Garth Road Widening
Traffic Analysis

BAYTOWN, TEXAS

MARCH 2020

Prepared for: City of Baytown and TxDOT

Prepared by:

Kimley»Horn

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INTRODUCTION

PURPOSE

Kimley-Horn was contracted by City of Baytown for preliminary engineering, environmental, and developing diagrammatic concept plans for Garth Road from SH 146 to IH-10. Preliminary engineering included traffic analysis and concept plans for access management and capacity improvements. This technical memorandum describes traffic analysis methodology and results which were used to determine recommended improvements. The scope of services for this analysis includes the following items:

- Inventory existing (2020) roadway network
- Aggregate existing traffic volumes
- Adjust existing traffic volumes for growth and future design year (2040)
- Describe proposed roadway configurations
- Evaluate traffic operations for 2020 Existing and 2040 Proposed scenarios
- Document Level-of-Service (LOS) at study intersections
- Provide access management and capacity recommendations

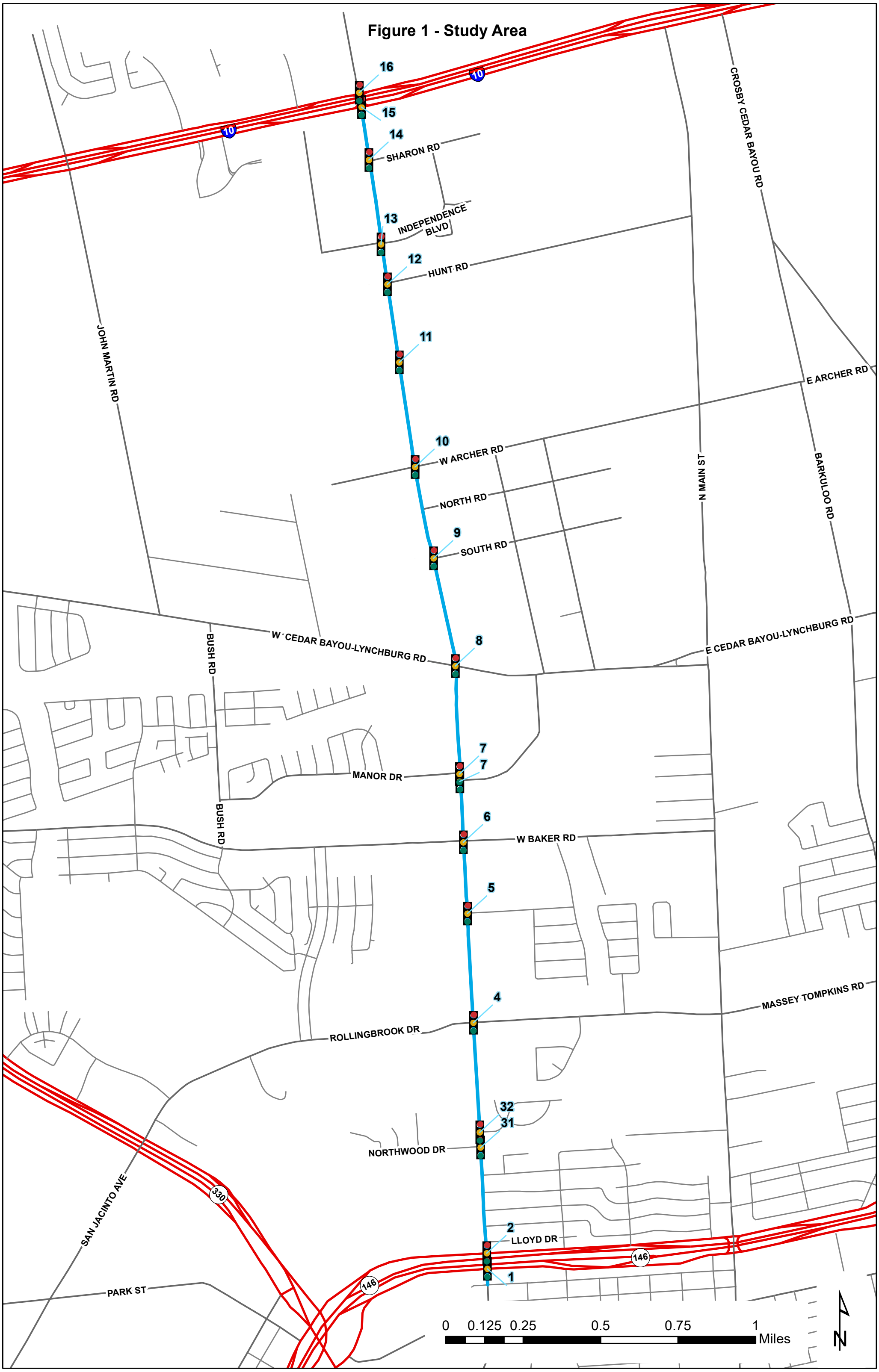
STUDY AREA

For purposes of the traffic analysis, the study corridor includes two segments. South Segment, Garth Road from SH 146 to Barker Road, is not expected to be widened and proposed improvements primarily include driveway closures and raised median installments. North Segment, Garth Road from Baker Road to IH-10, is expected to be widened therefore capacity improvements are also recommended. An aerial of the study area is provided as **Figure 1**. A list of intersections along Garth Road included for evaluation within the study area are provided as **Table 1**.

Table 1 – Study Area Intersections

Node	Segment	Cross Street
1	South	SH 146 (EB)
2	South	SH 146 (WB)
31	South	Northwood Dr
32	South	Scenic Dr
4	South	Rollingbrook Dr
5	South	Birdsong Dr
6		Baker Rd
7	North	Baytown Central Blvd
8	North	Lynchburg Cedar Bayou Rd
9	North	South Rd
10	North	W Archer Rd
11	North	Santavy St
12	North	Hunt Rd
13	North	Independence Blvd
14	North	Sharon Ln
15	North	IH 10 (EB)
16	North	IH 10 (WB)

Figure 1 - Study Area



ANALYSIS METHODOLOGY

ANALYSIS SCENARIOS

Traffic analysis of the study area consists of two scenarios for which peak hour LOS analyses were performed. For both capacity analysis calculations and traffic simulation results, this analysis was conducted using *Synchro 10™* software and analysis output is provided as an **Appendix**. Traffic signal timings at study intersections were optimized as an adaptive system is operating along Garth Road. **Table 2** provides a summary of the analysis assumptions for each scenario.

Table 2 – Analysis Scenario Summary

Scenario	Roadway Network	Traffic Volumes
2020 Existing	2020 Lane Assignments	2020 Peak Hour Volumes
2040 Background	2020 Existing	2020 Existing + **Background Growth + Left-Turn Volume Redistribution**
2040 Proposed	2020 Existing + **Proposed Improvements**	2040 Background

2020 EXISTING SCENARIO

Within the study area, Garth Road is a north-south roadway approximately 3.8 miles in length bounded by SH 146 to the south and IH 10 to the north. From SH 146 to Baker Road (1.4 miles), Garth Road is primarily a 60-foot wide concrete roadway consisting of two 12-foot lanes in each direction with a 12-foot wide center two-way-left-turn lane (TWLTL). This south segment has curb-and-gutter drainage and a back-of-curb sidewalk on the westside. South of Baker Road, the posted speed limit is 40 miles-per-hour.

From Baker Road to IH 10 (2.4 miles), Garth Road is primarily a 76-foot wide concrete roadway consisting of two 12-foot lanes in each direction, a 12-foot wide center TWLTL, with 8-foot shoulders. This north segment has open-ditch drainage and discontinuous sidewalks on the westside. North of Baker Road, the posted speed limit is 45 miles-per-hour. 2020 existing lane assignments are provided as **Figure 2**. 24-hour turning movement counts at signalized intersections along Garth Road were provided by City of Baytown in January of 2020. 2020 existing PM peak hour volumes are provided as **Figure 3**.

Figure 2 - 2020 Existing Lane Assignments

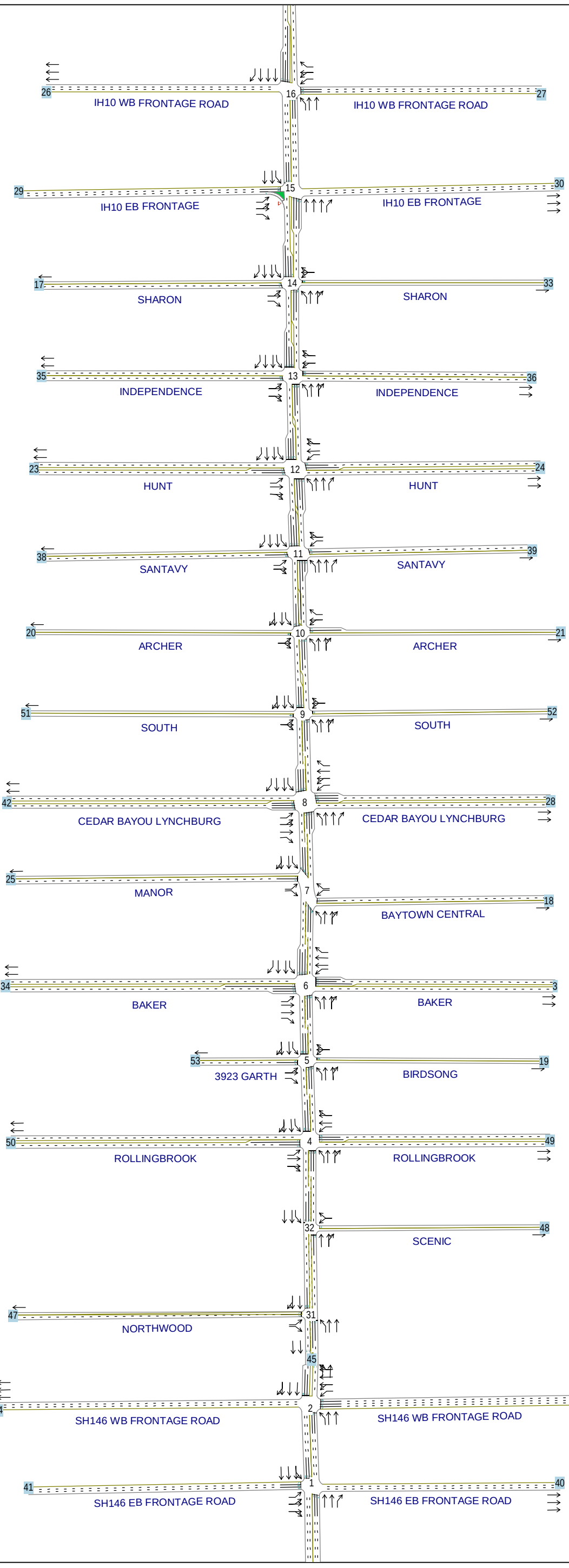
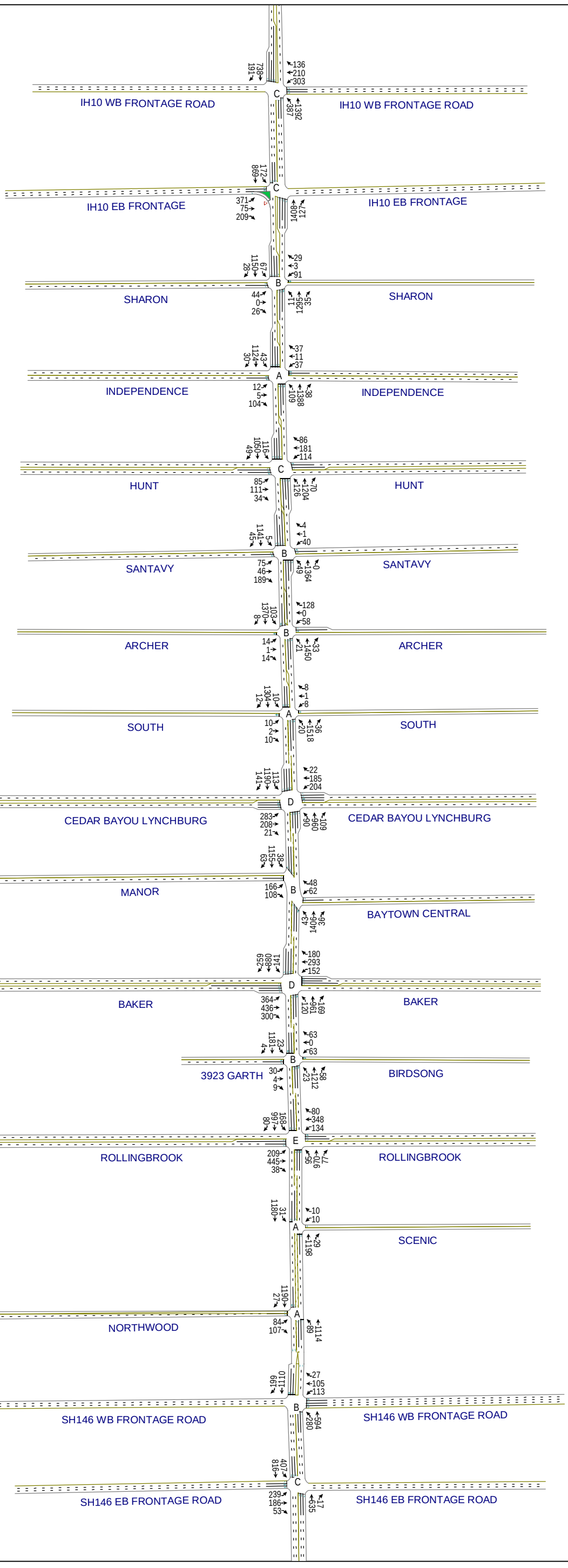


Figure 3 - 2020 Existing Peak Hour Volumes



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2040 TRAFFIC VOLUMES

Houston-Galveston Area Council (H-GAC) is the Metropolitan Planning Organization for Harris County and the surrounding region. H-GAC maintains a Travel Demand Model for the region which is used to model traffic patterns based on roadway connections and socioeconomic characteristics (population, employment, etc.). HGAC Travel Demand Model output for years 2020 and 2045 was reviewed to calculate an annual growth rate along Garth Road. Average daily traffic (ADT) and growth rates vary by segment along Garth Road and are provided as **Table 3**. Annual growth rates were applied to existing (2020) turning movement count volumes to estimate year 2040 volumes. Year 2019 (counts collected Thursday, September 5th, 2019) and year 2040 ADTs are provided as **Table 4**. Year 2040 (background and proposed scenarios) PM peak hour volumes are provided as **Figure 4**.

Table 3 – Projected ADT and Growth Rate

Segment	2020 Volume	2045 Volume	Cumulative Growth	Annual Growth
North	18,956	34,688	83%	2.40%
South	27,520	38,506	40%	1.40%

Table 4 – Years 2019 and 2040 ADT Comparison

Segment	2019 ADT	Annual Growth	Cumulative Growth	2040 Volume
North	35,917	2.40%	62%	58,243
South	33,308	1.40%	31%	43,577

2040 ROADWAY NETWORK

Several proposed improvements were incorporated into the 2040 roadway network and analyzed to determine if sufficient capacity is provided to accommodate projected traffic volume growth. 2040 proposed lane assignments are provided as **Figure 5**. In addition to capacity improvements, access management improvements are proposed along south and north segments of Garth Road. With the installation of raised median, access will be restricted at many driveways and minor streets which intersect Garth Road. As a result, left-turn volumes were increased at signalized intersections based on anticipated left-turn volume redistribution.

Figure 4 - 2040 PM Peak Hour Volumes

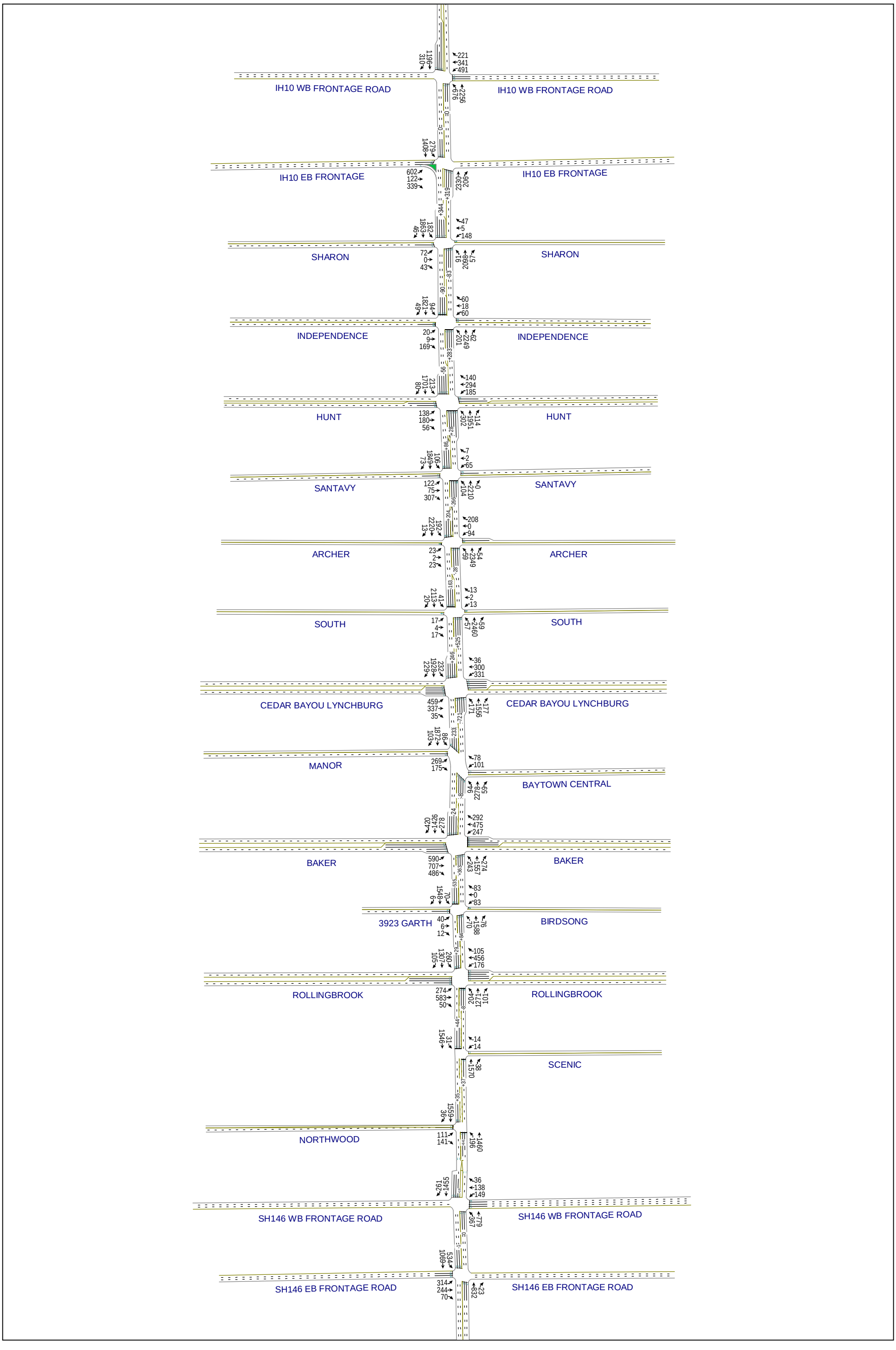

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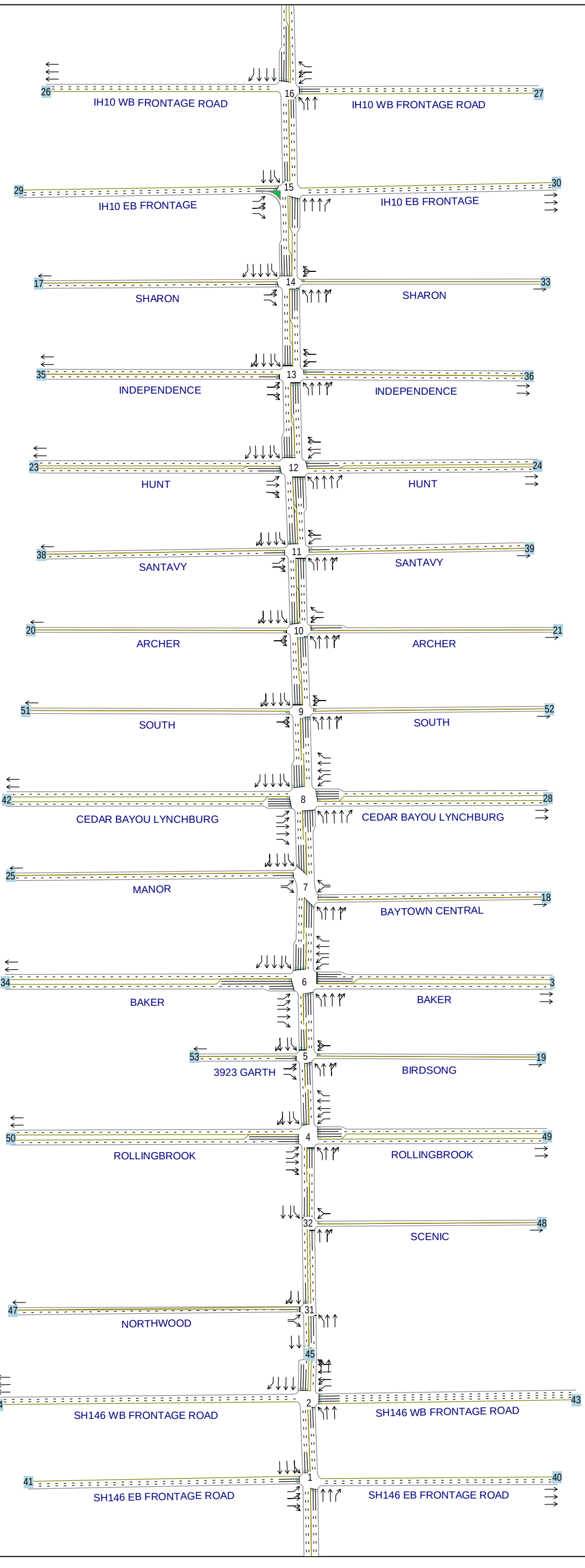
Figure 5 - 2040 Proposed Lane Assignments



TRAFFIC ANALYSIS

LEVEL-OF-SERVICE EVALUATIONS

Traffic analysis of the study area consists only of PM peak hour LOS analysis because, at nearly every turning movement, larger volumes are observed during the PM peak. The purpose of this analysis is to determine 2020 Existing and 2040 Proposed scenario LOS at study intersections, identify deficiencies in the roadway network and recommend mitigation improvements, if necessary.

Traffic operations are affected by various geometric factors including roadway type (e.g. divided or undivided), number of lanes, lane widths, and grades. LOS, which is a measure of the degree of congestion, ranges from LOS A (free flowing) to LOS F (a congested, forced flow condition). LOS thresholds for signalized intersections are presented in **Table 5**.

Table 5 – LOS Thresholds

Level of Service	Control Delay for Signalized Intersections (sec/veh)	Description
A	≤ 10	No delays at intersections with continuous flow traffic. Uncongested operations; high frequency of long gaps available for all left and right-turning traffic; no observable queues.
B	> 10 and ≤ 20	
C	> 20 and ≤ 35	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	> 35 and ≤ 55	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No long-standing lines formed.
E	> 55 and ≤ 80	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 80	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

2020 EXISTING LOS RESULTS

2020 Existing scenario delay, volume-to-capacity (v/c) ratios, and Level of Service (LOS) were determined at signalized intersections based on **existing volumes, existing roadway** configuration, and existing signal timing parameters. Corridor-level capacity analyses were also performed which report various measures of effectiveness (MOEs) such as total delay, stops, and total travel time. 2020 existing LOS results are provided as **Table 6** and *Synchro 10™* output is provided as an **Appendix**.

Table 6 – 2020 Existing LOS Results (PM Peak Hour)

Node	Intersection	Intersection		EB		WB		NB		SB	
1	SH 146 (EB) @ Garth Rd	17.5	B	58.6	E	0.0		13.3	B	3.7	A
2	SH 146 (WB) @ Garth Rd	16.7	B	0.0		43.5	D	16.2	B	11.9	B
31	Northwood Dr @ Garth Rd	9.6	A	39.5	D	0.0	A	11.4	B	3.2	A
32	Scenic Dr @ Garth Rd	4.9	A	0.0		35.5	D	2.9	A	6.4	A
4	Rollingbrook Dr @ Garth Rd	48.3	D	65.9	E	70.2	E	37.5	D	38.5	D
5	Birdsong Dr @ Garth Rd	6.7	A	47.7	D	37.3	D	3.3	A	5.8	A
6	Baker Rd @ Garth Rd	43.5	D	51.0	D	66.4	E	35.7	D	33.4	C
7	Baytown Central Blvd @ Garth Rd	14.7	B	44.4	D	33.2	C	9.7	A	12.5	B
8	Lynchburg Cedar Bayou Rd @ Garth Rd	39.4	D	67.3	E	66.1	E	30.6	C	28.9	C
9	South Rd @ Garth Rd	4.5	A	43.0	D	43.9	D	3.5	A	4.6	A
10	W Archer Rd @ Garth Rd	10.7	B	35.4	D	31.5	C	10.0	B	8.3	A
11	Santavy St @ Garth Rd	14.0	B	39.1	D	61.7	E	7.0	A	14.0	B
12	Hunt Rd @ Garth Rd	23.5	C	54.3	D	60.9	E	14.7	B	16.2	B
13	Independence Blvd @ Garth Rd	7.7	A	18.8	B	38.8	D	5.4	A	7.3	A
14	Sharon Ln @ Garth Rd	10.4	B	31.6	C	68.1	E	6.2	A	8.1	A
15	IH 10 (EB) @ Garth Rd	26.3	C	42.5	D	0.0		28.7	C	12.5	B
16	IH 10 (WB) @ Garth Rd	22.2	C	0.0		50.3	D	11.3	B	23.5	C

As shown in the table above, all study area intersections operate at LOS D or better in the PM peak hour.

2040 BACKGROUND LOS RESULTS

2040 Background scenario delay, volume-to-capacity (v/c) ratios, and Level of Service (LOS) were determined at signalized intersections based on **future volumes**, existing roadway configuration, and existing signal timing parameters. Corridor-level capacity analyses were also performed which report various measures of effectiveness (MOEs) such as total delay, stops, and total travel time. 2040 background LOS results are provided as **Table 7** and *Synchro 10*^{TM} output is provided as an **Appendix**.

Table 7 – 2040 Background LOS Results (PM Peak Hour)

Node	Intersection	Intersection		EB		WB		NB		SB	
1	SH 146 (EB) @ Garth Rd	26.5	C	65.3	E	0.0		23.5	C	12.8	B
2	SH 146 (WB) @ Garth Rd	27.1	C	0.0		42.0	D	43.9	D	13.1	B
31	Northwood Dr @ Garth Rd	13.3	B	40.9	D	0.0	A	18.7	B	3.3	A
32	Scenic Dr @ Garth Rd	5.0	A	0.0		33.4	C	4.0	A	5.5	A
4	Rollingbrook Dr @ Garth Rd	102.4	F	78.9	E	138.5	F	125.6	F	77.4	E
5	Birdsong Dr @ Garth Rd	11.7	B	46.0	D	46.2	D	10.4	B	8.4	A
6	Baker Rd @ Garth Rd	179.2	F	167.1	F	201.2	F	232.5	F	126.9	F
7	Baytown Central Blvd @ Garth Rd	40.3	D	53.4	D	31.1	C	46.1	D	31.3	C
8	Lynchburg Cedar Bayou Rd @ Garth Rd	137.1	F	136.9	F	111.9	F	114.0	F	162.6	F
9	South Rd @ Garth Rd	13.1	B	44.7	D	43.6	D	12.8	B	12.6	B
10	W Archer Rd @ Garth Rd	40.4	D	35.4	D	48.6	D	56.2	E	23.5	C
11	Santavy St @ Garth Rd	122.1	F	50.8	D	78.8	E	172.8	F	83.5	F
12	Hunt Rd @ Garth Rd	142.0	F	64.6	E	92.3	F	182.3	F	124.1	F
13	Independence Blvd @ Garth Rd	56.2	E	34.4	C	40.5	D	51.7	D	65.2	E
14	Sharon Ln @ Garth Rd	49.7	D	31.0	C	83.7	F	56.2	E	40.5	D
15	IH 10 (EB) @ Garth Rd	89.4	F	89.9	F	0.0		103.4	F	68.1	E
16	IH 10 (WB) @ Garth Rd	82.7	F	0.0		101.4	F	72.9	E	88.8	F

As shown in the table above, several study area intersections are over capacity due to background traffic volume growth and operate at LOS E or F in the PM peak hour. Increased delay is most prevalent along the North Segment of Garth Road, from Baker Road to IH-10.

2040 PROPOSED LOS RESULTS

2040 Proposed scenario delay, volume-to-capacity (v/c) ratios, and Level of Service (LOS) were determined at signalized intersections based on 2040 projected volumes, **proposed roadway** configuration, and optimized signal timing splits/offsets. Corridor-level capacity analyses were also performed which report various MOEs such as total delay, stops, and total travel time. 2040 proposed LOS results are provided as **Table 8** and *Synchro 10™* output is provided as an **Appendix**.

Table 8 – 2040 Proposed LOS Results (PM Peak Hour)

Node	Intersection	Intersection		EB		WB		NB		SB	
1	SH 146 (EB) @ Garth Rd	27.0	C	65.2	E	0.0		23.5	C	13.9	B
2	SH 146 (WB) @ Garth Rd	24.9	C	0.0		42.0	D	42.0	D	10.2	B
31	Northwood Dr @ Garth Rd	13.3	B	40.9	D	0.0	A	18.7	B	3.4	A
32	Scenic Dr @ Garth Rd	5.0	A	0.0		33.4	C	4.0	A	5.7	A
4	Rollingbrook Dr @ Garth Rd	68.0	E	86.4	F	69.2	E	69.3	E	56.4	E
5	Birdsong Dr @ Garth Rd	11.7	B	46.0	D	46.2	D	11.0	B	7.6	A
6	Baker Rd @ Garth Rd	74.4	E	81.2	F	90.1	F	90.4	F	45.4	D
7	Baytown Central Blvd @ Garth Rd	20.6	C	53.4	D	31.1	C	15.4	B	18.7	B
8	Lynchburg Cedar Bayou Rd @ Garth Rd	49.3	D	73.7	E	74.0	E	40.7	D	40.8	D
9	South Rd @ Garth Rd	6.7	A	44.7	D	43.6	D	5.4	A	7.2	A
10	W Archer Rd @ Garth Rd	19.0	B	35.4	D	48.6	D	16.9	B	17.2	B
11	Santavy St @ Garth Rd	33.5	C	50.8	D	78.8	E	28.5	C	33.1	C
12	Hunt Rd @ Garth Rd	45.3	D	64.6	E	92.3	F	38.2	D	35.6	D
13	Independence Blvd @ Garth Rd	15.9	B	34.4	C	40.5	D	9.6	A	20.5	C
14	Sharon Ln @ Garth Rd	21.6	C	30.5	C	78.7	E	13.4	B	24.5	C
15	IH 10 (EB) @ Garth Rd	77.8	E	83.3	F	0.0		78.7	E	73.1	E
16	IH 10 (WB) @ Garth Rd	72.5	E	0.0		106.7	F	70.1	E	53.1	D

As shown in the table above, proposed roadway improvements reduce delay (as compared to 2040 Background scenario results) at several study area intersections. All study area intersections operate at LOS D or better in the PM peak hour with the exception Rollingbrook, Baker, and IH 10 where ROW constraints limit additional capacity improvements.

SUPPLEMENTAL ROADWAY CAPACITY ANALYSIS

Additionally, a traffic simulation was performed to validate the anticipated corridor LOS along Garth Road and confirm that the proposed cross-section (with access management improvements) provides sufficient capacity for year 2040 volumes. Based on discussions with City of Baytown staff, capacity analysis methodology referenced Chapter 18 of the 2016 Highway Capacity Manual (HCM). Per Exhibit 18-1, provided as **Figure 6**, urban street segment LOS is related to travel speed as a percentage of base free-flow speed.

Per Equation 18-3, provided as **Figure 7**, base free-flow speed is a function of posted speed limit, cross section, access point density, and on-street parking. Base free-flow speed was calculated by segment (south and north) for 2020 Existing and 2040 Proposed scenarios. Base free-flow speed calculations and corresponding assumptions are provided as an **Appendix**.

Figure 6 – LOS Criteria: Motorized Vehicle Mode

LOS	Travel Speed Threshold by Base Free-Flow Speed (mi/h)							Volume-to-Capacity Ratio[a]
	55	50	45	40	35	30	25	
A	>44	>40	>36	>32	>28	>24	>20	≤ 1.0
B	>37	>34	>30	>27	>23	>20	>17	
C	>28	>25	>23	>20	>18	>15	>13	
D	>22	>20	>18	>16	>14	>12	>10	
E	>17	>15	>14	>12	>11	>9	>8	
F	≤17	≤15	≤14	≤12	≤11	≤9	≤8	
F	Any							> 1.0

Note: [a] Volume-to-capacity ratio of through movement at downstream boundary intersection.

Figure 7 - Base Free-Flow Speed (Equation 18-3)

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

where

S_{fo} = base free-flow speed (mi/h),

S_{calib} = base free-flow speed calibration factor (mi/h),

S_0 = speed constant (mi/h),

f_{CS} = adjustment for cross section (mi/h),

f_A = adjustment for access points (mi/h), and

f_{pk} = adjustment for on-street parking (mi/h).

Multiple (five) runs were performed by SimTraffic for which travel speed was reported at each roadway link (between intersections) along Garth Road. Arterial speed (average run travel speed) reported by SimTraffic and corresponding LOS for roadway links along Garth Road for years 2020 and 2040 PM peak hour are provided as **Table 9** and **Table 10**.

Table 9 – Arterial Speed and LOS (Northbound)

Northbound							
Cross Street	Distance (mi)	2020			2040		
		Speed	BFFS	LOS	Speed	BFFS	LOS
SH146 EB FRONTAGE	0.1	12	41.216	F	9	39.759	F
SH146 WB FRONTAGE	0	24	41.216	C	22	39.759	C
NORTHWOOD	0.3	42	41.216	A	36	39.759	A
SCENIC	0.1	25	41.216	C	22	39.759	C
ROLLINGBROOK	0.4	20	41.216	D	14	39.759	E
BIRDSONG	0.4	28	41.216	B	27	39.759	B
BAKER	0.2	12	41.216	F	10	39.759	F
BAYTOWN CENTRAL	0.2	30	41.216	B	28	39.759	B
CEDAR BAYOU LYNCHBUR	0.4	25	41.216	C	24	39.759	C
SOUTH	0.4	37	44.918	A	35	43.191	A
ARCHER	0.3	32	44.918	B	27	43.191	C
SANTAVY	0.3	32	44.918	B	20	43.191	D
HUNT	0.3	23	44.918	C	14	43.191	E
INDEPENDENCE	0.1	23	44.918	C	20	43.191	D
SHARON	0.3	29	44.918	C	12	43.191	F
IH10 EB FRONTAGE	0.2	15	44.918	E	7	43.191	F
IH10 WB FRONTAGE	0	21	44.918	D	20	43.191	D

Table 10 – Arterial Speed and LOS (Southbound)

Southbound							
Cross Street	Distance (mi)	2020			2040		
		Speed	BFFS	LOS	Speed	BFFS	LOS
IH10 WB FRONTAGE	0.1	15	44.918	E	13	43.191	E
IH10 EB FRONTAGE	0	21	44.918	D	20	43.191	D
SHARON	0.2	30	44.918	C	23	43.191	C
INDEPENDENCE	0.3	32	44.918	B	27	43.191	C
HUNT	0.1	17	44.918	E	10	43.191	F
SANTAVY	0.3	25	44.918	C	18	43.191	D
ARCHER	0.3	34	44.918	B	30	43.191	B
SOUTH	0.3	38	44.918	A	34	43.191	B
CEDAR BAYOU LYNCHBUR	0.4	21	44.918	D	20	43.191	D
MANOR	0.4	34	44.918	B	30	43.191	B
BAKER	0.2	15	44.918	E	7	43.191	F
3923 GARTH	0.2	31	41.216	B	31	39.759	B
ROLLINGBROOK	0.4	23	41.216	C	22	39.759	C
SCENIC	0.4	32	41.216	B	30	39.759	B
NORTHWOOD	0.1	26	41.216	C	22	39.759	C
SH146 WB FRONTAGE	0.3	25	41.216	C	17	39.759	D
SH146 EB FRONTAGE	0	17	41.216	D	18	39.759	D

CONCLUSIONS AND RECOMMENDATIONS

Based on the 2040 Proposed scenario analysis, LOS along Garth Road is expected to be maintained (or deteriorate slightly) at study area intersections. Widening from two to three lanes is recommended between Baker Rd and IH 10 (north segment) to accommodate project growth. All study area intersections operate at LOS D or better in the PM peak hour with the exception Rollingbrook, Baker, and IH 10 where ROW constraints limit additional capacity improvements. Capacity improvements, shown conceptually as **Figure 5**, recommended at signalized intersections along Garth Road from SH 146 to IH-10 are enumerated as **Table 10**. Turn lane lengths should be designed to accommodate 2040 95th percentile queue lengths (provided as **Table 11**) where space permits.

Table 11 – Recommended Capacity Improvements

Index	Cross Street	Mvmt	Capacity Improvement
1	SH 146 (WB)	SBR	Add exclusive lane
2	Rollingbrook Dr	EBL	Provide dual left-turn lane
3	Rollingbrook Dr	WBL	Provide dual left-turn lane
4	Rollingbrook Dr	WBR	Add exclusive right-turn lane (with RT overlap phase)
5	Baker Rd	NBT	Add thru lane (widen outside edge of pavement)
6	Baker Rd	EBL	Provide dual left-turn lane
7	Baker Rd	WBL	Provide dual left-turn lane
8	Lynchburg Cedar Bayou Rd	EBL	Add dual left-turn lane
9	Lynchburg Cedar Bayou Rd	WBL	Add dual left-turn lane
10	Lynchburg Cedar Bayou Rd	INT	East-west split-phased removed
11	Santavy St	NBR	Existing right-turn lane to be removed
12	Santavy St	SBR	Existing right-turn lane to be removed
13	Independence Blvd	SBR	Existing right-turn lane to be removed
14	IH 10 (EB)	EBR	Provide free right-turn movement
15	IH 10 (WB)	WBR	Add right-turn lane

Table 12 - PM Peak Hour Queue Length Comparison (By Movement)

Index	Node	Intersection	Movement	2019 Existing	2040 Background	2040 Proposed	Storage Length Recommended
1	2	SH 146 WBFR	SBR	0	0	46	**200**
2	31	Northwood Dr	NBL	128	314	314	250
3	32	Scenic Dr	SBL	6	4	5	**150**
4	4	Rollingbrook Dr	NBL	168	411	338	**400**
5	4	Rollingbrook Dr	SBL	249	443	394	**400**
6	5	Birdsong Dr	NBL	2	10	14	**150**
7	5	Birdsong Dr	SBL	5	9	6	**150**
8	6	Baker Rd	NBL	209	477	366	**400**
9	6	Baker Rd	SBL	267	462	461	400
10	6	Baker Rd	SBR	48	149	137	**200**
11	7	Baytown Central Blvd	NBL	42	70	86	**150**
12	7	Baytown Central Blvd	SBL	68	159	159	150
13	8	W Cedar Bayou Rd	NBL	145	325	289	**350**
14	8	W Cedar Bayou Rd	SBL	168	345	324	**350**
15	9	South Rd	NBL	5	11	10	**150**
16	9	South Rd	SBL	3	24	25	**150**
17	10	Archer Rd	NBL	8	55	43	**150**
18	10	Archer Rd	SBL	48	119	170	**200**
19	11	Santavy St	NBL	8	52	84	**200**
20	11	Santavy St	SBL	3	58	85	**200**
21	12	Hunt Rd	NBL	69	192	351	300
22	12	Hunt Rd	NBR	1	4	9	**200**
23	12	Hunt Rd	SBL	60	209	309	250
24	12	Hunt Rd	SBR	7	5	21	**200**
25	13	Independence Blvd	NBL	23	105	142	**250**
26	13	Independence Blvd	SBL	21	47	89	**200**
27	14	Sharon Ln	NBL	16	84	148	**200**
28	14	Sharon Ln	SBL	106	345	343	200
29	14	Sharon Ln	SBR	4	9	11	**200**
30	15	IH-10 EBFR	NBR	96	120	160	**200**

APPENDIX

Kimley»Horn

Synchro Reports Summary – LOS Comparison

PM Peak Hour LOS Comparison (By Intersection)

Node	Intersection	2019 Existing		2040 Background		2040 Proposed	
		sec/veh	LOS	sec/veh	LOS	sec/veh	LOS
1	SH 146 (EB) @ Garth Rd	17.5	B	26.5	C	27.0	C
2	SH 146 (WB) @ Garth Rd	16.7	B	27.1	C	24.9	C
31	Northwood Dr @ Garth Rd	9.6	A	13.3	B	13.3	B
32	Scenic Dr @ Garth Rd	4.9	A	5.0	A	5.0	A
4	Rollingbrook Dr @ Garth Rd	48.3	D	102.4	**F**	68.0	**E**
5	Birdsong Dr @ Garth Rd	6.7	A	11.7	B	11.7	B
6	Baker Rd @ Garth Rd	43.5	D	179.2	**F**	74.4	**E**
7	Baytown Central Blvd @ Garth Rd	14.7	B	40.3	D	20.6	C
8	Lynchburg Cedar Bayou Rd @ Garth Rd	39.4	D	137.1	**F**	49.3	D
9	South Rd @ Garth Rd	4.5	A	13.1	B	6.7	A
10	W Archer Rd @ Garth Rd	10.7	B	40.4	D	19.0	B
11	Santavy St @ Garth Rd	14.0	B	122.1	**F**	33.5	C
12	Hunt Rd @ Garth Rd	23.5	C	142.0	**F**	45.3	D
13	Independence Blvd @ Garth Rd	7.7	A	56.2	**E**	15.9	B
14	Sharon Ln @ Garth Rd	10.4	B	49.7	D	21.6	C
15	IH 10 (EB) @ Garth Rd	26.3	C	89.4	**F**	77.8	**E**
16	IH 10 (WB) @ Garth Rd	22.2	C	82.7	**F**	72.5	**E**

PM Peak Hour LOS Comparison (By Approach)

Intersection	Approach	2019 Existing		2040 Background		2040 Proposed	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Signalized Intersections							
SH 146 (EB) @ Garth Rd	NB Approach	13.3	B	23.5	C	23.5	C
	SB Approach	3.7	A	12.8	B	13.9	B
	EB Approach	58.6	**E**	65.3	**E**	65.2	**E**
	WB Approach	0.0	A	0.0	A	0.0	A
	Intersection	**17.5**	**B**	**26.5**	**C**	**27.0**	**C**
SH 146 (WB) @ Garth Rd	NB Approach	16.2	B	43.9	D	42.0	D
	SB Approach	11.9	B	13.1	B	10.2	B
	EB Approach	0.0	A	0.0	A	0.0	A
	WB Approach	43.5	D	42.0	D	42.0	D
	Intersection	**16.7**	**B**	**27.1**	**C**	**24.9**	**C**
Northwood Dr @ Garth Rd	NB Approach	11.4	B	18.7	B	18.7	B
	SB Approach	3.2	A	3.3	A	3.4	A
	EB Approach	39.5	D	40.9	D	40.9	D
	WB Approach	0.0	A	0.0	A	0.0	A
	Intersection	**9.6**	**A**	**13.3**	**B**	**13.3**	**B**
Scenic Dr @ Garth Rd	NB Approach	2.9	A	4.0	A	4.0	A
	SB Approach	6.4	A	5.5	A	5.7	A
	EB Approach	0.0	A	0.0	A	0.0	A
	WB Approach	35.5	D	33.4	C	33.4	C
	Intersection	**4.9**	**A**	**5.0**	**A**	**5.0**	**A**
Rollingbrook Dr @ Garth Rd	NB Approach	37.5	D	125.6	**F**	69.3	**E**
	SB Approach	38.5	D	77.4	**E**	56.4	**E**
	EB Approach	65.9	**E**	78.9	**E**	86.4	**F**
	WB Approach	70.2	**E**	138.5	**F**	69.2	**E**
	Intersection	**48.3**	**D**	**102.4**	**F**	**68.0**	**E**
Birdsong Dr @ Garth Rd	NB Approach	3.3	A	10.4	B	11.0	B
	SB Approach	5.8	A	8.4	A	7.6	A
	EB Approach	47.7	D	46.0	D	46.0	D
	WB Approach	37.3	D	46.2	D	46.2	D
	Intersection	**6.7**	**A**	**11.7**	**B**	**11.7**	**B**
Baker Rd @ Garth Rd	NB Approach	35.7	D	232.5	**F**	90.4	**F**
	SB Approach	33.4	C	126.9	**F**	45.4	D
	EB Approach	51.0	D	167.1	**F**	81.2	**F**
	WB Approach	66.4	**E**	201.2	**F**	90.1	**F**
	Intersection	**43.5**	**D**	**179.2**	**F**	**74.4**	**E**
Baytown Central Blvd @ Garth Rd	NB Approach	9.7	A	46.1	D	15.4	B
	SB Approach	12.5	B	31.3	C	18.7	B
	EB Approach	44.4	D	53.4	D	53.4	D
	WB Approach	33.2	C	31.1	C	31.1	C
	Intersection	**14.7**	**B**	**40.3**	**D**	**20.6**	**C**

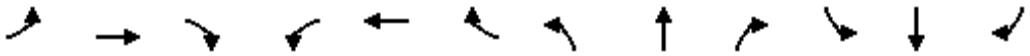
PM Peak Hour LOS Comparison (By Approach)

Intersection	Approach	2019 Existing		2040 Background		2040 Proposed	
		Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS	Delay (Sec/Veh)	LOS
Signalized Intersections							
Lynchburg Cedar Bayou Rd @ Garth Rd	NB Approach	30.6	C	114.0	**F**	40.7	D
	SB Approach	28.9	C	162.6	**F**	40.8	D
	EB Approach	67.3	**E**	136.9	**F**	73.7	**E**
	WB Approach	66.1	**E**	111.9	**F**	74.0	**E**
	Intersection	**39.4**	**D**	**137.1**	**F**	**49.3**	**D**
South Rd @ Garth Rd	NB Approach	3.5	A	12.8	B	5.4	A
	SB Approach	4.6	A	12.6	B	7.2	A
	EB Approach	43.0	D	44.7	D	44.7	D
	WB Approach	43.9	D	43.6	D	43.6	D
	Intersection	**4.5**	**A**	**13.1**	**B**	**6.7**	**A**
W Archer Rd @ Garth Rd	NB Approach	10.0	B	56.2	**E**	16.9	B
	SB Approach	8.3	A	23.5	C	17.2	B
	EB Approach	35.4	D	35.4	D	35.4	D
	WB Approach	31.5	C	48.6	D	48.6	D
	Intersection	**10.7**	**B**	**40.4**	**D**	**19.0**	**B**
Santavy St @ Garth Rd	NB Approach	7.0	A	172.8	**F**	28.5	C
	SB Approach	14.0	B	83.5	**F**	33.1	C
	EB Approach	39.1	D	50.8	D	50.8	D
	WB Approach	61.7	**E**	78.8	**E**	78.8	**E**
	Intersection	**14.0**	**B**	**122.1**	**F**	**33.5**	**C**
Hunt Rd @ Garth Rd	NB Approach	14.7	B	182.3	**F**	38.2	D
	SB Approach	16.2	B	124.1	**F**	35.6	D
	EB Approach	54.3	D	64.6	**E**	64.6	**E**
	WB Approach	60.9	**E**	92.3	**F**	92.3	**F**
	Intersection	**23.5**	**C**	**142.0**	**F**	**45.3**	**D**
Independence Blvd @ Garth Rd	NB Approach	5.4	A	51.7	D	9.6	A
	SB Approach	7.3	A	65.2	**E**	20.5	C
	EB Approach	18.8	B	34.4	C	34.4	C
	WB Approach	38.8	D	40.5	D	40.5	D
	Intersection	**7.7**	**A**	**56.2**	**E**	**15.9**	**B**
Sharon Ln @ Garth Rd	NB Approach	6.2	A	56.2	**E**	13.4	B
	SB Approach	8.1	A	40.5	D	24.5	C
	EB Approach	31.6	C	31.0	C	30.5	C
	WB Approach	68.1	**E**	83.7	**F**	78.7	**E**
	Intersection	**10.4**	**B**	**49.7**	**D**	**21.6**	**C**
IH 10 (EB) @ Garth Rd	NB Approach	28.7	C	103.4	**F**	78.7	**E**
	SB Approach	12.5	B	68.1	**E**	73.1	**E**
	EB Approach	42.5	D	89.9	**F**	83.3	**F**
	WB Approach	0.0	A	0.0	A	0.0	A
	Intersection	**26.3**	**C**	**89.4**	**F**	**77.8**	**E**
IH 10 (WB) @ Garth Rd	NB Approach	11.3	B	72.9	**E**	70.1	**E**
	SB Approach	23.5	C	88.8	**F**	53.1	D
	EB Approach	0.0	A	0.0	A	0.0	A
	WB Approach	50.3	D	101.4	**F**	106.7	**F**
	Intersection	**22.2**	**C**	**82.7**	**F**	**72.5**	**E**

Kimley»Horn

2020 Existing Scenario Synchro Reports

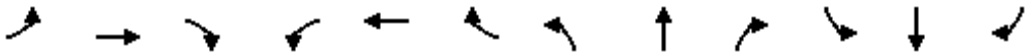
1: GARTH & SH146 EB FRONTAGE ROAD



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	239	186	53	0	0	0	0	635	17	407	816	0
Future Volume (vph)	239	186	53	0	0	0	0	635	17	407	816	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)	34%											
Lane Group Flow (vph)	166	338	0	0	0	0	0	668	18	0	1287	0
Act Effct Green (s)	18.5	18.5						75.7	75.7		93.0	
Actuated g/C Ratio	0.15	0.15						0.61	0.61		0.74	
v/c Ratio	0.70	0.68						0.31	0.02		0.47	
Control Delay	65.5	54.7						13.7	0.1		3.7	
Queue Delay	0.5	0.2						0.0	0.0		0.0	
Total Delay	66.0	54.9						13.7	0.1		3.7	
LOS	E	D						B	A		A	
Approach Delay		58.6						13.3			3.7	
Approach LOS		E						B			A	
Queue Length 50th (ft)	142	137						128	0		38	
Queue Length 95th (ft)	214	180						212	0		54	
Internal Link Dist (ft)		24			44			493			155	
Turn Bay Length (ft)												
Base Capacity (vph)	367	756						2142	994		3300	
Starvation Cap Reductn	0	0						0	0		245	
Spillback Cap Reductn	40	82						15	0		0	
Storage Cap Reductn	0	0						0	0		0	
Reduced v/c Ratio	0.51	0.50						0.31	0.02		0.42	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 17.5	Intersection LOS: B
Intersection Capacity Utilization 62.0%	ICU Level of Service B
Analysis Period (min) 15	

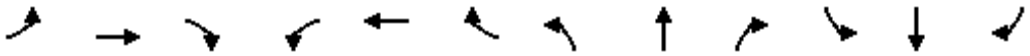
2: GARTH & SH146 WB FRONTAGE ROAD



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	113	105	27	280	594	0	0	1110	199
Future Volume (vph)	0	0	0	113	105	27	280	594	0	0	1110	199
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	64	194	0	295	625	0	0	1377	0
Act Effct Green (s)				18.5	18.5		93.0	97.5			69.9	
Actuated g/C Ratio				0.15	0.15		0.74	0.78			0.56	
v/c Ratio				0.28	0.28		0.62	0.23			0.49	
Control Delay				49.0	41.7		37.5	5.3			11.9	
Queue Delay				0.0	0.0		1.0	0.4			0.0	
Total Delay				49.0	41.7		38.5	5.6			11.9	
LOS				D	D		D	A			B	
Approach Delay					43.5			16.2			11.9	
Approach LOS					D			B			B	
Queue Length 50th (ft)				54	48		129	83			187	
Queue Length 95th (ft)				101	70		249	102			116	
Internal Link Dist (ft)		33			37			155			396	
Turn Bay Length (ft)												
Base Capacity (vph)				347	1073		692	2759			2792	
Starvation Cap Reductn				0	0		196	1499			0	
Spillback Cap Reductn				0	0		0	0			0	
Storage Cap Reductn				0	0		0	0			0	
Reduced v/c Ratio				0.18	0.18		0.59	0.50			0.49	

Intersection Summary			
Cycle Length: 125			
Actuated Cycle Length: 125			
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 56.8%		ICU Level of Service B	
Analysis Period (min) 15			

4: GARTH & ROLLINGBROOK

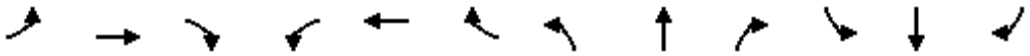


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	209	445	38	134	348	80	95	970	77	168	997	80
Future Volume (vph)	209	445	38	134	348	80	95	970	77	168	997	80
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	220	508	0	141	450	0	100	1102	0	177	1133	0
Act Effct Green (s)	18.8	21.7		15.0	17.9		9.4	49.5		14.8	54.9	
Actuated g/C Ratio	0.15	0.17		0.12	0.14		0.08	0.40		0.12	0.44	
v/c Ratio	0.83	0.83		0.67	0.89		0.75	0.79		0.85	0.74	
Control Delay	75.9	61.5		68.6	70.7		95.7	32.3		74.1	32.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	75.9	61.5		68.6	70.7		95.7	32.3		74.1	32.9	
LOS	E	E		E	E		F	C		E	C	
Approach Delay		65.9			70.2			37.5			38.5	
Approach LOS		E			E			D			D	
Queue Length 50th (ft)	173	207		109	181		86	444		115	371	
Queue Length 95th (ft)	#264	264		#205	#287		#168	307		#249	583	
Internal Link Dist (ft)		413			526			289			1785	
Turn Bay Length (ft)	237			115			100			150		
Base Capacity (vph)	311	704		215	509		141	1390		226	1541	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.71	0.72		0.66	0.88		0.71	0.79		0.78	0.74	

Intersection Summary

Cycle Length: 125
Actuated Cycle Length: 125
Offset: 88 (70%), Referenced to phase 2:SBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 48.3 — Intersection LOS: D
Intersection Capacity Utilization 82.3% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

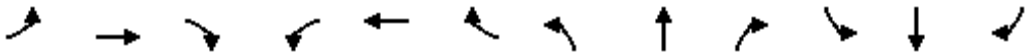
5: GARTH & 3923 GARTH/BIRDSONG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	30	4	9	63	0	63	23	1212	58	23	1181	4
Future Volume (vph)	30	4	9	63	0	63	23	1212	58	23	1181	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	9	0	132	0	24	1323	0	24	1234	0
Act Effct Green (s)		11.8	11.8		11.8		97.6	93.4		97.6	93.4	
Actuated g/C Ratio		0.09	0.09		0.09		0.78	0.75		0.78	0.75	
v/c Ratio		0.34	0.04		0.64		0.07	0.50		0.07	0.47	
Control Delay		59.9	0.3		37.3		1.7	3.3		2.8	5.9	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		59.9	0.3		37.3		1.7	3.3		2.8	5.9	
LOS		E	A		D		A	A		A	A	
Approach Delay		47.7			37.3			3.3			5.8	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)		27	0		41		2	95		3	157	
Queue Length 95th (ft)		59	0		104		m2	47		m5	183	
Internal Link Dist (ft)		77			630			1785			381	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)		184	331		306		361	2628		331	2645	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.19	0.03		0.43		0.07	0.50		0.07	0.47	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 29 (23%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 61.0%	ICU Level of Service B
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

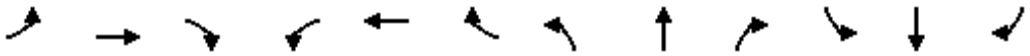


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	364	436	300	152	293	180	120	961	169	141	880	259
Future Volume (vph)	364	436	300	152	293	180	120	961	169	141	880	259
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	387	464	319	162	312	191	128	1202	0	150	936	276
Act Effct Green (s)	29.0	26.9	26.9	14.5	12.4	12.4	11.3	48.1		11.5	48.4	48.4
Actuated g/C Ratio	0.23	0.22	0.22	0.12	0.10	0.10	0.09	0.38		0.09	0.39	0.39
v/c Ratio	0.94	0.61	0.63	0.82	0.92	0.59	0.81	0.89		0.93	0.68	0.38
Control Delay	80.0	48.8	19.1	83.9	88.6	15.3	98.1	29.1		120.4	27.7	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	80.0	48.8	19.1	83.9	88.6	15.3	98.1	29.1		120.4	27.7	5.5
LOS	E	D	B	F	F	B	F	C		F	C	A
Approach Delay		51.0			66.4			35.7			33.4	
Approach LOS		D			E			D			C	
Queue Length 50th (ft)	309	183	61	128	134	0	106	182		130	336	16
Queue Length 95th (ft)	#504	242	166	#231	#227	73	#209	380		#267	250	48
Internal Link Dist (ft)		847			673			676			508	
Turn Bay Length (ft)	330		100	175		120	110			116		116
Base Capacity (vph)	417	760	510	219	338	323	169	1368		162	1384	730
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.93	0.61	0.63	0.74	0.92	0.59	0.76	0.88		0.93	0.68	0.38

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 11 (9%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 43.5	Intersection LOS: D
Intersection Capacity Utilization 88.0%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

7: GARTH & MANOR/BAYTOWN CENTRAL

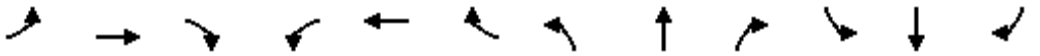


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	166	0	108	62	0	48	43	1406	36	38	1155	63
Future Volume (vph)	166	0	108	62	0	48	43	1406	36	38	1155	63
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	171	0	111	64	0	49	44	1486	0	39	1256	0
Act Effct Green (s)	17.3		17.3	17.3		17.3	8.5	88.3		7.9	87.7	
Actuated g/C Ratio	0.14		0.14	0.14		0.14	0.07	0.71		0.06	0.70	
v/c Ratio	0.70		0.35	0.26		0.19	0.37	0.60		0.35	0.51	
Control Delay	65.9		11.1	49.1		12.4	51.9	8.4		64.3	10.9	
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	65.9		11.1	49.1		12.4	51.9	8.4		64.3	10.9	
LOS	E		B	D		B	D	A		E	B	
Approach Delay		44.4			33.2			9.7			12.5	
Approach LOS		D			C			A			B	
Queue Length 50th (ft)	134		0	47		0	34	200		31	236	
Queue Length 95th (ft)	199		51	87		33	m42	m246		68	364	
Internal Link Dist (ft)		424			375			438			531	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)	346		399	346		352	151	2491		125	2465	
Starvation Cap Reductn	0		0	0		0	0	0		0	0	
Spillback Cap Reductn	0		0	0		0	0	0		0	0	
Storage Cap Reductn	0		0	0		0	0	0		0	0	
Reduced v/c Ratio	0.49		0.28	0.18		0.14	0.29	0.60		0.31	0.51	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 14.7	Intersection LOS: B
Intersection Capacity Utilization 64.2%	ICU Level of Service C
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

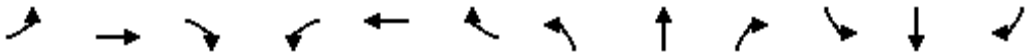
8: GARTH & CEDAR BAYOU LYNCHBURG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	283	208	21	204	185	22	90	960	109	113	1190	141
Future Volume (vph)	283	208	21	204	185	22	90	960	109	113	1190	141
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)	43%			38%								
Lane Group Flow (vph)	172	350	22	135	279	23	96	1021	116	120	1266	150
Act Effct Green (s)	16.9	16.9	16.9	14.1	14.1	14.1	10.1	57.5	57.5	12.5	59.8	59.8
Actuated g/C Ratio	0.14	0.14	0.14	0.11	0.11	0.11	0.08	0.46	0.46	0.10	0.48	0.48
v/c Ratio	0.79	0.80	0.07	0.75	0.74	0.08	0.67	0.63	0.15	0.68	0.75	0.18
Control Delay	77.0	66.8	0.4	77.6	65.9	0.5	78.4	29.2	3.3	79.3	27.1	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.0	66.8	0.4	77.6	65.9	0.5	78.4	29.2	3.3	79.3	27.1	4.2
LOS	E	E	A	E	E	A	E	C	A	E	C	A
Approach Delay		67.3			66.1			30.6			28.9	
Approach LOS		E			E			C			C	
Queue Length 50th (ft)	148	151	0	116	120	0	76	334	0	103	448	5
Queue Length 95th (ft)	#252	207	0	#205	169	0	#145	442	29	168	336	41
Internal Link Dist (ft)		467			939			143			1786	
Turn Bay Length (ft)	100		100	100		100	75		75	100		100
Base Capacity (vph)	244	489	343	206	427	316	156	1627	798	226	1694	825
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.70	0.72	0.06	0.66	0.65	0.07	0.62	0.63	0.15	0.53	0.75	0.18

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 39.4	Intersection LOS: D
Intersection Capacity Utilization 76.2%	ICU Level of Service D
Analysis Period (min) 15	

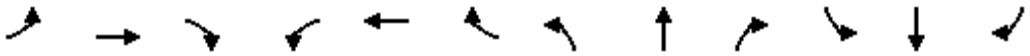
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	10	2	10	8	1	8	20	1518	36	10	1304	12
Future Volume (vph)	10	2	10	8	1	8	20	1518	36	10	1304	12
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	22	0	0	17	0	21	1619	0	10	1371	0
Act Effct Green (s)		7.1			7.1		109.9	111.3		107.4	107.0	
Actuated g/C Ratio		0.06			0.06		0.88	0.89		0.86	0.86	
v/c Ratio		0.22			0.19		0.06	0.52		0.04	0.45	
Control Delay		43.0			43.9		1.8	3.6		1.9	4.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		43.0			43.9		1.8	3.6		1.9	4.6	
LOS		D			D		A	A		A	A	
Approach Delay		43.0			43.9			3.5			4.6	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)		9			7		2	83		1	194	
Queue Length 95th (ft)		37			32		m5	198		3	243	
Internal Link Dist (ft)		278			489			1786			781	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		359			322		337	3139		270	3026	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.06			0.05		0.06	0.52		0.04	0.45	

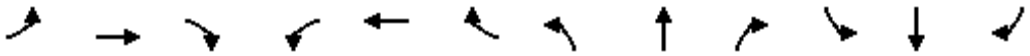
Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay: 4.5	Intersection LOS: A
Intersection Capacity Utilization 58.9%	ICU Level of Service B
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	14	1	14	58	0	128	21	1450	33	103	1370	8
Future Volume (vph)	14	1	14	58	0	128	21	1450	33	103	1370	8
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	29	0	0	59	131	21	1514	0	105	1406	0
Act Effct Green (s)		9.9			9.9	9.9	90.8	86.0		96.5	93.6	
Actuated g/C Ratio		0.08			0.08	0.08	0.76	0.72		0.80	0.78	
v/c Ratio		0.22			0.52	0.51	0.07	0.60		0.40	0.51	
Control Delay		35.4			68.1	15.0	3.2	10.1		9.6	8.2	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		35.4			68.1	15.0	3.2	10.1		9.6	8.2	
LOS		D			E	B	A	B		A	A	
Approach Delay		35.4			31.5			10.0			8.3	
Approach LOS		D			C			B			A	
Queue Length 50th (ft)		11			45	0	2	263		6	22	
Queue Length 95th (ft)		40			87	55	8	397		48	463	
Internal Link Dist (ft)		422			515			657			851	
Turn Bay Length (ft)						150	150			150		
Base Capacity (vph)		190			171	316	293	2531		329	2767	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.15			0.35	0.41	0.07	0.60		0.32	0.51	

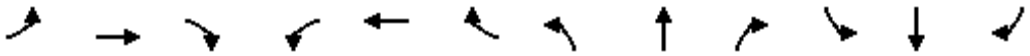
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 82 (68%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.60	
Intersection Signal Delay: 10.7	Intersection LOS: B
Intersection Capacity Utilization 70.2%	ICU Level of Service C
Analysis Period (min) 15	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	75	46	189	40	1	4	49	1364	0	5	1141	45
Future Volume (vph)	75	46	189	40	1	4	49	1364	0	5	1141	45
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	250	0	43	5	0	52	1451	0	5	1214	48
Act Effct Green (s)	17.8	12.3		7.4	9.7		83.8	82.4		80.1	74.5	74.5
Actuated g/C Ratio	0.15	0.10		0.06	0.08		0.70	0.69		0.67	0.62	0.62
v/c Ratio	0.31	0.79		0.40	0.03		0.19	0.60		0.02	0.55	0.05
Control Delay	49.1	36.0		65.2	31.2		4.0	7.1		10.6	14.5	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	49.1	36.0		65.2	31.2		4.0	7.1		10.6	14.5	0.4
LOS	D	D		E	C		A	A		B	B	A
Approach Delay		39.1			61.7			7.0			14.0	
Approach LOS		D			E			A			B	
Queue Length 50th (ft)	52	63		33	1		2	25		1	200	0
Queue Length 95th (ft)	#151	146		72	13		m8	576		m3	281	m1
Internal Link Dist (ft)		467			437			790			324	
Turn Bay Length (ft)							350			175		150
Base Capacity (vph)	261	546		108	454		278	2428		236	2197	1034
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.31	0.46		0.40	0.01		0.19	0.60		0.02	0.55	0.05

Intersection Summary		
Cycle Length: 120		
Actuated Cycle Length: 120		
Offset: 112 (93%), Referenced to phase 2:SBTL, Start of Green		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.79		
Intersection Signal Delay: 14.0	Intersection LOS: B	
Intersection Capacity Utilization 75.6%	ICU Level of Service D	
Analysis Period (min) 15		

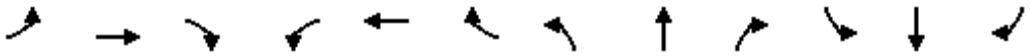
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	85	111	34	114	181	86	126	1204	70	116	1050	49
Future Volume (vph)	85	111	34	114	181	86	126	1204	70	116	1050	49
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	154	0	121	284	0	134	1281	74	123	1117	52
Act Effct Green (s)	9.6	11.7		10.4	12.5		73.8	64.8	64.8	73.9	64.8	64.8
Actuated g/C Ratio	0.08	0.10		0.09	0.10		0.62	0.54	0.54	0.62	0.54	0.54
v/c Ratio	0.63	0.43		0.79	0.70		0.44	0.67	0.08	0.47	0.58	0.06
Control Delay	73.2	43.2		86.8	49.8		14.0	15.6	0.6	15.4	17.0	0.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.2	43.2		86.8	49.8		14.0	15.6	0.6	15.4	17.0	0.9
LOS	E	D		F	D		B	B	A	B	B	A
Approach Delay		54.3			60.9			14.7			16.2	
Approach LOS		D			E			B			B	
Queue Length 50th (ft)	68	47		93	88		8	376	2	20	267	0
Queue Length 95th (ft)	124	78		#188	131		69	142	m1	60	391	7
Internal Link Dist (ft)		732			770			405			306	
Turn Bay Length (ft)	150			150			150		150	150		100
Base Capacity (vph)	162	820		162	832		307	1909	916	261	1910	917
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.19		0.75	0.34		0.44	0.67	0.08	0.47	0.58	0.06

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 23.5	Intersection LOS: C
Intersection Capacity Utilization 73.3%	ICU Level of Service D
Analysis Period (min) 15	

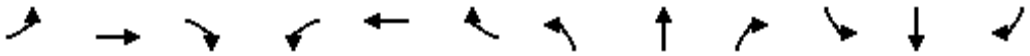
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	12	5	104	37	11	37	109	1388	38	43	1124	30
Future Volume (vph)	12	5	104	37	11	37	109	1388	38	43	1124	30
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	127	0	0	90	0	115	1501	0	45	1183	32
Act Effct Green (s)		7.8			7.8		96.3	89.8		93.4	86.4	86.4
Actuated g/C Ratio		0.06			0.06		0.80	0.75		0.78	0.72	0.72
v/c Ratio		0.45			0.44		0.29	0.57		0.15	0.46	0.03
Control Delay		18.8			38.8		3.5	5.5		4.0	7.6	1.2
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		18.8			38.8		3.5	5.5		4.0	7.6	1.2
LOS		B			D		A	A		A	A	A
Approach Delay		18.8			38.8			5.4			7.3	
Approach LOS		B			D			A			A	
Queue Length 50th (ft)		6			20		10	151		3	107	0
Queue Length 95th (ft)		38			47		m23	193		m21	231	m4
Internal Link Dist (ft)		443			515			238			258	
Turn Bay Length (ft)							150			100		170
Base Capacity (vph)		715			622		410	2640		291	2548	1087
Starvation Cap Reductn		0			0		0	26		0	0	0
Spillback Cap Reductn		0			0		0	0		0	0	0
Storage Cap Reductn		0			0		0	0		0	0	0
Reduced v/c Ratio		0.18			0.14		0.28	0.57		0.15	0.46	0.03

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 6 (5%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 7.7	Intersection LOS: A
Intersection Capacity Utilization 69.1%	ICU Level of Service C
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

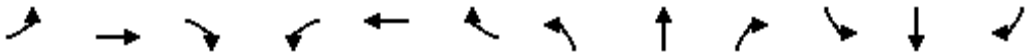


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	44	0	26	91	3	29	11	1295	35	67	1150	28
Future Volume (vph)	44	0	26	91	3	29	11	1295	35	67	1150	28
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	27	0	127	0	11	1371	0	69	1186	29
Act Effct Green (s)		14.7	14.7		14.7		7.0	80.5		9.4	90.7	90.7
Actuated g/C Ratio		0.12	0.12		0.12		0.06	0.67		0.08	0.76	0.76
v/c Ratio		0.28	0.10		0.73		0.11	0.58		0.50	0.44	0.02
Control Delay		50.0	0.8		68.1		63.5	5.7		67.3	4.9	0.8
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		50.0	0.8		68.1		63.5	5.7		67.3	4.9	0.8
LOS		D	A		E		E	A		E	A	A
Approach Delay		31.6			68.1			6.2			8.1	
Approach LOS		C			E			A			A	
Queue Length 50th (ft)		32	0		88		10	60		44	31	0
Queue Length 95th (ft)		66	0		147		m16	214		106	197	4
Internal Link Dist (ft)		243			551			249			400	
Turn Bay Length (ft)							140			100		150
Base Capacity (vph)		242	357		257		103	2379		158	2676	1177
Starvation Cap Reductn		0	0		0		0	0		0	0	0
Spillback Cap Reductn		0	0		0		0	0		0	0	0
Storage Cap Reductn		0	0		0		0	0		0	0	0
Reduced v/c Ratio		0.19	0.08		0.49		0.11	0.58		0.44	0.44	0.02

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 12 (10%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 10.4	Intersection LOS: B
Intersection Capacity Utilization 71.4%	ICU Level of Service C
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

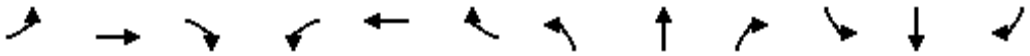
15: GARTH & IH10 EB FRONTAGE



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	371	75	209	0	0	0	0	1408	127	172	869	0
Future Volume (vph)	371	75	209	0	0	0	0	1408	127	172	869	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)	40%											
Lane Group Flow (vph)	225	226	211	0	0	0	0	1422	128	174	878	0
Act Effct Green (s)	23.9	23.9	23.9					64.2	64.2	82.6	87.1	
Actuated g/C Ratio	0.20	0.20	0.20					0.54	0.54	0.69	0.73	
v/c Ratio	0.67	0.66	0.47					0.52	0.14	0.44	0.34	
Control Delay	53.8	53.1	13.5					29.7	17.1	30.5	7.9	
Queue Delay	2.7	2.5	0.0					0.0	0.0	1.9	0.6	
Total Delay	56.4	55.6	13.5					29.8	17.1	32.4	8.5	
LOS	E	E	B					C	B	C	A	
Approach Delay		42.5						28.7			12.5	
Approach LOS		D						C			B	
Queue Length 50th (ft)	171	172	29					266	36	67	120	
Queue Length 95th (ft)	240	240	92					397	96	179	141	
Internal Link Dist (ft)		19			45			358			149	
Turn Bay Length (ft)									140			
Base Capacity (vph)	525	535	608					2718	883	454	2536	
Starvation Cap Reductn	0	0	0					0	0	159	1174	
Spillback Cap Reductn	195	199	0					41	0	0	0	
Storage Cap Reductn	0	0	0					0	0	0	0	
Reduced v/c Ratio	0.68	0.67	0.35					0.53	0.14	0.59	0.64	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 26.3	Intersection LOS: C
Intersection Capacity Utilization 77.5%	ICU Level of Service D
Analysis Period (min) 15	

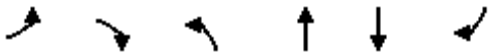
16: GARTH & IH10 WB FRONTAGE ROAD



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	303	210	136	387	1392	0	0	738	191
Future Volume (vph)	0	0	0	303	210	136	387	1392	0	0	738	191
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				17%								
Lane Group Flow (vph)	0	0	0	254	264	137	391	1406	0	0	745	193
Act Effct Green (s)				23.9	23.9	23.9	82.6	87.1			50.0	50.0
Actuated g/C Ratio				0.20	0.20	0.20	0.69	0.73			0.42	0.42
v/c Ratio				0.76	0.76	0.35	0.55	0.55			0.36	0.25
Control Delay				59.4	58.7	15.9	21.3	7.2			27.9	6.6
Queue Delay				0.4	0.3	0.0	3.0	0.4			0.0	0.0
Total Delay				59.7	59.0	15.9	24.3	7.6			27.9	6.6
LOS				E	E	B	C	A			C	A
Approach Delay					50.3			11.3			23.5	
Approach LOS					D			B			C	
Queue Length 50th (ft)				197	205	27	88	132			140	4
Queue Length 95th (ft)				271	280	77	222	174			236	65
Internal Link Dist (ft)		36			31			149			553	
Turn Bay Length (ft)												140
Base Capacity (vph)				525	547	560	818	2551			2046	766
Starvation Cap Reductn				0	0	0	314	555			0	0
Spillback Cap Reductn				53	55	0	0	0			0	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				0.54	0.54	0.24	0.78	0.70			0.36	0.25

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 22.2	Intersection LOS: C
Intersection Capacity Utilization 77.5%	ICU Level of Service D
Analysis Period (min) 15	

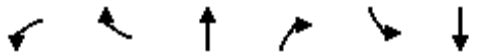
31: GARTH & NORTHWOOD



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	84	107	89	1114	1190	27
Future Volume (vph)	84	107	89	1114	1190	27
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	87	110	92	1148	1255	0
Act Effct Green (s)	10.7	10.7	11.0	98.3	81.3	
Actuated g/C Ratio	0.09	0.09	0.09	0.79	0.65	
v/c Ratio	0.58	0.47	0.59	0.41	0.55	
Control Delay	69.3	16.0	63.8	7.2	3.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	69.3	16.0	63.8	7.2	3.2	
LOS	E	B	E	A	A	
Approach Delay	39.5			11.4	3.2	
Approach LOS	D			B	A	
Queue Length 50th (ft)	69	0	74	176	17	
Queue Length 95th (ft)	120	55	128	294	7	
Internal Link Dist (ft)	435			391	190	
Turn Bay Length (ft)			150			
Base Capacity (vph)	212	286	213	2782	2298	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	2	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.41	0.38	0.43	0.41	0.55	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 9.6	Intersection LOS: A
Intersection Capacity Utilization 63.8%	ICU Level of Service B
Analysis Period (min) 15	

32: GARTH & SCENIC



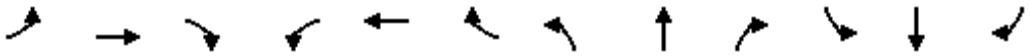
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	10	10	1198	29	31	1180
Future Volume (vph)	10	10	1198	29	31	1180
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	0	1265	0	32	1216
Act Effct Green (s)	10.7		98.3		81.3	81.3
Actuated g/C Ratio	0.09		0.79		0.65	0.65
v/c Ratio	0.13		0.46		0.12	0.53
Control Delay	35.5		2.8		5.4	6.5
Queue Delay	0.0		0.1		0.0	0.0
Total Delay	35.5		2.9		5.4	6.5
LOS	D		A		A	A
Approach Delay	35.5		2.9			6.4
Approach LOS	D		A			A
Queue Length 50th (ft)	8		51		7	151
Queue Length 95th (ft)	32		58		m6	100
Internal Link Dist (ft)	255		190			1242
Turn Bay Length (ft)					150	
Base Capacity (vph)	212		2773		266	2304
Starvation Cap Reductn	0		358		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.09		0.52		0.12	0.53

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 4.9	Intersection LOS: A
Intersection Capacity Utilization 53.2%	ICU Level of Service A
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

2040 Background Scenario Synchro Reports

1: GARTH & SH146 EB FRONTAGE ROAD

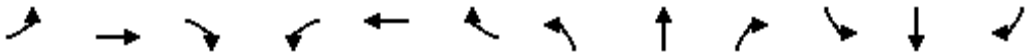


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	314	244	70	0	0	0	0	832	23	534	1069	0
Future Volume (vph)	314	244	70	0	0	0	0	832	23	534	1069	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)	34%											
Lane Group Flow (vph)	218	444	0	0	0	0	0	876	24	0	1687	0
Act Effct Green (s)	22.5	22.5						62.5	62.5		89.0	
Actuated g/C Ratio	0.18	0.18						0.50	0.50		0.71	
v/c Ratio	0.75	0.74						0.50	0.03		0.94dl	
Control Delay	64.6	54.2						24.0	0.0		12.6	
Queue Delay	11.8	5.7						0.1	0.0		0.3	
Total Delay	76.4	59.8						24.2	0.0		12.8	
LOS	E	E						C	A		B	
Approach Delay		65.3						23.5			12.8	
Approach LOS		E						C			B	
Queue Length 50th (ft)	186	182						237	0		78	
Queue Length 95th (ft)	268	229						377	0		258	
Internal Link Dist (ft)		24			44			493			155	
Turn Bay Length (ft)												
Base Capacity (vph)	367	756						1768	837		3153	
Starvation Cap Reductn	0	0						0	0		659	
Spillback Cap Reductn	122	249						207	0		0	
Storage Cap Reductn	0	0						0	0		0	
Reduced v/c Ratio	0.89	0.88						0.56	0.03		0.68	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 26.5	Intersection LOS: C
Intersection Capacity Utilization 77.8%	ICU Level of Service D
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

2: GARTH & SH146 WB FRONTAGE ROAD

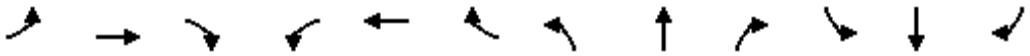


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	149	138	36	367	779	0	0	1455	261
Future Volume (vph)	0	0	0	149	138	36	367	779	0	0	1455	261
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	85	255	0	386	820	0	0	1807	0
Act Effct Green (s)				22.5	22.5		89.0	93.5			58.7	
Actuated g/C Ratio				0.18	0.18		0.71	0.75			0.47	
v/c Ratio				0.31	0.30		0.79	0.31			0.77	
Control Delay				46.2	40.3		65.3	6.3			13.0	
Queue Delay				0.8	0.0		57.6	0.5			0.2	
Total Delay				47.0	40.3		122.9	6.7			13.1	
LOS				D	D		F	A			B	
Approach Delay					42.0			43.9			13.1	
Approach LOS					D			D			B	
Queue Length 50th (ft)				70	63		283	111			60	
Queue Length 95th (ft)				120	87		399	130			#661	
Internal Link Dist (ft)		33			37			155			396	
Turn Bay Length (ft)												
Base Capacity (vph)				347	1074		626	2624			2350	
Starvation Cap Reductn				0	0		302	1228			0	
Spillback Cap Reductn				115	117		0	0			86	
Storage Cap Reductn				0	0		0	0			0	
Reduced v/c Ratio				0.37	0.27		1.19	0.59			0.80	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 27.1	Intersection LOS: C
Intersection Capacity Utilization 70.4%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

4: GARTH & ROLLINGBROOK



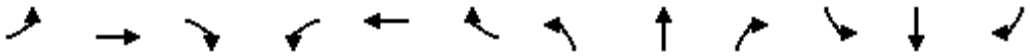
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	274	583	50	176	456	105	204	1271	101	260	1307	105
Future Volume (vph)	274	583	50	176	456	105	204	1271	101	260	1307	105
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	288	667	0	185	591	0	215	1444	0	274	1487	0
Act Effct Green (s)	21.6	24.8		14.2	17.4		10.0	46.0		16.0	52.0	
Actuated g/C Ratio	0.17	0.20		0.11	0.14		0.08	0.37		0.13	0.42	
v/c Ratio	0.94	0.96		0.92	1.19		1.52	1.12		1.21	1.02	
Control Delay	90.5	73.9		100.9	150.2		301.8	99.3		168.1	60.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	90.5	73.9		100.9	150.2		301.8	99.3		168.1	60.7	
LOS	F	E		F	F		F	F		F	E	
Approach Delay		78.9			138.5			125.6			77.4	
Approach LOS		E			F			F			E	
Queue Length 50th (ft)	232	280		151	~303		~248	~686		~267	~691	
Queue Length 95th (ft)	#401	#401		#296	#424		#411	#831		#443	#832	
Internal Link Dist (ft)		413			526			289			1785	
Turn Bay Length (ft)	237			115			100			150		
Base Capacity (vph)	311	704		201	495		141	1292		226	1460	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.93	0.95		0.92	1.19		1.52	1.12		1.21	1.02	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 88 (70%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.52	
Intersection Signal Delay: 102.4	Intersection LOS: F
Intersection Capacity Utilization 103.9%	ICU Level of Service G
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

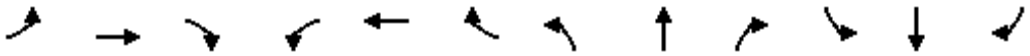
5: GARTH & 3923 GARTH/BIRDSONG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	40	6	12	83	0	83	70	1588	76	70	1548	6
Future Volume (vph)	40	6	12	83	0	83	70	1588	76	70	1548	6
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	13	0	172	0	73	1733	0	73	1619	0
Act Effct Green (s)		14.5	14.5		14.5		93.7	88.1		93.7	88.1	
Actuated g/C Ratio		0.12	0.12		0.12		0.75	0.70		0.75	0.70	
v/c Ratio		0.39	0.05		0.74		0.31	0.70		0.35	0.65	
Control Delay		58.3	0.4		46.2		5.0	10.6		8.9	8.4	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		58.3	0.4		46.2		5.0	10.6		8.9	8.4	
LOS		E	A		D		A	B		A	A	
Approach Delay		46.0			46.2			10.4			8.4	
Approach LOS		D			D			B			A	
Queue Length 50th (ft)		36	0		73		4	56		8	202	
Queue Length 95th (ft)		74	0		146		m10	m683		m9	m111	
Internal Link Dist (ft)		77			630			1785			381	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)		177	331		303		233	2477		208	2491	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.27	0.04		0.57		0.31	0.70		0.35	0.65	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 29 (23%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 11.7	Intersection LOS: B
Intersection Capacity Utilization 83.5%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	590	707	486	247	475	292	243	1557	274	278	1426	420
Future Volume (vph)	590	707	486	247	475	292	243	1557	274	278	1426	420
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	628	752	517	263	505	311	259	1947	0	296	1517	447
Act Effct Green (s)	29.0	25.0	25.0	16.0	12.0	12.0	12.0	49.0		11.0	48.0	48.0
Actuated g/C Ratio	0.23	0.20	0.20	0.13	0.10	0.10	0.10	0.39		0.09	0.38	0.38
v/c Ratio	1.53	1.06	1.15	1.20	1.54	1.00	1.53	1.42		1.91	1.12	0.62
Control Delay	285.3	99.6	121.6	171.9	295.1	73.6	302.8	223.1		458.9	93.8	19.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	285.3	99.6	121.6	171.9	295.1	73.6	302.8	223.1		458.9	93.8	19.2
LOS	F	F	F	F	F	E	F	F		F	F	B
Approach Delay		167.1			201.2			232.5			126.9	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~711	~352	~370	~258	~301	110	~302	~1101		~378	~732	95
Queue Length 95th (ft)	#939	#478	#591	#430	#414	#303	#477	#1246		m#462	m#862	m149
Internal Link Dist (ft)		847			673			676			508	
Turn Bay Length (ft)	330		100	175		120	110			116		116
Base Capacity (vph)	410	707	448	219	328	312	169	1368		155	1358	720
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.53	1.06	1.15	1.20	1.54	1.00	1.53	1.42		1.91	1.12	0.62

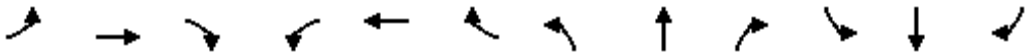
Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 11 (9%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.91	
Intersection Signal Delay: 179.2	Intersection LOS: F
Intersection Capacity Utilization 133.0%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

7: GARTH & MANOR/BAYTOWN CENTRAL



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	269	0	175	101	0	78	94	2278	59	86	1872	103
Future Volume (vph)	269	0	175	101	0	78	94	2278	59	86	1872	103
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	277	0	180	104	0	80	97	2409	0	89	2036	0
Act Effct Green (s)	22.6		22.6	22.6		22.6	10.0	80.1		8.7	78.9	
Actuated g/C Ratio	0.18		0.18	0.18		0.18	0.08	0.64		0.07	0.63	
v/c Ratio	0.87		0.47	0.33		0.23	0.69	1.07		0.72	0.92	
Control Delay	75.3		19.8	46.9		10.6	54.8	45.8		87.8	28.9	
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	75.3		19.8	46.9		10.6	54.8	45.8		87.8	28.9	
LOS	E		B	D		B	D	D		F	C	
Approach Delay		53.4			31.1			46.1			31.3	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	216		40	72		0	82	~1134		72	748	
Queue Length 95th (ft)	#351		109	128		43	m70	m307		#159	#985	
Internal Link Dist (ft)		424			375			438			531	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)	346		408	346		374	148	2261		125	2218	
Starvation Cap Reductn	0		0	0		0	0	0		0	0	
Spillback Cap Reductn	0		0	0		0	0	0		0	0	
Storage Cap Reductn	0		0	0		0	0	0		0	0	
Reduced v/c Ratio	0.80		0.44	0.30		0.21	0.66	1.07		0.71	0.92	

Intersection Summary

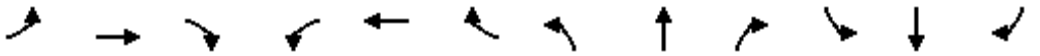
Cycle Length: 125
Actuated Cycle Length: 125
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 40.3 Intersection LOS: D
Intersection Capacity Utilization 95.8% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

8: GARTH & CEDAR BAYOU LYNCHBURG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	459	337	35	331	300	36	171	1556	177	232	1928	229
Future Volume (vph)	459	337	35	331	300	36	171	1556	177	232	1928	229
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)	43%			38%								
Lane Group Flow (vph)	278	569	37	218	453	38	182	1655	188	247	2051	244
Act Effct Green (s)	19.0	19.0	19.0	16.0	16.0	16.0	11.0	50.0	50.0	16.0	55.0	55.0
Actuated g/C Ratio	0.15	0.15	0.15	0.13	0.13	0.13	0.09	0.40	0.40	0.13	0.44	0.44
v/c Ratio	1.14	1.16	0.11	1.06	1.06	0.12	1.17	1.17	0.26	1.09	1.32	0.32
Control Delay	147.7	140.5	0.6	130.8	112.2	0.8	175.7	119.1	9.3	122.8	184.4	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	147.7	140.5	0.6	130.8	112.2	0.8	175.7	119.1	9.3	122.8	184.4	20.2
LOS	F	F	A	F	F	A	F	F	A	F	F	C
Approach Delay		136.9			111.9			114.0			162.6	
Approach LOS		F			F			F			F	
Queue Length 50th (ft)	~287	~299	0	~212	~220	0	~175	~837	28	~225	~1118	101
Queue Length 95th (ft)	#481	#422	0	#387	#335	0	#325	#977	79	m#345	#1300	m167
Internal Link Dist (ft)		467			939			143			1786	
Turn Bay Length (ft)	100		100	100		100	75		75	100		100
Base Capacity (vph)	244	489	343	206	427	316	155	1415	711	226	1557	769
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.14	1.16	0.11	1.06	1.06	0.12	1.17	1.17	0.26	1.09	1.32	0.32

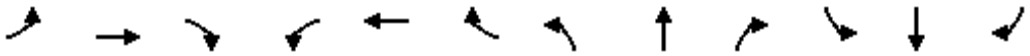
Intersection Summary

Cycle Length: 125
Actuated Cycle Length: 125
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 137.1 Intersection LOS: F
Intersection Capacity Utilization 109.8% ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

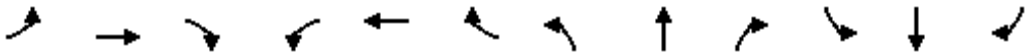
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	17	4	17	13	2	13	57	2460	59	41	2113	20
Future Volume (vph)	17	4	17	13	2	13	57	2460	59	41	2113	20
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	40	0	0	30	0	59	2624	0	43	2222	0
Act Effct Green (s)		7.5			7.5		104.1	100.4		102.5	99.6	
Actuated g/C Ratio		0.06			0.06		0.83	0.80		0.82	0.80	
v/c Ratio		0.35			0.30		0.42	0.93		0.33	0.79	
Control Delay		44.7			43.6		27.0	12.4		14.0	12.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		44.7			43.6		27.0	12.4		14.0	12.5	
LOS		D			D		C	B		B	B	
Approach Delay		44.7			43.6			12.8			12.6	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)		17			13		8	468		4	531	
Queue Length 95th (ft)		54			44		m11	m111		24	773	
Internal Link Dist (ft)		278			489			1786			781	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		363			325		141	2835		131	2817	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.11			0.09		0.42	0.93		0.33	0.79	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 13.1	Intersection LOS: B
Intersection Capacity Utilization 85.7%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.



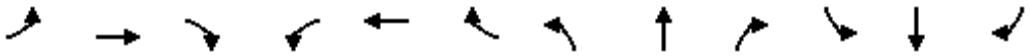
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	23	2	23	94	0	208	59	2349	54	192	2220	13
Future Volume (vph)	23	2	23	94	0	208	59	2349	54	192	2220	13
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	0	0	96	212	60	2452	0	196	2278	0
Act Effct Green (s)		11.5			11.5	11.5	83.5	79.0		96.5	88.2	
Actuated g/C Ratio		0.10			0.10	0.10	0.70	0.66		0.80	0.74	
v/c Ratio		0.31			0.64	0.77	0.47	1.05		0.85	0.88	
Control Delay		35.4			70.8	38.6	24.9	56.9		29.3	23.0	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		35.4			70.8	38.6	24.9	56.9		29.3	23.0	
LOS		D			E	D	C	E		C	C	
Approach Delay		35.4			48.6			56.2			23.5	
Approach LOS		D			D			E			C	
Queue Length 50th (ft)		18			73	57	8	~1133		118	593	
Queue Length 95th (ft)		55			128	141	#55	#1268		m119	m572	
Internal Link Dist (ft)		422			515			657			851	
Turn Bay Length (ft)						150	150			150		
Base Capacity (vph)		192			195	316	127	2325		239	2598	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.25			0.49	0.67	0.47	1.05		0.82	0.88	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 82 (68%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 40.4	Intersection LOS: D
Intersection Capacity Utilization 101.8%	ICU Level of Service G
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



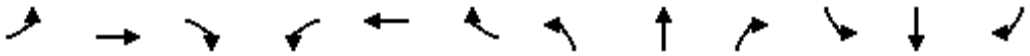
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	122	75	307	65	2	7	104	2210	0	106	1849	73
Future Volume (vph)	122	75	307	65	2	7	104	2210	0	106	1849	73
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	130	407	0	69	9	0	111	2351	0	113	1967	78
Act Effct Green (s)	27.6	24.6		7.0	11.8		66.9	59.6		67.1	59.6	59.6
Actuated g/C Ratio	0.23	0.20		0.06	0.10		0.56	0.50		0.56	0.50	0.50
v/c Ratio	0.32	0.90		0.67	0.05		0.63	1.34		0.64	1.12	0.09
Control Delay	42.1	53.6		85.6	26.2		33.2	179.4		36.7	89.3	5.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	42.1	53.6		85.6	26.2		33.2	179.4		36.7	89.3	5.0
LOS	D	D		F	C		C	F		D	F	A
Approach Delay		50.8			78.8			172.8			83.5	
Approach LOS		D			E			F			F	
Queue Length 50th (ft)	73	206		53	2		47	~1306		68	~958	4
Queue Length 95th (ft)	#255	#321		#126	15		m52	m#1285		m58	m#734	m1
Internal Link Dist (ft)		467			437			790			324	
Turn Bay Length (ft)							350			175		150
Base Capacity (vph)	406	529		103	458		176	1756		177	1758	854
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.32	0.77		0.67	0.02		0.63	1.34		0.64	1.12	0.09

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 112 (93%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.34	
Intersection Signal Delay: 122.1	Intersection LOS: F
Intersection Capacity Utilization 115.7%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	138	180	56	185	294	140	302	1951	114	213	1701	80
Future Volume (vph)	138	180	56	185	294	140	302	1951	114	213	1701	80
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	251	0	197	462	0	321	2076	121	227	1810	85
Act Effct Green (s)	11.0	18.9		11.0	18.9		66.1	50.0	50.0	66.1	50.0	50.0
Actuated g/C Ratio	0.09	0.16		0.09	0.16		0.55	0.42	0.42	0.55	0.42	0.42
v/c Ratio	0.91	0.45		1.22	0.79		1.07	1.41	0.16	0.76	1.23	0.12
Control Delay	104.2	41.4		186.2	52.2		87.6	207.5	2.7	49.1	139.1	2.9
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.2	41.4		186.2	52.2		87.6	207.5	2.7	49.1	139.1	2.9
LOS	F	D		F	D		F	F	A	D	F	A
Approach Delay		64.6			92.3			182.3			124.1	
Approach LOS		E			F			F			F	
Queue Length 50th (ft)	115	81		~187	159		~233	~1113	6	142	~902	0
Queue Length 95th (ft)	#240	116		#338	207		m#192	m#714	m4	m#209	#1040	m5
Internal Link Dist (ft)		732			770			405			306	
Turn Bay Length (ft)	150			150			150		150	150		100
Base Capacity (vph)	162	821		162	833		299	1474	738	299	1474	738
Starvation Cap Reductn	0	0		0	0		0	0	0	0	5	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.31		1.22	0.55		1.07	1.41	0.16	0.76	1.23	0.12

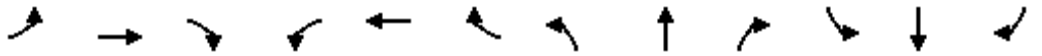
Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.41
Intersection Signal Delay: 142.0 Intersection LOS: F
Intersection Capacity Utilization 106.0% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

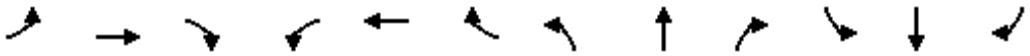
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	20	9	169	60	18	60	201	2249	62	94	1821	49
Future Volume (vph)	20	9	169	60	18	60	201	2249	62	94	1821	49
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	145	0	212	2432	0	99	1917	52
Act Effct Green (s)		9.2			9.2		98.8	84.7		81.9	73.8	73.8
Actuated g/C Ratio		0.08			0.08		0.82	0.71		0.68	0.62	0.62
v/c Ratio		0.65			0.60		0.62	0.98		0.55	0.88	0.06
Control Delay		34.4			40.5		44.4	18.3		20.9	22.4	3.3
Queue Delay		0.0			0.0		0.0	34.0		0.0	46.8	0.0
Total Delay		34.4			40.5		44.4	52.4		20.9	69.2	3.3
LOS		C			D		D	D		C	E	A
Approach Delay		34.4			40.5			51.7			65.2	
Approach LOS		C			D			D			E	
Queue Length 50th (ft)		37			32		131	321		36	392	1
Queue Length 95th (ft)		76			65		m105	m99		m47	#898	m2
Internal Link Dist (ft)		443			515			238			258	
Turn Bay Length (ft)							150			100		170
Base Capacity (vph)		713			585		341	2488		181	2177	940
Starvation Cap Reductn		0			0		0	241		0	0	0
Spillback Cap Reductn		9			5		0	0		0	616	0
Storage Cap Reductn		0			0		0	0		0	0	0
Reduced v/c Ratio		0.30			0.25		0.62	1.08		0.55	1.23	0.06

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 6 (5%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 56.2	Intersection LOS: E
Intersection Capacity Utilization 102.1%	ICU Level of Service G
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	72	0	43	148	5	47	91	2098	57	182	1863	46
Future Volume (vph)	72	0	43	148	5	47	91	2098	57	182	1863	46
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	44	0	206	0	94	2222	0	188	1921	47
Act Effct Green (s)		20.1	20.1		20.1		7.7	70.0		11.9	74.2	74.2
Actuated g/C Ratio		0.17	0.17		0.17		0.06	0.58		0.10	0.62	0.62
v/c Ratio		0.34	0.13		0.90		0.82	1.08		1.07	0.88	0.05
Control Delay		48.0	2.4		83.7		88.8	54.8		138.9	30.6	2.9
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	1.1	0.0
Total Delay		48.0	2.4		83.7		88.8	54.8		138.9	31.7	2.9
LOS		D	A		F		F	D		F	C	A
Approach Delay		31.0			83.7			56.2			40.5	
Approach LOS		C			F			E			D	
Queue Length 50th (ft)		50	0		147		78	~1001		~188	804	1
Queue Length 95th (ft)		98	8		#278		m84	m#1050		#345	887	m9
Internal Link Dist (ft)		243			551			249			400	
Turn Bay Length (ft)							140			100		150
Base Capacity (vph)		237	357		251		114	2057		175	2187	977
Starvation Cap Reductn		0	0		0		0	0		0	106	0
Spillback Cap Reductn		0	0		0		0	0		0	0	0
Storage Cap Reductn		0	0		0		0	0		0	0	0
Reduced v/c Ratio		0.31	0.12		0.82		0.82	1.08		1.07	0.92	0.05

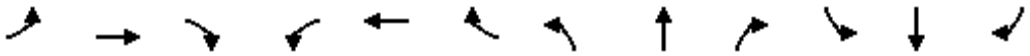
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 12 (10%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.08	
Intersection Signal Delay: 49.7	Intersection LOS: D
Intersection Capacity Utilization 102.9%	ICU Level of Service G
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

15: GARTH & IH10 EB FRONTAGE



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	602	122	339	0	0	0	0	2330	206	279	1408	0
Future Volume (vph)	602	122	339	0	0	0	0	2330	206	279	1408	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)	40%											
Lane Group Flow (vph)	365	366	342	0	0	0	0	2354	208	282	1422	0
Act Effct Green (s)	33.7	33.7	33.7					49.2	49.2	72.8	77.3	
Actuated g/C Ratio	0.28	0.28	0.28					0.41	0.41	0.61	0.64	
v/c Ratio	0.77	0.76	0.67					1.13	0.30	0.69	0.62	
Control Delay	51.1	50.0	33.4					109.5	30.2	50.2	22.3	
Queue Delay	65.3	65.1	1.2					0.4	0.0	0.0	49.4	
Total Delay	116.4	115.1	34.6					109.9	30.2	50.2	71.7	
LOS	F	F	C					F	C	D	E	
Approach Delay		89.9						103.4			68.1	
Approach LOS		F						F			E	
Queue Length 50th (ft)	265	264	165					~820	119	209	300	
Queue Length 95th (ft)	378	376	266					m#747	m120	m222	m306	
Internal Link Dist (ft)		19			45			358			149	
Turn Bay Length (ft)									140			
Base Capacity (vph)	525	535	560					2085	696	409	2279	
Starvation Cap Reductn	0	0	0					0	0	0	1153	
Spillback Cap Reductn	350	356	80					272	0	0	0	
Storage Cap Reductn	0	0	0					0	0	0	0	
Reduced v/c Ratio	2.09	2.04	0.71					1.30	0.30	0.69	1.26	

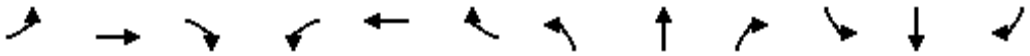
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 89.4	Intersection LOS: F
Intersection Capacity Utilization 120.8%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

16: GARTH & IH10 WB FRONTAGE ROAD



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	491	341	221	676	2256	0	0	1196	310
Future Volume (vph)	0	0	0	491	341	221	676	2256	0	0	1196	310
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				17%								
Lane Group Flow (vph)	0	0	0	412	428	223	683	2279	0	0	1208	313
Act Effct Green (s)				33.7	33.7	33.7	72.8	77.3			28.5	28.5
Actuated g/C Ratio				0.28	0.28	0.28	0.61	0.64			0.24	0.24
v/c Ratio				0.87	0.87	0.43	0.96	1.00			1.04	0.61
Control Delay				60.5	59.6	21.7	49.4	27.9			80.6	22.6
Queue Delay				62.8	62.3	0.0	47.0	38.0			25.3	0.0
Total Delay				123.3	121.9	21.7	96.5	65.9			105.9	22.6
LOS				F	F	C	F	E			F	C
Approach Delay					101.4			72.9			88.8	
Approach LOS					F			E			F	
Queue Length 50th (ft)				310	322	76	~419	~465			~368	90
Queue Length 95th (ft)				#464	#458	147	m391	m354			#463	190
Internal Link Dist (ft)		36			31			149			553	
Turn Bay Length (ft)												140
Base Capacity (vph)				525	547	560	715	2279			1167	512
Starvation Cap Reductn				0	0	0	347	593			0	0
Spillback Cap Reductn				337	351	0	0	0			69	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				2.19	2.18	0.40	1.86	1.35			1.10	0.61

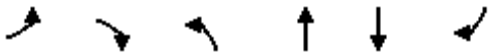
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.13	
Intersection Signal Delay: 82.7	Intersection LOS: F
Intersection Capacity Utilization 120.8%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

31: GARTH & NORTHWOOD



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	111	141	196	1460	1559	36
Future Volume (vph)	111	141	196	1460	1559	36
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	114	145	202	1505	1644	0
Act Effct Green (s)	11.9	11.9	16.7	97.1	74.4	
Actuated g/C Ratio	0.10	0.10	0.13	0.78	0.60	
v/c Ratio	0.68	0.52	0.86	0.55	0.78	
Control Delay	74.1	14.8	79.0	10.6	3.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	74.1	14.8	79.0	10.6	3.3	
LOS	E	B	E	B	A	
Approach Delay	40.9			18.7	3.3	
Approach LOS	D			B	A	
Queue Length 50th (ft)	90	0	163	306	13	
Queue Length 95th (ft)	151	62	#314	433	14	
Internal Link Dist (ft)	435			391	190	
Turn Bay Length (ft)			150			
Base Capacity (vph)	212	317	236	2749	2102	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	84	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.54	0.46	0.86	0.56	0.78	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 79.6%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	14	14	1570	38	31	1546
Future Volume (vph)	14	14	1570	38	31	1546
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	1658	0	32	1594
Act Effct Green (s)	11.9		97.1		74.4	74.4
Actuated g/C Ratio	0.10		0.78		0.60	0.60
v/c Ratio	0.16		0.61		0.20	0.76
Control Delay	33.4		4.0		4.7	5.5
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	33.4		4.0		4.7	5.5
LOS	C		A		A	A
Approach Delay	33.4		4.0			5.5
Approach LOS	C		A			A
Queue Length 50th (ft)	10		104		4	111
Queue Length 95th (ft)	40		75		m4	m112
Internal Link Dist (ft)	255		190			1242
Turn Bay Length (ft)					150	
Base Capacity (vph)	215		2739		164	2106
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.13		0.61		0.20	0.76

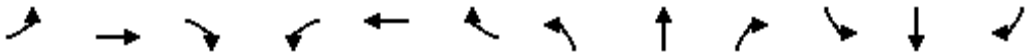
Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 5.0	Intersection LOS: A
Intersection Capacity Utilization 63.8%	ICU Level of Service B
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Kimley»Horn

2040 Proposed Scenario Synchro Reports

1: GARTH & SH146 EB FRONTAGE ROAD

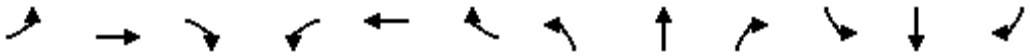


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	314	244	70	0	0	0	0	832	23	534	1069	0
Future Volume (vph)	314	244	70	0	0	0	0	832	23	534	1069	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)	34%											
Lane Group Flow (vph)	218	444	0	0	0	0	0	876	24	0	1687	0
Act Effct Green (s)	22.5	22.5						62.5	62.5		89.0	
Actuated g/C Ratio	0.18	0.18						0.50	0.50		0.71	
v/c Ratio	0.75	0.74						0.50	0.03		0.94dl	
Control Delay	64.6	54.2						24.0	0.0		13.6	
Queue Delay	11.8	5.6						0.1	0.0		0.3	
Total Delay	76.4	59.8						24.1	0.0		13.9	
LOS	E	E						C	A		B	
Approach Delay		65.2						23.5			13.9	
Approach LOS		E						C			B	
Queue Length 50th (ft)	186	182						237	0		76	
Queue Length 95th (ft)	268	229						377	0		260	
Internal Link Dist (ft)		24			44			493			155	
Turn Bay Length (ft)												
Base Capacity (vph)	367	756						1768	837		3153	
Starvation Cap Reductn	0	0						0	0		662	
Spillback Cap Reductn	122	248						149	0		0	
Storage Cap Reductn	0	0						0	0		0	
Reduced v/c Ratio	0.89	0.87						0.54	0.03		0.68	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 27.0	Intersection LOS: C
Intersection Capacity Utilization 77.8%	ICU Level of Service D
Analysis Period (min) 15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

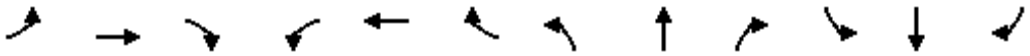
2: GARTH & SH146 WB FRONTAGE ROAD



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	149	138	36	367	779	0	0	1455	261
Future Volume (vph)	0	0	0	149	138	36	367	779	0	0	1455	261
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	0	0	0	85	255	0	386	820	0	0	1532	275
Act Effct Green (s)				22.5	22.5		89.0	93.5			58.7	58.7
Actuated g/C Ratio				0.18	0.18		0.71	0.75			0.47	0.47
v/c Ratio				0.31	0.30		0.76	0.31			0.64	0.33
Control Delay				46.2	40.3		59.7	6.3			11.6	2.1
Queue Delay				0.8	0.0		57.2	0.5			0.1	0.0
Total Delay				47.0	40.3		116.9	6.7			11.7	2.1
LOS				D	D		F	A			B	A
Approach Delay					42.0			42.0			10.2	
Approach LOS					D			D			B	
Queue Length 50th (ft)				70	63		267	111			61	0
Queue Length 95th (ft)				120	87		387	130			416	m46
Internal Link Dist (ft)		33			37			155			396	
Turn Bay Length (ft)												200
Base Capacity (vph)				347	1074		642	2624			2388	846
Starvation Cap Reductn				0	0		303	1228			0	0
Spillback Cap Reductn				115	117		0	0			145	0
Storage Cap Reductn				0	0		0	0			0	0
Reduced v/c Ratio				0.37	0.27		1.14	0.59			0.68	0.33

Intersection Summary			
Cycle Length: 125			
Actuated Cycle Length: 125			
Offset: 39 (31%), Referenced to phase 2:NBSB, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 24.9		Intersection LOS: C	
Intersection Capacity Utilization 64.6%		ICU Level of Service C	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.



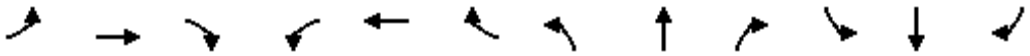
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	274	583	50	176	456	105	204	1271	101	260	1307	105
Future Volume (vph)	274	583	50	176	456	105	204	1271	101	260	1307	105
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	288	667	0	185	480	111	215	1444	0	274	1487	0
Act Effct Green (s)	11.0	24.0		7.0	20.0	20.0	16.0	50.0		20.0	54.0	
Actuated g/C Ratio	0.09	0.19		0.06	0.16	0.16	0.13	0.40		0.16	0.43	
v/c Ratio	0.95	0.99		0.96	0.85	0.31	0.95	1.03		0.97	0.98	
Control Delay	98.0	81.5		114.8	65.9	7.3	95.3	65.4		90.1	50.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	98.0	81.5		114.8	65.9	7.3	95.3	65.4		90.1	50.2	
LOS	F	F		F	E	A	F	E		F	D	
Approach Delay		86.4			69.2			69.3			56.4	
Approach LOS		F			E			E			E	
Queue Length 50th (ft)	121	283		78	201	0	181	~496		200	676	
Queue Length 95th (ft)	#210	#413		#155	#285	38	#338	#779		#394	#803	
Internal Link Dist (ft)		413			526			289			1785	
Turn Bay Length (ft)	237			115		115	100			150		
Base Capacity (vph)	302	676		192	566	363	226	1404		283	1516	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.95	0.99		0.96	0.85	0.31	0.95	1.03		0.97	0.98	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 88 (70%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.03	
Intersection Signal Delay: 68.0	Intersection LOS: E
Intersection Capacity Utilization 96.3%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

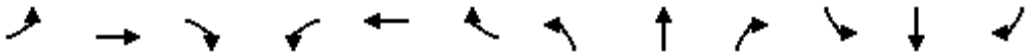
5: GARTH & 3923 GARTH/BIRDSONG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	40	6	12	83	0	83	70	1588	76	70	1548	6
Future Volume (vph)	40	6	12	83	0	83	70	1588	76	70	1548	6
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	13	0	172	0	73	1733	0	73	1619	0
Act Effct Green (s)		14.5	14.5		14.5		93.7	88.1		93.7	88.1	
Actuated g/C Ratio		0.12	0.12		0.12		0.75	0.70		0.75	0.70	
v/c Ratio		0.39	0.05		0.74		0.31	0.70		0.35	0.65	
Control Delay		58.3	0.4		46.2		5.8	11.2		13.4	7.4	
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Total Delay		58.3	0.4		46.2		5.8	11.2		13.4	7.4	
LOS		E	A		D		A	B		B	A	
Approach Delay		46.0			46.2			11.0			7.6	
Approach LOS		D			D			B			A	
Queue Length 50th (ft)		36	0		73		1	22		10	204	
Queue Length 95th (ft)		74	0		146		m14	m774		m6	m85	
Internal Link Dist (ft)		77			630			1785			381	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)		177	331		303		233	2477		208	2491	
Starvation Cap Reductn		0	0		0		0	0		0	0	
Spillback Cap Reductn		0	0		0		0	0		0	0	
Storage Cap Reductn		0	0		0		0	0		0	0	
Reduced v/c Ratio		0.27	0.04		0.57		0.31	0.70		0.35	0.65	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 29 (23%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 11.7	Intersection LOS: B
Intersection Capacity Utilization 83.5%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	590	707	486	247	475	292	243	1557	274	278	1426	420
Future Volume (vph)	590	707	486	247	475	292	243	1557	274	278	1426	420
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	628	752	517	263	505	311	259	1947	0	296	1517	447
Act Effct Green (s)	21.0	28.0	28.0	10.0	17.0	17.0	20.1	44.0		19.0	42.9	42.9
Actuated g/C Ratio	0.17	0.22	0.22	0.08	0.14	0.14	0.16	0.35		0.15	0.34	0.34
v/c Ratio	1.09	0.95	0.98	0.99	1.09	0.77	0.91	1.10		1.10	0.87	0.67
Control Delay	112.7	69.8	59.5	110.8	117.1	28.9	85.7	91.0		139.7	35.6	16.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	112.7	69.8	59.5	110.8	117.1	28.9	85.7	91.0		139.7	35.6	16.4
LOS	F	E	E	F	F	C	F	F		F	D	B
Approach Delay		81.2			90.1			90.4			45.4	
Approach LOS		F			F			F			D	
Queue Length 50th (ft)	~294	317	248	111	~241	64	222	~637		~279	323	74
Queue Length 95th (ft)	#412	#441	#480	#201	#354	#198	#366	#736		#461	411	137
Internal Link Dist (ft)		847			673			676			508	
Turn Bay Length (ft)	330		100	175		120	110			116		116
Base Capacity (vph)	576	792	530	265	465	403	297	1770		269	1743	672
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.09	0.95	0.98	0.99	1.09	0.77	0.87	1.10		1.10	0.87	0.67

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 11 (9%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.10	
Intersection Signal Delay: 74.4	Intersection LOS: E
Intersection Capacity Utilization 101.6%	ICU Level of Service G
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

7: GARTH & MANOR/BAYTOWN CENTRAL

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	269	0	175	101	0	78	94	2278	59	86	1872	103
Future Volume (vph)	269	0	175	101	0	78	94	2278	59	86	1872	103
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	277	0	180	104	0	80	97	2409	0	89	2036	0
Act Effct Green (s)	22.6		22.6	22.6		22.6	10.0	80.1		8.7	78.9	
Actuated g/C Ratio	0.18		0.18	0.18		0.18	0.08	0.64		0.07	0.63	
v/c Ratio	0.87		0.47	0.33		0.23	0.69	0.74		0.72	0.64	
Control Delay	75.3		19.8	46.9		10.6	64.2	13.4		87.8	15.7	
Queue Delay	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0	
Total Delay	75.3		19.8	46.9		10.6	64.2	13.4		87.8	15.7	
LOS	E		B	D		B	E	B		F	B	
Approach Delay		53.4			31.1			15.4			18.7	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	216		40	72		0	82	265		72	367	
Queue Length 95th (ft)	#351		109	128		43	m86	m257		#159	416	
Internal Link Dist (ft)		424			375			438			531	
Turn Bay Length (ft)							100			100		
Base Capacity (vph)	346		408	346		374	148	3248		125	3188	
Starvation Cap Reductn	0		0	0		0	0	0		0	0	
Spillback Cap Reductn	0		0	0		0	0	0		0	0	
Storage Cap Reductn	0		0	0		0	0	0		0	0	
Reduced v/c Ratio	0.80		0.44	0.30		0.21	0.66	0.74		0.71	0.64	

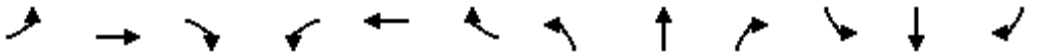
Intersection Summary

Cycle Length: 125
Actuated Cycle Length: 125
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 20.6 Intersection LOS: C
Intersection Capacity Utilization 76.2% ICU Level of Service D
Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

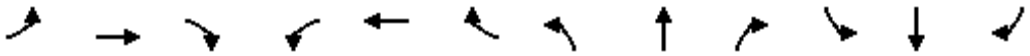
8: GARTH & CEDAR BAYOU LYNCHBURG



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	459	337	35	331	300	36	171	1556	177	232	1928	229
Future Volume (vph)	459	337	35	331	300	36	171	1556	177	232	1928	229
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	488	359	37	352	319	38	182	1655	188	247	2051	244
Act Effct Green (s)	18.9	15.4	15.4	15.8	12.3	12.3	13.9	49.8	49.8	20.1	55.9	55.9
Actuated g/C Ratio	0.15	0.12	0.12	0.13	0.10	0.10	0.11	0.40	0.40	0.16	0.45	0.45
v/c Ratio	0.94	0.85	0.11	0.81	0.92	0.12	0.92	0.82	0.25	0.87	0.90	0.31
Control Delay	79.8	72.9	0.6	69.2	87.9	0.8	102.3	38.1	4.8	76.5	39.6	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.8	72.9	0.6	69.2	87.9	0.8	102.3	38.1	4.8	76.5	39.6	15.4
LOS	E	E	A	E	F	A	F	D	A	E	D	B
Approach Delay		73.7			74.0			40.7			40.8	
Approach LOS		E			E			D			D	
Queue Length 50th (ft)	203	151	0	145	136	0	148	443	3	206	349	48
Queue Length 95th (ft)	#306	#224	0	#225	#229	0	#289	508	50	#324	640	192
Internal Link Dist (ft)		467			939			143			1786	
Turn Bay Length (ft)	100		100	100		100	75		75	100		100
Base Capacity (vph)	521	437	355	432	346	320	198	2024	740	311	2278	781
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.82	0.10	0.81	0.92	0.12	0.92	0.82	0.25	0.79	0.90	0.31

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 124 (99%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 49.3	Intersection LOS: D
Intersection Capacity Utilization 88.1%	ICU Level of Service E
Analysis Period (min) 15	

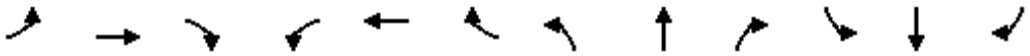
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	17	4	17	13	2	13	57	2460	59	41	2113	20
Future Volume (vph)	17	4	17	13	2	13	57	2460	59	41	2113	20
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	40	0	0	30	0	59	2624	0	43	2222	0
Act Effct Green (s)		7.5			7.5		104.6	100.4		102.0	99.1	
Actuated g/C Ratio		0.06			0.06		0.84	0.80		0.82	0.79	
v/c Ratio		0.35			0.30		0.34	0.64		0.33	0.55	
Control Delay		44.7			43.6		17.2	5.1		14.3	7.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		44.7			43.6		17.2	5.1		14.3	7.1	
LOS		D			D		B	A		B	A	
Approach Delay		44.7			43.6			5.4			7.2	
Approach LOS		D			D			A			A	
Queue Length 50th (ft)		17			13		8	198		4	250	
Queue Length 95th (ft)		54			44		m10	42		25	335	
Internal Link Dist (ft)		278			489			1786			781	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		363			325		175	4073		130	4027	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.11			0.09		0.34	0.64		0.33	0.55	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 39 (31%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 6.7	Intersection LOS: A
Intersection Capacity Utilization 64.7%	ICU Level of Service C
Analysis Period (min) 15	

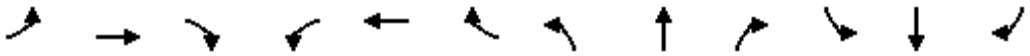
m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	23	2	23	94	0	208	59	2349	54	192	2220	13
Future Volume (vph)	23	2	23	94	0	208	59	2349	54	192	2220	13
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	0	0	96	212	60	2452	0	196	2278	0
Act Effct Green (s)		11.5			11.5	11.5	82.7	77.9		96.5	87.8	
Actuated g/C Ratio		0.10			0.10	0.10	0.69	0.65		0.80	0.73	
v/c Ratio		0.31			0.64	0.77	0.43	0.74		0.79	0.61	
Control Delay		35.4			70.8	38.6	20.4	16.8		39.1	15.3	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		35.4			70.8	38.6	20.4	16.8		39.1	15.3	
LOS		D			E	D	C	B		D	B	
Approach Delay		35.4			48.6			16.9			17.2	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)		18			73	57	8	468		83	464	
Queue Length 95th (ft)		55			128	141	#43	518		m#170	366	
Internal Link Dist (ft)		422			515			657			851	
Turn Bay Length (ft)						150	150			150		
Base Capacity (vph)		192			195	316	139	3340		256	3734	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.25			0.49	0.67	0.43	0.73		0.77	0.61	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 82 (68%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 19.0	Intersection LOS: B
Intersection Capacity Utilization 81.8%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



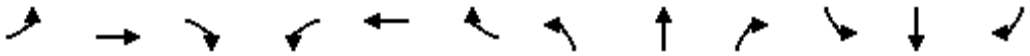
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	122	75	307	65	2	7	104	2210	0	106	1849	73
Future Volume (vph)	122	75	307	65	2	7	104	2210	0	106	1849	73
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	130	407	0	69	9	0	111	2351	0	113	2045	0
Act Effct Green (s)	27.6	24.6		7.0	11.8		66.9	59.6		67.1	59.6	
Actuated g/C Ratio	0.23	0.20		0.06	0.10		0.56	0.50		0.56	0.50	
v/c Ratio	0.32	0.90		0.67	0.05		0.63	0.93		0.64	0.81	
Control Delay	42.1	53.6		85.6	26.2		43.4	27.8		45.3	32.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	42.1	53.6		85.6	26.2		43.4	27.8		45.3	32.5	
LOS	D	D		F	C		D	C		D	C	
Approach Delay		50.8			78.8			28.5			33.1	
Approach LOS		D			E			C			C	
Queue Length 50th (ft)	73	206		53	2		39	~683		68	337	
Queue Length 95th (ft)	#255	#321		#126	15		m84	#830		m85	m#403	
Internal Link Dist (ft)		467			437			790			324	
Turn Bay Length (ft)							350			175		
Base Capacity (vph)	406	529		103	458		176	2523		177	2514	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.77		0.67	0.02		0.63	0.93		0.64	0.81	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 112 (93%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.93	
Intersection Signal Delay: 33.5	Intersection LOS: C
Intersection Capacity Utilization 97.3%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	138	180	56	185	294	140	302	1951	114	213	1701	80
Future Volume (vph)	138	180	56	185	294	140	302	1951	114	213	1701	80
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	251	0	197	462	0	321	2076	121	227	1810	85
Act Effct Green (s)	11.0	18.9		11.0	18.9		66.1	50.0	50.0	66.1	50.0	50.0
Actuated g/C Ratio	0.09	0.16		0.09	0.16		0.55	0.42	0.42	0.55	0.42	0.42
v/c Ratio	0.91	0.45		1.22	0.79		1.07	0.98	0.16	0.76	0.85	0.12
Control Delay	104.2	41.4		186.2	52.2		105.6	29.9	2.9	52.3	34.9	4.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.2	41.4		186.2	52.2		105.6	29.9	2.9	52.3	34.9	4.8
LOS	F	D		F	D		F	C	A	D	C	A
Approach Delay		64.6			92.3			38.2			35.6	
Approach LOS		E			F			D			D	
Queue Length 50th (ft)	115	81		~187	159		~233	186	6	115	490	3
Queue Length 95th (ft)	#240	116		#338	207		m#351	m#666	m9	#309	546	m21
Internal Link Dist (ft)		732			770			405			306	
Turn Bay Length (ft)	150			150			150		150	150		100
Base Capacity (vph)	162	821		162	833		299	2118	738	299	2118	738
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.31		1.22	0.55		1.07	0.98	0.16	0.76	0.85	0.12

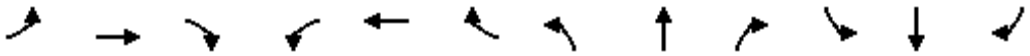
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 45.3	Intersection LOS: D
Intersection Capacity Utilization 89.8%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

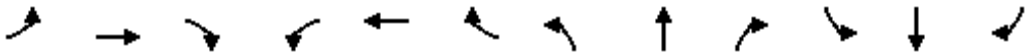
13: GARTH & INDEPENDENCE



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	20	9	169	60	18	60	201	2249	62	94	1821	49
Future Volume (vph)	20	9	169	60	18	60	201	2249	62	94	1821	49
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	145	0	212	2432	0	99	1969	0
Act Effct Green (s)		9.2			9.2		98.8	84.6		80.7	72.6	
Actuated g/C Ratio		0.08			0.08		0.82	0.70		0.67	0.60	
v/c Ratio		0.65			0.60		0.58	0.68		0.55	0.64	
Control Delay		34.4			40.5		37.5	7.1		27.6	20.1	
Queue Delay		0.0			0.0		0.0	0.1		0.0	0.0	
Total Delay		34.4			40.5		37.5	7.2		27.6	20.1	
LOS		C			D		D	A		C	C	
Approach Delay		34.4			40.5			9.6			20.5	
Approach LOS		C			D			A			C	
Queue Length 50th (ft)		37			32		129	197		45	372	
Queue Length 95th (ft)		76			65		m142	m90		m89	223	
Internal Link Dist (ft)		443			515			238			258	
Turn Bay Length (ft)							150			100		
Base Capacity (vph)		713			585		368	3574		181	3064	
Starvation Cap Reductn		0			0		0	163		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.29			0.25		0.58	0.71		0.55	0.64	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 6 (5%), Referenced to phase 2:SBTL, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 15.9	Intersection LOS: B
Intersection Capacity Utilization 82.8%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

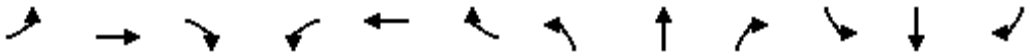


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	72	0	43	148	5	47	91	2098	57	182	1863	46
Future Volume (vph)	72	0	43	148	5	47	91	2098	57	182	1863	46
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	74	44	0	206	0	94	2222	0	188	1921	47
Act Effct Green (s)		20.6	20.6		20.6		8.8	64.4		16.9	72.5	72.5
Actuated g/C Ratio		0.17	0.17		0.17		0.07	0.54		0.14	0.60	0.60
v/c Ratio		0.33	0.13		0.87		0.72	0.82		0.76	0.63	0.05
Control Delay		47.2	2.4		78.7		80.7	10.6		74.3	20.2	3.2
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0	0.0
Total Delay		47.2	2.4		78.7		80.7	10.6		74.3	20.2	3.2
LOS		D	A		E		F	B		E	C	A
Approach Delay		30.5			78.7			13.4			24.5	
Approach LOS		C			E			B			C	
Queue Length 50th (ft)		49	0		145		68	221		153	531	1
Queue Length 95th (ft)		98	8		#278		m#148	76		#343	573	m11
Internal Link Dist (ft)		243			551			249			400	
Turn Bay Length (ft)							140			100		150
Base Capacity (vph)		242	364		257		130	2957		249	3144	977
Starvation Cap Reductn		0	0		0		0	0		0	0	0
Spillback Cap Reductn		0	0		0		0	0		0	0	0
Storage Cap Reductn		0	0		0		0	0		0	0	0
Reduced v/c Ratio		0.31	0.12		0.80		0.72	0.75		0.76	0.61	0.05

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 12 (10%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 21.6	Intersection LOS: C
Intersection Capacity Utilization 84.9%	ICU Level of Service E
Analysis Period (min) 15	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

15: GARTH & IH10 EB FRONTAGE



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	602	122	339	0	0	0	0	2330	206	279	1408	0
Future Volume (vph)	602	122	339	0	0	0	0	2330	206	279	1408	0
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)	40%											
Lane Group Flow (vph)	365	366	342	0	0	0	0	2354	208	282	1422	0
Act Effct Green (s)	30.4	30.4	120.0					58.9	58.9	76.1	80.6	
Actuated g/C Ratio	0.25	0.25	1.00					0.49	0.49	0.63	0.67	
v/c Ratio	0.86	0.84	0.22					0.94	0.25	0.90	0.60	
Control Delay	63.0	61.1	0.3					53.4	22.6	60.0	15.8	
Queue Delay	59.9	60.3	0.0					30.3	0.0	53.4	49.3	
Total Delay	122.9	121.4	0.3					83.6	22.6	113.4	65.1	
LOS	F	F	A					F	C	F	E	
Approach Delay		83.3						78.7			73.1	
Approach LOS		F						E			E	
Queue Length 50th (ft)	285	284	0					668	109	210	248	
Queue Length 95th (ft)	#456	#451	0					#727	m160	m229	m300	
Internal Link Dist (ft)		19			45			358			149	
Turn Bay Length (ft)									140			
Base Capacity (vph)	427	435	1583					2495	824	315	2376	
Starvation Cap Reductn	0	0	0					0	0	111	1218	
Spillback Cap Reductn	242	246	0					288	0	0	0	
Storage Cap Reductn	0	0	0					0	0	0	0	
Reduced v/c Ratio	1.97	1.94	0.22					1.07	0.25	1.38	1.23	

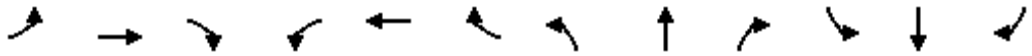
Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 77.8 Intersection LOS: E
Intersection Capacity Utilization 119.7% ICU Level of Service H
Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

16: GARTH & IH10 WB FRONTAGE ROAD



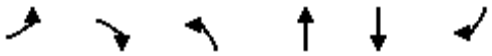
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	0	0	491	341	221	676	2256	0	0	1196	310
Future Volume (vph)	0	0	0	491	341	221	676	2256	0	0	1196	310
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Shared Lane Traffic (%)				17%								
Lane Group Flow (vph)	0	0	0	412	428	223	683	2279	0	0	1208	313
Act Effct Green (s)				30.4	30.4	30.4	76.1	80.6			32.5	32.5
Actuated g/C Ratio				0.25	0.25	0.25	0.63	0.67			0.27	0.27
v/c Ratio				0.97	0.96	0.47	0.97	0.96			0.91	0.59
Control Delay				81.1	79.5	25.0	54.1	18.1			53.2	24.9
Queue Delay				48.0	48.3	0.0	44.0	43.6			7.2	0.0
Total Delay				129.1	127.8	25.0	98.1	61.7			60.4	24.9
LOS				F	F	C	F	E			E	C
Approach Delay					106.7			70.1			53.1	
Approach LOS					F			E			D	
Queue Length 50th (ft)				333	346	82	368	283			331	112
Queue Length 95th (ft)				#547	#561	160	m#564	m#366			#415	209
Internal Link Dist (ft)		36			31			149			553	
Turn Bay Length (ft)												140
Base Capacity (vph)				427	445	473	704	2376			1331	533
Starvation Cap Reductn				0	0	0	305	440			0	0
Spillback Cap Reductn				219	228	0	0	0			104	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				1.98	1.97	0.47	1.71	1.18			0.98	0.59

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSB, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 72.5	Intersection LOS: E
Intersection Capacity Utilization 119.7%	ICU Level of Service H
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

31: GARTH & NORTHWOOD



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Volume (vph)	111	141	196	1460	1559	36
Future Volume (vph)	111	141	196	1460	1559	36
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	114	145	202	1505	1644	0
Act Effct Green (s)	11.9	11.9	16.7	97.1	74.4	
Actuated g/C Ratio	0.10	0.10	0.13	0.78	0.60	
v/c Ratio	0.68	0.52	0.86	0.55	0.78	
Control Delay	74.1	14.8	79.0	10.6	3.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	74.1	14.8	79.0	10.6	3.4	
LOS	E	B	E	B	A	
Approach Delay	40.9			18.7	3.4	
Approach LOS	D			B	A	
Queue Length 50th (ft)	90	0	163	306	12	
Queue Length 95th (ft)	151	62	#314	433	13	
Internal Link Dist (ft)	435			391	190	
Turn Bay Length (ft)			150			
Base Capacity (vph)	212	317	236	2749	2102	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	84	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.54	0.46	0.86	0.56	0.78	

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 79.6%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	14	14	1570	38	31	1546
Future Volume (vph)	14	14	1570	38	31	1546
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	1658	0	32	1594
Act Effct Green (s)	11.9		97.1		74.4	74.4
Actuated g/C Ratio	0.10		0.78		0.60	0.60
v/c Ratio	0.16		0.61		0.20	0.76
Control Delay	33.4		4.0		5.2	5.7
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	33.4		4.0		5.2	5.7
LOS	C		A		A	A
Approach Delay	33.4		4.0			5.7
Approach LOS	C		A			A
Queue Length 50th (ft)	10		104		4	113
Queue Length 95th (ft)	40		75		m5	m116
Internal Link Dist (ft)	255		190			1242
Turn Bay Length (ft)					150	
Base Capacity (vph)	215		2739		164	2106
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.13		0.61		0.20	0.76

Intersection Summary	
Cycle Length: 125	
Actuated Cycle Length: 125	
Offset: 110 (88%), Referenced to phase 2:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.86	
Intersection Signal Delay: 5.0	Intersection LOS: A
Intersection Capacity Utilization 63.8%	ICU Level of Service B
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Kimley»Horn

2016 HCM Roadway Capacity Analysis

Arterial Level of Service: NB GARTH

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
SH146 EB FRONTAGE RO	1	23.0	32.1	0.1	12	13	21.0
SH146 WB FRONTAGE RO	2	2.4	6.7	0.0	24	24	2.2
NORTHWOOD	31	7.5	29.9	0.3	42	39	8.8
SCENIC	32	3.0	7.4	0.1	25	23	3.5
ROLLINGBROOK	4	35.4	63.7	0.4	20	17	43.7
BIRDSONG	5	13.9	45.0	0.4	28	25	19.4
BAKER	6	50.7	68.9	0.2	12	12	48.7
BAYTOWN CENTRAL	7	9.4	24.9	0.2	30	29	9.8
CEDAR BAYOU LYNCHBUR	8	28.4	53.0	0.4	25	23	31.1
SOUTH	9	10.4	34.8	0.4	37	36	11.7
ARCHER	10	10.8	34.0	0.3	32	33	9.4
SANTAVY	11	13.4	38.9	0.3	32	30	14.7
HUNT	12	20.8	40.3	0.3	23	24	18.7
INDEPENDENCE	13	11.2	21.3	0.1	23	24	10.6
SHARON	14	13.4	34.2	0.3	29	26	16.7
IH10 EB FRONTAGE	15	27.9	41.1	0.2	15	17	23.8
IH10 WB FRONTAGE ROA	16	4.0	7.5	0.0	21	21	3.8
Total		285.5	583.6	3.9	24	24	297.6

Arterial Level of Service: NB GARTH

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
SH146 EB FRONTAGE RO	11	27.3	10	28.9	15	17.9	14
SH146 WB FRONTAGE RO	22	2.8	25	2.2	27	1.7	22
NORTHWOOD	39	9.0	42	6.9	43	6.1	45
SCENIC	26	2.8	25	2.8	25	3.1	26
ROLLINGBROOK	19	37.5	19	38.0	22	29.9	22
BIRDSONG	28	13.5	31	11.1	28	13.6	30
BAKER	11	55.4	14	40.5	11	55.6	12
BAYTOWN CENTRAL	30	9.9	34	6.4	32	8.4	27
CEDAR BAYOU LYNCHBUR	27	24.1	26	25.1	22	34.8	25
SOUTH	39	8.4	39	8.6	36	10.9	34
ARCHER	34	10.1	32	10.9	31	12.4	31
SANTAVY	31	14.4	33	10.8	31	14.6	33
HUNT	25	17.4	23	20.7	19	28.4	24
INDEPENDENCE	23	10.4	26	8.8	21	13.1	21
SHARON	30	12.5	32	10.0	29	13.4	27
IH10 EB FRONTAGE	14	32.7	15	30.1	15	29.5	17
IH10 WB FRONTAGE ROA	19	4.7	21	3.7	21	3.7	21
Total	24	292.8	25	265.4	24	296.9	25

Arterial Level of Service: SB GARTH

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
IH10 WB FRONTAGE ROA	16	19.3	28.8	0.1	15	16	18.9
IH10 EB FRONTAGE	15	3.8	7.4	0.0	21	20	4.3
SHARON	14	9.2	21.2	0.2	30	31	8.6
INDEPENDENCE	13	10.2	31.1	0.3	32	32	10.3
HUNT	12	18.4	28.4	0.1	17	18	16.0
SANTAVY	11	16.4	36.5	0.3	25	28	13.0
ARCHER	10	9.8	35.9	0.3	34	36	7.7
SOUTH	9	6.1	28.9	0.3	38	38	6.1
CEDAR BAYOU LYNCHBUR	8	36.4	61.0	0.4	21	21	35.6
MANOR	7	13.1	38.7	0.4	34	34	13.0
BAKER	6	32.7	49.3	0.2	15	15	35.1
3923 GARTH	5	7.7	26.9	0.2	31	30	8.1
ROLLINGBROOK	4	26.1	55.0	0.4	23	23	27.1
SCENIC	32	10.0	39.8	0.4	32	33	8.4
NORTHWOOD	31	2.9	7.2	0.1	26	27	2.5
SH146 WB FRONTAGE RO	2	20.1	49.7	0.3	25	23	23.2
SH146 EB FRONTAGE RO	1	5.0	9.7	0.0	17	17	4.5
Total		247.1	555.3	3.9	26	26	242.7

Arterial Level of Service: SB GARTH

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
IH10 WB FRONTAGE ROA	14	21.2	16	18.7	18	15.5	14
IH10 EB FRONTAGE	21	4.0	19	4.5	26	2.4	20
SHARON	28	10.4	27	10.8	33	7.0	29
INDEPENDENCE	29	13.1	35	7.3	31	11.0	33
HUNT	15	20.8	18	16.9	16	19.2	17
SANTAVY	27	14.6	26	15.2	25	17.2	21
ARCHER	34	10.3	36	8.8	33	10.5	33
SOUTH	36	7.6	39	4.3	39	5.1	36
CEDAR BAYOU LYNCHBUR	20	38.9	24	27.7	21	34.7	18
MANOR	34	12.9	37	9.8	34	12.7	31
BAKER	15	32.1	19	23.3	14	35.2	14
3923 GARTH	31	7.7	31	7.6	31	7.7	32
ROLLINGBROOK	24	22.9	23	27.0	23	25.1	22
SCENIC	34	8.1	29	14.5	31	10.7	34
NORTHWOOD	26	2.8	22	4.2	27	2.6	28
SH146 WB FRONTAGE RO	29	12.6	23	24.9	25	20.2	26
SH146 EB FRONTAGE RO	14	6.6	16	5.2	16	5.1	19
Total	26	246.4	26	230.8	26	242.0	25

Arterial Level of Service: NB GARTH

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
SH146 EB FRONTAGE RO	1	34.0	43.0	0.1	9	9	33.8
SH146 WB FRONTAGE RO	2	2.9	7.3	0.0	22	20	3.5
NORTHWOOD	31	12.6	34.5	0.3	36	33	16.1
SCENIC	32	4.1	8.5	0.1	22	22	4.1
ROLLINGBROOK	4	64.3	92.6	0.4	14	14	65.0
BIRDSONG	5	16.5	46.6	0.4	27	31	11.9
BAKER	6	64.2	81.3	0.2	10	8	81.9
BAYTOWN CENTRAL	7	11.6	27.2	0.2	28	27	12.7
CEDAR BAYOU LYNCHBUR	8	31.0	55.0	0.4	24	23	31.5
SOUTH	9	12.3	36.8	0.4	35	35	11.8
ARCHER	10	17.0	39.8	0.3	27	27	17.6
SANTAVY	11	37.6	62.6	0.3	20	17	47.5
HUNT	12	45.7	64.4	0.3	14	17	34.0
INDEPENDENCE	13	14.6	24.5	0.1	20	22	11.7
SHARON	14	62.6	82.3	0.3	12	16	39.4
IH10 EB FRONTAGE	15	78.6	110.6	0.2	7	8	66.4
IH10 WB FRONTAGE ROA	16	4.3	7.8	0.0	20	20	4.2
Total		513.8	824.9	3.9	18	18	493.0

Arterial Level of Service: NB GARTH

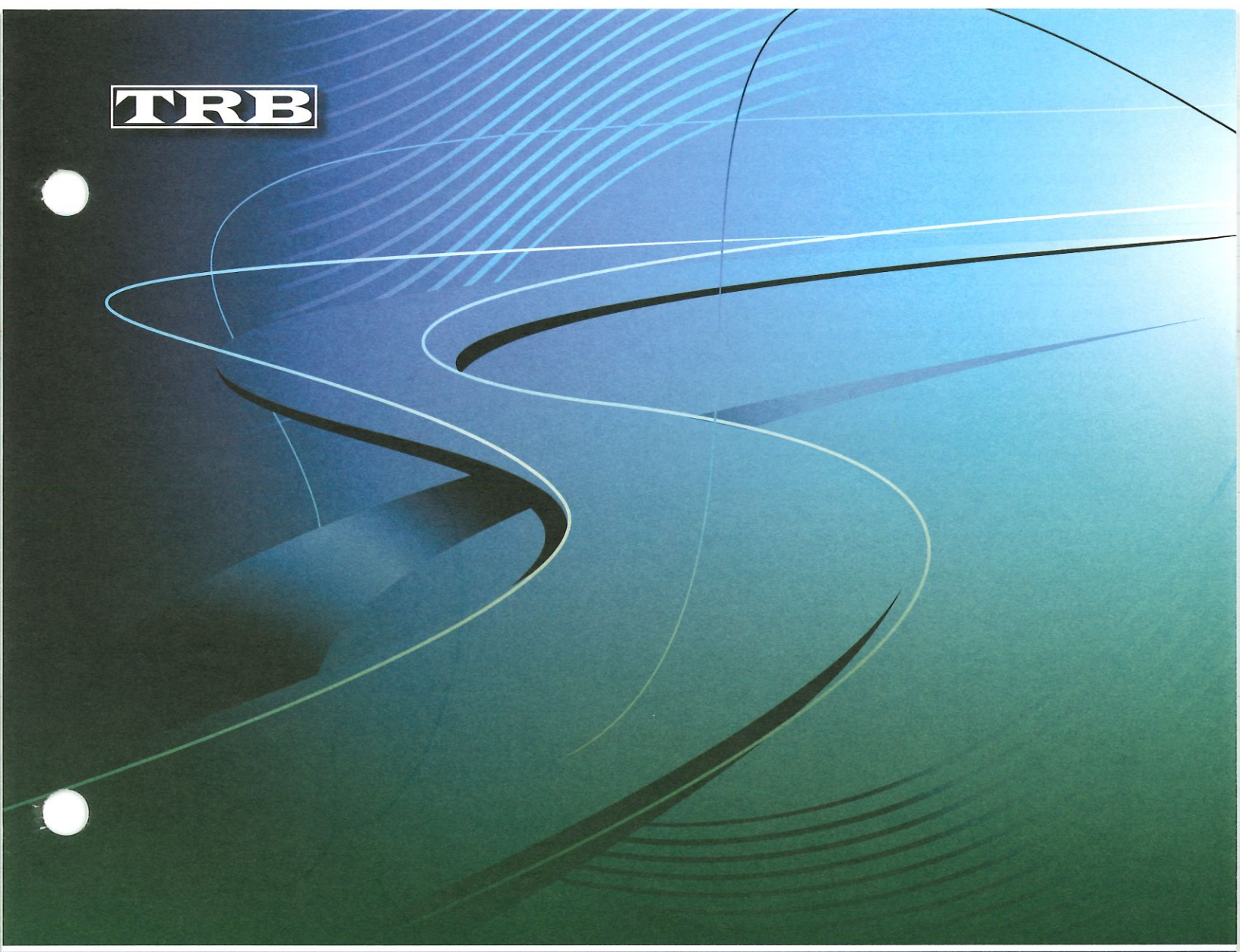
Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
SH146 EB FRONTAGE RO	9	33.9	7	48.8	10	29.1	12
SH146 WB FRONTAGE RO	23	2.6	22	3.1	22	2.9	24
NORTHWOOD	37	11.8	36	12.3	35	13.5	41
SCENIC	21	4.3	21	4.5	21	4.5	25
ROLLINGBROOK	16	48.9	16	52.2	10	105.2	17
BIRDSONG	26	18.1	24	22.7	26	18.5	30
BAKER	11	58.2	12	51.9	11	59.9	10
BAYTOWN CENTRAL	31	8.6	26	13.0	28	11.8	27
CEDAR BAYOU LYNCHBUR	24	29.7	23	34.2	24	29.3	24
SOUTH	34	12.9	34	13.1	37	10.3	34
ARCHER	29	15.4	28	16.4	26	19.5	28
SANTAVY	23	30.3	22	31.7	22	30.2	17
HUNT	11	64.4	17	34.5	16	39.0	13
INDEPENDENCE	18	16.7	22	12.6	19	15.0	18
SHARON	10	75.8	12	63.1	11	74.3	12
IH10 EB FRONTAGE	6	88.8	7	78.5	7	77.0	7
IH10 WB FRONTAGE ROA	20	4.1	21	3.8	20	4.2	18
Total	17	524.6	18	496.3	17	544.3	18

Arterial Level of Service: SB GARTH

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed	Run 1 Speed	Run 1 Delay
IH10 WB FRONTAGE ROA	16	25.5	35.2	0.1	13	12	28.2
IH10 EB FRONTAGE	15	4.4	8.0	0.0	20	19	4.8
SHARON	14	15.3	27.3	0.2	23	21	17.7
INDEPENDENCE	13	16.2	36.7	0.3	27	27	16.6
HUNT	12	35.8	45.8	0.1	10	12	31.3
SANTAVY	11	30.0	49.9	0.3	18	16	39.5
ARCHER	10	15.5	40.9	0.3	30	29	17.3
SOUTH	9	8.7	31.7	0.3	34	33	9.6
CEDAR BAYOU LYNCHBUR	8	39.7	63.9	0.4	20	20	39.7
MANOR	7	17.4	43.5	0.4	30	32	15.1
BAKER	6	100.0	114.9	0.2	7	8	76.4
3923 GARTH	5	9.2	27.0	0.2	31	30	10.8
ROLLINGBROOK	4	30.4	58.6	0.4	22	19	36.7
SCENIC	32	12.7	42.8	0.4	30	31	10.4
NORTHWOOD	31	4.0	8.3	0.1	22	22	4.2
SH146 WB FRONTAGE RO	2	43.5	71.9	0.3	17	22	27.5
SH146 EB FRONTAGE RO	1	4.0	8.7	0.0	18	18	4.3
Total		412.0	714.8	3.9	20	21	390.0

Arterial Level of Service: SB GARTH

Cross Street	Run 2 Speed	Run 2 Delay	Run 3 Speed	Run 3 Delay	Run 4 Speed	Run 4 Delay	Run 5 Speed
IH10 WB FRONTAGE ROA	13	23.5	13	24.7	13	25.7	13
IH10 EB FRONTAGE	20	4.3	20	4.1	20	4.2	19
SHARON	24	14.0	22	16.5	24	13.6	24
INDEPENDENCE	28	15.2	29	13.8	25	17.9	26
HUNT	9	45.1	12	31.2	11	32.6	10
SANTAVY	19	27.2	19	27.5	17	34.6	23
ARCHER	27	19.7	33	11.4	31	14.6	31
SOUTH	35	7.7	35	8.7	34	9.2	35
CEDAR BAYOU LYNCHBUR	22	35.3	21	37.3	18	48.3	20
MANOR	27	22.2	30	17.0	30	17.0	32
BAKER	5	123.3	6	115.2	7	92.4	7
3923 GARTH	35	6.5	27	12.1	32	7.7	31
ROLLINGBROOK	21	31.4	23	27.0	23	27.7	22
SCENIC	31	10.5	33	8.6	31	10.5	25
NORTHWOOD	25	3.0	24	3.4	23	3.9	19
SH146 WB FRONTAGE RO	15	55.2	19	36.3	14	59.6	18
SH146 EB FRONTAGE RO	19	3.5	20	3.5	21	2.8	16
Total	19	447.4	20	398.3	20	422.2	20



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reflects the fact that the methodologies described here were derived for and calibrated with data from street segments bounded by an intersection.

An access point intersection is an unsignalized intersection with one or two access point approaches to the segment. The approach can be a driveway or a public street. The through movements on the segment are uncontrolled at an access point intersection.

LOS CRITERIA

This subsection describes the LOS criteria for the motorized vehicle, pedestrian, bicycle, and transit modes. The criteria for the motorized vehicle mode are different from the criteria used for the other modes. Specifically, the criteria for the motorized vehicle mode are based on performance measures that are field-measurable and perceivable by travelers. With one exception, the criteria for the pedestrian and bicycle modes are based on scores reported by travelers indicating their perception of service quality. The exception is the pedestrian space measure (used with the pedestrian mode), which is field-measurable and perceivable by pedestrians. The criteria for the transit mode are based on measured changes in transit patronage due to changes in service quality.

Motorized Vehicle Mode

All uses of the word "volume" or the phrase "volume-to-capacity ratio" in this chapter refer to demand volume or demand-volume-to-capacity ratio.

Two performance measures are used to characterize vehicular LOS for a given direction of travel along an urban street segment. One measure is travel speed for through vehicles. This speed reflects the factors that influence running time along the link and the delay incurred by through vehicles at the boundary intersection. The second measure is the volume-to-capacity ratio for the through movement at the downstream boundary intersection. These performance measures indicate the degree of mobility provided by the segment. The following paragraphs characterize each service level.

"Free-flow speed" is the average running speed of through vehicles traveling along a segment under low-volume conditions and not delayed by traffic control devices or other vehicles.

The "base free-flow speed" is defined to be the free-flow speed on longer segments.

LOS A describes primarily free-flow operation. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at the boundary intersection is minimal. The travel speed exceeds 80% of the base free-flow speed, and the volume-to-capacity ratio is no greater than 1.0.

LOS B describes reasonably unimpeded operation. The ability to maneuver within the traffic stream is only slightly restricted, and control delay at the boundary intersection is not significant. The travel speed is between 67% and 80% of the base free-flow speed, and the volume-to-capacity ratio is no greater than 1.0.

LOS C describes stable operation. The ability to maneuver and change lanes at midsegment locations may be more restricted than at LOS B. Longer queues at the boundary intersection may contribute to lower travel speeds. The travel speed is between 50% and 67% of the base free-flow speed, and the volume-to-capacity ratio is no greater than 1.0.

LOS D indicates a less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed. This operation may be due to adverse signal progression, high volume, or inappropriate signal

timing at the boundary intersection. The travel speed is between 40% and 50% of the base free-flow speed, and the volume-to-capacity ratio is no greater than 1.0.

LOS E is characterized by unstable operation and significant delay. Such operations may be due to some combination of adverse progression, high volume, and inappropriate signal timing at the boundary intersection. The travel speed is between 30% and 40% of the base free-flow speed, and the volume-to-capacity ratio is no greater than 1.0.

LOS F is characterized by flow at extremely low speed. Congestion is likely occurring at the boundary intersection, as indicated by high delay and extensive queuing. The travel speed is 30% or less of the base free-flow speed, or the volume-to-capacity ratio is greater than 1.0.

Exhibit 18-1 lists the LOS thresholds established for the motorized vehicle mode on urban streets. The threshold value is interpolated when the base free-flow speed is between the values shown in the column headings of this exhibit. For example, the LOS A threshold for a segment with a base free-flow speed of 42 mi/h is 34 mi/h [= (42 – 40)/(45 – 40) × (36 – 32) + 32].

Exhibit 18-1
LOS Criteria: Motorized Vehicle Mode

LOS	Travel Speed Threshold by Base Free-Flow Speed (mi/h)							Volume-to-Capacity Ratio[a]
	55	50	45	40	35	30	25	
A	>44	>40	>36	>32	>28	>24	>20	≤ 1.0
B	>37	>34	>30	>27	>23	>20	>17	
C	>28	>25	>23	>20	>18	>15	>13	
D	>22	>20	>18	>16	>14	>12	>10	
E	>17	>15	>14	>12	>11	>9	>8	
F	≤17	≤15	≤14	≤12	≤11	≤9	≤8	
F	Any							> 1.0

Note: [a] Volume-to-capacity ratio of through movement at downstream boundary intersection.

Pedestrian, Bicycle, and Transit Modes

Historically, this manual has used a single performance measure as the basis for defining LOS. However, research documented in Chapter 5, Quality and Level-of-Service Concepts, indicates that travelers consider a wide variety of factors in assessing the quality of service provided to them. Some of these factors can be described as performance measures (e.g., speed), and others can be described as basic descriptors of the urban street character (e.g., sidewalk width). The methodologies for evaluating the pedestrian, bicycle, and transit modes combine these factors to determine the corresponding mode's LOS.

The Spatial Limits subsections of Sections 4 and 5 provide guidance on when to use segment- and link-based analyses for the pedestrian and bicycle modes, respectively.

Pedestrian quality of service can be evaluated for the segment, the link, or both. A segment-based pedestrian evaluation uses the worse of the LOS letters resulting from pedestrian space and the segment pedestrian LOS score to determine the overall segment pedestrian LOS. The left side of Exhibit 18-2 lists the threshold values associated with each LOS for the segment-based evaluation of the pedestrian travel mode. The LOS is determined by consideration of both the LOS score and the average pedestrian space on the sidewalk. The applicable LOS for an evaluation is determined from the table by finding the intersection of the row corresponding to the computed score value and the column corresponding to the computed space value.

queue dissipates and spillback is no longer present for the remainder of the cycle. This type of spillback can occur on short street segments with relatively long signal cycle lengths. The methodology may not provide a reliable estimate of segment performance if cyclic spillback occurs.

Sustained spillback occurs at some point during the analysis period and is a result of oversaturation (i.e., more vehicles discharging from the upstream intersection than can be served at the subject downstream intersection). The queue does not dissipate at the end of each cycle. Rather, it remains present until the downstream capacity is increased or the upstream demand is reduced.

The preceding discussion has focused on segment spillback; however, the concepts are equally applicable to turn bay spillback. In this case, the queue of turning vehicles exceeds the bay storage and spills back into the adjacent lane that is used by other vehicular movements.

The occurrence of both sustained segment and bay spillback must be checked during this step. A procedure is described in Section 3 of Chapter 30 for this purpose. If the spillback does not occur during the analysis period (i.e., it never occurs, or it occurs after the analysis period), the methodology will provide a reliable estimate of segment performance.

A procedure is described in Section 3 of Chapter 29 for evaluating the occurrence of sustained segment spillback during the analysis period.

If turn bay spillback occurs during the analysis period, the methodology may not yield reliable performance estimates. In this situation, the analyst should consider either (*a*) reducing the analysis period so that it ends before spillback occurs or (*b*) using an alternative analysis tool that can model the effect of spillback conditions.

Step 2: Determine Running Time

A procedure for determining segment running time is described in this step. This procedure includes the calculation of free-flow speed, a vehicle proximity adjustment factor, and the additional running time due to midsegment delay sources. Each calculation is discussed in the following subparts, which culminate with the calculation of segment running time.

A. Determine Free-Flow Speed

Free-flow speed is the average running speed of through vehicles traveling along a segment under low-volume conditions and not delayed by traffic control devices or other vehicles. It reflects the effect of the street environment on driver speed choice. Elements of the street environment that influence this choice under free-flow conditions include speed limit, access point density, median type, curb presence, and segment length.

The determination of free-flow speed is based on the calculation of base free-flow speed and an adjustment factor for signal spacing. These calculations are described in the next few paragraphs, which culminate in the calculation of free-flow speed.

Base Free-Flow Speed

The base free-flow speed is defined to be the free-flow speed on longer segments. It includes the influence of speed limit, access point density, median type, curb presence, and on-street parking presence. It is computed by using Equation 18-3. Alternatively, it can be measured in the field by using the technique described in Section 6 of Chapter 30.

Equation 18-3

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

where

S_{fo} = base free-flow speed (mi/h),

S_{calib} = base free-flow speed calibration factor (mi/h),

S_0 = speed constant (mi/h),

f_{CS} = adjustment for cross section (mi/h),

f_A = adjustment for access points (mi/h), and

f_{pk} = adjustment for on-street parking (mi/h).

The speed constant and adjustment factors used in Equation 18-3 are listed in Exhibit 18-11 (*1*). Equations provided in the table footnote can also be used to compute these adjustment factors for conditions not shown in the exhibit.

Exhibit 18-11
Base Free-Flow Speed Adjustment Factors

Speed Limit (mi/h)	Speed Constant S_0 (mi/h)[a]	Median Type	Percent with Restrictive Median (%)	Adjustment for Cross Section f_{CS} (mi/h)[b] No Curb	Curb
25	37.4	Restrictive	20	0.3	−0.9
30	39.7		40	0.6	−1.4
35	42.1		60	0.9	−1.8
40	44.4		80	1.2	−2.2
45	46.8		100	1.5	−2.7
50	49.1	Nonrestrictive	Not applicable	0.0	−0.5
55	51.5	No median	Not applicable	0.0	−0.5

Access Density D_a (points/mi)	Adjustment for Access Points f_A by Lanes N_{th} (mi/h)[c] 1 Lane	2 Lanes	3 Lanes	Percent with On-Street Parking (%)	Adjustment for Parking (mi/h)[d]
0	0.0	0.0	0.0	0	0.0
2	−0.2	−0.1	−0.1	20	−0.6
4	−0.3	−0.2	−0.1	40	−1.2
10	−0.8	−0.4	−0.3	60	−1.8
20	−1.6	−0.8	−0.5	80	−2.4
40	−3.1	−1.6	−1.0	100	−3.0
60	−4.7	−2.3	−1.6		

Notes:
[a] $S_0 = 25.6 + 0.47 S_{pl}$, where S_{pl} = posted speed limit (mi/h).
[b] $f_{CS} = 1.5\ p_{rm} - 0.47\ p_{curb} - 3.7\ p_{curb}\ p_{rm}$, where p_{rm} = proportion of link length with restrictive median (decimal) and p_{curb} = proportion of segment with curb on the right-hand side (decimal).
[c] $f_A = -0.078\ D_a / N_{th}$ with $D_a = 5{,}280\ (N_{ap,s} + N_{ap,o})/(L - W_i)$, where D_a = access point density on segment (points/mi); N_{th} = number of through lanes on the segment in the subject direction of travel (ln); $N_{ap,s}$ = number of access point approaches on the right side in the subject direction of travel (points); $N_{ap,o}$ = number of access point approaches on the right side in the opposing direction of travel (points); L = segment length (ft); and W_i = width of signalized intersection (ft).
[d] f_{pk} = −3.0 × proportion of link length with on-street parking available on the right-hand side (decimal).

Equation 18-3 has been calibrated by using data for many urban street segments collectively located throughout the United States, so the default value of 0.0 mi/h for S_{calib} is believed to yield results that are reasonably representative of driver behavior in most urban areas. However, if desired, a locally

representative value can be determined from field-measured estimates of the base free-flow speed for several street segments. The local default value can be established for typical street segments or for specific street types. This calibration factor is determined as the one value that provides a statistically based best-fit between the prediction from Equation 18-3 and the field-measured estimates. A procedure for estimating the base free-flow speed from field data is described in Section 6 of Chapter 30.

Adjustment for Signal Spacing

Empirical evidence suggests that a shorter segment length (when defined by signalized boundary intersections) tends to influence the driver's choice of free-flow speed (*1*). Shorter segments have been found to have a slower free-flow speed, all other factors being the same. Equation 18-4 is used to compute the value of an adjustment factor that accounts for this influence.

$$f_L = 1.02 - 4.7\frac{S_{fo} - 19.5}{\max(L_s, 400)} \leq 1.0 \qquad \textbf{Equation 18-4}$$

where

f_L = signal spacing adjustment factor,

S_{fo} = base free-flow speed (mi/h), and

L_s = distance between adjacent signalized intersections (ft).

Equation 18-4 was derived by using signalized boundary intersections. For more general applications, the definition of distance L_s is broadened so that it equals the distance between the two intersections that (*a*) bracket the subject segment and (*b*) have a type of control that can impose a legal requirement to stop or yield on the subject through movement.

Free-Flow Speed

The predicted free-flow speed is computed by using Equation 18-5 on the basis of estimates of base free-flow speed and the signal spacing adjustment factor. Alternatively, it can be entered directly by the analyst. It can also be measured in the field by using the technique described in Chapter 30.

$$S_f = S_{fo}\, f_L \geq S_{pl} \qquad \textbf{Equation 18-5}$$

where S_f is the free-flow speed (mi/h), S_{pl} is the posted speed limit, and all other variables are as previously defined. The speed obtained from Equation 18-5 is always greater than or equal to the speed limit.

B. Compute Adjustment for Vehicle Proximity

The proximity adjustment factor adjusts the free-flow running time to account for the effect of traffic density. The adjustment results in an increase in running time (and corresponding reduction in speed) with an increase in volume. The reduction in speed is a result of shorter headways associated with the higher volume and drivers' propensity to be more cautious when headways are short. Equation 18-6 is used to compute the proximity adjustment factor.

2019 South Segment

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

BFFS= 41.21585

A) S_fo=25.6+0.47*S_pl

44.4	40
S_fo	S_pl

B) F_cs=1.5*P_rm-0.47*P_curb-3.7*P_curb*P_rm

-0.47	0	1
F_cs	P_rm	P_curb

C) F_a=-0.078*D_a/N_th

-2.71415	69.5936	2
F_a	D_a	N_th

D_a=5280*(N)/(L-W)

84	6973	600
N	L	W

D) F_pk=-3*parking

0	0
F_pk	%parking

2019 North Segment

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

BFFS= 44.91794

A) S_fo=25.6+0.47*S_pl

46.75	45
S_fo	S_pl

B) F_cs=1.5*P_rm-0.47*P_curb-3.7*P_curb*P_rm

0	0	0
F_cs	P_rm	P_curb

C) F_a=-0.078*D_a/N_th

-1.83206	46.9759	2
F_a	D_a	N_th

D_a=5280*(N)/(L-W)

103	12677	1100
N	L	W

D) F_pk=-3*parking

0	0
F_pk	%parking

2040 South Segment

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

BFFS= 39.75901

A) S_fo=25.6+0.47*S_pl

44.4	40
S_fo	S_pl

B) F_cs=1.5*P_rm-0.47*P_curb-3.7*P_curb*P_rm

-2.67	1	1
F_cs	P_rm	P_curb

C) F_a=-0.078*D_a/N_th

-1.97099	50.53821	2
F_a	D_a	N_th

D_a=5280*(N)/(L-W)

61	6973	600
N	L	W

D) F_pk=-3*parking

0	0
F_pk	%parking

2040 North Segment

$$S_{fo} = S_{calib} + S_0 + f_{cs} + f_A + f_{pk}$$

BFFS= 43.19065

A) S_fo=25.6+0.47*S_pl

46.75	45
S_fo	S_pl

B) F_cs=1.5*P_rm-0.47*P_curb-3.7*P_curb*P_rm

-2.67	1	1
F_cs	P_rm	P_curb

C) F_a=-0.078*D_a/N_th

-0.88935	34.20575	3
F_a	D_a	N_th

D_a=5280*(N)/(L-W)

75	12677	1100
N	L	W

D) F_pk=-3*parking

0	0
F_pk	%parking

Abv	Description
S_fo	Base Free-Flow Speed
S_clib	Calibration Factor
S_o	Speed Constant
F_cs	Cross Section
F_a	Access Points
F_pk	On-Street Parking

Format	Description
	Calculation
	Input