Cotton Belt Corridor Regional Rail

Traffic Analysis

Technical Memorandum

December 2013

Prepared for Dallas Area Rapid Transit

General Planning Consultant Managed by URS Corporation

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Prepared by Alliance Transportation Group

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1.0 INTRODUCTION

This technical memorandum reviews and summarizes key transportation issues associated with the proposed Dallas Area Rapid Transit (DART) Cotton Belt Regional Rail project, including general traffic impacts at the proposed station locations along the Cotton Belt Corridor and traffic operations at proposed at-grade rail crossings.

Evaluation of traffic impacts at the station locations includes a summary of trip generation characteristics for each location; an estimation of the number of vehicular trips expected to and from each station during the AM and PM peak periods; an evaluation of signal warrant criteria for the major access points at each station location; and a review of peak-hour vehicular operations, including level of service (LOS) for the station access locations along the corridor. Other general observations related to the proposed station layouts, regarding site access, parking and on-site circulation are also provided for each station as appropriate.

Traffic analysis of the proposed at-grade crossings includes an evaluation of each location as compared to current grade-separation criteria developed by DART and an evaluation of peak-hour vehicular congestion and traffic operations at the at-grade crossing locations, based on projected arterial street traffic and train operating parameters.

1.1 Project Background

The proposed regional rail project implements passenger transit service within a 26-mile section of the Cotton Belt Corridor from Dallas/Fort Worth International Airport (DFW Airport) to the Richardson/Plano area of Texas. The alignment extends eastward from DFW Airport, through three counties: Tarrant, Dallas, and Collin; and seven cities: Grapevine, Coppell, Carrollton, Addison, Dallas, Richardson and Plano. The primary purpose of the project is to provide regional rail service that will improve mobility, accessibility and system linkages to major employment, population and activity centers in the northern part of the DART Service Area. Service would be provided every 20 minutes during the peak periods and every 60 minutes during the off-peak periods. The proposed Cotton Belt alignment in relation to the Dallas-Fort Worth area is shown in **Figure 1-1**.

Figure 1-1: Cotton Belt Corridor Regional Rail Proposed Rail Corridor and Station Locations

1.1.1 Proposed Cotton Belt Alignment

The Cotton Belt Rail will largely be constructed within an existing freight rail corridor. Within the study area, the Cotton Belt Rail will connect with DFW Airport (DFW North and DFW Terminal B stations) and the planned DART light rail transit (LRT) Orange Line (pedestrian connection between DFW Terminal B and DFW Terminal A stations) and will run generally eastward to the Shiloh Road area in Plano. The total length of this alignment is approximately 26 miles.

The alternatives being considered are primarily within existing DART right of way with the exception of track alignment deviations near North Lake and the planned Cypress Waters development in the Coppell/Dallas area and near the President George Bush Turnpike (PGBT) in Richardson.

- In the Cypress Waters alternatives, the Cotton Belt Rail running parallel and north of Belt Line Road, between Denton Tap Road and Moore Road, would be realigned to serve the proposed master development (Cypress Waters) south of the existing Belt Line Road.

- In North Dallas, three additional design options are being considered that would retain the alignment at grade or place the alignment below grade within a trench or tunnel.

- The west end of the Cotton Belt Rail project, from Alma Road to N Avenue, includes two alternatives, the North Alignment alternative, which generally follows the existing Cotton Belt tracks, and the South Alignment, which deviates from the existing Cotton Belt track within that section. The South Alignment veers south and away from the PGBT, crosses the floodplain and US 75/North Central Expressway on an aerial structure, then turns north and descends to the Bush Turnpike Station and adjacent existing Red Line LRT station. From this station, the South Alignment alternative travels north and parallel to the DART Red Line up to 12th Street in Plano and realigns with the existing Cotton Belt track beyond Municipal Avenue.

The Cotton Belt Rail will connect to DFW Airport via the DFW North Station, generally located north of state highway (SH) 114 near the north entrance to the airport. A rail connection from this station into DFW Airport's Terminal B is being developed. This will link the Cotton Belt Rail with DFW Airport's people mover system, known as Skylink. Primary planning and engineering for this connection is being led by the T. Traffic and operational analysis for this link is therefore not included in this document.

The Cotton Belt Rail will also connect to three of DART's LRT lines, including the Orange Line at DFW Airport, the Green Line in Downtown Carrollton and the Red Line in the Richardson/Plano area. An additional connection will be provided to the Addison Transit Center, which provides extensive bus connectivity within the northern part of the DART Service Area in Dallas County.

1.1.2 Cotton Belt Rail Operations

The Cotton Belt Rail is currently proposed to operate as a regional rail line, with generally higher operating speeds and less-frequent stops compared to existing DART LRT lines. Although no specific vehicle has been selected, for the purposes of this analysis a vehicle similar to the GTW DMU rail vehicle manufactured by Stadler Bussnang AG (Switzerland) is assumed.

Some of the key operating characteristics for the Cotton Belt Rail as currently planned include the following:

- 2018 is the anticipated initial operating year for revenue service along the Cotton Belt Rail corridor;
- Cotton Belt vehicles will be diesel/electric, articulated rail vehicles similar to vehicles currently in use by the Denton County Transportation Authority (DCTA) along the A-Train route;
- Each vehicle will have a total passenger capacity of 200 passengers, comprised of 104 seats (including 16 flip-up seats) and standing room for 96 passengers;
- Trains along the Cotton Belt corridor will consist of two vehicles during all times of the day, for a total capacity of 400 passengers per train;
- Trains will operate with 20-minute headways (each direction) in the peak hours and 60-minute headways in the off-peak periods;
- Maximum operating speeds for trains will be 60 miles per hour (mph), with trains generally operating at speeds of 35 mph to 50 mph between most stations;
- Cotton Belt Rail will generally be operated using double track (eastbound and westbound), with five short segments (ranging in length from 800 feet to 4,700 feet) of single-track operations along the corridor; and
- Freight rail traffic is expected to continue to operate on select segments within the corridor, separated by either time or separate tracks.

1.1.3 Station Locations and Descriptions

The DART portion of the Cotton Belt Rail line begins just north of DFW Airport on airport property and extends approximately 26 miles east/northeast to Plano. There are 11 station locations currently planned for this portion of the Cotton Belt Rail. Brief descriptions of each station location are provided in this section. Two location options (each) were evaluated for Cypress Waters, Renner Village and 12th Street Plano stations. Planning-level station layouts for each of the 14 stations are provided in **Appendix A**.

DFW North Station – This station serves as the connection between the Cotton Belt Rail and DFW Airport, via a planned rail connection to the Terminal B Station. This connection is currently being planned as part of the T's portion of the rail line, identified as TEX Rail. The DFW North Station will include side platforms for each of the two rail lines serving the station, a shared 704 parking area with the T, and bus bays, located west of the station. Dallas Road will be extended east of the existing trucking facility, providing access to SH 26 (Texan Trail) from the station.

North Lake Station (Existing Belt Line Option) – The North Lake Station (considered only with the Cypress Waters alternative) would be located on the south side of the existing Belt Line Road between Denton Tap Road and Moore Road, just northwest of North Lake. For the North Lake Station, the Cotton Belt Rail guideway west of Moore Road would be realigned to serve the proposed master development (Cypress Waters), which is located south of the existing Belt Line Road. This station will include side platforms for the Cotton Belt Rail line, a parking area with approximately 170 spaces and bus bays. Access to the parking area will be provided by a single full-access driveway onto Beltline Road. The bus bay area will be accessed by a separate one-way circulating drive, with full movement access (left and right turn-outs) at the exit.

North Lake Station (Relocated Belt Line Option) – Considered as an additional design option, the existing four-lane divided section of Belt Line Road (between Denton Tap Road and Moore Road) is proposed to be realigned such that it runs parallel and south of the realigned Cotton Belt Rail guidewayfrom Moore Road to west of the station, and then intersects Denton Tap Road at Wrangler Drive, south of its current intersection. A portion of the existing Belt Line Road, east of the proposed station will be retained to function as an access driveway to the station and an existing commercial facility. This driveway access will be 'button-hooked' to cross the proposed rail and intersect the realigned Belt Line Road between the station and Moore Road. The station layout is identical to the layout proposed for the Existing Beltline Option described above. (Access to the parking and bus bay areas also remain unchanged, and thus, for the purpose of traffic impact discussion, no distinction was made between the two North Lake Station options.)

Downtown Carrollton Station – This station will be located north of Belt Line Road between Broadway Street and Denton Drive in downtown Carrollton, immediately adjacent to the existing DART Green Line station. This station includes side platforms for the Cotton Belt Rail and a pedestrian connection to the Green Line station at the end of the Cotton Belt platforms. Two additional parking areas will be added, with a total of approximately 231 new spaces. Access to the new parking areas will be provided by two full-access driveways onto Denton Drive.

Addison Station – This station will be placed on the north side of the existing Addison Transit Center, currently located on the north side of Arapaho Road between Addison Road and Quorum Drive. The station will include side platforms for the Cotton Belt Rail and a pedestrian connection to the Addison Transit Center facilities at the west end of the platforms. No new parking or site circulation driveways will be constructed as part of the Cotton Belt Rail, as new traffic and rail users will be accommodated by the existing facilities at the Addison Transit Center or by a future municipal parking garage.

Knoll Trail Station – This station will be located approximately one-quarter mile north of Addison Road just east of Knoll Trail Drive in Dallas. The station will include side platforms for the Cotton Belt Rail, but dedicated parking[1] or drop-off areas are not currently planned. Bus activity would be limited and located on Knoll Trail Drive. Riders will access this station on foot, by bicycle, or from existing transit services in the area.

Preston Road Station – This station will be located south of Keller Springs Road just east of the Preston Road grade separation in Dallas. The station will include a center platform for the Cotton Belt Rail, but will not have any dedicated parking or drop-off areas as currently planned. Riders will access this station on foot, by bicycle or from existing transit services in the area.

Renner Village Station (East Option) – This station will be located just west of Coit Road approximately one-third mile north of McCallum Boulevard in Dallas. The station will include side platforms for the Cotton Belt Rail, a new parking area with approximately 197 spaces and bus bays. Access to the parking area and the bus bays will be provided by a single full-access driveway onto Coit Road.

[1] Although Knoll Trail Station will not offer dedicated parking, there is a large private parking area in a shopping center immediately south of the Knoll Trail Station. It is expected that this parking area will be used as a de-facto pick-up and drop-off area for the Cotton Belt Rail; some vehicular traffic was therefore assigned to this parking area in the subsequent analysis.

Renner Village Station (West Option) – This station will be located just east of Dickerson Street approximately one-quarter mile north of McCallum Boulevard in Dallas. The station will include side platforms for the Cotton Belt Rail, a new parking area with approximately 321 spaces and bus bays. Access to the parking area and the bus bays will be provided by a single full-access driveway onto Dickerson Street.

UTD/Synergy Station – This station will be located south of Waterview Parkway between the Frankford Road and Renner Road intersections, on the north side of the UT-Dallas campus in Richardson. The station will include a center platform for the Cotton Belt Rail, a new parking area with 151 spaces and bus bays. Access to the parking area and the bus bays will be provided by a single full-access driveway onto Waterview Parkway. Although the platform location is fixed, additional station elements could be altered to fit the development of UT-Dallas campus plan.

Bush Turnpike Station (Southern Alignment Option) – This station will be located immediately adjacent to the existing DART Bush Turnpike LRT station, which is south of the President George Bush Turnpike (PGBT) and east of US 75 in Richardson. This station will include side platforms for the Cotton Belt Rail, and will require reconfiguration of the circulation area, but will not add any additional parking beyond that already in place for the LRT station. The existing parking lot has 1,193 spaces and the average occupancy rate of the lot was 61 percent, based on the findings of a parking study conducted by Alliance as part of DART's General Planning Contract in May 2013. This station will provide a connection between the Cotton Belt Rail and the DART Red Line.

12th Street Aerial Station (South Alignment Option) – This station is planned along 12th Street in Plano, between the existing K Avenue and Municipal Avenue. The aerial station will include side platforms for the Cotton Belt Rail, a new parking area with approximately 196 spaces and bus bays. Access to the parking area and the bus bays will be provided by two driveways on a new segment of 12th Place between J Avenue and K Avenue, and two driveways on K Avenue located north of the Cotton Belt Rail line. Additionally, a fire lane is also proposed along the south side of the new station between K Avenue and Municipal Avenue. Most of the site-generated trips at this station will access the station via the 12th Place/K Avenue and 12th Place/Municipal Avenue intersections. Realignment and modification to portions of 12th Street, K Avenue, 12th Place and J Avenue will be required in the area around this station. It is noteworthy that the existing freight track will be depressed between 10th Street and N Avenue to allow sufficient clearance for the elevated Cotton Belt Rail guideway. K Avenue and Municipal Avenue will be reconstructed so as to cross the freight track at grade.

12th Street At-Grade Station (North Alignment Option) – This station is planned along 12th Street in Plano, between the Red Line and K Avenue. This at-grade station will include a center platform for the Cotton Belt Rail, a new parking area with approximately 256 spaces and bus bays. Access to the parking area and the bus bays will be provided by two driveways on a new segment of 12th Place between J Avenue and K Avenue, one driveway on 12th Place between K Avenue and Municipal Avenue, and two driveways on K Avenue located north of the Cotton Belt Rail line. Most of the site-generated trips at this station will access the station via 12th Place/K Avenue and 12th Place/Municipal Avenue intersection. Realignment and modification to portions of 12th Street, K Avenue, 12th Place and J Avenue will be required in the area around this station. As compared to the Bush Turnpike Station, this station would provide

an alternative connection to the DART Red Line, which would require construction of a new LRT station on the Red Line at this location.

Shiloh Road Station – This station will be located on the west side of Shiloh Road between Plano Parkway and 14th Street in Plano. This station will include a center platform for the Cotton Belt Rail, one new parking area with a total of approximately 702 spaces and bus bays. Primary access to the main and secondary parking areas as well as access to the bus bays will be provided by a full-access driveway and a right-in/right-out driveway onto Shiloh Road.

A summary of these station characteristics, including platform types, access characteristics and available parking, is provided in **Table 1-1**.

Table 1-1: Summary of Station Characteristics

Station	City	Platform Type	Bus Bays	Parking Facility	Number of New Parking Spaces	Vehicular Access Points	Major Transit Connections
DFW North	Grapevine	Side	4	Yes	704	1	TEX Rail
North Lake	Dallas	Side	4	Yes	170	3	
Downtown Carrollton	Carrollton	Side	Existing	Yes	231	2	Green Line
Addison	Addison	Side	Existing	Existing	Existing	Existing	Addison TC
Knoll Trail	Dallas	Side	No	No	n/a	n/a	
Preston Road	Dallas	Center	No	No	n/a	n/a	
Renner Village (East Option)	Dallas	Side	5	Yes	197	1	
Renner Village (West Option)	Dallas	Side	4	Yes	321	1	
UTD/Synergy	Richardson	Center	6	Yes	151	1	
Bush Turnpike (South Alignment)	Richardson	Side	Existing	Existing	Existing	Existing	Red Line
12th Street (South Alignment)	Plano	Side	3	Yes	196	4	Red Line
12th Street (North Alignment)	Plano	Center	3	Yes	256	5	
Shiloh Road	Plano	Center	2	Yes	702	2	

2.0 STATION-AREA TRAFFIC IMPACTS

Brief traffic impact analyses were performed for each of the proposed station sites along the corridor to determine the effects of the Cotton Belt Rail on existing vehicular traffic and arterial street operations at the planned station locations. Impact analyses were generally focused on the site access driveways for each station. The methodology, results and recommendations for these impact studies are described in the following section.

2.1 Summary of Methodology

A brief traffic impact analysis for each station was completed as part of the overall Cotton Belt Rail traffic analysis. The scope of the impact analysis was generally limited to the station access driveways onto the adjacent arterial street network, with a focus on quantifying driveway operations and evaluating the need for installation of a traffic signal at any of the station locations. The impact analysis was completed based on the following information:

- Preliminary station locations and site layouts as provided by the project team
- Available traffic data as previously collected (no new traffic counts were performed as part of this analysis)
- Planned opening-year rail operations, including vehicle capacity, headways and ridership forecasts as provided by the project team

The traffic impact analyses were limited to those stations that will allow for some form of automobile access – either on-site parking or bus bay facilities. Stations with parking areas can be anticipated to attract more automobile traffic (particularly during peak hours) and might therefore have more localized traffic impacts on the surrounding area. Traffic impact evaluation for these stations along the Cotton Belt Rail corridor was focused to evaluate the peak-hour traffic operations at the site access driveways, including the need for a new traffic signal and/or other geometric improvements to accommodate projected traffic upon opening of the transit station.

Downtown and neighborhood-type stations that do not provide automobile access and depend on walk-up riders or those arriving via another transportation mode (bicycling, transit) were not evaluated for traffic impacts as part of this analysis. Along the Cotton Belt Rail corridor, there are two stations (Knoll Trail Station and Preston Road Station) that do not provide specific access via automobile. At these locations, it is anticipated that automobile traffic impacts to the surrounding street network would be limited to pick-up and drop-off activity, estimated to be a small percentage of total passenger boardings at these stations.

The methodology used to develop the traffic impact analysis data and results for each station is described in the following section. The process was applied to each station to develop site-specific mitigation recommendations.

2.1.1 Adjacent Street Traffic Volumes

For each station location, existing average daily traffic (ADT) volumes were gathered for the adjacent street onto which the station parking areas and bus bay driveways will have access. Since no new data collection activities were completed as part of this analysis, ADT volumes were generally obtained for the most recent year available from various sources, including city

traffic count databases (Plano, Richardson and Addison) and the *Cotton Belt Regional Rail: Grade Separation Analysis* (August 2011), prepared by the DART General Planning Consultant (GPC) team.

To develop projected ADT volumes for the 2018 opening year anticipated for the Cotton Belt Rail line, historical growth rates were reviewed, and a nominal 2% average annual growth rate was applied to existing ADT volumes on the streets adjacent to the proposed Cotton Belt stations. To develop peak-hour traffic volumes for the adjacent street, it was assumed that 8% of ADT occurs during the AM peak hour and 10% of ADT occurs during the PM peak hour.

These assumptions resulted in projected 2018 peak-hour traffic volumes along the streets immediately adjacent to the proposed Cotton Belt Rail stations, which were used in subsequent portions of this analysis. Worksheets showing adjacent street traffic volumes for the anticipated 2018 opening year at each station location are provided in **Appendix B**.

2.1.2 Mode Split

Cotton Belt Rail ridership is anticipated to arrive at the various station locations via multiple transportation modes. As part of previous DART rail-planning efforts, the projected ridership (boardings and alightings) associated with each station along the Cotton Belt Rail line was determined, using multiple model runs of the regional travel demand model. These model runs were based on a 2035 model year, rather than the Cotton Belt opening year, but were used as a starting point for the expected station trip modal splits. From this modeling effort, the number of daily riders accessing the Cotton Belt Rail by various transportation modes and systems was determined.

A summary of the ridership origin and destination modeling is provided in **Table 2-1**. On a daily basis roughly 32% of those boarding the Cotton Belt Rail will arrive at the various stations by automobile, approximately 15% are expected to arrive on foot, and the remaining 53% are expected to arrive by other transit modes (including DART buses, feeder shuttles and existing LRT lines). The station-specific modal split was used as input into automobile trip generation for each station location as described in detail in the next section.

Table 2-1: 2035 Cotton Belt Line Ridership – Build Alternative											
	BOARDING RAIL FROM										
Station	Walk	Drive	DART Feeder	DFW-APM	Local Bus	DART Exp	LRT	CRT	Total Boarding		
DFW Terminal B	0	0	0	0	52	0	176	3	231		
DFW North	183	817	0	0	222	0	0	1,027	2,249		
North Lake	33	224	32	0	167	0	0	0	456		
Downtown Carrollton	97	395	255	0	16	0	796	1,713	3,272		
Addison	287	193	363	0	300	0	0	2	1,146		
Knoll Trail	292	352	0	0	163	0	0	86	893		
Preston Road	349	106	0	0	98	0	0	0	552		
Renner Village	565	440	2	0	254	61	0	26	1,349		
UTD/Synergy	208	318	1,218	0	0	0	0	41	1,785		
Bush Turnpike (South Alignment)	24	1,245	8	0	0	0	1,184	0	2,460		
12th Street (South Alignment)	55	360	108	0	72	0	1,184	45	744		
12th Street (North Alignment)	79	1,605	116	0	72	0	110	0	3,204		
Shiloh Road	330	806	100	0	7	0	0	0	1,244		
Cotton Belt Boarding by Mode of Access	***2,418***	***5,256***	***2,086***	***0***	***1,351***	***61***	***2,266***	***2,944***	***16,382***		
	14.8%	**32.1%**	**12.7%**	**0.0%**	**8.2%**	**0.4%**	**13.8%**	**18.0%**	**100.0%**		
	ALIGHTING RAIL TO									Total Station Activity	Total Station Ridership
Station	Walk	Drive	DART Feeder	DFW-APM	Local Bus	DART Exp	LRT	CRT	Total Alighting		
DFW Terminal B	2,092	0	0	2,018	203	0	631	3	4,948	**5,179**	**2,590**
DFW North	83	0	0	0	300	0	0	502	885	**3,135**	**1,567**
North Lake	61	0	400	0	299	0	0	0	760	**1,215**	**608**
Downtown Carrollton	369	0	128	0	184	0	1,270	214	2,165	**5,438**	**2,719**
Addison	1,520	0	323	0	661	23	0	2	2,528	**3,674**	**1,837**
Knoll Trail	813	0	0	0	204	0	0	86	1,102	**1,995**	**998**
Preston Road	3391	0	0	0	145	0	0	0	537	**1,089**	**544**
Renner Village	296	0	12	0	313	26	0	26	674	**2,023**	**1,012**
UTD/Synergy	463	0	392	0	0	0	0	41	896	**2,681**	**1,341**
Bush Turnpike (South Alignment)	49	0	5	0	24	0	934	0	1,011	**3,472**	**1,736**
12th Street (South Alignment)	75	0	53	0	20	0	262	45	456	**1,200**	**600**
12th Street (North Alignment)	124	0	58	0	44	0	1,196	45	1,467	**4,672**	**2,336**
Shiloh Road	411	0	6	0	0	0	0	0	418	**1,661**	**831**
Cotton Belt Alighting by Mode of Access	***6,623***	***0***	***1,319***	***2,018***	***2,353***	***50***	***3,098***	***921***	***16,382***	***32,763***	***16,382***
	40.4%	**0.0%**	**8.1%**	**12.3%**	**14.4%**	**0.3%**	**18.9%**	**5.6%**	**100.0%**		

2.1.3 Trip Generation

Site-generated traffic associated with each of the Cotton Belt Rail stations was generated based on projected peak-hour ridership for the Cotton Belt line, available parking at each station location and the anticipated modal split of riders at each location. Cotton Belt Rail riders will make trips to and from each rail station by automobile, walking or other transit vehicles (buses, LRT, feeder shuttles).

As shown previously in **Table 2-1**, the percentages of riders accessing the Cotton Belt Rail line via the various modes changes depending on the station location and facilities. Using the Shiloh Road station as an example, 806 daily riders are expected to arrive at the station by private vehicle.

To determine the peak-hour private vehicle trip generation for each station location, anticipated daily ridership and modal split percentages were used, along with additional data collected previously as part of a park-and-ride study completed for DART in 2012. This park-and-ride study was completed as Task Order 36 of the DART GPC, and was focused on developing trip generation rates for DART LRT stations. The study included data collection at eight stations along the DART Red, Blue and Green LRT lines in the Dallas area. Using the ridership forecasts for each Cotton Belt station and the peak-hour trip generation rates developed for these existing Dallas-area DART LRT stations, AM and PM peak-hour vehicle trips were determined for each of the proposed Cotton Belt stations. Trip generation results are shown in **Table 2-2**.

Table 2-2: Peak-Hour Site-Generated Traffic Volumes

Station	Total AM Trips	Total PM Trips
DFW North	158	171
North Lake	43	47
Downtown Carrollton	76	83
Addison	37	40
Knoll Trail	68	74
Preston Road	20	22
Renner Village (East and West Options)	85	92
UTD/Synergy	61	67
Bush Turnpike (South Alignment)	240	261
12th Street (South Alignment)	69	76
12th Street (North Alignment)	310	337
Shiloh Road	155	169

Trip distribution and entering/exiting percentages during the AM and PM Peak hour were also estimated using data from the park-and-ride study. Key results of the data collection effort that were incorporated into this Cotton Belt Rail analysis include the following:

- Of those riders arriving at or leaving the Cotton Belt Rail stations by private automobile each day, 19% arrive or depart in the AM peak hour;
- During the AM peak hour, 66% of the site-generated private vehicle traffic are entering vehicles, while 34% are exiting vehicles, including both “park-and-ride” and “kiss-and-ride” users;
- Of those riders arriving at or leaving the Cotton Belt Rail stations by private automobiles each day, 21% arrive or depart in the PM peak hour; and

- During the PM peak hour, 27% of the site-generated private vehicle traffic are entering vehicles, while 73% are exiting vehicles, including both "park-and-ride" and "kiss-and-ride" users.

These peak-hour percentages and directional distributions are further summarized in **Table 2-3**.

Table 2-3: Peak-Hour Percentages and Directional Distribution

	Peak-Hour Total Traffic	Directional Distribution	
Period	**Percent of ADT**	**% Entering**	**% Exiting**
AM Peak	19%	66%	34%
PM Peak	21%	27%	73%

As shown in **Table 2-3**, approximately 40% of the site-generated private vehicle traffic at the Cotton Belt Rail stations is expected to occur during the AM or PM peak periods, consistent with an expected user profile of a workday commuter. The directional splits during the peak periods also reflect the expected use by riders who both drive to the station and park for the day, and those who are dropped off by someone in a private vehicle. These characteristics were used in developing peak-hour site-generated traffic volumes for stations with planned parking lots. For those Cotton Belt stations with no parking lots, additional adjustments to the directional distribution were included.

Additional vehicular traffic at the stations will be generated by DART buses that will pick up and drop off passengers at each station. The number of buses accessing each station was not precisely determined at this time, as bus schedules and routing could be expected to change upon opening the Cotton Belt Rail. Due to the limited data available at this time, quantifying the peak-hour bus activity for the opening year was not included as part of this analysis.

2.1.4 Traffic Assignment

Traffic assignments for each of the eleven Cotton Belt Rail station locations was determined using data and assumptions previously described for modal split, daily vehicular traffic volumes, peak-hour percentages and directional distribution. Site-generated trips were then assigned to the site access driveway (or multiple driveways, where applicable) and distributed to the surrounding street network based on the density of residential development in the area surrounding each station. Worksheets showing peak-hour site-generated traffic assignment for the site access driveways at each location are provided in **Appendix C**.

2.1.5 Signal Warrant Analysis

For each of the station locations, a signal warrant analysis was performed for the site access points, focusing on the intersection of each site access driveway and the adjacent arterial street. The signal warrant evaluation was conducted in accordance with Chapter 4C of the 2011 *Texas Manual on Uniform Traffic Control Devices* (TMUTCD). As stated in the TMUTCD, traffic control signals should not be installed unless one or more of the signal warrants are met. Forecasted 2018 opening year traffic data was analyzed to determine whether a traffic signal is warranted at the study intersection.

The engineering study is based on the nine Warrants set forth in the TMUTCD. These nine warrants are as follows:

- Warrant 1 - Eight-Hour Vehicular Volume
- Warrant 2 - Four-Hour Vehicular Volume
- Warrant 3 - Peak Hour
- Warrant 4 - Pedestrian Volume
- Warrant 5 - School Crossing
- Warrant 6 - Coordinated Signal System
- Warrant 7 - Crash Experience
- Warrant 8 - Roadway Network
- Warrant 9 - Intersection Near an At-Grade Crossing

The TMUTCD allows for reductions in the volumes required for satisfying warrants 1, 2, 3 and 4, if the 85th percentile speed of major street traffic exceeds 40 mph, or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000. While the Cotton Belt Rail is planned for the urbanized area of the Dallas-Fort Worth metroplex, reduced volume thresholds were evaluated where posted speed limits on the adjacent arterial street currently exceed 40 mph.

Performing a signal warrant evaluation for a future, forecasted condition limits some of the data that can be evaluated. Based on a preliminary analysis, Warrants 4-9 were generally not found to be applicable to the Cotton Belt Rail station traffic signal warrant evaluation, and were therefore not evaluated for reasons summarized as follows:

- Warrant 4 – Although substantial pedestrian activity is expected near the Cotton Belt Rail stations, future pedestrian volumes were not forecasted to a level of accuracy necessary for this warrant. Upon opening the Cotton Belt Rail, pedestrian activity can be evaluated to determine if pedestrian volumes satisfy the Pedestrian Volume signal warrant.

- Warrant 5 – The School Crossing signal warrant is intended for application where school children crossing a major street is the principal reason for considering the installation of a traffic control signal. While substantial volumes of school children crossing near the stations are not anticipated at this time, this warrant can be more fully evaluated upon the opening of the Cotton Belt Rail.

- Warrant 6 – The Coordinated Signal System signal warrant is usually considered to maintain proper platooning. This warrant is only applied where the resultant spacing of traffic signals would be greater than 1,000 feet. While detailed evaluation of each corridor was not completed within the developed urban area that will be served by the Cotton Belt Rail, existing signal spacing is generally adequate (typically one-quarter mile or less) to provide the necessary degree of platooning along the arterial street network.

- Warrant 7 – The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. Future-year crashes cannot be forecasted to a level of accuracy necessary for evaluation of this warrant. Crash experience can be evaluated a few years after the opening of the Cotton Belt Rail.

- Warrant 8 – The Roadway Network signal warrant is not satisfied at the station locations as the minor street (generally the station access driveway at each location) will not be categorized as a major route.

- Warrant 9 – The Intersection Near a Grade Crossing signal warrant is applicable only where the proximity of a grade crossing to an intersection approach controlled by a stop or yield sign is the principal reason for installing a traffic control signal. Although grade crossings are present near many of the proposed Cotton Belt Rail stations, the approaches are not planned to be stop or yield controlled. Cotton Belt Rail crossings are expected to be controlled with active warning devices, including lights, bells and crossing arms.

The remaining three signal warrants (1, 2 and 3) can be generally referred to as the volume-based warrants, as they rely on an evaluation of major street and minor street conflicting volumes during various hours of the day. For purposes of this planning-level signal warrant evaluation, these volume-based warrants were evaluated based on the two hours of traffic data (AM and PM peak hours) forecasted for the 2018 opening year. Results of the signal warrant evaluation for the site access intersections at nine of the 12 station locations are summarized in **Table 2-4**. A signal warrant evaluation was not completed for the site access driveway at the DFW North Station. The proposed site driveway will connect to the existing Texan Trail/Dallas Road intersection through an extension of Dallas Road from its existing terminus just east of Texan Trail to the DFW North Station. The intersection of Texan Trail and Dallas Road is currently signalized. Complete signal warrant analysis worksheets are available in **Appendix D**.

2.1.6 Traffic Operational Analysis

Peak-hour traffic operational analysis was completed for the site access driveways at each of the Cotton Belt Rail stations. Operational analysis was conducted using the peak-hour traffic volumes developed as previously described for the AM and PM peak hours and the expected traffic control at the intersection. Each driveway approach was assumed to operate as stop controlled.

Results are summarized to show AM and PM peak-hour level of service (LOS) for these intersections, based on methodology described in the most recent version of the *Highway Capacity Manual* (HCM), published by the Transportation Research Board (TRB) in 2010. For unsignalized intersections, LOS is reported as the worst-movement LOS from among all conflicting movements (generally defined as left- and right-turn exits from the stop-controlled driveway and left-turn entries from the major street in case exclusive turn lanes are provided). Approach LOS is reported in case of shared lane configurations. For the Cotton Belt Rail stations, the worst-movement LOS is generally the left-turn movement for vehicles exiting the station onto the arterial street network, except in cases where the driveway is planned for right-in/right-out access only. Complete LOS results for the driveways are summarized in **Table 2-5**.

Table 2-4: Signal Warrant Summary (Vehicle Volume-Based Warrants)				
Station*	**Intersection**	**Warrant Evaluation Results**		
		Warrant 1 – Eight-Hour Volume	*Warrant 2 – Four-Hour Volume*	*Warrant 3 – Peak-Hour Volume*
North Lake	Belt Line Road/ Driveway 1	No	No	No
Downtown Carrollton	Denton Drive/ Driveway 1	No	No	No
	Denton Drive/ Driveway 2	No	No	No
Addison	Quorum Drive/ Driveway 1	No	No	No
	Arapaho Road/ Driveway 2	No	No	No
Knoll Trail	Knoll Trail Drive/ Driveway 1 (private parking area)	No	No	No
Renner Village (East Option)	Coit Road/ Driveway 1	No	No	No
Renner Village (West Option)	Dickerson Street/ Driveway 1	No	No	No
UTD/Synergy	Waterview Parkway/ Driveway 1	No	No	No
Bush Turnpike (South Alignment)	PGBT EBFR/SW Driveway	No	No	No
	PGBT EBFR/Crawford Drive	No	No	No
	PGBT EBFR/S Central Driveway	No	No	No
	PGBT EBFR/SE Driveway	No	No	No
	PGBT WBFR/NE Driveway	No	No	No
	PGBT WBFR/N Central Driveway	No	No	No
	PGBT WBFR/Crawford Drive	No	No	No
	PGBT WBFR/NW Driveway	No	No	No
12th Street ** (South Alignment)	12th Place/ K Avenue	No	No	No
	12th Place/ Municipal Avenue	No	No	No
12th Street ** (North Alignment)	12th Place/ K Avenue	No	No	No
	12th Place/ Municipal Avenue	No	No	No
Shiloh Road	Shiloh Road / Driveway 1	No	No	No

* DFW North - The station's access driveway will be tied into an existing, signalized intersection; no signal warrant analysis was completed.

Preston Road - Station does not include any dedicated automobile access (parking area); no signal warrant analysis was completed.

** 12th Street Station has multiple vehicle access driveways onto 12th Place and onto K Avenue. Trip distribution shows that most vehicle traffic passes through 12th Place/Municipal Avenue and 12th Place/K Avenue intersections; these intersections were therefore selected for operational evaluation.

Table 2-5: Year 2018 Unsignalized Intersection Level of Service							
Station*	Intersection/ Driveway	AM Peak			PM Peak		
		Worst Movement	LOS	Average Delay (seconds/ vehicle)	Worst Movement	LOS	Average Delay (seconds/ vehicle)
North Lake	Belt Line Road/ Driveway 1	SB**	B	13.8	SB**	C	16.9
Downtown Carrollton	Denton Drive/ Driveway 1	EB Left	B	14.3	EB Left	C	16.6
	Denton Drive/ Driveway 2	EB Left	B	14.4	EB Left	C	16.7
Addison	Quorum Drive/ Driveway 1	EB Right	A	9.2	EB Right	A	9.5
	Arapaho Road/ Driveway 2	SB**	C	19.6	SB**	D	31.2
Knoll Trail	Knoll Trail Drive/ Driveway 1	WB**	A	9.4	WB**	A	9.7
Renner Village (East Option)	Coit Road/ Driveway 1	EB Left	F	>120.0	EB Left	F	>120.0
Renner Village (West Option)	Dickerson St/ Driveway 1	WB**	A	9.4	WB**	A	9.6
UTD/ Synergy	Waterview Parkway/ Driveway 1	NB Left	F	>120.0	NB Left	F	>120.0
Bush Turnpike (South Alignment)	PGBT EBFR/SW Driveway	SB Left	A	0.0	SB Left	A	0.0
	PGBT EBFR/Crawford Drive	SB Left	B	12.8	SB Left	B	12.5
	PGBT EBFR/S Central Driveway	SB Left	A	0.0	SB Left	A	0.0
	PGBT EBFR/SE Driveway	SB Left	A	0.0	SB Left	A	0.0
	PGBT WBFR/NE Driveway	NB Left	A	0.0	NB Left	A	0.0
	PGBT WBFR/N Central Driveway	NB Left	A	0.0	NB Left	A	0.0
	PGBT WBFR/Crawford Drive	NB Left	B	11.5	NB Left	B	11.9
	PGBT WBFR/NW Driveway	NB Left	A	0.0	NB Left	A	0.0
12th Street (South Alignment)	12th Place/ K Avenue	EB**	B	12.7	EB**	B	14.6
	12th Place/ Municipal Avenue	EB Left	A	0.0	EB Left	A	0.0
12th Street (North Alignment)	12th Place/ K Avenue	EB**	B	14.3	EB**	C	20.5
	12th Place/ Municipal Avenue	EB Left	A	0.0	EB Left	A	0.0
Shiloh	Shiloh Road/ Driveway 1	EB**	C	15.8	EB**	C	21.5
	Shiloh Road/ Driveway 2	EB Right	B	11.5	EB Right	B	12.7

* Preston Road - Station does not include any dedicated automobile access (parking area); no LOS analysis was completed.
** Driveway has one approach/exit for all applicable movements.

As shown, most of the station access driveways are expected to operate at an acceptable LOS of D or better during the AM and PM peak periods. There are two stations, however, where acceptable LOS is not anticipated, due in large part to the heavy through movements on adjacent major arterial streets. Station driveways, where a lower LOS is anticipated, include the following:

- **Renner Village (East Option)** – Left-turn movements from the single site access driveway are projected to operate at LOS F during both AM and PM peak periods. Left-turn movements into the parking lot from northbound Coit Road will operate at LOS C during the AM peak and LOS D during the PM peak. The heavy through volumes on Coit Road lead to insufficient gaps for vehicles waiting to make a left-turn out of the driveway resulting in excessive delays for this movement. In lieu of a full access driveway at this location, consideration should be given to limiting movements at this driveway to right-in, right-out (RIRO) only, or a three-quarter access (right-in, right-out and left-in).

- **UTD/Synergy** – Left-turn movements from the single site access driveway are projected to operate at LOS F during both AM and PM peak periods largely due to the heavy through volumes on Waterview Parkway; rather than a full access driveway at this location, consideration should be given to modifying the existing median break and limiting movements at this driveway to right-in, right-out only, or a three-quarter access (right-in, right-out and left-in). Additional access improvements should be coordinated with the City of Richardson and UT-Dallas in the development of campus plans.

2.2 Traffic Impact Results and Recommendations

The traffic impact analysis for each station location was completed based on the traffic forecasting and analysis methodology described in the previous sections. Generally, the impact analysis included a review of likely automobile traffic patterns to and from each station; evaluation of the need for a traffic signal at each site access point; and a peak-hour operational analysis for each site access driveway. The impact analysis was based on planned Cotton Belt Rail operational parameters, an opening year of 2018, conceptual station site layouts, planned parking areas and available traffic volume data.

The traffic impact assessment was completed for those stations along the Cotton Belt Rail that will include some form of automobile access. Two stations along the corridor are not expected to include any dedicated automobile access to the Cotton Belt Rail – the Knoll Trail and Preston Road stations (although the Knoll Trail Station is located near large, existing parking areas located on private property). Traffic impacts at these stations are expected to be relatively minimal and limited to possible bus activity and very reduced kiss-and-ride traffic.

General results of the station area traffic impact analysis are summarized in **Table 2-6**. Results and recommendations are based on previously-described Cotton Belt Rail operations and forecasted automobile traffic volumes for the 2018 opening year.

Table 2-6: Summary of Traffic Impacts by Cotton Belt Rail Station Location	
DFW North Station	
Parking Lot	Yes
Number of Parking Spaces	704
Number of Bus Bays	4
Projected Daily Total Boardings	2,249
Projected Daily Drive-Access Boardings	817
Estimated AM/PM Peak Hour Automobile Trips	158/171
Access Points	1
Primary Access Street	SH-26/Texan Trail
Number of Lanes on Access Street	Texan Trail (6 lanes)
Traffic Signal Warrant Results	n/a (currently signalized)
Worst-Movement LOS – AM Peak	n/a (no existing turning movements/signal timing data available)
Worst-Movement LOS – PM Peak	n/a (no existing turning movements/signal timing data available)
Recommended Site Access Modifications	None
North Lake Station	
Parking Lot	Yes
Number of Parking Spaces	170
Number of Bus Bays	4
Projected Daily Total Boardings	456
Projected Daily Drive-Access Boardings	224
Estimated AM/PM Peak Hour Automobile Trips	43/47
Access Points	1
Primary Access Street	Belt Line Road
Number of Lanes on Access Street	Belt Line Road (4 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS B
Worst-Movement LOS – PM Peak	Driveway 1: LOS C
Recommended Site Access Modifications	None
Downtown Carrollton Station	
Parking Lot	Yes
Number of Parking Spaces	231 (in addition to existing spaces)
Number of Bus Bays	Existing Green Line LRT Bus Drop
Projected Daily Total Boardings	3,272
Projected Daily Drive-Access Boardings	395
Estimated AM/PM Peak Hour Automobile Trips	76/83
Access Points	2
Primary Access Street	Denton Drive
Number of Lanes on Access Street	Denton Drive (2 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS B; Driveway 2: LOS B
Worst-Movement LOS – PM Peak	Driveway 1: LOS C; Driveway 2: LOS C
Recommended Site Access Modifications	None
Addison Station	
Parking Lot	Existing/Addison Transit Center
Number of Parking Spaces	Existing/No Additional Spaces Added
Number of Bus Bays	Existing/Addison Transit Center

Table 2-6: Summary of Traffic Impacts by Cotton Belt Rail Station Location	
Projected Daily Total Boardings	1,146
Projected Daily Drive-Access Boardings	193
Estimated AM/PM Peak Hour Automobile Trips	37/40
Access Points	3 (existing)
Primary Access Street	Arapaho Road
Number of Lanes on Access Street	Arapaho Road (4 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS A; Driveway 2: LOS C
Worst-Movement LOS – PM Peak	Driveway 1: LOS A; Driveway 2: LOS D
Recommended Site Access Modifications	None
Knoll Trail Station	
Parking Lot	No
Number of Parking Spaces	n/a
Number of Bus Bays	None
Projected Daily Total Boardings	893
Projected Daily Drive-Access Boardings	352
Estimated AM/PM Peak Hour Automobile Trips	68/74
Access Points	No dedicated access; existing private driveway
Primary Access Street	Knoll Trail Drive
Number of Lanes on Access Street	Knoll Trail Drive (4 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS A
Worst-Movement LOS – PM Peak	Driveway 1: LOS A
Recommended Site Access Modifications	None
Preston Road Station	
Parking Lot	No
Number of Parking Spaces	n/a
Number of Bus Bays	None
Projected Daily Total Boardings	552
Projected Daily Drive-Access Boardings	106
Estimated AM/PM Peak Hour Automobile Trips	20/22
Access Points	No dedicated vehicular access
Primary Access Street	Keller Springs Road
Number of Lanes on Access Street	Keller Springs Road (2 lanes)
Traffic Signal Warrant Results	n/a; no site access driveways, walk access only
Worst-Movement LOS – AM Peak	n/a; no site access driveways, walk access only
Worst-Movement LOS – PM Peak	n/a; no site access driveways, walk access only
Recommended Site Access Modifications	None
Renner Village Station (East Option)	
Parking Lot	Yes
Number of Parking Spaces	197
Number of Bus Bays	5
Projected Daily Total Boardings	1,349
Projected Daily Drive-Access Boardings	440
Estimated AM/PM Peak Hour Automobile Trips	85/92
Access Points	1
Primary Access Street	Coit Road
Number of Lanes on Access Street	Coit Road (6 lanes)

Table 2-6: Summary of Traffic Impacts by Cotton Belt Rail Station Location	
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS F
Worst-Movement LOS – PM Peak	Driveway 1: LOS F
Recommended Site Access Modifications	Limit access to ½ access (right-in/right-out) or three-quarter access (right-in/right-out and left-in)
Renner Village Station (West Option)	
Parking Lot	Yes
Number of Parking Spaces	321
Number of Bus Bays	4
Projected Daily Total Boardings	1,349
Projected Daily Drive-Access Boardings	440
Estimated AM/PM Peak Hour Automobile Trips	85/92
Access Points	1
Primary Access Street	Dickerson Street
Number of Lanes on Access Street	Dickerson Street (2 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS A
Worst-Movement LOS – PM Peak	Driveway 1: LOS A
Recommended Site Access Modifications	None
UTD/Synergy Station	
Parking Lot	Yes
Number of Parking Spaces	151
Number of Bus Bays	6
Projected Daily Total Boardings	1,785
Projected Daily Drive-Access Boardings	318
Estimated AM/PM Peak Hour Automobile Trips	61/67
Access Points	1
Primary Access Street	Waterview Parkway
Number of Lanes on Access Street	Waterview Parkway (6 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	Driveway 1: LOS F
Worst-Movement LOS – PM Peak	Driveway 1: LOS F
Recommended Site Access Modifications	Limit access to ½ access (right-in/right-out) or three-quarter access (right-in/right-out and left-in) Additional access improvements should be coordinated with the City of Richardson and UT-Dallas in the development of campus plans.
Bush Turnpike Station (South Alignment)	
Parking Lot	Existing/Red Line LRT Station
Number of Parking Spaces	Existing/No Additional Spaces Added
Number of Bus Bays	Existing/Red Line LRT Station
Projected Daily Total Boardings	2,460
Projected Daily Drive-Access Boardings	1,245
Estimated AM/PM Peak Hour Automobile Trips	240/261
Access Points	8 (existing)
Primary Access Street	SH-190/President Bush Highway
Number of Lanes on Access Street	SH-190/President Bush Highway (3 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied

Table 2-6: Summary of Traffic Impacts by Cotton Belt Rail Station Location	
Worst-Movement LOS – AM Peak	SW Driveway: LOS A; (S)Crawford Drive: LOS B; S Central Driveway: LOS A; SE Driveway: LOS A; NE Driveway: LOS A; N Central Driveway: LOS A; (N)Crawford Drive: LOS B; NW Driveway: LOS A
Worst-Movement LOS – PM Peak	SW Driveway: LOS A; (S)Crawford Drive: LOS B; S Central Driveway: LOS A; SE Driveway: LOS A; NE Driveway: LOS A; N Central Driveway: LOS A; (N)Crawford Drive: LOS B; NW Driveway: LOS A
Recommended Site Access Modifications	None
12th Street Station (South Alignment)	
Parking Lot	Yes
Number of Parking Spaces	196
Number of Bus Bays	3
Projected Daily Total Boardings	744
Projected Daily Drive-Access Boardings	360
Estimated AM/PM Peak Hour Automobile Trips	69/76
Access Points	4
Primary Access Street	Municipal Avenue, K Avenue
Number of Lanes on Access Street	Municipal Avenue (3 lanes), K Avenue (3 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	12th Place/K Avenue: LOS B; 12th Place/Municipal Avenue: LOS A
Worst-Movement LOS – PM Peak	12th Place/K Avenue: LOS B; 12th Place/Municipal Avenue: LOS A
Recommended Site Access Modifications	None
12th Street Station (North Alignment)	
Parking Lot	Yes
Number of Parking Spaces	256
Number of Bus Bays	3
Projected Daily Total Boardings	3,204
Projected Daily Drive-Access Boardings	1,605
Estimated AM/PM Peak Hour Automobile Trips	310/337
Access Points	5
Primary Access Street	Municipal Avenue, K Avenue
Number of Lanes on Access Street	Municipal Avenue (3 lanes), K Avenue (3 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied
Worst-Movement LOS – AM Peak	12th Place/K Avenue: LOS B; 12th Place/Municipal Avenue: LOS C
Worst-Movement LOS – PM Peak	12th Place/K Avenue: LOS A; 12th Place/Municipal Avenue: LOS A
Recommended Site Access Modifications	None
Shiloh Road Station	
Parking Lot	Yes
Number of Parking Spaces	702
Number of Bus Bays	2
Projected Daily Total Boardings	1,244
Projected Daily Drive-Access Boardings	806
Estimated AM/PM Peak Hour Automobile Trips	155/169
Access Points	2

Table 2-6: Summary of Traffic Impacts by Cotton Belt Rail Station Location	
Primary Access Street	Shiloh Road
Number of Lanes on Access Street	Shiloh Road (6 lanes)
Traffic Signal Warrant Results	No volume-based warrants satisfied for both the peak hours
Worst-Movement LOS – AM Peak	Driveway 1: LOS C; Driveway 2: LOS B
Worst-Movement LOS – PM Peak	Driveway 1: LOS C; Driveway 2: LOS B
Recommended Site Access Modifications	None

3.0 GRADE CROSSING ANALYSIS

At-grade crossing is the term used to describe the intersection of a roadway and the Cotton Belt Rail tracks. The Cotton Belt Rail will operate within its own railroad right-of-way throughout the corridor, and the moving train will always take precedence over automobile traffic at the grade crossings through the use of priority signals and warning devices. The need for train priority is due to many factors but the primary reasons are the higher operating speeds and longer stopping distances required by the proposed Cotton Belt Rail vehicles. Because of this, all at-grade crossings along the corridor are expected to have active warning devices, train signals and/or gates that are activated by an approaching Cotton Belt Rail vehicle to warn pedestrians and drivers not to enter the track area. Gates not only provide audible and visual warnings but also block access to the crossing. At crossing locations where vehicle traffic is very high, a grade separation might be needed to provide adequate train and automobile operations.

3.1 At-Grade Crossing Summary

In selecting protection options for at-grade crossings, the best practical at-grade design will consider not only the physical configuration of the intersection and the operational features of the Cotton Belt Rail, but also how best to minimize impacts to the traveling public. The best solution is one that maximizes safety while balancing travel delays and planned Cotton Belt Rail operations. In circumstances where the combination of train activity and vehicular traffic at a particular crossing is extremely high, an at-grade crossing may not provide acceptable operations. In such situations, a grade separation should be provided to serve train and roadway traffic.

3.1.1 Safety Considerations

The principal safety factor at a grade crossing is to avoid collisions between trains and roadway vehicles. An additional consideration is limiting secondary accidents that may only involve roadway vehicles, but are considered to be a result of the train activity or activation of the grade crossing warning system (similar to the concern with rear end type accidents that occur at red traffic signals). The primary safety concerns are mitigated if clear warning and efficient traffic controls are provided and drivers do not violate the established safety devices. Safety is typically enhanced if sight distance is available for both the roadway vehicles and train operators approaching the crossing. Where sight distance is limited, grade crossing warning and protective systems are essential to maintain safety, which typically include flashing lights, audible devices and automatic gates. Setting aside the issues related to violations and enforcement, safety is improved if provisions are taken to minimize the possibility that vehicles will become caught on the tracks behind a queue of vehicles or waiting for gaps in traffic at a parallel roadway immediately downstream from the grade crossing. For this reason, traffic control devices and the roadway design surrounding the grade crossing need to include provisions to limit queuing on the tracks and to clear vehicles prior to the arrival of trains.

A wide range of measures is available to keep the crossing clear, including:

- Geometric features to provide vehicular storage downstream from the grade crossing
- Roadway shoulders to provide a refuge area downstream from the crossing
- Stop signs for frontage (parallel) roadway traffic at unsignalized intersections
- Use of active warning devices

- Use of “pre-signals” (traffic signals placed in advance of the grade crossing instead of at the downstream intersection). In some cases, pre-signals are used in addition to downstream intersection traffic signals (with this scenario the pre-signals typically are designed to turn red prior to downstream intersection traffic signals). The appropriate use of pre-signals is dependent on the distance from the grade crossing and the downstream intersection
- Use of “queue cutters” (traffic signals ahead of the grade crossing that break the traffic flow into platoons, which can clear the tracks)
- Use of “metering” of traffic from upstream traffic signals so that queuing on the tracks does not occur
- Preemption of downstream traffic signals to provide track clearance phases.

3.1.2 Mobility Considerations

Total vehicular delay is the product of all the vehicle queues while the grade crossing is blocked by the Cotton Belt Rail vehicle, and continues to accrue until all of the vehicles in the queue have regained their initial travel speed. For planned Cotton Belt Rail at-grade crossings, given the relatively small blocking times per train and the relatively few trains per hour, the total hourly impact of the crossing closure is typically far less than the delay which occurs at signalized intersections along the cross streets in the surrounding area of the grade crossing. The operating plan anticipated for the Cotton Belt Rail is six trains per hour in the peak hour. This operating plan equates to three trains at 20-minute headways for each direction.

Assuming approximately 60 seconds of crossing gate closure per train (based on an estimated 20 seconds for the gates to descend, 20 seconds for the train to pass and 20 seconds for the gates to return to an upright position), the hourly Volume/Capacity impact at the grade crossing would be 0.10, which equals an effective green time percentage for vehicular traffic across the train tracks of 90 percent. This can be compared with the typical maximum green time to total cycle time of 40 to 45 percent, which is typically available to a major movement at a signalized intersection. Therefore, the hourly impacts to traffic at Cotton Belt Rail at-grade crossings are considered to be minimal.

In addition to the average hourly impact, secondary traffic operational impacts can occur, especially when grade crossing closures impact platoons of vehicles that are moving through a progressive, coordinated traffic signal system. A portion of the platoon may be cut off and vehicles may or may not be able to clear a downstream traffic signal when released from the grade crossing. Additional impacts may occur if an adjacent traffic signal is preempted in conjunction with the grade crossing gate activation. Preemption is provided so that a traffic signal can provide a “track clearance” phase, which will display a green signal indication to assure that vehicles on the trackway can clear the crossing prior to train arrival. In addition, preemption sequences ordinarily provide a “limited service” phase, which allows non-conflicting roadway movements to continue during gate blocking and train passage. Although preemption can provide benefits to parallel roadways, the traffic signal is randomly pulled out of coordination and the disruption to flow may extend to the next signal cycle after the train passage.

3.2 At-Grade Crossing Evaluation

As part of previous Cotton Belt Rail planning activities, a detailed analysis of the planned grade crossings was completed. The results of this analysis are summarized in the technical report titled *Cotton Belt Corridor Regional Rail: Grade Separation Analysis* (August 2011). This report is incorporated into this document by reference. A review of the report is summarized in this section, along with the addition of minor updates as needed where Cotton Belt Rail assumptions, proposed routing or planned operations have changed.

3.2.1 At-Grade Crossings along Corridor

Based on the current Cotton Belt Rail alignment, there are 50 at-grade crossings along the proposed route. Existing traffic volumes at nearly all of these locations were collected for the most recent year available from various sources, including North Central Texas Council of Governments (NCTCOG) and Texas Department of Transportation (TxDOT) data. These traffic volumes, along with the functional classification and number of lanes for each roadway at the location of a Cotton Belt Rail crossing, are summarized in **Table 3-1**.

Table 3-1: Arterial Street Characteristics at At-Grade Crossing Locations

No.	Street Name	Functional Classification	2010 ADT*	# of Lanes
1	S Royal Lane	Principal Arterial	13,144	4
2	Freeport Parkway	Collector	12,154	4
3	Coppell Road	Collector	3,575	2
4	S Denton Tap Road	Principal Arterial	29,446	6
5	Belt Line Road (Denton Tap-Moore)**	Principal Arterial	13,355	4
6	Belt Line Road (MacArthur-Mockingbird)	Principal Arterial	14,490	4
7	S Moore Road	Collector	5,530	2
8	Mockingbird Lane	Collector	3,363	2
9	MacArthur Boulevard	Principal Arterial	19,350	6
10	Fairway Drive	Collector	4,323	2
11	Private Driveway (Ledbetter Road)	None (Driveway)	1,049	2
12	N Luna Road	Arterial	16,814	6
13	IH-35E SB Frontage Road	Arterial	9,552	4
14	IH-35E NB Frontage Road	Arterial	9,301	2
15	N Broadway Street	Collector	4,627	2
16	N Denton Drive	Collector	3,233	2
17	Perry Road	Collector	3,773	2
18	N Josey Lane	Arterial	31,625	6
19	Kelly Boulevard	Arterial	11,278	4
20	Private Driveway (The Honors Golf Club)	None (Driveway)	159	2
21	N Marsh Lane	Arterial	34,293	6
22	Surveyor Boulevard	Commercial Collector	4,096	2
23	Midway Road	Principal Arterial	35,544	6
24	Addison Road	Minor Arterial	14,936	4
25	Quorum Drive	Minor Arterial	7,293	4
26	Spectrum Drive	Residential Collector	2,444	2
27	Dallas North Tollway SB Frontage Road	Arterial	12,764	3
28	Dallas North Tollway NB Frontage Road	Arterial	12,144	3
29	Knoll Trail Drive	Minor Arterial	6,298	4
30	Davenport Road (South)	Collector	4,733	4
31	Campbell Road	Principal Arterial	15,674	6

Table 3-1: Arterial Street Characteristics at At-Grade Crossing Locations				
No.	**Street Name**	**Functional Classification**	**2010 ADT***	**# of Lanes**
32	Davenport Road (North)	Collector	3,692	2
33	Hillcrest Road	Principal Arterial	15,832	6
34	McCallum Boulevard	Collector	4,696	4
35	Meandering Way	Collector	2,569	4
36	Dickerson Street	Local	1,257	2
37	Coit Road	Principal Arterial	39,631	6
38	Reveille Run	Local	NA	2
39	Waterview Parkway	Arterial	19,932	6
40	Custer Parkway	Arterial	15,602	6
41	Alma Road	Arterial	9,933	4
42	US 75 SB Frontage Road	Arterial	18,761***	3
43	US 75 NB Frontage Road	Arterial	4,022***	3
44	E Plano Parkway	Major Thoroughfare	30,851	6
45	F Avenue	Secondary Thoroughfare	2,018	2
46	10th Street	Local	1,510	2
47	K Avenue	Major Thoroughfare	8,528	3
48	Municipal Avenue (L Avenue)	Major Thoroughfare	7,118	3
49	N Avenue	Secondary Thoroughfare	1,606	2
50	Jupiter Road	Major Thoroughfare	NA	6

* 24-hour machine traffic counts collected along each roadway which crosses the Cotton Belt Rail line in 2010.
** Consideration of this at-grade crossing is only associated with the North Lake – Existing Belt Line Option.
*** 2009 Volumes from NCTCOG grown over a period of one year at an assumed growth rate of 2%.

3.2.2 ITE Grade Separation Policy and Analysis

The Institute of Transportation Engineers' (ITE's) *Light Rail Transit Grade Separation Guidelines* (January 1993) provides guidance on various types of grade-crossing strategies based upon cross-street roadway traffic volumes and train headway thresholds. Based on the proposed 20-minute headways for the Cotton Belt Rail, the ITE thresholds are summarized in **Table 3-2**.

Table 3-2: Summary of ITE Grade Separation Thresholds				
Threshold	**ADT for 2-lane roads**	**ADT for 3-lane roads***	**ADT for 4-lane roads**	**ADT for 6-lane roads**
1. At-grade crossing is acceptable	< 8,500	< 15,600	< 17,500	< 26,000
2. Site-specific conditions should be analyzed to determine the feasibility of traffic signal preemption and at-grade crossing desirability	8,500 – 15,000	15,600 – 31,200	17,500 – 35,000	26,000 – 52,000
3. Grade separation is necessary (unless the train can be delayed)	15,000 – 22,000	31,200 – 39,600	35,000 – 44,000	52,000 – 66,000
4. Grade separation is required	> 22,000	> 39,600	> 44,000	> 66,000

Source: Light Rail Transit Grade Separation Guidelines, ITE Journal, January 1993.
*ITE Study did not establish a threshold for 3-lane roadways. 60% of threshold values for 6-lane roads were used to establish thresholds for 3-lane facilities. (Source: Florida DOT)

Each grade crossing location along the Cotton Belt Rail was evaluated as part of the August 2011 GPC report. This evaluation compared anticipated future-year ADT volumes and the number of lanes for each roadway with the ITE grade separation criteria. The previous GPC analysis used 2030 as the future analysis year and the projected 2030 ADT volumes at each grade crossing were obtained from NCTCOG forecasts. At minor street locations where NCTCOG projected volumes were not available, future year ADT was estimated by increasing the existing 2010 ADT by an annual growth factor of 2% per year. Although current Cotton Belt Rail planning efforts anticipate an earlier opening year of 2018, the 2030 traffic forecasts are considered a conservative estimation for the grade crossing analysis, and no adjustments were made. Based on projected 2030 traffic and geometric conditions, 28 grade crossing locations fall under Threshold 1; 18 grade crossing locations fall under Threshold 2; and two grade crossing locations fall under Threshold 3, listed as follows:

- Midway Road (Addison)
- Coit Road (Dallas)

While generally used to evaluate LRT crossings, these thresholds were applied to the Cotton Belt Rail regional commuter service to determine locations where grade separation might be needed. However, Threshold 3 is intended for use with LRT operating in conditions and at speeds that permit trains to stop for crossings until receiving a signal to proceed. The Cotton Belt Rail will be a different, heavier rail technology, operating at higher speeds with longer stopping distances. As a result, grade separation was considered at those locations that fall within the third threshold. No grade crossing locations were classified as Threshold 4.

ATG reviewed the 2011 analysis as part of this effort and generally concurs with the methodology and results; no substantial changes or modifications are needed at this time. No additional analysis for the South Alignment was done as the Cotton Belt Line is proposed to follow the existing light rail alignment, north of the Bush Turnpike Station.

3.2.3 DART Grade Separation Policy and Analysis

DART has established criteria for evaluating the need for grade separations of rail crossings, initially developed in 1997 and amended in 1998. The DART policy lists measures that must be met when considering a rail/roadway grade separation. The DART policy states the following:

> *"DART has determined that, subject to a determination that other reasonable and effective traffic mitigation measures are not feasible, two specific warrants can effectively measure if a street intersecting a rail line should be grade separated. These grade separation warrants are:*
>
> - *Queuing impacts*
> - *Level of Service (LOS) impacts*
>
> *Queuing impacts: If the presence of DART's rail line causes vehicular traffic on streets adjacent to the rail line to queue through adjoining intersections or queue through the LRT intersection, a queuing impact may exist.*

Level of Service (LOS) impacts: If the presence of DART's rail line causes the level of service (LOS) on streets adjacent to the rail line to drop two or more levels or cause the street to have a LOS of "F", a LOS impact may exist."

In addition to the ITE screening criteria, grade crossings were evaluated in the August 2011 GPC report relative to DART's grade separation policy. All grade crossings that met ITE Threshold 2 or Threshold 3 (as there were no crossings that met Threshold 4) were further evaluated in accordance with DART's grade separation criteria. Of these locations, seven locations were identified that are not expected to operate within the parameters of the DART criteria. These seven locations were identified as follows:

- Denton Tap Road (Coppell)
- Luna Road (Carrollton)
- Midway Road (Addison)
- Addison Road (Addison)
- Coit Road (Dallas)
- Alma Road (Richardson)
- E Plano Parkway and US 75 NB/SB Frontage Roads (Plano)

Additional operational analyses of these locations were performed to determine the impacts of Cotton Belt Rail operation on queuing and level of service on these roadways and at nearby existing signalized intersections. These results are summarized in the following section of this report.

3.2.4 Grade Crossing Operational Evaluation

For the 2011 *Grade Separation Analysis*, peak-hour traffic volumes at each of the grade crossings were collected and used to evaluate the effects of the Cotton Belt Rail on roadway traffic at seven grade crossing locations that are not expected to meet DART screening criteria for at-grade crossings. This evaluation included a queuing and LOS analysis for each approach crossing the Cotton Belt Rail tracks, based on assumed operational parameters for the Cotton Belt Rail, which are summarized as follows:

- Cotton Belt Rail trains will be 200 feet in total length
- The train will travel at an average speed of 30 MPH
- Gate arms at each crossing will take approximately 20 seconds to get into the down position
- Gate arms will take approximately 20 seconds to get into the upright position
- Train crossing time is dependent upon the intersection roadway cross section/width

Complete results and detailed Synchro analysis for these grade crossing locations is available in the *Grade Separation Analysis* (August 2011). Results show that implementing some adjustments to the signal timing and railroad preemption will provide acceptable operations and reduced queuing at the Alma Road and Addison Road at-grade crossings. At the Luna Road crossing, the operational analysis suggests that a grade separation is needed; however, physical constraints related to the close proximity of the nearby PGBT prevent construction of a grade separation at this location. At the remaining four locations, the August 2011 report recommends construction of a grade separation, based on a combination of 1) the ITE *Grade Separation*

Screening Criteria and 2) DART's grade separation policy. These recommended locations for a grade separation include the following:

- Denton Tap Road
- Midway Road
- Coit Road
- E Plano Parkway and US 75 NB/SB Frontage Roads

As part of this updated analysis, the GPC team generally concurs with the recommendations provided and agrees that no substantial changes or modifications are needed at this time.

4.0 CONCLUSION

This study reviewed and summarized key transportation issues associated with the proposed Cotton Belt Rail, including general traffic impacts at the proposed station locations along the Cotton Belt Corridor and traffic operations at proposed at-grade rail crossings. Review and analysis has been performed for the anticipated 2018 opening year of the Cotton Belt Rail, for the approximately 26-mile segment from DFW Airport to Shiloh Road in Plano.

Based on the findings presented in this report, it is anticipated that the proposed Cotton Belt Rail will slightly impact transportation conditions and traffic operations in the vicinity of the 11 proposed station locations. However, the additional traffic volumes generated by each station during the AM and PM peak hours are not expected to substantially impact traffic flow or require additional capacity on the adjacent street network.

Installation of a traffic signal at access driveways and intersections is generally not warranted, based on TMUTCD volume-based warrant criteria, at any of the proposed station locations.

Some ingress and egress movements at two station site access driveways are anticipated to operate at unacceptable LOS during the AM and/or PM peak hours. Recommended mitigation measures at these locations are summarized as follows:

- **Renner Village Station (East Option)** – Due to heavy traffic volumes on Coit Road, consider limiting movements at the single site access driveway to right-in/right-out only or a three-quarter access (right-in, right-out, left-in). It is noted that the Coit Road rail crossing located approximately 425 feet north of the proposed driveway is recommended to be grade separated based on additional analysis of at-grade crossing criteria

- **UTD/Synergy Station** – Due to heavy traffic volumes on Waterview Parkway, consider limiting movements at the single site access driveway to right-in/right-out only or a three-quarter access (right-in, right-out, left-in). Additional access improvements should be coordinated with the City of Richardson and UT-Dallas in the development of campus plans.

Based on results of this analysis and a review of the previous GPC evaluation, the Cotton Belt Rail will only slightly impact traffic operations at most of the 48 studied crossings. Most locations can continue to operate as at-grade crossings with only minimal, short-term, localized impacts to roadway LOS and queuing at crossings and adjacent intersections.

As noted in the August 2011 report, seven locations are not expected to operate within the LOS and queuing parameters of established DART criteria for at-grade crossings once the Cotton Belt Rail is in place. At these locations, adjacent intersections will be substantially impacted by queuing related to the crossing. According to the 2011 GPC analysis, traffic operations at two of these locations (Addison Road and Alma Road) can be managed by preempting and adjusting the signal timing of the adjacent signalized intersections. At a third location (Luna Road) existing physical constraints related to the close proximity of the PGBT prevent a grade separation; this location will be planned as an at-grade crossing.

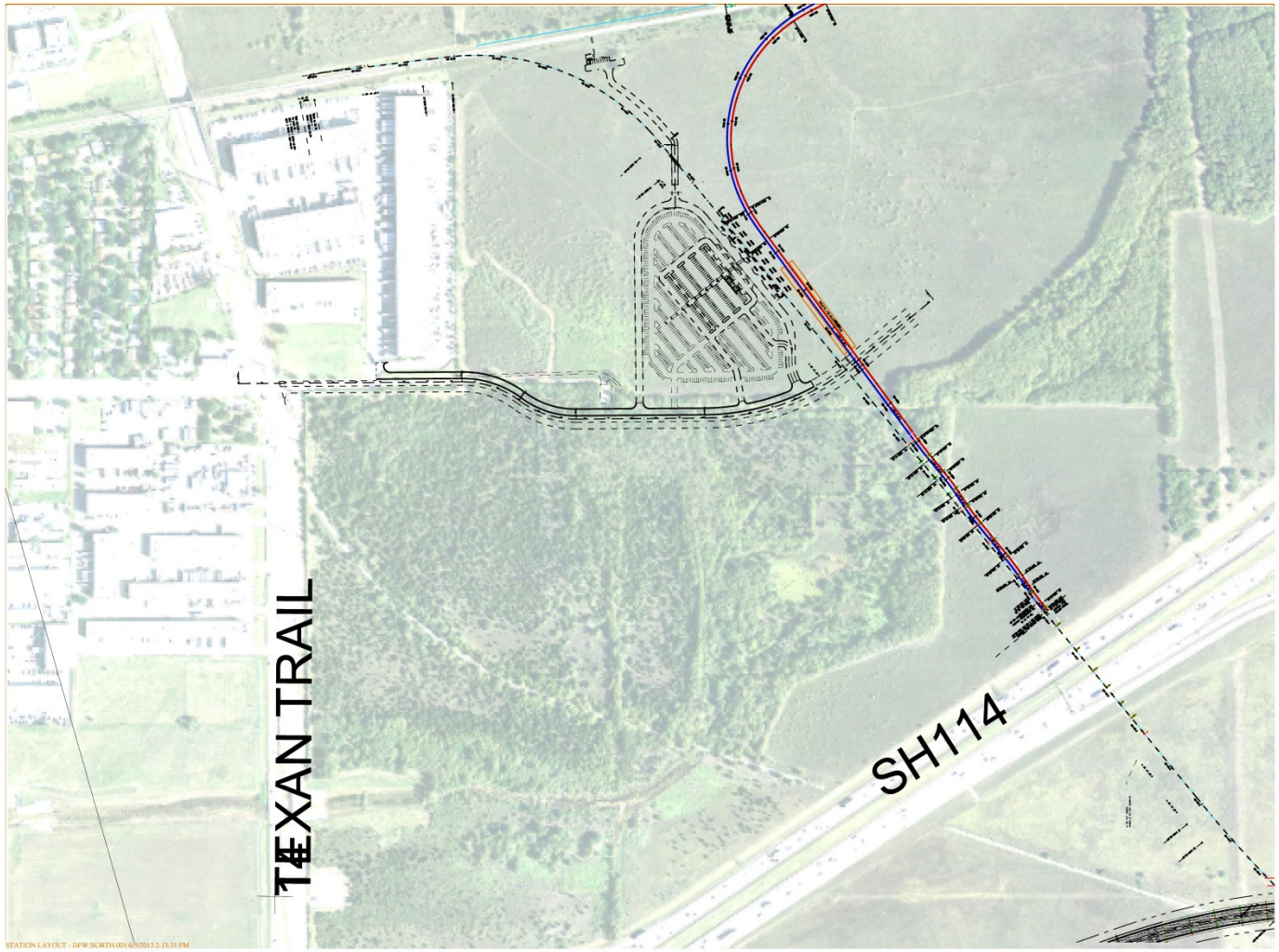
At the four remaining locations, a grade separation is recommended based upon a combination of ITE grade separation guidelines and the existing DART grade separation policy. These locations include the following:

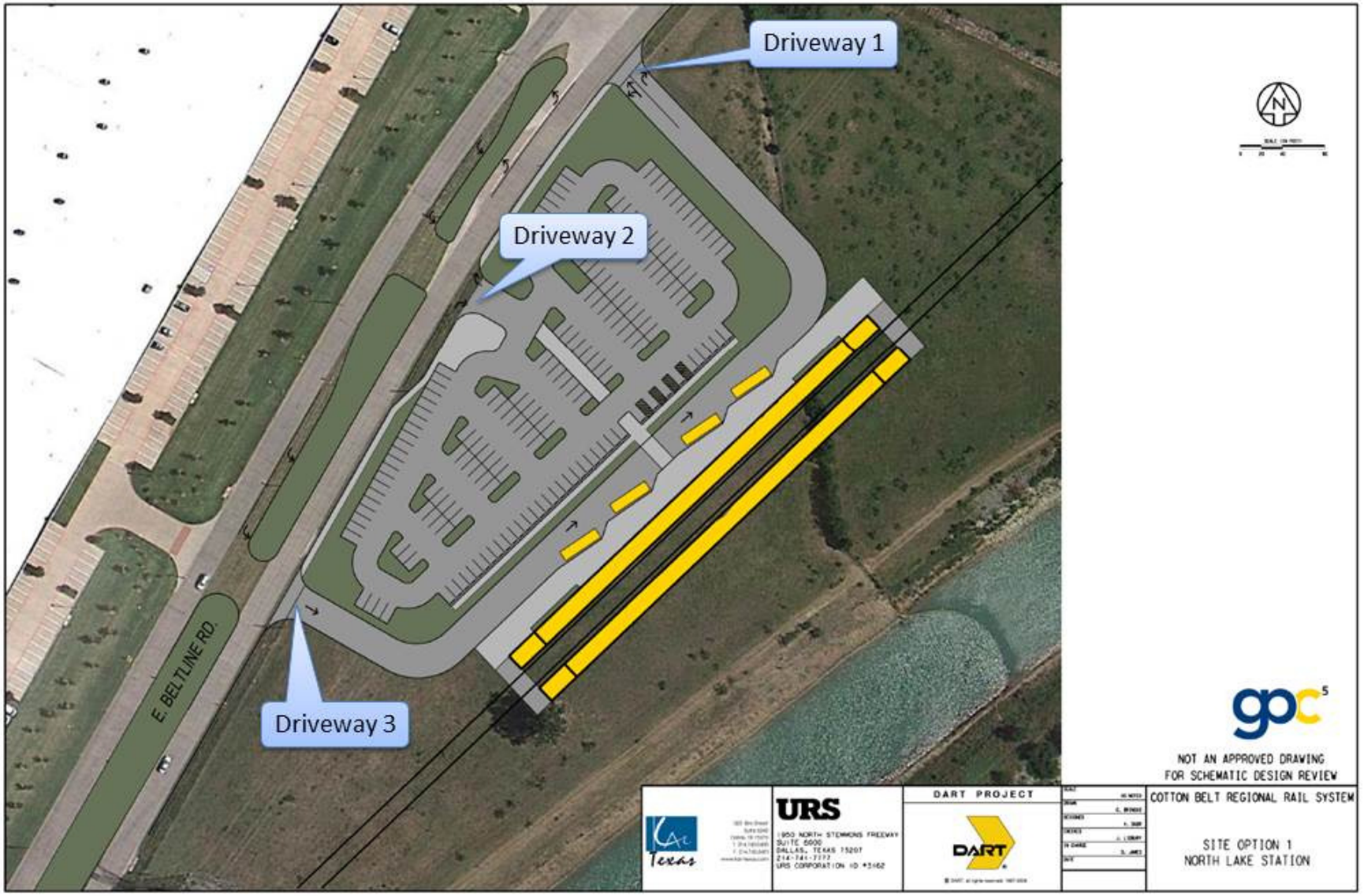
- Denton Tap Road
- Midway Road
- Coit Road
- E Plano Parkway and US 75 NB/SB Frontage Roads

ATG reviewed the August 2011 grade separation methodology, Synchro analysis and recommendations and generally concurs with the recommendations provided; no substantial changes or modifications are needed at this time.

APPENDIX A
STATION LAYOUTS

DFW North Station

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Driveway 2
Driveway 3
E. BELTLINE RD.
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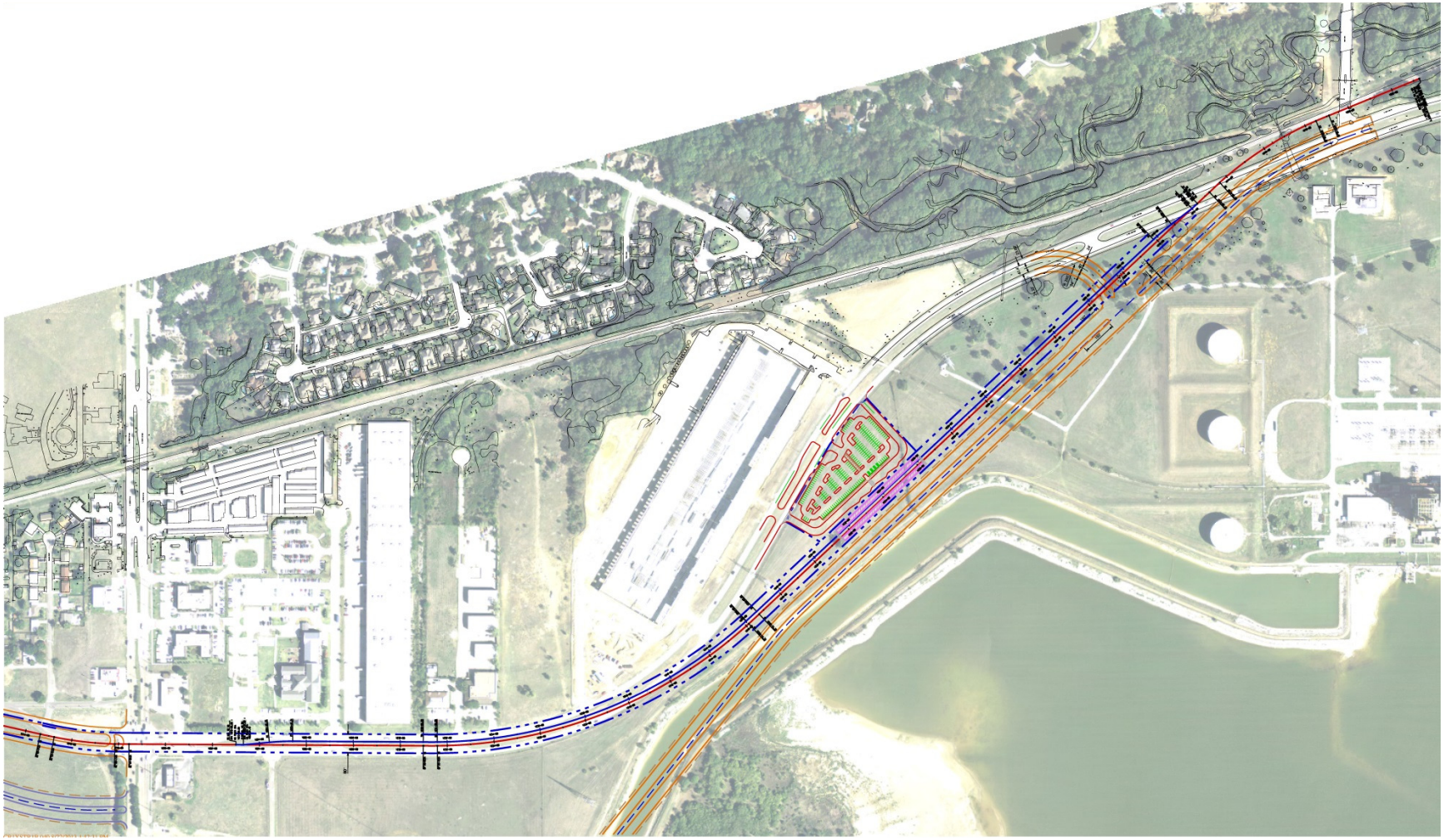
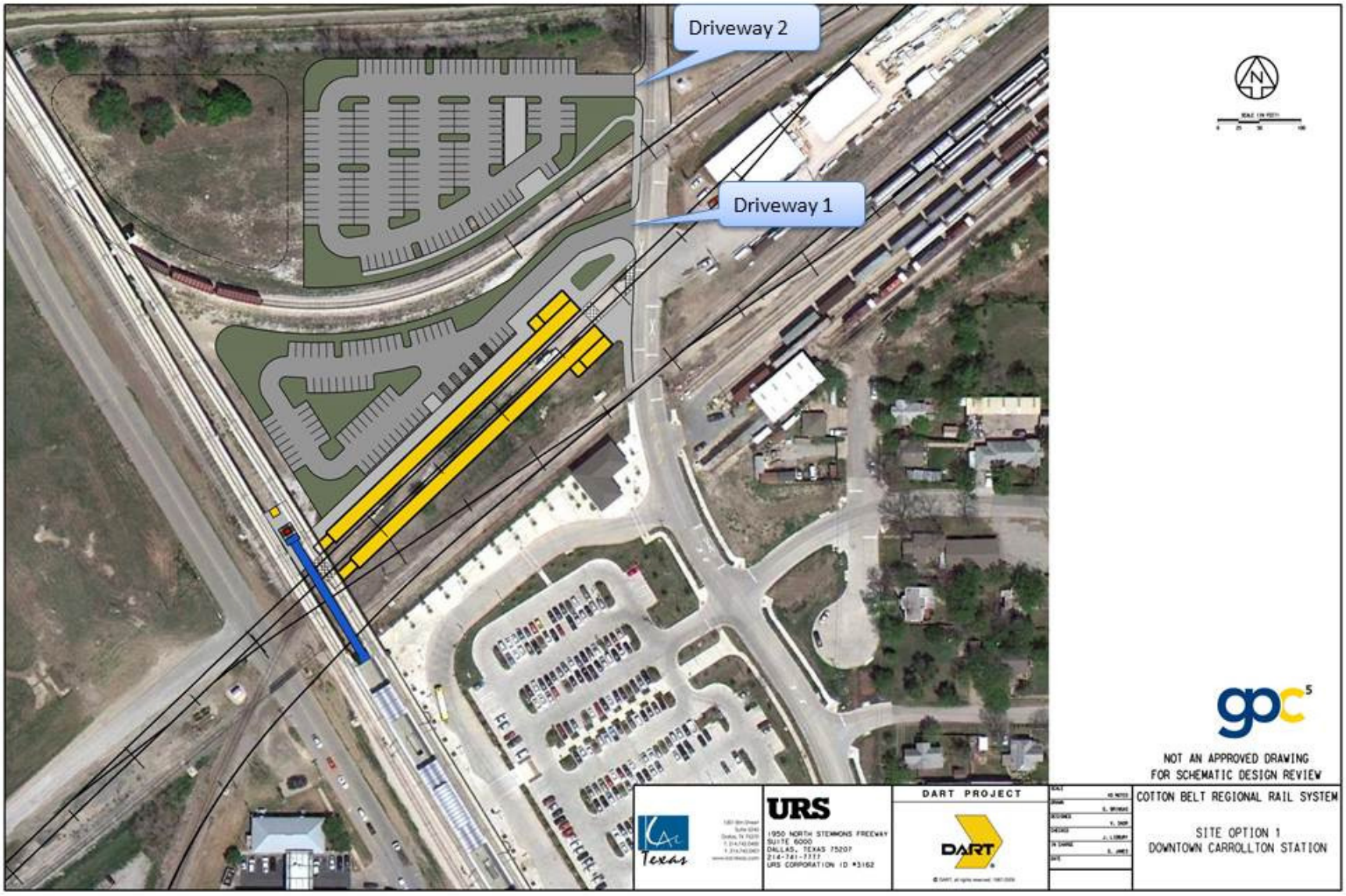
FOR SCHEMATIC DESIGN REVIEW
URS
1950 NORTH STEMMONS FREEWAY
SUITE 6000
DALLAS, TEXAS 75207
214-741-7272
URS CORPORATION ID #3462
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 1
NORTH LAKE STATION

North Lake Station (Relocated Belt Line Option)

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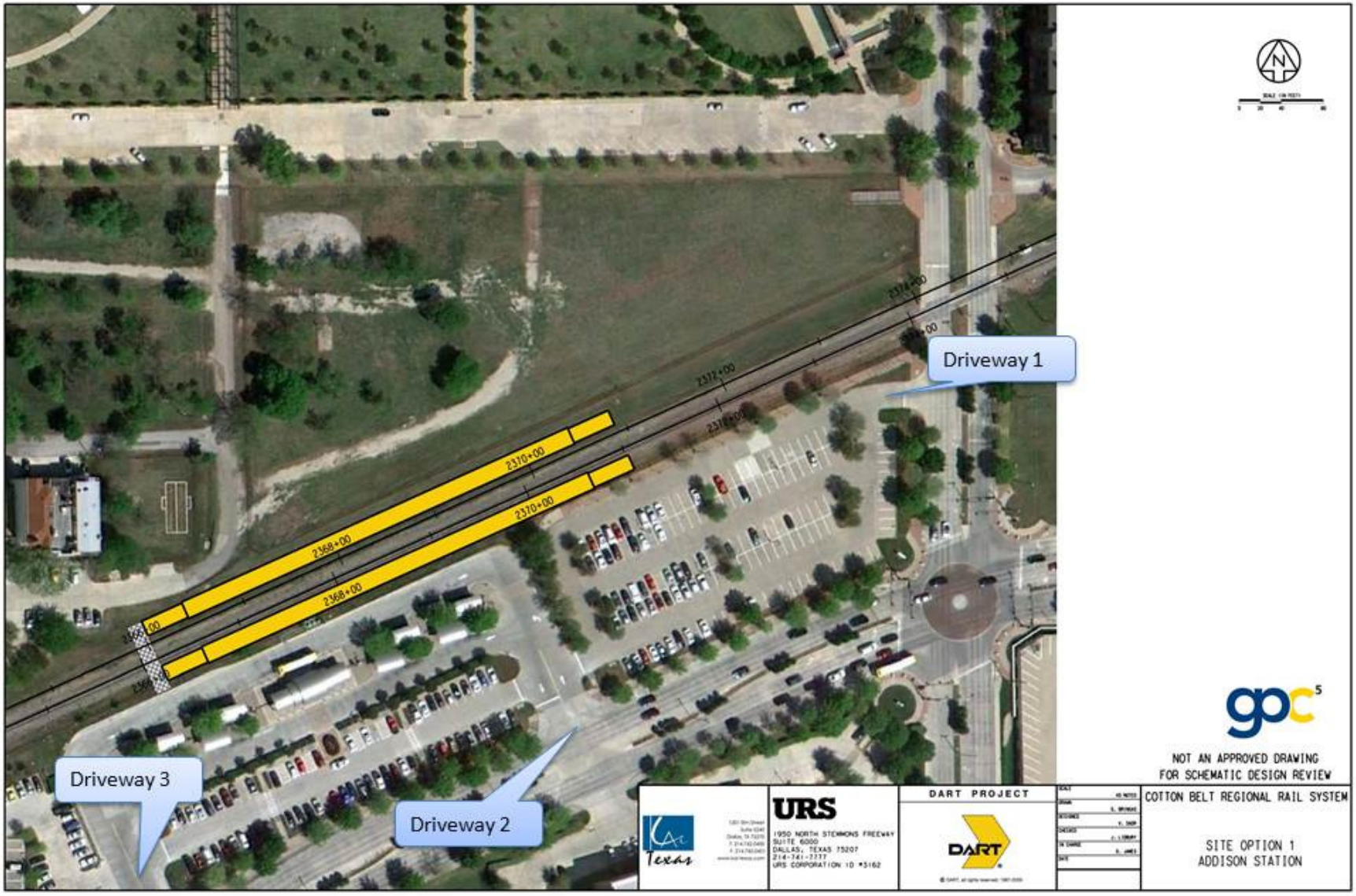
SUITE 6000
DALLAS, TEXAS 75207
214-741-7777
URS CORPORATION ID #3162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 1
DOWNTOWN CARROLLTON STATION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Driveway 2
Driveway 3
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URS
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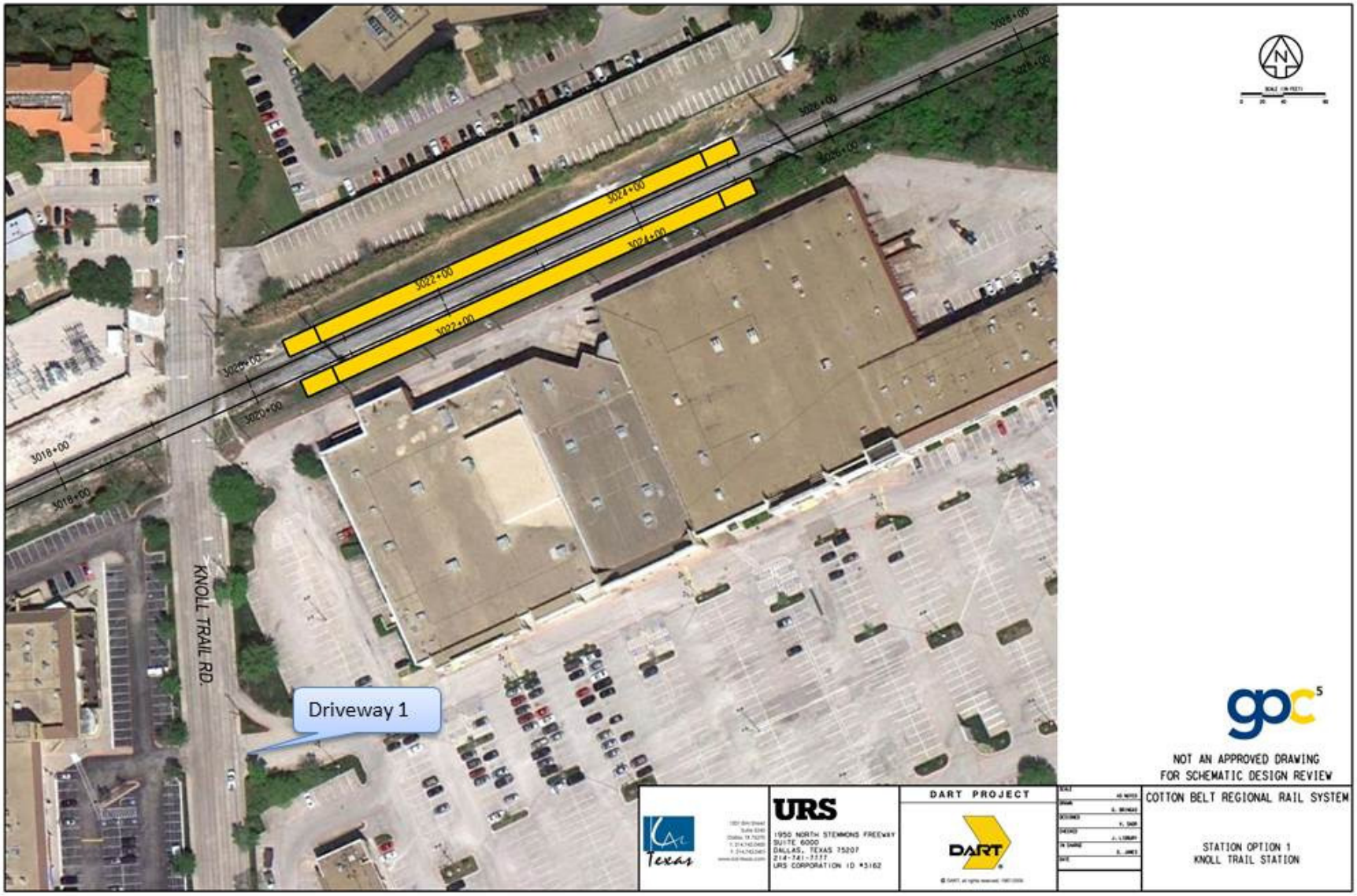
SUITE 6000
DALLAS, TEXAS 75207
214-741-7777
URS CORPORATION ID #5162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 1
ADDISON STATION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Driveway 1
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3018+00
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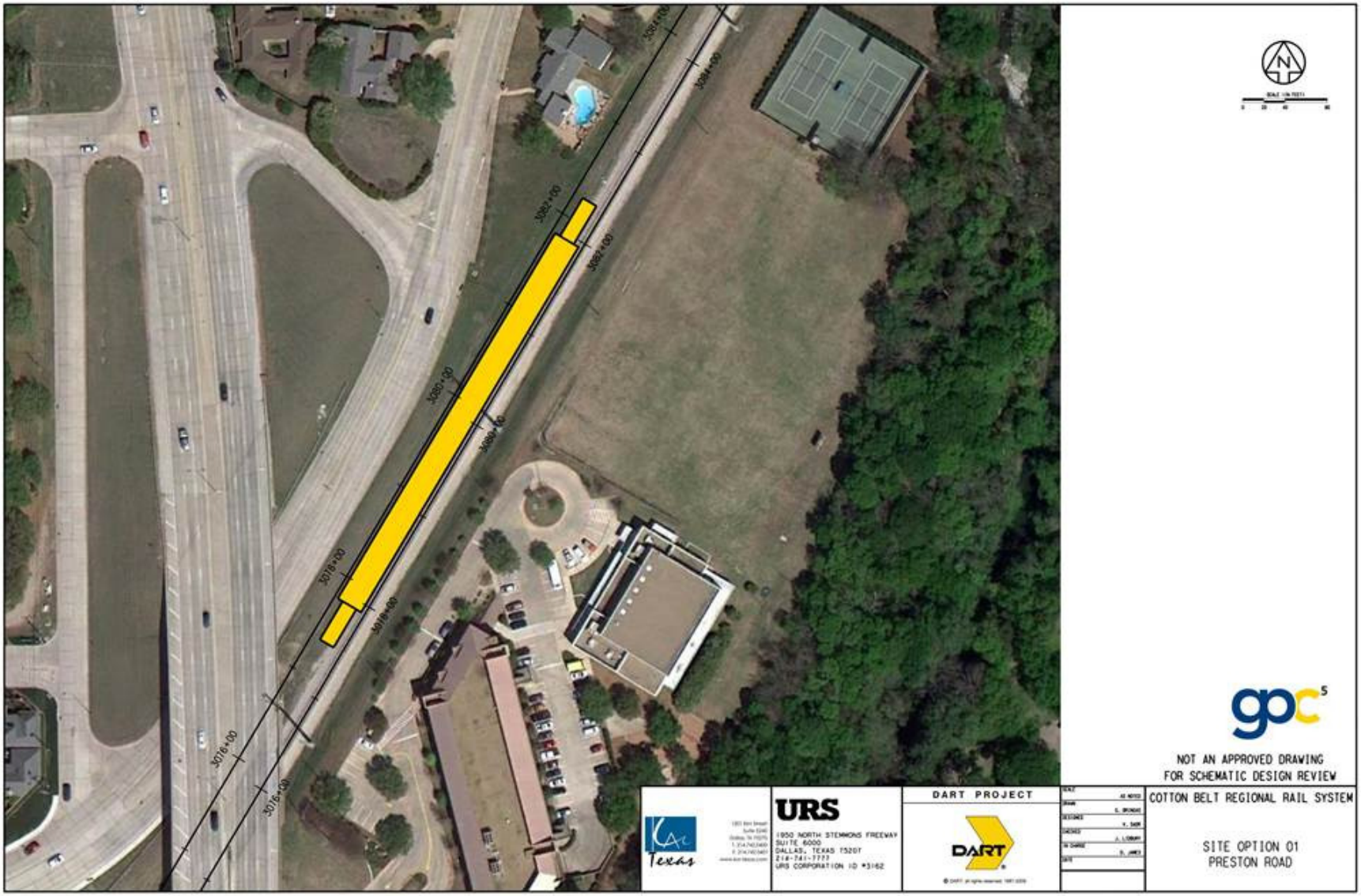
FOR SCHEMATIC DESIGN REVIEW
URS
1950 NORTH STEMMONS FREEWAY
SUITE 6000
DALLAS, TEXAS 75207
214-741-7777
URS CORPORATION ID #3162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
STATION OPTION 1
KNOLL TRAIL STATION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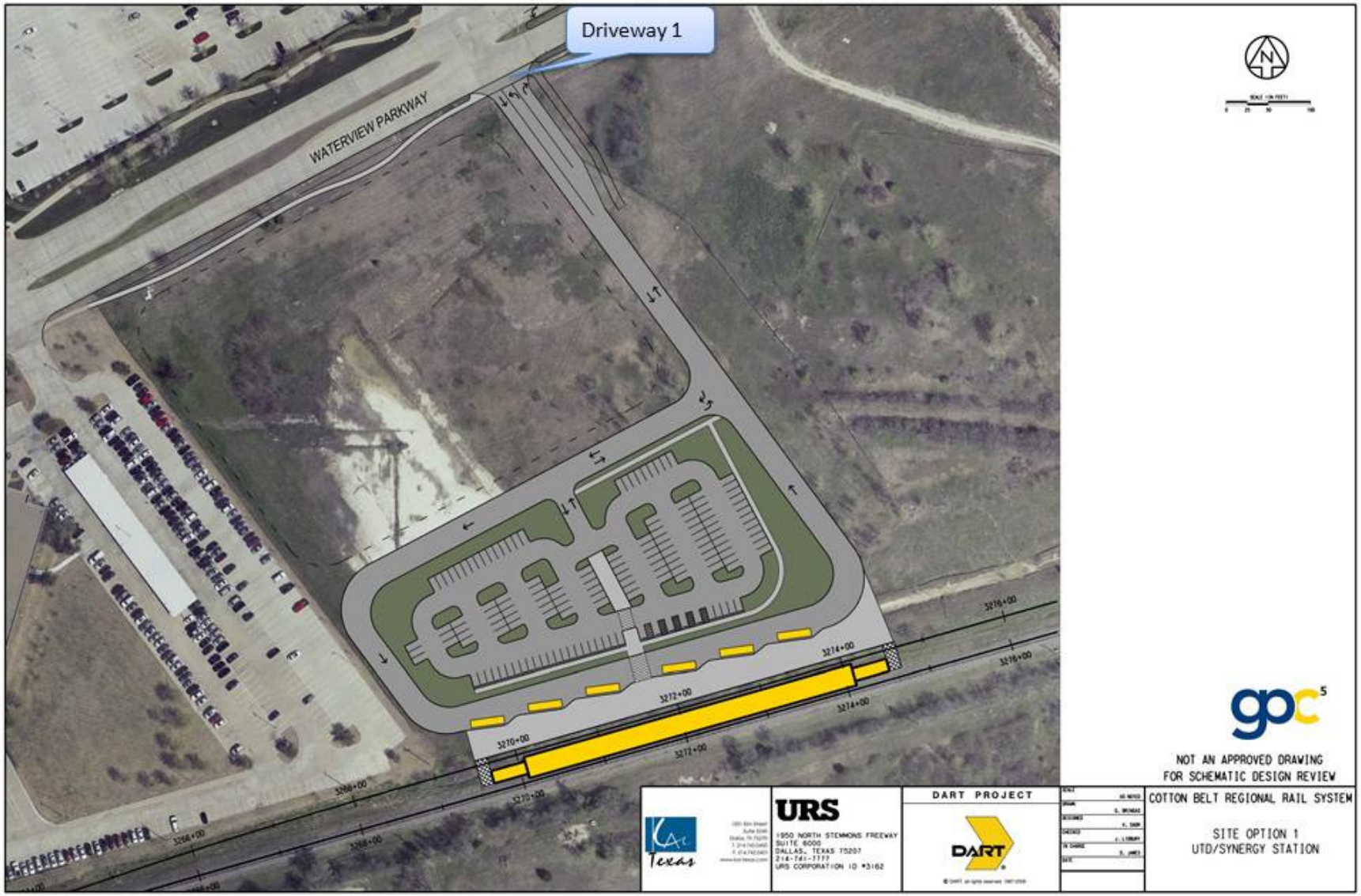
SUITE 6000
DALLAS, TEXAS 75207
214-741-7717
URS CORPORATION ID #3162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 01
PRESTON ROAD

Renner Village (East and West) Stations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3274+00
3272+00
3270+00
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3266+00
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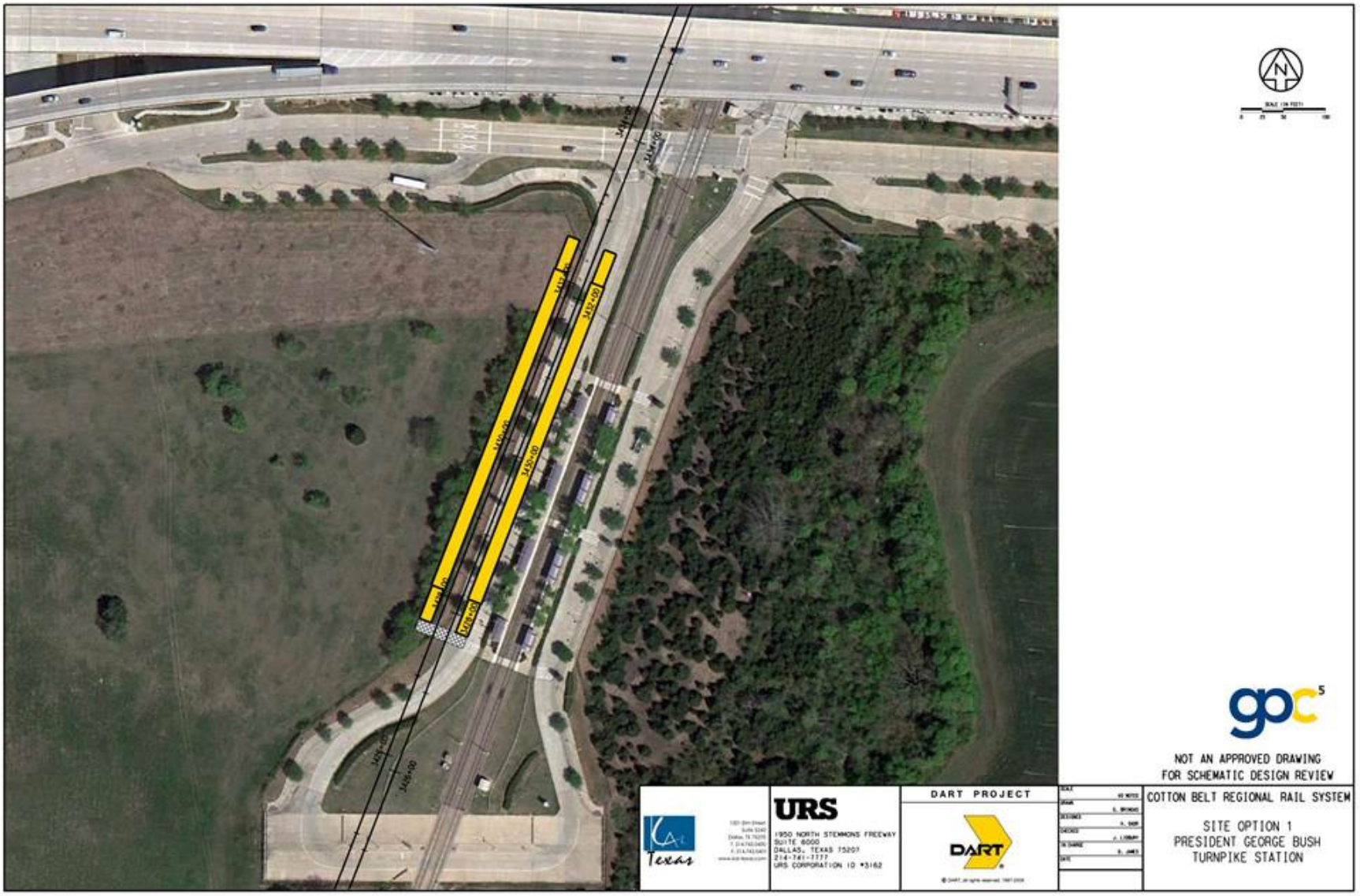
URS
1950 NORTH STEMMONS FREEWAY
SUITE 6000
DALLAS, TEXAS 75207
214-741-1717
URS CORPORATION ID #3162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 1
UTD/SYNERGY STATION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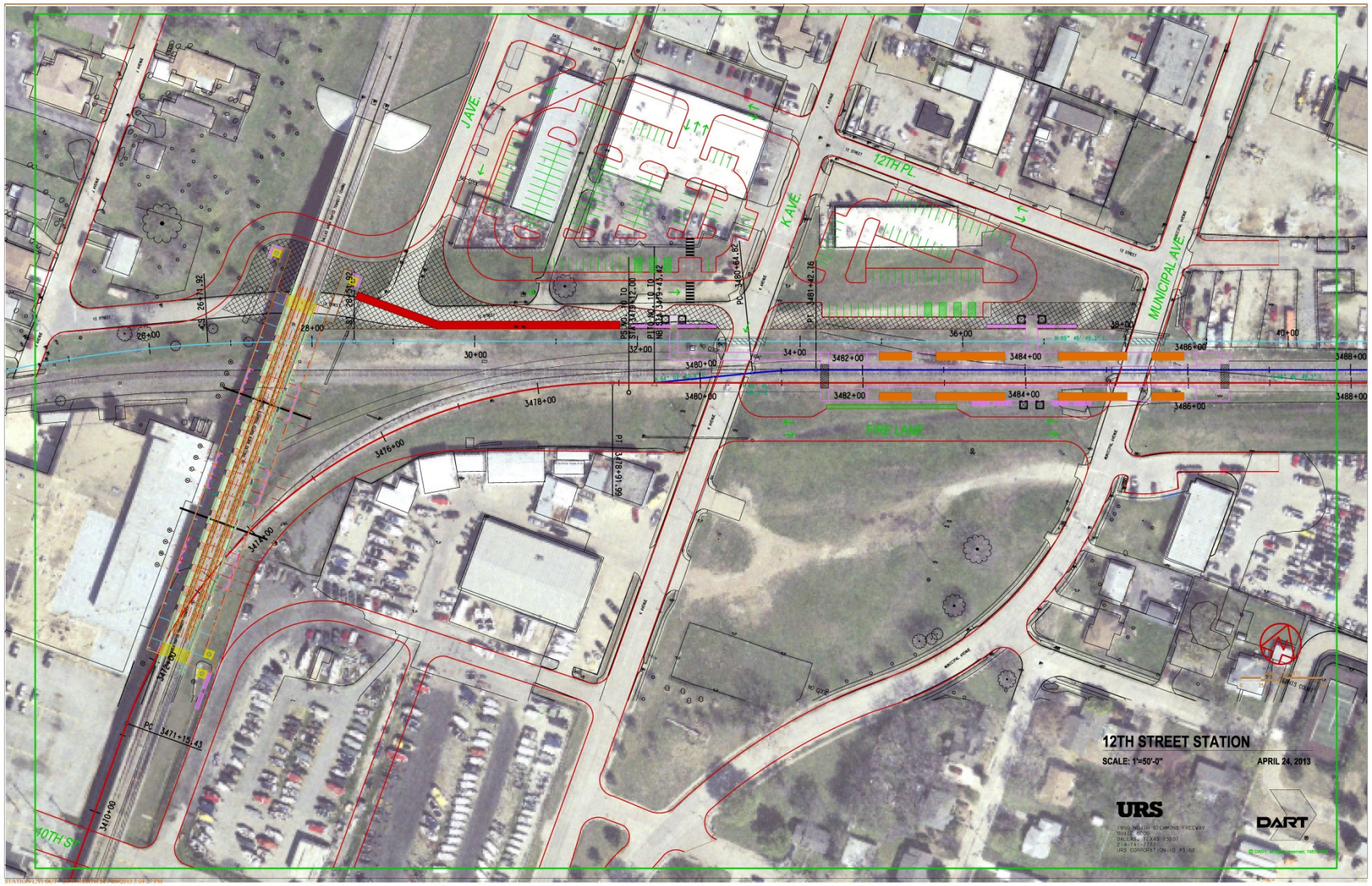
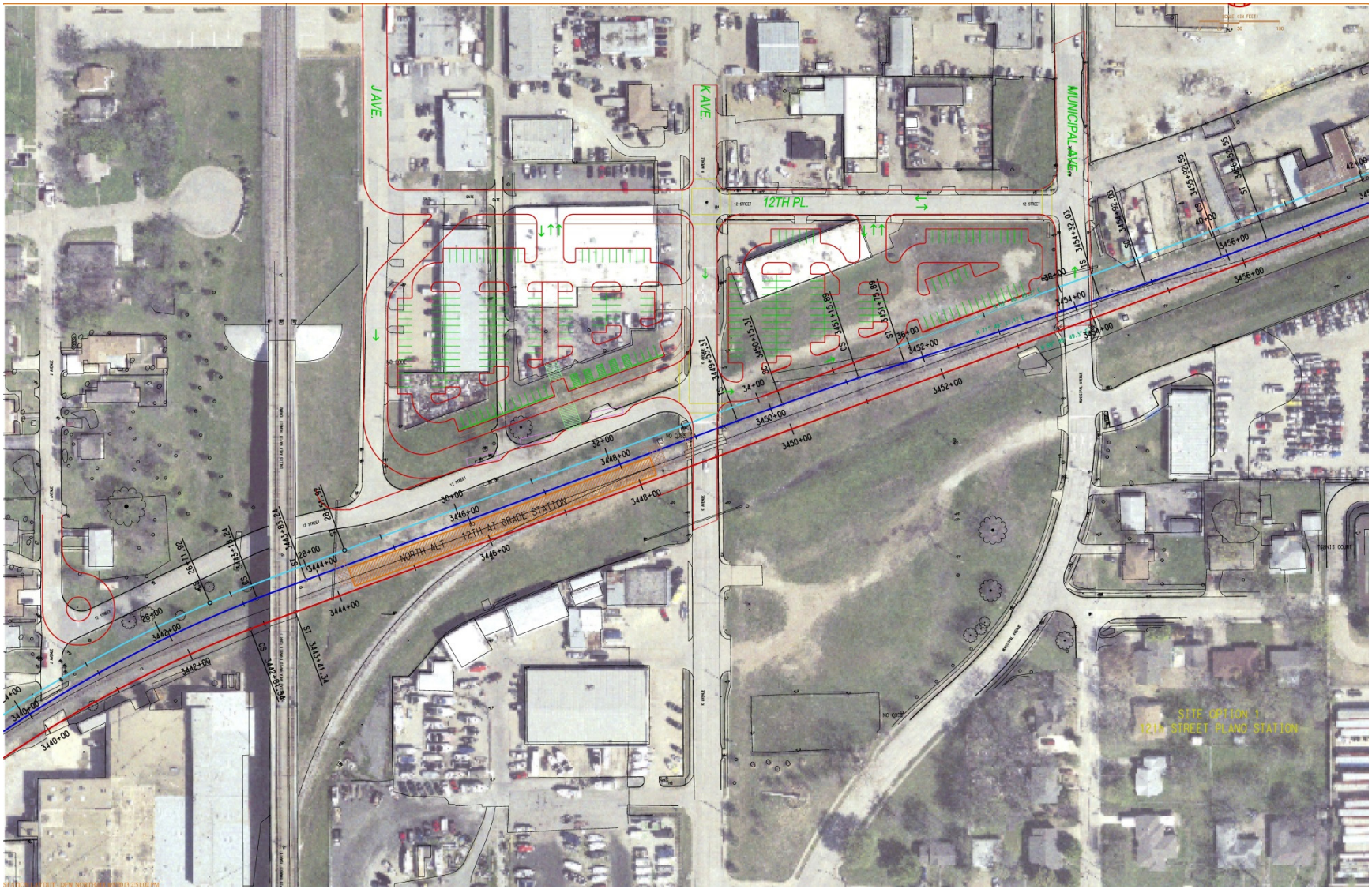
1950 NORTH STEMMONS FREEWAY
SUITE 6000
DALLAS, TEXAS 75207
214-741-1777
URS CORPORATION ID #3162
DART PROJECT
DART
COTTON BELT REGIONAL RAIL SYSTEM
SITE OPTION 1
PRESIDENT GEORGE BUSH
TURNPIKE STATION

Bush Turnpike Station (South Alignment) - Driveways

12th Street Station (South Alignment)



12th Street Station (North Alignment)



Shiloh Road Station

APPENDIX B

STATION-AREA EXISTING TRAFFIC VOLUMES

Station		2010 ADT (NCTCOG)	AM				PM				Year of traffic data	Source
			NB	SB	WB	EB	NB	SB	WB	EB		
Shiloh	Shiloh Rd NB	9538	382				477				2010	Plano counts
	Shiloh Rd SB	9538		382				477				
	-											
	-											
12th St Plano (North & South Alignments)	Municipal NB	7118	569				712				2010	Grade Crossing analysis
	K Ave SB	8528		682				853				
	-											
	-											
Bush Turnpike	-											
	-											
	PGBT WB FR RD	2491			199				249		2009	TxDOT Counts
	PGBT EB FR RD	1221				98				122	2006	NCTCOG/City of Plano
UTD/Synergy Park	-										2011	Richardson counts
	-											
	Waterview WB	9900			792				1395			
	Waterview EB	11000				1504				1100		
Renner Village (East Option)	Coit Rd NB	39631	1585				1982				2010	Grade Crossing analysis
	Coit Rd SB	39631		1585				1982				
	-											
	-											
Renner Village (West Option)	Dickerson St NB	1257	50				63				2010	Grade Crossing analysis
	Dickerson St SB	1257		50				63				
	-											
	-											
Knoll Trail	Knoll Trail NB	6298	252				315				2010	Grade Crossing analysis
	Knoll Trail SB	6298		252				315				
	-											
	-											
Addison	Quorum NB @ EL	7125	570				713				2011	Addison counts
	Quorum SB @ EL	3919		314				392				
	Quorum NB @ Arap	4420	354				442					
	Quorum SB @ Arap	3152		252				315				
	Arapaho WB	7550			604				755			
	Arapaho EB	7005				560				701		
	Edwin Lewis WB	557			45				56			
	Edwin Lewis EB	715				57				72		
Carrollton	Denton NB	3233	259				323				2010	Grade Crossing analysis
	Denton SB	3233		259				323				
	-											
	-											
North Lake (Cypress)	-										2010	Grade Crossing analysis
	-											
	Belt Line WB	13355			534				668			
	Belt Line EB	13355				534				668		

XXX Actual Peak Hour Counts

Assumptions
50% of ADT NB/SB & EB/WB
8% of ADT during AM peak
10% of ADT during PM peak

Station		2018 ADT	AM				PM				Year of traffic data	Source
			NB	SB	WB	EB	NB	SB	WB	EB		
Shiloh	Shiloh Rd NB	11175	447				559				2010	Plano counts
	Shiloh Rd SB	11175		447				559				
	-											
	-											
12th St Plano (North & South Alignments)	Municipal NB	8340	667				834				2010	Grade Crossing analysis
	K Ave SB	9992		799				999				
	-											
	-											
Bush Turnpike	-											
	-											
	PGBT WB FR RD	2919			233				292		2009	TxDOT Counts
	PGBT EB FR RD	1431				114				143	2006	NCTCOG/City of Plano
UTD/Synergy Park	-										2011	Richardson counts
	-											
	Waterview WB	11372			910				1602			
	Waterview EB	12636				1728				1264		
Renner Village (East Option)	Coit Rd NB	46434	1857				2322				2010	Grade Crossing analysis
	Coit Rd SB	46434		1857				2322				
	-											
	-											
Renner Village (West Option)	Dickerson St NB	1473	59				74				2010	Grade Crossing analysis
	Dickerson St SB	1473		59				74				
	-											
	-											
Knoll Trail	Knoll Trail NB	7379	295				369				2010	Grade Crossing analysis
	Knoll Trail SB	7379		295				369				
	-											
	-											
Addison	Quorum NB @ EL	8184	655				818				2011	Addison counts
	Quorum SB @ EL	4502		360				450				
	Quorum NB @ Arap	5077	406				508					
	Quorum SB @ Arap	3621		290				362				
	Arapaho WB	8673			694				867			
	Arapaho EB	8047				644				805		
	Edwin Lewis WB	640			51				64			
	Edwin Lewis EB	821				66				82		
Carrollton	Denton NB	3788	303				379				2010	Grade Crossing analysis
	Denton SB	3788		303				379				
	-											
	-											
North Lake (Cypress)	-										2010	Grade Crossing analysis
	-											
	Belt Line WB	15648			626				782			
	Belt Line EB	15648				626				782		

XXX Obtained by Applying Growth Rate to Actual Peak Hour Counts

Assumptions

2%	Growth rate
2018	Build Out Year

APPENDIX C

STATION AUTOMOBILE TRIP GENERATION AND DISTRIBUTION

Station	2035 ADT (auto)		AM IB	AM OB	Vol in AM Peak - Egress	Vol in AM Peak - Ingress	Exit Driveway Used	Driveway	Exiting Driveway Volume	Entering Driveway Volume	Total Ingress	Total Egress	Total
Shiloh	806	To/From North	75%	75%	39	77	Driveway 1	Driveway 1:	13	26			
		To/From South	25%	25%	13	26	Driveway 2	Driveway 2:	39	77			
		To/From East	-	-									
		To/From West	-	-							103	53	155
12th St Plano (North Alignment)	1605	To/From North	60%	60%	63	123	12th/Municipal Ave	12th Pl:	63	82			
		To/From South	40%	40%	42	82	12th/K Ave	12th Pl:	125	71			
		To/From East	-	-									
		To/From West	-	-							205	105	310
12th St Plano (South Alignment)	360	To/From North	60%	60%	14	28	12th/Municipal Ave	12th Pl:	14	18			
		To/From South	40%	40%	9	18	12th/K Ave	12th Pl:	28	16			
		To/From East	-	-									
		To/From West	-	-							46	24	69
Bush Turnpike (South Alignment)	1245	To/From North	-	-									
		To/From South	-	-									
		To/From East	40%	40%	33	64	All						
		To/From West	60%	60%	49	95	All				159	81	240
UTD/Synergy Park	318	To/From East	40%	40%	8	16	Driveway 1	Driveway 1:	21	41			
		To/From West	60%	60%	12	24	Driveway 1						
		To/From North	-	-									
		To/From South	-	-							41	21	61
Renner Village (East Option)	440	To/From North	40%	40%	11	22	Driveway 1	Driveway 1:	29	56			
		To/From South	60%	60%	17	34	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							56	29	85
Renner Village (West Option)	440	To/From North	40%	40%	11	22	Driveway 1	Driveway 1:	29	56			
		To/From South	60%	60%	17	34	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							56	29	85
Preston Rd	106	To/From North	70%	70%	5								
		To/From South	30%	30%	2								
		To/From East	-	-									
		To/From West	-	-							14	7	20
Knoll Trail	352	To/From North	50%	50%	11	22	Driveway 1	Driveway 1:	23	45			
		To/From South	50%	50%	11	22	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							45	23	68
Addison	193	To/From North	25%	25%	3	6	Driveway 2	Driveway 1:	1	6			
		To/From South	25%	25%	3	6	Driveway 1 & 2 & EL	Driveway 2:	8	10			
		To/From East	25%	25%	3	6	Driveway 1 & 2 & EL	Edwin Lewis Dr:	3	9			
		To/From West	25%	25%	3	6	Driveway 2 & EL				25	13	37
Carrollton	395	To/From North	40%	40%	10	20	Driveway 1 & 2	Driveway 1:	10	20			
		To/From South	60%	60%	15	30	Driveway 1 & 2	Driveway 2:	15	30			
		To/From East	-	-									
		To/From West	-	-							50	26	76
North Lake (Cypress)	224	To/From North	-	-				Driveway 1:	15	29			
		To/From South	-	-									
		To/From East	50%	50%	7	14	Driveway 1						
		To/From West	50%	50%	7	14	Driveway 1				29	15	43
Airport North	817	To/From North		0%									
		To/From South		0%									
		To/From East		0%									
		To/From West		0%							104	53	158

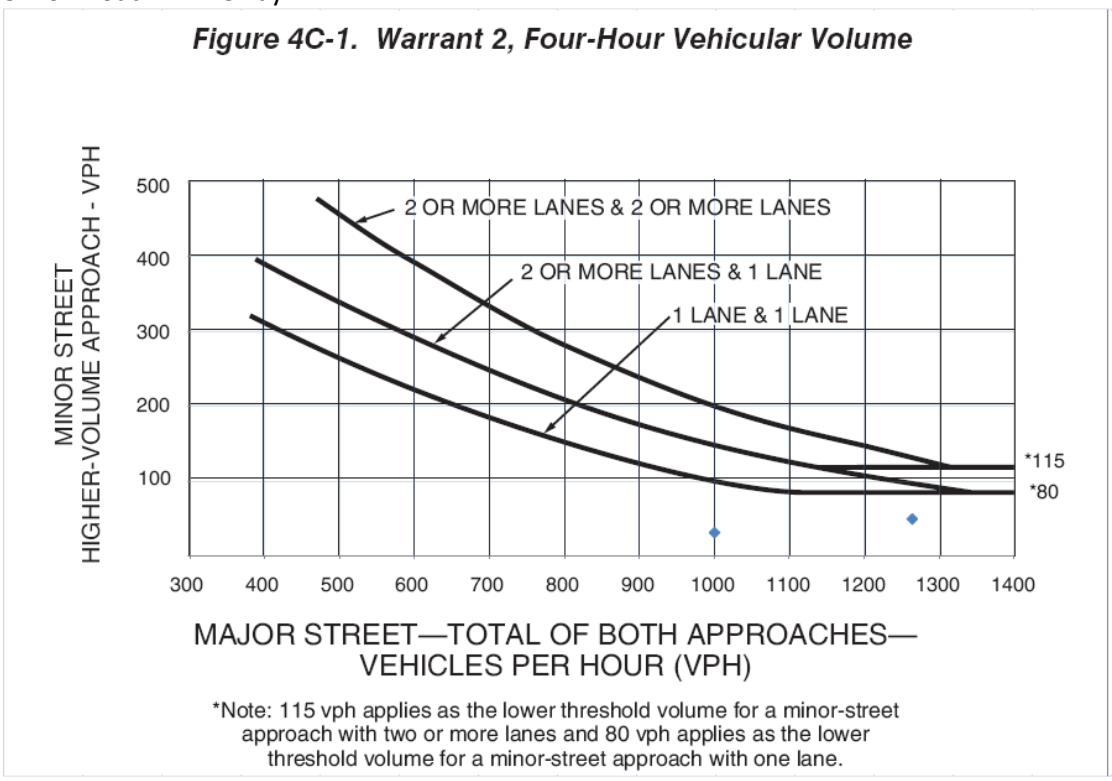
Station	2035 ADT (auto)		PM IB	PM OB	Vol in PM Peak - Egress	Vol in PM Peak - Ingress	Exit Driveway Used	Driveway	Exiting Driveway Volume	Entering Driveway Volume	Total Ingress	Total Egress	Total
Shiloh	806	To/From North	75%	75%	92	35	Driveway 1	Driveway 1:	31	12			
		To/From South	25%	25%	31	12	Driveway 2	Driveway 2:	92	35			
		To/From East	-	-									
		To/From West	-	-							46	123	169
12th St Plano (North Alignment)	1605	To/From North	60%	60%	147	55	12th/Municipal Ave	12th Pl:	147	37			
		To/From South	40%	40%	98	37	12th/K Ave	12th Pl:	215	35			
		To/From East	-	-									
		To/From West	-	-							92	245	337
12th St Plano (South Alignment)	360	To/From North	60%	60%	33	12	12th/Municipal Ave	12th Pl:	33	8			
		To/From South	40%	40%	22	8	12th/K Ave	12th Pl:	48	8			
		To/From East	-	-									
		To/From West	-	-							21	55	76
Bush Turnpike (South Alignment)	1245	To/From North	-	-									
		To/From South	-	-									
		To/From East	40%	40%	76	29	All						
		To/From West	60%	60%	114	43	All				72	190	261
UTD/Synergy Park	318	To/From East	40%	40%	19	7	Driveway 1	Driveway 1:	48	18			
		To/From West	60%	60%	29	11	Driveway 1						
		To/From North	-	-									
		To/From South	-	-							18	48	67
Renner Village (East Option)	440	To/From North	40%	40%	27	10	Driveway 1	Driveway 1:	67	25			
		To/From South	60%	60%	40	15	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							25	67	92
Renner Village (West Option)	440	To/From North	40%	40%	27	10	Driveway 1	Driveway 1:	67	25			
		To/From South	60%	60%	40	15	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							25	67	92
Preston Rd	106	To/From North		0%	0								
		To/From South		0%	0								
		To/From East		0%	0								
		To/From West		0%	0						6	16	22
Knoll Trail	352	To/From North	50%	50%	27	10	Driveway 1	Driveway 1:	54	20			
		To/From South	50%	50%	27	10	Driveway 1						
		To/From East	-	-									
		To/From West	-	-							20	54	74
Addison	193	To/From North	25%	25%	7	3	Driveway 2	Driveway 1:	3	3			
		To/From South	25%	25%	7	3	Driveway 1 & 2 & EL	Driveway 2:	19	4			
		To/From East	25%	25%	7	3	Driveway 1 & 2 & EL	Edwin Lewis Dr:	7	4			
		To/From West	25%	25%	7	3	Driveway 2 & EL				11	29	40
Carrollton	395	To/From North	40%	40%	24	9	Driveway 1 & 2	Driveway 1:	24	9			
		To/From South	60%	60%	36	14	Driveway 1 & 2	Driveway 2:	36	14			
		To/From East	-	-									
		To/From West	-	-							23	60	83
North Lake (Cypress)	224	To/From North	-	-				Driveway 1:	34	13			
		To/From South	-	-									
		To/From East	50%	50%	17	6	Driveway 1						
		To/From West	50%	50%	17	6	Driveway 1				13	34	47
Airport North	817	To/From North		0%									
		To/From South		0%									
		To/From East		0%									
		To/From West		0%							47	124	171

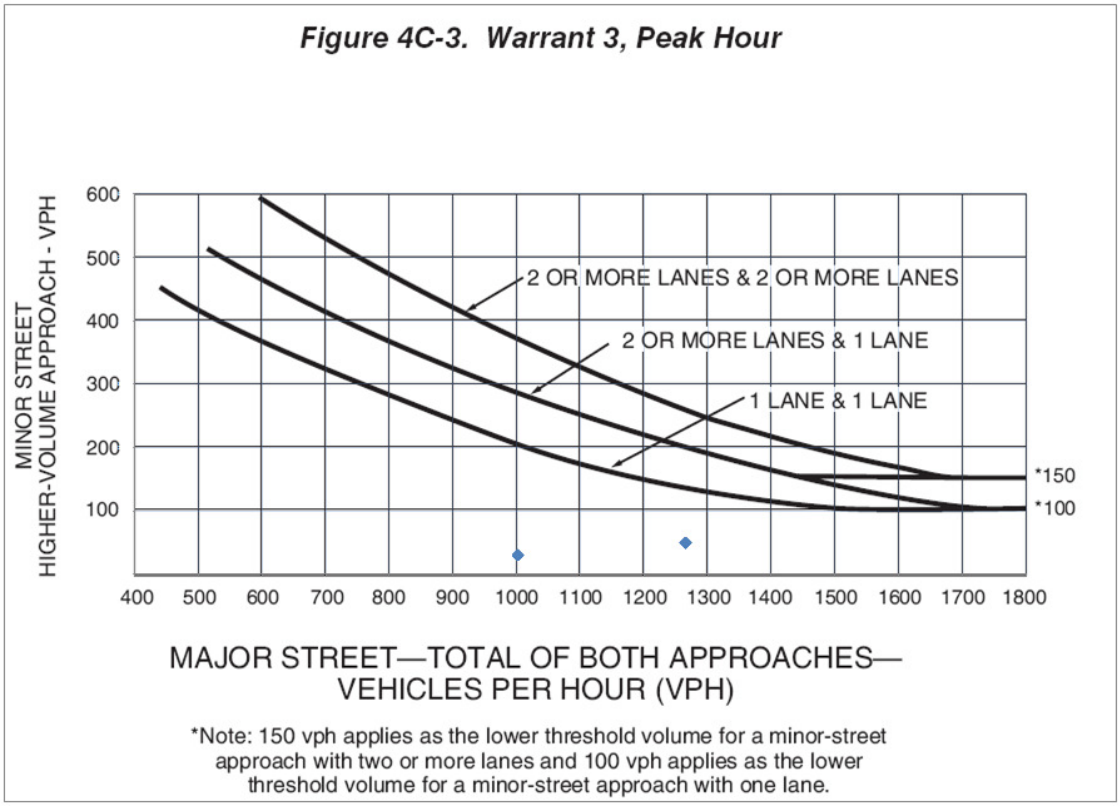
APPENDIX D

SIGNAL WARRANT ANALYSIS WORKSHEETS

Shiloh Road Station

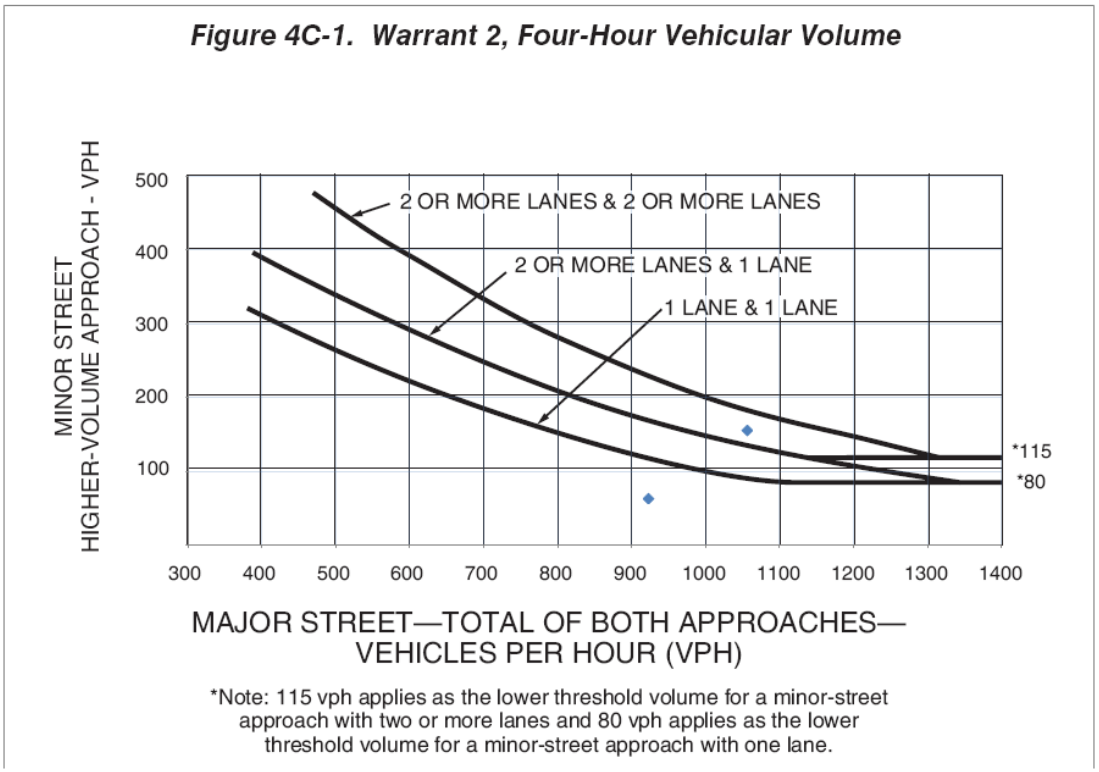
Shiloh Road – Driveway 1

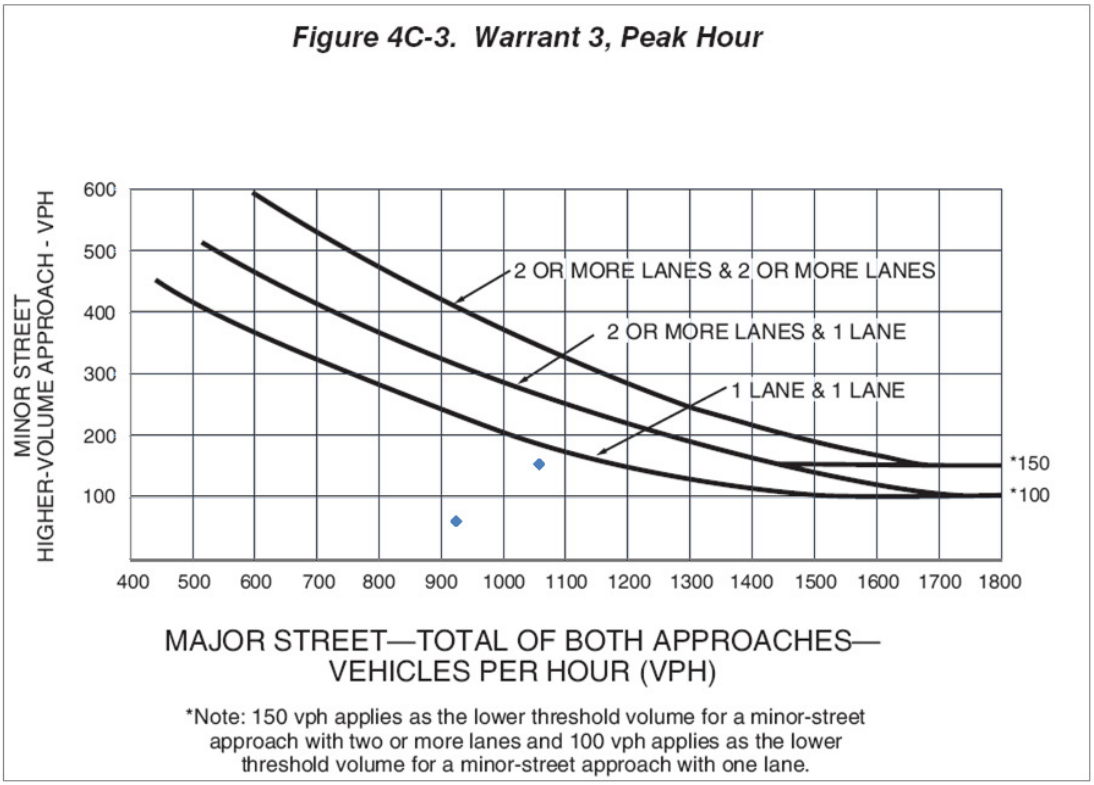




12th Street Plano Station (North Alignment)

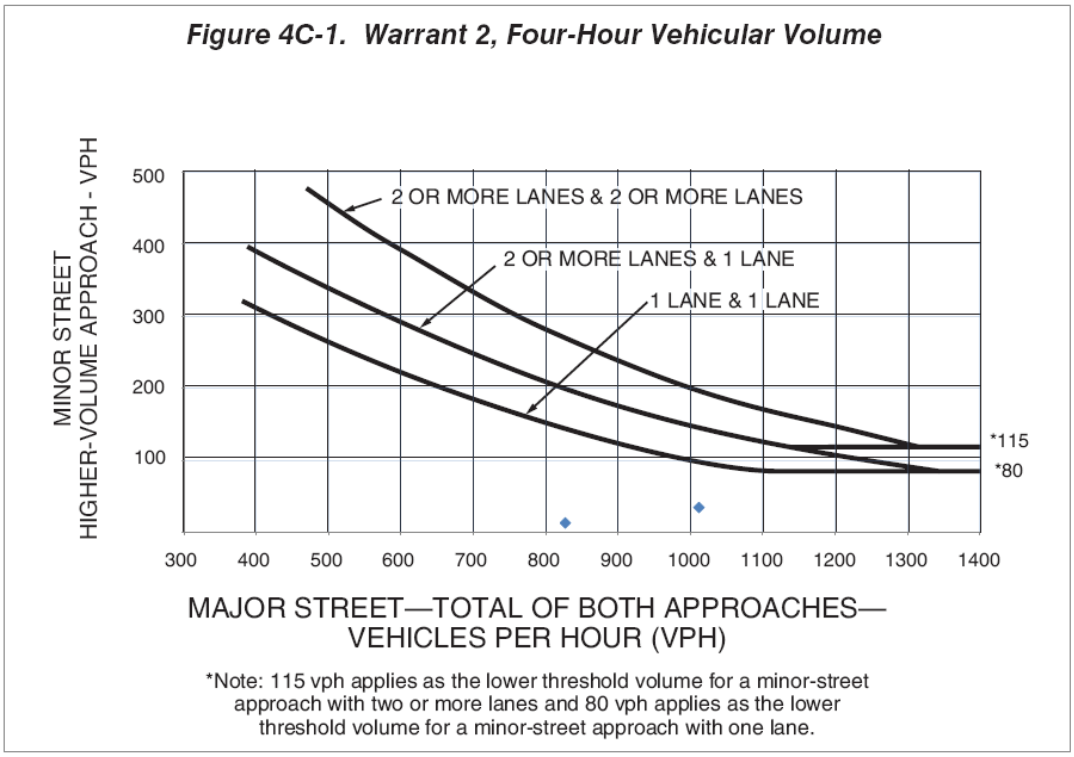
12th Place and K Avenue

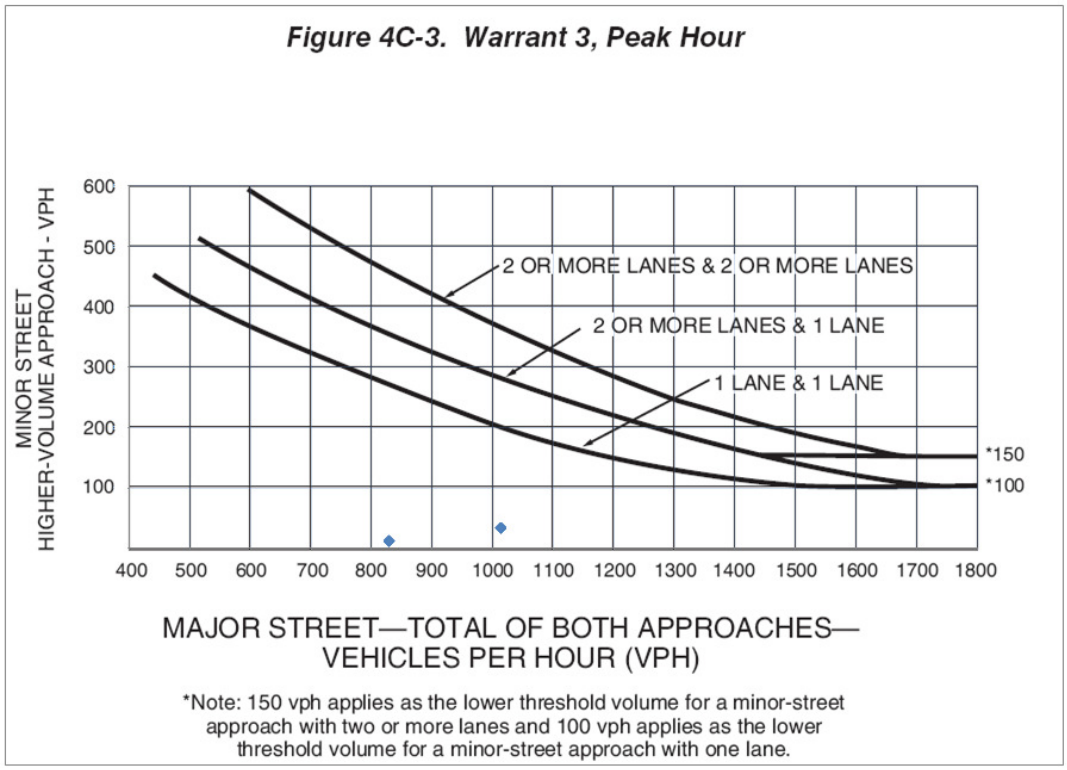




12th Street Plano Station (South Alignment)

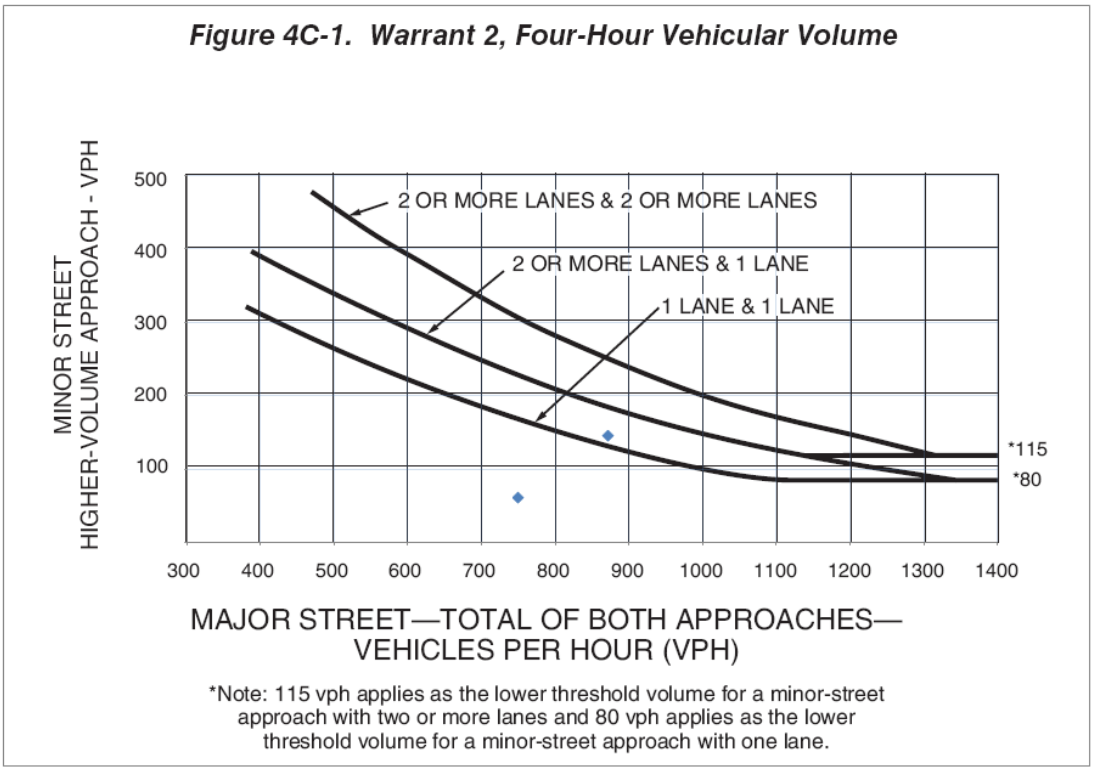
12th Place and K Avenue

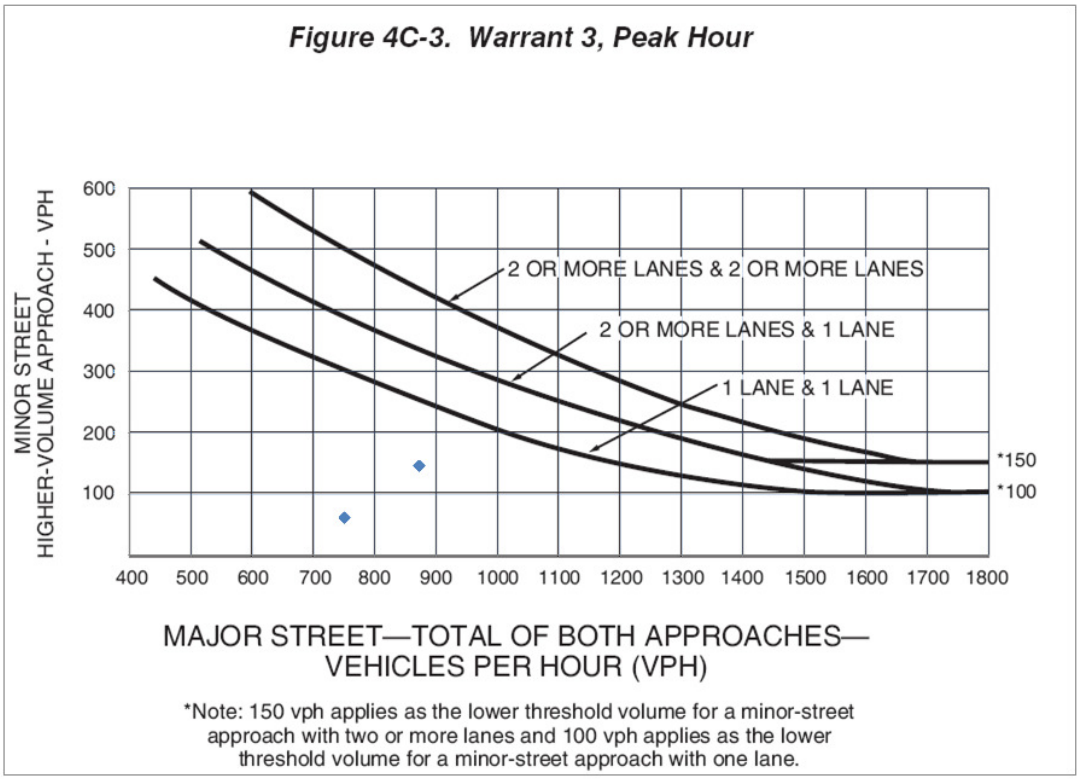




12th Street Plano Station (North Alignment)

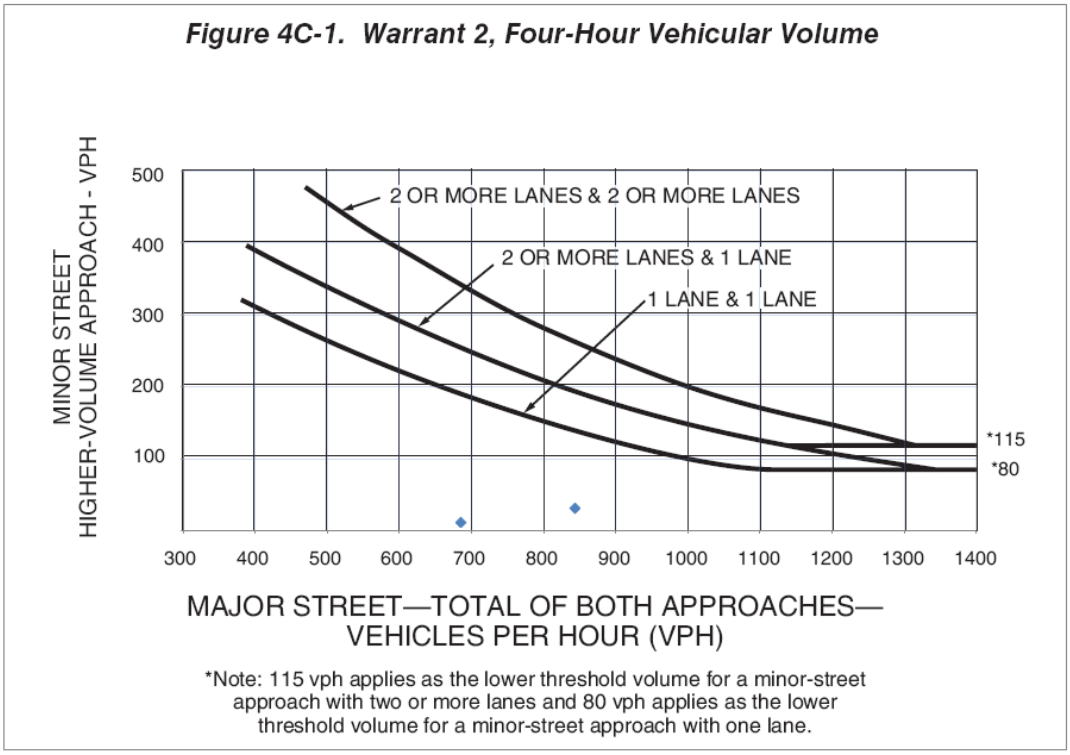
12th Place and Municipal Avenue

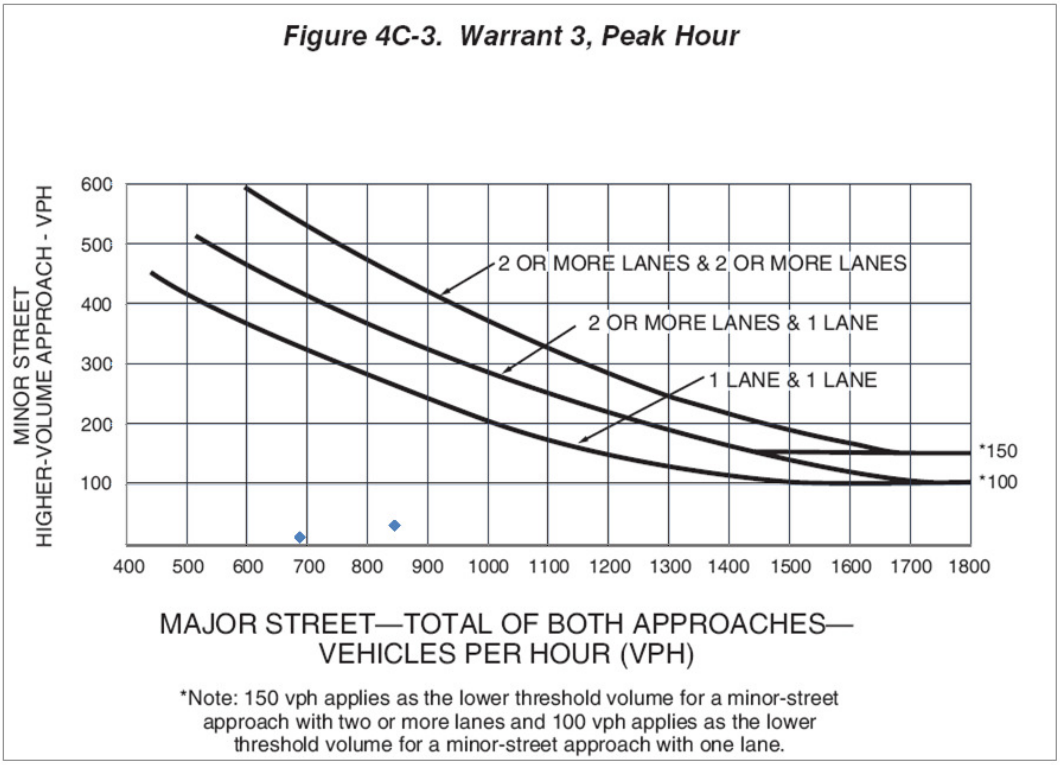




12th Street Plano Station (South Alignment)

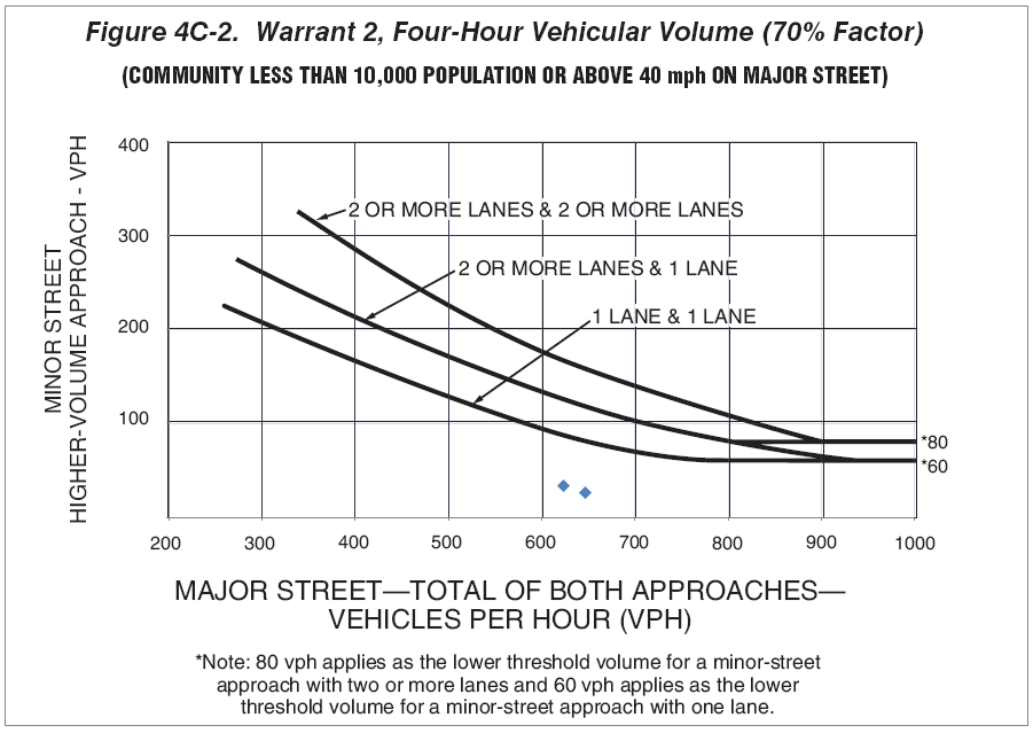
12th Place and Municipal Avenue

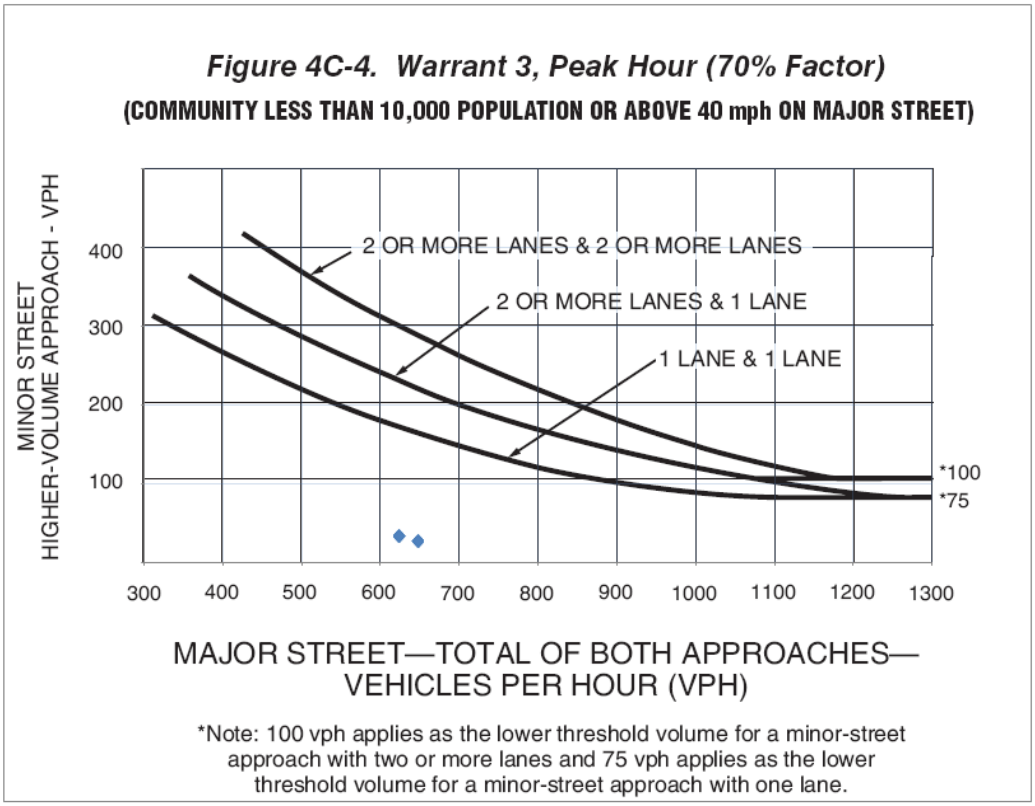




Bush Turnpike Station (South Alignment)

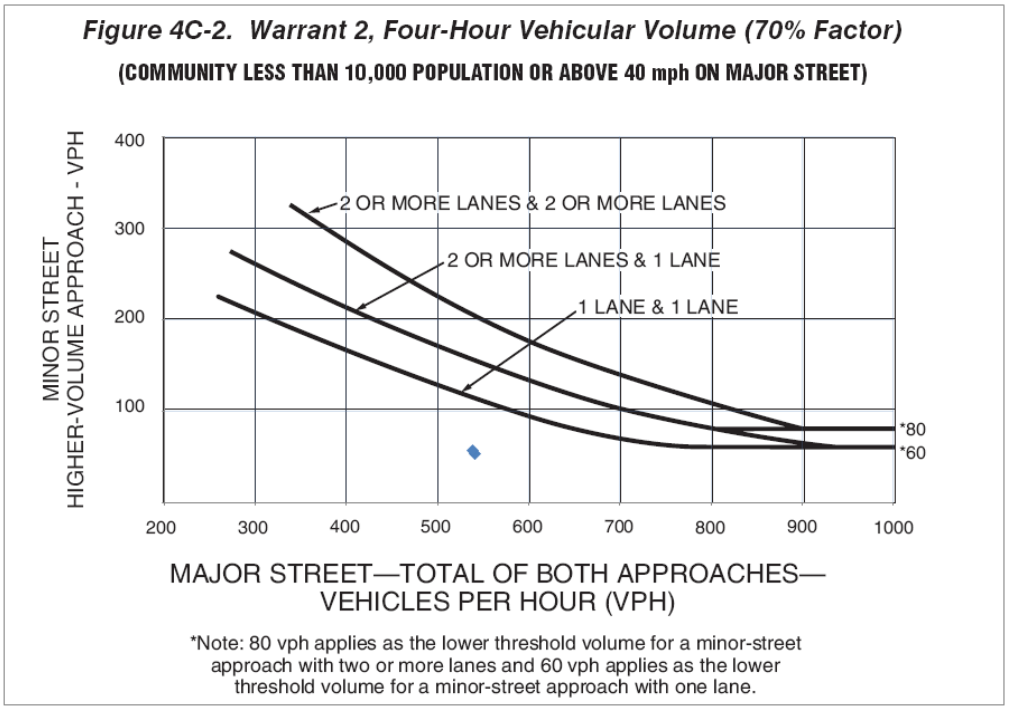
PGBT EB Frontage Road and SW Driveway

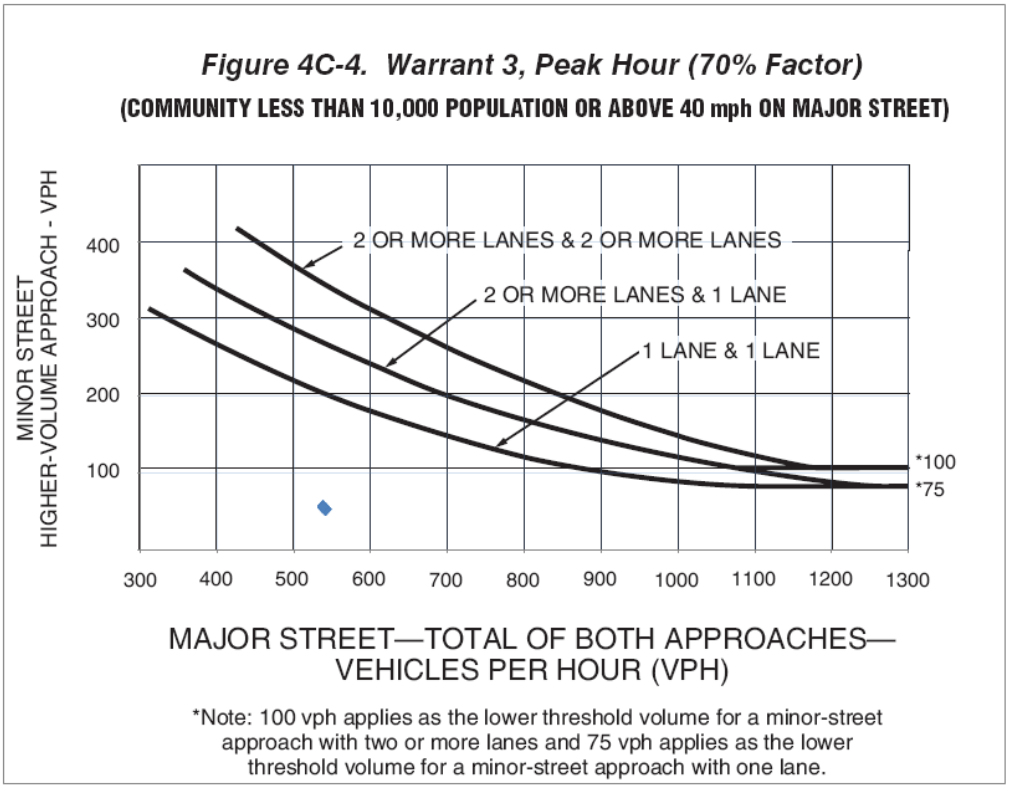




Bush Turnpike Station (South Alignment)

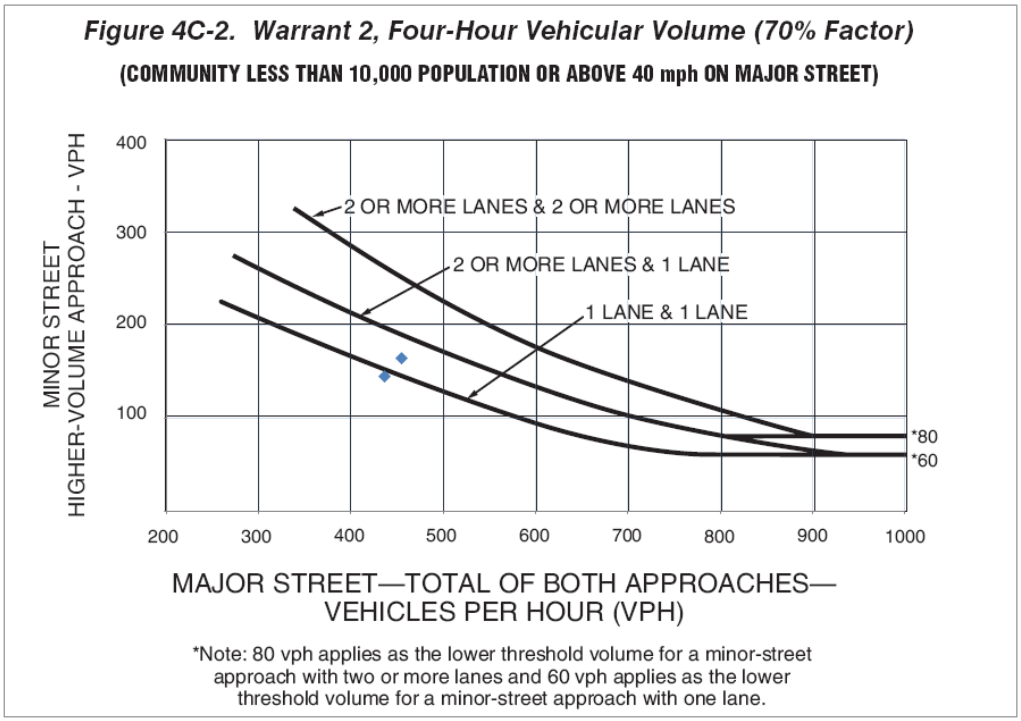
PGBT EB Frontage Road and Crawford Drive

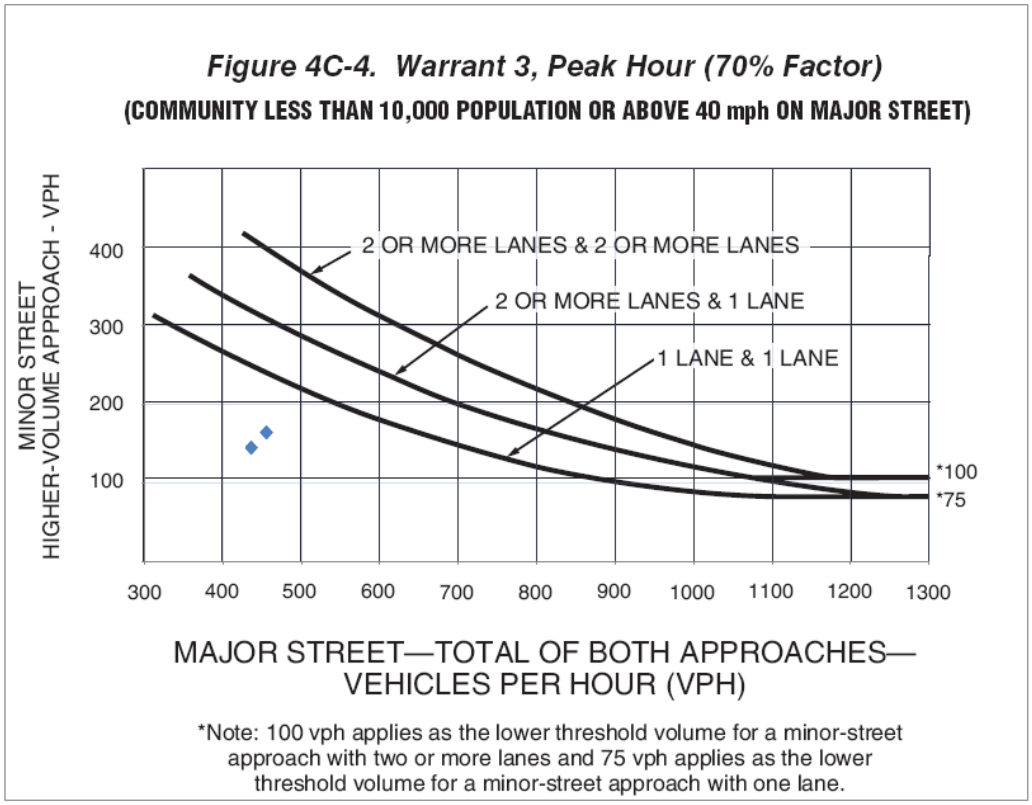




Bush Turnpike Station (South Alignment)

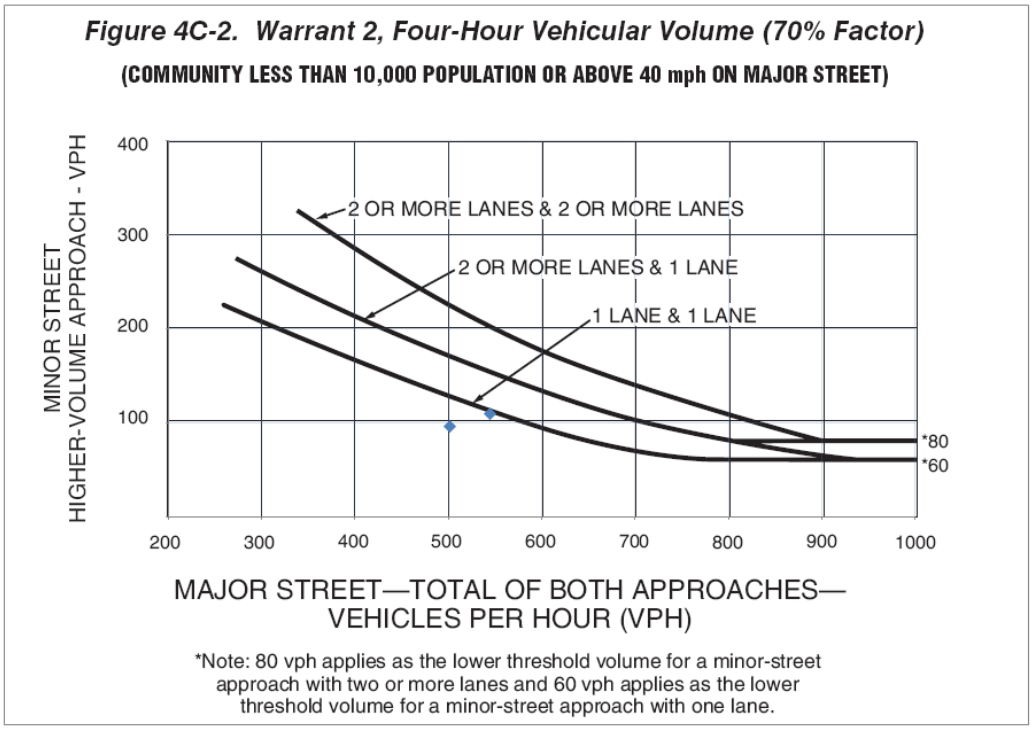
PGBT EB Frontage Road and South Central Driveway

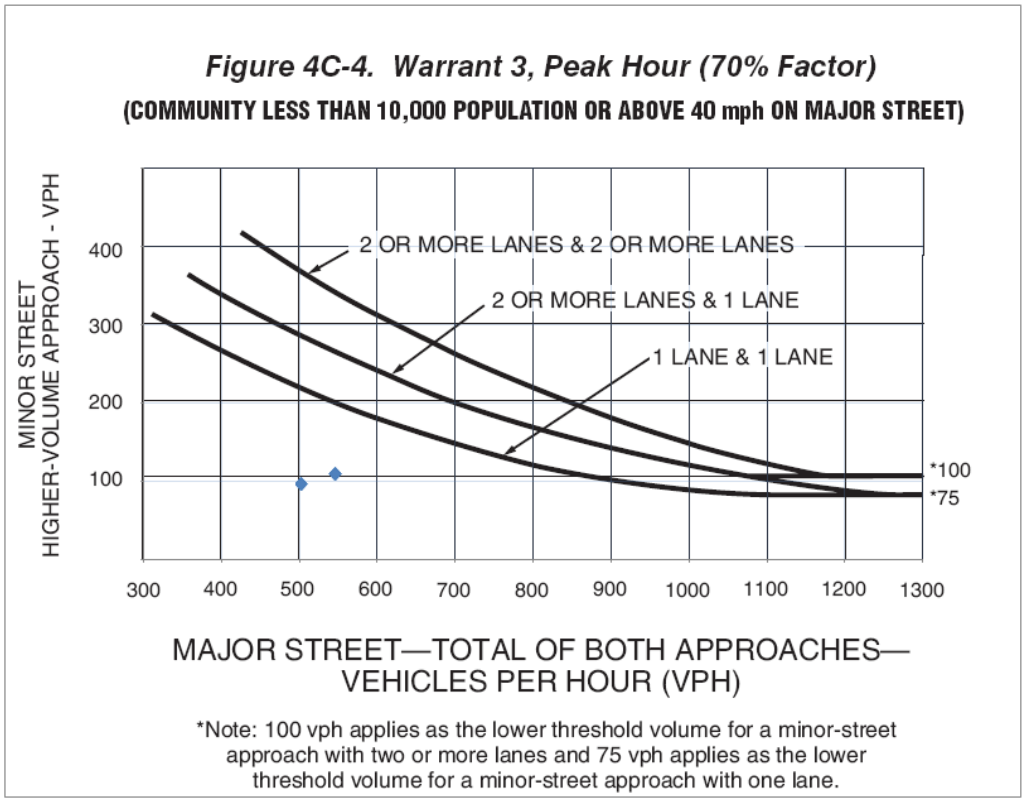




Bush Turnpike Station (South Alignment)

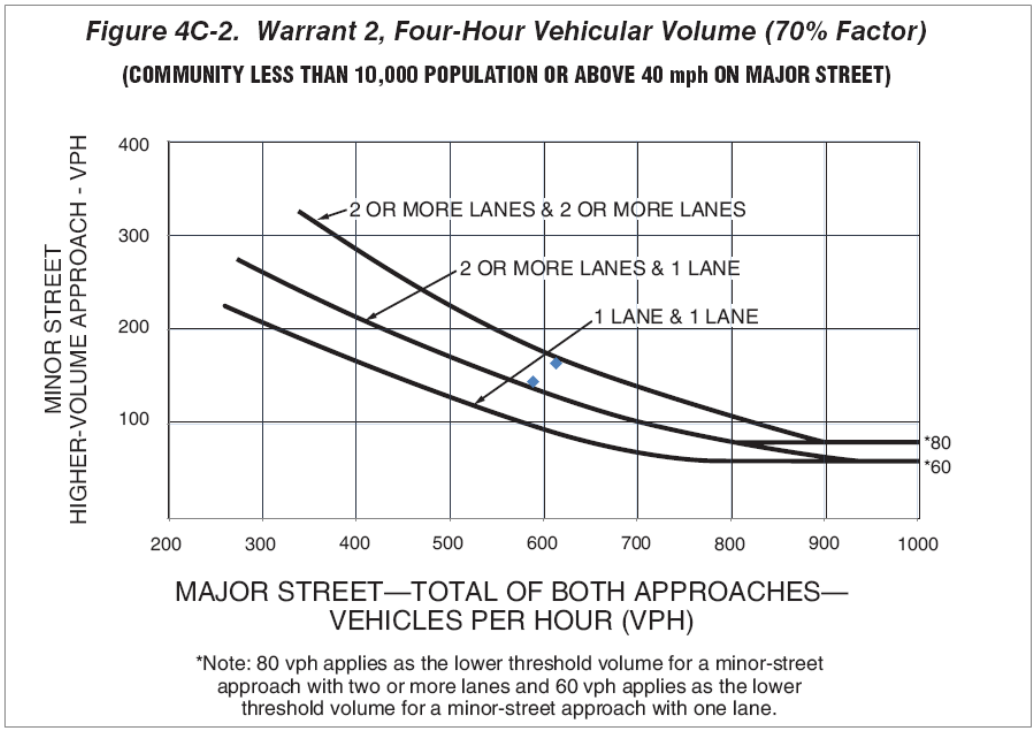
PGBT EB Frontage Road and SE Driveway

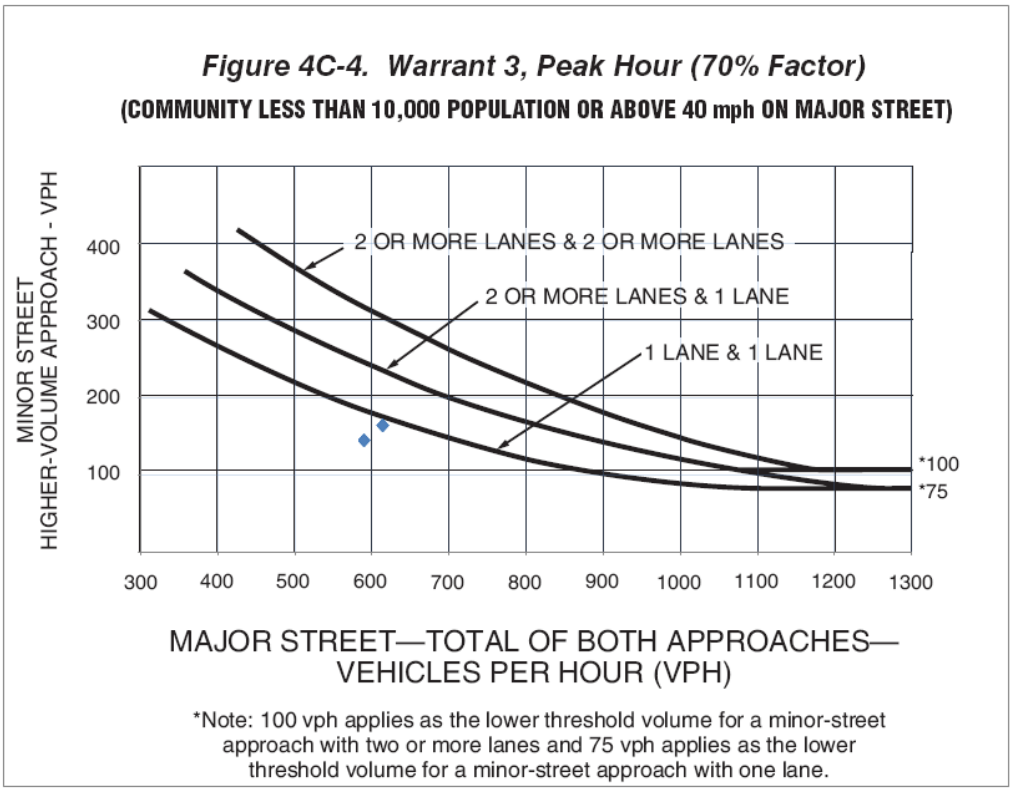




Bush Turnpike Station (South Alignment)

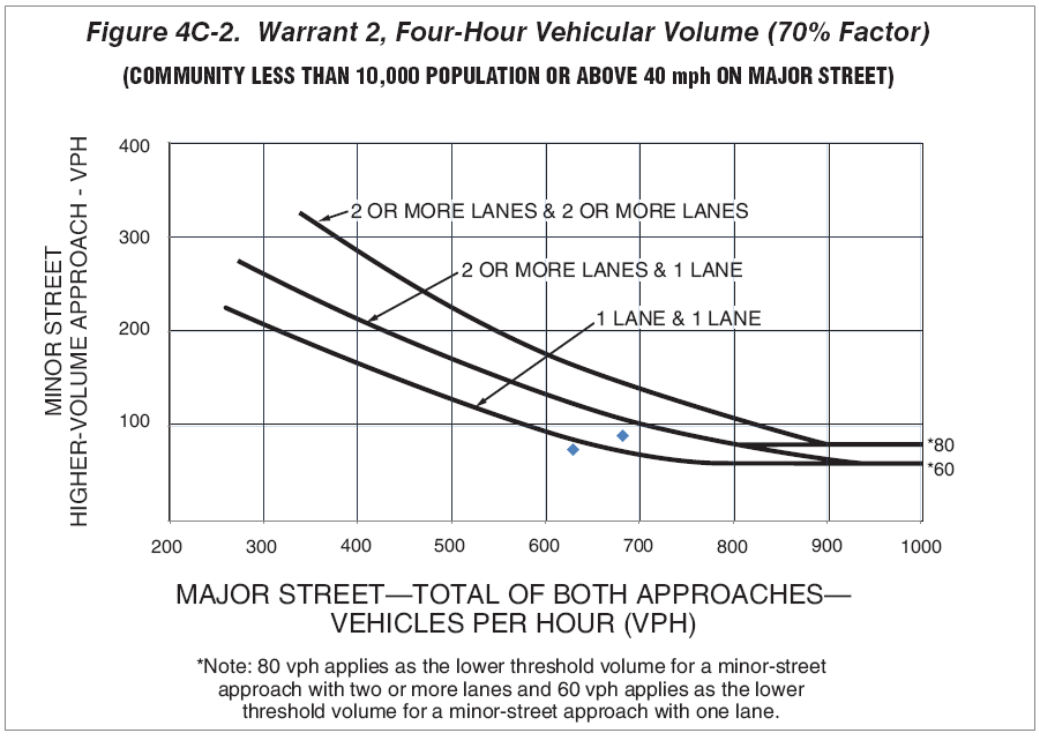
PGBT WB Frontage Road and NE Driveway

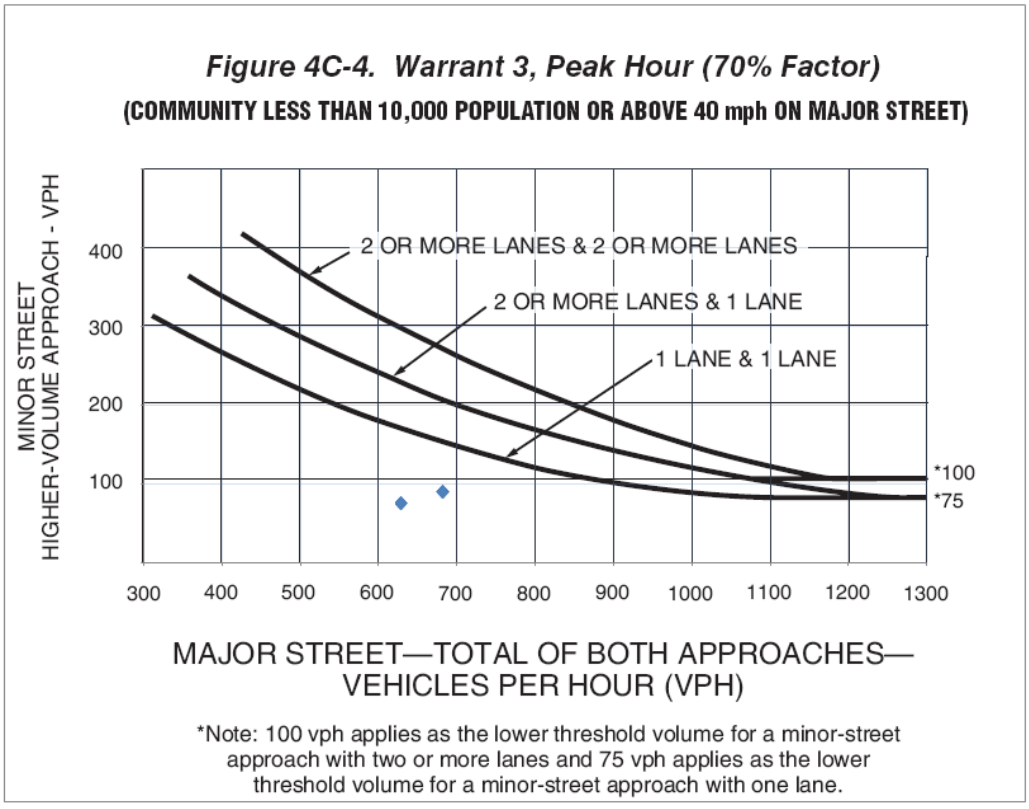




Bush Turnpike Station (South Alignment)

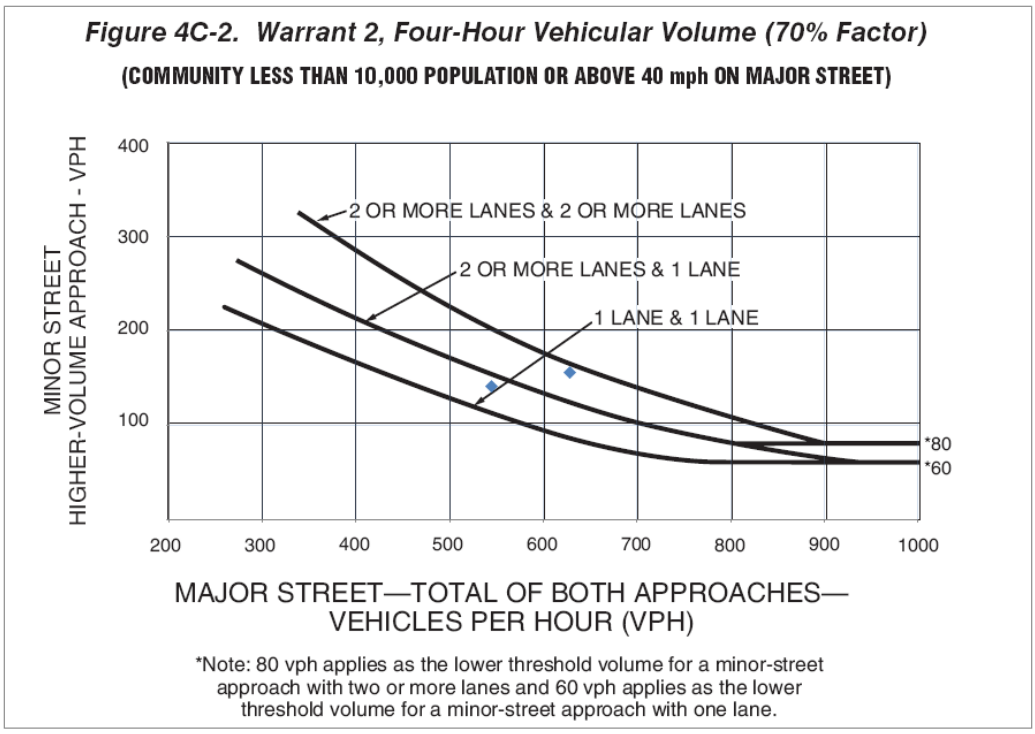
PGBT WB Frontage Road and North Central Driveway

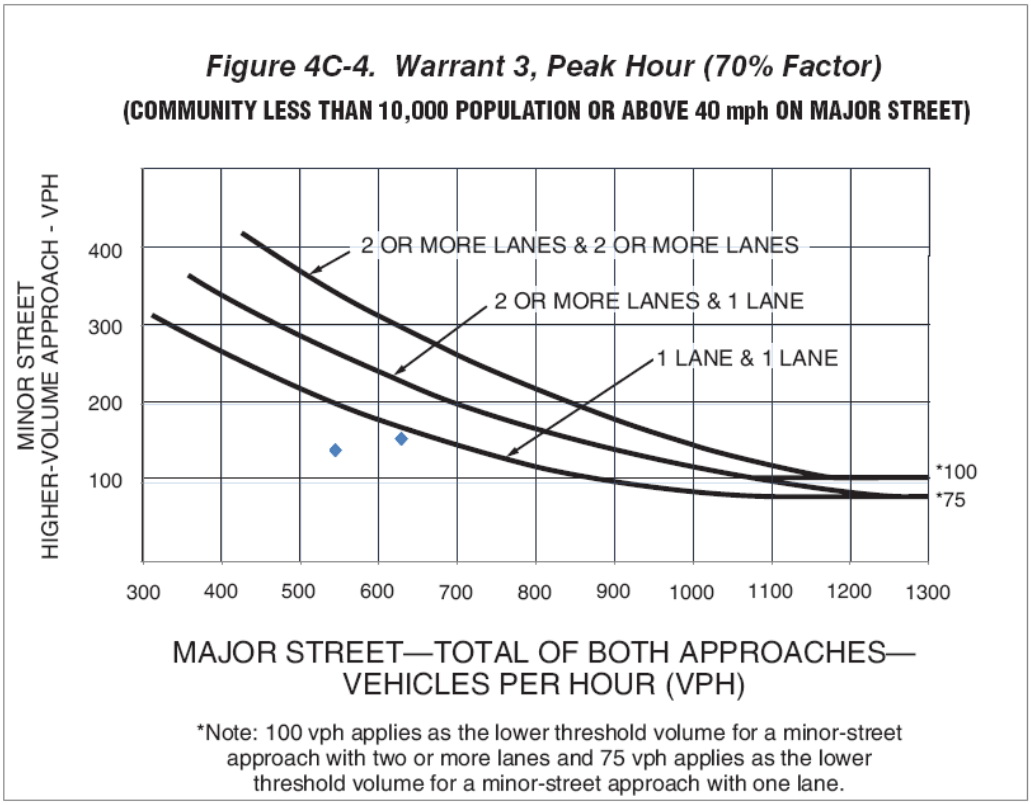




Bush Turnpike Station (South Alignment)

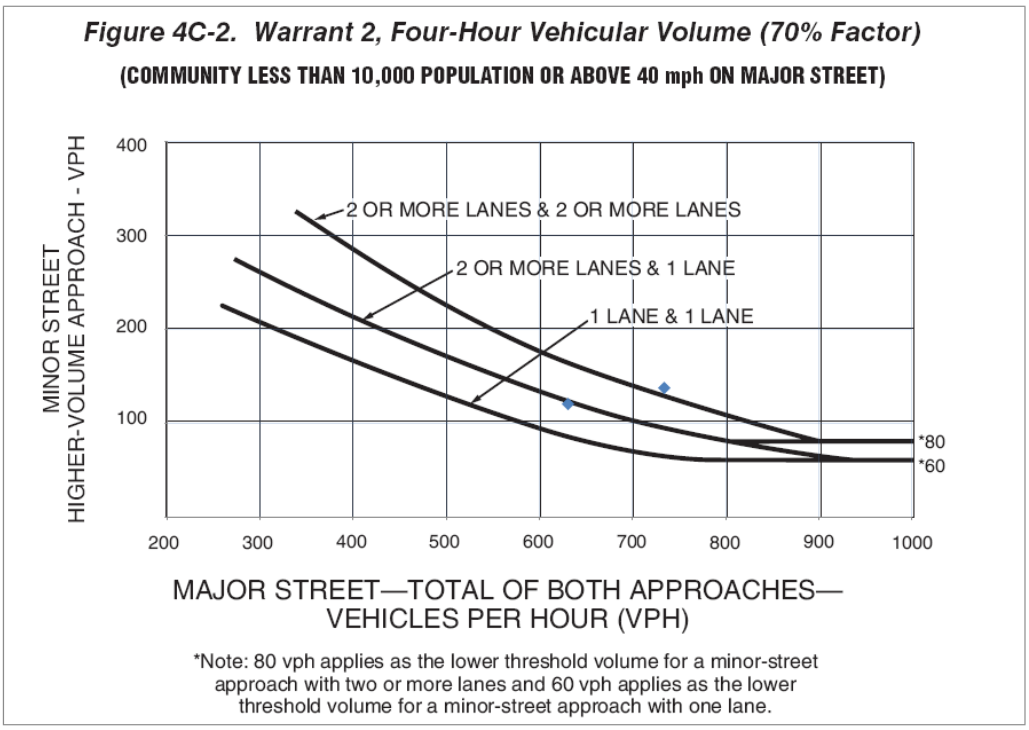
PGBT WB Frontage Road and Crawford Drive

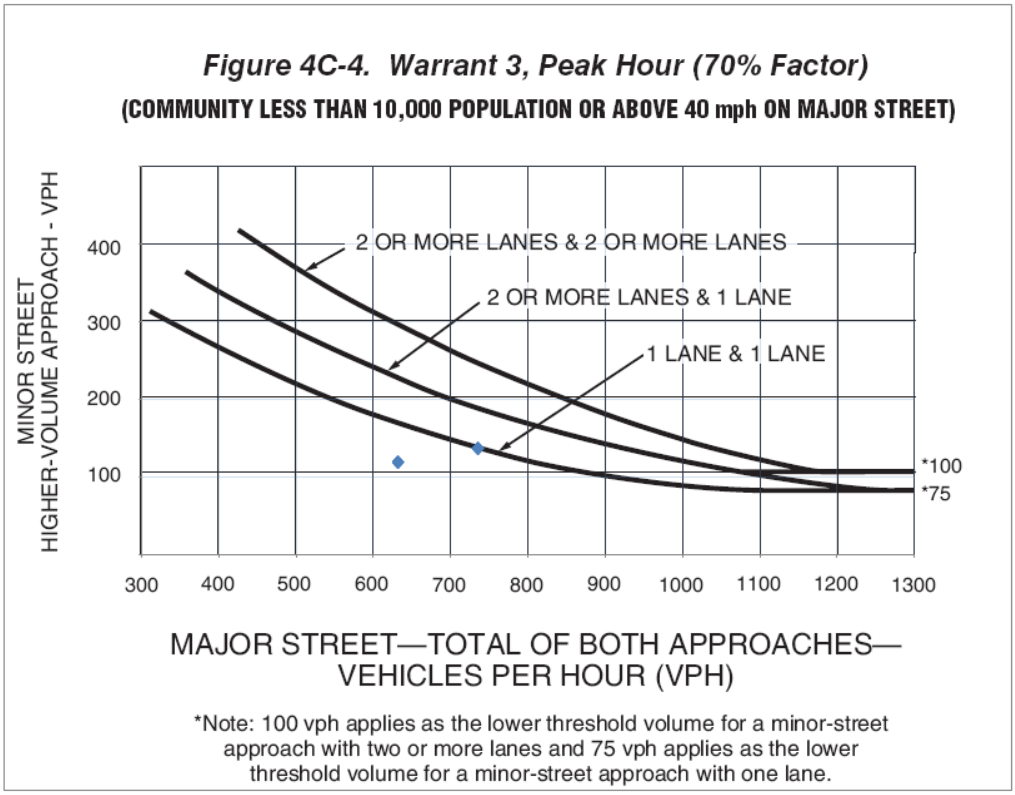




Bush Turnpike Station (South Alignment)

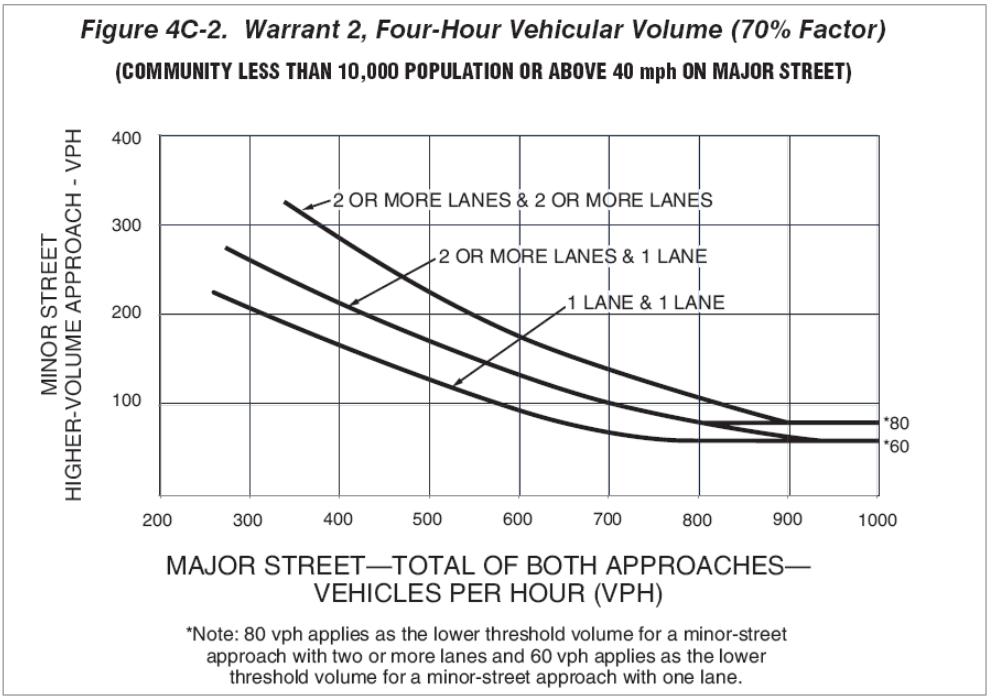
PGBT WB Frontage Road and NW Driveway



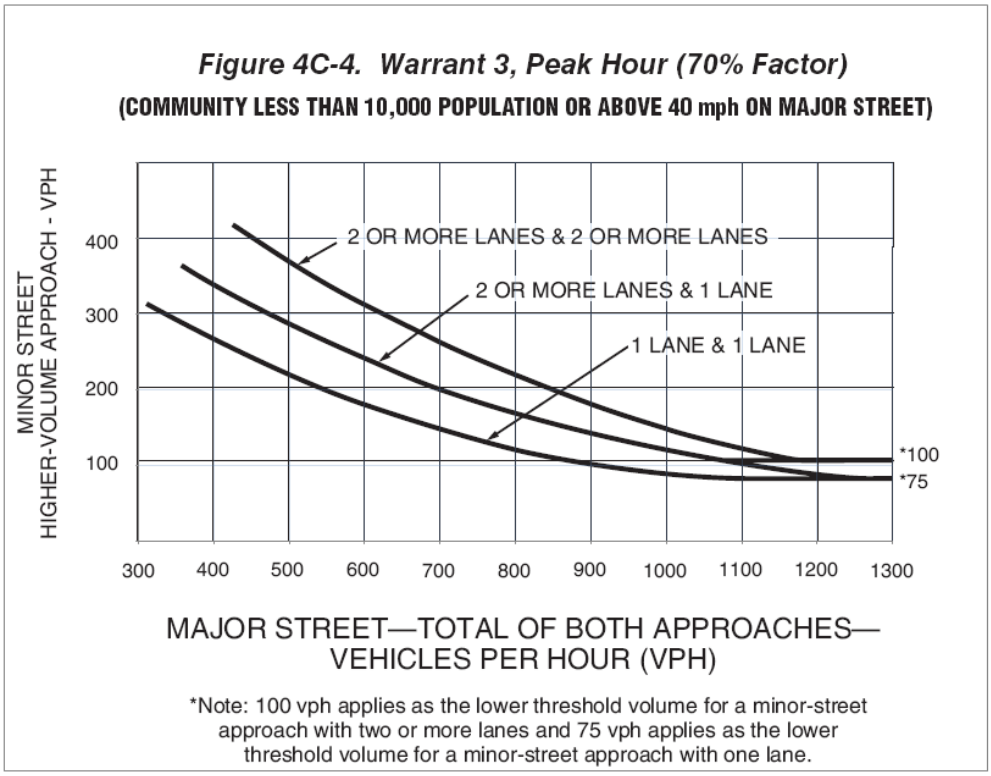


UTD/Synergy Station

Waterview Parkway – Driveway 1



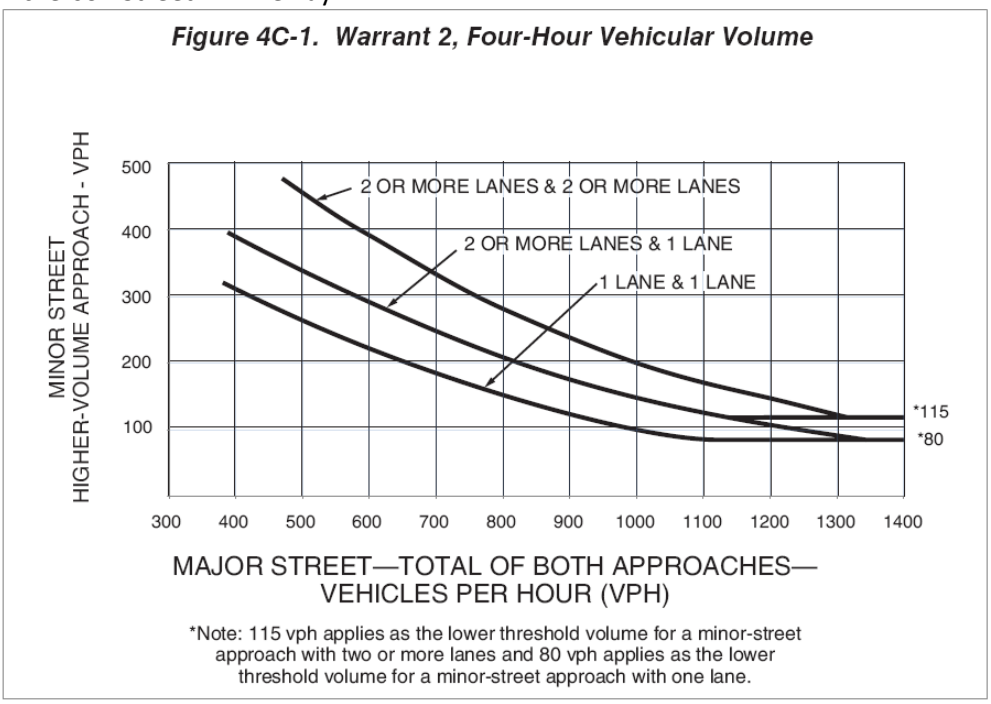
All data points not displayed in graph. Volume on major street >1000.



All data points not displayed in graph. Volume on major street >1300.

Renner Village Station (West Option)

Dickerson Street – Driveway 1



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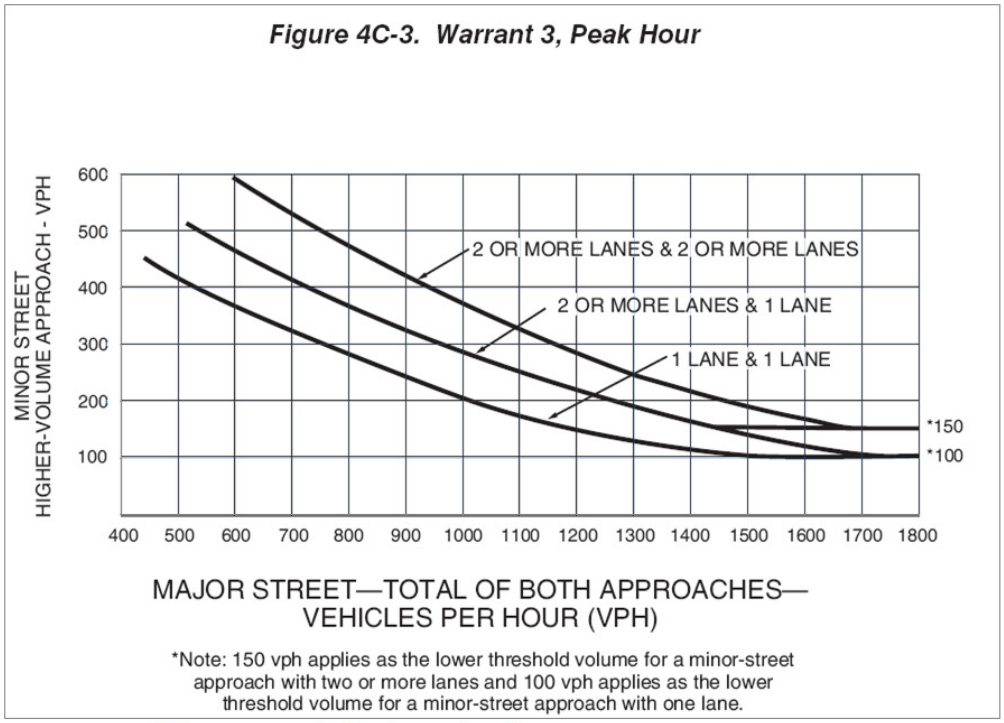

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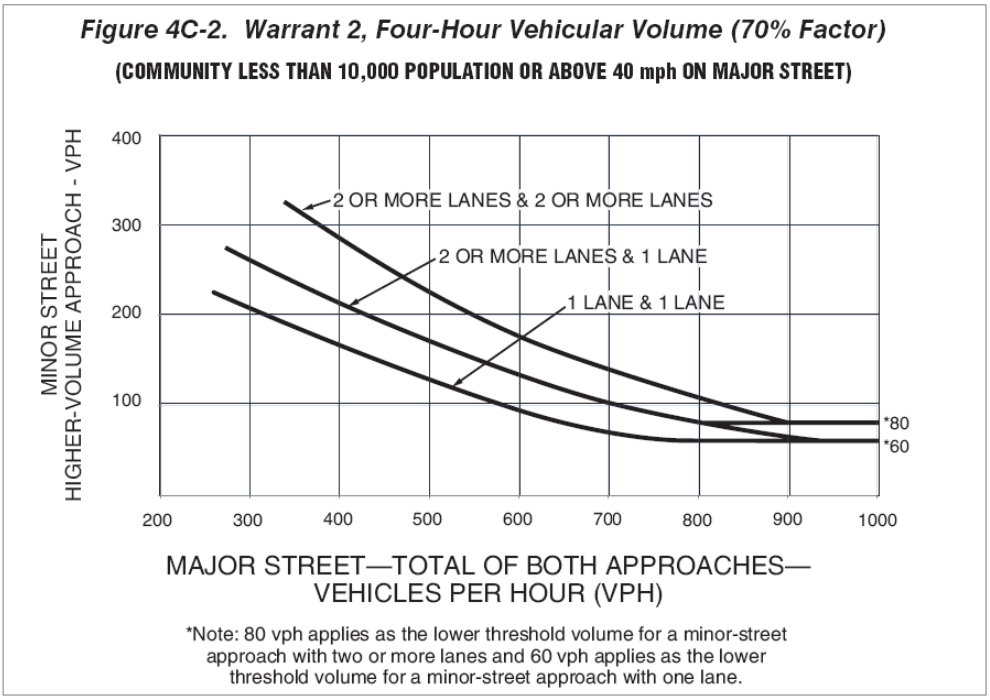
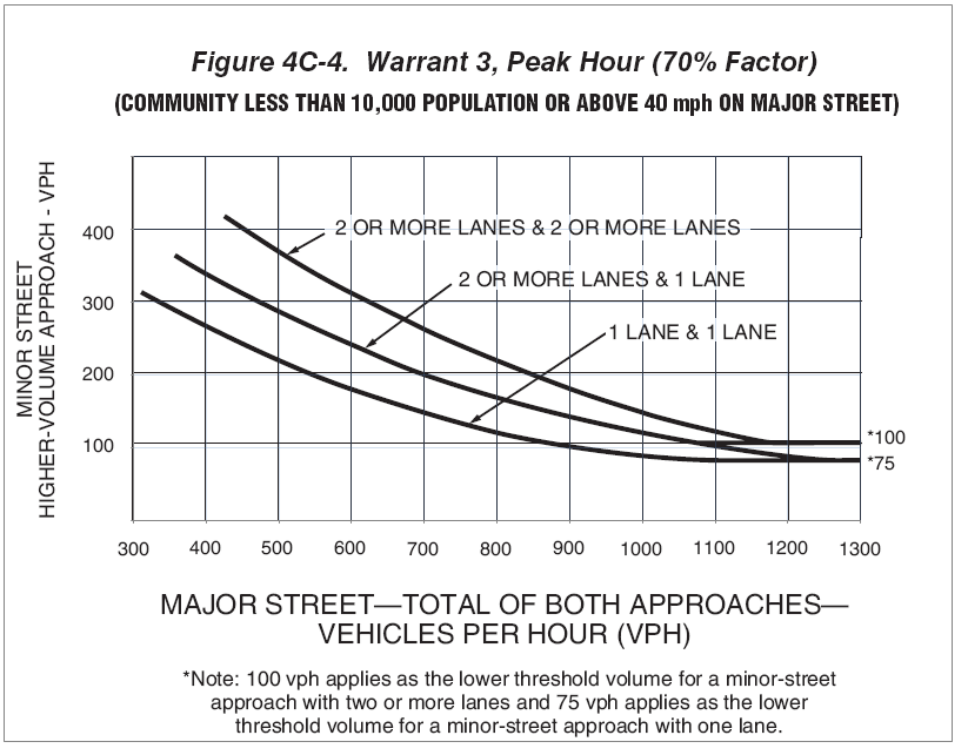
Renner Village Station (East Option)

Coit Road – Driveway 1



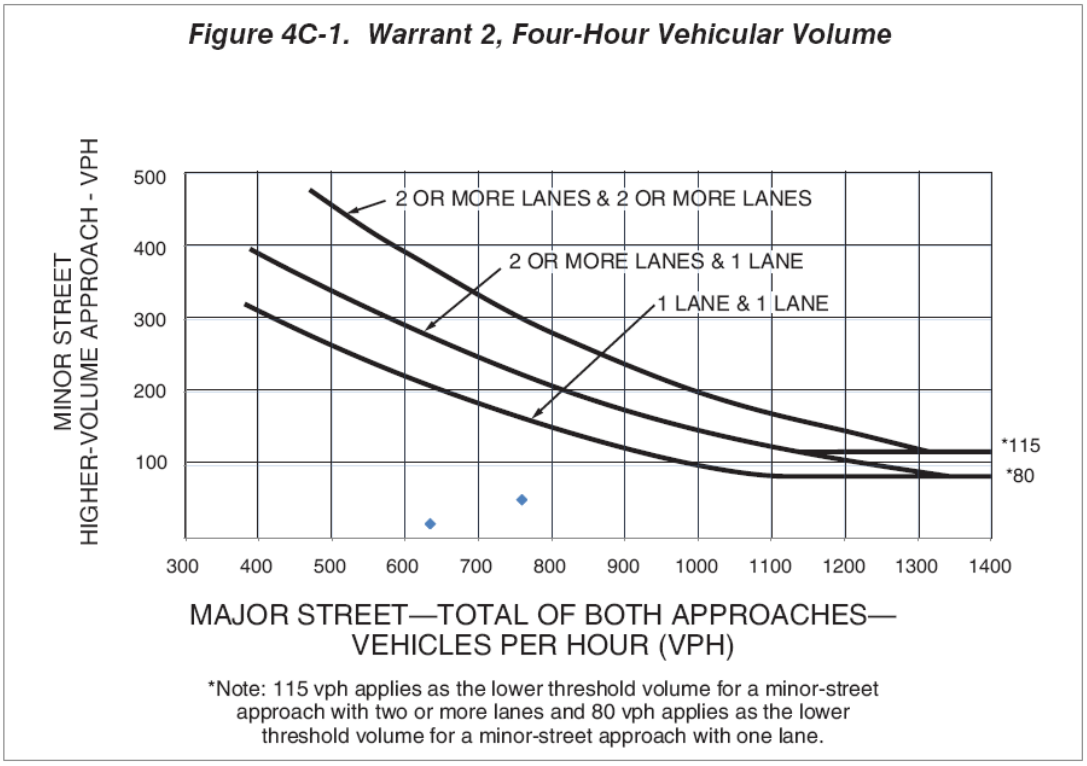
All data points not displayed in graph. Volume on major street >1000 & Volume on minor street < 80

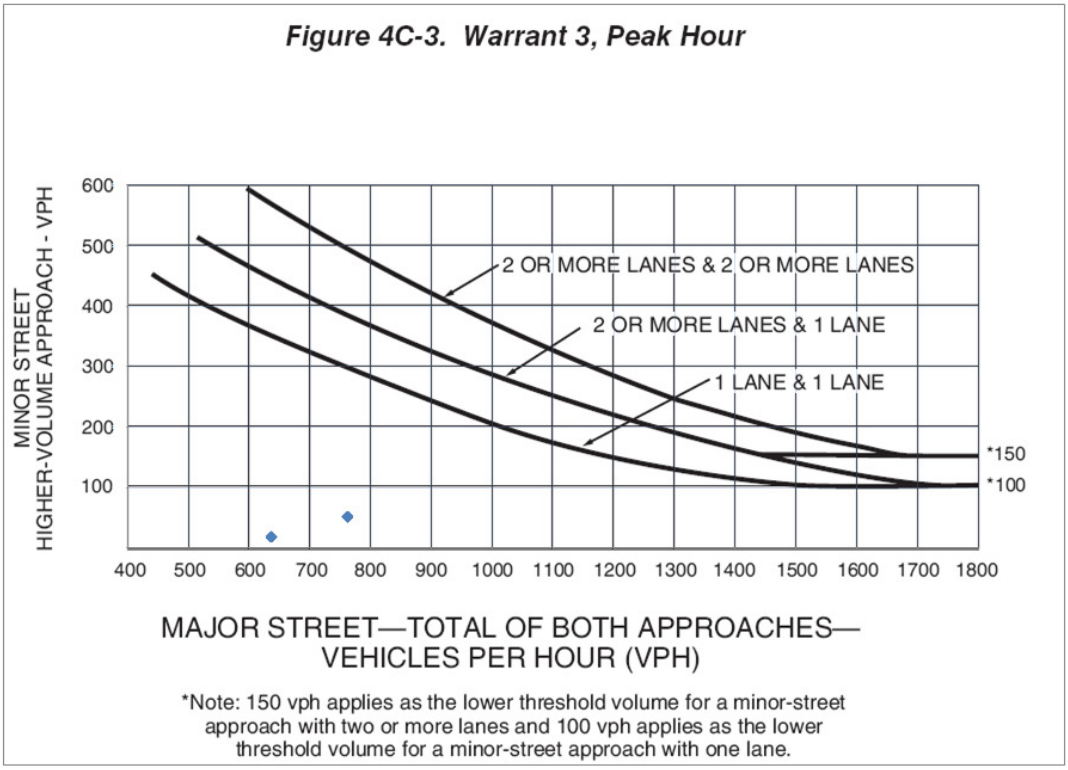


All data points not displayed in graph. Volume on major street >1300 & Volume on minor street <100.

Knoll Trail Station

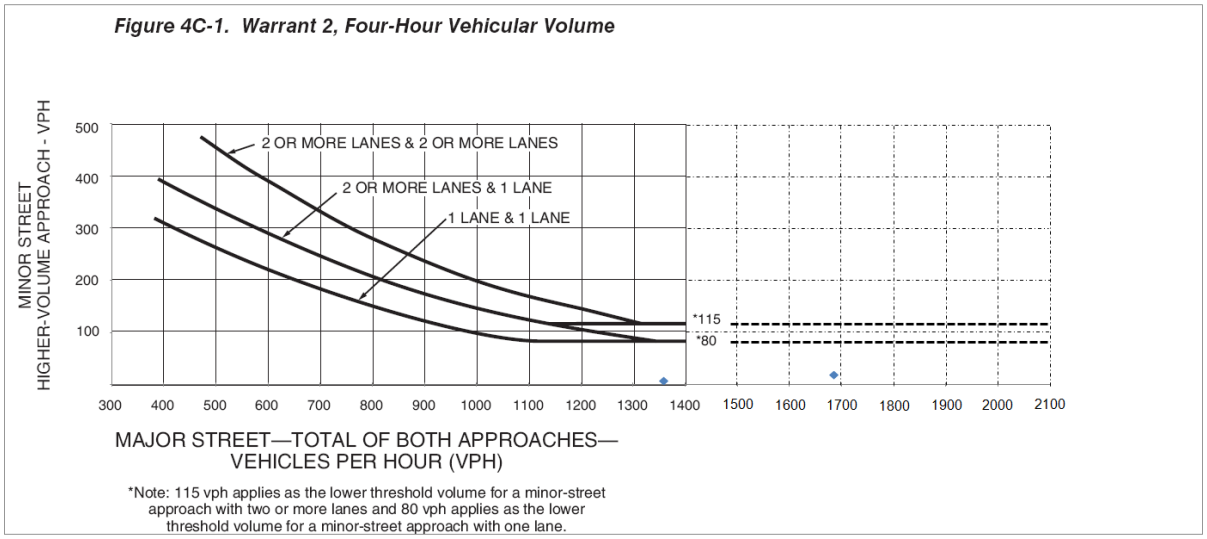
Knoll Trail Drive – Driveway 1

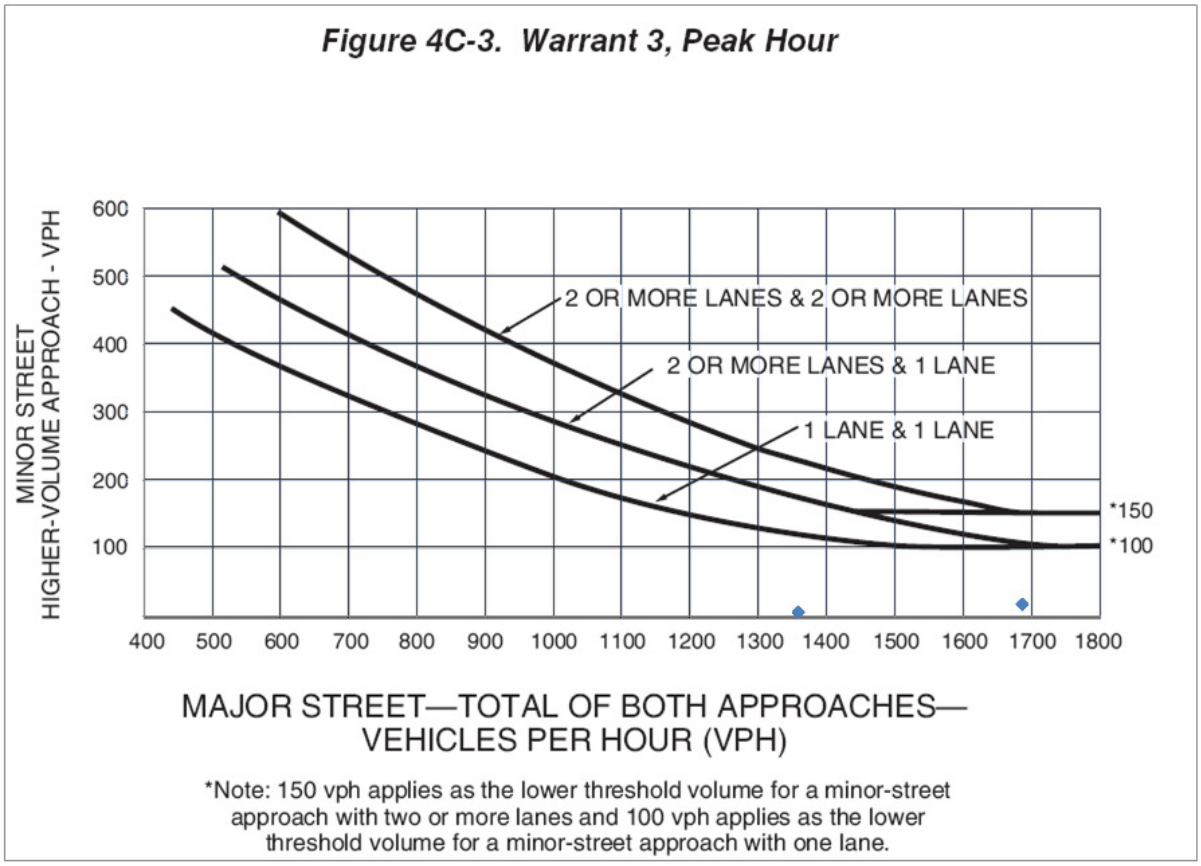




Addison Station

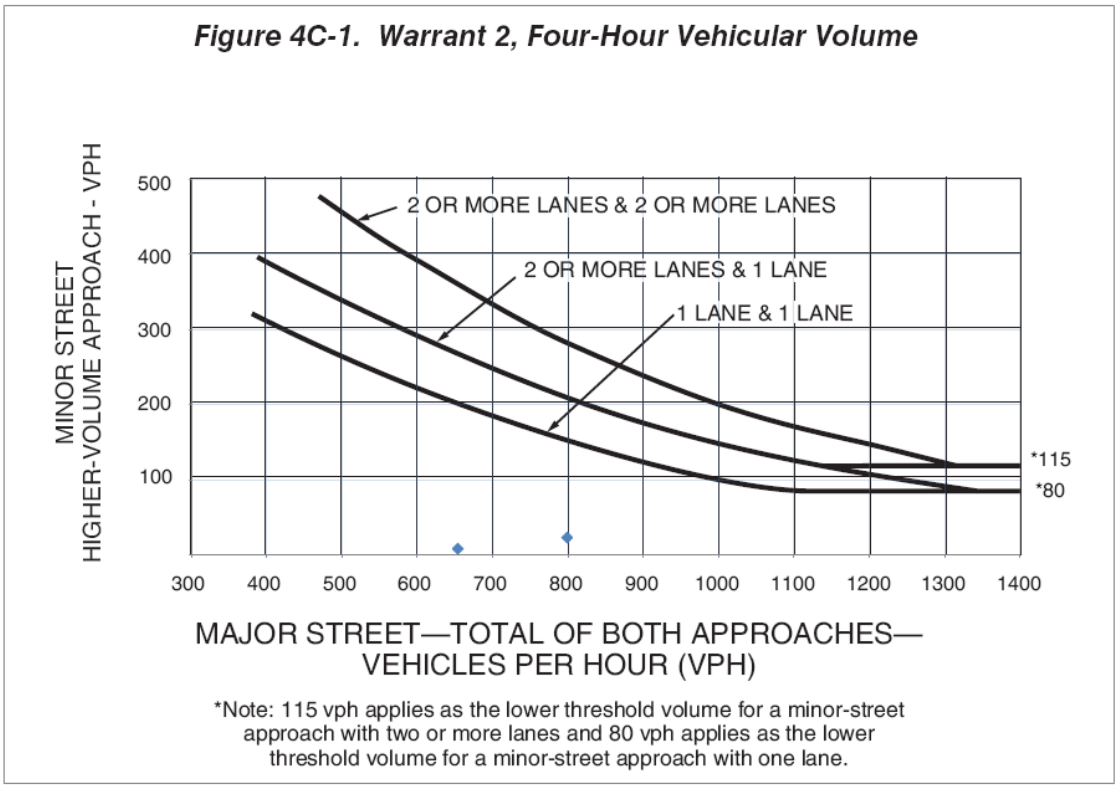
Arapaho Road – Driveway 2

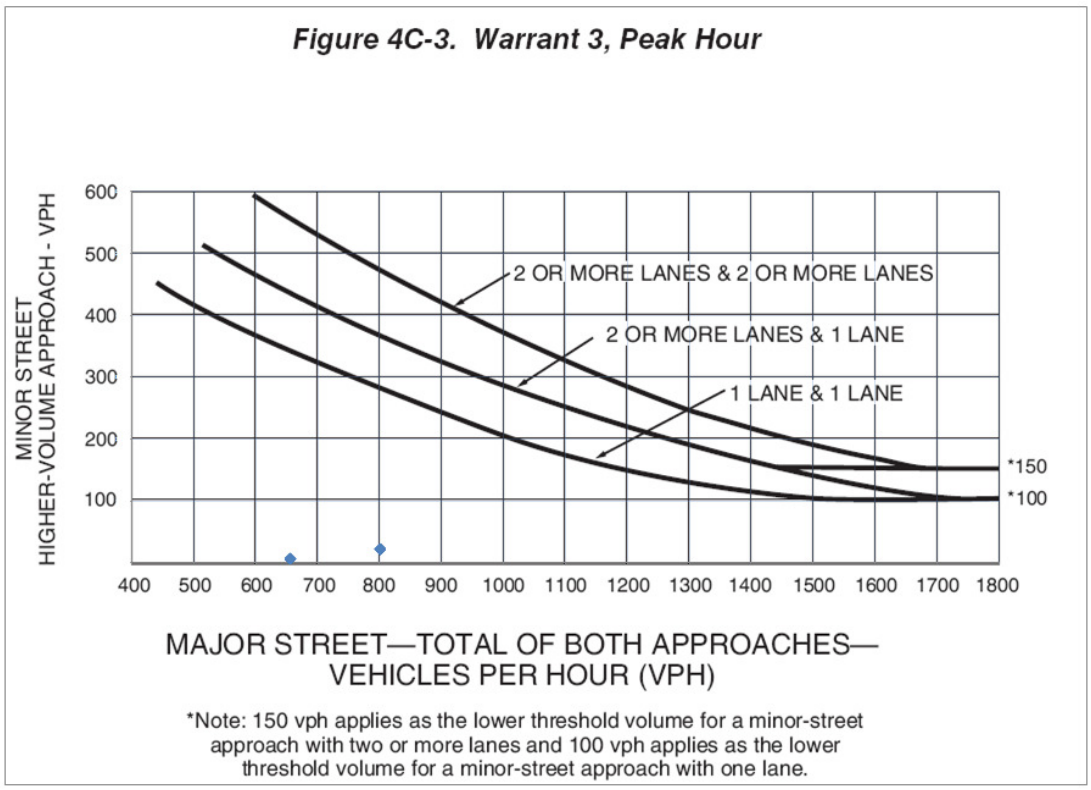




Downtown Carrollton Station

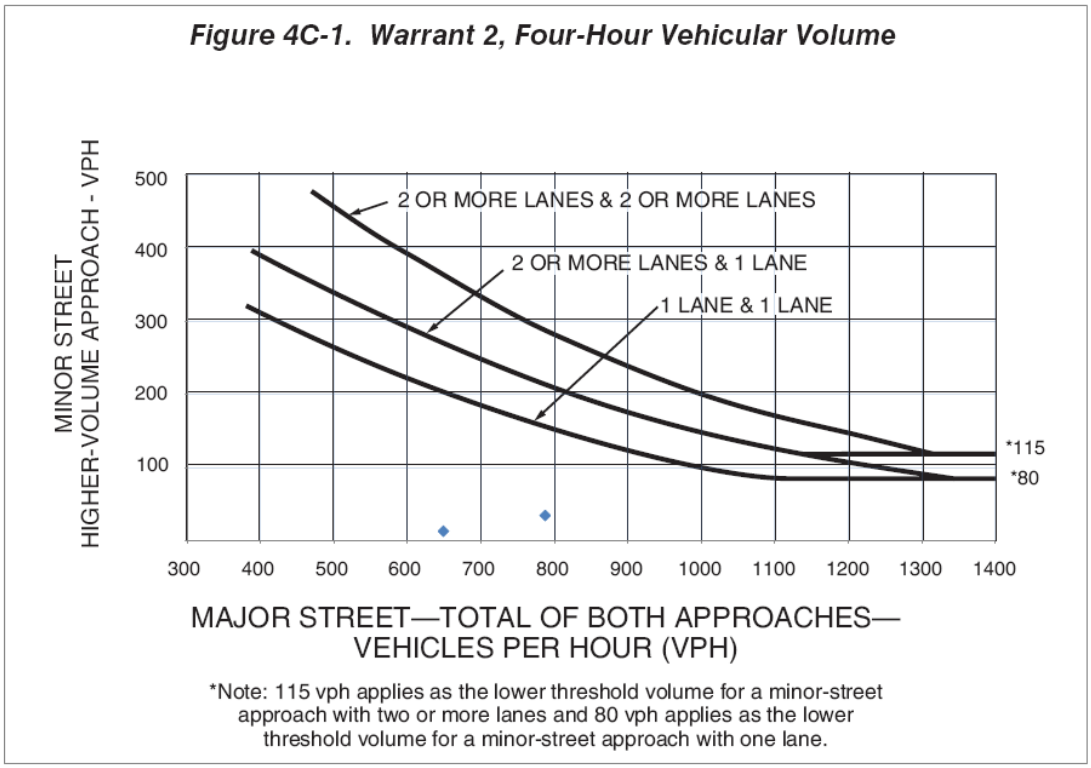
Denton Drive – Driveway 1

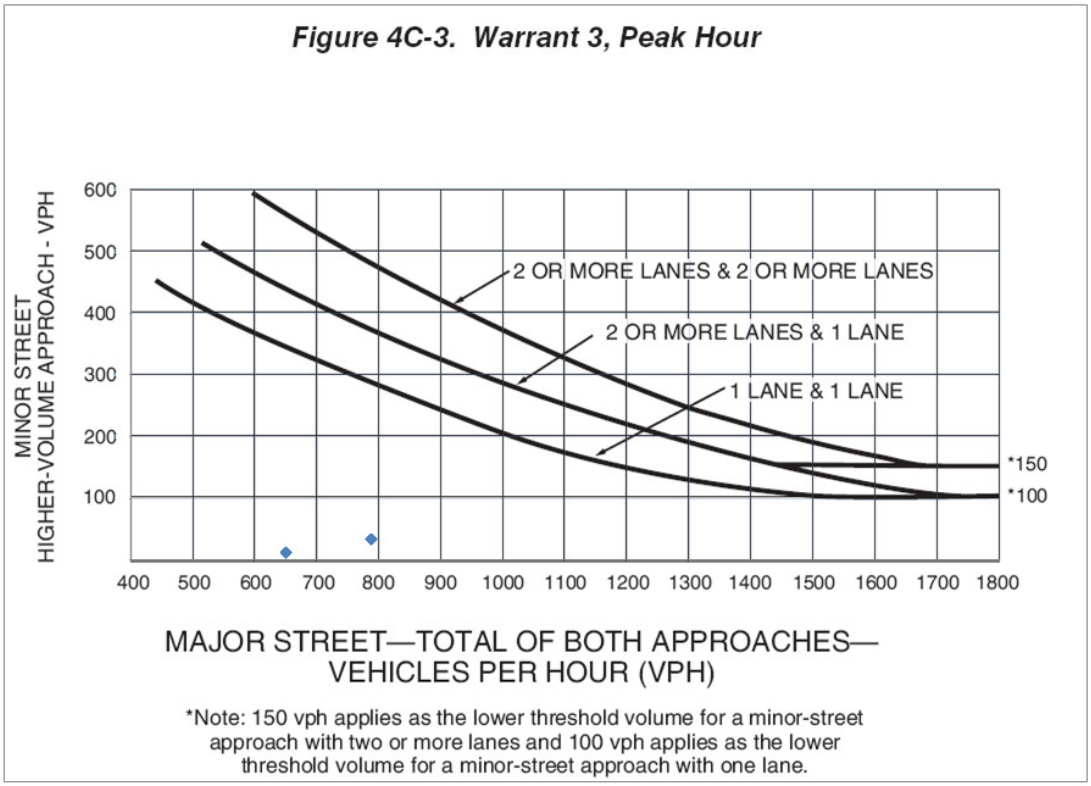




Downtown Carrollton Station

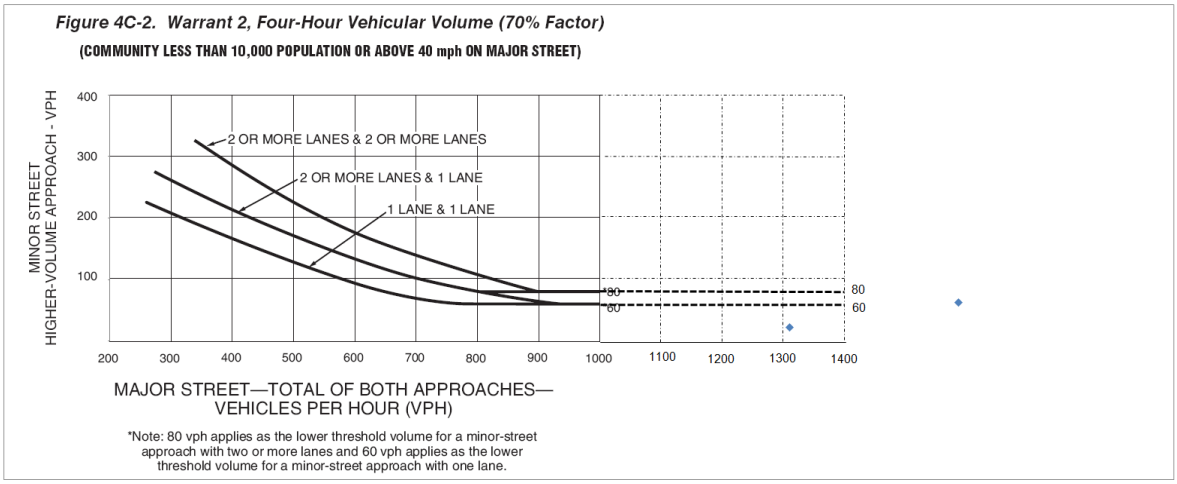
Denton Drive – Driveway 2

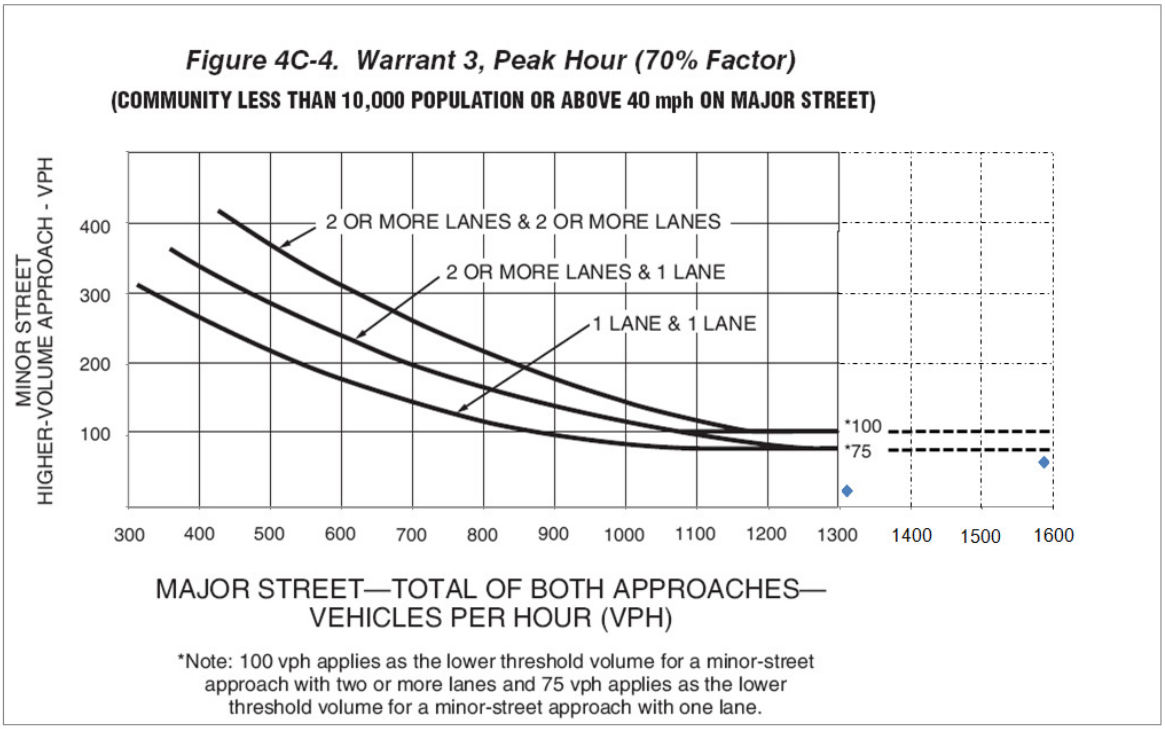




North Lake Station

Belt Line Road – Driveway 1





APPENDIX E

PEAK-HOUR CAPACITY ANALYSIS WORKSHEETS

HCM 2010 TWSC
801: Shiloh Rd & Driveway 1

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	0	13	10	0	10	36	447	10	10	457	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	14	11	0	11	39	486	11	11	497	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	860	1162	254	853	1162	248	508	0	0	497	0	0
Stage 1	587	587	-	570	570	-	-	-	-	-	-	-
Stage 2	273	575	-	283	592	-	-	-	-	-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Capacity-1 Maneuver	309	194	635	311	194	641	671	-	-	679	-	-
Stage 1	383	495	-	393	504	-	-	-	-	-	-	-
Stage 2	651	501	-	642	492	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	290	183	635	291	183	641	671	-	-	679	-	-
Mov Capacity-2 Maneuver	290	183	-	291	183	-	-	-	-	-	-	-
Stage 1	361	495	-	370	475	-	-	-	-	-	-	-
Stage 2	603	472	-	628	492	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.8	14.5	0.8	0.7
HCM LOS	C	B		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBU	SBL	SBT	SBR
Capacity (veh/h)	671	-	-	369	400	958	679	-	-
HCM Lane V/C Ratio	0.058	-	-	0.097	0.054	0.033	0.016	-	-
HCM Control Delay (s)	10.697	-	-	15.8	14.5	-	9.4	-	-
HCM Lane LOS	B			C	B	A			
HCM 95th %tile Q(veh)	0.185	-	-	0.321	0.172	0.102	0.049	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
802: Shiloh Rd & Driveway 2

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	39	0	506	467	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	42	0	550	508	84

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	769	296	591	0	-	0
Stage 1	549	-	-	-	-	-
Stage 2	220	-	-	-	-	-
Follow-up Headway	3.82	3.92	3.12	-	-	-
Pot Capacity-1 Maneuver	405	597	614	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	405	597	614	-	-	-
Mov Capacity-2 Maneuver	405	-	-	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	731	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	0	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	614	-	597	-	-
HCM Lane V/C Ratio	-	-	0.071	-	-
HCM Control Delay (s)	0	-	11.5	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	0.229	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
803: 12th Pl & K Ave

DART TO 42 - Cotton Belt
2018 AM Peak (North Alignment)

Intersection	
Intersection Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	36	24	18	47	0	0	0	0	26	825	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	39	26	20	51	0	0	0	0	28	897	77

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	1018	992	486	435	1030	0				0	0	0
Stage 1	992	992	-	0	0	-				-	-	-
Stage 2	26	0	-	435	1030	-				-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	-				-	-	-
Pot Capacity-1 Maneuver	304	244	451	588	232	-				-	-	-
Stage 1	245	322	-	-	-	-				-	-	-
Stage 2	-	-	-	567	309	-				-	-	-
Time blocked-Platoon, %											-	-
Mov Capacity-1 Maneuver	304	# 0	451	588	# 0	-				-	-	-
Mov Capacity-2 Maneuver	304	# 0	-	588	# 0	-				-	-	-
Stage 1	245	# 0	-	-	# 0	-				-	-	-
Stage 2	-	# 0	-	567	# 0	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	14.3	+	0
HCM LOS	B	-	

Minor Lane / Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	451	+	-	-	-
HCM Lane V/C Ratio	0.145	+	-	-	-
HCM Control Delay (s)	14.3	+	-	-	-
HCM Lane LOS	B	+			
HCM 95th %tile Q(veh)	0.502	+	-	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
804: 12th Pl & Municipal Ave

DART TO 42 - Cotton Belt
2018 AM Peak (North Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	63	0	82	667	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	68	0	89	725	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	468	0	0	0
Stage 1	0	-	-	-
Stage 2	468	-	-	-
Follow-up Headway	3.82	-	-	-
Pot Capacity-1 Maneuver	518	-	-	-
Stage 1	-	-	-	-
Stage 2	498	-	-	-
Time blocked-Platoon, %				-
Mov Capacity-1 Maneuver	518	-	-	-
Mov Capacity-2 Maneuver	518	-	-	-
Stage 1	-	-	-	-
Stage 2	498	-	-	-

Approach	EB	NB
HCM Control Delay, s	+	0
HCM LOS	-	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
803: 12th Pl & K Ave

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	8	5	4	10	0	0	0	0	6	805	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	9	5	4	11	0	0	0	0	7	875	17

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	902	897	445	367	905	0				0	0	0
Stage 1	897	897	-	0	0	-				-	-	-
Stage 2	5	0	-	367	905	-				-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	-				-	-	-
Pot Capacity-1 Maneuver	348	278	479	634	275	-				-	-	-
Stage 1	279	357	-	-	-	-				-	-	-
Stage 2	-	-	-	615	353	-				-	-	-
Time blocked-Platoon, %											-	-
Mov Capacity-1 Maneuver	348	# 0	479	634	# 0	-				-	-	-
Mov Capacity-2 Maneuver	348	# 0	-	634	# 0	-				-	-	-
Stage 1	279	# 0	-	-	# 0	-				-	-	-
Stage 2	-	# 0	-	615	# 0	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	12.7	+	0
HCM LOS	B	-	

Minor Lane / Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	479	+	-	-	-
HCM Lane V/C Ratio	0.029	+	-	-	-
HCM Control Delay (s)	12.7	+	-	-	-
HCM Lane LOS	B	+			
HCM 95th %tile Q(veh)	0.091	+	-	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
804: 12th Pl & Municipal Ave

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	14	0	18	667	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	0	20	725	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	329	0	0	0
Stage 1	0	-	-	-
Stage 2	329	-	-	-
Follow-up Headway	3.82	-	-	-
Pot Capacity-1 Maneuver	620	-	-	-
Stage 1	-	-	-	-
Stage 2	603	-	-	-
Time blocked-Platoon, %				-
Mov Capacity-1 Maneuver	620	-	-	-
Mov Capacity-2 Maneuver	620	-	-	-
Stage 1	-	-	-	-
Stage 2	603	-	-	-

Approach	EB	NB
HCM Control Delay, s	+	0
HCM LOS	-	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
901: PGBT EBFR & SW Drwy

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	133	513	0	0	27	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	145	558	0	0	29	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	512	0
Stage 1	-	-	0	-
Stage 2	-	-	512	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	489	-
Stage 1	-	-	-	-
Stage 2	-	-	468	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	489	-
Mov Capacity-2 Maneuver	-	-	489	-
Stage 1	-	-	-	-
Stage 2	-	-	468	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
902: PGBT EBFR & Crawford Rd

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	159	381	0	0	54	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	173	414	0	0	59	0

Major/Minor	Major1			Minor2	
Conflicting Flow All	0	0		511	0
Stage 1	-	-		0	-
Stage 2	-	-		511	-
Follow-up Headway	-	-		3.82	-
Pot Capacity-1 Maneuver	-	-		489	-
Stage 1	-	-		-	-
Stage 2	-	-		469	-
Time blocked-Platoon, %		-			
Mov Capacity-1 Maneuver	-	-		489	-
Mov Capacity-2 Maneuver	-	-		489	-
Stage 1	-	-		-	-
Stage 2	-	-		469	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	489	+
HCM Lane V/C Ratio	-	-	0.06	+
HCM Control Delay (s)	-	-	12.8	+
HCM Lane LOS			B	+
HCM 95th %tile Q(veh)	-	-	0.191	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
903: PGBT EBFR & S Central Drwy

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	80	355	0	0	146	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	87	386	0	0	159	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	328	0
Stage 1	-	-	0	-
Stage 2	-	-	328	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	621	-
Stage 1	-	-	-	-
Stage 2	-	-	604	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	621	-
Mov Capacity-2 Maneuver	-	-	621	-
Stage 1	-	-	-	-
Stage 2	-	-	604	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
904: PGBT EBFR & SE Drwy

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	160	341	0	0	97	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	371	0	0	105	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	496	0
Stage 1	-	-	0	-
Stage 2	-	-	496	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	499	-
Stage 1	-	-	-	-
Stage 2	-	-	479	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	499	-
Mov Capacity-2 Maneuver	-	-	499	-
Stage 1	-	-	-	-
Stage 2	-	-	479	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
905: NE Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	106	482	146	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	115	524	159	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	440	0
Stage 1	-	-	0	-
Stage 2	-	-	440	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	537	-
Stage 1	-	-	-	-
Stage 2	-	-	518	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	537	-
Mov Capacity-2 Maneuver	-	-	537	-
Stage 1	-	-	-	-
Stage 2	-	-	518	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
906: N Central Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	160	468	76	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	174	509	83	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	551	0
Stage 1	-	-	0	-
Stage 2	-	-	551	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	464	-
Stage 1	-	-	-	-
Stage 2	-	-	444	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	464	-
Mov Capacity-2 Maneuver	-	-	464	-
Stage 1	-	-	-	-
Stage 2	-	-	444	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
907: Crawford Rd & PGBT WBFR

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	56	488	0	142	0	0	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	61	530	0	154	0	0	0	5	0

Major/Minor	Major2			Minor1			Minor2		
Conflicting Flow All	0	0	0	337	652	0	652	652	264
Stage 1	-	-	-	0	0	-	652	652	-
Stage 2	-	-	-	337	652	-	0	0	-
Follow-up Headway	-	-	-	3.82	4.02	-	3.82	4.02	3.92
Pot Capacity-1 Maneuver	-	-	-	655	386	-	462	386	626
Stage 1	-	-	-	-	-	-	392	462	-
Stage 2	-	-	-	637	462	-	-	-	-
Time blocked-Platoon, %		-	-						
Mov Capacity-1 Maneuver	-	-	-	655	0	-	462	# 0	626
Mov Capacity-2 Maneuver	-	-	-	655	0	-	462	# 0	-
Stage 1	-	-	-	-	0	-	392	# 0	-
Stage 2	-	-	-	637	0	-	-	# 0	-

Approach	WB	NB	SB
HCM Control Delay, s	0	+	+
HCM LOS		-	-

Minor Lane / Major Mvmt	NBLn1	NBLn2	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	655	+	-	-	-	0
HCM Lane V/C Ratio	0.157	+	-	-	-	+
HCM Control Delay (s)	11.5	+	-	-	-	+
HCM Lane LOS	B	+				+
HCM 95th %tile Q(veh)	0.555	+	-	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
908: NW Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 AM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	32	598	121	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	35	650	132	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	330	0
Stage 1	-	-	0	-
Stage 2	-	-	330	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	619	-
Stage 1	-	-	-	-
Stage 2	-	-	602	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	619	-
Mov Capacity-2 Maneuver	-	-	619	-
Stage 1	-	-	-	-
Stage 2	-	-	602	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
805: Driveway 1 & Waterview Pkwy

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	1728	24	16	910	0	12	0	8	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1878	26	17	989	0	13	0	9	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	989	0	0	1904	0	0	2321	2915	952	1775	2928	495
Stage 1	-	-	-	-	-	-	1891	1891	-	1024	1024	-
Stage 2	-	-	-	-	-	-	430	1024	-	751	1904	-
Follow-up Headway	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Capacity-1 Maneuver	396	-	-	140	-	-	40	15	223	87	15	445
Stage 1	-	-	-	-	-	-	46	117	-	192	311	-
Stage 2	-	-	-	-	-	-	525	311	-	335	115	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	396	-	-	140	-	-	36	13	223	76	13	445
Mov Capacity-2 Maneuver	-	-	-	-	-	-	36	13	-	76	13	-
Stage 1	-	-	-	-	-	-	46	117	-	192	273	-
Stage 2	-	-	-	-	-	-	461	273	-	322	115	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	105.4	0
HCM LOS			F	A

Minor Lane / Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	42	223	396	-	-	140	-	-	0	0
HCM Lane V/C Ratio	0.38	0.026	-	-	-	0.124	-	-	+	+
HCM Control Delay (s)	135.9	21.6	0	-	-	34.329	-	-	0	0
HCM Lane LOS	F	C	A			D			A	A
HCM 95th %tile Q(veh)	1.309	0.08	0	-	-	0.414	-	-	+	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
814: Driveway 1 & Dickerson St

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	17	11	59	34	22	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	12	64	37	24	64

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	195	83	0	0	101	0
Stage 1	83	-	-	-	-	-
Stage 2	112	-	-	-	-	-
Follow-up Headway	3.518	3.318	-	-	2.218	-
Pot Capacity-1 Maneuver	794	976	-	-	1491	-
Stage 1	940	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	781	976	-	-	1491	-
Mov Capacity-2 Maneuver	781	-	-	-	-	-
Stage 1	940	-	-	-	-	-
Stage 2	897	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	2
HCM LOS	A		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	848	1491	-
HCM Lane V/C Ratio	-	-	0.036	0.016	-
HCM Control Delay (s)	-	-	9.4	7.454	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.112	0.049	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
806: Driveway 1 & Coit Rd

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	11	17	34	1857	1857	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	18	37	2018	2018	24

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2911	1021	2042	0	-	0
Stage 1	2030	-	-	-	-	-
Stage 2	881	-	-	-	-	-
Follow-up Headway	3.82	3.92	3.12	-	-	-
Pot Capacity-1 Maneuver	29	201	119	-	-	-
Stage 1	54	-	-	-	-	-
Stage 2	331	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	20	201	119	-	-	-
Mov Capacity-2 Maneuver	20	-	-	-	-	-
Stage 1	54	-	-	-	-	-
Stage 2	228	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	145.6	0.9	0
HCM LOS	F		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	119	-	20	201	-	-
HCM Lane V/C Ratio	0.311	-	0.598	0.092	-	-
HCM Control Delay (s)	48.328	-	$ 332.4	24.7	-	-
HCM Lane LOS	E		F	C		
HCM 95th %tile Q(veh)	1.209	-	1.674	0.3	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
807: Driveway 1 & Knoll Trail Dr

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	11	11	295	22	22	295
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	12	321	24	24	321

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	541	172	0	0	345	0
Stage 1	333	-	-	-	-	-
Stage 2	208	-	-	-	-	-
Follow-up Headway	3.52	3.32	-	-	2.22	-
Pot Capacity-1 Maneuver	471	842	-	-	1211	-
Stage 1	698	-	-	-	-	-
Stage 2	807	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	460	842	-	-	1211	-
Mov Capacity-2 Maneuver	460	-	-	-	-	-
Stage 1	698	-	-	-	-	-
Stage 2	788	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0.7
HCM LOS	A		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	920	1211	-
HCM Lane V/C Ratio	-	-	0.026	0.02	-
HCM Control Delay (s)	-	-	9	8.033	0.1
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.08	0.06	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
808: Quorum Dr & Driveway 1

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	1	0	406	290	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1	0	441	315	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	539	161	322	0	-	0
Stage 1	318	-	-	-	-	-
Stage 2	221	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	473	855	1235	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	795	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	473	855	1235	-	-	-
Mov Capacity-2 Maneuver	473	-	-	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	795	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1235	-	855	-	-
HCM Lane V/C Ratio	-	-	0.001	-	-
HCM Control Delay (s)	0	-	9.2	-	-
HCM Lane LOS	A		A		
HCM 95th %tile Q(veh)	0	-	0.004	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
809: Arapaho Rd & Driveway 2

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	3	646	701	7	6	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	702	762	8	7	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	770	0	-	0	1124	385
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	358	-
Follow-up Headway	2.22	-	-	-	3.52	3.32
Pot Capacity-1 Maneuver	840	-	-	-	199	613
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	678	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	840	-	-	-	198	613
Mov Capacity-2 Maneuver	-	-	-	-	198	-
Stage 1	-	-	-	-	419	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	19.6
HCM LOS			C

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	840	-	-	-	256
HCM Lane V/C Ratio	0.004	-	-	-	0.038
HCM Control Delay (s)	9.302	-	-	-	19.6
HCM Lane LOS	A				C
HCM 95th %tile Q(veh)	0.012	-	-	-	0.119

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
810: Denton Dr & Driveway 1

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	6	12	321	312	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	7	13	349	339	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	718	343	348	0	-	0
Stage 1	343	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Follow-up Headway	3.518	3.318	2.218	-	-	-
Pot Capacity-1 Maneuver	396	700	1211	-	-	-
Stage 1	719	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	391	700	1211	-	-	-
Mov Capacity-2 Maneuver	391	-	-	-	-	-
Stage 1	719	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0.3	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1211	-	391	700	-	-
HCM Lane V/C Ratio	0.011	-	0.011	0.009	-	-
HCM Control Delay (s)	8.005	0	14.3	10.2	-	-
HCM Lane LOS	A	A	B	B		
HCM 95th %tile Q(veh)	0.033	-	0.034	0.028	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
811: Denton Dr & Driveway 2

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	6	9	18	307	311	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	10	20	334	338	13

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	718	345	351	0	-	0
Stage 1	345	-	-	-	-	-
Stage 2	373	-	-	-	-	-
Follow-up Headway	3.518	3.318	2.218	-	-	-
Pot Capacity-1 Maneuver	396	698	1208	-	-	-
Stage 1	717	-	-	-	-	-
Stage 2	696	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	388	698	1208	-	-	-
Mov Capacity-2 Maneuver	388	-	-	-	-	-
Stage 1	717	-	-	-	-	-
Stage 2	682	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.9	0.4	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1208	-	388	698	-	-
HCM Lane V/C Ratio	0.016	-	0.017	0.014	-	-
HCM Control Delay (s)	8.029	0	14.4	10.2	-	-
HCM Lane LOS	A	A	B	B		
HCM 95th %tile Q(veh)	0.049	-	0.051	0.043	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
812: Belt Line Rd (Realigned) & Driveway 1

DART TO 42 - Cotton Belt
2018 AM Peak

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	29	626	626	29	12	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	680	680	32	13	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	712	0	-	0	1099	356
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	403	-
Follow-up Headway	2.22	-	-	-	3.52	3.32
Pot Capacity-1 Maneuver	884	-	-	-	207	640
Stage 1	-	-	-	-	456	-
Stage 2	-	-	-	-	644	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	884	-	-	-	200	640
Mov Capacity-2 Maneuver	-	-	-	-	328	-
Stage 1	-	-	-	-	456	-
Stage 2	-	-	-	-	621	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	13.8
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	884	-	-	-	434
HCM Lane V/C Ratio	0.036	-	-	-	0.06
HCM Control Delay (s)	9.223	-	-	-	13.8
HCM Lane LOS	A				B
HCM 95th %tile Q(veh)	0.111	-	-	-	0.191

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
801: Shiloh Rd & Driveway 1

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	33	0	18	10	0	10	22	559	10	10	582	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	0	20	11	0	11	24	608	11	11	633	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1101	1476	322	1086	1476	309	643	0	0	618	0	0
Stage 1	810	810	-	661	661	-	-	-	-	-	-	-
Stage 2	291	666	-	425	815	-	-	-	-	-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	3.92	3.12	-	-	3.12	-	-
Pot Capacity-1 Maneuver	223	125	575	228	125	586	580	-	-	596	-	-
Stage 1	269	391	-	341	458	-	-	-	-	-	-	-
Stage 2	635	456	-	528	389	-	-	-	-	-	-	-
Time blocked-Platoon, %								-	-		-	-
Mov Capacity-1 Maneuver	212	120	575	213	120	586	580	-	-	596	-	-
Mov Capacity-2 Maneuver	212	120	-	213	120	-	-	-	-	-	-	-
Stage 1	258	391	-	327	439	-	-	-	-	-	-	-
Stage 2	597	437	-	510	389	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.5	17.4	0.4	1.2
HCM LOS	C	C		

Minor Lane / Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBU	SBL	SBT	SBR
Capacity (veh/h)	580	-	-	273	312	855	596	-	-
HCM Lane V/C Ratio	0.041	-	-	0.203	0.07	0.088	0.018	-	-
HCM Control Delay (s)	11.474	-	-	21.5	17.4	-	10	-	-
HCM Lane LOS	B			C	C	B			
HCM 95th %tile Q(veh)	0.129	-	-	0.744	0.223	0.288	0.056	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
802: Shiloh Rd & Driveway 2

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	92	0	671	579	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	100	0	729	629	38

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	940	334	667	0	-	0
Stage 1	648	-	-	-	-	-
Stage 2	292	-	-	-	-	-
Follow-up Headway	3.82	3.92	3.12	-	-	-
Pot Capacity-1 Maneuver	333	565	565	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	671	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	333	565	565	-	-	-
Mov Capacity-2 Maneuver	333	-	-	-	-	-
Stage 1	394	-	-	-	-	-
Stage 2	671	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	0	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	565	-	565	-	-
HCM Lane V/C Ratio	-	-	0.177	-	-
HCM Control Delay (s)	0	-	12.7	-	-
HCM Lane LOS	A		B		
HCM 95th %tile Q(veh)	0	-	0.638	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
803: 12th Pl & K Ave

DART TO 42 - Cotton Belt
2018 PM Peak (North Alignment)

Intersection	
Intersection Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	94	62	35	24	0	0	0	0	10	1009	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	102	67	38	26	0	0	0	0	11	1097	38

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	1151	1138	566	512	1157	0				0	0	0
Stage 1	1138	1138	-	0	0	-				-	-	-
Stage 2	13	0	-	512	1157	-				-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	-				-	-	-
Pot Capacity-1 Maneuver	260	200	400	540	195	-				-	-	-
Stage 1	199	275	-	-	-	-				-	-	-
Stage 2	-	-	-	517	269	-				-	-	-
Time blocked-Platoon, %											-	-
Mov Capacity-1 Maneuver	260	# 0	400	540	# 0	-				-	-	-
Mov Capacity-2 Maneuver	260	# 0	-	540	# 0	-				-	-	-
Stage 1	199	# 0	-	-	# 0	-				-	-	-
Stage 2	-	# 0	-	517	# 0	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	20.5	+	0
HCM LOS	C	-	

Minor Lane / Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	400	+	-	-	-
HCM Lane V/C Ratio	0.424	+	-	-	-
HCM Control Delay (s)	20.5	+	-	-	-
HCM Lane LOS	C	+			
HCM 95th %tile Q(veh)	2.06	+	-	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
804: 12th Pl & Municipal Ave

DART TO 42 - Cotton Belt
2018 PM Peak (North Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	147	0	37	834	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	160	0	40	907	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	443	0	0	0
Stage 1	0	-	-	-
Stage 2	443	-	-	-
Follow-up Headway	3.82	-	-	-
Pot Capacity-1 Maneuver	535	-	-	-
Stage 1	-	-	-	-
Stage 2	515	-	-	-
Time blocked-Platoon, %				-
Mov Capacity-1 Maneuver	535	-	-	-
Mov Capacity-2 Maneuver	535	-	-	-
Stage 1	-	-	-	-
Stage 2	515	-	-	-

Approach	EB	NB
HCM Control Delay, s	+	0
HCM LOS	-	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
803: 12th Pl & K Ave

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	21	14	8	5	0	0	0	0	2	1001	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	23	15	9	5	0	0	0	0	2	1088	9

Major/Minor	Minor2			Minor1						Major2		
Conflicting Flow All	1100	1097	547	451	1101	0				0	0	0
Stage 1	1097	1097	-	0	0	-				-	-	-
Stage 2	3	0	-	451	1101	-				-	-	-
Follow-up Headway	3.82	4.02	3.92	3.82	4.02	-				-	-	-
Pot Capacity-1 Maneuver	276	212	412	578	211	-				-	-	-
Stage 1	211	287	-	-	-	-				-	-	-
Stage 2	-	-	-	556	286	-				-	-	-
Time blocked-Platoon, %											-	-
Mov Capacity-1 Maneuver	276	# 0	412	578	# 0	-				-	-	-
Mov Capacity-2 Maneuver	276	# 0	-	578	# 0	-				-	-	-
Stage 1	211	# 0	-	-	# 0	-				-	-	-
Stage 2	-	# 0	-	556	# 0	-				-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	14.6	+	0
HCM LOS	B	-	

Minor Lane / Major Mvmt	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	412	+	-	-	-
HCM Lane V/C Ratio	0.092	+	-	-	-
HCM Control Delay (s)	14.6	+	-	-	-
HCM Lane LOS	B	+			
HCM 95th %tile Q(veh)	0.303	+	-	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
804: 12th Pl & Municipal Ave

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	33	0	8	834	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	0	9	907	0	0

Major/Minor	Minor2		Major1	
Conflicting Flow All	380	0	0	0
Stage 1	0	-	-	-
Stage 2	380	-	-	-
Follow-up Headway	3.82	-	-	-
Pot Capacity-1 Maneuver	580	-	-	-
Stage 1	-	-	-	-
Stage 2	562	-	-	-
Time blocked-Platoon, %				-
Mov Capacity-1 Maneuver	580	-	-	-
Mov Capacity-2 Maneuver	580	-	-	-
Stage 1	-	-	-	-
Stage 2	562	-	-	-

Approach	EB	NB
HCM Control Delay, s	+	0
HCM LOS	-	

Minor Lane / Major Mvmt	NBL	NBT	EBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
901: PGBT EBFR & SW Drwy

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	120	503	0	0	34	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	547	0	0	37	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	480	0
Stage 1	-	-	0	-
Stage 2	-	-	480	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	510	-
Stage 1	-	-	-	-
Stage 2	-	-	490	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	510	-
Mov Capacity-2 Maneuver	-	-	510	-
Stage 1	-	-	-	-
Stage 2	-	-	490	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
902: PGBT EBFR & Crawford Rd

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	141	396	0	0	58	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	153	430	0	0	63	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	479	0
Stage 1	-	-	0	-
Stage 2	-	-	479	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	510	-
Stage 1	-	-	-	-
Stage 2	-	-	490	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	510	-
Mov Capacity-2 Maneuver	-	-	510	-
Stage 1	-	-	-	-
Stage 2	-	-	490	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	510	+
HCM Lane V/C Ratio	-	-	0.062	+
HCM Control Delay (s)	-	-	12.5	+
HCM Lane LOS			B	+
HCM 95th %tile Q(veh)	-	-	0.197	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
903: PGBT EBFR & S Central Drwy

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	75	379	0	0	165	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	412	0	0	179	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	328	0
Stage 1	-	-	0	-
Stage 2	-	-	328	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	621	-
Stage 1	-	-	-	-
Stage 2	-	-	604	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	621	-
Mov Capacity-2 Maneuver	-	-	621	-
Stage 1	-	-	-	-
Stage 2	-	-	604	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
904: PGBT EBFR & SE Drwy

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	144	400	0	0	110	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	157	435	0	0	120	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	0	0	487	0
Stage 1	-	-	0	-
Stage 2	-	-	487	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	505	-
Stage 1	-	-	-	-
Stage 2	-	-	485	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	505	-
Mov Capacity-2 Maneuver	-	-	505	-
Stage 1	-	-	-	-
Stage 2	-	-	485	-

Approach	EB	SB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	+
HCM Lane V/C Ratio	-	-	+
HCM Control Delay (s)	-	-	+
HCM Lane LOS			+
HCM 95th %tile Q(veh)	-	-	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
905: NE Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	96	516	165	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	104	561	179	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	433	0
Stage 1	-	-	0	-
Stage 2	-	-	433	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	542	-
Stage 1	-	-	-	-
Stage 2	-	-	523	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	542	-
Mov Capacity-2 Maneuver	-	-	542	-
Stage 1	-	-	-	-
Stage 2	-	-	523	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
906: N Central Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	144	537	91	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	157	584	99	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	547	0
Stage 1	-	-	0	-
Stage 2	-	-	547	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	467	-
Stage 1	-	-	-	-
Stage 2	-	-	446	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	467	-
Mov Capacity-2 Maneuver	-	-	467	-
Stage 1	-	-	-	-
Stage 2	-	-	446	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
907: Crawford Rd & PGBT WBFR

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	52	576	0	157	0	0	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	57	626	0	171	0	0	0	5	0

Major/Minor	Major2			Minor1			Minor2		
Conflicting Flow All	0	0	0	366	739	0	739	739	312
Stage 1	-	-	-	0	0	-	739	739	-
Stage 2	-	-	-	366	739	-	0	0	-
Follow-up Headway	-	-	-	3.82	4.02	-	3.82	4.02	3.92
Pot Capacity-1 Maneuver	-	-	-	634	344	-	419	344	583
Stage 1	-	-	-	-	-	-	348	422	-
Stage 2	-	-	-	615	422	-	-	-	-
Time blocked-Platoon, %		-	-						
Mov Capacity-1 Maneuver	-	-	-	634	0	-	419	# 0	583
Mov Capacity-2 Maneuver	-	-	-	634	0	-	419	# 0	-
Stage 1	-	-	-	-	0	-	348	# 0	-
Stage 2	-	-	-	615	0	-	-	# 0	-

Approach	WB	NB	SB
HCM Control Delay, s	0	+	+
HCM LOS		-	-

Minor Lane / Major Mvmt	NBLn1	NBLn2	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	634	+	-	-	-	0
HCM Lane V/C Ratio	0.179	+	-	-	-	+
HCM Control Delay (s)	11.9	+	-	-	-	+
HCM Lane LOS	B	+				+
HCM 95th %tile Q(veh)	0.65	+	-	-	-	+

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
908: NW Drwy & PGBT WBFR

DART TO 42 - Cotton Belt
2018 PM Peak (South Alignment)

Intersection	
Intersection Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	0	0	28	705	138	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	30	766	150	0

Major/Minor	Major2		Minor1	
Conflicting Flow All	0	0	367	0
Stage 1	-	-	0	-
Stage 2	-	-	367	-
Follow-up Headway	-	-	3.82	-
Pot Capacity-1 Maneuver	-	-	590	-
Stage 1	-	-	-	-
Stage 2	-	-	572	-
Time blocked-Platoon, %		-		
Mov Capacity-1 Maneuver	-	-	590	-
Mov Capacity-2 Maneuver	-	-	590	-
Stage 1	-	-	-	-
Stage 2	-	-	572	-

Approach	WB	NB
HCM Control Delay, s	0	+
HCM LOS		-

Minor Lane / Major Mvmt	NBLn1	WBL	WBT
Capacity (veh/h)	+	-	-
HCM Lane V/C Ratio	+	-	-
HCM Control Delay (s)	+	-	-
HCM Lane LOS	+		
HCM 95th %tile Q(veh)	+	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
805: Driveway 1 & Waterview Pkwy

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	1264	11	7	1602	0	29	0	19	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	150	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1374	12	8	1741	0	32	0	21	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1741	0	0	1386	0	0	2092	3137	693	2307	3143	871
Stage 1	-	-	-	-	-	-	1380	1380	-	1757	1757	-
Stage 2	-	-	-	-	-	-	712	1757	-	550	1386	-
Follow-up Headway	3.12	-	-	3.12	-	-	3.82	4.02	3.92	3.82	4.02	3.92
Pot Capacity-1 Maneuver	169	-	-	254	-	-	56	11	331	41	11	253
Stage 1	-	-	-	-	-	-	108	210	-	58	137	-
Stage 2	-	-	-	-	-	-	354	137	-	444	209	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	169	-	-	254	-	-	55	11	331	38	11	253
Mov Capacity-2 Maneuver	-	-	-	-	-	-	55	11	-	38	11	-
Stage 1	-	-	-	-	-	-	108	210	-	58	133	-
Stage 2	-	-	-	-	-	-	343	133	-	416	209	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	93.1	0
HCM LOS			F	A

Minor Lane / Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	65	331	169	-	-	254	-	-	0	0
HCM Lane V/C Ratio	0.591	0.042	-	-	-	0.03	-	-	+	+
HCM Control Delay (s)	120.6	16.3	0	-	-	19.61	-	-	0	0
HCM Lane LOS	F	C	A			C			A	A
HCM 95th %tile Q(veh)	2.481	0.13	0	-	-	0.092	-	-	+	+

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
814: Driveway 1 & Dickerson St

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	40	27	74	15	10	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	29	80	16	11	80

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	191	89	0	0	97	0
Stage 1	89	-	-	-	-	-
Stage 2	102	-	-	-	-	-
Follow-up Headway	3.518	3.318	-	-	2.218	-
Pot Capacity-1 Maneuver	798	969	-	-	1496	-
Stage 1	934	-	-	-	-	-
Stage 2	922	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	792	969	-	-	1496	-
Mov Capacity-2 Maneuver	792	-	-	-	-	-
Stage 1	934	-	-	-	-	-
Stage 2	915	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0	0.9
HCM LOS	A		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	855	1496	-
HCM Lane V/C Ratio	-	-	0.085	0.007	-
HCM Control Delay (s)	-	-	9.6	7.424	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.279	0.022	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
806: Driveway 1 & Coit Rd

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	11.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	27	40	15	2322	2322	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	43	16	2524	2524	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	3571	1267	2535	0	-	0
Stage 1	2529	-	-	-	-	-
Stage 2	1042	-	-	-	-	-
Follow-up Headway	3.82	3.92	3.12	-	-	-
Pot Capacity-1 Maneuver	# 12	137	66	-	-	-
Stage 1	# 26	-	-	-	-	-
Stage 2	271	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	# 9	137	66	-	-	-
Mov Capacity-2 Maneuver	# 9	-	-	-	-	-
Stage 1	# 26	-	-	-	-	-
Stage 2	205	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	$ 764.5	0.5	0
HCM LOS	F		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	66	-	9	137	-	-
HCM Lane V/C Ratio	0.247	-	3.261	0.317	-	-
HCM Control Delay (s)	76.584	-	$ 1833.3	43	-	-
HCM Lane LOS	F		F	E		
HCM 95th %tile Q(veh)	0.864	-	4.825	1.259	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
807: Driveway 1 & Knoll Trail Dr

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	27	27	369	10	10	369
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yeild	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	29	401	11	11	401

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	629	206	0	0	412	0
Stage 1	407	-	-	-	-	-
Stage 2	222	-	-	-	-	-
Follow-up Headway	3.52	3.32	-	-	2.22	-
Pot Capacity-1 Maneuver	414	800	-	-	1143	-
Stage 1	641	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Time blocked-Platoon, %			-	-		-
Mov Capacity-1 Maneuver	409	800	-	-	1143	-
Mov Capacity-2 Maneuver	409	-	-	-	-	-
Stage 1	641	-	-	-	-	-
Stage 2	784	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0	0.2
HCM LOS	A		

Minor Lane / Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	818	1143	-
HCM Lane V/C Ratio	-	-	0.072	0.01	-
HCM Control Delay (s)	-	-	9.7	8.18	0
HCM Lane LOS			A	A	A
HCM 95th %tile Q(veh)	-	-	0.231	0.029	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
808: Quorum Dr & Driveway 1

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	0	3	0	508	362	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	3	0	552	393	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	671	198	397	0	-	0
Stage 1	395	-	-	-	-	-
Stage 2	276	-	-	-	-	-
Follow-up Headway	3.52	3.32	2.22	-	-	-
Pot Capacity-1 Maneuver	390	810	1158	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	746	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	390	810	1158	-	-	-
Mov Capacity-2 Maneuver	390	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	746	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0	0
HCM LOS	A		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1158	-	810	-	-
HCM Lane V/C Ratio	-	-	0.004	-	-
HCM Control Delay (s)	0	-	9.5	-	-
HCM Lane LOS	A		A		
HCM 95th %tile Q(veh)	0	-	0.012	-	-

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
809: Arapaho Rd & Driveway 2

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	2	809	870	3	15	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	879	946	3	16	4

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	949	0	-	0	1391	474
Stage 1	-	-	-	-	947	-
Stage 2	-	-	-	-	444	-
Follow-up Headway	2.22	-	-	-	3.52	3.32
Pot Capacity-1 Maneuver	719	-	-	-	133	537
Stage 1	-	-	-	-	337	-
Stage 2	-	-	-	-	614	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	719	-	-	-	133	537
Mov Capacity-2 Maneuver	-	-	-	-	133	-
Stage 1	-	-	-	-	337	-
Stage 2	-	-	-	-	612	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	31.2
HCM LOS			D

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	719	-	-	-	158
HCM Lane V/C Ratio	0.003	-	-	-	0.131
HCM Control Delay (s)	10.022	-	-	-	31.2
HCM Lane LOS	B				D
HCM 95th %tile Q(veh)	0.009	-	-	-	0.44

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
810: Denton Dr & Driveway 1

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	10	14	5	387	401	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	15	5	421	436	4

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	870	438	440	0	-	0
Stage 1	438	-	-	-	-	-
Stage 2	432	-	-	-	-	-
Follow-up Headway	3.518	3.318	2.218	-	-	-
Pot Capacity-1 Maneuver	322	619	1120	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	655	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	320	619	1120	-	-	-
Mov Capacity-2 Maneuver	320	-	-	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	651	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.3	0.1	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1120	-	320	619	-	-
HCM Lane V/C Ratio	0.005	-	0.034	0.025	-	-
HCM Control Delay (s)	8.23	0	16.6	11	-	-
HCM Lane LOS	A	A	C	B		
HCM 95th %tile Q(veh)	0.015	-	0.105	0.076	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
811: Denton Dr & Driveway 2

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	14	22	8	389	383	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	24	9	423	416	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	859	419	422	0	-	0
Stage 1	419	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Follow-up Headway	3.518	3.318	2.218	-	-	-
Pot Capacity-1 Maneuver	327	634	1137	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Time blocked-Platoon, %				-	-	-
Mov Capacity-1 Maneuver	324	634	1137	-	-	-
Mov Capacity-2 Maneuver	324	-	-	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	643	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.2	0.2	0
HCM LOS	B		

Minor Lane / Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1137	-	324	634	-	-
HCM Lane V/C Ratio	0.008	-	0.047	0.038	-	-
HCM Control Delay (s)	8.191	0	16.7	10.9	-	-
HCM Lane LOS	A	A	C	B		
HCM 95th %tile Q(veh)	0.023	-	0.147	0.117	-	-

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

HCM 2010 TWSC
812: Belt Line Rd & Driveway 1

DART TO 42 - Cotton Belt
2018 PM Peak

Intersection	
Intersection Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	11	782	782	11	32	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	850	850	12	35	35

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	862	0	-	0	1305	431
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	449	-
Follow-up Headway	2.22	-	-	-	3.52	3.32
Pot Capacity-1 Maneuver	776	-	-	-	152	573
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	610	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	776	-	-	-	150	573
Mov Capacity-2 Maneuver	-	-	-	-	275	-
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	601	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	16.9
HCM LOS			C

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	776	-	-	-	372
HCM Lane V/C Ratio	0.015	-	-	-	0.187
HCM Control Delay (s)	9.712	-	-	-	16.9
HCM Lane LOS	A				C
HCM 95th %tile Q(veh)	0.047	-	-	-	0.678

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Alliance Transportation Group
Arredondo, Zepeda & Brunz
Bowman Engineering
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