.0						24.0	24.0
Actuated g/C Ratio		0.47		0.47	0.47						0.33	0.33
v/c Ratio		0.61		0.18	0.36						0.64	0.02
Control Delay		15.6		9.2	8.2						22.4	0.0
Queue Delay		0.0		0.0	0.7						0.0	0.0
Total Delay		15.7		9.2	9.0						22.4	0.0
LOS		B		A	A						C	A
Approach Delay		15.7			9.0						22.2	
Approach LOS		B			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 55.4%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

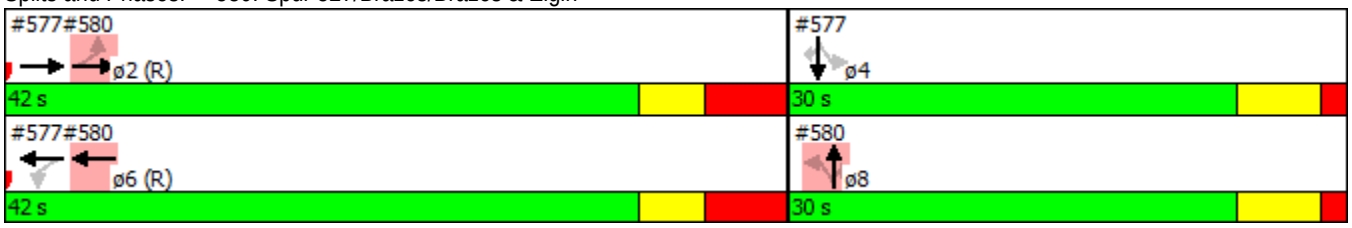
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	668	0	0	367	51	140	659	16	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3536	0	0	3465	0	1770	3539	1583	0	0	0
Flt Permitted		0.938					0.950					
Satd. Flow (perm)	0	3320	0	0	3465	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					34				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.44	0.83	0.93	0.93	0.92	0.80	0.78	0.93	0.80	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	935	0	0	528	0	205	808	23	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	42.0	42.0			42.0		30.0	30.0	30.0			
Total Lost Time (s)		8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)		34.0			34.0		24.0	24.0	24.0			
Actuated g/C Ratio		0.47			0.47		0.33	0.33	0.33			
v/c Ratio		0.60			0.32		0.35	0.69	0.04			
Control Delay		6.3			22.5		20.2	24.4	0.1			
Queue Delay		0.4			0.0		0.0	0.0	0.0			
Total Delay		6.7			22.5		20.2	24.4	0.1			
LOS		A			C		C	C	A			
Approach Delay		6.7			22.5			23.0				
Approach LOS		A			C			C				

Intersection Summary

Area Type: Other
Cycle Length: 72
Actuated Cycle Length: 72
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 16.8 Intersection LOS: B
Intersection Capacity Utilization 59.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



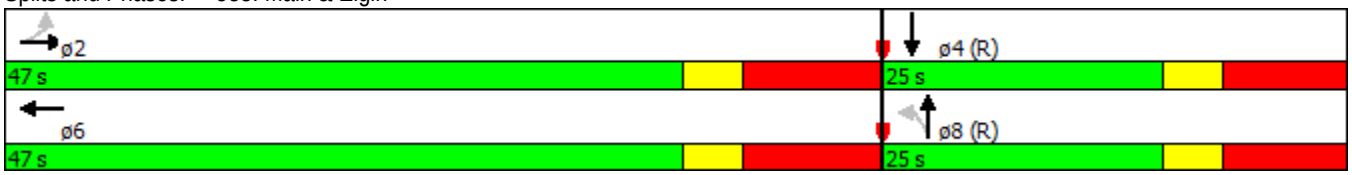
Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	30.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	640	31	0	773	5	2	147	23	0	100	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3507	0	0	3536	0	0	1822	0	0	1816	0
Flt Permitted		0.946						0.991				
Satd. Flow (perm)	0	3318	0	0	3536	0	0	1807	0	0	1816	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			2			12			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.50	0.88	0.65	0.93	0.94	0.63	0.50	0.88	0.72	0.93	0.71	0.81
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	888	0	0	946	0	0	231	0	0	198	0
Turn Type	Perm	NA			NA		Perm	NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2						8					
Total Split (s)	47.0	47.0			47.0		25.0	25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		27.0			27.0			24.3			24.3	
Actuated g/C Ratio		0.38			0.38			0.34			0.34	
v/c Ratio		0.71			0.71			0.37			0.32	
Control Delay		14.6			21.9			21.1			20.0	
Queue Delay		0.4			0.0			0.0			0.0	
Total Delay		15.0			21.9			21.1			20.0	
LOS		B			C			C			B	
Approach Delay		15.0			21.9			21.1			20.0	
Approach LOS		B			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 30 (42%), Referenced to phase 4:SBT and 8:NBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 19.0		Intersection LOS: B	
Intersection Capacity Utilization 54.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 583: Main & Elgin

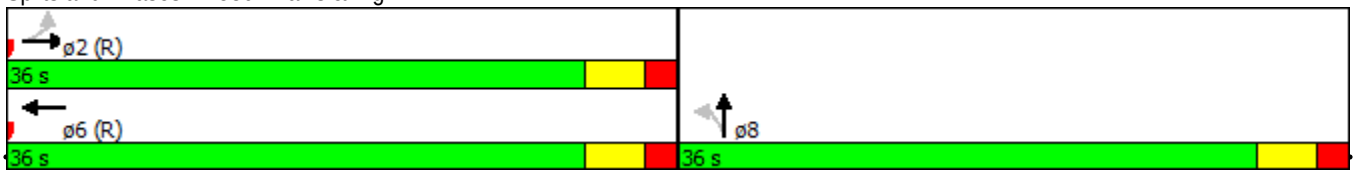


N2013T-C01;0012: Westheimer Road from Shepherd Drive to Main Street 2040 No Build AM
586: Travis & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	746	0	0	491	93	51	1590	116	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3447	0	0	6325	0	0	0	0
Flt Permitted	0.267							0.998				
Satd. Flow (perm)	497	3539	0	0	3447	0	0	6325	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					2			31				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.78	0.90	0.93	0.93	0.85	0.78	0.80	0.95	0.81	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	945	0	0	795	0	0	2144	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.36	0.62			0.54			0.78				
Control Delay	17.4	15.9			33.1			19.9				
Queue Delay	0.0	0.1			0.7			0.0				
Total Delay	17.4	16.0			33.9			19.9				
LOS	B	B			C			B				
Approach Delay		16.1			33.9			19.9				
Approach LOS		B			C			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 21.7		Intersection LOS: C	
Intersection Capacity Utilization 64.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 586: Travis & Elgin

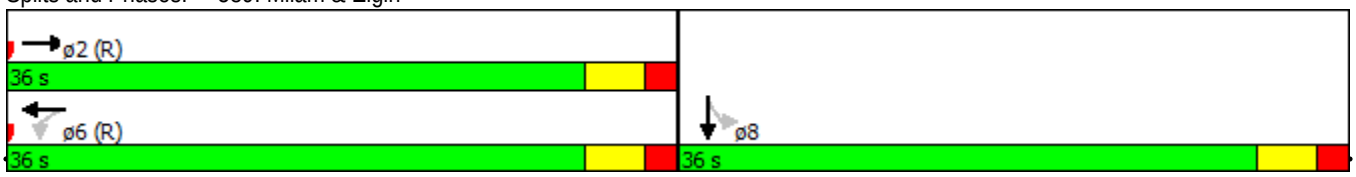


N2013T-C01;0012: Westheimer Road from Shepherd Drive to Main Street 2040 No Build AM
589: Milam & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	652	29	48	512	0	0	0	0	147	528	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3514	0	1770	3539	0	0	0	0	0	6255	0
Flt Permitted				0.233							0.989	
Satd. Flow (perm)	0	3514	0	434	3539	0	0	0	0	0	6255	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9									38	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.90	0.81	0.80	0.88	0.93	0.93	0.93	0.93	0.78	0.95	0.82
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	867	0	68	663	0	0	0	0	0	931	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0						5.0	
Act Effct Green (s)		31.0		31.0	31.0						31.0	
Actuated g/C Ratio		0.43		0.43	0.43						0.43	
v/c Ratio		0.57		0.37	0.44						0.34	
Control Delay		8.6		10.8	7.5						13.5	
Queue Delay		0.0		0.0	0.1						0.0	
Total Delay		8.7		10.8	7.6						13.5	
LOS		A		B	A						B	
Approach Delay		8.7			7.9						13.5	
Approach LOS		A			A						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 10.2		Intersection LOS: B	
Intersection Capacity Utilization 64.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

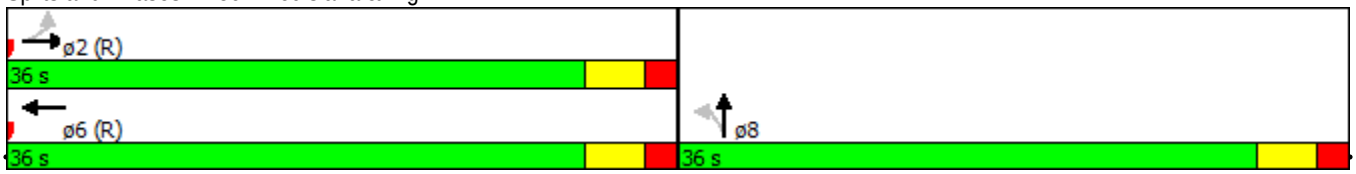


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	636	0	0	375	157	31	1898	66	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3359	0	0	7484	0	0	0	0
Flt Permitted	0.307							0.999				
Satd. Flow (perm)	572	3539	0	0	3359	0	0	7484	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					1			19				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.82	0.90	0.93	0.93	0.90	0.74	0.78	0.98	0.72	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	229	806	0	0	717	0	0	2357	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.93	0.53			0.50			0.73				
Control Delay	52.4	5.0			5.0			18.5				
Queue Delay	0.0	0.2			0.0			0.0				
Total Delay	52.4	5.2			5.0			18.5				
LOS	D	A			A			B				
Approach Delay		15.6			5.0			18.5				
Approach LOS		B			A			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 15.4		Intersection LOS: B	
Intersection Capacity Utilization 67.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 592: Louisiana & Elgin

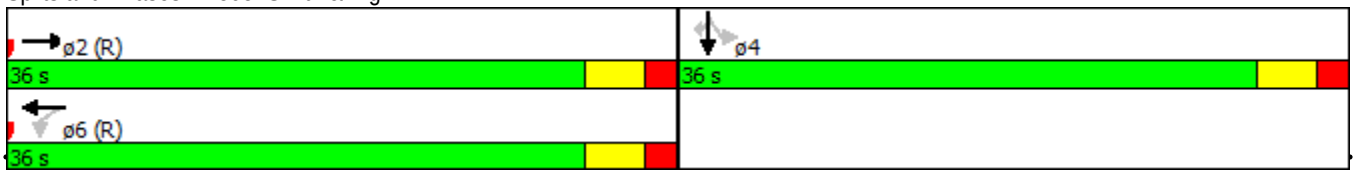


N2013T-C01;0012: Westheimer Road from Shepherd Drive to Main Street 2040 No Build AM
595: Smith & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	673	12	77	342	0	0	0	0	128	733	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3525	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.216						0.950		
Satd. Flow (perm)	0	3525	0	402	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4										110
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.87	0.60	0.80	0.87	0.93	0.93	0.93	0.93	0.84	0.92	0.79
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	905	0	110	448	0	0	0	0	174	908	110
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.60		0.64	0.29					0.23	0.41	0.15
Control Delay		21.0		30.8	11.1					14.0	14.9	3.4
Queue Delay		12.8		0.0	0.0					0.0	0.0	0.0
Total Delay		33.7		30.8	11.1					14.0	14.9	3.4
LOS		C		C	B					B	B	A
Approach Delay		33.7			15.0						13.7	
Approach LOS		C			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 20.8		Intersection LOS: C	
Intersection Capacity Utilization 67.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	499	18	69	374	6	29	45	54	4	54	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3522	0	0	3504	0	0	1737	0	0	1826	0
Flt Permitted		0.952			0.746			0.924			0.987	
Satd. Flow (perm)	0	3352	0	0	2635	0	0	1623	0	0	1807	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			2			33			6	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	639	0	0	550	0	0	157	0	0	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)		4.9			4.9			4.7			4.7	
Act Effct Green (s)		70.1			70.1			40.3			40.3	
Actuated g/C Ratio		0.58			0.58			0.34			0.34	
v/c Ratio		0.33			0.36			0.28			0.13	
Control Delay		20.4			12.6			24.4			26.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		20.4			12.6			24.4			26.4	
LOS		C			B			C			C	
Approach Delay		20.4			12.6			24.4			26.4	
Approach LOS		C			B			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.36			
Intersection Signal Delay: 18.1		Intersection LOS: B	
Intersection Capacity Utilization 57.8%		ICU Level of Service B	
Analysis Period (min) 15			

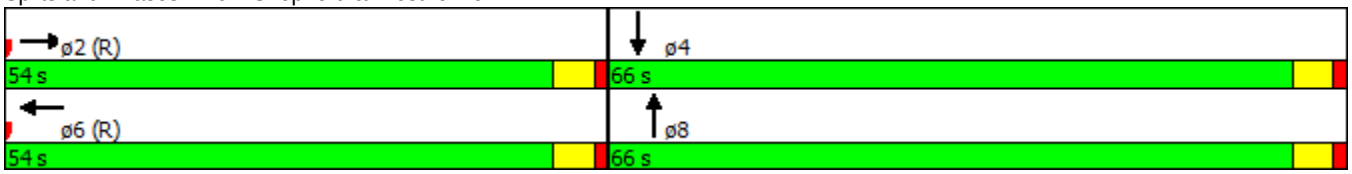
Splits and Phases: 603: Mandell & Westheimer

64: Shepherd & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	954	52	0	741	90	0	1221	101	0	1137	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Flt Permitted												
Satd. Flow (perm)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			13			10			24	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			1181			1479			2366	
Travel Time (s)		87.1			40.3			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1233	0	0	1018	0	0	1621	0	0	1639	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		54.0			54.0			66.0			66.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		49.7			49.7			60.3			60.3	
Actuated g/C Ratio		0.41			0.41			0.50			0.50	
v/c Ratio		0.86			0.71			0.92			0.94	
Control Delay		37.5			42.9			37.3			51.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		37.5			42.9			37.3			51.1	
LOS		D			D			D			D	
Approach Delay		37.5			42.9			37.3			51.1	
Approach LOS		D			D			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 55 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 42.5		Intersection LOS: D	
Intersection Capacity Utilization 83.4%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer



65: Dunlavy & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	669	41	42	739	41	11	318	55	25	319	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1844	0	0	3392	0	0	3461	0	0	3440	0
Flt Permitted		0.887			0.847			0.897			0.793	
Satd. Flow (perm)	0	1641	0	0	2881	0	0	3108	0	0	2736	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			10			14			18	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		783			1063			294			3799	
Travel Time (s)		17.8			24.2			6.7			86.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	924	0	0	1007	0	0	470	0	0	507	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	89.0	89.0		89.0	89.0		31.0	31.0		31.0	31.0	
Total Lost Time (s)		5.0			5.0			4.7			4.7	
Act Effct Green (s)		86.2			86.2			24.1			24.1	
Actuated g/C Ratio		0.72			0.72			0.20			0.20	
v/c Ratio		0.78			0.49			0.74			0.90	
Control Delay		23.7			11.0			52.9			61.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		23.7			11.0			52.9			61.0	
LOS		C			B			D			E	
Approach Delay		23.7			11.0			52.9			61.0	
Approach LOS		C			B			D			E	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 30.5		Intersection LOS: C	
Intersection Capacity Utilization 113.9%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 65: Dunlavy & Westheimer

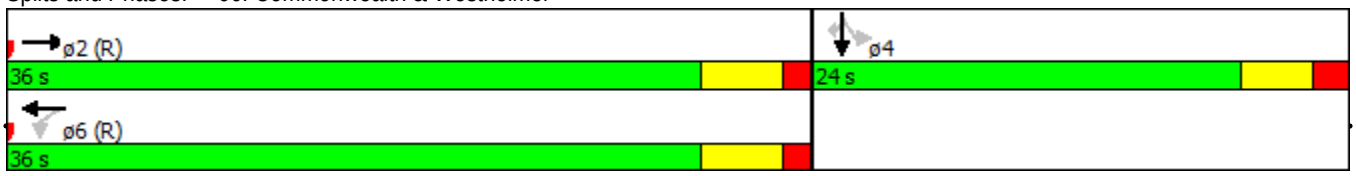
66: Commonwealth & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	934	38	3	701	0	0	0	0	118	292	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	100		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3455	0	1770	3497	0	0	0	0	0	3490	1583
Flt Permitted				0.184							0.986	
Satd. Flow (perm)	0	3455	0	343	3497	0	0	0	0	0	3490	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10										121
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		988			340			246			2907	
Travel Time (s)		22.5			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1192	0	4	859	0	0	0	0	0	503	288
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					24.0	24.0	24.0
Total Lost Time (s)		5.0		5.0	5.0						4.9	4.9
Act Effct Green (s)		35.8		35.8	35.8						14.3	14.3
Actuated g/C Ratio		0.60		0.60	0.60						0.24	0.24
v/c Ratio		0.58		0.02	0.41						0.61	0.61
Control Delay		9.9		7.8	8.2						23.0	16.9
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		9.9		7.8	8.2						23.0	16.9
LOS		A		A	A						C	B
Approach Delay		9.9			8.2						20.8	
Approach LOS		A			A						C	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 30 (50%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 12.4 Intersection LOS: B
Intersection Capacity Utilization 52.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer

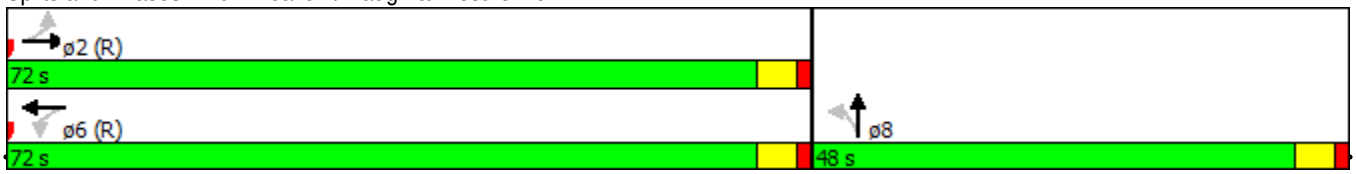


67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	795	58	34	665	106	49	423	86	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3504	0	1770	3465	0	0	3444	0	0	0	0
Flt Permitted	0.263			0.230				0.996				
Satd. Flow (perm)	490	3504	0	428	3465	0	0	3444	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			24			19				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			356			607	
Travel Time (s)		5.3			10.4			8.1			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	1046	0	42	945	0	0	684	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2			6			8					
Total Split (s)	72.0	72.0		72.0	72.0		48.0	48.0				
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0				
Act Effct Green (s)	79.7	79.7		79.7	79.7			30.3				
Actuated g/C Ratio	0.66	0.66		0.66	0.66			0.25				
v/c Ratio	0.32	0.45		0.15	0.41			0.77				
Control Delay	10.1	8.0		5.0	4.5			46.5				
Queue Delay	0.0	0.2		0.0	0.4			0.0				
Total Delay	10.1	8.2		5.0	4.9			46.5				
LOS	B	A		A	A			D				
Approach Delay		8.3			4.9			46.5				
Approach LOS		A			A			D				

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 16.4		Intersection LOS: B	
Intersection Capacity Utilization 66.1%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 67: Yoakum/Waugh & Westheimer



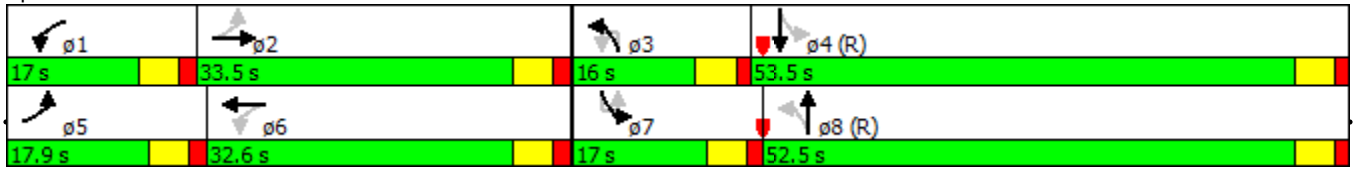
68: Montrose & Westheimer

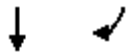
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Volume (vph)	165	496	86	148	487	96	2	152	1068	85	1	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	50		0		150		0		150
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	25			25				25				25
Satd. Flow (prot)	1770	3347	0	1770	3399	0	0	1770	3479	0	0	1770
Flt Permitted	0.142			0.147				0.084				0.082
Satd. Flow (perm)	265	3347	0	274	3399	0	0	156	3479	0	0	153
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		18			17				10			
Link Speed (mph)		30			30				35			
Link Distance (ft)		456			1676				2158			
Travel Time (s)		10.4			38.1				42.0			
Peak Hour Factor	0.94	0.90	0.80	0.88	0.85	0.90	0.50	0.88	0.96	0.79	0.25	0.84
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	0	2	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	200	751	0	192	775	0	0	202	1391	0	0	225
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		custom	pm+pt
Protected Phases	5	2		1	6			3	8			7
Permitted Phases	2			6			3	8			7	4
Total Split (s)	17.9	33.5		17.0	32.6		16.0	16.0	52.5		17.0	17.0
Total Lost Time (s)	5.3	5.3		5.3	5.3			5.0	5.0			5.0
Act Effct Green (s)	40.8	28.2		39.0	27.3			58.5	47.5			60.5
Actuated g/C Ratio	0.34	0.24		0.32	0.23			0.49	0.40			0.50
v/c Ratio	0.81	0.94		0.82	0.99			0.90	1.01			0.95
Control Delay	66.0	65.3		53.9	67.5			61.9	57.2			86.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	66.0	65.3		53.9	67.5			61.9	57.2			86.1
LOS	E	E		D	E			E	E			F
Approach Delay		65.5			64.8				57.8			
Approach LOS		E			E				E			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 53.7 Intersection LOS: D
Intersection Capacity Utilization 93.5% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 68: Montrose & Westheimer





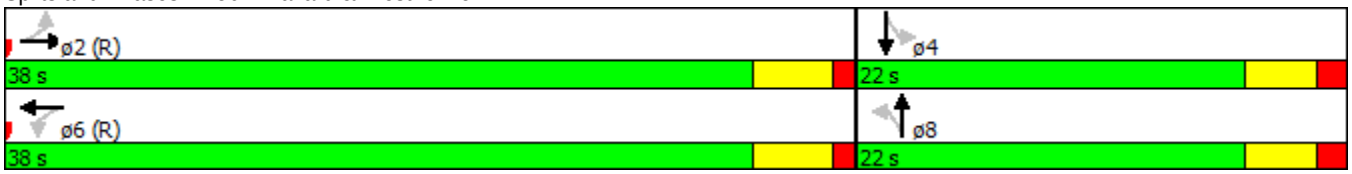
Lane Group	SBT	SBR
Lane Configurations		
Volume (vph)	877	110
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Satd. Flow (prot)	3361	0
Flt Permitted		
Satd. Flow (perm)	3361	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	16	
Link Speed (mph)	35	
Link Distance (ft)	1109	
Travel Time (s)	21.6	
Peak Hour Factor	0.97	0.83
Growth Factor	114%	114%
Bus Blockages (#/hr)	16	0
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1182	0
Turn Type	NA	
Protected Phases	4	
Permitted Phases		
Total Split (s)	53.5	
Total Lost Time (s)	5.0	
Act Effct Green (s)	48.5	
Actuated g/C Ratio	0.40	
v/c Ratio	0.86	
Control Delay	23.6	
Queue Delay	0.0	
Total Delay	23.6	
LOS	C	
Approach Delay	33.6	
Approach LOS	C	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	768	39	33	682	4	40	82	48	3	32	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Satd. Flow (prot)	0	3500	0	0	3522	0	0	1888	0	0	1898	0
Flt Permitted		0.895			0.865			0.911			0.982	
Satd. Flow (perm)	0	3139	0	0	3055	0	0	1738	0	0	1869	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			4			36			27	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		1181			784			907			993	
Travel Time (s)		40.3			26.7			20.6			22.6	
Peak Hour Factor	0.69	0.95	0.75	0.83	0.95	0.33	0.83	0.73	0.71	0.75	0.67	0.63
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1022	0	0	877	0	0	260	0	0	86	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	38.0	38.0		38.0	38.0		22.0	22.0		22.0	22.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		38.0			38.0			12.8			12.8	
Actuated g/C Ratio		0.63			0.63			0.21			0.21	
v/c Ratio		0.51			0.45			0.65			0.21	
Control Delay		14.0			8.8			26.0			14.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.0			8.8			26.0			14.3	
LOS		B			A			C			B	
Approach Delay		14.0			8.8			26.0			14.3	
Approach LOS		B			A			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 10 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 13.3		Intersection LOS: B	
Intersection Capacity Utilization 74.6%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 567: Hazard & Westheimer



570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	669	93	45	656	14	22	148	31	22	107	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3465	0	0	3507	0	0	1802	0	0	1804	0
Flt Permitted		0.880			0.747			0.938			0.889	
Satd. Flow (perm)	0	3055	0	0	2631	0	0	1700	0	0	1618	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			5			12			9	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.59	0.93	0.83	0.75	0.93	0.58	0.69	0.86	0.60	0.55	0.72	0.88
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	985	0	0	900	0	0	291	0	0	260	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	75.0	75.0		75.0	75.0		45.0	45.0		45.0	45.0	
Total Lost Time (s)		4.6			4.6			4.6			4.6	
Act Effct Green (s)		70.4			70.4			40.4			40.4	
Actuated g/C Ratio		0.59			0.59			0.34			0.34	
v/c Ratio		0.55			0.58			0.50			0.47	
Control Delay		5.5			10.0			34.0			33.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		5.5			10.0			34.0			33.7	
LOS		A			A			C			C	
Approach Delay		5.5			10.0			34.0			33.7	
Approach LOS		A			A			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 75.0% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 570: Woodhead & Westheimer

573: Taft & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	675	14	36	858	29	16	122	59	25	69	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3511	0	0	3504	0	0	1779	0	0	1783	0
Flt Permitted		0.833			0.882			0.943			0.858	
Satd. Flow (perm)	0	2933	0	0	3097	0	0	1688	0	0	1552	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			16			34			22	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1676			1143			877			953	
Travel Time (s)		38.1			26.0			19.9			21.7	
Peak Hour Factor	0.75	0.93	0.58	0.82	0.90	0.52	0.57	0.95	0.92	0.52	0.82	0.83
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	905	0	0	1201	0	0	251	0	0	192	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	39.0	39.0		39.0	39.0		21.0	21.0		21.0	21.0	
Total Lost Time (s)		4.7			4.7			4.5			4.5	
Act Effct Green (s)		34.3			34.3			16.5			16.5	
Actuated g/C Ratio		0.57			0.57			0.28			0.28	
v/c Ratio		0.54			0.68			0.51			0.43	
Control Delay		16.2			11.3			20.2			19.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		16.2			11.3			20.2			19.5	
LOS		B			B			C			B	
Approach Delay		16.2			11.3			20.2			19.5	
Approach LOS		B			B			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 30 (50%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 14.5 Intersection LOS: B
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15

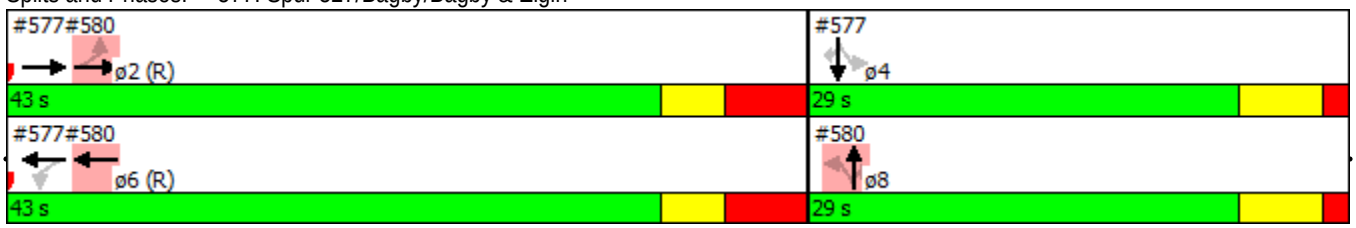
Splits and Phases: 573: Taft & Westheimer

577: Spur 527/Bagby/Bagby & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	136	31	47	833	0	0	0	0	104	594	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3440	0	1770	3539	0	0	0	0	0	5050	1583
Flt Permitted				0.620							0.993	
Satd. Flow (perm)	0	3440	0	1155	3539	0	0	0	0	0	5050	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30										76
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.90	0.90	0.73	0.92	0.93	0.93	0.93	0.93	0.90	0.80	0.67
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	211	0	73	1032	0	0	0	0	0	978	14
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		43.0		43.0	43.0					29.0	29.0	29.0
Total Lost Time (s)		8.0		8.0	8.0						6.0	6.0
Act Effct Green (s)		35.0		35.0	35.0						23.0	23.0
Actuated g/C Ratio		0.49		0.49	0.49						0.32	0.32
v/c Ratio		0.13		0.13	0.60						0.61	0.03
Control Delay		8.9		3.1	4.2						22.6	0.1
Queue Delay		0.0		0.9	0.5						0.6	0.0
Total Delay		8.9		4.0	4.7						23.2	0.1
LOS		A		A	A						C	A
Approach Delay		8.9			4.7						22.9	
Approach LOS		A			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 12.9		Intersection LOS: B	
Intersection Capacity Utilization 58.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



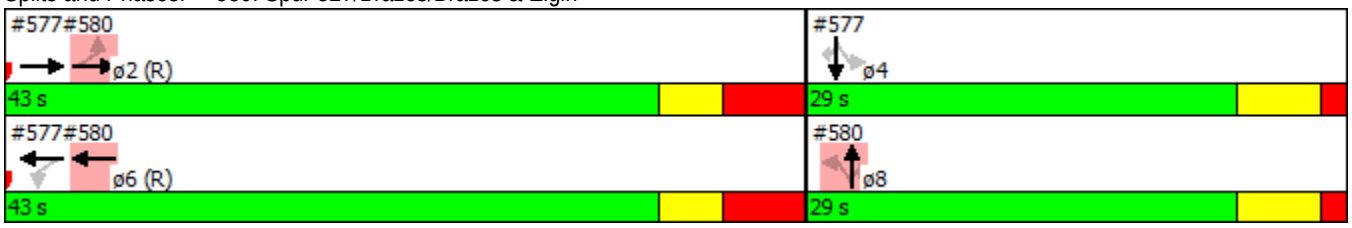
Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	29.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	670	0	0	779	107	103	601	10	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3536	0	0	3472	0	1770	3539	1583	0	0	0
Flt Permitted		0.937					0.950					
Satd. Flow (perm)	0	3316	0	0	3472	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					32				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.25	0.93	0.93	0.93	0.91	0.84	0.88	0.95	0.63	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	830	0	0	1121	0	133	721	18	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	43.0	43.0			43.0		29.0	29.0	29.0			
Total Lost Time (s)		8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)		35.0			35.0		23.0	23.0	23.0			
Actuated g/C Ratio		0.49			0.49		0.32	0.32	0.32			
v/c Ratio		0.52			0.66		0.24	0.64	0.03			
Control Delay		14.5			28.8		19.5	24.0	0.1			
Queue Delay		32.8			22.5		0.0	0.0	0.0			
Total Delay		47.3			51.3		19.5	24.0	0.1			
LOS		D			D		B	C	A			
Approach Delay		47.3			51.3			22.9				
Approach LOS		D			D			C				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 41.3		Intersection LOS: D	
Intersection Capacity Utilization 59.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	29.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

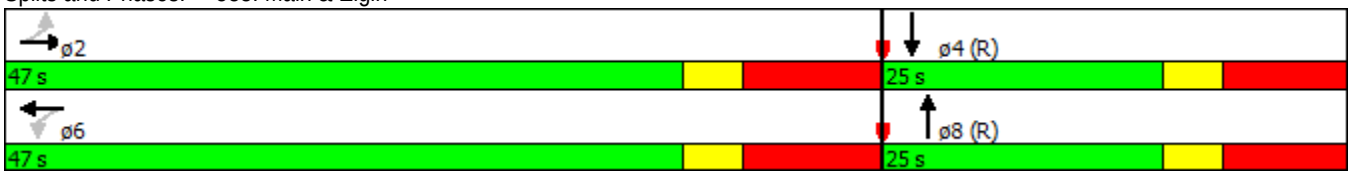
Intersection Summary

583: Main & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	906	51	1	931	14	0	173	36	0	168	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3504	0	0	3532	0	0	1825	0	0	1840	0
Flt Permitted		0.947			0.946							
Satd. Flow (perm)	0	3318	0	0	3341	0	0	1825	0	0	1840	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			3			11			6	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.25	0.94	0.71	0.25	0.95	0.88	0.50	0.75	0.90	0.93	0.84	0.80
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1186	0	0	1140	0	0	309	0	0	251	0
Turn Type	Perm	NA		Perm	NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6								
Total Split (s)	47.0	47.0		47.0	47.0			25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		32.8			32.8			18.5			18.5	
Actuated g/C Ratio		0.46			0.46			0.26			0.26	
v/c Ratio		0.78			0.75			0.65			0.53	
Control Delay		31.0			19.3			32.8			28.7	
Queue Delay		6.4			28.4			0.0			0.0	
Total Delay		37.4			47.8			32.8			28.7	
LOS		D			D			C			C	
Approach Delay		37.4			47.8			32.8			28.7	
Approach LOS		D			D			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 57 (79%), Referenced to phase 4:SBT and 8:NBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 40.3		Intersection LOS: D	
Intersection Capacity Utilization 61.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 583: Main & Elgin

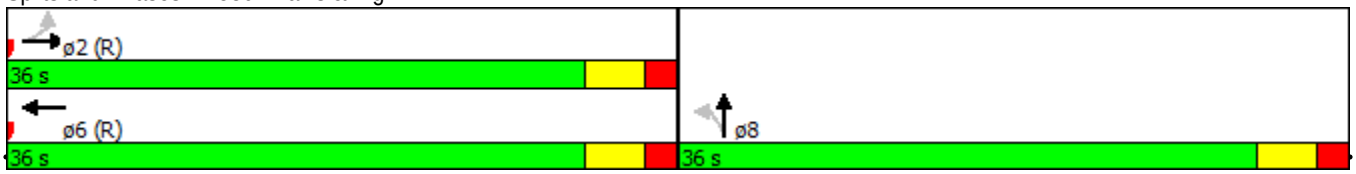


586: Travis & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	680	0	0	851	104	116	1075	134	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3483	0	0	6267	0	0	0	0
Flt Permitted	0.129							0.995				
Satd. Flow (perm)	240	3539	0	0	3483	0	0	6267	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					17			55				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.93	0.86	0.93	0.93	0.93	0.93	0.81	0.93	0.82	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	901	0	0	1170	0	0	1667	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	0.84	0.59			0.78			0.61				
Control Delay	70.6	13.5			19.0			16.4				
Queue Delay	0.0	0.2			49.0			0.3				
Total Delay	70.6	13.7			68.0			16.7				
LOS	E	B			E			B				
Approach Delay		18.7			68.0			16.7				
Approach LOS		B			E			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 32.9		Intersection LOS: C	
Intersection Capacity Utilization 69.9%		ICU Level of Service C	
Analysis Period (min) 15			

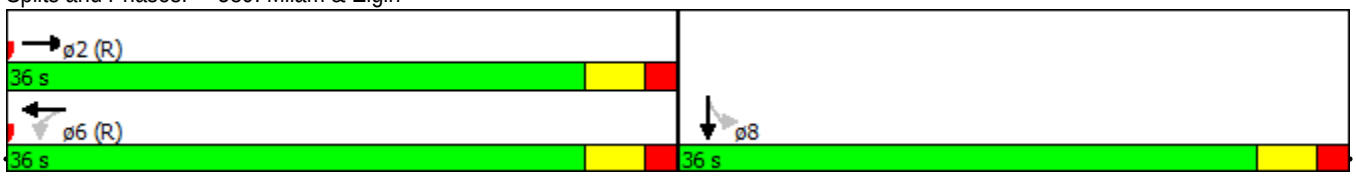
Splits and Phases: 586: Travis & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	634	68	123	828	0	0	0	0	123	1294	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3483	0	1770	3539	0	0	0	0	0	6382	0
Flt Permitted				0.226							0.996	
Satd. Flow (perm)	0	3483	0	421	3539	0	0	0	0	0	6382	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6										
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.92	0.81	0.88	0.90	0.93	0.93	0.93	0.93	0.90	0.92	0.74
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	882	0	159	1049	0	0	0	0	0	1759	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0						5.0	
Act Effct Green (s)		31.0		31.0	31.0						31.0	
Actuated g/C Ratio		0.43		0.43	0.43						0.43	
v/c Ratio		0.59		0.88	0.69						0.64	
Control Delay		8.2		44.1	7.6						17.4	
Queue Delay		0.0		0.0	0.5						0.0	
Total Delay		8.3		44.1	8.1						17.4	
LOS		A		D	A						B	
Approach Delay		8.3			12.8						17.4	
Approach LOS		A			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 13.9		Intersection LOS: B	
Intersection Capacity Utilization 69.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

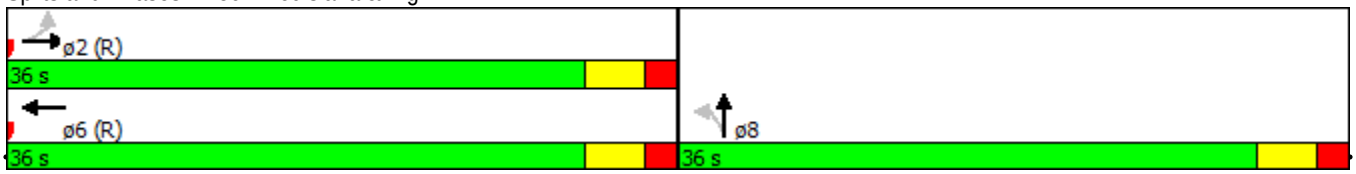


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	668	0	0	763	154	55	657	78	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3444	0	0	7364	0	0	0	0
Flt Permitted	0.129							0.996				
Satd. Flow (perm)	240	3539	0	0	3444	0	0	7364	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					45			68				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.93	0.91	0.93	0.93	0.92	0.86	0.72	0.93	0.65	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	141	837	0	0	1149	0	0	1029	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0			5.0				
Act Effct Green (s)	31.0	31.0			31.0			31.0				
Actuated g/C Ratio	0.43	0.43			0.43			0.43				
v/c Ratio	1.37	0.55			0.76			0.32				
Control Delay	230.7	6.6			11.8			12.9				
Queue Delay	0.0	0.2			0.0			0.0				
Total Delay	230.7	6.8			11.8			12.9				
LOS	F	A			B			B				
Approach Delay		39.1			11.8			12.9				
Approach LOS		D			B			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.37			
Intersection Signal Delay: 20.6		Intersection LOS: C	
Intersection Capacity Utilization 77.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 592: Louisiana & Elgin

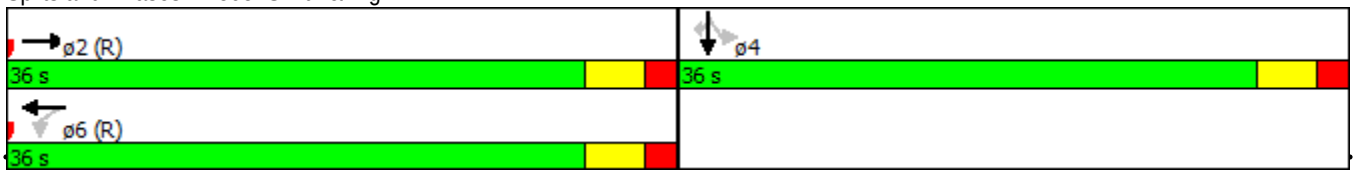


595: Smith & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	618	43	118	705	0	0	0	0	181	1644	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3500	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.246						0.950		
Satd. Flow (perm)	0	3500	0	458	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2										66
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.91	0.77	0.84	0.89	0.93	0.93	0.93	0.93	0.84	0.96	0.94
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	838	0	160	903	0	0	0	0	246	1952	218
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.56		0.81	0.59					0.32	0.89	0.30
Control Delay		21.3		39.7	13.1					15.1	25.7	10.5
Queue Delay		5.3		0.0	0.3					0.0	0.0	2.6
Total Delay		26.6		39.7	13.5					15.1	25.7	13.1
LOS		C		D	B					B	C	B
Approach Delay		26.6			17.4						23.5	
Approach LOS		C			B						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 22.6		Intersection LOS: C	
Intersection Capacity Utilization 77.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	673	25	34	651	16	52	90	66	4	57	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1852	0	0	3522	0	0	1761	0	0	1827	0
Flt Permitted		0.981			0.866			0.905			0.982	
Satd. Flow (perm)	0	1818	0	0	3056	0	0	1613	0	0	1800	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			4			18			5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	871	0	0	860	0	0	255	0	0	85	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	86.0	86.0		86.0	86.0		34.0	34.0		34.0	34.0	
Total Lost Time (s)		4.9			4.9			4.7			4.7	
Act Effct Green (s)		81.1			81.1			29.3			29.3	
Actuated g/C Ratio		0.68			0.68			0.24			0.24	
v/c Ratio		0.71			0.42			0.63			0.19	
Control Delay		16.4			5.5			45.3			35.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		16.4			5.5			45.3			35.2	
LOS		B			A			D			D	
Approach Delay		16.4			5.5			45.3			35.2	
Approach LOS		B			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 70 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 16.2		Intersection LOS: B	
Intersection Capacity Utilization 81.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	576	51	0	543	60	0	680	148	0	1143	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3434	0	0	3451	0	0	3423	0	0	3458	0
Flt Permitted												
Satd. Flow (perm)	0	3434	0	0	3451	0	0	3423	0	0	3458	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			11			37			20	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			757			1479			2366	
Travel Time (s)		87.1			25.8			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	769	0	0	740	0	0	1015	0	0	1586	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		45.0			45.0			75.0			75.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		44.0			44.0			66.0			66.0	
Actuated g/C Ratio		0.37			0.37			0.55			0.55	
v/c Ratio		0.61			0.58			0.53			0.83	
Control Delay		40.8			29.0			19.7			14.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		40.8			29.0			19.7			14.5	
LOS		D			C			B			B	
Approach Delay		40.8			29.0			19.7			14.5	
Approach LOS		D			C			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 5 (4%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 23.3		Intersection LOS: C	
Intersection Capacity Utilization 69.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer

65: Dunlavy & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	500	48	36	377	19	22	185	51	21	198	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		100
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1839	0	1770	1731	0	1770	1801	0	1770	1811	0
Flt Permitted	0.445			0.338			0.229			0.247		
Satd. Flow (perm)	829	1839	0	630	1731	0	427	1801	0	460	1811	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			4			12			10	
Link Speed (mph)		35			30			30			30	
Link Distance (ft)		783			1063			294			3799	
Travel Time (s)		15.3			24.2			6.7			86.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	672	0	44	485	0	27	290	0	26	299	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	77.0	77.0		77.0	77.0		43.0	43.0		43.0	43.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		4.7	4.7		4.7	4.7	
Act Effct Green (s)	86.4	86.4		86.4	86.4		23.9	23.9		23.9	23.9	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.20	0.20		0.20	0.20	
v/c Ratio	0.09	0.51		0.10	0.39		0.32	0.79		0.29	0.81	
Control Delay	8.1	12.2		12.4	15.3		54.6	66.4		66.5	76.7	
Queue Delay	0.0	0.4		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.1	12.6		12.4	15.3		54.6	66.4		66.5	76.7	
LOS	A	B		B	B		D	E		E	E	
Approach Delay		12.3			15.1			65.4			75.9	
Approach LOS		B			B			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 32.8 Intersection LOS: C
Intersection Capacity Utilization 70.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 65: Dunlavy & Westheimer

66: Commonwealth & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	611	76	38	329	0	0	0	0	108	305	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		100	100		0	0		0	0		0
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3416	0	0	3479	0	0	0	0	0	3493	1583
Flt Permitted					0.795						0.987	
Satd. Flow (perm)	0	3416	0	0	2780	0	0	0	0	0	3493	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18										234
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		594			340			246			2907	
Travel Time (s)		13.5			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	842	0	0	450	0	0	0	0	0	506	234
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		73.0		73.0	73.0					47.0	47.0	47.0
Total Lost Time (s)		5.0			5.0						4.9	4.9
Act Effct Green (s)		86.8			86.8						23.3	23.3
Actuated g/C Ratio		0.72			0.72						0.19	0.19
v/c Ratio		0.34			0.22						0.75	0.47
Control Delay		5.8			2.7						52.4	8.0
Queue Delay		0.0			0.0						0.0	0.0
Total Delay		5.8			2.7						52.4	8.0
LOS		A			A						D	A
Approach Delay		5.8			2.7						38.4	
Approach LOS		A			A						D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 25 (21%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 17.0 Intersection LOS: B
Intersection Capacity Utilization 59.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer

67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	39	604	0	0	329	97	26	86	36	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	150		0	0		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3419	0	1770	3383	0	0	0	0
Flt Permitted	0.459						0.950					
Satd. Flow (perm)	855	3539	0	0	3419	0	1770	3383	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					70			44				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			184			607	
Travel Time (s)		5.3			10.4			4.2			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	740	0	0	522	0	32	149	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	86.0	86.0			86.0		34.0	34.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	94.0	94.0			94.0		16.0	16.0				
Actuated g/C Ratio	0.78	0.78			0.78		0.13	0.13				
v/c Ratio	0.07	0.27			0.19		0.14	0.30				
Control Delay	2.0	2.4			1.6		47.6	34.7				
Queue Delay	0.0	0.0			0.0		0.0	0.0				
Total Delay	2.0	2.4			1.6		47.6	34.7				
LOS	A	A			A		D	C				
Approach Delay		2.4			1.6			37.0				
Approach LOS		A			A			D				

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 25 (21%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.30			
Intersection Signal Delay: 6.3		Intersection LOS: A	
Intersection Capacity Utilization 43.1%		ICU Level of Service A	
Analysis Period (min) 15			

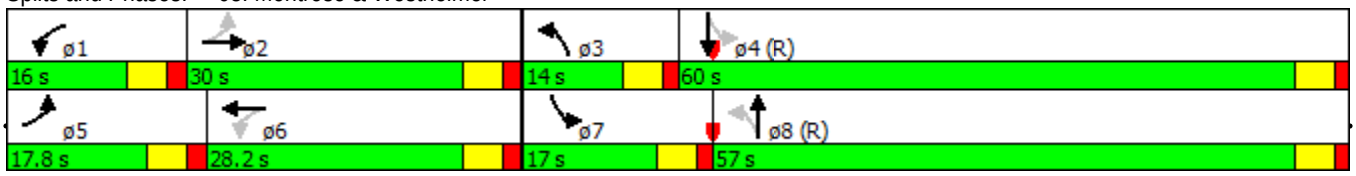
Splits and Phases: 67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	370	97	111	262	69	123	619	95	122	938	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	50		0	150		0	300		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3327	0	1770	3375	0	1770	3451	0	1770	3399	0
Flt Permitted	0.306			0.175			0.077			0.168		
Satd. Flow (perm)	570	3327	0	326	3375	0	143	3451	0	313	3399	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			24			19			6	
Link Speed (mph)		30			30			35			35	
Link Distance (ft)		456			359			2158			1109	
Travel Time (s)		10.4			8.2			42.0			21.6	
Peak Hour Factor	0.86	0.86	0.87	0.82	0.91	0.91	0.85	0.86	0.82	0.92	0.81	0.75
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	2	0	0	16	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	150	617	0	154	414	0	165	953	0	151	1393	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	17.8	30.0		16.0	28.2		14.0	57.0		17.0	60.0	
Total Lost Time (s)	5.3	5.3		5.3	5.3		5.0	5.0		5.0	5.0	
Act Effct Green (s)	37.2	24.7		33.6	22.9		61.0	52.0		67.0	55.0	
Actuated g/C Ratio	0.31	0.21		0.28	0.19		0.51	0.43		0.56	0.46	
v/c Ratio	0.50	0.88		0.70	0.62		0.85	0.63		0.47	0.89	
Control Delay	27.9	45.8		40.3	40.8		52.3	26.2		18.4	28.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	27.9	45.8		40.3	40.8		52.3	26.2		18.4	28.3	
LOS	C	D		D	D		D	C		B	C	
Approach Delay		42.3			40.6			30.1			27.3	
Approach LOS		D			D			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 75 (63%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 32.8 Intersection LOS: C
Intersection Capacity Utilization 78.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 68: Montrose & Westheimer



567: Hazard & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	586	44	37	412	4	64	60	59	18	30	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1844	0	1770	1859	0	1770	1850	0	1770	1921	0
Flt Permitted	0.407			0.243			0.698			0.265		
Satd. Flow (perm)	758	1844	0	453	1859	0	1300	1850	0	494	1921	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			2			32			11	
Link Speed (mph)		35			20			30			30	
Link Distance (ft)		424			784			907			993	
Travel Time (s)		8.3			26.7			20.6			22.6	
Peak Hour Factor	0.75	0.79	0.79	0.54	0.83	0.50	0.62	0.54	0.62	0.50	0.54	0.63
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	14	909	0	78	575	0	118	235	0	41	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	91.0	91.0		91.0	91.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Act Effct Green (s)	92.1	92.1		92.1	92.1		18.7	18.7		18.7	18.7	
Actuated g/C Ratio	0.77	0.77		0.77	0.77		0.16	0.16		0.16	0.16	
v/c Ratio	0.02	0.64		0.22	0.40		0.58	0.75		0.53	0.26	
Control Delay	3.2	14.9		6.7	7.0		57.6	55.6		69.8	38.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3.2	14.9		6.7	7.0		57.6	55.6		69.8	38.7	
LOS	A	B		A	A		E	E		E	D	
Approach Delay		14.7			7.0			56.3			49.1	
Approach LOS		B			A			E			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 21.5 Intersection LOS: C
Intersection Capacity Utilization 61.6% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 567: Hazard & Westheimer

570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	462	143	50	372	2	44	72	49	15	113	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1794	0	1770	1861	0	1770	1738	0	1770	1777	0
Flt Permitted	0.410			0.110			0.453			0.555		
Satd. Flow (perm)	764	1794	0	205	1861	0	844	1738	0	1034	1777	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		51			1			64			35	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.72	0.71	0.66	0.73	0.83	0.50	0.61	0.69	0.58	0.42	0.69	0.46
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	36	989	0	78	516	0	82	215	0	41	269	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	41.0	41.0		41.0	41.0		19.0	19.0		19.0	19.0	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Act Effct Green (s)	36.4	36.4		36.4	36.4		14.4	14.4		14.4	14.4	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.24	0.24		0.24	0.24	
v/c Ratio	0.08	0.89		0.63	0.46		0.41	0.46		0.17	0.59	
Control Delay	6.9	24.8		35.1	8.3		26.4	17.3		20.1	23.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	6.9	24.8		35.1	8.3		26.4	17.3		20.1	23.7	
LOS	A	C		D	A		C	B		C	C	
Approach Delay		24.1			11.8			19.8			23.3	
Approach LOS		C			B			B			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 25 (42%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 20.1		Intersection LOS: C	
Intersection Capacity Utilization 76.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	672	12	17	502	32	8	67	60	35	38	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		100	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1857	0	1770	1844	0	1770	1760	0	1770	1744	0
Flt Permitted	0.339			0.188			0.667			0.429		
Satd. Flow (perm)	631	1857	0	350	1844	0	1242	1760	0	799	1744	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			8			21			28	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1317			1143			877			953	
Travel Time (s)		29.9			26.0			19.9			21.7	
Peak Hour Factor	0.50	0.80	0.75	0.85	0.91	0.80	1.00	0.60	0.94	0.67	0.79	0.53
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	976	0	23	675	0	9	200	0	60	96	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	92.0	92.0		92.0	92.0		28.0	28.0		28.0	28.0	
Total Lost Time (s)	4.7	4.7		4.7	4.7		4.5	4.5		4.5	4.5	
Act Effct Green (s)	87.3	87.3		87.3	87.3		23.5	23.5		23.5	23.5	
Actuated g/C Ratio	0.73	0.73		0.73	0.73		0.20	0.20		0.20	0.20	
v/c Ratio	0.10	0.72		0.09	0.50		0.04	0.55		0.38	0.26	
Control Delay	3.1	15.6		5.8	8.5		39.8	45.4		50.4	31.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3.1	15.6		5.8	8.5		39.8	45.4		50.4	31.0	
LOS	A	B		A	A		D	D		D	C	
Approach Delay		15.0			8.4			45.2			38.5	
Approach LOS		B			A			D			D	

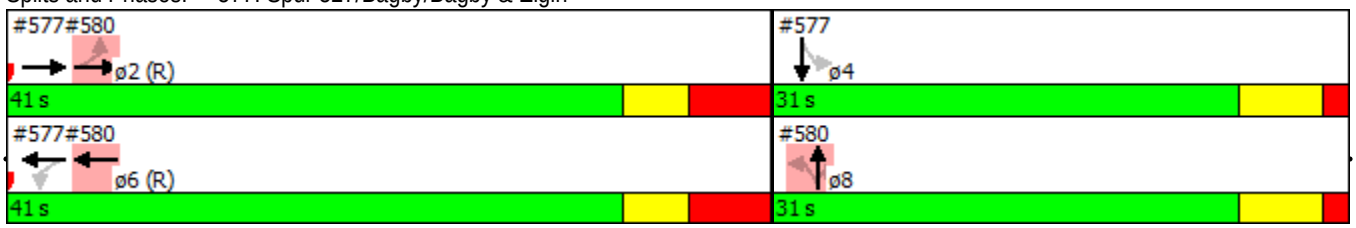
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 75 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 17.6		Intersection LOS: B	
Intersection Capacity Utilization 64.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 573: Taft & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	589	143	24	485	0	0	0	0	88	814	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3433	0	1770	3539	0	0	0	0	0	5050	0
Flt Permitted				0.220							0.994	
Satd. Flow (perm)	0	3433	0	410	3539	0	0	0	0	0	5050	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28									2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.85	0.81	0.75	0.91	0.93	0.93	0.93	0.93	0.73	0.99	0.25
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	991	0	36	608	0	0	0	0	0	1083	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						4	
Permitted Phases				6						4		
Total Split (s)		41.0		41.0	41.0					31.0	31.0	
Total Lost Time (s)		8.0		8.0	8.0						6.0	
Act Effct Green (s)		33.0		33.0	33.0						25.0	
Actuated g/C Ratio		0.46		0.46	0.46						0.35	
v/c Ratio		0.62		0.19	0.37						0.62	
Control Delay		16.5		9.8	8.5						21.4	
Queue Delay		0.0		0.0	0.7						0.0	
Total Delay		16.5		9.8	9.3						21.4	
LOS		B		A	A						C	
Approach Delay		16.5			9.3						21.4	
Approach LOS		B			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 95.0%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



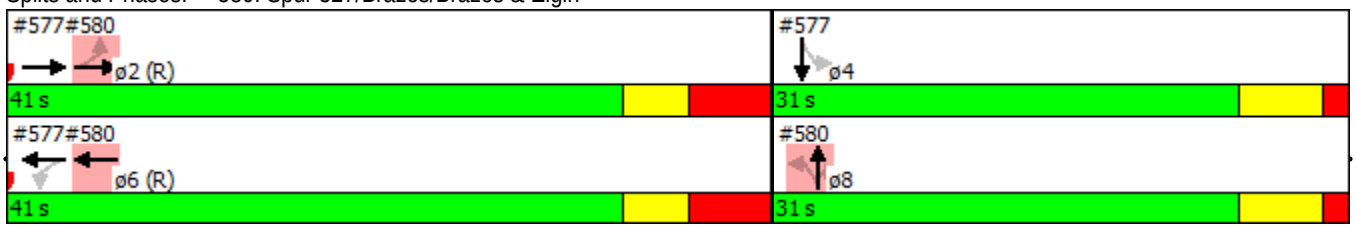
Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	31.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	668	0	0	367	51	140	659	16	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3465	0	1770	3539	1583	0	0	0
Flt Permitted	0.456						0.950					
Satd. Flow (perm)	849	3539	0	0	3465	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					33				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.44	0.83	0.93	0.93	0.92	0.80	0.78	0.93	0.80	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	18	917	0	0	528	0	205	808	23	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	41.0	41.0			41.0		31.0	31.0	31.0			
Total Lost Time (s)	8.0	8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)	33.0	33.0			33.0		25.0	25.0	25.0			
Actuated g/C Ratio	0.46	0.46			0.46		0.35	0.35	0.35			
v/c Ratio	0.05	0.57			0.33		0.33	0.66	0.04			
Control Delay	4.8	6.2			22.6		19.3	23.0	0.1			
Queue Delay	0.0	0.5			0.0		0.0	0.0	0.0			
Total Delay	4.8	6.8			22.6		19.3	23.0	0.1			
LOS	A	A			C		B	C	A			
Approach Delay		6.7			22.6			21.8				
Approach LOS		A			C			C				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 16.3		Intersection LOS: B	
Intersection Capacity Utilization 95.0%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	31.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

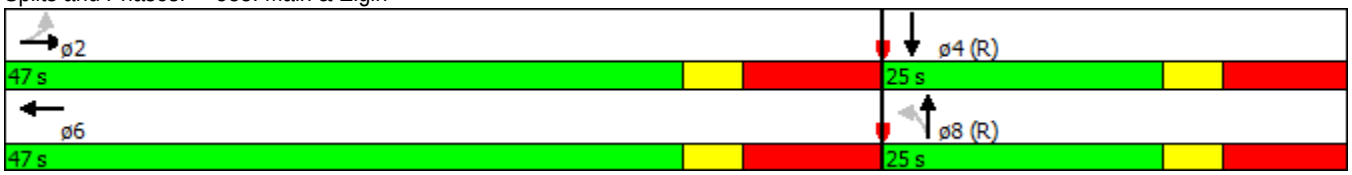
Intersection Summary

583: Main & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	640	31	0	773	5	2	147	23	0	100	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3507	0	0	3536	0	0	1822	0	0	1816	0
Flt Permitted		0.946						0.991				
Satd. Flow (perm)	0	3318	0	0	3536	0	0	1807	0	0	1816	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			2			12			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.50	0.88	0.65	0.93	0.94	0.63	0.50	0.88	0.72	0.93	0.71	0.81
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	888	0	0	946	0	0	231	0	0	198	0
Turn Type	Perm	NA			NA		Perm	NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2						8					
Total Split (s)	47.0	47.0			47.0		25.0	25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		27.0			27.0			24.3			24.3	
Actuated g/C Ratio		0.38			0.38			0.34			0.34	
v/c Ratio		0.71			0.71			0.37			0.32	
Control Delay		14.7			21.9			21.1			20.0	
Queue Delay		0.4			0.0			0.0			0.0	
Total Delay		15.0			21.9			21.1			20.0	
LOS		B			C			C			B	
Approach Delay		15.0			21.9			21.1			20.0	
Approach LOS		B			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 30 (42%), Referenced to phase 4:SBT and 8:NBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 19.0		Intersection LOS: B	
Intersection Capacity Utilization 54.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 583: Main & Elgin

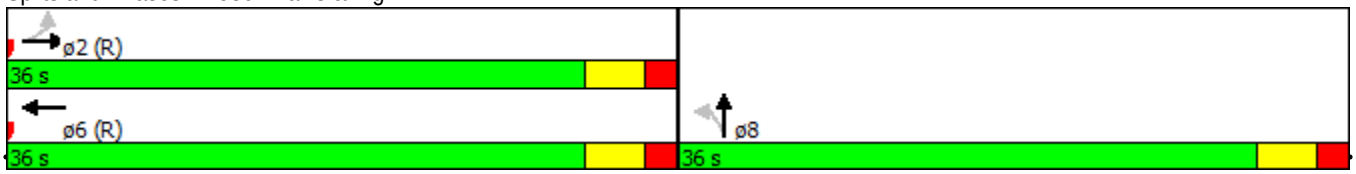


586: Travis & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	746	0	0	491	93	51	1590	116	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	100		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3447	0	1770	6331	0	0	0	0
Flt Permitted	0.267						0.950					
Satd. Flow (perm)	497	3539	0	0	3447	0	1770	6331	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					2			33				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.78	0.90	0.93	0.93	0.85	0.78	0.80	0.95	0.81	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	945	0	0	795	0	73	2071	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	31.0	31.0			31.0		31.0	31.0				
Actuated g/C Ratio	0.43	0.43			0.43		0.43	0.43				
v/c Ratio	0.36	0.62			0.54		0.10	0.75				
Control Delay	17.6	16.1			33.1		12.7	19.2				
Queue Delay	0.0	0.1			0.7		0.0	0.0				
Total Delay	17.6	16.2			33.9		12.7	19.2				
LOS	B	B			C		B	B				
Approach Delay		16.3			33.9			19.0				
Approach LOS		B			C			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 64.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 586: Travis & Elgin

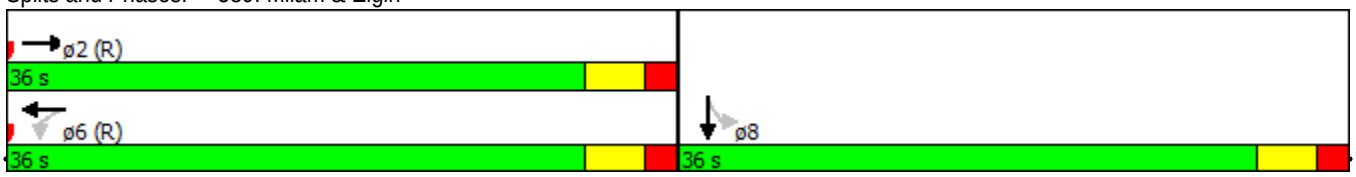


589: Milam & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	652	29	48	512	0	0	0	0	147	528	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	100		0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3514	0	1770	3539	0	0	0	0	1770	6299	0
Flt Permitted				0.233						0.950		
Satd. Flow (perm)	0	3514	0	434	3539	0	0	0	0	1770	6299	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9									57	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.90	0.81	0.80	0.88	0.93	0.93	0.93	0.93	0.78	0.95	0.82
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	867	0	68	663	0	0	0	0	215	716	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	
v/c Ratio		0.57		0.37	0.44					0.28	0.26	
Control Delay		8.7		11.7	7.9					14.6	12.3	
Queue Delay		0.0		0.0	0.1					0.0	0.0	
Total Delay		8.7		11.7	8.0					14.6	12.3	
LOS		A		B	A					B	B	
Approach Delay		8.7			8.4						12.9	
Approach LOS		A			A						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 10.1		Intersection LOS: B	
Intersection Capacity Utilization 64.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

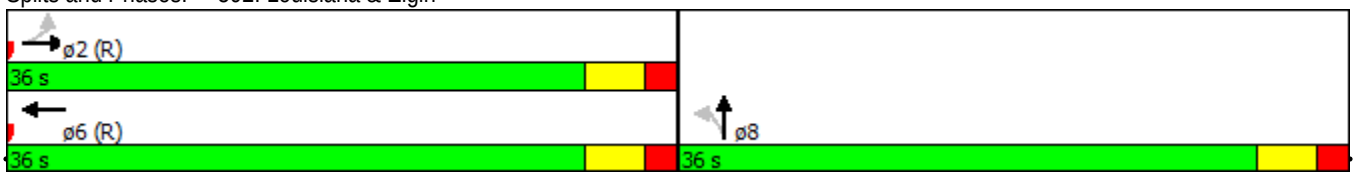


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	636	0	0	375	157	31	1898	66	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	100		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3359	0	1770	7491	0	0	0	0
Flt Permitted	0.307						0.950					
Satd. Flow (perm)	572	3539	0	0	3359	0	1770	7491	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					1			20				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.82	0.90	0.93	0.93	0.90	0.74	0.78	0.98	0.72	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	229	806	0	0	717	0	45	2312	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	31.0	31.0			31.0		31.0	31.0				
Actuated g/C Ratio	0.43	0.43			0.43		0.43	0.43				
v/c Ratio	0.93	0.53			0.50		0.06	0.71				
Control Delay	52.4	5.0			5.1		12.3	18.2				
Queue Delay	0.0	0.2			0.0		0.0	0.0				
Total Delay	52.4	5.2			5.1		12.3	18.2				
LOS	D	A			A		B	B				
Approach Delay		15.6			5.1			18.1				
Approach LOS		B			A			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 15.2		Intersection LOS: B	
Intersection Capacity Utilization 66.5%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 592: Louisiana & Elgin

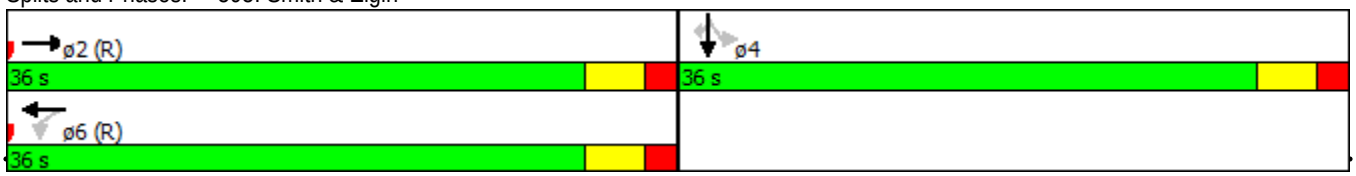


595: Smith & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	673	12	77	342	0	0	0	0	128	733	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3525	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.216						0.950		
Satd. Flow (perm)	0	3525	0	402	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4										110
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.87	0.60	0.80	0.87	0.93	0.93	0.93	0.93	0.84	0.92	0.79
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	905	0	110	448	0	0	0	0	174	908	110
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.60		0.64	0.29					0.23	0.41	0.15
Control Delay		21.3		31.6	11.5					14.0	14.9	3.4
Queue Delay		12.5		0.0	0.0					0.0	0.0	0.0
Total Delay		33.8		31.6	11.5					14.0	14.9	3.4
LOS		C		C	B					B	B	A
Approach Delay		33.8			15.5						13.7	
Approach LOS		C			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 20.9		Intersection LOS: C	
Intersection Capacity Utilization 66.5%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	499	18	69	374	6	29	45	54	4	54	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1853	0	1770	1859	0	1770	1710	0	0	1826	0
Flt Permitted	0.456			0.357			0.685				0.985	
Satd. Flow (perm)	849	1853	0	665	1859	0	1276	1710	0	0	1804	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			2			45			5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	634	0	85	465	0	36	121	0	0	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	91.0	91.0		91.0	91.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)	4.9	4.9		4.9	4.9		4.7	4.7			4.7	
Act Effct Green (s)	86.1	86.1		86.1	86.1		24.3	24.3			24.3	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.20	0.20			0.20	
v/c Ratio	0.01	0.48		0.18	0.35		0.14	0.32			0.22	
Control Delay	5.2	12.6		6.0	6.0		41.1	27.9			39.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	12.6		6.0	6.0		41.1	27.9			39.3	
LOS	A	B		A	A		D	C			D	
Approach Delay		12.5			6.0			30.9			39.3	
Approach LOS		B			A			C			D	

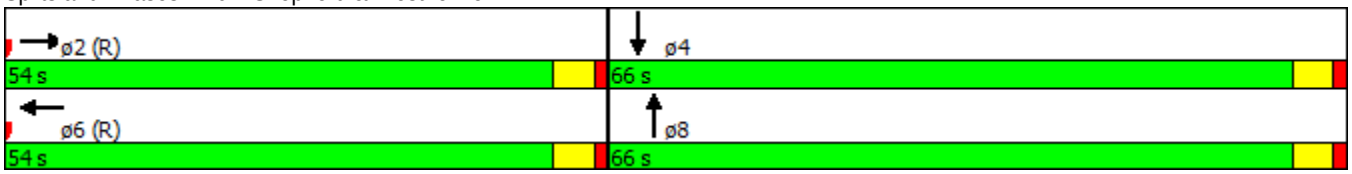
Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 80 (67%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 60.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	954	52	0	741	90	0	1221	101	0	1137	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Flt Permitted												
Satd. Flow (perm)	0	3448	0	0	3448	0	0	3479	0	0	3441	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			13			10			24	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		2556			806			1479			2366	
Travel Time (s)		87.1			27.5			33.6			53.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	5	0	0	3	0	0	3	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1233	0	0	1018	0	0	1621	0	0	1639	0
Turn Type		NA			NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases												
Total Split (s)		54.0			54.0			66.0			66.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		49.7			49.7			60.3			60.3	
Actuated g/C Ratio		0.41			0.41			0.50			0.50	
v/c Ratio		0.86			0.71			0.92			0.94	
Control Delay		37.5			38.8			37.3			51.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		37.5			38.8			37.3			51.1	
LOS		D			D			D			D	
Approach Delay		37.5			38.8			37.3			51.1	
Approach LOS		D			D			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 55 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 41.7		Intersection LOS: D	
Intersection Capacity Utilization 83.4%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 64: Shepherd & Westheimer



65: Dunlavy & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	669	41	42	739	41	11	318	55	25	319	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	100		100
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1846	0	1770	1730	0	1770	1822	0	1770	1812	0
Flt Permitted	0.133			0.182			0.119			0.134		
Satd. Flow (perm)	248	1846	0	339	1730	0	222	1822	0	250	1812	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			4			7			9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		783			1063			294			514	
Travel Time (s)		17.8			24.2			6.7			11.7	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	0	0	0	16	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	870	0	51	956	0	13	457	0	31	476	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	79.0	79.0		79.0	79.0		41.0	41.0		41.0	41.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		4.7	4.7		4.7	4.7	
Act Effct Green (s)	76.6	76.6		76.6	76.6		33.7	33.7		33.7	33.7	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.28	0.28		0.28	0.28	
v/c Ratio	0.34	0.74		0.24	0.86		0.21	0.89		0.45	0.93	
Control Delay	14.0	15.7		15.7	32.6		50.3	66.1		61.6	67.9	
Queue Delay	0.0	0.4		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.0	16.0		15.7	32.6		50.3	66.1		61.6	67.9	
LOS	B	B		B	C		D	E		E	E	
Approach Delay		15.9			31.7			65.7			67.5	
Approach LOS		B			C			E			E	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 38.4 Intersection LOS: D
Intersection Capacity Utilization 79.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 65: Dunlavy & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	934	96	42	701	0	0	0	0	118	292	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		0	0		0	0		100
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3427	0	0	3486	0	0	0	0	0	3490	1583
Flt Permitted					0.823						0.986	
Satd. Flow (perm)	0	3427	0	0	2878	0	0	0	0	0	3490	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29										139
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		491			340			246			2907	
Travel Time (s)		11.2			7.7			5.6			66.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	9	0	0	6	0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1263	0	0	910	0	0	0	0	0	503	288
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		38.0		38.0	38.0					22.0	22.0	22.0
Total Lost Time (s)		5.0			5.0						4.9	4.9
Act Effct Green (s)		36.3			36.3						13.8	13.8
Actuated g/C Ratio		0.60			0.60						0.23	0.23
v/c Ratio		0.61			0.52						0.62	0.61
Control Delay		10.1			7.2						24.0	16.1
Queue Delay		0.0			0.0						0.0	0.0
Total Delay		10.1			7.2						24.0	16.1
LOS		B			A						C	B
Approach Delay		10.1			7.2						21.1	
Approach LOS		B			A						C	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 30 (50%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 12.1 Intersection LOS: B
Intersection Capacity Utilization 79.3% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 66: Commonwealth & Westheimer

67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	795	0	0	665	106	49	423	86	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		0	100		100	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3465	0	1770	3451	0	0	0	0
Flt Permitted	0.267						0.950					
Satd. Flow (perm)	497	3539	0	0	3465	0	1770	3451	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					26			21				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		234			456			356			607	
Travel Time (s)		5.3			10.4			8.1			13.8	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	104	975	0	0	945	0	60	624	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	75.0	75.0			75.0		45.0	45.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	81.9	81.9			81.9		28.1	28.1				
Actuated g/C Ratio	0.68	0.68			0.68		0.23	0.23				
v/c Ratio	0.31	0.40			0.40		0.14	0.76				
Control Delay	9.5	7.7			3.9		35.2	47.1				
Queue Delay	0.0	0.2			0.4		0.0	0.0				
Total Delay	9.5	7.9			4.3		35.2	47.1				
LOS	A	A			A		D	D				
Approach Delay		8.0			4.3			46.1				
Approach LOS		A			A			D				

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 16.3 Intersection LOS: B
Intersection Capacity Utilization 62.1% ICU Level of Service B
Analysis Period (min) 15

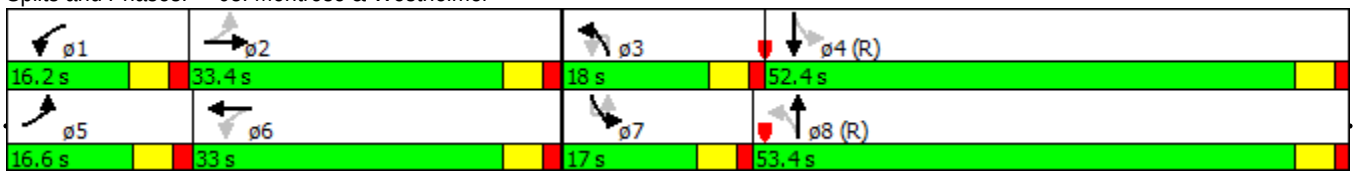
Splits and Phases: 67: Yoakum/Waugh & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL
Lane Configurations												
Volume (vph)	165	496	86	148	487	96	2	152	1068	85	1	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	250		0	100		0		150		0		300
Storage Lanes	1		0	1		0		1		0		1
Taper Length (ft)	25			25				25				25
Satd. Flow (prot)	1770	3347	0	1770	3399	0	0	1770	3479	0	0	1770
Flt Permitted	0.142			0.144				0.083				0.084
Satd. Flow (perm)	265	3347	0	268	3399	0	0	155	3479	0	0	156
Right Turn on Red			Yes			Yes				Yes		
Satd. Flow (RTOR)		18			17				10			
Link Speed (mph)		30			30				35			
Link Distance (ft)		456			419				2158			
Travel Time (s)		10.4			9.5				42.0			
Peak Hour Factor	0.94	0.90	0.80	0.88	0.85	0.90	0.50	0.88	0.96	0.79	0.25	0.84
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Bus Blockages (#/hr)	0	15	0	0	8	0	0	0	2	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	200	751	0	192	775	0	0	202	1391	0	0	225
Turn Type	pm+pt	NA		pm+pt	NA		custom	pm+pt	NA		custom	pm+pt
Protected Phases	5	2		1	6			3	8			7
Permitted Phases	2			6			3	8			7	4
Total Split (s)	16.6	33.4		16.2	33.0		18.0	18.0	53.4		17.0	17.0
Total Lost Time (s)	5.3	5.3		5.3	5.3			5.0	5.0			5.0
Act Effct Green (s)	39.4	28.1		38.6	27.7			61.4	48.4			59.4
Actuated g/C Ratio	0.33	0.23		0.32	0.23			0.51	0.40			0.50
v/c Ratio	0.88	0.94		0.86	0.97			0.80	0.99			0.95
Control Delay	77.5	64.4		46.0	50.4			43.0	52.0			85.9
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0			0.0
Total Delay	77.5	64.4		46.0	50.4			43.0	52.0			85.9
LOS	E	E		D	D			D	D			F
Approach Delay		67.2			49.6				50.9			
Approach LOS		E			D				D			

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 70 (58%), Referenced to phase 4:SBTL and 8:NBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 49.3 Intersection LOS: D
Intersection Capacity Utilization 93.5% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 68: Montrose & Westheimer



Lane Group	SBT	SBR
Lane Configurations		
Volume (vph)	877	110
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Satd. Flow (prot)	3361	0
Flt Permitted		
Satd. Flow (perm)	3361	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	16	
Link Speed (mph)	35	
Link Distance (ft)	1109	
Travel Time (s)	21.6	
Peak Hour Factor	0.97	0.83
Growth Factor	114%	114%
Bus Blockages (#/hr)	16	0
Shared Lane Traffic (%)		
Lane Group Flow (vph)	1182	0
Turn Type	NA	
Protected Phases	4	
Permitted Phases		
Total Split (s)	52.4	
Total Lost Time (s)	5.0	
Act Effct Green (s)	47.4	
Actuated g/C Ratio	0.40	
v/c Ratio	0.88	
Control Delay	25.8	
Queue Delay	0.0	
Total Delay	25.8	
LOS	C	
Approach Delay	35.4	
Approach LOS	D	

Intersection Summary

567: Hazard & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	768	39	33	682	4	40	82	48	3	32	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	14	12	12	14	12
Storage Length (ft)	100		0	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1846	0	1770	1857	0	1770	1876	0	1770	1888	0
Flt Permitted	0.248			0.166			0.704			0.518		
Satd. Flow (perm)	462	1846	0	309	1857	0	1311	1876	0	965	1888	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			3			47			27	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		375			784			907			993	
Travel Time (s)		12.8			26.7			20.6			22.6	
Peak Hour Factor	0.69	0.95	0.75	0.83	0.95	0.33	0.83	0.73	0.71	0.75	0.67	0.63
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	41	981	0	45	832	0	55	205	0	5	81	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	41.4	41.4		41.4	41.4		18.6	18.6		18.6	18.6	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Act Effct Green (s)	40.6	40.6		40.6	40.6		10.2	10.2		10.2	10.2	
Actuated g/C Ratio	0.68	0.68		0.68	0.68		0.17	0.17		0.17	0.17	
v/c Ratio	0.13	0.78		0.22	0.66		0.25	0.57		0.03	0.24	
Control Delay	7.5	27.5		7.4	10.9		23.0	23.3		19.0	16.3	
Queue Delay	0.0	0.5		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	7.5	28.0		7.4	10.9		23.0	23.4		19.0	16.3	
LOS	A	C		A	B		C	C		B	B	
Approach Delay		27.1			10.7			23.3			16.5	
Approach LOS		C			B			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 10 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 19.9 Intersection LOS: B
Intersection Capacity Utilization 65.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 567: Hazard & Westheimer

570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	669	93	45	656	14	22	148	31	22	107	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		0	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1825	0	1770	1853	0	1770	1798	0	1770	1803	0
Flt Permitted	0.243			0.184			0.436			0.357		
Satd. Flow (perm)	453	1825	0	343	1853	0	812	1798	0	665	1803	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			4			12			10	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		784			783			373			450	
Travel Time (s)		26.7			26.7			8.5			10.2	
Peak Hour Factor	0.59	0.93	0.83	0.75	0.93	0.58	0.69	0.86	0.60	0.55	0.72	0.88
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	37	948	0	68	832	0	36	255	0	46	214	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	88.8	88.8		88.8	88.8		31.2	31.2		31.2	31.2	
Total Lost Time (s)	4.6	4.6		4.6	4.6		4.6	4.6		4.6	4.6	
Act Effct Green (s)	84.2	84.2		84.2	84.2		26.6	26.6		26.6	26.6	
Actuated g/C Ratio	0.70	0.70		0.70	0.70		0.22	0.22		0.22	0.22	
v/c Ratio	0.12	0.74		0.28	0.64		0.20	0.63		0.31	0.53	
Control Delay	8.0	13.4		7.1	7.7		41.6	47.9		46.1	44.5	
Queue Delay	0.0	4.1		0.0	0.4		0.0	0.0		0.0	0.0	
Total Delay	8.0	17.6		7.1	8.0		41.6	47.9		46.1	44.5	
LOS	A	B		A	A		D	D		D	D	
Approach Delay		17.2			8.0			47.1			44.8	
Approach LOS		B			A			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 20.3 Intersection LOS: C
Intersection Capacity Utilization 75.1% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 570: Woodhead & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	675	14	36	858	29	16	122	59	25	69	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		100	100		100	100		0	100		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1853	0	1770	1848	0	1770	1770	0	1770	1779	0
Flt Permitted	0.109			0.192			0.669			0.538		
Satd. Flow (perm)	203	1853	0	358	1848	0	1246	1770	0	1002	1779	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			9			39			33	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1257			1143			877			953	
Travel Time (s)		28.6			26.0			19.9			21.7	
Peak Hour Factor	0.75	0.93	0.58	0.82	0.90	0.52	0.57	0.95	0.92	0.52	0.82	0.83
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	855	0	50	1151	0	32	219	0	55	137	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	41.5	41.5		41.5	41.5		18.5	18.5		18.5	18.5	
Total Lost Time (s)	4.7	4.7		4.7	4.7		4.5	4.5		4.5	4.5	
Act Effct Green (s)	36.8	36.8		36.8	36.8		14.0	14.0		14.0	14.0	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.23	0.23		0.23	0.23	
v/c Ratio	0.40	0.75		0.23	1.01		0.11	0.50		0.24	0.31	
Control Delay	19.6	24.2		8.4	44.9		19.3	20.8		21.8	16.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.6	24.2		8.4	44.9		19.3	20.8		21.8	16.9	
LOS	B	C		A	D		B	C		C	B	
Approach Delay		24.0			43.4			20.6			18.3	
Approach LOS		C			D			C			B	

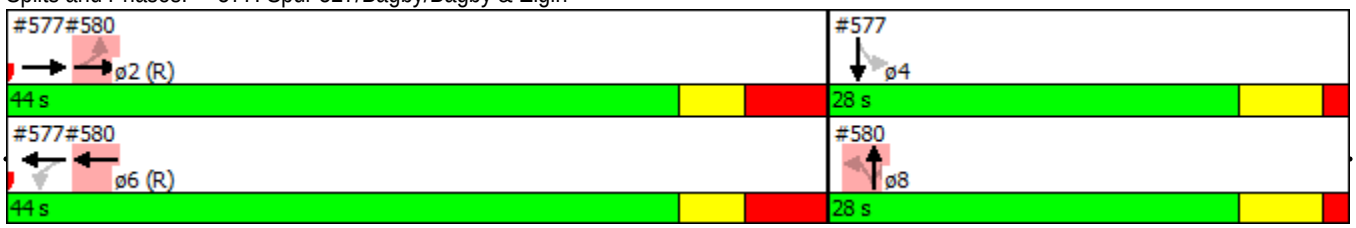
Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 30 (50%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.01			
Intersection Signal Delay: 32.4		Intersection LOS: C	
Intersection Capacity Utilization 80.5%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 573: Taft & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	136	31	47	833	0	0	0	0	104	594	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3440	0	1770	3539	0	0	0	0	0	5040	0
Flt Permitted				0.620							0.993	
Satd. Flow (perm)	0	3440	0	1155	3539	0	0	0	0	0	5040	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26									3	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		287			167			582			585	
Travel Time (s)		6.5			3.8			13.2			13.3	
Peak Hour Factor	0.93	0.90	0.90	0.73	0.92	0.93	0.93	0.93	0.93	0.90	0.80	0.67
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	211	0	73	1032	0	0	0	0	0	992	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						4	
Permitted Phases				6						4		
Total Split (s)		44.0		44.0	44.0					28.0	28.0	
Total Lost Time (s)		8.0		8.0	8.0						6.0	
Act Effct Green (s)		36.0		36.0	36.0						22.0	
Actuated g/C Ratio		0.50		0.50	0.50						0.31	
v/c Ratio		0.12		0.13	0.58						0.64	
Control Delay		8.6		2.9	4.0						23.9	
Queue Delay		0.0		0.8	0.4						0.8	
Total Delay		8.6		3.8	4.4						24.6	
LOS		A		A	A						C	
Approach Delay		8.6			4.4						24.6	
Approach LOS		A			A						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 13.5		Intersection LOS: B	
Intersection Capacity Utilization 78.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 577: Spur 527/Bagby/Bagby & Elgin



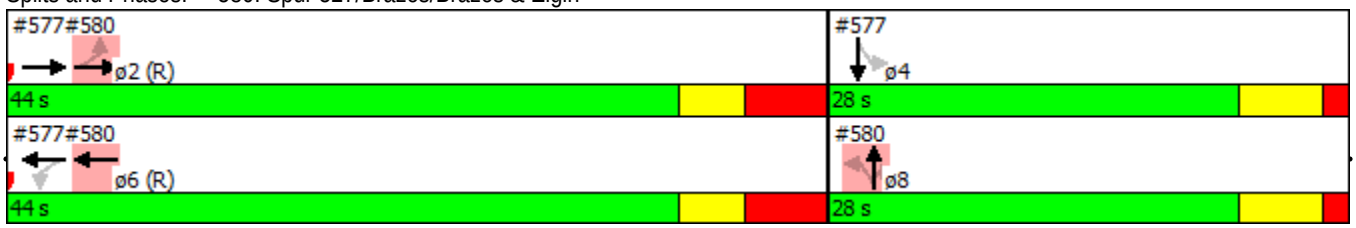
Lane Group	ø8
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	8
Permitted Phases	
Total Split (s)	28.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	670	0	0	779	107	103	601	10	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3472	0	1770	3539	1583	0	0	0
Flt Permitted	0.187						0.950					
Satd. Flow (perm)	348	3539	0	0	3472	0	1770	3539	1583	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					33				76			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		167			327			533			596	
Travel Time (s)		3.8			7.4			12.1			13.5	
Peak Hour Factor	0.25	0.93	0.93	0.93	0.91	0.84	0.88	0.95	0.63	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	821	0	0	1121	0	133	721	18	0	0	0
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		2			6			8				
Permitted Phases	2						8		8			
Total Split (s)	44.0	44.0			44.0		28.0	28.0	28.0			
Total Lost Time (s)	8.0	8.0			8.0		6.0	6.0	6.0			
Act Effct Green (s)	36.0	36.0			36.0		22.0	22.0	22.0			
Actuated g/C Ratio	0.50	0.50			0.50		0.31	0.31	0.31			
v/c Ratio	0.05	0.46			0.64		0.25	0.67	0.03			
Control Delay	10.0	13.1			28.5		20.3	25.4	0.1			
Queue Delay	0.0	23.9			22.3		0.0	0.0	0.0			
Total Delay	10.0	36.9			50.8		20.3	25.4	0.1			
LOS	A	D			D		C	C	A			
Approach Delay		36.6			50.8			24.1				
Approach LOS		D			D			C				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 5 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 38.4		Intersection LOS: D	
Intersection Capacity Utilization 78.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 580: Spur 527/Brazos/Brazos & Elgin



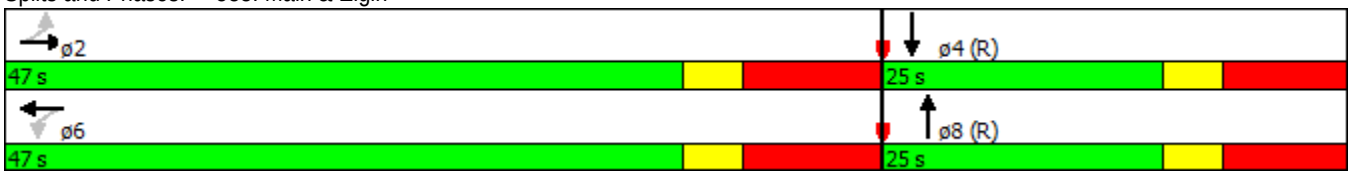
Lane Group	ø4
Lane Configurations	
Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Growth Factor	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	4
Permitted Phases	
Total Split (s)	28.0
Total Lost Time (s)	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	906	51	1	931	14	0	173	36	0	168	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	3504	0	0	3532	0	0	1825	0	0	1840	0
Flt Permitted		0.947			0.946							
Satd. Flow (perm)	0	3318	0	0	3341	0	0	1825	0	0	1840	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			3			11			6	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		351			340			350			562	
Travel Time (s)		8.0			7.7			8.0			12.8	
Peak Hour Factor	0.25	0.94	0.71	0.25	0.95	0.88	0.50	0.75	0.90	0.93	0.84	0.80
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1186	0	0	1140	0	0	309	0	0	251	0
Turn Type	Perm	NA		Perm	NA			NA			NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6								
Total Split (s)	47.0	47.0		47.0	47.0			25.0			25.0	
Total Lost Time (s)		10.7			10.7			10.0			10.0	
Act Effct Green (s)		32.8			32.8			18.5			18.5	
Actuated g/C Ratio		0.46			0.46			0.26			0.26	
v/c Ratio		0.78			0.75			0.65			0.53	
Control Delay		31.0			19.3			32.9			28.7	
Queue Delay		5.9			27.4			0.0			0.0	
Total Delay		36.9			46.7			32.9			28.7	
LOS		D			D			C			C	
Approach Delay		36.9			46.7			32.9			28.7	
Approach LOS		D			D			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 57 (79%), Referenced to phase 4:SBT and 8:NBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 39.6		Intersection LOS: D	
Intersection Capacity Utilization 61.3%		ICU Level of Service B	
Analysis Period (min) 15			

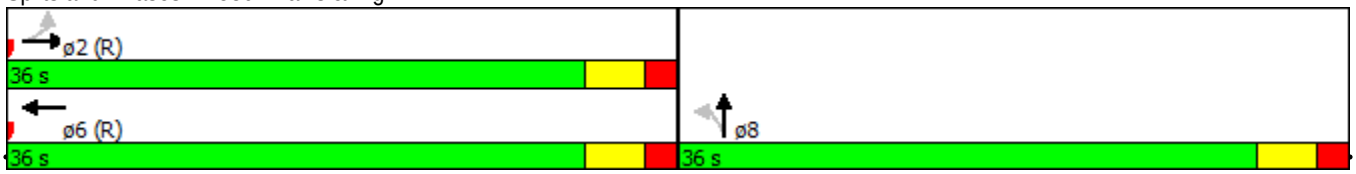
Splits and Phases: 583: Main & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	680	0	0	851	104	116	1075	134	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	65		0	0		0	100		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3483	0	1770	6286	0	0	0	0
Flt Permitted	0.129						0.950					
Satd. Flow (perm)	240	3539	0	0	3483	0	1770	6286	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					17			62				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		322			351			312			587	
Travel Time (s)		7.3			8.0			7.1			13.3	
Peak Hour Factor	0.93	0.86	0.93	0.93	0.93	0.93	0.81	0.93	0.82	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	901	0	0	1170	0	163	1504	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	31.0	31.0			31.0		31.0	31.0				
Actuated g/C Ratio	0.43	0.43			0.43		0.43	0.43				
v/c Ratio	0.84	0.59			0.78		0.21	0.55				
Control Delay	73.0	14.2			19.0		13.8	15.5				
Queue Delay	0.0	0.2			49.0		0.0	0.2				
Total Delay	73.0	14.3			68.0		13.8	15.7				
LOS	E	B			E		B	B				
Approach Delay		19.5			68.0			15.5				
Approach LOS		B			E			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 32.6		Intersection LOS: C	
Intersection Capacity Utilization 67.9%		ICU Level of Service C	
Analysis Period (min) 15			

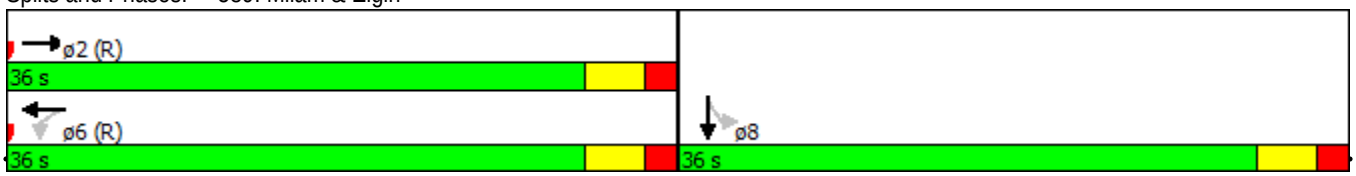
Splits and Phases: 586: Travis & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	634	68	123	828	0	0	0	0	123	1294	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	60		0	0		0	100		0
Storage Lanes	0		0	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3483	0	1770	3539	0	0	0	0	1770	7544	0
Flt Permitted				0.226						0.950		
Satd. Flow (perm)	0	3483	0	421	3539	0	0	0	0	1770	7544	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6										
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		346			322			410			527	
Travel Time (s)		7.9			7.3			9.3			12.0	
Peak Hour Factor	0.93	0.92	0.81	0.88	0.90	0.93	0.93	0.93	0.93	0.90	0.92	0.74
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	882	0	159	1049	0	0	0	0	156	1603	0
Turn Type		NA		Perm	NA					Perm	NA	
Protected Phases		2			6						8	
Permitted Phases				6						8		
Total Split (s)		36.0		36.0	36.0					36.0	36.0	
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	
v/c Ratio		0.59		0.88	0.69					0.20	0.49	
Control Delay		8.2		46.6	8.2					13.7	15.5	
Queue Delay		0.0		0.0	0.5					0.0	0.0	
Total Delay		8.3		46.6	8.7					13.7	15.5	
LOS		A		D	A					B	B	
Approach Delay		8.3			13.7						15.3	
Approach LOS		A			B						B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 13.2		Intersection LOS: B	
Intersection Capacity Utilization 67.9%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 589: Milam & Elgin

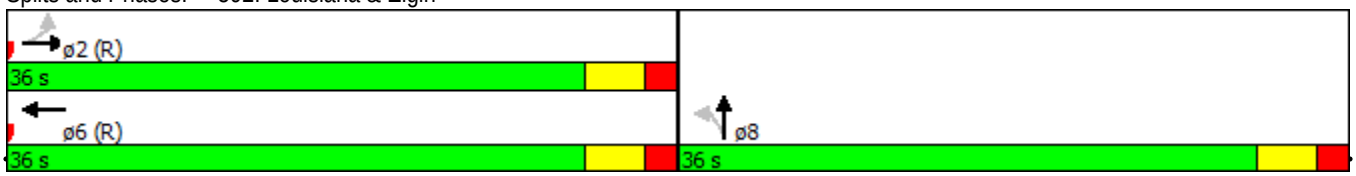


592: Louisiana & Elgin

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	668	0	0	763	154	55	657	78	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	80		0	0		0	100		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	3539	0	0	3444	0	1770	7378	0	0	0	0
Flt Permitted	0.129						0.950					
Satd. Flow (perm)	240	3539	0	0	3444	0	1770	7378	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					45			75				
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		328			346			382			0	
Travel Time (s)		7.5			7.9			8.7			0.0	
Peak Hour Factor	0.93	0.91	0.93	0.93	0.92	0.86	0.72	0.93	0.65	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	141	837	0	0	1149	0	87	942	0	0	0	0
Turn Type	Perm	NA			NA		Perm	NA				
Protected Phases		2			6			8				
Permitted Phases	2						8					
Total Split (s)	36.0	36.0			36.0		36.0	36.0				
Total Lost Time (s)	5.0	5.0			5.0		5.0	5.0				
Act Effct Green (s)	31.0	31.0			31.0		31.0	31.0				
Actuated g/C Ratio	0.43	0.43			0.43		0.43	0.43				
v/c Ratio	1.37	0.55			0.76		0.11	0.29				
Control Delay	230.7	6.6			11.7		12.9	12.5				
Queue Delay	0.0	0.2			0.0		0.0	0.0				
Total Delay	230.7	6.8			11.7		12.9	12.5				
LOS	F	A			B		B	B				
Approach Delay		39.1			11.7			12.5				
Approach LOS		D			B			B				

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.37			
Intersection Signal Delay: 20.5		Intersection LOS: C	
Intersection Capacity Utilization 77.2%		ICU Level of Service D	
Analysis Period (min) 15			

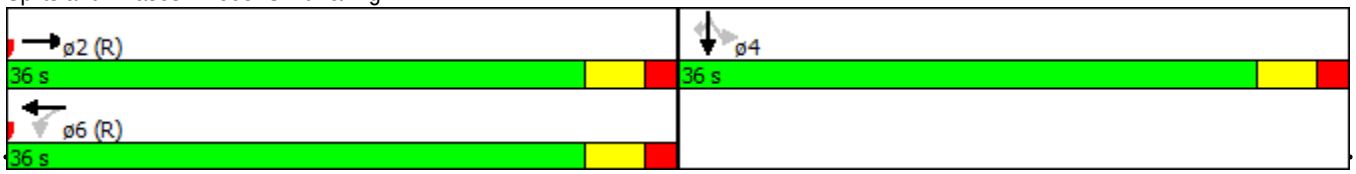
Splits and Phases: 592: Louisiana & Elgin



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	618	43	118	705	0	0	0	0	181	1644	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	70		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	0	3500	0	1770	3539	0	0	0	0	1770	5085	1583
Flt Permitted				0.246						0.950		
Satd. Flow (perm)	0	3500	0	458	3539	0	0	0	0	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2										66
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		327			328			494			414	
Travel Time (s)		7.4			7.5			11.2			9.4	
Peak Hour Factor	0.93	0.91	0.77	0.84	0.89	0.93	0.93	0.93	0.93	0.84	0.96	0.94
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	838	0	160	903	0	0	0	0	246	1952	218
Turn Type		NA		Perm	NA					Perm	NA	Perm
Protected Phases		2			6						4	
Permitted Phases				6						4		4
Total Split (s)		36.0		36.0	36.0					36.0	36.0	36.0
Total Lost Time (s)		5.0		5.0	5.0					5.0	5.0	5.0
Act Effct Green (s)		31.0		31.0	31.0					31.0	31.0	31.0
Actuated g/C Ratio		0.43		0.43	0.43					0.43	0.43	0.43
v/c Ratio		0.56		0.81	0.59					0.32	0.89	0.30
Control Delay		21.5		40.3	13.2					15.1	25.7	10.5
Queue Delay		5.3		0.0	0.3					0.0	0.0	2.6
Total Delay		26.8		40.3	13.5					15.1	25.7	13.1
LOS		C		D	B					B	C	B
Approach Delay		26.8			17.5						23.5	
Approach LOS		C			B						C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 72			
Actuated Cycle Length: 72			
Offset: 35 (49%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 22.7		Intersection LOS: C	
Intersection Capacity Utilization 77.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 595: Smith & Elgin



603: Mandell & Westheimer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	673	25	34	651	16	52	90	66	4	57	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Satd. Flow (prot)	1770	1853	0	1770	1855	0	1770	1744	0	0	1827	0
Flt Permitted	0.256			0.236			0.678				0.983	
Satd. Flow (perm)	477	1853	0	440	1855	0	1263	1744	0	0	1802	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			28			5	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1063			533			939			1301	
Travel Time (s)		24.2			12.1			21.3			29.6	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Growth Factor	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%	114%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	15	856	0	42	818	0	64	191	0	0	85	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Total Split (s)	90.0	90.0		90.0	90.0		30.0	30.0		30.0	30.0	
Total Lost Time (s)	4.9	4.9		4.9	4.9		4.7	4.7			4.7	
Act Effct Green (s)	85.1	85.1		85.1	85.1		25.3	25.3			25.3	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.21	0.21			0.21	
v/c Ratio	0.04	0.65		0.13	0.62		0.24	0.49			0.22	
Control Delay	8.9	19.5		3.9	8.0		42.3	40.3			38.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	8.9	19.5		3.9	8.0		42.3	40.3			38.7	
LOS	A	B		A	A		D	D			D	
Approach Delay		19.3			7.8			40.8			38.7	
Approach LOS		B			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 70 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 18.0		Intersection LOS: B	
Intersection Capacity Utilization 60.1%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 603: Mandell & Westheimer

Appendix K
Additional METRO Coordination Documentation

GUNDA CORPORATION
Engineers, Planners & Managers

MEMO

To: Priya Zachariah
Senior Transit Planner, METRO

From: Geoff Carleton
Traffic Engineers, Inc.

CC: James Llamas, TEI
Sammy Chen, TEI

Date: October 23, 2017

Re: Responses to City of Houston Comments on METRO Lower Westheimer Study

Below are clarifications and responses to comments (in blue) received from the City of Houston design team regarding the METRO Lower Westheimer Traffic Simulation.

Comment: Disagree because average delay is low./ By any measure maximum of average delay of 12.4 seconds is good!!!!!!! During the PM peak period. I have never seen roadway designed for Max Delay in my career. Even roadway capacity are designed for the 30th highest daily traffic when looking at AADT.

Response: The average delay shown in Table 3 represents the average of all 40 bus trips (8 trips in each peak hour by 5 simulation runs) including buses skipping the pull-out stops. The maximum delay shown in Table 3 represents the average value of the 5 maximum delays from the 8 bus trips in the peak hour for each simulation run. Stops like Stanford have very low ridership; thus, the buses skip the stops (have "0" delay time) on most trips which draws down the value of the average delay. The high maximum delays at such stops indicate that when the bus does pull out it will have a hard time merging back into the traffic flow. An irregular delay of one minute, or even 30 seconds, reentering traffic has the potential to cause or exacerbate bus bunching when buses are scheduled every 4 to 8 minutes as on Westheimer during the peak.

Comment: I think the best to compare will be build and no-build in 2040 just like the analysis for the roadway./ I would recommend eliminating this as it is not realistic

Response: Existing volumes with future geometry were analyzed to better understand the roadway geometry impacts only, without the influence of traffic growth. The 14% traffic growth projection needs further discussion given the change in roadway geometry and the historical trend of counts. Traffic operations will be change and travel time on Lower Westheimer will increase due to the reduction of travel lanes. Drivers on non-local trips are likely to seek alternative routes for a more competitive travel time until travel time equilibrium is achieved between similar routes again. This will likely impact future traffic volumes that utilize the corridor.

Comment: Remove the bus pull-out at Bagby and place stop in lane. - Disagree. It is close to the signal and average delay is minimal during the PM Peak Period

Response: The existing design will require the bus driver change two lanes to get back into the travel lane from the pull-out stop in a relatively short distance. The bus driver would need to find gaps in a traffic stream that is

merging from two lanes to one, a complex task that could potentially cause safety and operation issues. Average delay is low because it is drawn down by the "0" delay trips when buses skip the stop. The maximum delay (23.5 sec) reflects the situation the bus would encounter when it stops at the pull-out stop. The relatively low ridership at the stop and its location on a four-lane section of street would minimize the traffic impact of an in-lane stop.

Comment: Table 4 – Got to check this in the analysis as the geometry does not change in the future.

Response: Downstream of the intersections the street is changed from two lanes to one lane. The downstream merging constrains the capacity of the through movements for both the Bagby and Montrose intersections.

Comment: Consider adding a second eastbound travel lane from the bus pull-out at Mt. Vernon to Yoakum. – Agreed and also recommend adding the additional lane west of Commonwealth

Response: Adding a second eastbound approach lane shortly before Commonwealth would improve traffic and bus operations but would increase pedestrian crossing distance, affecting the walkability of the design. This concern could be minimized by designing the striped median area as a pedestrian refuge island. The additional eastbound lane could function as a queue jump if designated "bus and right turn only." This could be further assessed in final design.

Comment: Consider signage and pavement markings requiring traffic to yield to merging buses. – Disagree because I don't believe Non Standard additional signage is going to benefit the special detail

Response: See NCTR Research Report BDK85 977-33: Recommendations for Yield-to-Bus Traffic Control Devices and Bus Pullout Bays Design Characteristics for pavement marking and signage recommendations. Provides alternative strategies should proposed design result in operational issues for buses and vehicles on the corridor. Report can be downloaded here: (https://www.nctr.usf.edu/wp-content/uploads/2013/05/77939.pdf)

MEMO

To: Priya Zachariah
Senior Transit Planner, METRO

From: Da Li, PE, PTOE
Traffic Engineers, Inc.

CC: Geoff Carleton, TEI
Sammy Chen, TEI
James Llamas, TEI
Patricia Wascowiak, PB
Jenny Wang, PB

Date: May 18, 2017

Re: DRAFT Review and Traffic Simulation of Lower Westheimer Corridor Design

The purpose of this memo is to document major findings of a traffic and transit modeling analysis to support METRO engagement with the City of Houston's Lower Westheimer Corridor Study. The study is based on the City of Houston schematic design from April 2017. The design was reviewed and a VISSIM model was developed to assess the impacts of the design on METRO bus operations. Based on the model results, the review of the proposed schematic, and field tests of bus stop geometry, potential recommendations were identified, focused on the segment of Lower Westheimer between Shepherd and Brazos.

The corridor was modeled based on traffic volumes for the PM peak period for various scenarios. The PM peak was chosen as it is typically the peak traffic period for the corridor. The scenarios include existing conditions, the proposed COH April schematics, and a version incorporating potential recommendations. The scenarios were modeled for existing traffic volumes and utilizing background traffic growth assumptions of 14% growth for future projections for some scenarios.

This study also reflects findings from a field test of typical bus stop pullout designs conducted at METRO Fallbrook Bus Operating Facility on April 28, 2017. The findings of that test are summarized as an attachment to this memo.

Key Findings

- Through the Lower Westheimer pre-engineering project, the City of Houston has developed a proposed roadway schematic that provides a more walkable corridor with a wider pedestrian realm, a narrowed vehicle travelway, and dedicated bus stop pull outs. This is in line with feedback from the community.
- The implementation of the City's proposed schematics, assuming existing traffic volumes and transit signal priority (TSP) for buses at minor intersections, is estimated to increase bus travel time on the Westheimer corridor.
    - Increases of 11% eastbound and 4% westbound are projected with existing volumes (Scenario 2a). The travel time increase is most significant on the segment between Yupon and Stanford.

- Transit signal priority at minor intersections is shown to benefit bus and passenger vehicle travel times on Westheimer as it typically adds green time to the highest volume traffic movements.
- At proposed bus pull-out stops where there is no adjacent signal to create gaps in traffic for buses to renter the travel lane, significant merge delays are projected. It is recommended that the design of these stops be reassessed, potentially to allow the bus to stop in the travel lane.
- Passenger vehicle travel times for this scenario are projected to increase 26% eastbound and 15% westbound for existing volume with proposed geometry.
- The implementation of a scenario incorporating this study's recommendations (Scenario 5) to City's schematic design would improve bus travel times by about 4% for each direction on Westheimer versus existing conditions. General traffic on Westheimer would experience more delay compared to existing conditions (12.1% travel time increase for eastbound and 2.8% travel time increase for westbound) but less than with the currently proposed geometrics.
- Assuming a projected travel volume growth of 14%, bus travel times are projected to increase on the corridor. This is true for both existing geometry and the proposed schematic.
    - Existing geometry: Increase of 38% for eastbound and 20% for westbound with existing volumes (Scenario 3).
    - Proposed Schematic: Increase of 50% for eastbound and 46% for westbound with existing volumes (Scenario 4).
    - If projected traffic volumes are realized, which may be unlikely given the change in roadway geometry, traffic operations will be challenging, regardless of the corridor design, given the narrow right-of-way and desire to create a high-quality, walkable corridor.
- General findings on bus stop placement, design, and geometry include:
    - Bus position at a stop must be sufficiently offset from the travel lane to provide visibility of approaching traffic in the bus driver's mirrors. Details of this are captured in the attached summary of the bus stop field test.
    - Bus stops located more than two blocks downstream of a signal should be placed in-lane rather than in a pull-out to avoid excessive merge delays.
    - Placement of bus stops – especially pull-outs – and lane merges in close succession should be avoided.
    - Stops and related passenger amenities such as shelters should be designed so that drivers have good visibility of passengers waiting at the stop, as drivers will need to make an active decision to pull into the bus pullouts or pass by the stop. This includes appropriate lighting for evening time and periods of inclement weather.

Scope of Study

The VISSIM model for this study covers the selected segment of lower Westheimer just west of Shepherd Drive to just east of Brazos Street, a distance of two miles. The signalized intersections that were modeled are:

- Elgin @ Brazos
- Westheimer/Elgin @ Bagby
- Westheimer @ Taft
- Westheimer @ Montrose
- Westheimer @ Yoakum
- Westheimer @ Commonwealth
- Westheimer @ Mandell
- Westheimer @ Dunlavy
- Westheimer @ Woodhead
- Westheimer @ Hazard
- Westheimer @ Shepherd

The existing cross-section of lower Westheimer is a four-lane undivided roadway. A five-lane cross-section with a two-way-left-turn-lane is provided between Commonwealth and Montrose. The right-of-way on lower Westheimer typically varies between 60 and 70 feet. Existing lane width on the study segment is 9 to 10 feet, narrower than ideal for smooth bus operations.

The future geometry of lower Westheimer proposed in the City of Houston April schematic is generally one lane in each direction with left-turn lanes at signalized intersections. An expanded pedestrian realm will improve walkability, a key priority of the surrounding community, while also improving access to bus stops. In some areas, such as near the intersection with Montrose, the proposed cross-section of Westheimer is wider. Existing in-lane bus stops have been consolidated and designed with pull-outs to remove stopped buses from travel lane.

Data Collection

The following data were collected for use in conducting the modeling and analyses:

- Existing geometry of Westheimer and bus stop locations
- Schematic of proposed roadway design including bus stops
- Existing turning movement counts at the study intersections and assumed traffic growth rate for the design year
- Existing traffic signal timing at the intersections (from the City of Houston)
- Bus headway during peak hours (from METRO)
- Existing bus ridership numbers including boarding & alighting passengers (from METRO)
- Existing 82 Westheimer bus occupancy during PM peak on the study segment
- Minimum gap required for buses pulling out into traffic
- Bus specifications (dimensions, acceleration/deceleration rates, etc.)
- GPS-based bus travel times, as benchmarks for model calibration, were collected in March 2017 with five runs performed for each direction of travel during the PM peak. Figure 1 and Figure 2 represent the average of the five field runs and show the average speed and travel time between east of Shepherd and west of Brazos.

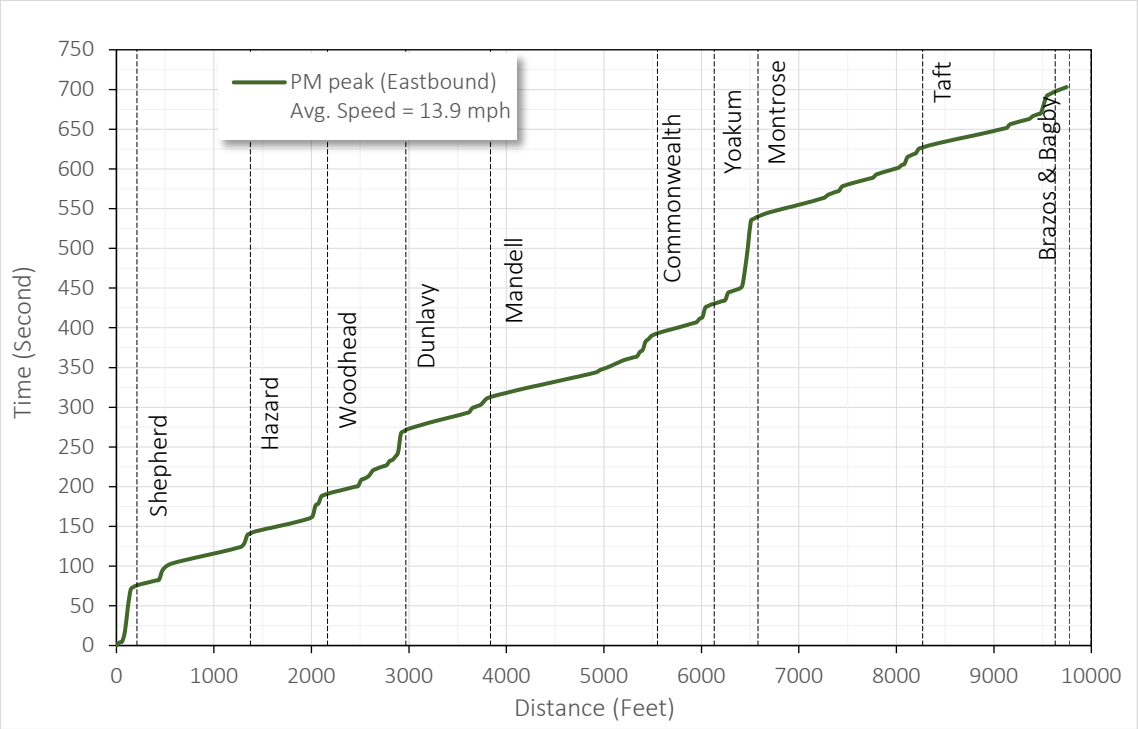


Figure 1 Eastbound Travel Time Runs

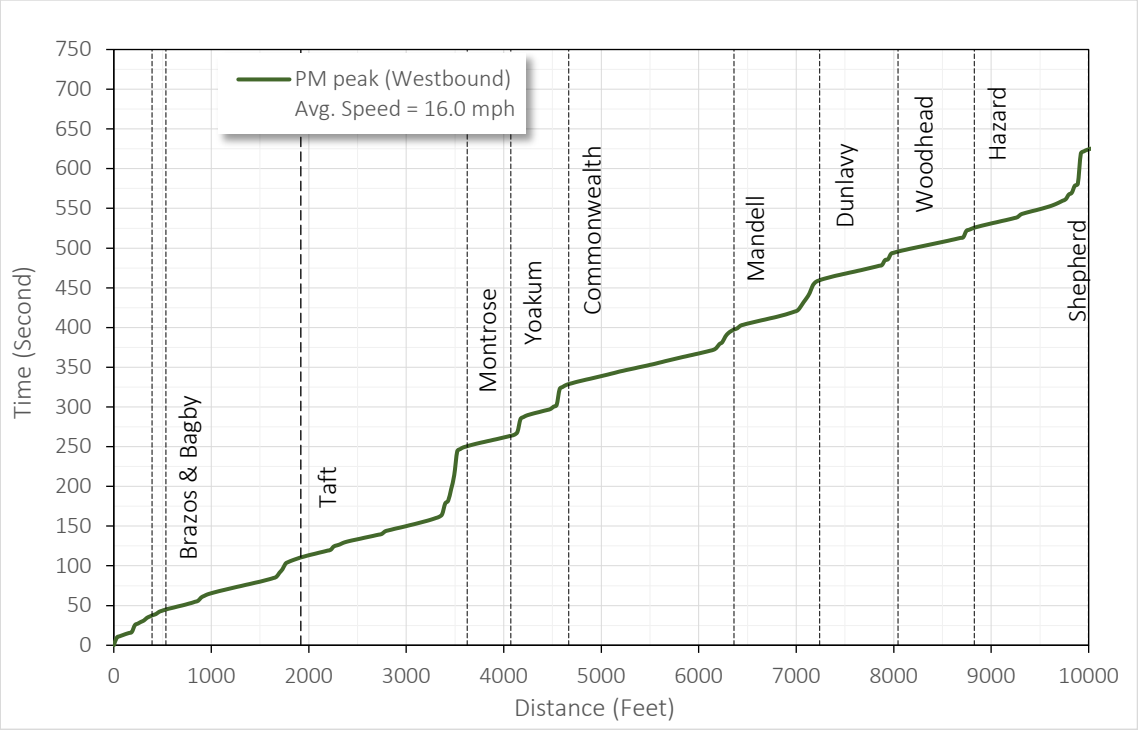


Figure 2 Westbound Travel Time Runs

Calibration and Validation

The data associated with traffic conditions, signal timing, roadway geometrics, bus specifications, and desired bus headway were used to develop the VISSIM traffic simulation scenarios. Ridership information, including boarding and alighting passengers at each stop and the bus occupancy of each bus, was also input to VISSIM to estimate dwell times at stops. The baseline model was developed to replicate the existing geometrics, PM peak traffic, signal operation conditions, as well as bus operation along the selected segment of Lower Westheimer Road. The baseline model was fine-tuned by adjusting VISSIM parameters such that the difference between the model-estimated and field-measured travel times were within an acceptable range (i.e., ±10%). Table 1 shows the goodness of fit of the baseline model for the existing conditions which were all under 7%.

Table 1: Goodness of Fit of Existing Condition Model

Segment Level Travel Time Results	Average Bus Travel Time (seconds)							
	Eastbound				Westbound			
	Shepherd to Yupon	Yupon to Stanford	Stanford to Brazos	Total	Yupon to Shepherd	Stanford to Yupon	Brazos to Stanford	Total
Distance	5222	2871	2657	10750	5207	2889	2674	10770
Measured Travel Time	360	226	132	718	289	219	137	645
Simulated Travel Time	372	229	124	725	285	229	129	657
Relative Error	+3.4%	+1.2%	-6.3%	+0.9%	-1.4%	+4.4%	-5.8%	-0.4%

Figure 3 illustrates the segments in Table 1.

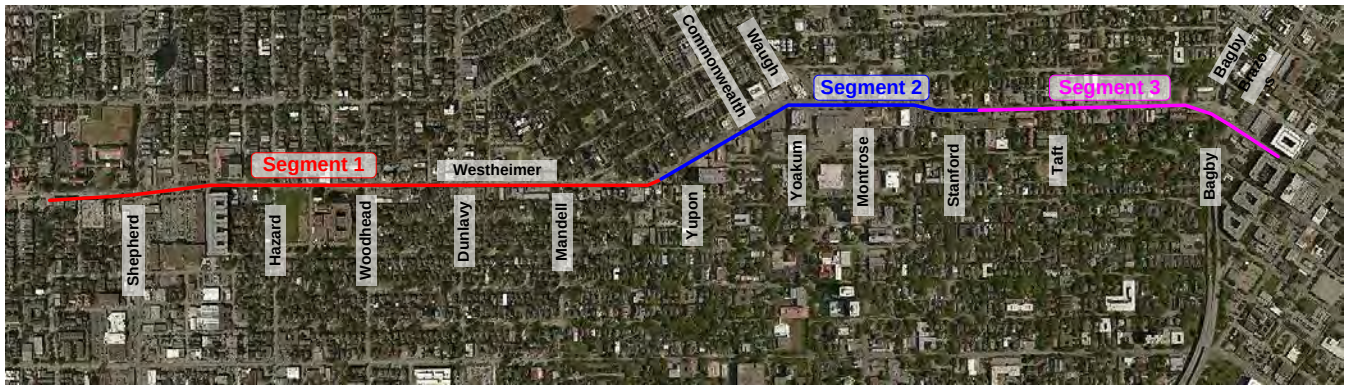


Figure 3 Illustration of Analyzed Segments

Design Alternatives for Analysis

To evaluate the bus and vehicular traffic operation for the proposed schematics, six alternatives were modeled. Specifications of the design alternatives are summarized in Table 2.

Table 2: Description of Design Alternatives

Design Alternatives	Bus Operation	Signal Operation	Typical Westheimer Cross-Section
Scenario 1 - Existing Conditions (Calibrated)	• In-lane bus stops • Near-side stops	Existing signal timing	4 Lanes
Scenario 2a - Future Geometrics w/Existing Volumes & TSP	• Pull-out bus stops • Far-side stops • Consolidated bus stops	Transit signal priority at minor intersections	2 lanes
Scenario 2b - Future Geometrics w/Existing Volumes but No TSP		Existing signal timing	2 lanes
Scenario 3 - Existing Geometrics with Projected Volume	• In-lane bus stops • Near-side stops	Existing signal timing	4 Lanes
Scenario 4 – Future Geometrics w/Projected Volumes & TSP	• Pull-out and in-lane bus stops • Far-side stops • Consolidated bus stops	Transit signal priority at minor intersections	2 lanes
Scenario 5 – Study Recommendation w/Existing Volumes & TSP		Transit signal priority at minor intersections	2 lanes

Assumptions

Bus Ridership

The numbers of boardings and alightings in the peak hour are assumed to be 10% of the daily ridership at each stop based on overall route data. A 14% growth rate is applied on the existing ridership numbers for the future scenarios, in line with the projected traffic volume increase.

Bus Dwell Time

The service time at stops is assumed to be 2.9 seconds per person for boarding and 0.6 seconds per person for alighting.

Background Traffic Volume

Traffic growth of 14% on the top of existing volume was considered to be “projected volume” in Scenario 3 and 4 based on assumptions provided by the City of Houston. This growth assumption is based on an assumed annualized growth rate. Actual volumes may differ significantly based on the final desing of the street as motorists may choose alternate routes, different modes of travel, or different trip times. Traffic ultimately will find a new equilibrium on the corridor; thus, scenarios for both existing and projected traffic volumes should be considered.

Transit Signal Priority

Transit signal priority is assumed to be provided at the minor intersections on Westheimer for the future scenarios. Montrose and Shepherd are considered major corridors and existing signal timings are retained for these two intersections for all scenarios.

The maximum extension of green time for transit priority phase is assumed to be 20 seconds. When the bus is served by a priority phase on one direction of Westheimer, a green signal is also assumed to be displayed for the opposite direction on Westheimer.

Signal Phasing

Existing signal phasing was used including left turn treatments at signalized intersections. Introduction of protected left turns at minor intersection may be considered but would likely have negative impact on traffic operations as potential queues could exceed the relatively short left turn bays and block the single through traffic lane.

Bus Stop Behavior

It was assumed that if no passenger wanted to board or alight the bus at a particular stop on a bus trip, the bus would bypass the stop and not enter the bus pullout.

Bus Merge Behavior

The behavior when a bus merges from the proposed bus pull-out stops back to a travel lane was modeled using the VISSIM lane-change model as it was assessed to be the most realistic for both the bus drivers' and trailing cars' experience. In the model, we assume the bus can merge when a gap of at least 80 feet is available between successive cars.

Merge Delay from Pull-Out Stops

Table 3 shows the average and maximum delay in seconds that buses will experience when they reenter traffic from each stop with the City's schematic and bus stop design (Scenario 2a). The average delay at a stop includes all buses, whether they service or pass by (skip) the specific stop in the PM peak hour. As shown in Table 5, the eastbound stop at Hudly and westbound stop at Bagby will experience relatively high average and maximum delays, as the two locations are located near the points where the travel lanes merge from two lanes to one lane. It would be more difficult for bus drivers to find gaps in a merging traffic stream.

Buses at the westbound Stanford stop will experience relatively low average delay but high maximum delay. The Stanford stop has light ridership and is only served by about one in five trips; as a result, the average delay is relatively low because of the pass-by (zero delay) trips. However, when the bus does pull out at the stop, it is difficult for it to reenter as the long distance from upstream signals would scatter the platoon created by the traffic signal. When closer to the stop, upstream signals meter the traffic and increase the availability of gaps for buses to reenter the travel lane.

Table 3 Bus Merge Delay (Seconds) by Stop

Eastbound			Westbound		
Stop	**Avg. Delay**	**Max. Delay**	**Stop**	**Avg. Delay**	**Max. Delay**
Huldy	12.4	60.6	Bagby	7.9	23.5
Hazard	2.2	30.1	Taft	1.1	21.5
Woodhead	3.1	48.2	Stanford	3.6	64.9
Dunlavy	1.6	5.2	Montrose	2.8	12.7
Yupon	0.8	2.5	Yoakum	1.2	2.6
Commonwealth	2.5	15.7	Yupon	1.1	2.1
Montrose	1.7	2.9	Mandell	1.9	11.9
Stanford	1.8	23.9	Dunlavy	2.1	5.8
Taft	0.7	2.0	Woodhead	0.8	11.4
			Hazard	0.8	2.2

Analysis Results

Travel Time and Delay

Table 4 shows the travel time results for buses and passenger cars on Westheimer for different scenarios in terms of the number of seconds to travel the analyzed corridor. The percent changes in travel time for all scenarios are compared to the existing conditions. Positive numbers (shown in red) indicate longer travel time and negative numbers (shown in green) indicate shorter travel time compared with existing conditions.

As shown in Table 4, the implementation of City's proposed schematics and TSP for buses at minor intersections will increase the bus travel time by 10.5% for eastbound and 4.2% for westbound with existing volumes (Scenario 2a). The travel time increase occurs primarily on the segment between Yupon and Stanford which is also the most congested segment on lower Westheimer today and includes signalized intersections at Montrose, Waugh, and Commonwealth. Transit signal priority benefits the movements of both buses and cars on Westheimer (see the comparison between Scenario 2a and 2b). As shown in Table 5, the level-of-service (LOS) of intersections at Montrose and Shepherd will degrade from LOS D to LOS E.

The results of Scenarios 3 and 4, which both assume 14% traffic volume increase above existing volumes, show that this growth would significantly increase the travel time for both buses and passenger cars on Westheimer, even with existing roadway geometry. The LOS of Montrose at Westheimer will degrade for both existing or future geometries with the volume increase. For future geometry, the LOS of Bagby/Brazos at Westheimer will change from LOS C to LOS E.

By incorporating the recommendations outlined in this study (Scenario 5), bus travel times could be improved by 4% for each direction on Westheimer than existing conditions, assuming existing traffic volumes. General traffic on Westheimer would experience more delay compared to the existing conditions (12.1% travel time increase eastbound and 2.8% travel time increase westbound) but less than in the other scenarios. The intersection of Montrose at Westheimer will operate at LOS E and all other signalized intersections will operate at LOS D or better, generally considered an acceptable performance level for an urban area in the peak hour.

To accommodate these recommendations, there are some locations where the proposed pedestrian realm would need to be narrowed from what is shown in the current schematics. In most cases the design should accommodate a pedestrian realm wider than existing. It appears the tightest point on the corridor would be between Waughcrest and Waugh and some design trade-offs may be required.

The recommendations modeled in Scenario 5 are outlined in the following section of this memo.

Table 4 Comparison of Bus and Passenger Car Travel Times

Segment Level Bus Travel Time (s) Results		Scenario 1		Scenario 2a		Scenario 2b		Scenario 3		Scenario 4		Scenario 5	
		Existing Conditions (Calibrated)		Future Geometrics w/ Existing Volumes & TSP**		Future Geometrics w/ Existing Volumes but No TSP		Existing Geometrics w/ Projected Volumes but No TSP		Future Geometrics w/ Projected Volumes & TSP		Recommended Future Geometrics w/ Existing Volumes & TSP	
		Travel Time	Relative Error*	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change
Bus EB	Shepherd to Yupon	372	+3.4%	411	+10.5%	476	+27.9%	488	+31.1%	612	+64.4%	365	-2.0%
	Yupon to Stanford	229	+1.2%	257	+12.5%	249	+8.8%	367	+60.4%	316	+38.1%	216	-5.6%
	Stanford to Brazos	124	-6.3%	132	+6.7%	142	+14.7%	146	+18.1%	156	+26.2%	114	-7.8%
	EB Total	**725**	**+0.9%**	**801**	**+10.5%**	**867**	**+19.6%**	**1001**	**+38.1%**	**1084**	**+49.6%**	**695**	**-4.1%**
Bus WB	Yupon to Shepherd	285	-1.4%	291	+2.1%	374	+31.2%	319	+11.9%	300	+5.3%	282	-1.1%
	Stanford to Yupon	229	+4.4%	243	+6.1%	253	+10.7%	306	+33.8%	290	+26.8%	201	-12.1%
	Brazos to Stanford	129	-5.8%	136	+5.4%	169	+31.0%	148	+14.7%	352	+172.9 %	132	+2.3%
	WB Total	**643**	**-0.4%**	**670**	**+4.2%**	**796**	**+23.9%**	**773**	**+20.3%**	**942**	**+46.6%**	**615**	**-4.3%**
Pass-enger Car EB	Shepherd to Yupon	271	-	351	+29.4%	406	+49.8%	392	+44.6%	543	+100.3 %	326	+20.3%
	Yupon to Stanford	130	-	182	+40.3%	178	+37.0%	262	+101.9 %	240	+84.4%	151	+16.4%
	Stanford to Brazos	110	-	112	+2.4%	117	+7.2%	124	+12.8%	134	+22.0%	95	-13.0%
	EB Total	**511**	**-**	**645**	**+26.4%**	**702**	**+37.4%**	**778**	**+52.3%**	**917**	**+79.5%**	**573**	**+12.1%**
Pass-enger Car WB	Yupon to Shepherd	211	-	224	+6.4%	262	+24.4%	229	+8.9%	233	+10.6%	227	+7.8%
	Stanford to Yupon	143	-	179	+24.9%	180	+25.8%	186	+30.2%	226	+58.0%	142	-0.7%
	Brazos to Stanford	108	-	129	+18.9%	137	+26.5%	119	+9.8%	339	+213.1 %	106	-2.1%
	WB Total	**462**	**-**	**532**	**+15.1%**	**579**	**+25.3%**	**535**	**+15.7%**	**798**	**+72.7%**	**475**	**+2.8%**

Note: * relative error: compared with the average of five field runs

** TSP not provided at Shepherd and Montrose

Table 5 Impact on Intersections

Segment Level Bus Travel Time (s) Results	Scenario 1		Scenario 2a		Scenario 2b		Scenario 3		Scenario 4		Scenario 5	
	Existing Conditions (Calibrated)		Future Geometrics w/ Existing Volumes & TSP**		Future Geometrics w/ Existing Volumes but No TSP		Existing Geometrics w/ Projected Volumes but No TSP		Future Geometrics w/ Projected Volumes & TSP		Recommended Future Geometrics w/ Existing Volumes & TSP	
	Travel Time	Relative Error*	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change	Travel Time	% of Change
Intersection LOS & Delay (s)	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**
1: Shepherd	C	30	D	35	E	71	D	36	D	48	D	43
2: Hazard	A	9	B	14	C	21	C	25	C	24	B	11
3: Woodhead	C	25	C	24	C	25	D	40	C	31	B	13
4: Dunlavy	C	25	D	37	C	29	C	24	D	44	B	13
5: Mandell	B	15	B	18	B	10	B	16	C	23	A	6
6: Common-wealth	B	13	C	24	D	37	C	32	D	36	B	10
7: Yoakum	C	22	C	24	D	38	D	47	C	30	C	21
8: Montrose	D	47	D	50	E	62	E	75	F	83	E	67
9: Taft	A	10	B	17	B	19	B	13	D	50	B	15
10: Bagby/ Brazos	C	29	C	29	D	49	D	36	E	58	C	23

Study Recommendations

Based upon the modeling results, bus tests, and bus stop spacing considerations, the following recommendations are proposed for the future geometrics and bus operations of the Lower Westheimer corridor.

General Recommendations

Bus stops should be designed with adequate visibility.

- Bus position at a stop must be sufficiently offset from the travel lane to provide visibility of approaching traffic in the bus driver's mirrors. Details of this are captured in the attached summary of the bus stop field test.
- Stops and related passenger amenities such as shelters should be designed so that drivers have good visibility of passengers waiting at the stop, as drivers will need to make an active decision to pull into the bus pullouts or pass by the stop. This includes appropriate lighting for evening time and periods of inclement weather.

Bus stops located more than two blocks downstream of a signal should be placed in-lane rather than in a pull-out.

- Bus pull-outs away from signalized intersections have the potential to cause significant merge delay for a bus to re-enter the traffic flow due to absence of gaps. Consider placing such stops, especially those with low boarding volume, in-lane.

Avoid placing bus stops – especially pull-outs – and lane merges in close succession.

- Complexity of two merges at once could cause operations and potential safety issues.
- Traffic approaching from directly behind the bus, which would then pass the bus while it is also looking to merge into a single traffic lane, is not visible to the bus driver.

General stop placement and design:

- Where possible, develop stops in pairs with common cross-street name. This has been accomplished at most stops along the corridor except for the area encompassing Mandell, Yupon, Commonwealth, and Waughcrest. This segment presents some challenges and METRO may wish to reconsider stop placement in this section in coordination with other recommendations.
- Stops should be placed to support customer's ability to make quality transfers. Key transfer locations occur at the intersections of Shepherd and Montrose with Westheimer, and along the segment of Elgin east of Brazos.

Specific Schematic Recommendations

1. Consider continuing the second westbound travel lane on Westheimer from Lincoln past Commonwealth to a merge in the vicinity of Graustark.

    a. With one through lane, the model indicates that queues from downstream signals (Commonwealth, Waugh/Yoakum) extend back to back through the Waugh and Montrose intersections, increasing delay.
    b. The low volume of left turns at Commonwealth should allow a shared through/left turn lane to perform acceptably, avoiding the need to widen the roadway to add the second through lane.
    c. This change narrows the pedestrian realm somewhat but greatly minimizes complexity for buses and vehicles through the curves on Westheimer.

2. Consider adding a second eastbound travel lane from the bus pull-out at Mt. Vernon to Yoakum.

    a. With one through lane, the model indicates that the queue from Waugh/Yoakum extends back through the Commonwealth intersection, increasing delay.
    b. Adding a second lane beginning at the bus stop will also reduce bus reentry delay and minimize complexity for transit and vehicles through the curves on Westheimer.
    c. With the conversion of Waughcrest to one-way southbound, left turns at Waugh are likely to increase. Adding a second lane through this segment will minimize the instances where left turn volumes queue back into the through lane.

3. Remove the westbound Waughcrest stop which is very close to the stop at Montrose.

    a. Proposed Montrose and Waughcrest stops are 0.11 miles (580 feet) apart, less than the METRO Service Standards target of 0.25 miles.
    b. Removing Waughcrest would create spacing of 0.29 miles between Montrose and Yupon. Stop locations in this segment could be reconsidered if closer spacing is desired.

4. Design in-lane stops at Stanford to avoid excessive merge delay.

    a. Distance from upstream signals reduced the availability of gaps for buses to reenter traffic from the Stanford stops, causing the highest bus delay among the westbound stops and maximum merge delays exceeding 60 seconds.
    b. Only about one in five trips stops at Stanford and stops are typically under 15 seconds, minimizing any impact of in-lane stops on traffic flow.
    c. Removal of the pull-outs reduces crossing distance for pedestrians and creates the opportunity for additional on-street parking, supporting project goals.

5. Improve geometry of the reverse curve near Crocker.

    a. The reverse curve for eastbound Westhemier traffic, west of Crocker, could be straightened by flattening the curve somewhat to smooth the transition to a two-lane cross-section.

6. Remove the bus pull-out at Bagby and place stop in lane.

    a. Placement of the pull-out immediately before the two lanes merge to one would require the bus driver to find gaps in a merging traffic stream, a complex task that could potentially cause safety issues.
    b. The location of the pull-out between the intersection and a driveway may lead drivers to use the bus pull-out as a turn lane.
    c. The stop sees low boarding volumes and is bypassed by most trips so in-lane stops should have minimal impact on traffic flow.
    d. The stop is located on a four-lane section, allowing traffic to bypass a bus stopped in the travel lane. Extending the four-lane section further to the west, closer to Helena, is recommended.

7. Locate bus stops at Shepherd on the far side of the intersection in both directions; consolidate eastbound stops.

    a. Westbound, space exists on the far side of the intersection to provide a stop much closer to the intersection than the proposed near-side location, reducing transfer distance and avoiding blockage of right turns.
    b. Eastbound, the proposed Shepherd and Huldy stops are 0.07 miles (370 feet) apart, far closer than the METRO Service Standards target of 0.25 miles.
    c. Consolidating the eastbound stops to a new, far-side location would improve the speed of bus service while reducing blockage of right turns and requiring no more than 180 ft. of additional walking for any bus rider.
    d. Locating the new far-side stop closer to Shepherd will also avoid bus stop and lane merges placed in a close succession.

8. Consider signage and pavement markings requiring traffic to yield to merging buses.

    a. Bus reentry delay could be minimized by placing a yield bar and text on the pavement indicating drivers should yield to the bus when it reenters traffic.

Figure 4 illustrates a schematic of the recommendations on geometry and bus stops between Graustark and Montrose.

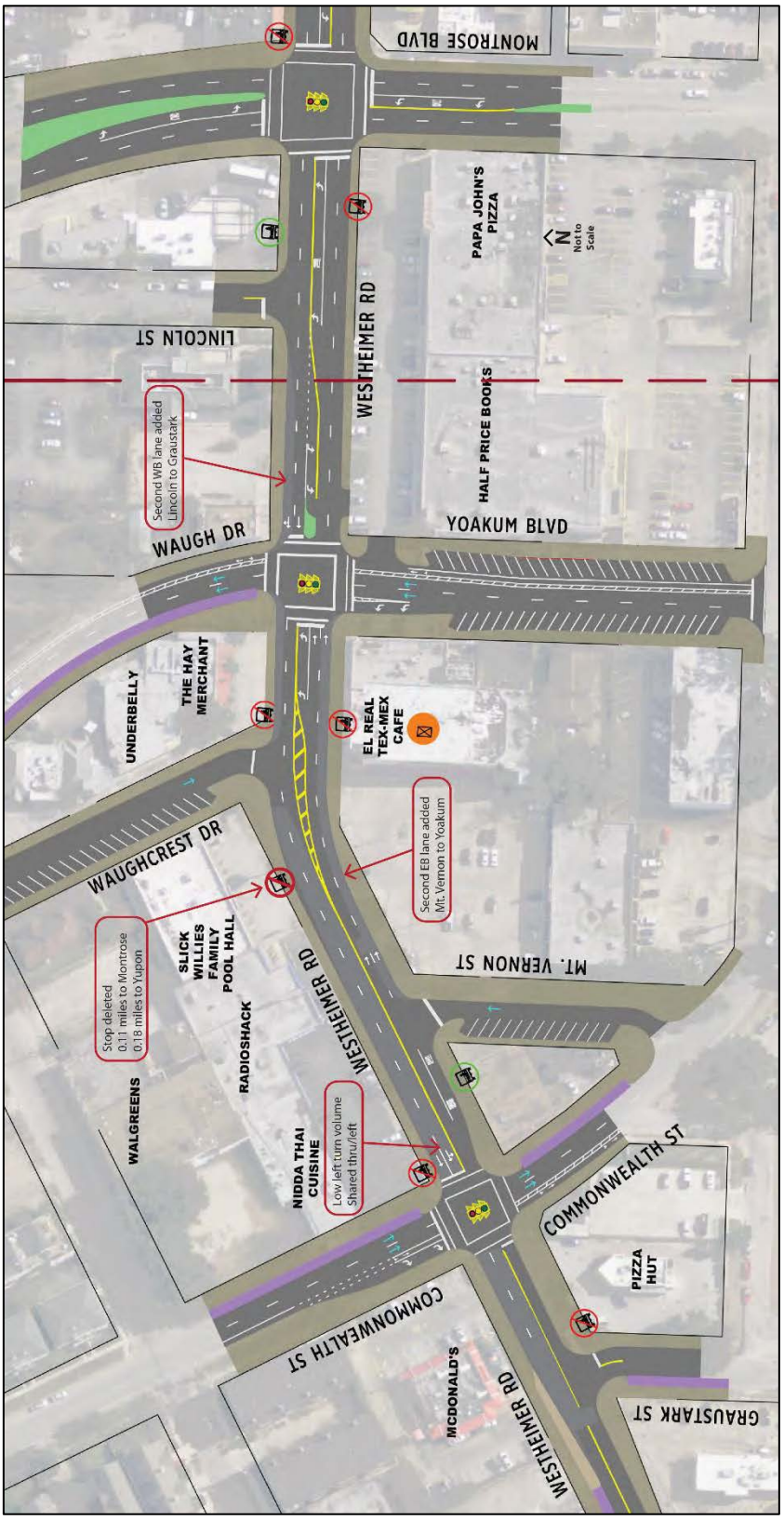


Figure 4 - Recommended schematic and bus stop locations between Graustark St. and Montrose Blvd.

Lower Westheimer Bus Stop Design Testing

Date – April 28th, 2017, METRO Fallbrook Bus Operating Facility
Present:
METRO - Kurt Luhrsen, Mike Williams, Priya Zachariah, METRO Field Operations, METRO Bus Supervisors/Drivers
TEI – Geoff Carleton
Gunda – Michael Ereti

1. Purpose: To layout and test a typical bus stop design as proposed for the redesign of Lower Westheimer.

2. Scenarios Tested:

    - Proposed Lower Westheimer bus stop design from April 2017 schematic. This included far side bus stops with a 33' street cross-sections where buses would pull straight into bus stop at a location just downstream from the opposing direction left turn bay.
    - Revised bus stop design based on field observations to improve visibility and geometry to accommodate larger vehicles.

3. Vehicles: METRO Standard 40-foot and articulated 60-foot buses. Test included assessment of the ability for one bus to pass another bus stopped at the stop when vehicles were queued in the opposing direction left turn lane.

4. Findings/ concerns – Original proposal for pull out (see Figure below)

    - Limited line of sight made it difficult for bus operator to identify a safe gap when leaving bus pullout. Due to lack of offset between the bus pullout and the vehicle travel lane behind the bus, passing vehicles approaching from the rear of the bus were difficult for the driver to see until they were nearly adjacent to the bus. This made it difficult for the driver to make a clear determination of when there was an acceptable gap to merge back into traffic when exiting the bus stop.
    - The existing geometry and taper length for the bus pullout/left turn lane created restricted space for another bus or large vehicle to move around the articulated bus serving the stop. This was more difficult with cars placed in the opposing direction left turn lane and an articulated bus stopped in the bus pullout.

5. Findings and Recommendations

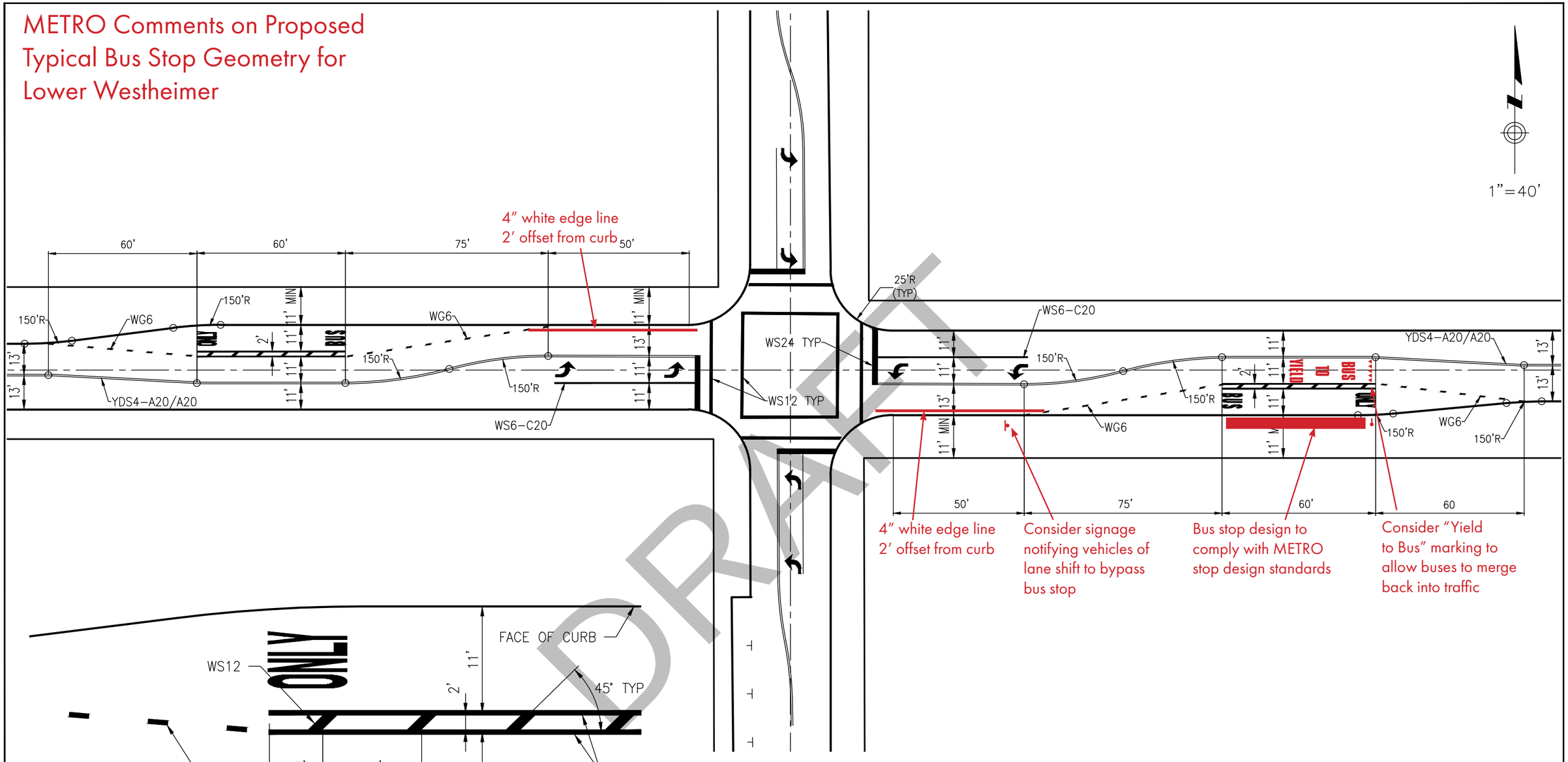
    - In general, all stops should be designed such that the driver of a bus stopped at the bus stop has clear visibility of vehicles approaching

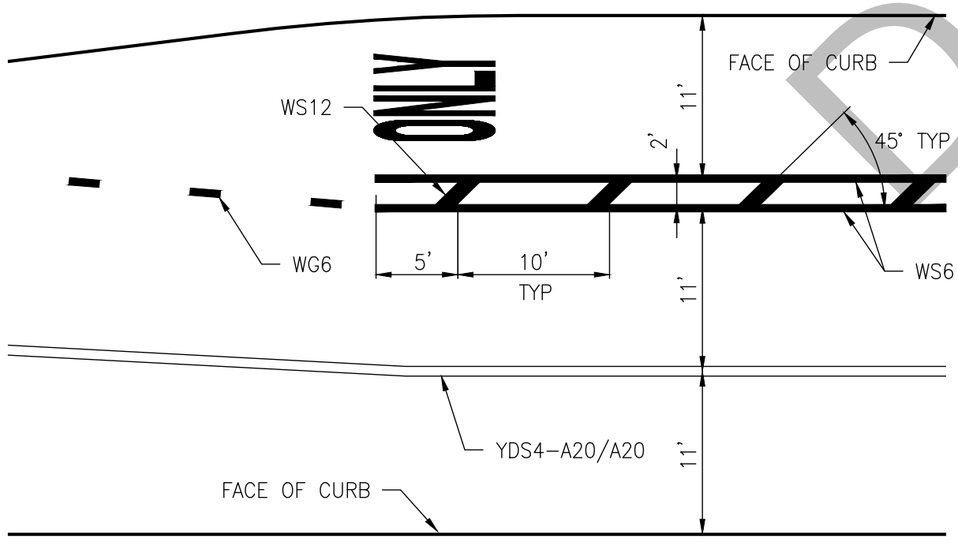
from the rear. This will allow the driver to make a determination of when to safely exit the bus stop pullout area and merge back into the travel lane. The centerline of the bus stop should be sufficiently offset from the centerline of the approaching travel lane and the visibility should be available through the driver's side view mirror.

- For the stop design tested, bus pullout width was increase to 13' from 11' to provide additional offset and visibility. A 2' buffer was proposed to be striped on the outside of the bus stop away from the curb to further designate the bus stop area.
- In final design, other bus stop locations may have different proposed geometry due to roadway curvature or lane geometry differences from the tested stop location. These stops should be designed with appropriate visibility
- Other recommended dimensions based on field test
    i. Approach taper length increased to 75' minimum (from 60'). This change in combination with the wider bus stop lane allowed passing vehicles adequate room to bypass bus when vehicles are parked in the opposing left turn lane
    ii. Departure taper length at 60' minimum
    iii. 2' buffer striped between bus stop and travel lane
    iv. Departure taper curb angled to merge bus back into standard 13' lane
    v. 4" white edge stripe offset from curb on approach to bus stop pullout to help position approaching vehicles in visible area for the bus driver.
- Proposed 60' bus storage length at stop was sufficient for a single 40' or 60' buses
- Accessible bus stop landing area for length of bus stop including clear area aligned with front and back doors of 40 and 60' METRO buses

6. Other recommendations and results
    - Consider "Yield to Bus" markings in the adjacent travel lane to support buses ability to merge back into traffic
    - Consider signage and/or pavement marking strategies to discourage vehicles from pulling into the bus stop area by following the bus.
    - Where design would not allow adequate visibility for bus to merge into traffic from the pullout or where insufficient gaps exist to reenter the travel lane in a timely manner, it is recommended the bus stop be located in the travel lane.

METRO Comments on Proposed Typical Bus Stop Geometry for Lower Westheimer





DETAIL
1"=20'

NOTE: These comments refer to a typical bus stop pull-out. Individual bus stops should be assessed to ensure they maintain adequate sight distance and ability for bus driver to safely merge into travel lane and find an acceptable gap in a timely manner.

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LOWER WESTHEIMER
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