FINAL REPORT

FOR

HARRY WURZBACH TAPS MEMORIAL BLVD. PROGRAMMING ASSESSMENT

Prepared for:
City of San Antonio

STATE OF TEXAS
MICHAEL C. RIOJAS
69690
LICENSED PROFESSIONAL ENGINEER

Submitted / Prepared by:

S&B INFRASTRUCTURE, LTD.
Engineering · Management · Technology

May 17, 2011

TABLE OF CONTENTS

Section I Purpose of Project

Section II Existing Conditions / Basis of Final Design

Section III S&B Engineering Analysis and Recommendations

Section IV Draft Programming Assessment

Appendices

Section I Purpose of Project

1. Introduction / Background

Over the last decade, the City of San Antonio has steadily grown in population. According to the recently released U.S. Census data, San Antonio is now the second largest city in Texas with population of 1,373,668. One contributing factor to San Antonio's growth is the creation of jobs to the area. One major job creator was the Defense Base Realignment and Closure Commission, which recommended and has expanded Fort Sam Houston by over 12,500 personnel and 46,000 military medical training students to the area. Currently, infrastructure improvements are being made to accommodate the growth at Fort Sam Houston East Gate along Interstate Highway 35. Harry Wurzbach/TAPS Memorial Boulevard which connects to the Fort Sam Houston north gate continues to experience delays due to installation's population growth. Harry Wurzbach/TAPS Memorial Boulevard connects Fort Sam Houston to Interstate Highway 410.

2. Scope of Work

The City of San Antonio secured the services of S&B Infrastructure, Ltd. (S&B) to provide a Draft Programming Assessment for Harry Wurzbach/TAPS Memorial Blvd. from the Fort Sam Houston Gate to IH410. The work provided consists of engineering services to be developed in accordance with the City of San Antonio, Texas Department of Transportation, and Federal Highway Administration design standards.

A. Work Requirements

(1) Utilizing existing photogrametry from previous project and/or studies create base map and outline study area limits.

(2) Perform site visits for field reconnaissance to identify potential project constraints and issues, including major utilities, parks, historic structures, potential hazardous materials, floodplains and/or drainage issues, cemeteries, cultural facilities, intersection geometries, etc.

(3) Gather data to include, but not be limited to previous studies, land records, property and facility management records, land use, engineering data, permits, public safety requirements, and/or environmental requirements from previous studies and/or available resources.

(4) From data collected, prepare a geographical information system catalogued database.

(5) Perform preliminary hydraulic analysis for structure sizing.

(6) Identify project purpose, need, and objectives in accordance with TxDOT/FHWA planning criteria:

- (a) Identify community concerns and critical issues
- (b) Review existing geometrics and compare to / identify current criteria for suburban roadways, prepare existing and proposed typical sections.

(c) Evaluate and identify potential route alternative(s);
(d) Identify the right of way requirements.
(e) Review and analyze available accident information to identify locations having a high incidence of traffic accidents.
(f) Prepare a draft purpose and need statement in accordance with TxDOT/FHWA criteria.

(7) Prepare preliminary construction cost estimate, to include proposed length, proposed interchanges or overpasses, major drainage structures, estimated/anticipated pavement structure (based on area designs, will not include formal design), significant traffic control/detour costs, major utilities, anticipated environmental mitigation measures. Identify potential funding options or assignment of costs to appropriate entities. (Miscellaneous minor items (erosion control, pavement markings, signs) will be estimated based on a percentage in accordance with TxDOT/FHWA criteria for preliminary construction estimates at initial planning stage.) Compare total costs to cost per mile for similar projects in area.

(8) Prepare preliminary right of way cost estimate.

(9) Prepare ***Draft Programming Assessment***, containing the following text and/or supporting documentation:
(a) Brief project description;
(b) Text addressing each of the following:
(1) Conformance with the Texas Transportation Plan (TTP);
(2) Major Environmental Issues;
(3) Level of Community Support;
(4) Preliminary identification of Cost Benefits;
(5) Safety Issues;
(6) Planning Level of Service Analysis (Projected traffic volumes will be based on data provided.);
(7) Other areas of interest;
(8) Conclusion.
(c) Project Location Map
(d) Existing and proposed typical sections.

(10) Preliminary Concept Conference (PCC) – Coordinate, conduct, and facilitate preliminary concept conference with OWNER to review and present findings.

3. Project Description: Harry Wurzbach/TAPS Memorial Blvd.

The Harry Wurzbach/TAPS Memorial Blvd. project begins just north of the Fort Sam Houston Harry Wurzbach (E) Gate (Latitude: 29°27'46.37"N, Longitude: 98°26'47.01"W) and ends at Interstate Highway 410 (Latitude: 29°30'51.02"N, Longitude: 98°26'11.82"W). The length of the project is approximately 3.61 miles long. The project is located in the City of San Antonio, Bexar County, Texas. Harry Wurzbach is functional classified as a Major Arterial by San Antonio-Bexar County Metropolitan Planning Organization (SABCMPO). Harry Wurzbach/TAPS Memorial Blvd. provides access to Fort Sam Houston, Fort Sam Houston National Cemetery, Brooks Army Medical Center and the City of Terrell Hills. Two schools, Garner Middle School and Cole High School are located on Harry Wurzbach. Harry Wurzbach provides connectivity to residential neighborhoods, multi-family developments, commercial areas, recreational facilities, governmental facilities and two cemeteries.

The following Table provides a list of the major road crossings:

Major Crossing Listing		
Name	**Approx. Station**	
Burr Road	58+00	Signalized
Rittiman Road	80+00	Signalized
Austin Highway (SP368)	115+20	Underpass
Eisenhauer Road	122+80	Signalized
Urban Crest Drive/ Oakwell Ct	159+10	Signalized
Oakwell Farms Parkway	171+60	Signalized

4. Data

A. Data Collection

Data collection included obtaining digital aerial images 6' resolution and 2 foot contours from Texas Natural Resources Information System (TINRS), National Geodetic Survey (NGS) monumentation from NGS website, field visits enabled S&B to obtain from digital photographs, visual reconnaissance surveys of Americans with Disabilities Act (ADA) features, and existing drainage structure sizes. Parcel information was obtained from the Bexar Appraisal District. Existing and projected traffic counts were obtained from the San Antonio-Bexar County Metropolitan Planning Organization.

B. Base Mapping

The base mapping for the project analysis and design will be based on the aerial images and 2 foot contours files. The aerial photos were augmented with the NGS control data to assure the images were in the correct state plain coordinate system.

C. Information Provided by City of San Antonio

The City of San Antonio has provided the following information:

1. Copy of work produced for TAP Memorial Blvd. Conceptual Street Scapes

2. Pavement design, Typical Sections and pavement marking sheets for the Harry Wurzbach Intersection Improvements at Burr Rd. and Rittiman Rd. intersection improvement project.

3. Pavement Condition scores for Harry Wurzbach/TAPS Memorial Blvd.

4. Bridge Layouts for the Austin Highway Underpass.

5. Traffic Counts along Harry Wurzbach/TAPS Memorial Blvd.

Section II Existing Conditions / Basis of Final Design

Visual Reconnaissance Survey

(A) General Condition. Several site visits were conducted by S&B team members to fully assess the project due to the lack of as-built drawings. See Appendix A for photographs taken during site visits. The assessment team concentrated on obtaining information for the existing drainage and roadway features.

(B) Existing Typical Section. Harry Wurzbach/TAPS Memorial Blvd. consists of two 4 lane roadway types. From Fort Sam Houston to just north of the Fort Sam Houston National Cemetery, the 4 lane roadway is undivided. From just south of Rittiman Road to IH410 the roadway is divided with a depressed grass median. (See typical section sheets in Appendix C). Several sections of the existing pavement showed signs of sub-grade failures. This situation is not uncommon due to the expansive clays in the area as well as the increased traffic and vehicle loads.

(C) Other Characteristics. During the site visit, it was noticeable that the few sidewalks that existed were not ADA compliant. The existing sidewalk widths did not meet minimum widths and cross-slopes on many of the sidewalks were greater than 2%, the maximum for ADA. Very few of the transit stops were connected to the existing sidewalks. Harry Wurzbach currently does not have any bicycle facilities, neither dedicated bicycle lanes nor wider outside shared use lanes exist.

(D) Drainage Structures. Site visits to observe the existing drainage structures were conducted. The results are shown below:

Approx. Station	Size	Design Designation
25+00	6’x 5’ SBC	Culvert A
48+00	5’x 5’ SBC	Culvert B
67+00	10’x 5.5’ SBC	Culvert C
75+00	6’x 5’ SBC	Culvert D
77+00	6’x 2’ SBC	Culvert E
106+00	6’x 6’ SBC	Culvert F
153+00	2-6’x 5’ MBC	Culvert G
168+00	7’x 6’ SBC	Culvert H

Section III S&B Engineering Analysis and Recommendations

1. General Analysis and Recommendations

The S&B team analyzed the Harry Wurzbach/TAPS Memorial Blvd. project to develop a program assessment that would meet the needs of the community and satisfy Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) criteria for future funding. The existing conditions were analyzed to assure that all current corridor deficiencies were addressed. Though the existing corridor makes an attempt to accommodate multiple modes of transportation, there are several deficiencies which need to address.

The San Antonio-Bexar County MPO currently classifies Harry Wurzbach as a “POOR” roadway segment for bicycle quality of service. The existing roadway has no bicycle lanes, either dedicated or joint use type. In order to include bicycling as a mode of transportation, the proposed typical section should have one dedicated bicycle lane in each direction of travel. The bicycle lanes will improve the bicycling mode of transportation in the corridor.

As previously stated, the existing sidewalks do not provide a continuous pedestrian linkage through out the corridor. Existing sidewalks do not meet Americans with Disabilities Act (ADA) requirements for width and cross-slope. The proposed corridor will have six foot sidewalks. There may be locations with restricted right of way and cross-sectional elements constraints that the sidewalk may need to be 4 to 5 feet wide, still meeting ADA requirements. Sidewalks will be located on each side of the road and wheelchair ramps will be located at the cross streets. Additionally the sidewalks will be seated from the curb where ever the cross-sectional elements allow.

Via Metropolitan Transit operates several bus routes number 509 and 647 along Harry Wurzbach. Improvements to the transit will include the placement of bus stops and shelters to provide connectivity to sidewalks. The placement of bus pull-outs will decrease interruption to traffic while buses are loading and unloading. Concrete bus pads will add to the preservation of the pavements.

Vehicular traffic along Harry Wurzbach is in need of several improvements. The City of San Antonio is currently in the process of making improvements along Harrry Wurzbach at Burr Road, Winans Road and Rittiman Road intersections. The improvements at Rittiman road will involve the full reconstruction and widening of the existing pavement. This section of pavement is excluded from the preliminary cost estimates. Improvements to vehicular traffic include the full reconstruction of the pavement, adding left turn lanes, addition of curbs, replacing traffic signals and reconfiguring intersections for improved efficiency. Additional improvements are discussed in the following sections.

2. Proposed Typical Sections

The proposed typical section elements including number of lanes, lane widths, clear distances, sidewalks and median types were determined based on FHWA and TxDOT criteria. The existing average daily traffic counts and projected traffic counts did not warrant increasing the number of travel lanes from the existing 4 lane, 2 each way, section. The typical section from Fort Sam Houston to south of Rittiman will consist of a 4 lane roadway with bicycle lanes and a median. The type of median (flush or raised) will be determined in the Preliminary Design phase after public meetings on the issue are conducted. A raised median will allow for greater mobility and provide a location for landscape areas. A flush median will provide for greater access to streets and alleys in Terrell Hill. The typical section from North of Rittiman to IH410 will consist of a 4 lane roadway with bicycle lanes, curbs, sidewalks and a depressed median. The depressed median will allow for landscaping in the median area. See Appendix C for the existing and proposed typical sections.

3. Drainage

Within the Harry-Wurzbach/TAPS Memorial Blvd. project limits, there are eight (8) existing cross drainage structures and labeled from this point forward A thru H from South to North. The design criteria for Harry-Wuzrbach/TAPS Memorial Blvd. report is determined by the COSA Design Guidance Manual. Based on the guidelines, on page 4-3 under culverts, it is required to use the TxDOT Hydraulic Design Manual for the design criteria.

For preliminary purposes, the Rational Method was used to determine the runoff for drainage areas A thru H. However during the actual design phase, a more in depth drainage study needs to take place using the SCS method on drainage areas greater than 200 acres. Drainage Areas C, D, and G will need to be reevaluated using the SCS method but at this time by using the Rational Method Culvert "C" currently meets the design criteria. Culverts D and G need to be replaced but once the SCS method is use to analyze the existing culverts the size of culvert may increase. The Average Runoff Coefficient "C" values used were determined by looking at aerial maps and determining what overall C factor to use for each area. Average rainfall intensities where used for the San Antonio area with minimum time of Concentration of 10 minutes. Under these guidelines, an analysis of the existing cross drainage structures needs to meet the 25 year event. If they do not meet the 25 year event, a proposed cross drainage structure needs to be designed to meet the 25 year event.

Based on the design criteria set above, three (3) out of the eight (8) existing cross drainage structures did not meet the design of a 25 year event. The culverts that did not meet the 25 year event, a design analysis was performed to determine the size of structure that would convey the 25 year event. The cross drainage structures that did meet the 25 year event extending the existing cross drainage structure is proposed on each side to fit in the ultimate proposed roadway section for Harry-Wurzbach/TAPS Memorial Blvd.

The following are the preliminary design analysis for each cross drainage structure.

At approximate Station 25+00R1 is Culvert "A", an existing 6'x5' SBC with a Runoff of 224cfs. The culvert analysis meets the 25yr event. Propose extending both ends by 10LF and adding new Headwalls.

At approximate Station 48+00R1 is Culvert "B", an existing 5'x5' SBC with a Runoff of 153cfs. The culvert analysis meets the 25yr event. Propose extending both ends by 10LF and adding new Headwalls.

At approximate Station 67+00R1 is Culvert “C”, an existing 10’x5.5’ SBC with a Runoff of 295cfs. The culvert analysis meets the 25yr event. Propose extending both ends by 10LF and adding new Headwalls. During the design phase, use the SCS method to determine the runoff.

At approximate Station 75+00R1 is Culvert “D”, an existing 4~6’x5’ SBC with a Runoff of 700cfs. The culvert analysis meets the 25yr event. Propose extending both ends by 10LF and adding new Headwalls. During the design phase, use the SCS method to determine the runoff.

At approximate Station 77+00R2 is Culvert “E”, an existing 6’x2’ SBC with a Runoff of 399cfs. The culvert analysis does not meet the 25yr event. Propose 3~8’X4’ total 354LF with new Headwalls.

At approximate Station 106+00R2 is Culvert “F”, an existing 6’x6’ SBC with a Runoff of 546cfs. The culvert analysis does not meet the 25yr event. Propose 2~7’X6’ total 212LF with new Headwalls.

At approximate Station 153+00R2 is Culvert “G”, an existing 2~6’x5’ SBC with a Runoff of 555.6cfs. The culvert analysis does not meet the 25yr event. Propose 3~7’X5’ total 273LF with new Headwalls. During the design phase, use the SCS method to determine the runoff.

At approximate Station 168+00R2 is Culvert “H”, an existing 7’x6’ SBC with a Runoff of 200cfs. The culvert analysis meets the 25yr event. Propose extending both ends by 10LF and adding new Headwalls.

Additional analysis and design will be performed with the development of the project.

4. Community Coordination

S&B Infrastructure has worked closely with the public governmental entities directly impacted by the Harry Wurzbach/TAPS Memorial Blvd. project. S&B has been in constant communication with the City of San Antonio, the City of Terrell Hills, Bexar County and the Fort Sam Houston Army Installation. The S&B Staff presented before the City of Terrell Hills City Council Meeting on Monday February 15th. The result of the presentation and question and answer session was a unanimous vote by the Council to present San Antonio City Councilman John Clamp with a letter supporting the project. Other efforts undertaken by S&B include coordinating with the City of San Antonio Mayor's office, the Fort Sam Houston Public Information Officer and Bexar County Commissioner Kevin Wolff's office to secure letters of support. At this point in time while those letters have not been secured, S&B has been given assurances that the letters will be drafted and sent to either the Councilman's office or S&B's San Antonio office. Once all four letters have been collected, S&B will make certain that they are shared with the appropriate City of San Antonio staff.

5. Traffic Analysis

The MPO provided GIS data with traffic counts through out the project limits that broke up the project into 15 segments. Within this segment, a length was given with a time lapse for travel time and average speed. Also, within this data the 2010, 2025 and 2035 ADT's were provided.

S&B also collected data for the analysis by driving the project limits during the peak hours in the morning (7am to 9am), afternoon (11am to 1pm) and evening (4pm to 6pm) for each segment. The segments coordinated with each segment provided by the MPO for comparison. Each segment for each time frame was driven and timed three times each direction. The average time was used for the analysis.

Based on the COSA design manual, the Highway Capacity Manual (HCM) is required to determine the Level Of Service (LOS) and design criteria for Harry-Wurzbach. Based on the HCM, Harry-Wurzbach falls under the classification of an Urban Arterial Roadway. The design criteria for this would then be chapter 11. Worksheet 11-37 and Table 11-1 Arterial Levels of Service Class I was used to determine the level of service based on average travel speed (MPH) per each segment defined.

Part of the data was analyzed using chapter 7, Multilane Rural and Suburban Highways. Using the Planning Analysis Worksheet 7-37 of the HCM the LOS was determined for each segment. A spread sheet was developed to show the LOS for each segment. This data would be used later to compare what was analyzed using chapter 11.

TABLE 11-1 ATERIAL LEVELS OF SERVICE

	ARTERIAL CLASSIFICATION		
	I	II	III
Range of free-flow Speeds (mph)	45 to 35	35 to 30	35 to 25
Typical free-flow Speeds (mph)	40	33	27
LEVEL OF SERVICE	AVERAGE TRAVEL SPEED (MPH)		
A	≥35	≥30	≥25
B	≥28	≥24	≥19
C	≥22	≥18	≥13
D	≥17	≥14	≥9
E	≥13	≥10	≥7
F	<13	<10	<7

Once all the worksheets had been completed for each segment with all the data collected a spread sheet was created to compare this information and determine what upgrades, if any, should be recommended. From the analysis, an overall average was determined for each direction of traffic, southbound and northbound, during the morning, afternoon and evening peak hours. In the morning Peak Hour gave a LOS C Southbound and LOS B Northbound. For the afternoon Peak Hour a LOS B Southbound and LOS C Northbound was analyzed. In the evening Peak Hour a LOS B Southbound and LOS D Northbound was analyzed. It is recommended for the LOS D Northbound in the evening to be considered for an upgrade.

Taking a closer look into the study by segments, only a few segments had LOS F while some others were at LOS A. A recommendation of adding left and right turn lanes in the areas with LOS F and LOS D. In the areas where there are existing turn lanes it is recommended to analyze and upgrade the existing storage length to increase the LOS to C.

6. Alternatives

Upon completion and evaluation of the level of service analysis, the delays attributed to the Eisenhauer Road traffic signal were evident. The five-legged intersection and heavy left-turn movements observed, create excessive delays for Harry Wurzbach through traffic. The proposed alternative will be to create an underpass at Eisenhauer Road. The close proximity to the Austin Highway Underpass allows for the depressed grades to continue under Eisenhauer Road. This alternative will require ramps to be constructed south of Austin Highway. The Austin Highway bridge outside spans will need to be removed and retaining wall to be placed in order for the ramps to remain within the existing right-of-way. The northbound exit ramp will continue past Austin Highway to provide access to Eisenhauer Road. The northbound ramp will continue back to Harry Wurzbach as an entrance ramp. The southbound exit ramp from Harry Wurzbach to Eisenhauer will align with the existing Old Harry Wurzbach alignment, providing continuity to Austin Highway. This alternative will allow for free flow of traffic along Harry Wurzbach through the Eisenhauer intersection. See Appendix E for the Alternative layout.

7. Construction Cost Estimates

Preliminary cost estimates were developed for the roadway improvements previously discussed. The estimates shown in Appendix I were developed in detail to follow the proposed typical sections and define the items included in the total project cost. Unit prices were based on City of San Antonio average bid prices in January 2011. The total project cost with the Eisenhauer Road Alternative 1 included is $53,933,000. The cost of the Eisenhauer Road alternative is $8,173,000.

8. Purpose and Need

FHWA requires the project purpose and need to be defined for the development of the environmental documentation.

A. Purpose:

Development of the roadway facility that provides access to a national cemetery, a military installation and multiple cities, to provide safe and efficient multimodal movement of people and goods. Multimodal elements shall include vehicular, pedestrian and bicycle modes of travel.

B. Need:

Harry Wurzbach provides access to Fort Sam Houston National Cemetery, For Sam Houston, City of San Antonio and City of Terrell Hills. The Harry Wurzbach does not provide safe and efficient travel for Pedestrian, Bicycle, Transit and Vehicular traffic. Pedestrians do not have ADA compliant sidewalks throughout the project. The few sections of sidewalks there are do not meet ADA requirements. Bicyclists do not have designated travel lanes and the existing facility is has a poor bicycle rating by the SA-BC MPO. Most Transit stops do provide pedestrian linkage to the transit system. Buses loading and unloading during peak hours provide addition reduction in travel speed and reduce the level of service of the facility. Vehicular traffic has a poor level of service for current traffic travel rates. As traffic counts increase the LOS will continue to deteriorate.

Section IV Draft programming Assessment

The Harry Wurzbach/TAPS Memorial Boulevard project located in the City of San Antonio, Bexar County, Texas will provide an efficient multimodal transportation linkage to Fort Sam Houston, Fort Sam Houston National Cemetery, Brooks Army Medical Center and the Cities of San Antonio and Terrell Hills. This project provides for the rehabilitation of the existing roadway and adding operational improvements such as turn lanes, an underpass, bus turnouts, bicycle lanes and sidewalks to Harry Wurzbach/TAPS Memorial Boulevard. The existing facility is a four-lane roadway with the majority of the roadway having a depressed median. The roadway experiences numerous delays due to the lack of left turn lanes and long delays at major intersections. Harry Wurzbach/TAPS Memorial Boulevard serves as the direct route to the Fort Sam Houston National Cemetery the final resting place of many of our service men and women.

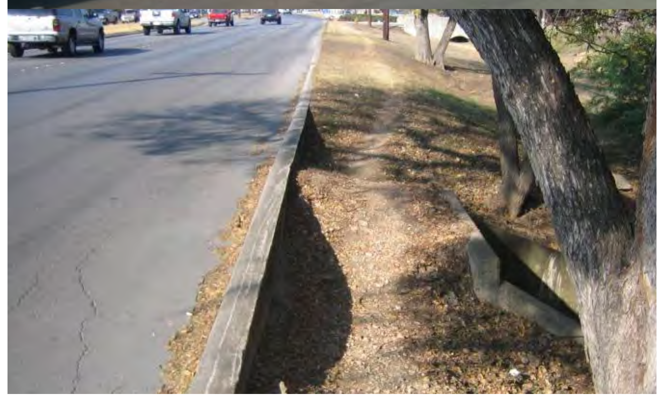
The Harry Wurzbach/TAPS Memorial Boulevard project is approximate 3.6 miles long, from the Fort Sam Houston Installation Gate to south of IH410. The project is consistent with the San Antonio Bexar County Metropolitan Mobility Plan “Mobility 2035”, but due the funding constraints the project is unfunded in the plan. The project is also consistent with the San Antonio-Bexar County MPO Bicycle Master Plan.

As with most projects, the Harry Wurzbach/TAPS Memorial Boulevard project has several underground storage tanks, leaking petroleum storage tanks and dry cleaner sites along the project site that will have to be evaluated closer during the project development phase but no major environmental issues have been identified along the project at this time.

Coordination and communication with the local governmental stakeholders will be important to the success of the project. Several entities like the City of Terrell Hills, Bexar County, City of San Antonio and Fort Sam Houston have expressed their support for the project. Each expressed support for any improvements that can be made to Harry Wurzbach/TAPS Memorial Boulevard to improve mobility and drainage in the community.

The project will provide immediate benefits to the users of the roadway by reducing traffic delays. Additional benefits of the project will be the enhancement of the multimodal transportation elements: transit, bicycling and walking. The improved travel times will increase the movement of buses and addition of bus pull-outs will keep buses from impeding traffic flow while at loading/unloading stops. The addition of bicycle lanes will provide for a dedicated and safe space for bicyclists commuting along the roadway (currently there are no bicycle lanes). Sidewalks along the entire project will provide for contiguous pedestrian movement as well as being ADA compliant. Left-turn lanes will provide benefits to through traffic by providing a storage area without impeding through traffic and reducing travel speeds. The preliminary construction cost for the proposed upgrades on Harry-Wurzbach/TAPS Memorial Blvd. is **$66,717,000.00.** Additional traffic studies are needed to quantify the benefits to the users due to reducing delays.

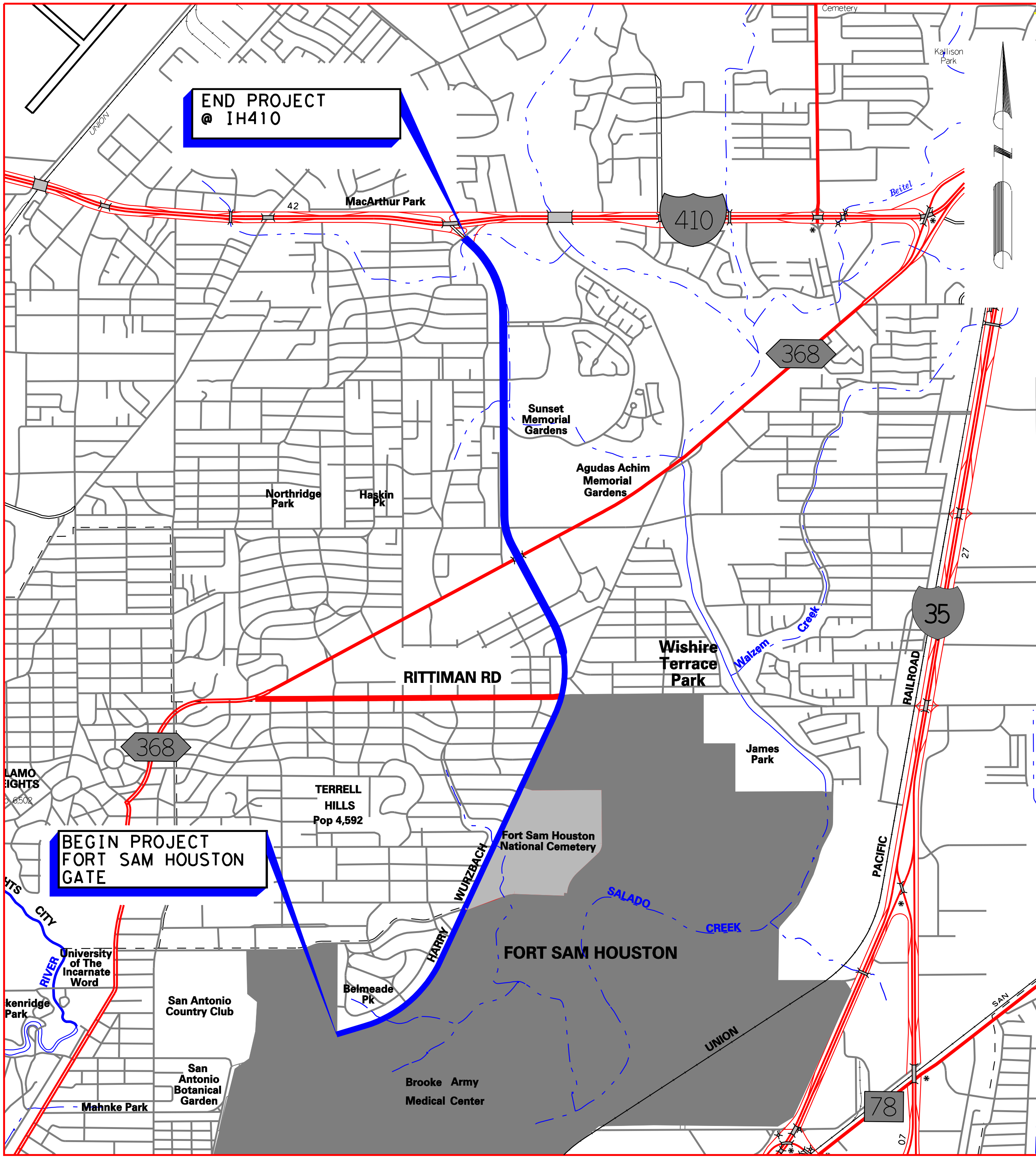
The existing roadway can be significantly enhancement to increase the safety to motorist, bicyclist and pedestrians. The lack of left turn lanes and congested intersections increase accident rates. During one of the field visits for this project, an accident occurred that involved a motorcycle police officer and a SUV attempting to make a left turn. Bicyclists do not currently have dedicated lanes and must travel in the regular vehicular travel lanes. The majority of the project does not have sidewalks and the few existing sidewalk sections do not meet ADA standards. There are numerous locations which show clear sign of heavy pedestrian usage with no sidewalks. Physically Challenged people in wheel chairs must travel in the roadway competing with vehicles in order to be able to commute along the route.

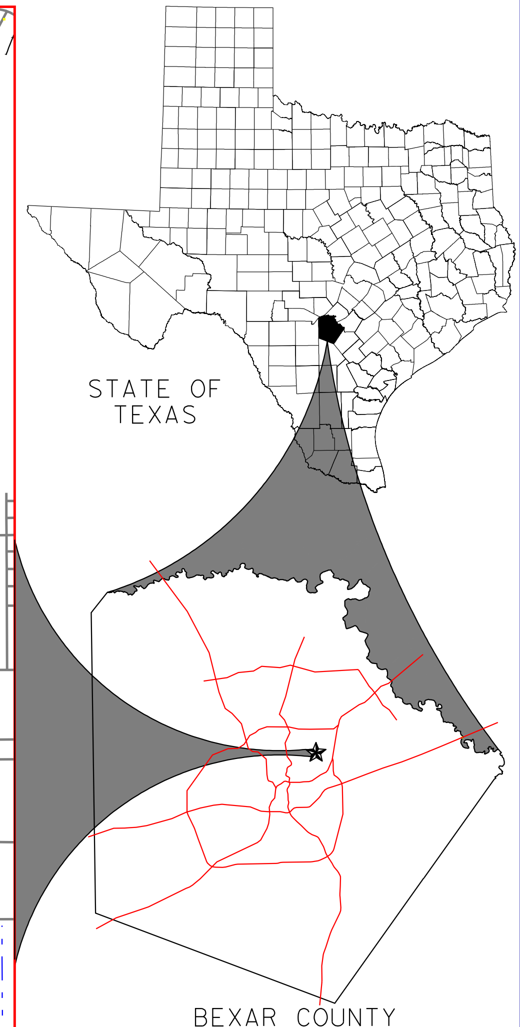


Preliminary level of service analysis for 2011 traffic showed segments of Harry Wurzbach/TAPS Memorial Boulevard were operating at a Level of Service (LOS) “F”. The average LOS for the corridor is currently operating at a LOS “C”. This LOS will degrade as traffic volumes increase with additional personnel assignments to Fort Sam Houston and Brooks Army Medical Center as a result of BRAC.

The Harry Wurzbach/TAPS Memorial Boulevard project will provide quality of life enhancements to the City of San Antonio, City of Terrell Hills, Bexar County and Fort Sam Houston (BAMC) by improving the mobility of multiple modes of transportation. The project will reduce travel times for passenger and transit vehicles and increasing safety. Safety for both pedestrians and bicyclists will be enhanced by having contiguous ADA compliant sidewalks and bicycle lanes. The project will be developed in phases beginning with the preliminary engineering phase to refine the project design elements and costs. $600,000 is being requested to continue the development of the Harry Wurzbach/TAPS Memorial Boulevard project.

APPENDIX A
LOCATION MAP





S&B INFRASTRUCTURE, LTD.

Engineering · Management · Technology

LOCATION MAP
HARRY WURZBACH
TAPS MEMORIAL BLVD

DRAWN BY: BP	DATE:	SCALE: 1" = 3500'
CHECKED BY: MCR	DATE:	PROJECT NO:
APPROVED BY:	DATE:	

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
6				1
STATE	DIST.	COUNTY		
TEXAS	SAT	BEXAR		
CONT.	SECT.	JOB	HIGHWAY NO.	
			CS	

APPENDIX B
PHOTOGRAPHS

Harry Wurzbach / TAPS Memorial Blvd.

IH410 - Harry Wurzbach Exit

IH410 Frontage Road at Harry Wurzbach

Harry Wurzbach at North End of Project

Harry Wurzbach   National Cemetery Signage

Harry Wurzbach / TAPS Memorial Blvd.

Harry Wurzbach TAPS signage

Harry Wurzbach - No Sidwalks

Harry Wurzbach at Eisenhauer Rd

Harry Wurzbach at Austin Highway Underpass

Harry Wurzbach / TAPS Memorial Blvd.

Harry Wurzbach Side Ditch Drainage Structure

Harry Wurzbach Pedestrians No Sidewalks

Harry Wurzbach / TAPS Memorial Blvd.

Harry Wurzbach Non-ADA Compliant Sidewalk

Harry Wurzbach Pedestrian Path No Sidewalks

Harry Wurzbach / TAPS Memorial Blvd.

Harry Wurzbach Approaching Rittiman Rd

Harry Wurzbach Pedestrians BAMC Students

Harry Wurzbach at Cole High School Entrance

Harry Wurzbach Side Ditch Drainage in Terrell Hills

Harry Wurzbach Fort Sam Houston National Cemetery Entrance

Harry Wurzbach Fort Sam Houston National Cemetery Entrance

Harry Wurzbach Approaching Burr Rd

Harry Wurzbach Approaching Burr Rd.

Harry Wurzbach / TAPS Memorial Blvd.

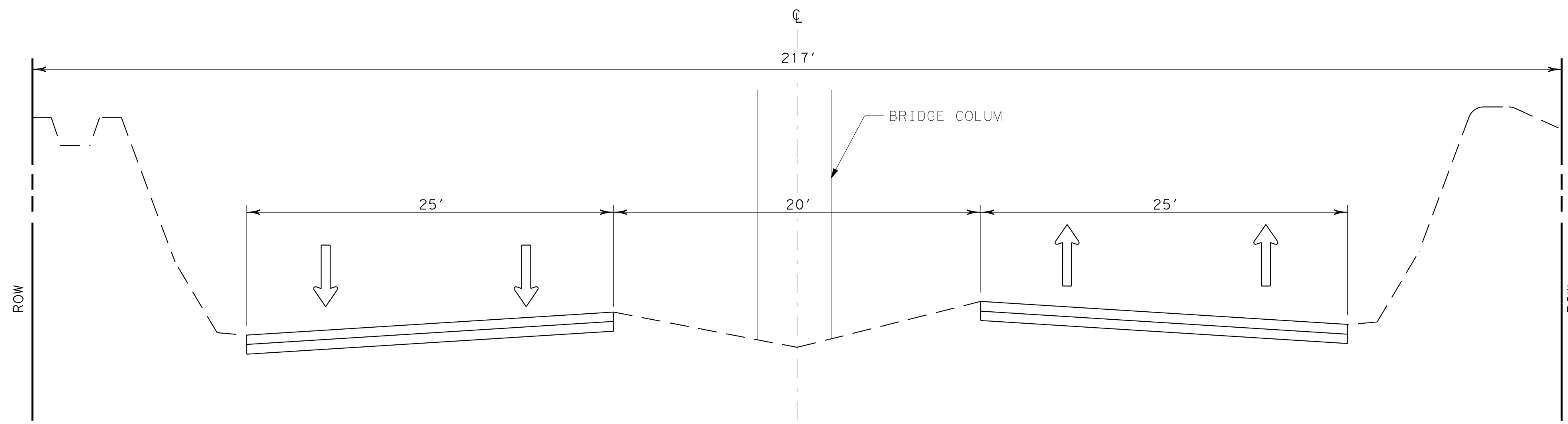
Harry Wurzbach Fort Sam Houston Golf Club Entrance

Harry Wurzbach Fort Sam Houston Gate

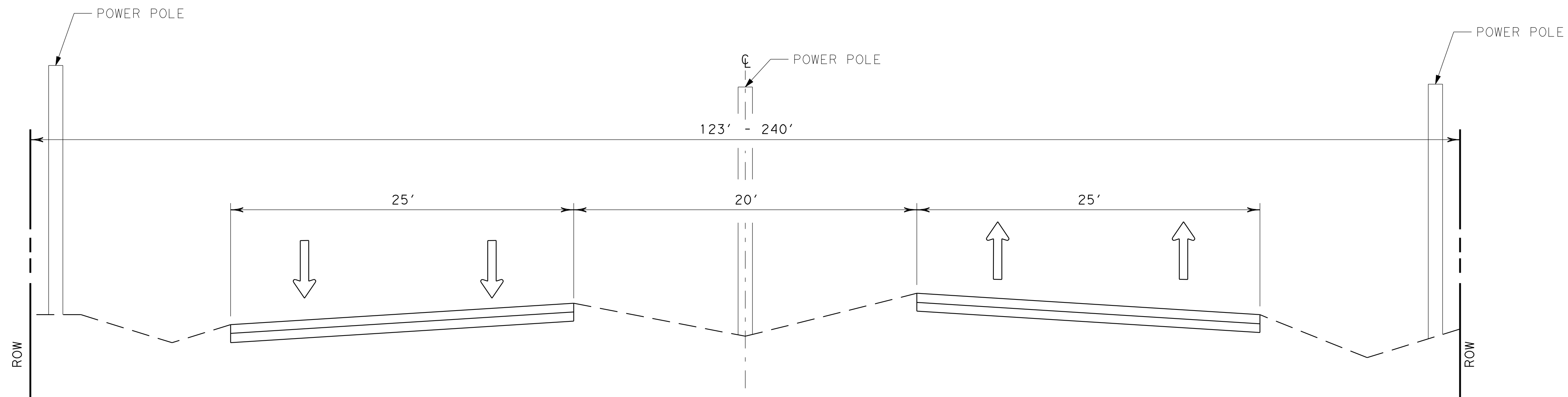
Harry Wurzbach / TAPS Memorial Blvd.

Harry Wurzbach Vehicular Accident

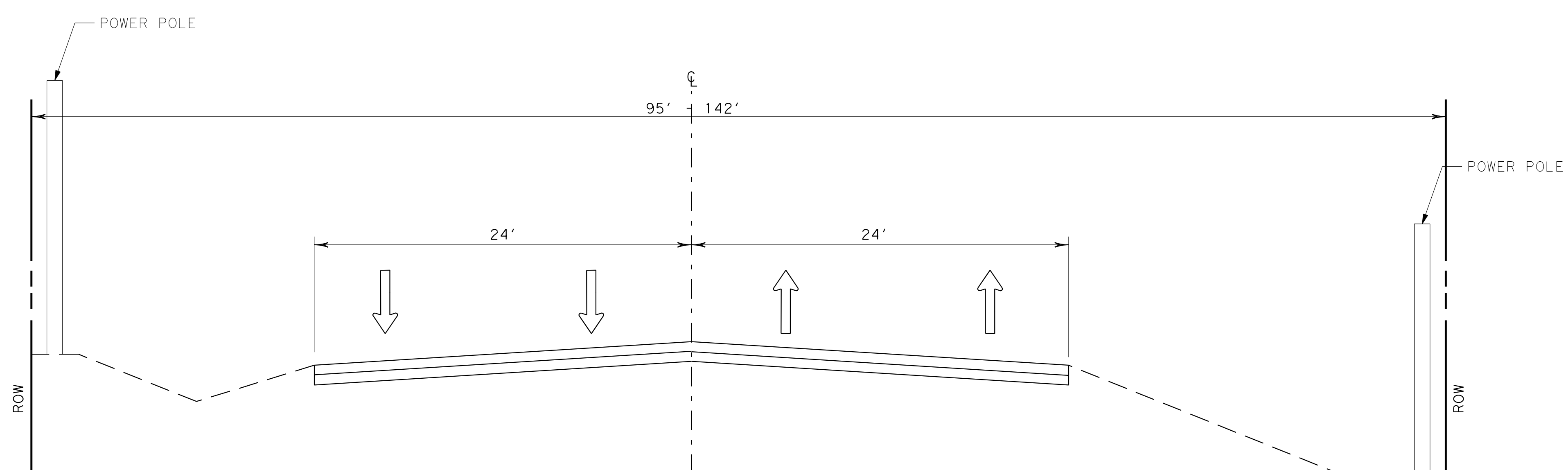
APPENDIX C
TYPICAL SECTIONS



STA 115+00 R2



STA 109+00 R1 TO STA 114+00 R2
STA 116+00 R2 TO 170+00 R2



STA 16+00 R1 TO STA 106+00 R1

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

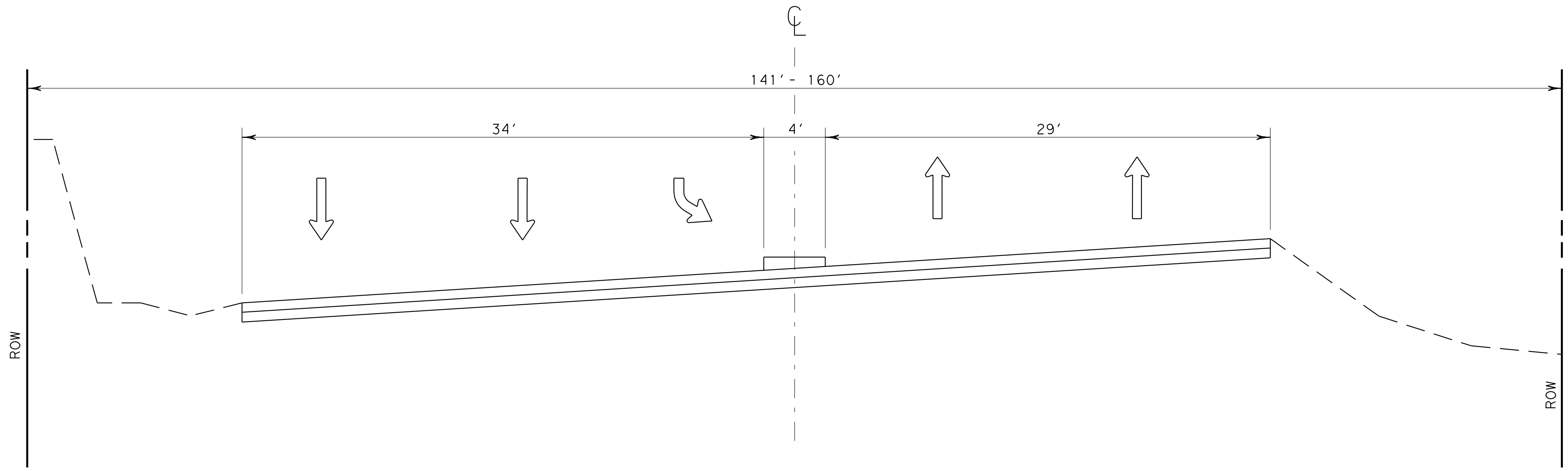
S&B INFRASTRUCTURE, LTD.
Engineering • Management • Technology TX PE FIRM # 1582
5805 CALLAGHAN RD. SUITE 202 SAN ANTONIO, TX 78228
PHONE: 210.706.5800 FAX: 210.706.9233 WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

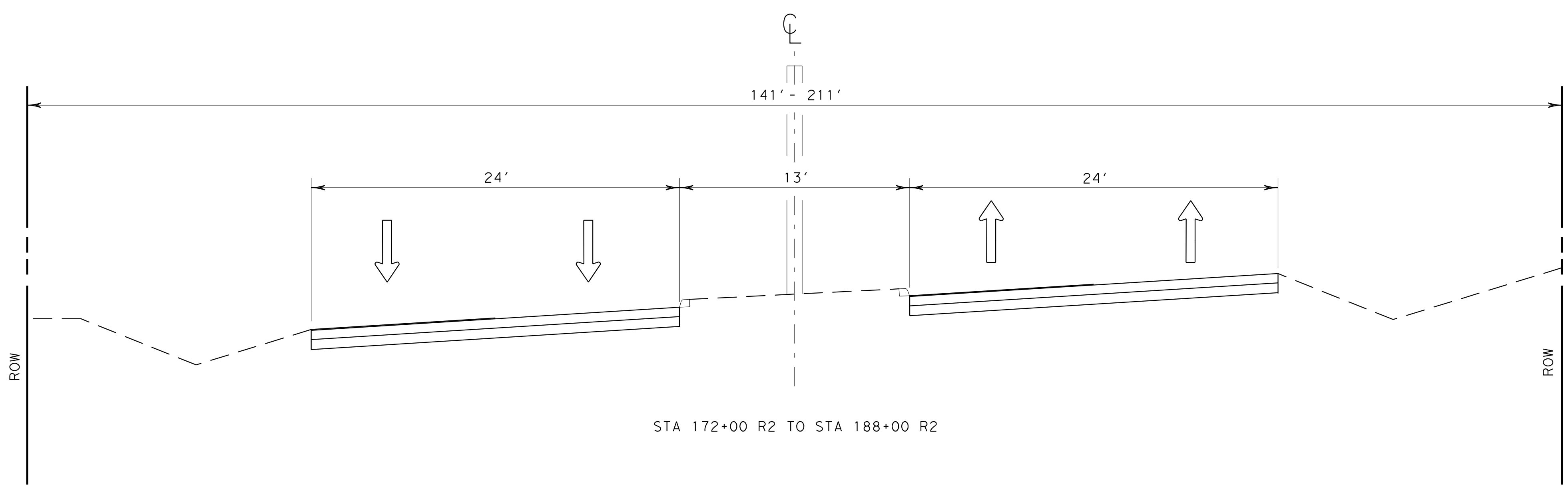
HARRY WURZBACH
TAPS MEMORIAL BLVD
EXISTING TYPICAL SECTION

SHEET 1 OF 2

95% SUBMITTAL	PROJECT NO.: U1679		DATE: 2/22/2011
DRWN. BY: BRP	DSGN. BY: EAC	CHKD. BY: MCR	



STA 188+00 R2 TO STA 193+00 R2



STA 172+00 R2 TO STA 188+00 R2

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE LTD.
Engineering • Management • Technology
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

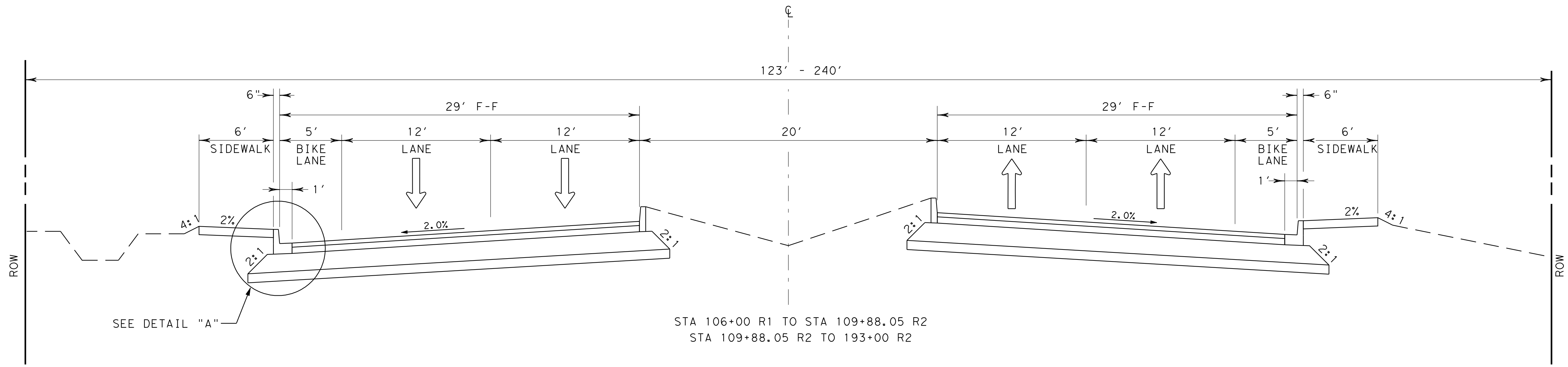
CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

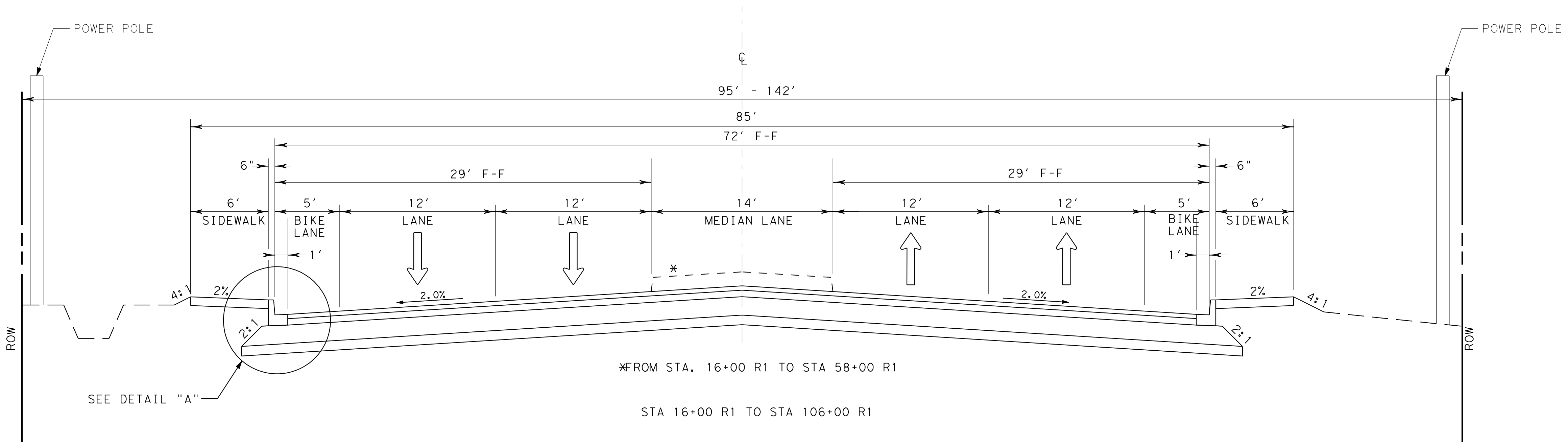
HARRY WURZBACH
TAPS MEMORIAL BLVD
EXISTING TYPICAL SECTION

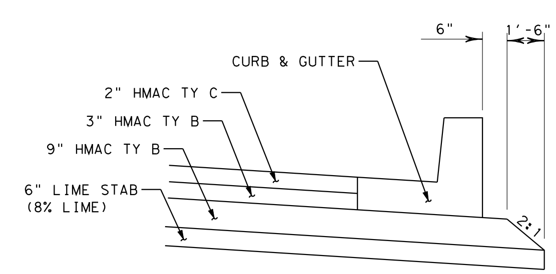
SHEET 2 OF 2

95% SUBMITTAL	PROJECT NO.: U1679	DATE: 2/22/2011
DRWN. BY: BRP	DSGN. BY: EAC	CHKD. BY: MCR

2/22/2011 10:08:21 AM
n:\project\U1679\DESIGN\Dgn\1679SRTS01.dgn







DETAIL "A"

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
MICHAEL C. RIOJAS
P.E. 69690 on 5/18/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
Engineering • Management • Technology
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

HARRY WURZBACH
TAPS MEMORIAL BLVD
PROPOSED TYPICAL SECTIONS

SHEET 1 OF 1

95% SUBMITTAL	PROJECT NO.: U1679		DATE:5/18/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

5/18/2011 2:06:08 PM
N:\project\U1679\DESIGN\Dgn\1679SRTS01.dgn

``City of San Antonio Design Summary Report

The DSR is intended to be a tool that can be used by the Project Delivery team to anticipate and memorialize basic project information, with the objective being to minimize or eliminate rework, last minute surprises, and their associated costs and delays.

Although the DSR addresses a wide range of issues that can affect the design and delivery of a project, every project is unique and, as such, every project warrants thoughtful consideration about how its design and construction will be accomplished. Not all factors identified in the DSR will apply to each project and factors will arise on some projects that are not addressed in the standard DSR. Those individuals contributing the DSR are encouraged to think comprehensively and tailor their use of the DSR form to meet the unique needs of the project.

It is likely that the DSR will be partially completed prior to the Initial Scope Meeting (ISM) and updated from time to time as the project progresses. As information is added or revised, it is strongly recommended that they be associated with a date and the author of the change. Information that is outdated should not be deleted, but stricken, so as to preserve a more complete record of the progression of the project design. The ISM should be stored on the Web Portal and available for all parties to review. The City PM and the Consultant PM should be the only parties that can modify the ISM.

I. SCHEDULING, FUNDING, AND DELIVERY

Project: Harry Wurzbach Development of a draft Programming Assessment

Type of Project: Rehabilitation

Project Background, History, Goals and Objectives: Route Study and Report Phase

City Council District: 10

Other Projects affected by this project: Other Projects

Preliminary Engineering Report Required (COSA PM Decision) yes/no

Project Schedule	Start	Completion	Duration
Design	M/D/YYYY	M/D/YYYY	days
Environmental/Permitting	M/D/YYYY	M/D/YYYY	days
ROW Acquisition	M/D/YYYY	M/D/YYYY	days
Construction	M/D/YYYY	M/D/YYYY	days

Programmed Funding and Date Available (Excluding Utility Costs):

Design	$0.00	Date	M/D/YYYY
ROW	$0.00	Date	M/D/YYYY
Construction	$0.00	Date	M/D/YYYY

Project Construction Cost Estimate History (Excluding Utility Relocation Costs):

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY

PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

Project Funding Partners and Description of Work, etc.

☐ SAWS - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ CPS - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ TxDOT - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ ROW Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ Environmental Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

☐ Capital Administration Costs - Description of Work, Etc.

Level 1 Project Estimate	$0.00	Date	M/D/YYYY
Level 2 Project Estimate	$0.00	Date	M/D/YYYY
PER Project Estimate	$0.00	Date	M/D/YYYY
40% Design Project Estimate	$0.00	Date	M/D/YYYY
70% Design Project Estimate	$0.00	Date	M/D/YYYY
95% Design Project Estimate	$0.00	Date	M/D/YYYY

Project Delivery

Anticipated method of project delivery

- ☒ Design-bid-build
- ☐ Competitive Sealed Proposals (list factors influencing awards)
  - ☐ Cost (000%)
  - ☐ Schedule (000%)
  - ☐ Prior Experience (000%)
  - ☐ Other (000%)
- ☐ Construction Manager at Risk
- ☐ Design-Build

II. EXISTING CONDITIONS

A1. Existing typical roadway conditions for Harry Wurzbach (From 900ft south of Rittman Rd to IH410)

1. Number of traffic lanes	4
2. Approximate lane width	12ft
3. Approximate shoulder/parkway width	Varies
4. Sidewalks	A small section of the project 2' wide
5 Median width	20'
6 Curbs	Yes
7. Underground Storm Drainage System	Yes

A2. Existing typical roadway conditions for Harry Wurzbach (From Fort Sam Gate to about 900ft south of Rittman Rd)

1. Number of traffic lanes	4
2. Approximate lane width	12ft
3. Approximate shoulder/parkway width	varies
4. Sidewalks	None
5. Median width	No
6 Curbs	No
7. Underground Storm Drainage System	No

B. Existing bridge and bridge class structure data

1. Name of stream, tributary, etc	Name
2. Structure type	Type
3. Structure length	Length
4. Date of construction	M/YYYY

5. Is structure adequate for:
   - a. Roadway Yes
   - b. Sidewalk and pedestrian Yes
   - c. Hydraulic capacity Yes

C. Underground and cross drainage facilities:

Location A	Description: SBC 6' X 5' Meets 25Yr Event
Location B	Description: SBC 5' x 5' Meets 25Yr Event
Location C	Description: SBC 10' X 5.5' Meets 25Yr Event
Location D	Description: MBC 4~6' X 5' Meets 25Yr Event
Location E	Description: SBC 6' X 2' Does not meet 25Yr Event
Location F	Description: SBC 6' X 6' Does not meet 25Yr Event
Location G	Description: MBC 2~6' X 5' Does not meet 25Yr Event
Location H	Description: SBC 7' X 6' Meets 25Yr Event

D. ROW

Existing ROW width Length

Is ROW adequate? No
Existing Sidewalks (Condition 0-3) 0
Existing Curb Ramps (Condition 0-3) 0
Estimated number of adjacent parcels ##
Estimated number of parcels required ##
Will “corner clips” be acquired? Yes
Characterize adjacent land use: Description

E. Environmental

Potential environmental concerns (i.e., gas stations, industrial sites, auto shops, landfills, etc.: Description: Describe
Existing Creeks and/or Tributaries: Description: Describe
Potential Historical Area (50 years or older) Description: Describe
Potential Archeological Sites: Description: Describe
Potential Endangered Species Habitat Area: Description: Describe
Project over Edwards Aquifer Recharge or Transition Zone: Description: Describe

F. Constraints

Schools: Yes
Parks: Description
Businesses: Yes
Cemeteries: Yes
Trees: Description
Other: Golf Course

G. Railroads: ☐ crossing ☐ adjoining ☐ grade separation

Railroad owner: Owner's Name
Type of warning device:

- ☐ Passive
- ☐ Flashing lights only
- ☐ Lights and gates
- ☐ Other (pre-emption, crossing consolidation, etc.): Explain

H. Airport Clearance Zone issues: None

I. Preliminary Utility Inventory (Briefly describe facilities, locations, age, adequacy (if known), condition (if known), anticipated or potential conflict, conceptual approach, and any especially critical issues related to the utility.)

Sanitary Sewer: Yes
Water: Yes
Natural Gas: Yes
Underground Electric: Description
Overhead Electric: Yes
Cable Television: Yes
Telephone: Yes
Other: Description

Will the Utility Owner or Design Consultant perform conflict assessment and design?

	Utility	Consultant
Sanitary Sewer	☐	☐
Water	☐	☐
Natural Gas	☐	☐
Underground Electric	☐	☐
Overhead Electric	☐	☐
Cable Television	☐	☐

Telephone	☐	☐
Other	☐	☐

Will utility owner joint bid or perform work ahead of City project?

	Joint bid	Prior to Project
Sanitary Sewer	☐	☐
Water	☐	☐
Natural Gas	☐	☐
Underground Electric	☐	☐
Overhead Electric	☐	☐
Cable Television	☐	☐
Telephone	☐	☐
Other	☐	☐

Owner of poles supporting overhead lines Utility Co
Are there locations of multiple contacts? Yes
Any AC water or sewer lines? Yes

K. Are there any existing traffic signals, crosswalks, school zones, fire stations, emergency medical facilities, etc. that warrant special design consideration? Description

L. Any other relevant information about the project that should be considered, such as existing historic structures or aesthetic design enhancement? Description

III. BASE MAPPING, GEOTECHNICAL & ENVIRONMENTAL, PERMITTING, & COMMUNITY RELATIONS ISSUES

Surveying and Mapping

Is aerial topo and mapping desired? Y Scale: 1”=40’

- ☒ planimetric
- ☐ orthophoto
- ☒ contours

Coordinate system to be used: State Plain South Central Texas
Vertical control system to be used: NAD 83

ROW and/easements required? ☒ Yes ☐ Unknown ☐ No
Conceptual ROW Expansion approach (e.g., corner clips only, equal amounts both sides, all on one side, variable, etc.) Description

Locate apparent ROW only ☐ Locate and resolve ROW and side lot lines ☐
Tree mitigation survey requirements (e.g., tie clusters, all trees over certain diameter, trunk size only, canopy) Description

Geotechnical and Environmental Investigations

Soil types in project area per Bexar County Soil Survey: Narrative

Are geotechnical reports for other projects in or near the area available and adequate for use on this project? ☒ Yes ☐ No (list)

Drilling and/or testing required for

- ☒ Pavement design
- ☐ Bridge class structures
- ☐ Scour Analysis
- ☒ Trench Excavation Protection

☐ Subsurface Investigation (rock, groundwater, etc)

Pavement Design(s) ☒ Provided by geotech
☐ Provided by City

Scour analysis required? ☐ Yes ☒ No

Permitting Issues

Cultural resource survey required? ☐ Yes ☐ No
Historic Preservation Permit likely? ☐ Yes ☒ No
NEPA Permit likely required? ☐ Yes ☒ No
Hazardous Waste Contamination assessment ☒ Yes ☐ No
Endangered species assessment needed? ☐ Yes ☒ No
USACE401 permit likely? ☐ Yes ☒ No
USACE404 permit likely? ☐ Yes ☒ No
☐ Nationwide
☐ Individual
Wetlands delineation survey required? ☐ Yes ☒ No
Environmental Waste Management Plan,
Spec's, Quantities, & Details ☐ Yes ☐ No
WPAP (TCEQ Permit likely required)? ☒ Yes ☐ No
Tree Permit required? ☐ Yes ☒ No
TxDOT ROW permit required? ☒ Yes ☐ No
Railroad permit required? ☐ Yes ☒ No

TDLR Review
☒ Submitted by City
☐ Submitted by Design Consultant

TDLR Inspection
☒ Coordinated by City
☐ Coordinated by Design Consultant

San Antonio River Authority
Sand and Gravel Permit
☒ Submitted by City
☐ Submitted by Design Consultant

Community relations issues

Is a formal public relations plan required? TBD ☐ Yes ☐ No
Project info website required? ☐ Yes ☐ No
Stakeholder list required? ☒ Yes ☐ No
Project PowerPoint required? ☐ Yes ☐ No
Is coordination of historic district or enhancements required ☐ Yes ☐ No

Public meetings (Check all that apply)
☐ None
☒ Pre-design
☒ Preliminary design concept
☐ Interim meeting(s) – estimated # 00
☐ Present final design
☐ Pre-construction
☐ Construction – estimated # 00

Special requirements
☒ Mailed notifications

☐ English only
☒ Spanish and English
☐ Other: Description

IV. DESIGN ISSUES

Governing Specifications: AASHTO 04

Roadways

Functional Classification for each roadway: Urban Principal Arterial

Design Speed: 45 mph

Preliminary Lane configuration

4 Number of lanes
12ft Width of lanes
☒ Dual Left Turn Lane Width: ##
Type Curbed Median/surface treatment (concrete, grass, landscape, etc.)
Bike Facilities (check all that apply)
☒ Bike Lanes How many: 2
☐ Bike Accommodation Lanes
☐ Bike Paths

Sidewalk locations: Both Sides 5' wide

Bus stop pads: ☒ Yes ☐ No

Clear Zone width: 1.5ft from face of curb to top of ditch

Conceptual parkway restoration approach: Description

Controlling geometric design criteria

☐ UDC
☒ AASHTO
☐ Other: Describe

Are any design waivers anticipated? ☐ Yes ☒ No
If so, what are they? Describe

Roadway Illumination

☐ Intersections only
☒ Continuous lighting

Photometric Design by:

☐ CPS
☒ Design Consultant

Traffic

Are additional traffic studies/counts required? ☒ Yes ☐ No
Describe if yes: Describe

Are there major generators in the project area? ☒ Yes ☐ No
Describe if yes: Fort Sam Houston Entrance Gate. Peek Hours.

Minimum Design Level of Service desired: C

Traffic signals

Signal head orientation ☐ Horizontal ☐ Vertical
☒ Mast arm ☐ Span wire/strain poles

Controller Type
☒ Type 2070 (City maintained)
☐ NEMA (TxDOT maintained)
Will controller maintenance be transferred to City? Yes
Are signal coordination communications facilities desired? Yes

School Zone Flashers
☐ None (school zone signs only)
☒ Roadside
☐ Overhead

Intelligent traffic systems issues

Storm Drainage

Design/Analysis Frequency (in years):

25 -year rainfall event Streets (may depend on functional classification)
25 -year rainfall event Inlets
25 -year rainfall event Underground storm drains
25 -year rainfall event Open channels
25 -year rainfall event Cross drainage facilities
100 -year rainfall event Creeks, rivers, etc delineated as Zone A on FIRM

Hydrology analyzed for: (Choose one of the following)
☒ existing conditions only
☐ ultimate conditions

Runoff methodology: (Choose one of the following)
☒ Rational method
☐ TR55
a TxDOT
☐ Other

Minimum number of un-flooded lanes to be provided for design storm: 1

On-grade inlet preferences: Description

Grate inlet preferences: Description

Open channel preferences
☒ Earth lined (max side slope 3:1)
☒ Geotextile armored (max side slope 2:1)
☒ Concrete armored (max side slope 1:1)
☐ Gabion armored

☐ Full channel
☐ Pilot channel only

☒ Vertical wall concrete channel

Outfall preferences
☐ Concrete chutes/scuppers
☒ Pipe/box culvert to toe of slope

Preliminary Maintenance Access Ramp locations: Description

Construction Phasing

Preliminary construction phasing preferences:
☒ Half at a time
☐ Section by Section
☐ Other: Describe

Temporary illumination to be provided? Yes

Design Enhancements

Describe preliminary design enhancements desired (concept, location, budget, etc): Description

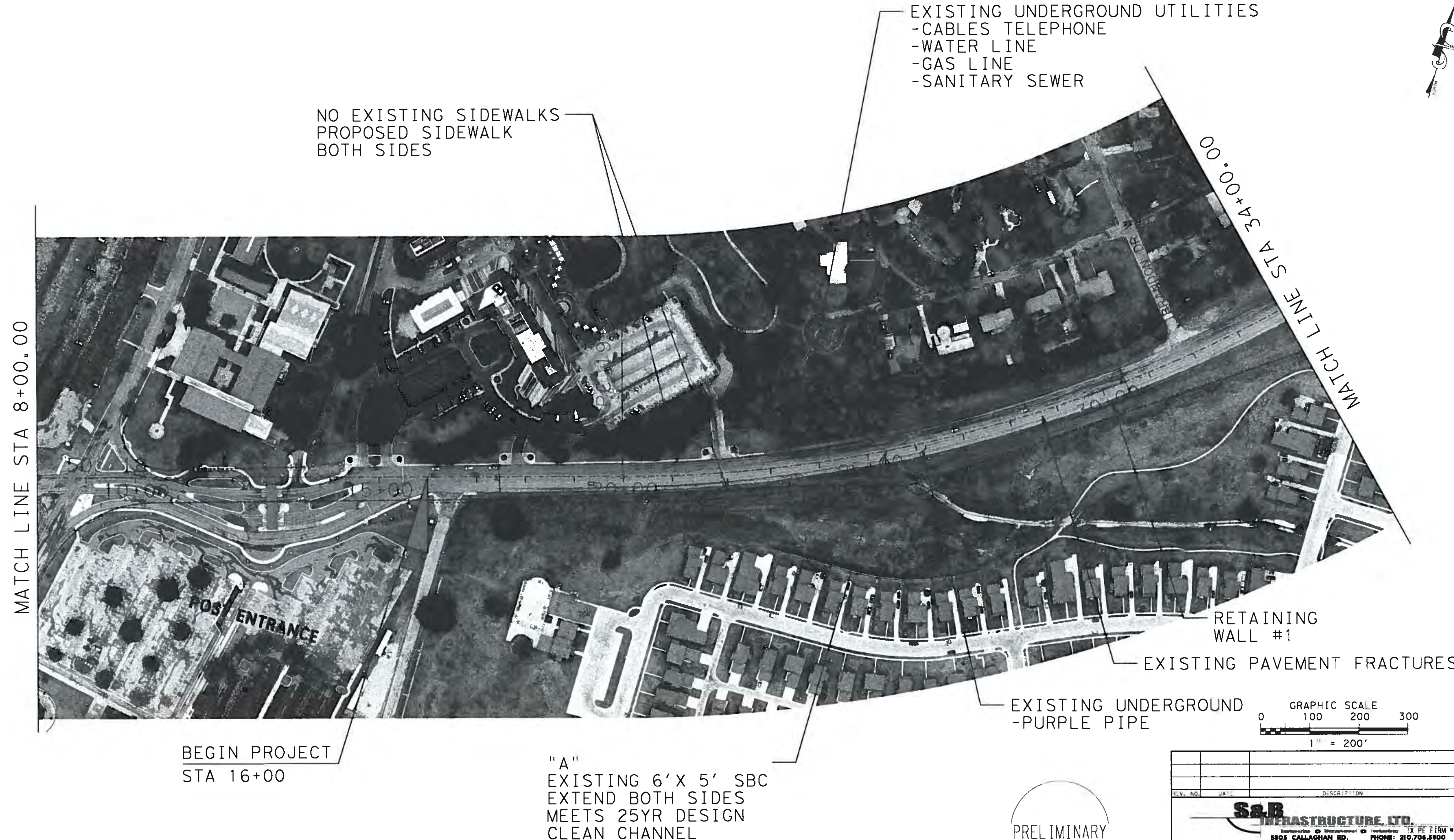
Overhead Utility Conversion? _____

V. PROJECT JOURNAL

Date Initially Created: MM/DD/YYYY

Date Modified/Updated: MM/DD/YYYY
Description: Describe
Date Modified/Updated: MM/DD/YYYY
Description: Describe
Date Modified/Updated: MM/DD/YYYY
Description: Describe
Project Closed: MM/DD/YYYY

APPENDIX D
PROJECT LAYOUT SHEETS



PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

EXISTING SPEED ZONE = 35 MPH

REV. NO.	DATE	DESCRIPTION	BY

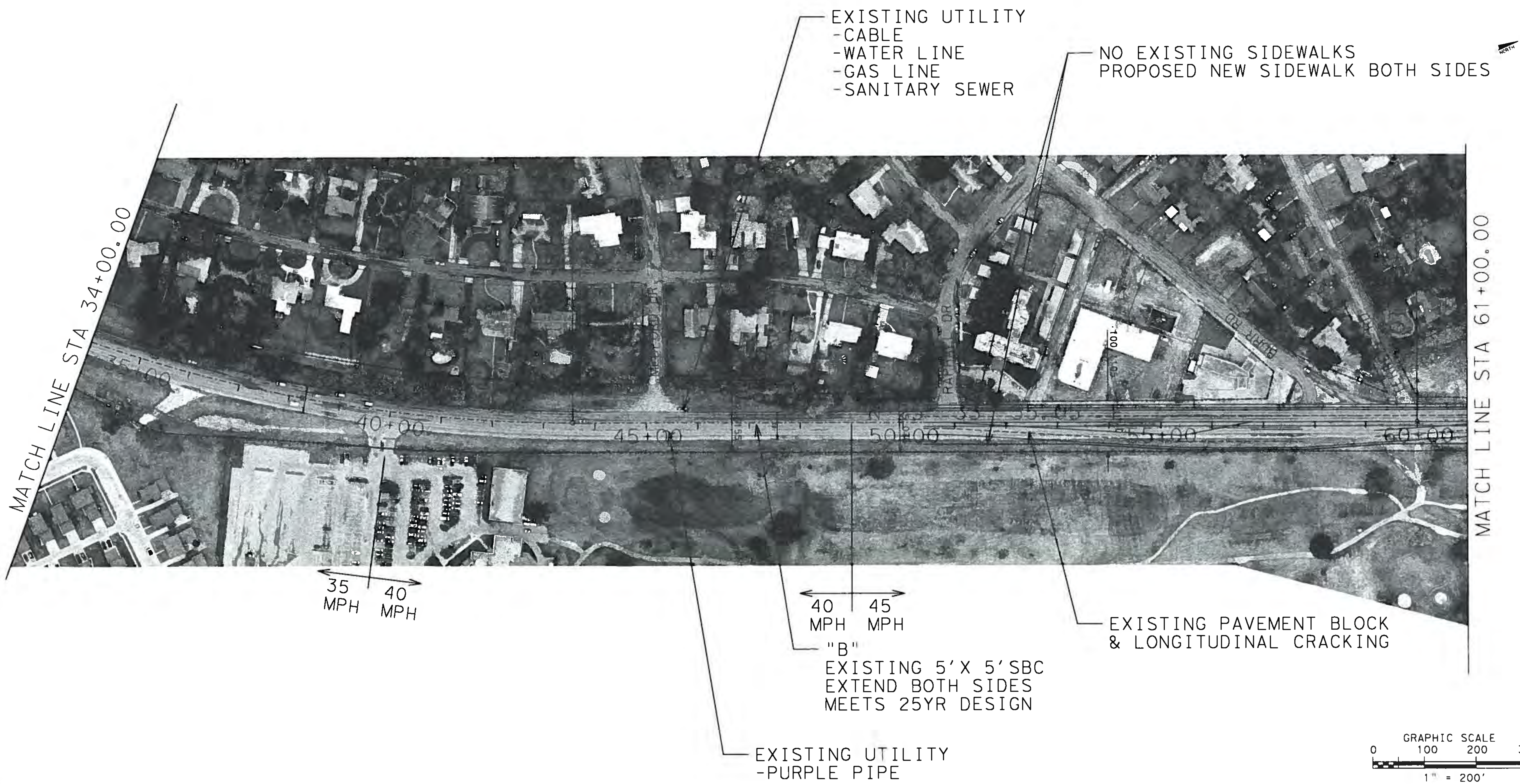
S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 1 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	



PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 2 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

NO EXISTING SIDEWALKS
PROPOSED NEW SIDEWALK
BOTH SIDES

RETAINING WALL
#2

"D"
EXISTING 4~ 6' X 5' MBC
EXTEND BOTH SIDES
MEETS 25YR DESIGN
MAJOR EROSION UPSTREAM
PROPOSE RIPRAP CHANNEL UPSTREAM

EXISTING UTILITY
-CABLE TELE

MATCH LINE STA 61+00.00

MATCH LINE STA 88+00.00

CLEAN CHANNEL

RETAINING WALL
#3

EXISTING UTILITY
-PURPLE PIPE

EXISTING SPEED ZONE = 45 MPH

GRAPHIC SCALE
0 100 200 300
1" = 200'

PRELIMINARY
SUBJECT TO REVISION
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 3 OF 9

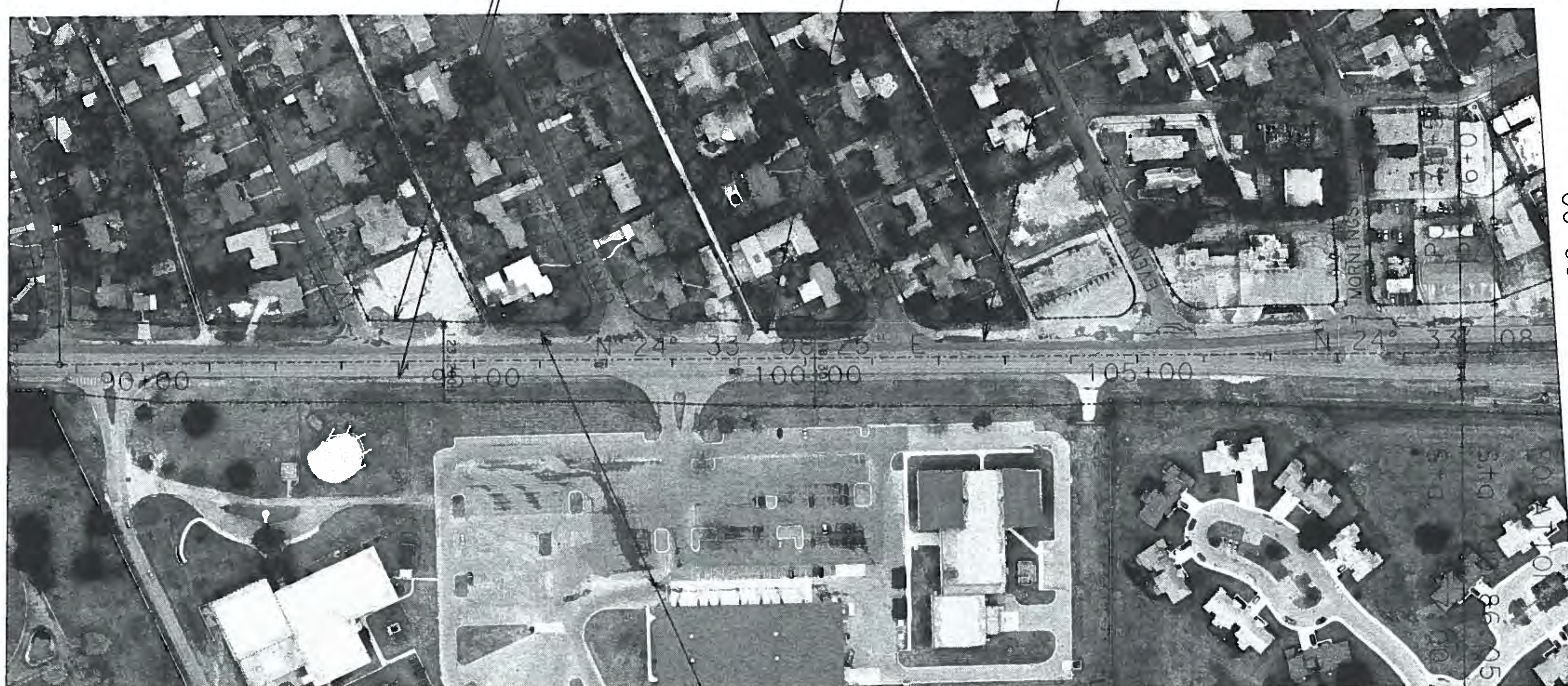
95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

NO EXISTING SIDEWALKS
PROPOSE NEW SIDEWALK
BOTH SIDES

RETAINING WALL
#4

EXISTING PAVEMENT BLOCK
& LONGITUDINAL CRACKING

MATCH LINE STA 88+00.00



MATCH LINE STA 77+00.00

EXISTING UTILITY
-CABLE TELE
-WATER LINE
-GAS LINE
-SANITARY SEWER

EXISTING SPEED ZONE = 45 MPH

GRAPHIC SCALE
0 100 200 300
1" = 200'

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 4 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

EXISTING UTILITIES
-CABLE TELE
-WATER LINE
-GAS LINE
-SANITARY SEWER

MEDIAN
NEEDS
TORM DRAIN

"E"
EXISTING 6' X 2' SBC
DOES NOT MEET 25YR DESIGN
PROPOSED 3 ~ 8' X 4' MBC
W/ US/DS HEADWALLS

EXISTING PAVEMENT BLOCK &
LONGITUDINAL CRACKING

GRAPHIC SCALE
0 100 200 300
1" = 200'

EXISTING SPEED ZONE = 45 MPH

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 5 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

EXISTING STORM SEWER SYSTEM
AT THE LOW POINT UNDER AUSTIN HWY.
NEED AS BUILTS TO VERIFY
UP GRADE

EXISTING ROADSIDE
DITCH NEEDS TO BE REGRADED
SEDIMENT HAS SETTLED

EXISTING MEDIAN CHANNEL
NEEDS PROPOSED
STORM DRAIN

MATCHLINE STA 100+00

MATCHLINE STA 124+00

NO EXISTING SIDEWALKS
PROPOSE NEW SIDEWALK

EXISTING PAVEMENT
HAS BLOCK & LONGITUDINAL
CRACKING

"F"
EXISTING 6'X 6' DOES NOT SBC
MEET 25YR DESIGN. PROPOSED
2~7'X6'MBC W/ UPSTREAM/DOWNSTREAM
HEADWALLS.

BUSINESS OWNER
STATED THAT MANY PEOPLE WALK IN THIS AREA
I NOTICED THE SAME. ALSO A FEW PEOPLE
IN WHEEL CHAIRS GET ON TO THE STREET
TO CROSS OVER THE CULVERT WHERE THERE
ARE NO SIDEWLKS.

EXISTING SPEED ZONE = 45 MPH

GRAPHIC SCALE
0 100 200 300
1" = 200'

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 6 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY:BRP	DSGN. BY:EAC	CHKD. BY:MCR	

EXISTING
SANITARY SEWER

PROPOSE MEDIAN CHANNEL
STORM DRAIN

NO EXISTING SIDEWALKS
PROPOSE NEW SIDEWALK
BOTH SIDES

EXISTING PAVEMENT FRACTURES
PROPOSE NEW PAVEMENT

GRAPHIC SCALE
0 100 200 300
1" = 200'

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 7 OF 9

95% SUBMITTAL	PROJECT NO.: U1679	DATE: 2/22/2011
DRWN. BY: BRP	DSGN. BY: EAC	CHKD. BY: MCR

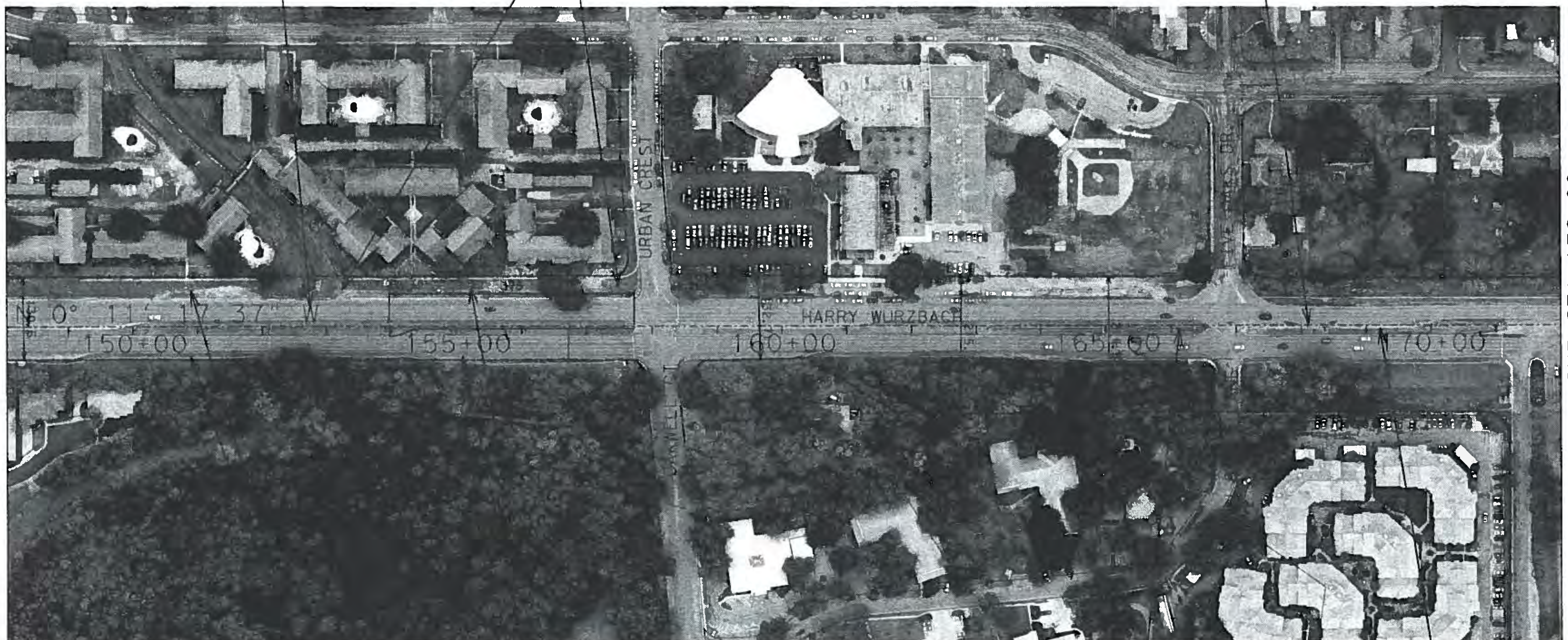
EXISTING SPEED ZONE = 45 MPH

"G"
EXISTING 2~6'X5' MBC
DOES NOT MEET 25YR DESIGN
PROPOSE 3~7'X5'MBC
UPSTREAM/DOWNSTREAM HEADWALLS

EXISTING STORM SEWER
INLET W/ 24" RCP
THAT OUTFALLS TO
EXISTING 2~6'X5'MBC

EXISTING 7'X6'SBC
EXTEND BOTH SIDES
MEETS 25YR DESIGN
PROPOSE REPLACING
UPSTREAM HEADWALL

MATCHLINE STA 148+00



MATCHLINE STA 172+00

EXISTING MEDIAN
CHANNEL DOES NOT
OUTFALL ANYWHERE.
PROPOSE STORM DRAIN
IN THE CENTER MEDIAN

EXISTING PAVEMENT
FRACTURES

EXISTING SIDEWALK ON ONE SIDE. DOES NOT MEET ADA
NO SIDEWALK ON ONE SIDE.
PROPOSE SIDEWALK ON BOTH SIDES

NO EXISTING SIDEWALKS
PROPOSED NEW SIDEWALKS
BOTH SIDES

EXISTING SPEED ZONE = 45 MPH

GRAPHIC SCALE
0 100 200 300
1" = 200'

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 8 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY: BRP	DSGN. BY: EAC	CHKD. BY: MCR	

ROADSIDE DITCH HAS EITHER BEEN ERODED OR SILTED UP IN VARIOUS AREAS OF THE EXISTING ROADSIDE DITCH. THIS IS NOT ALLOWING FOR THE RUNOFF TO FLOW THUS PONDING OCCURS ON THE ROADWAY. THE GREATER THE THE RAIN FALL INTESITY, THE MORE PONDING YOU WILL GET. PROPOSE A CHANNELIZED DITCH WITH RIPRAP OR ROCK RIPRAP ALONG THIS SIDE OF ROADWAY UP TO THE CULVERT TO ALLOW BETTER FLOW AND NO EROSION.

EXISTING SIDEWALK DO NOT MEET ADA PROPOSED 4' TO 5' SIDEWALKS ON BOTH SIDES

IF ANY WIDENING OF PAVEMENT A RETAINING WALL WILL BE REQUIRED AT THIS LOCATION AVERAGE HEIGHT 10FT

GRAPHIC SCALE
0 100 200 300
1" = 200'

EXISTING PAVEMENT BLOCK & LONGITUDINAL CRACKING

EXISTING SPEED ZONE = 45 MPH

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
EDUARDO A. CASTILLO
P.E. 98242 on 2/22/2011
It is not to be used for bidding, construction, or permit purposes.

REV. NO.	DATE	DESCRIPTION	BY

S&B INFRASTRUCTURE, LTD.
TX PE FIRM # 1582
5805 CALLAGHAN RD.
SUITE 202
SAN ANTONIO, TX 78228
PHONE: 210.706.5800
FAX: 210.706.9233
WWW.SBINFRA.COM

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

APPENDIX D
HARRY WURZBACH TAPS MEMORIAL BLVD
PLAN LAYOUT SHEET

SHEET 9 OF 9

95% SUBMITTAL	PROJECT NO.: U1679		DATE:2/22/2011
DRWN. BY: BRP	DSGN. BY: EAC	CHKD. BY: MCR	

APPENDIX E
EISENHAUER ROAD ALTERNATIVE

REV. NO.	BY	DATE	REVISION

PRELIMINARY
SUBJECT TO REVISION
This document is released for the purpose of interim review only under the authority of:
MICHAEL C. RIOJAS
P.E. 69690 on 5/17/2011
It is not to be used for bidding, construction, or permit purposes.

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

S&B INFRASTRUCTURE, LTD.
Engineering • Management • Technology

S&B INFRASTRUCTURE LTD.
TX PE FIRM • 1582
807 BRAZOS, SUITE 901
AUSTIN, TEXAS 78701

POTENTIAL ROUTE ALTERNATIVE - HARRY WURZBACH

NOTES	NAME	DATE
SURVEY BY		
DRAWN BY		
CHECKED BY		
DESIGNED BY		
REVIEWED BY		
SCALE: 1" = 50'		
CADD REF. NO.:		
CADD DIR.:		
SHEET OF		
SHEET NUMBER	___ OF ___	

N:\project\U1679\DESIGN\Dgn\zcm.dgn

APPENDIX F
LEVEL OF SERVICE DATA / ANALYSIS

Finally, for Vehicles 9 and 10, whose drivers were traveling at their desired speeds, the three types of speeds have the same value.

ARTERIAL LEVEL OF SERVICE

Arterial level of service is based on *average through-vehicle travel speed* for the segment, section, or entire arterial under consideration. This parameter is the basic measure of effectiveness (MOE) for Chapter 11. The average travel speed is computed from the running time on the arterial segment or segments and the intersection total delay for through movements at all intersections. To ensure that the arterial is of sufficient length so that average travel speed is a reasonable MOE, its length generally should be at least 1 mi in downtown areas and at least 2 mi in other areas.

Arterial level of service is defined in terms of *average travel speed* of all through vehicles on the arterial. It is strongly influenced by the number of signals per mile and the average intersection delay. On a given facility, such factors as inappropriate signal timing, poor progression, and increasing traffic flow can substantially degrade the arterial level of service. Arterials with medium to high signal densities (more than two signalized intersections per mile) are even more susceptible to these factors, and poor arterial level of service will probably be observed even before substantial intersection problems occur.

The following general statements may be made regarding arterial level of service:

1. *LOS A* describes primarily free-flow operations at average travel speeds, usually about 90 percent of the free-flow speed for the arterial classification. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersections is minimal.
2. *LOS B* represents reasonably unimpeded operations at average travel speeds, usually about 70 percent of the free-flow speed for the arterial classification. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.
3. *LOS C* represents stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than at LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial classification. Motorists will experience appreciable tension while driving.
4. *LOS D* borders on a range in which small increases in flow may cause substantial increases in delay and hence decreases in arterial speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these factors. Average travel speeds are about 40 percent of free-flow speed.
5. *LOS E* is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.
6. *LOS F* characterizes arterial flow at extremely low speeds below one-third to one-fourth of the free-flow speed. Intersection congestion is likely at critical signalized locations, with high delays and extensive queueing. Adverse progression is frequently a contributor to this condition.

Table 11-1 contains the arterial LOS definitions, which are based on average travel speed over the arterial segment being considered (up to and including the entire facility). It should be noted that if demand volume exceeds capacity at any point on the facility, average travel speed may not be a good measure of the arterial level of service. Thus, intersection volume-to-capacity ratios greater than 1.0 will probably result in a unacceptable level of service on the arterial. The arterial classification concept in Table 11-1 is defined as part of the methodology to follow.

TABLE 11-1. ARTERIAL LEVELS OF SERVICE

	ARTERIAL CLASSIFICATION		
	I	II	III
Range of free-flow speeds (mph)	45 to 35	35 to 30	35 to 25
Typical free-flow speeds (mph)	40	33	27
LEVEL OF SERVICE	AVERAGE TRAVEL SPEED (MPH)		
A	≥ 35	≥ 30	≥ 25
B	≥ 28	≥ 24	≥ 19
C	≥ 22	≥ 18	≥ 13
D	≥ 17	≥ 14	≥ 9
E	≥ 13	≥ 10	≥ 7
F	< 13	< 10	< 7

II. METHODOLOGY AND PROCEDURES FOR APPLICATION

This methodology provides the framework for arterial evaluation. If field data are available, this framework can be used to determine the level of service of a given arterial without reference to running time and intersection delay estimates. Rather than considering field evaluation to be a lesser method, the transportation analyst should consider such data to constitute a better and more accurate alternative. Arterial traffic models can also be used as alternatives for field data provided that input parameters such as running speeds and saturation flow rates are determined in a manner consistent with the procedures in this manual, the delay calculated or estimated by the model is defined consistent with the definition in this manual (i.e., average stopped delay per vehicle), and the delay outputs from the model are based on the delay equations in this manual or have been validated with field data.

Note that field data on free-flow speed will help in determining the arterial classification. In cases where the specific arterial does not yet exist, data on free-flow speed at comparable facilities are recommended as an estimate.

The procedure to determine arterial level of service involves seven steps, as shown in Figure 11-2:

1. Establish the location and length of the arterial to be considered;

Harry-Wurzbach Traffic Analysis
Field Visit

SUMMARY

South Bound

From and To	Segment	MORNING Arterial SPD mph	MORNING Arterial LOS	Afternoon Arterial SPD mph	Afternoon Arterial LOS	Evening Arterial SPD mph	Evening Arterial LOS	Average	
Scott Rd to Burr Rd	1	38.4	A	36.6	A	34.7	B	36.6	A
Burr Rd to Garraty Rd	2	37.7	A	38.2	A	29.3	B	35.1	B
Garraty Rd to Ivy	3	41.4	A	44.2	A	41.8	A	42.4	A
Ivy to Wiltshare Ave	4	36.8	A	30.9	B	38.4	A	35.3	B
Wiltshare Ave to Rittiman	5	36.5	A	38.7	A	39.3	A	38.2	B
Rittiman to Corinne Dr	6	4.6	F	7.7	F	24.4	C	12.2	F
Corinne Dr to Timberlane Dr	7	36.0	A	45.0	A	40.8	A	40.6	B
Timberlane Dr to Northeast Pkwy	8	36.0	A	13.3	E	36.9	A	28.7	C
Northeast Pkwy to Austin Hwy	9	15.1	E	19.2	D	24.8	C	19.7	**E**
Austin Hwy to Eisenhauer Rd	10	36.9	A	21.6	D	36.9	A	31.8	C
Eisenhauar Rd to Doven Haven Dr	11	30.1	B	25.6	C	26.0	C	27.2	C
Doven Haven Dr to Urban Crest Dr	12	33.9	B	35.5	A	41.0	A	36.8	B
Urban Crest Dr to Oakwell Farms	13	12.6	F	17.2	D	18.9	D	16.2	E
Oakwell Farms to Cripple Creek Str	14	32.5	B	35.7	A	41.5	A	36.6	B
Cripple Creek Str to Dalewood	15	22.0	C	24.0	C	22.5	C	22.8	D
		27.5	C	28.2	B	32.4	B	**30.7**	**C**

North Bound

From and To	Segment	Arterial SPD mph	Arterial LOS	Arterial SPD mph	Arterial LOS	Arterial SPD mph	Arterial LOS		
Scott Rd to Burr Rd	1	36.8	A	30.8	B	35.4	A	34.3	B
Burr Rd to Garraty Rd	2	39.6	A	35.6	A	38.2	A	37.8	B
Garraty Rd to Ivy	3	40.1	A	43.2	A	20.6	D	34.6	B
Ivy to Wiltshare Ave	4	45.5	A	39.3	A	12.1	F	32.3	C
Wiltshare Ave to Rittiman	5	19.3	D	15.2	E	9.4	F	14.6	F
Rittiman to Corinne Dr	6	27.0	C	28.0	B	27.0	C	27.3	C
Corinne Dr to Timberlane Dr	7	40.8	A	39.3	A	36.6	A	38.9	B
Timberlane Dr to Northeast Pkwy	8	40.9	A	37.8	A	36.0	A	38.2	B
Northeast Pkwy to Austin Hwy	9	26.7	C	29.9	B	19.0	D	25.2	C
Austin Hwy to Eisenhauer Rd	10	13.4	E	7.0	F	6.4	F	8.9	**F**
Eisenhauar Rd to Doven Haven Dr	11	44.4	A	39.1	A	39.4	A	41.0	A
Doven Haven Dr to Urban Crest Dr	12	24.5	C	26.4	C	23.3	C	24.7	C
Urban Crest Dr to Oakwell Farms	13	13.4	E	19.1	D	21.1	D	17.9	D
Oakwell Farms to Cripple Creek Str	14	32.7	B	52.8	A	23.2	C	36.2	A
Cripple Creek Str to Dalewood	15	7.2	F	6.0	F	4.6	F	5.9	F
		28.0	B	25.9	C	19.8	D	**27.9**	**C**

Harry-Wurzbach Traffic Analysis
Field Visit

MORNING

	South Bound		RUN, s					
			1	2	3		Arterial SPD	Arterial
From and To	Segment	Length, mi	7:15a	7:38a	8:04a	Avg, s	mph	LOS
Scott Rd to Burr Rd	1	0.81	77	77	74	76.00	38.4	A
Burr Rd to Garraty Rd	2	0.29	28	25	30	27.67	37.7	A
Garraty Rd to Ivy	3	0.36	30	34	30	31.33	41.4	A
Ivy to Wiltshare Ave	4	0.16	17	15	15	15.67	36.8	A
Wiltshare Ave to Rittiman	5	0.24	25	24	22	23.67	36.5	A
Rittiman to Corinne Dr	6	0.07	75	62	28	55.00	4.6	F
Corinne Dr to Timberlane Dr	7	0.20	21	18	21	20.00	36.0	A
Timberlane Dr to Northeast Pkwy	8	0.14	16	13	13	14.00	36.0	A
Northeast Pkwy to Austin Hwy	9	0.26	47	70	69	62.00	15.1	E
Austin Hwy to Eisenhauer Rd	10	0.14	15	14	12	13.67	36.9	A
Eisenhauar Rd to Doven Haven Dr	11	0.46	82	45	38	55.00	30.1	B
Doven Haven Dr to Urban Crest Dr	12	0.22	24	23	23	23.33	33.9	B
Urban Crest Dr to Oakwell Farms	13	0.17	48	52	46	48.67	12.6	F
Oakwell Farms to Cripple Creek Str	14	0.43	49	48	46	47.67	32.5	B
Cripple Creek Str to Dalewood	15	0.10	18	16	15	16.33	22.0	C
		4.05				530.00	27.5	C

North Bound		RUN, s					
		1	2	3		Arterial SPD	Arterial
Segment	Length, mi	12:15p	1:00p	1:45p	Avg, s	mph	LOS
1	0.81	75	81	83	79.67	36.6	A
2	0.29	28	26	28	27.33	38.2	A
3	0.36	33	29	26	29.33	44.2	A
4	0.16	17	14	25	18.67	30.9	B
5	0.24	25	23	19	22.33	38.7	A
6	0.07	10	61	27	32.67	7.7	F
7	0.20	17	17	14	16.00	45.0	A
8	0.14	13	13	88	38.00	13.3	E
9	0.26	23	100	23	48.67	19.2	D
10	0.14	14	16	40	23.33	21.6	D
11	0.46	30	134	30	64.67	25.6	C
12	0.22	21	17	29	22.33	35.5	A
13	0.17	29	23	55	35.67	17.2	D
14	0.43	47	28	55	43.33	35.7	A
15	0.10	14	14	17	15.00	24.0	C
	4.05				517.00	28.2	B

AFTERNOON

	North Bound		RUN, s					
			1	2	3		Arterial SPD	Arterial
	Segment	Length, mi	7:27a	7:50a	8:15a	Avg, s	mph	LOS
From and To	1	0.81	77	89	72	79.33	36.8	A
Scott Rd to Burr Rd	2	0.29	25	29	25	26.33	39.6	A
Burr Rd to Garraty Rd	3	0.36	30	37	30	32.33	40.1	A
Garraty Rd to Ivy	4	0.16	13	13	12	12.67	45.5	A
Ivy to Wiltshare Ave	5	0.24	20	90	24	44.67	19.3	D
Wiltshare Ave to Rittiman	6	0.07	7	11	10	9.33	27.0	C
Rittiman to Corinne Dr	7	0.20	16	18	19	17.67	40.8	A
Corinne Dr to Timberlane Dr	8	0.14	12	12	13	12.33	40.9	A
Timberlane Dr to Northeast Pkwy	9	0.26	61	22	22	35.00	26.7	C
Northeast Pkwy to Austin Hwy	10	0.14	14	55	44	37.67	13.4	E
Austin Hwy to Eisenhauer Rd	11	0.46	38	39	35	37.33	44.4	A
Eisenhauar Rd to Doven Haven Dr	12	0.22	37	42	18	32.33	24.5	C
Doven Haven Dr to Urban Crest Dr	13	0.17	43	66	28	45.67	13.4	E
Urban Crest Dr to Oakwell Farms	14	0.43	48	63	31	47.33	32.7	B
Oakwell Farms to Cripple Creek Str	15	0.10	27	105	18	50.00	7.2	F
Cripple Creek Str to Dalewood								
		4.05				520.00	28.0	B

North Bound		RUN, s					
		1	2	3		Arterial SPD	Arterial
Segment	Length, mi	12:00p	12:35p	1:30p	Avg, s	mph	LOS
1	0.81	87	107	90	94.67	30.8	B
2	0.29	28	30	30	29.33	35.6	A
3	0.36	26	34	30	30.00	43.2	A
4	0.16	17	14	13	14.67	39.3	A
5	0.24	36	45	90	57.00	15.2	E
6	0.07	10	9	8	9.00	28.0	B
7	0.20	20	18	17	18.33	39.3	A
8	0.14	14	14	12	13.33	37.8	A
9	0.26	44	25	25	31.33	29.9	B
10	0.14	75	71	71	72.33	7.0	F
11	0.46	46	42	39	42.33	39.1	A
12	0.22	18	41	31	30.00	26.4	C
13	0.17	33	34	29	32.00	19.1	D
14	0.43	33	29	26	29.33	52.8	A
15	0.10	63	81	37	60.33	6.0	F
	4.05				564.00	25.9	C

EVENING

	South Bound		RUN, s						RUN, s				
			1a	2a	1		Arterial SPD	Arterial	2	3		Arterial SPD	Arterial
From and To	Segment	Length, mi	4:10p	4:32p	4:50P	Avg, s	mph	LOS	5:15P	5:40P	Avg, s	mph	LOS
Scott Rd to Burr Rd	1	0.81	77	76	79	77.33	37.7	A	86	87	84.00	34.7	B
Burr Rd to Garraty Rd	2	0.29	26	46	25	32.33	32.3	B	33	49	35.67	29.3	B
Garraty Rd to Ivy	3	0.36	60	27	30	39.00	33.2	B	30	33	31.00	41.8	A
Ivy to Wiltshare Ave	4	0.16	34	13	13	20.00	28.8	B	16	16	15.00	38.4	A
Wiltshare Ave to Rittiman	5	0.24	33	22	22	25.67	33.7	B	21	23	22.00	39.3	A
Rittiman to Corinne Dr	6	0.07	37	48	16	33.67	7.5	F	7	8	10.33	24.4	C
Corinne Dr to Timberlane Dr	7	0.20	27	42	17	28.67	25.1	C	18	18	17.67	40.8	A
Timberlane Dr to Northeast Pkwy	8	0.14	12	13	14	13.00	38.8	A	14	13	13.67	36.9	A
Northeast Pkwy to Austin Hwy	9	0.26	24	95	38	52.33	17.9	D	42	33	37.67	24.8	C
Austin Hwy to Eisenhauer Rd	10	0.14	13	14	14	13.67	36.9	A	14	13	13.67	36.9	A
Eisenhauar Rd to Doven Haven Dr	11	0.46	46	147	39	77.33	21.4	D	103	49	63.67	26.0	C
Doven Haven Dr to Urban Crest Dr	12	0.22	17	19	15	17.00	46.6	A	21	22	19.33	41.0	A
Urban Crest Dr to Oakwell Farms	13	0.17	22	37	28	29.00	21.1	D	35	34	32.33	18.9	D
Oakwell Farms to Cripple Creek Str	14	0.43	49	41	31	40.33	38.4	A	41	40	37.33	41.5	A
Cripple Creek Str to Dalewood	15	0.10	12	15	16	14.33	25.1	C	16	16	16.00	22.5	C
		4.05				513.67	28.4	B			449.33	32.4	B

	North Bound		RUN, s						RUN, s				
			1a	2a	1		Arterial SPD	Arterial	2	3		Arterial SPD	Arterial
	Segment	Length, mi	4:20p	4:46p	5:05P	Avg, s	mph	LOS	5:25P	5:50P	Avg, s	mph	LOS
From and To	1	0.81	76	69	79	74.67	39.1	A	77	91	82.33	35.4	A
Scott Rd to Burr Rd	2	0.29	27	29	27	27.67	37.7	A	25	30	27.33	38.2	A
Burr Rd to Garraty Rd	3	0.36	51	42	74	55.67	23.3	C	63	52	63.00	20.6	D
Garraty Rd to Ivy	4	0.16	39	65	79	61.00	9.4	F	47	17	47.67	12.1	F
Ivy to Wiltshare Ave	5	0.24	68	113	182	121.00	7.1	F	58	36	92.00	9.4	F
Wiltshare Ave to Rittiman	6	0.07	10	11	9	10.00	25.2	C	10	9	9.33	27.0	C
Rittiman to Corinne Dr	7	0.20	19	17	19	18.33	39.3	A	19	21	19.67	36.6	A
Corinne Dr to Timberlane Dr	8	0.14	14	12	14	13.33	37.8	A	13	15	14.00	36.0	A
Timberlane Dr to Northeast Pkwy	9	0.26	23	54	31	36.00	26.0	C	26	91	49.33	19.0	D
Northeast Pkwy to Austin Hwy	10	0.14	114	69	36	73.00	6.9	F	94	108	79.33	6.4	F
Austin Hwy to Eisenhauer Rd	11	0.46	40	39	44	41.00	40.4	A	38	44	42.00	39.4	A
Eisenhauar Rd to Doven Haven Dr	12	0.22	25	33	26	28.00	28.3	B	50	26	34.00	23.3	C
Doven Haven Dr to Urban Crest Dr	13	0.17	41	22	31	31.33	19.5	D	26	30	29.00	21.1	D
Urban Crest Dr to Oakwell Farms	14	0.43	33	28	99	53.33	29.0	B	65	36	66.67	23.2	C
Oakwell Farms to Cripple Creek Str	15	0.10	40	47	150	79.00	4.6	F	72	15	79.00	4.6	F
Cripple Creek Str to Dalewood													
		4.05				723.33	20.2	D			734.67	19.8	D

MPO data

SB/NB				
			Arterial SPD	Arterial
Segment	Length, mi	Time, s	mph	LOS
1	0.81	137.00	21.3	D
2	0.29	50.00	20.9	D
3	0.36	62.00	20.9	D
4	0.16	29.00	19.9	D
5	0.24	44.00	19.6	D
6	0.07	14.00	18.0	D
7	0.20	34.00	21.2	D
8	0.14	24.00	21.0	D
9	0.26	44.00	21.3	D
10	0.14	25.00	20.2	D
11	0.46	74.00	22.4	C
12	0.22	35.00	22.6	C
13	0.17	26.00	23.5	C
14	0.43	73.00	21.2	D
15	0.10	14.00	25.7	C
	4.05	685.00	21.3	D

From and To
Scott Rd to Burr Rd
Burr Rd to Garraty Rd
Garraty Rd to Ivy
Ivy to Wiltshare Ave
Wiltshare Ave to Rittiman
Rittiman to Corinne Dr
Corinne Dr to Timberlane Dr
Timberlane Dr to Northeast Pkwy
Northeast Pkwy to Austin Hwy
Austin Hwy to Eisenhauer Rd
Eisenhauar Rd to Doven Haven Dr
Doven Haven Dr to Urban Crest Dr
Urban Crest Dr to Oakwell Farms
Oakwell Farms to Cripple Creek Str
Cripple Creek Str to Dalewood

MPO ADT'S

2025

SB/NB					
		Facility Environment		DDHV	Arterial
Segment	AADT, vpd	K	D	vph	LOS
1	24974	0.10	0.6	749.2	C
2	23756	0.10	0.6	712.7	C
3	24344	0.10	0.6	730.3	C
4	26712	0.10	0.6	801.4	C
5	26902	0.10	0.6	807.1	C
6	0	0.10	0.6	0.0	
7	24770	0.10	0.6	743.1	C
8	0	0.10	0.6	0.0	
9	27798	0.10	0.6	833.9	C
10	0	0.10	0.6	0.0	
11	31974	0.10	0.6	959.2	D
* 12	15101	0.10	0.6	906.1	C
* 13	18133	0.10	0.6	1088.0	D
* 14	17738	0.10	0.6	1064.3	D
* 15	17581	0.10	0.6	1054.9	D
			AVG	870.8	C

* One lane data

MPO data

Existing

2010

SB/NB				
ADT	Facility Environment		DDHV	Arterial
	K	D	vph	LOS
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
18861	0.10	0.6	565.8	B
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
	0.10	0.6	0.0	
32037	0.10	0.6	961.1	D
		AVG		

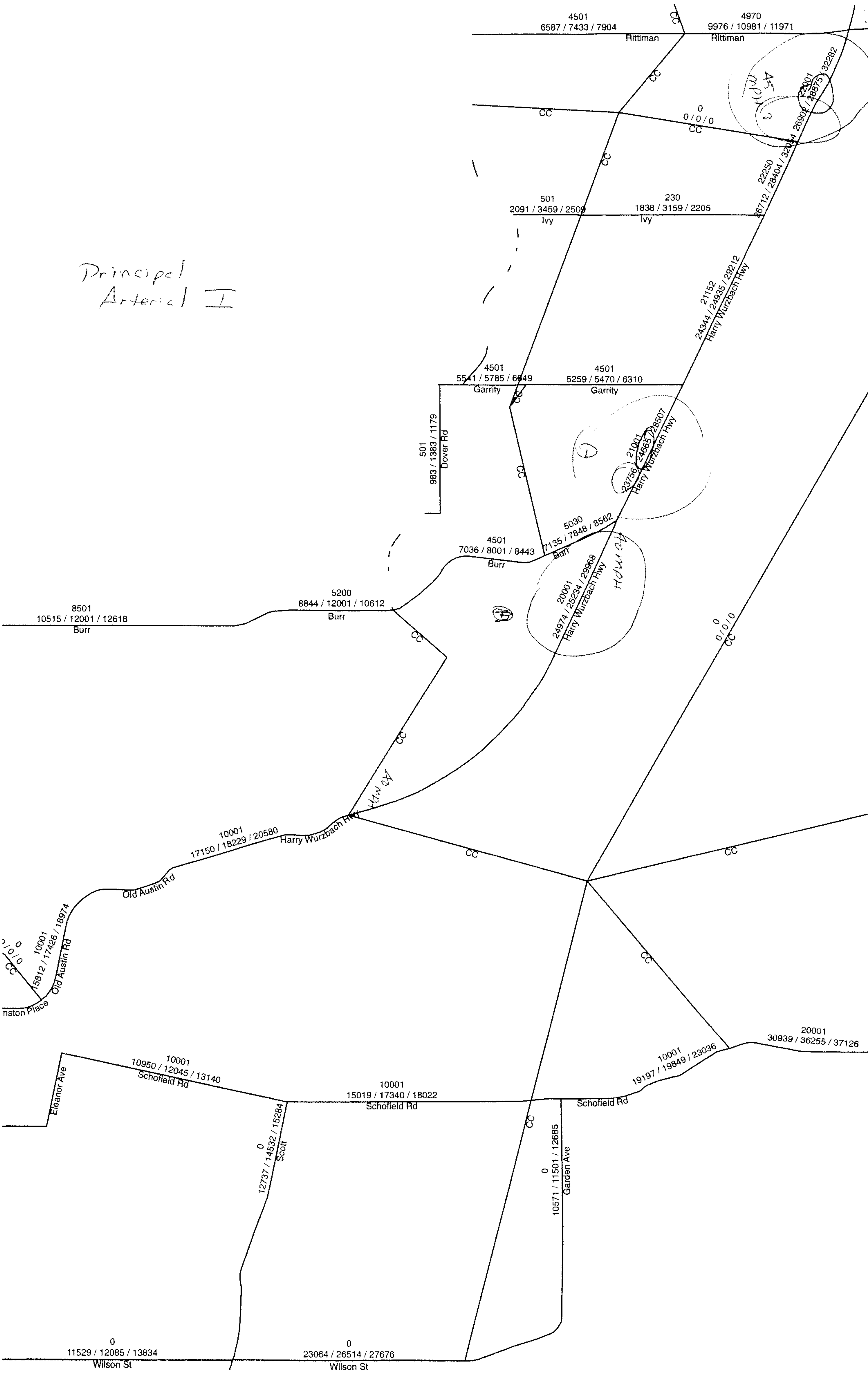
From and To
Scott Rd to Burr Rd
Burr Rd to Garraty Rd
Garraty Rd to Ivy
Ivy to Wiltshare Ave
Wiltshare Ave to Rittiman
Rittiman to Corinne Dr
Corinne Dr to Timberlane Dr
Timberlane Dr to Northeast Pkwy
Northeast Pkwy to Austin Hwy
Austin Hwy to Eisenhauer Rd
Eisenhauar Rd to Doven Haven Dr
Doven Haven Dr to Urban Crest Dr *
Urban Crest Dr to Oakwell Farms *
Oakwell Farms to Cripple Creek Str *
Cripple Creek Str to Dalewood *

MPO ADT'S

2035

SB/NB					
		Facility Environment		DDHV	Arterial
Segment	AADT, vpd	K	D	vph	LOS
1	25234	0.10	0.6	757.0	C
2	24665	0.10	0.6	740.0	C
3	24935	0.10	0.6	748.1	C
4	28404	0.10	0.6	852.1	C
5	28875	0.10	0.6	866.3	C
6	0	0.10	0.6	0.0	
7	27445	0.10	0.6	823.4	C
8	0	0.10	0.6	0.0	
9	30075	0.10	0.6	902.3	C
10	0	0.10	0.6	0.0	
11	35445	0.10	0.6	1063.4	D
12	15731	0.10	0.6	943.9	D
13	20672	0.10	0.6	1240.3	E
14	19511	0.10	0.6	1170.7	E
15	20063	0.10	0.6	1203.8	E
			AVG	942.6	D

* One lane data


4501
6587 / 7433 / 7904
Rittiman
4970
9976 / 10981 / 11971
Rittiman
22001 / 28875 / 32282
24504 / 26902 / 32054
45 mpH
0
0 / 0 / 0
CC
22250
26712 / 28404 / 32054
501
2091 / 3459 / 2509
Ivy
230
1838 / 3159 / 2205
Ivy
Principal Arterial I
21152
24344 / 24935 / 29212
Harry Wurzbach Hwy
4501
5541 / 5785 / 6649
Garrity
4501
5259 / 5470 / 6310
Garrity
501
983 / 1383 / 1179
Dover Rd
21001
24665 / 28507
Harry Wurzbach Hwy
23756
5030
7135 / 7848 / 8562
Burr
40 mpH
4501
7036 / 8001 / 8443
Burr
20001
24974 / 25234 / 29968
Harry Wurzbach Hwy
8501
10515 / 12001 / 12618
Burr
5200
8844 / 12001 / 10612
Burr
0
0 / 0 / 0
CC
40 mpH
10001
17150 / 18229 / 20580
Harry Wurzbach Hwy
Old Austin Rd
10001
15812 / 17426 / 18974
Old Austin Rd
nston Place
20001
30939 / 36255 / 37126
10001
19197 / 19849 / 23036
10001
10950 / 12045 / 13140
Schofield Rd
10001
15019 / 17340 / 18022
Schofield Rd
Schofield Rd
Eleanor Ave
0
12737 / 14532 / 15284
Scott
0
10571 / 11501 / 12685
Garden Ave
0
11529 / 12085 / 13834
Wilson St
0
23064 / 26514 / 27676
Wilson St

14480
13684 / 13735 / 16420
Holbrook
Ira Lee
1930
3091 / 3400 / 3709
2480
6051 / 7842 / 7261
Ira Lee Rd
1930
2459 / 2459 / 2950
0
0 / 0 / 0
CC
15822
19852 / 22167 / 23822
Eisenhauer Rd
19350
22345 / 26084 / 26814
Ritliman Rd
Corinne
7430
10487 / 12704 / 12584
13001
15931 / 17404 / 19117
Eisenhauer Rd
6160
7313 / 8965 / 8775
20001
23624 / 27470 / 28348
Ritliman
2730
0 / 0 / 0
Lp 368
20001
24770 / 27445 / 29724
45 mph
Harry Wurzbach Hwy
22001
27798 / 30075 / 33357
8260
12542 / 13306 / 15050
25001
35502 / 43331 / 42602
22001
26902 / 28875 / 32282
4970
9976 / 10981 / 11971
6921
12463 / 14697 / 14955
6541
9338 / 6501 / 11205
IH 410
13920
17738 / 19511 / 21285
13920
17581 / 20063 / 21097
3001
4266 / 5579 / 5119
45 mph
13501
8133 / 20672 / 21759
13092
15101 / 15731 / 18121
26501
31974 / 35445 / 38368
45 mph
4
2382
5233 / 6955 / 6279
Urban Crest
5770
9352 / 11193 / 11222
Eisenhauer Rd
23840
29196 / 34380 / 34999
Lp 368
0
0 / 0 / 0
4501
6587 / 7433 / 7904
Ritliman
0
0 / 0 / 0
1330
0 / 0 / 0
2001
5330 / 7111 / 6396
Urban Crest
6001
9070 / 10518 / 10884
Eisenhauer Rd
23501
28946 / 34337 / 34735
Lp 368
Vandiver
6001
6501 / 7001 / 7801
2570
7043 / 9263 / 8451
IH 410

CITY OF SAN ANTONIO
TRAFFIC ENGINEERING
COUNT DATA

MAIN ST: HARRY WURZBACH RD SB S OF
CROSS ST: BURR RD
COUNTER #: 2417

Site: NO BLK #

Weekly Volume, per Channel
Channel: SB

Interval Begin	Mon 10/25/2010	Tue 10/26/2010	Wed 10/27/2010	Thu 10/28/2010	Fri 10/29/2010	Sat 10/30/2010	Sun 10/31/2010	Mon - Fri Average	Week Average
12:00 AM	-	13	-	-	-	-	-	13.0	13.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
2:00 AM	-	11	-	-	-	-	-	11.0	11.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
4:00 AM	-	136	-	-	-	-	-	136.0	136.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
6:00 AM	-	983	-	-	-	-	-	983.0	983.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
8:00 AM	-	697	-	-	-	-	-	697.0	697.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
10:00 AM	-	295	-	-	-	-	-	295.0	295.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
12:00 PM	669	-	-	-	-	-	-	669.0	669.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
2:00 PM	258	-	-	-	-	-	-	258.0	258.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
4:00 PM	287	-	-	-	-	-	-	287.0	287.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
6:00 PM	225	-	-	-	-	-	-	225.0	225.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
8:00 PM	137	-	-	-	-	-	-	137.0	137.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
10:00 PM	54	-	-	-	-	-	-	54.0	54.0
[illegible]	[illegible]	[illegible]	-	-	-	-	-	[illegible]	[illegible]
Totals	3159	3976	-	-	-	-	-	7135.0	7135.0
Peak Hours									
12:00 AM - 12:00 PM	11:00 AM	7:00 AM	-	-	-	-	-	7:00 AM	7:00 AM
Volume	355	1107	-	-	-	-	-	1107.0	1107.0
12:00 PM - 12:00 AM	12:00 PM	-	-	-	-	-	-	12:00 PM	12:00 PM
Volume	669	-	-	-	-	-	-	669.0	669.0

CITY OF SAN ANTONIO
TRAFFIC ENGINEERING
COUNT DATA

MAIN ST: HARRY WURZBACH RD NB S OF
CROSS ST: BURR RD
COUNTER #: 2419

Site: NO BLK #

Weekly Volume, per Channel
Channel: NB

Interval Begin	Mon 10/25/2010	Tue 10/26/2010	Wed 10/27/2010	Thu 10/28/2010	Fri 10/29/2010	Sat 10/30/2010	Sun 10/31/2010	Mon - Fri Average	Week Average
12:00 AM	-	15	-	-	-	-	-	15.0	15.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2:00 AM	-	6	-	-	-	-	-	6.0	6.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4:00 AM	-	13	-	-	-	-	-	13.0	13.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6:00 AM	-	148	-	-	-	-	-	148.0	148.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8:00 AM	-	224	-	-	-	-	-	224.0	224.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10:00 AM	-	290	-	-	-	-	-	290.0	290.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12:00 PM	488	-	-	-	-	-	-	488.0	488.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2:00 PM	396	-	-	-	-	-	-	396.0	396.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4:00 PM	1383	-	-	-	-	-	-	1383.0	1383.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6:00 PM	426	-	-	-	-	-	-	426.0	426.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8:00 PM	166	-	-	-	-	-	-	166.0	166.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10:00 PM	75	-	-	-	-	-	-	75.0	75.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Totals	6112	1223	-	-	-	-	-	7335.0	7335.0
Peak Hours									
12:00 AM - 12:00 PM	11:00 AM	10:00 AM	-	-	-	-	-	11:00 AM	11:00 AM
Volume	694	290	-	-	-	-	-	694.0	694.0
12:00 PM - 12:00 AM	4:00 PM	-	-	-	-	-	-	4:00 PM	4:00 PM
Volume	1383	-	-	-	-	-	-	1383.0	1383.0

CITY OF SAN ANTONIO
TRAFFIC ENGINEERING
COUNT DATA

MAIN ST: HARRY WURZBACH RD NB/SB S OF
CROSS ST: LOOP 410
COUNTER #: 2853

Site: 4300 BLK

Weekly Volume

Interval Begin	Mon 10/25/2010 NB	SB	Tue 10/26/2010 NB	SB	Wed 10/27/2010 NB	SB	Thu 10/28/2010 NB	SB	Fri 10/29/2010 NB	SB	Sat 10/30/2010 NB	SB	Sun 10/31/2010 NB	SB	Mon - Fri Average NB	SB	Week Average NB	SB
12:00 AM	-	-	96	86	-	-	-	-	-	-	-	-	-	-	96.0	86.0	96.0	86.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2:00 AM	-	-	41	33	-	-	-	-	-	-	-	-	-	-	41.0	33.0	41.0	33.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4:00 AM	-	-	71	81	-	-	-	-	-	-	-	-	-	-	71.0	81.0	71.0	81.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6:00 AM	-	-	508	556	-	-	-	-	-	-	-	-	-	-	508.0	556.0	508.0	556.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8:00 AM	-	-	848	910	-	-	-	-	-	-	-	-	-	-	848.0	910.0	848.0	910.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10:00 AM	814	842	-	-	-	-	-	-	-	-	-	-	-	-	814.0	842.0	814.0	842.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12:00 PM	1278	1122	-	-	-	-	-	-	-	-	-	-	-	-	1278.0	1122.0	1278.0	1122.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2:00 PM	1020	956	-	-	-	-	-	-	-	-	-	-	-	-	1020.0	956.0	1020.0	956.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4:00 PM	1435	1287	-	-	-	-	-	-	-	-	-	-	-	-	1435.0	1287.0	1435.0	1287.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6:00 PM	1108	962	-	-	-	-	-	-	-	-	-	-	-	-	1108.0	962.0	1108.0	962.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8:00 PM	623	440	-	-	-	-	-	-	-	-	-	-	-	-	623.0	440.0	623.0	440.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10:00 PM	296	223	-	-	-	-	-	-	-	-	-	-	-	-	296.0	223.0	296.0	223.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Totals	13057	11464	3631	3885	-	-	-	-	-	-	-	-	-	-	16688.0	15349.0	16688.0	15349.0
Combined	24521		7516		-		-		-		-		-		32037.0		32037.0	
Split (%)	53.2	46.8	48.3	51.7	-	-	-	-	-	-	-	-	-	-	52.1	47.9	52.1	47.9
Peak Hours 12:00 AM - 12:00 PM	11:00 AM	11:00 AM	9:00 AM	7:00 AM	-	-	-	-	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	1041	1032	902	1054	-	-	-	-	-	-	-	-	-	-	1041.0	1054.0	1041.0	1054.0
12:00 PM - 12:00 AM	5:00 PM	5:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	5:00 PM
Volume	1557	1393	-	-	-	-	-	-	-	-	-	-	-	-	1557.0	1393.0	1557.0	1393.0

CITY OF SAN ANTONIO
TRAFFIC ENGINEERING
COUNT DATA

MAIN ST: HARRY WURZBACH RD NB/SB S OF
CROSS ST: AUSTIN HWY
COUNTER #: 2837

Site: 2600 BLK

Weekly Volume

Interval Begin	Mon 10/25/2010 NB	Mon SB	Tue 10/26/2010 NB	Tue SB	Wed 10/27/2010 NB	Wed SB	Thu 10/28/2010 NB	Thu SB	Fri 10/29/2010 NB	Fri SB	Sat 10/30/2010 NB	Sat SB	Sun 10/31/2010 NB	Sun SB	Mon - Fri Average NB	Mon - Fri Average SB	Week Average NB	Week Average SB
12:00 AM	-	-	51	58	-	-	-	-	-	-	-	-	-	-	51.0	58.0	51.0	58.0
[redacted]																		
2:00 AM	-	-	31	31	-	-	-	-	-	-	-	-	-	-	31.0	31.0	31.0	31.0
[redacted]																		
4:00 AM	-	-	39	110	-	-	-	-	-	-	-	-	-	-	39.0	110.0	39.0	110.0
[redacted]																		
6:00 AM	-	-	269	636	-	-	-	-	-	-	-	-	-	-	269.0	636.0	269.0	636.0
[redacted]																		
8:00 AM	-	-	419	742	-	-	-	-	-	-	-	-	-	-	419.0	742.0	419.0	742.0
[redacted]																		
10:00 AM	361	577	-	-	-	-	-	-	-	-	-	-	-	-	361.0	577.0	361.0	577.0
[redacted]																		
12:00 PM	561	757	-	-	-	-	-	-	-	-	-	-	-	-	561.0	757.0	561.0	757.0
[redacted]																		
2:00 PM	514	625	-	-	-	-	-	-	-	-	-	-	-	-	514.0	625.0	514.0	625.0
[redacted]																		
4:00 PM	809	690	-	-	-	-	-	-	-	-	-	-	-	-	809.0	690.0	809.0	690.0
[redacted]																		
6:00 PM	556	633	-	-	-	-	-	-	-	-	-	-	-	-	556.0	633.0	556.0	633.0
[redacted]																		
8:00 PM	287	296	-	-	-	-	-	-	-	-	-	-	-	-	287.0	296.0	287.0	296.0
[redacted]																		
10:00 PM	123	142	-	-	-	-	-	-	-	-	-	-	-	-	123.0	142.0	123.0	142.0
[redacted]																		
Totals	6410	7167	1800	3484	-	-	-	-	-	-	-	-	-	-	8210.0	10651.0	8210.0	10651.0
Combined	13577		5284		-		-		-		-		-		18861.0		18861.0	
Split (%)	47.2	52.8	34.1	65.9	-	-	-	-	-	-	-	-	-	-	43.5	56.5	43.5	56.5
Peak Hours 12:00 AM - 12:00 PM	11:00 AM	11:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	532	768	460	1026	-	-	-	-	-	-	-	-	-	-	532.0	1026.0	532.0	1026.0
12:00 PM - 12:00 AM	5:00 PM	12:00 PM	-	-	-	-	-	-	-	-	-	-	-	-	5:00 PM	12:00 PM	5:00 PM	12:00 PM
Volume	850	757	-	-	-	-	-	-	-	-	-	-	-	-	850.0	757.0	850.0	757.0

File: C:\Program Files\TMWin\Data-JDF\R1000856.rdf

Report Date: 10/26/2010 3:25 PM

John Wolters

From: Blas Pizzi
Sent: Thursday, October 21, 2010 3:34 PM
To: John Wolters
Cc: Christina De La Cruz
Subject: TRAFFIC COUNTS: HARRY WAURBACH RD

Traffic Count Data Base

Major Street	Location	Cross Street	Direction	Date Counted	Turned in	Completed	Volume
Harry Wurzbach Rd	W of	Scott	EB	4/7/2003	4/8/2003	4/9/2003	5700
Harry Wurzbach Rd	E of	Scott	WB	4/7/2003	4/8/2003	4/9/2003	4809
Harry Wurzbach Rd	N of	Base Entrance	NB	10/15/2003	10/16/2003	10/17/2003	6150
Harry Wurzbach Rd	N of	Base Entrance	SB	10/15/2003	10/16/2003	10/17/2003	5150
Harry Wurzbach Rd	S of	San Antonio Blvd	NB	9/6/2005	9/7/2005	9/8/2005	8629
Harry Wurzbach Rd	N of	San Antonio Blvd	SB	9/6/2005	9/7/2005	9/8/2005	8483
Harry Wurzbach Rd	S of	Rittiman Rd	NB	4/20/2006	4/21/2006	4/24/2006	9037
Harry Wurzbach Rd	N of	Rittiman Rd	SB	4/20/2006	4/21/2006	4/24/2006	10304
Harry Wurzbach Rd	S of	Burr Rd	NB	10/5/2006	10/6/2006	10/9/2006	5886
Harry Wurzbach Rd	S of	Burr Rd	SB	10/5/2006	10/6/2006	10/9/2006	4031
Harry Wurzbach Rd	N of	Eisehauer Rd	NB/SB	10/23/2007	10/24/2007	10/25/2007	22881
Harry Wurzbach Rd	S of	Rittiman Rd	NB/SB	2/7/2008	2/8/2008	2/11/2008	21068

APPENDIX A: TRAFFIC COUNTS

1. Introduction

The firm of GRAM Traffic Counting Inc. collected 24-hour bi-directional mid-block counts and peak period turning movement counts. Mechanical counters recorded the 24-hour mid-block counts in 15-minute intervals on January 22 and 23, 2007. Peak period turning movement counts were manually recorded at 15-minute intervals on January 23, 2007, from 7:00 am to 9:00 am, 11:00 am to 1:00 pm and 4:00 pm to 6:00 pm. The locations of mid-block and peak period turning movement counts are illustrated in **Figure A1** and tabulated in **Table A2**.

Figure A1: Mid-Block and Peak Hour Turning Movement Count Locations

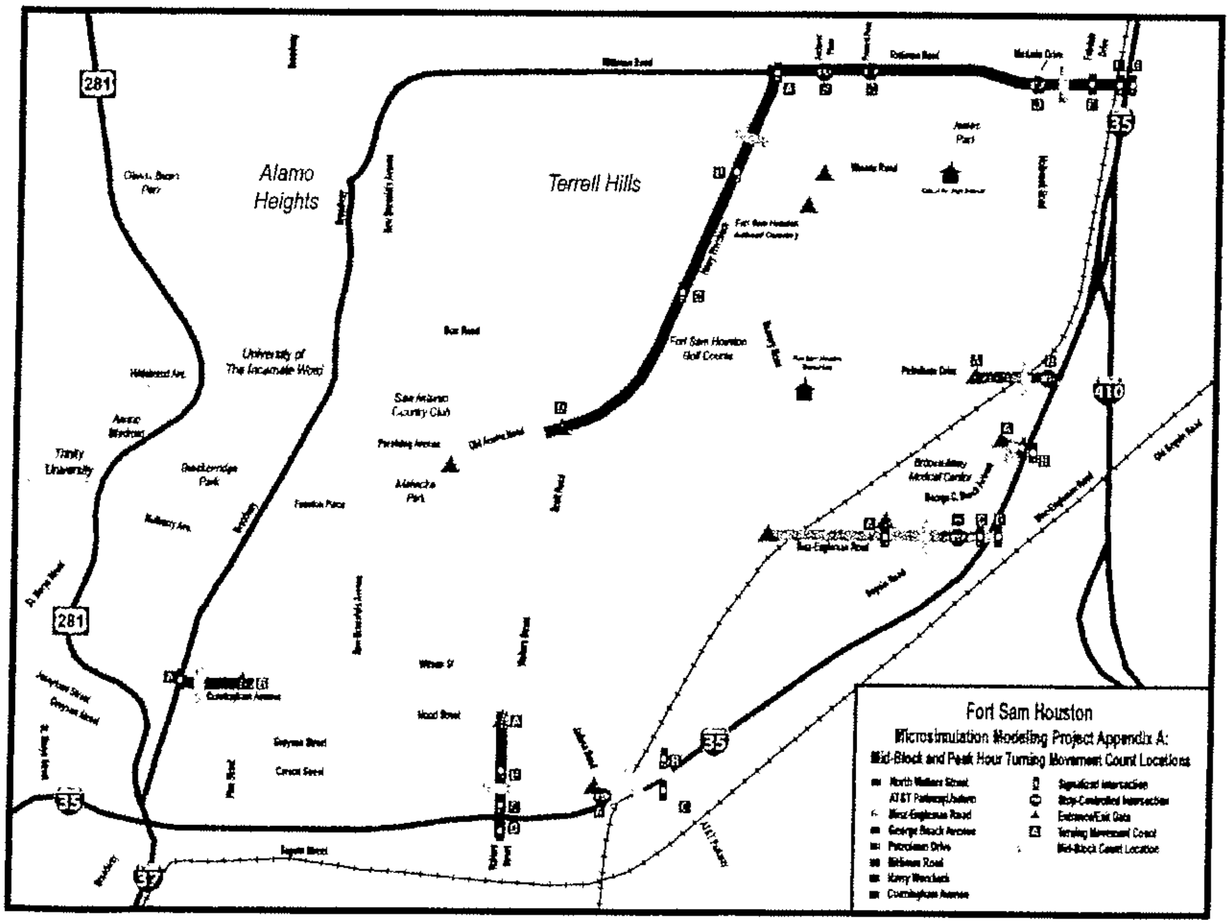


Table A1: Mid-Block Count Corridors

Mid-Block ID	Corridor	Location
1	North Walters Street	Between Carson Street and IH-35
2	AT&T Parkway/Jadwin	Between Jadwin Road and IH-35
3	Binz-Engleman Road	Between George C. Beach Avenue and Seguin Road
4	George C. Beach Avenue/BAMC	Between George C. Beach Avenue and IH-35
5	Petroleum Drive	Between Holbrook Road and IH-35
6	Rittiman Road	Between Holbrook Road and Fairdale Drive
7	Harry Wurzbach	Between Rittiman Road and Winans Road
8	Cunningham Avenue	Between Broadway Street and Pine Street

Table A2: Peak Period Turning Movement Count Locations

Intersection ID	Corridor	Location
A	North Walters Street	Hood Street/Walters Street
B		Carson Street/Walters Street
C		Walters Street/IH-35WBFR
D		Walters Street/IH-35EBFR
A	AT&T Parkway/Jadwin	AT&T Center Parkway/Jadwin Road
B		AT&T Center Parkway/IH-35WBFR
C		AT&T Center Parkway/IH-35EBFR
A	Binz-Engleman Road	Binz-Engleman Road/George C. Beach Avenue
B		Binz-Engleman Road/Seguin Road
C		Binz-Engleman Road/IH-35WBFR
D		Binz-Engleman Road/IH-35EBFR
A	George C. Beach Avenue/BAMC	George C. Beach Avenue/BAMC at IH-35WBFR
B		George C. Beach Avenue/BAMC at IH-35EBFR
A	Petroleum Drive	Petroleum Drive/Holbrook Road
B		Petroleum Drive/IH-35
A	Rittiman Road	Harry Wurzbach Highway/Rittiman Road
B		Rittiman Road/Andover Place
C		Rittiman Road/Fremont Place
D		Rittiman Road/Mandarin Drive
E		Rittiman Road/Fairdale Drive
F		Rittiman Road/IH-35WBFR
G		Rittiman Road/IH-35EBFR
B	Harry Wurzbach	Harry Wurzbach Highway/Winans Road
C		Harry Wurzbach Highway/Burr Road
D		Harry Wurzbach Highway/Scott Road
A	Cunningham Avenue	Cunningham Avenue/Broadway Street
B		Cunningham Avenue/Pine Street

Figure A8: Mid-Block Count, Harry Wurzbach Corridor (Tuesday, January 23, 2007)

	Southbound		Northbound	
Time	Morning	Afternoon	Morning	Afternoon
12:00 AM	9	166	11	207
12:15 AM	8	180	13	201
12:30 AM	8	201	10	166
12:45 AM	7	207	8	151
01:00 AM	4	200	6	147
01:15 AM	4	148	7	134
01:30 AM	6	157	5	143
01:45 AM	4	142	6	135
02:00 AM	4	104	4	121
02:15 AM	6	133	5	182
02:30 AM	6	129	3	162
02:45 AM	5	98	5	179
03:00 AM	5	115	4	178
03:15 AM	5	113	1	202
03:30 AM	6	104	1	182
03:45 AM	6	122	4	236
04:00 AM	9	108	5	275
04:15 AM	12	97	2	410
04:30 AM	39	106	3	349
04:45 AM	40	104	8	453
05:00 AM	46	131	12	433
05:15 AM	53	129	24	408
05:30 AM	78	110	19	351
05:45 AM	133	129	35	289
06:00 AM	95	123	28	241
06:15 AM	117	114	48	212
06:30 AM	165	95	52	175
06:45 AM	250	91	69	148
07:00 AM	311	74	76	124
07:15 AM	352	82	84	98
07:30 AM	418	67	105	105
07:45 AM	354	61	110	65
08:00 AM	290	60	99	66
08:15 AM	277	54	90	91
08:30 AM	225	73	91	72
08:45 AM	214	44	71	74
09:00 AM	168	46	85	53
09:15 AM	130	36	72	64
09:30 AM	105	35	76	54
09:45 AM	155	36	90	43
10:00 AM	108	32	94	32
10:15 AM	117	26	78	47
10:30 AM	112	24	124	25
10:45 AM	105	20	121	19
11:00 AM	121	22	136	18
11:15 AM	125	13	182	29
11:30 AM	122	12	227	17
11:45 AM	140	11	255	12
Total	5079	4484	2664	7578
Percent	53.1%	46.9%	26.0%	74.0%
Daily Total	9563		10242	

Figure A16: AM Peak Hour Turning Movement, Harry Wurzbach Corridor

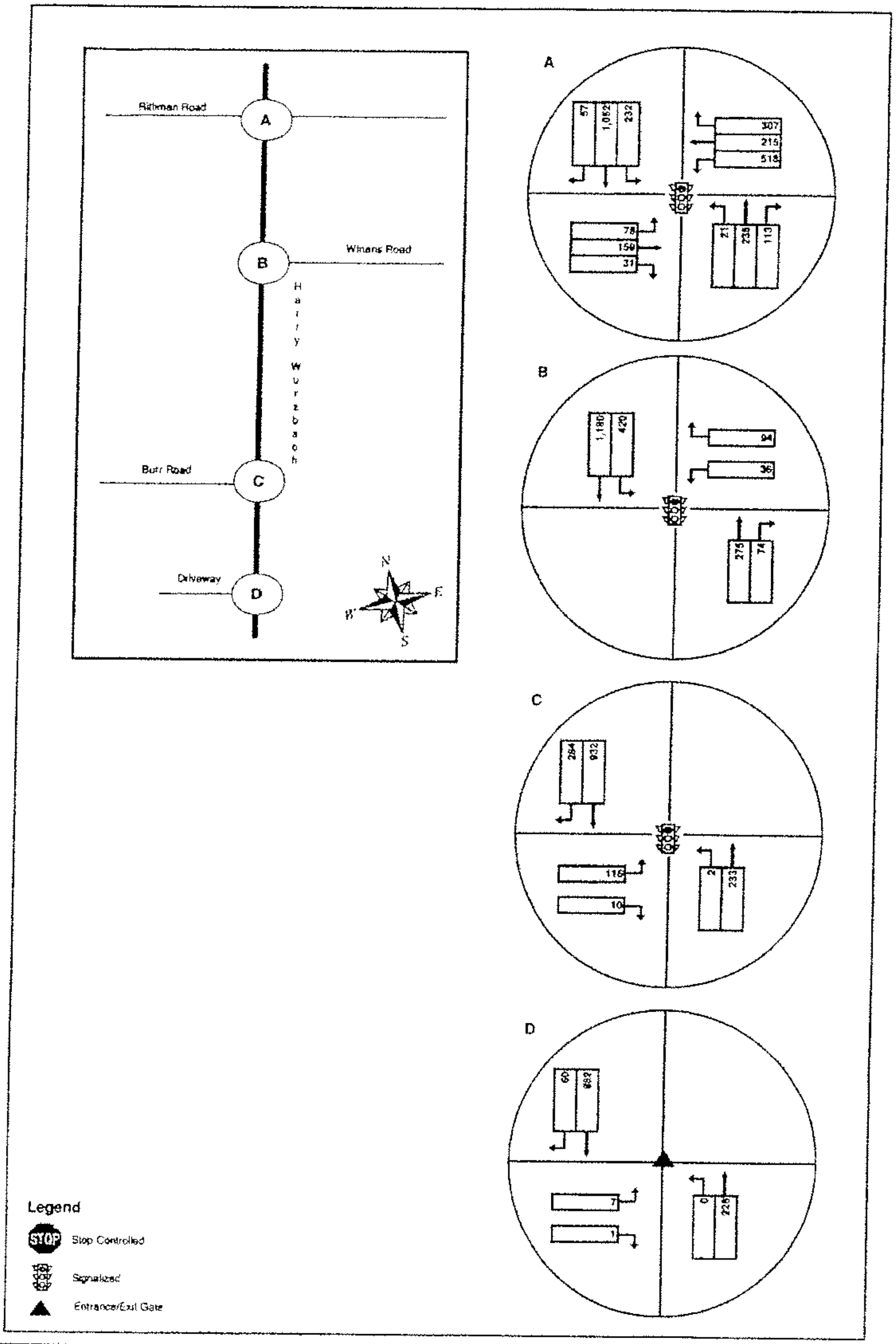


Figure A24: PM Peak Hour Turning Movement, Harry Wurzbach Corridor

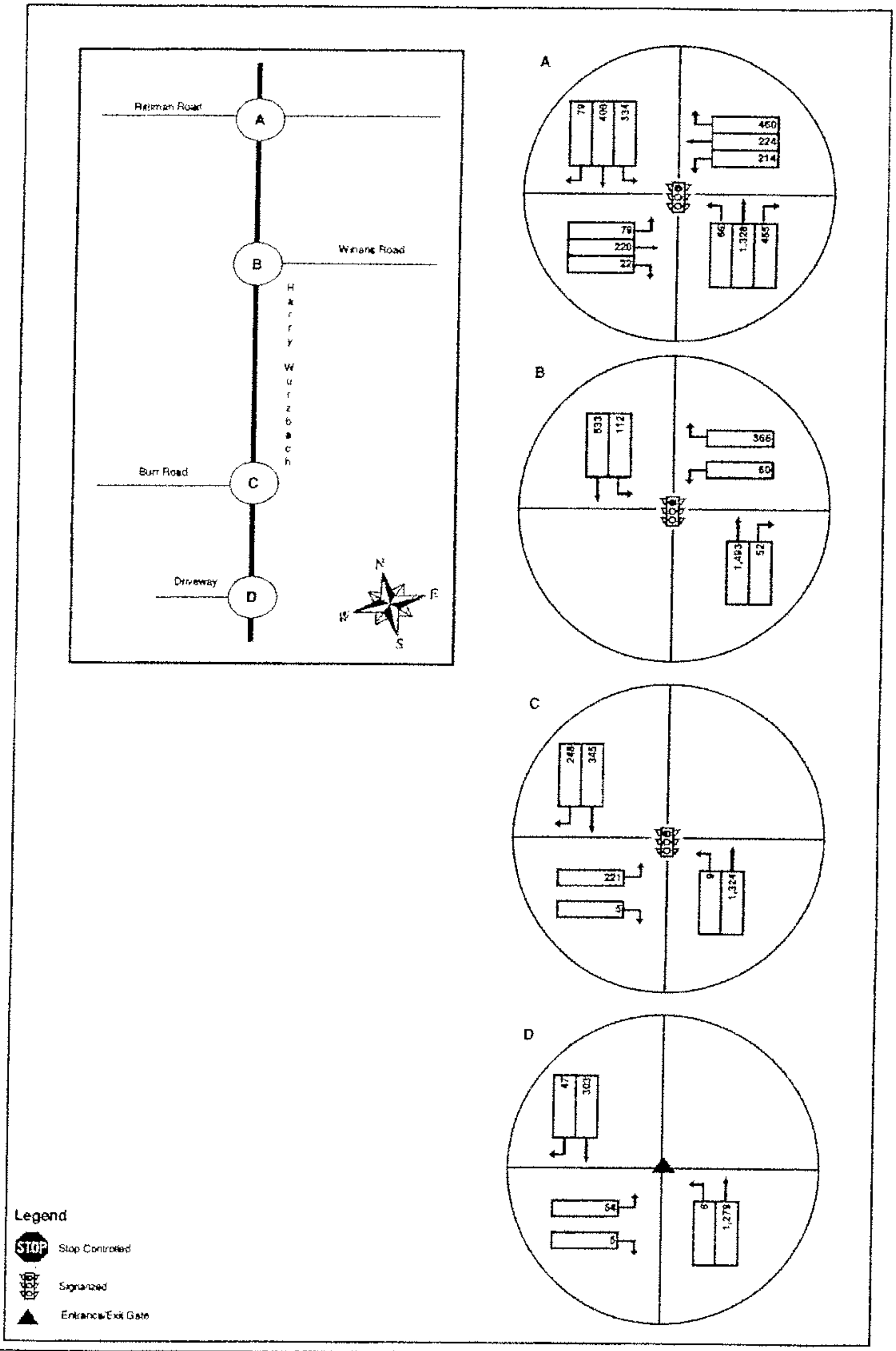


Figure H8: AM 2012 Peak Hour Forecasts, Harry Wurzbach Corridor

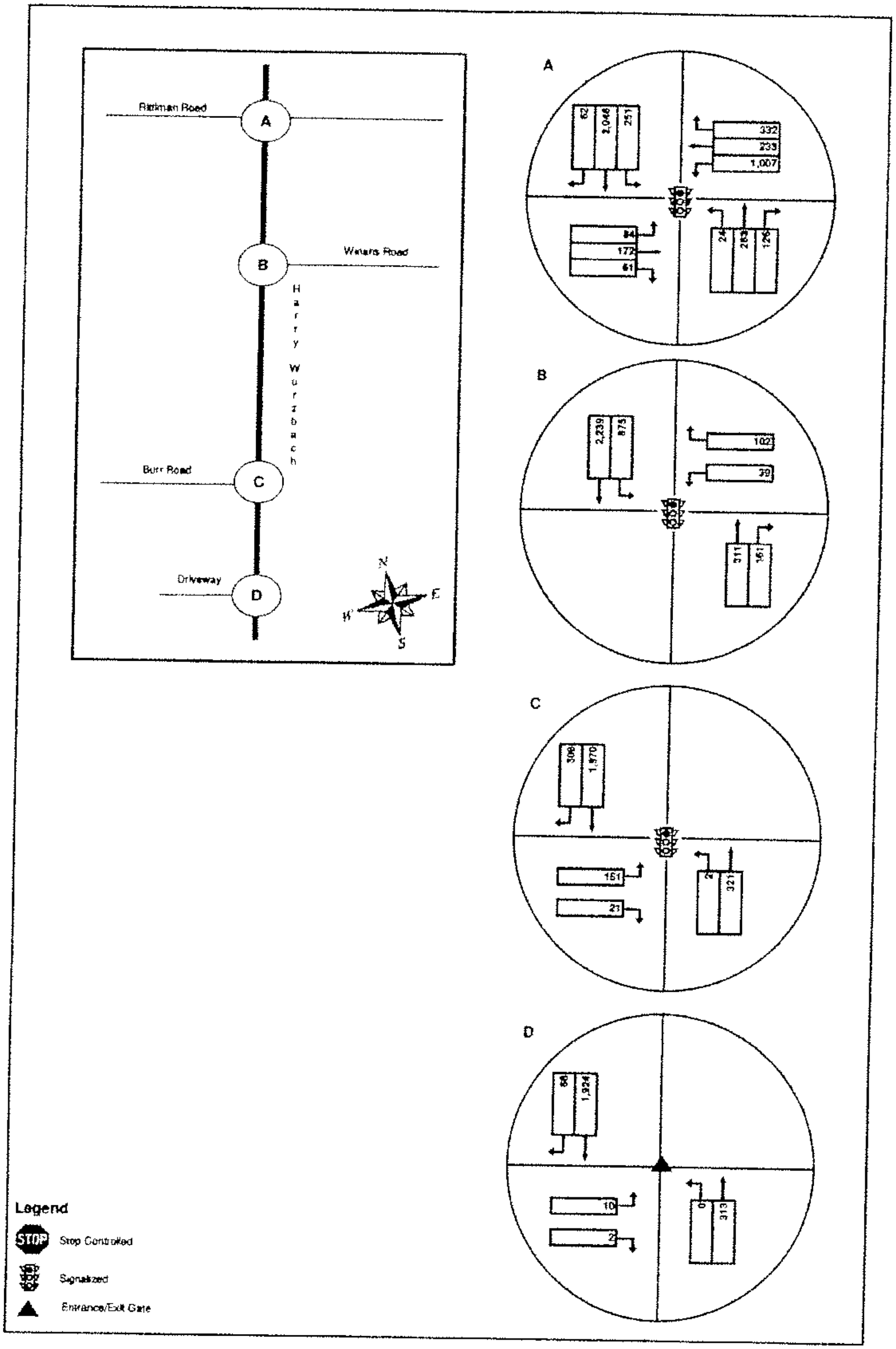
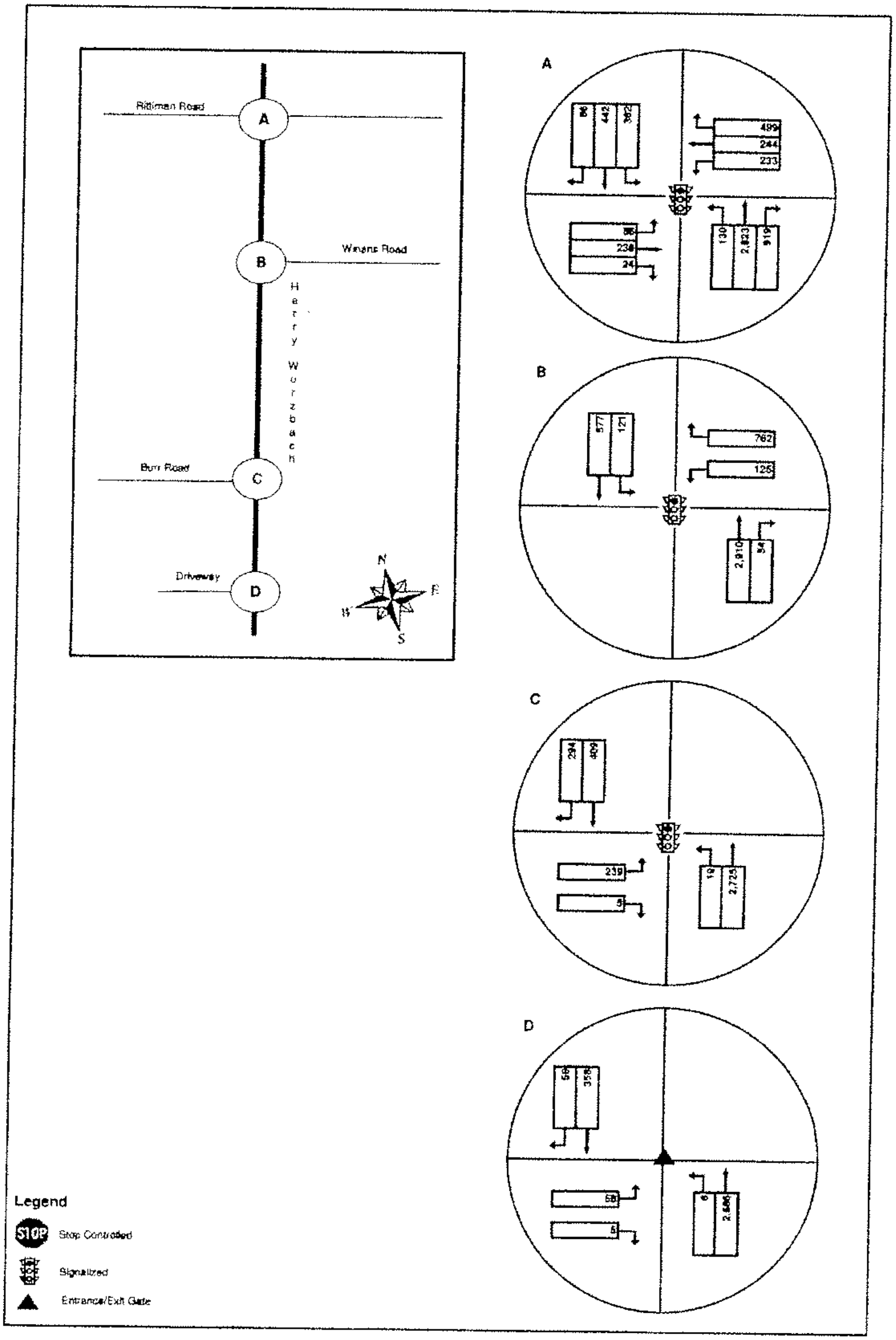


Figure H16: PM 2012 Peak Hour Forecasts, Harry Wurzbach Corridor



Evaluation Based on Field Data

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: ____________ ________ -bound

File or Case # ____________ Date: ________

____________ Prepared by: ________

ART SPD = $\frac{3600 \text{ (Sum of Length)}}{\text{Sum of Time}}$

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	40					136.8	0.81	21.32	D/C
2	0.29	I	40					49.8	0.29	20.96	D
3	0.36	I	45					61.8	0.36	20.97	D
4	0.16	I	45					28.8	0.16	20.00	D
5	0.24	I	45					43.8	0.24	19.73	D
6	0.07	I	45					14.4	0.07	17.50	D/E
7	0.20	I	45					33.6	0.20	21.40	D/C
8	0.14	I	45					24.0	0.14	21.00	D
9	0.26	I	45					43.8	0.26	21.37	D/C
10	0.14	I	45					24.6	0.14	20.49	D
11	0.46	I	45					77.8	0.46	22.44	C
12a	0.22	I	45	NB			35.1 <	39.0	0.22	20.31	D
12b				SB				31.2		24.23	C
13a	0.17	I	45	NB			26.1 <	30.0	0.17	20.40	D
13b				SB				22.2		27.56	C/B
14a	0.43	I	45	NB			72.9 <	76.2	0.43	20.31	D
14b				SB				69.6		22.24	C/D
15	0.1	I	45	NB				14.4	0.1	25.0	C
				SB							

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

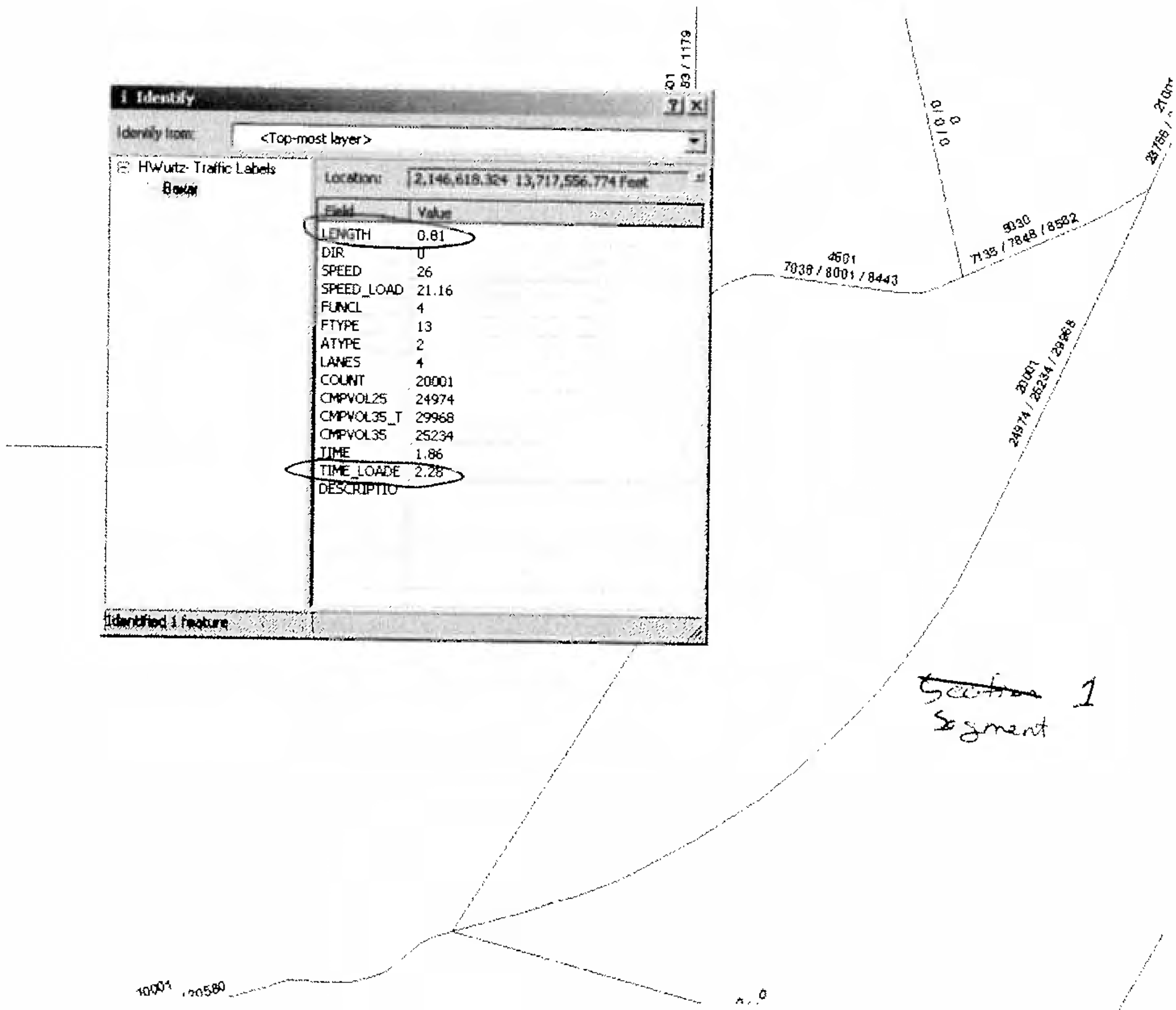
Multilane two-way divided arterial with left-turn bays and good access control

Grand Sum of Time (x) = ~~[illegible]~~ 683.7

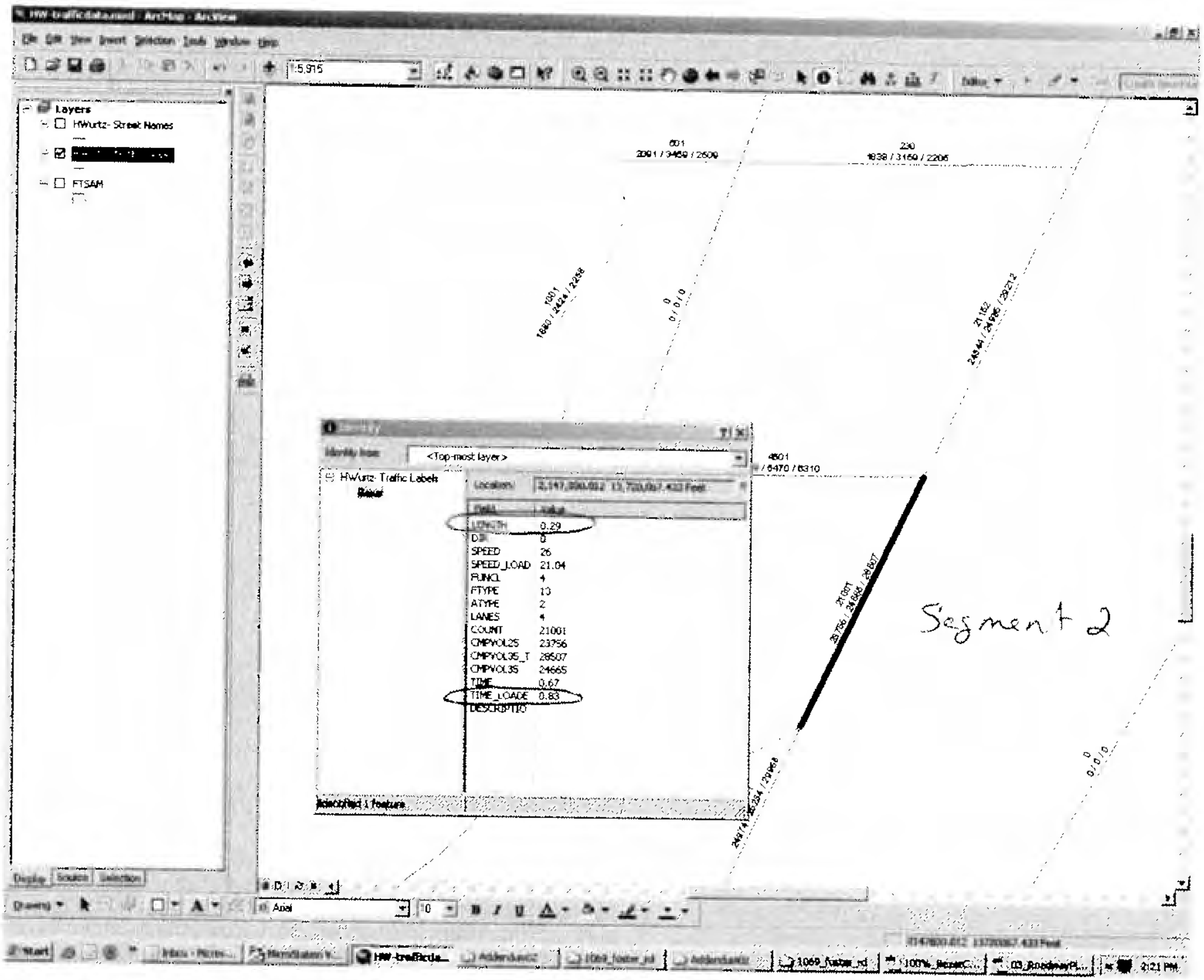
Grand Sum of Length (y) = 4.05

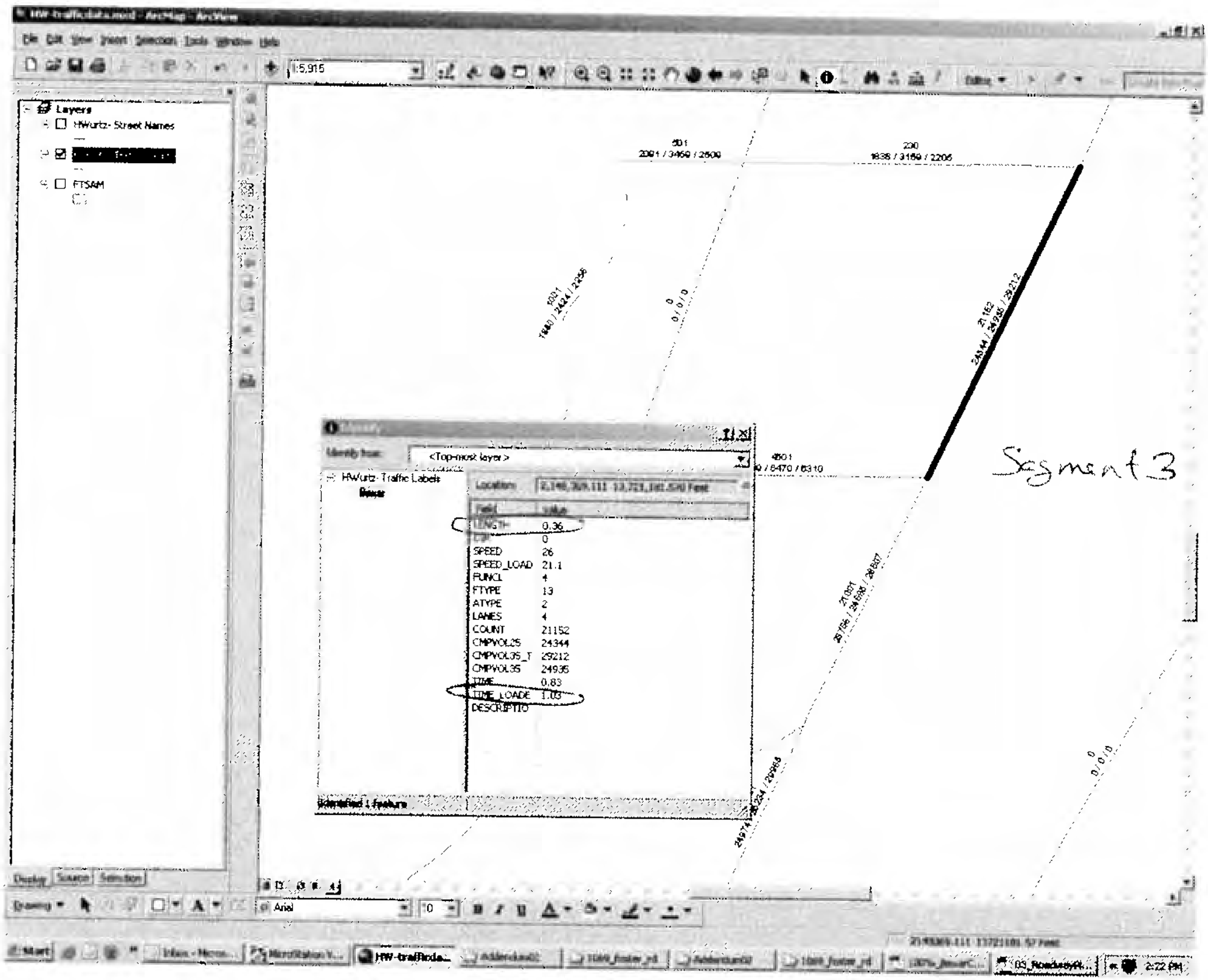
$\frac{3600 * (Y)}{(X)}$ = = ~~[illegible]~~ 21.32

Arterial LOS = D/

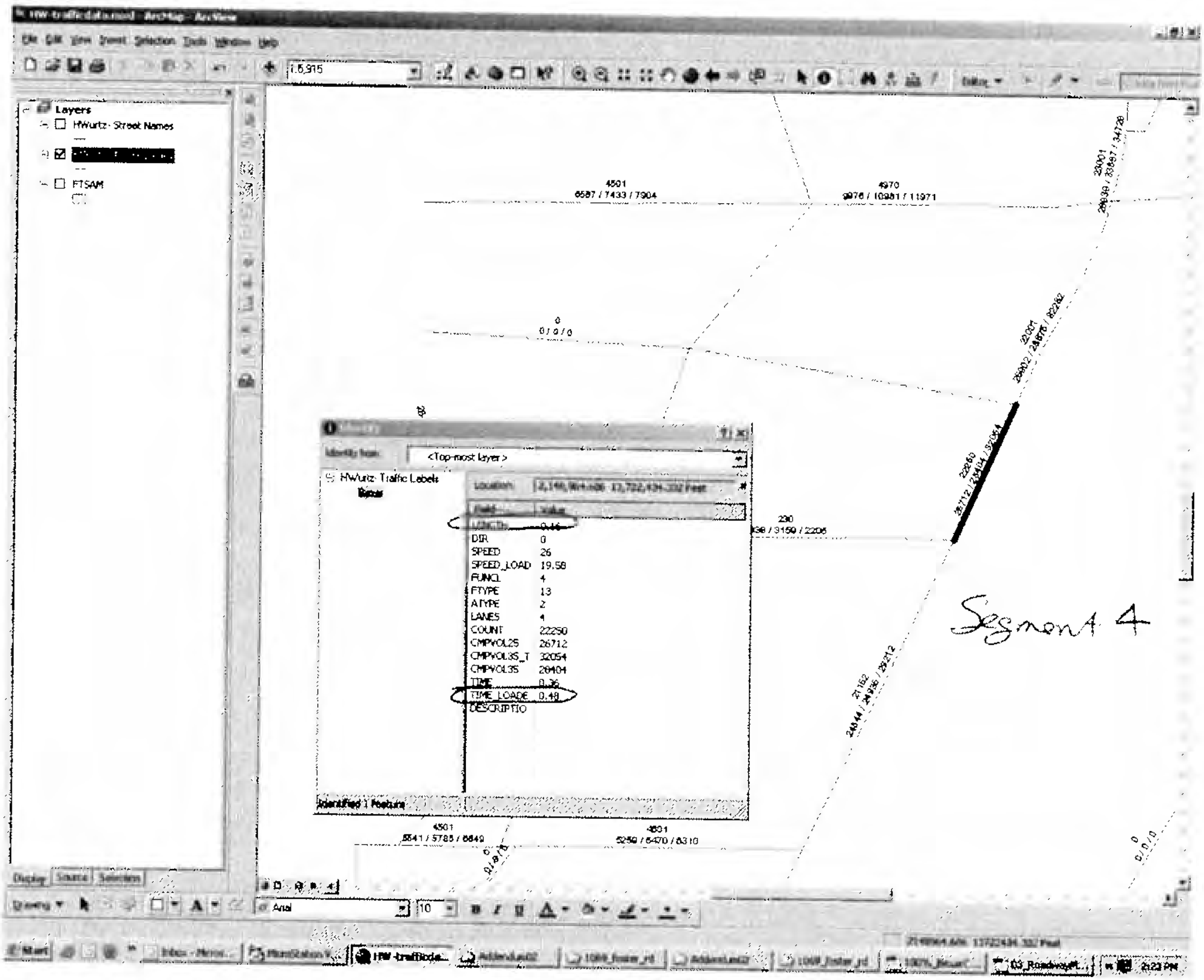


Identify
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Bexar
Location: 2,146,618.324 13,717,556.774 Feet
Field Value
LENGTH 0.81
DIR 0
SPEED 26
SPEED_LOAD 21.16
FUNCL 4
FTYPE 13
ATYPE 2
LANES 4
COUNT 20001
CMPVOL25 24974
CMPVOL35_T 29968
CMPVOL35 25234
TIME 1.86
TIME_LOADE 2.28
DESCRIPTIO
Identified 1 feature
4601
7038 / 8001 / 8443
0 / 0 / 0
0
9030
7135 / 7848 / 8582
20001
24974 / 25234 / 29968
~~Section~~ 1
Segment

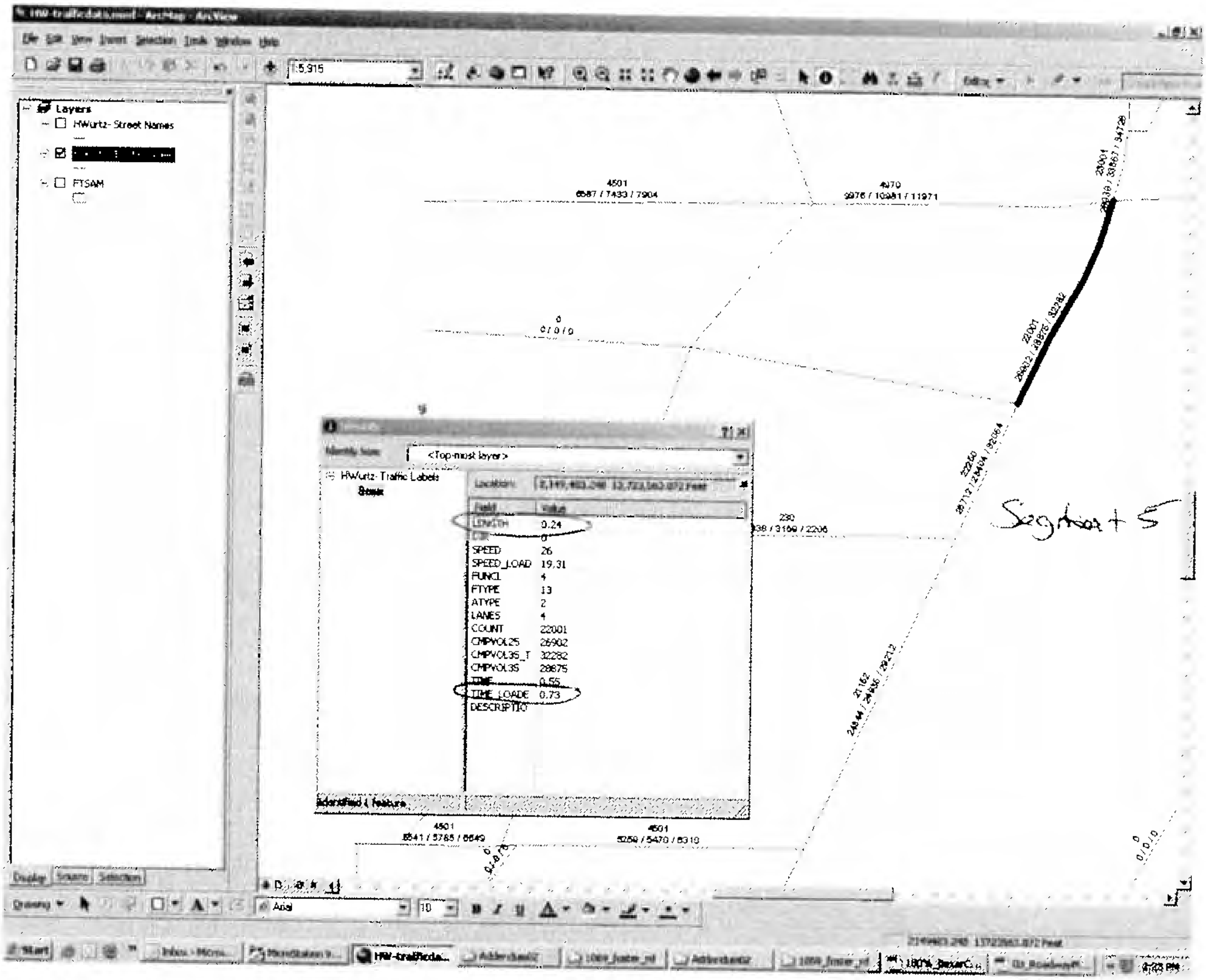

HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
601
2091 / 3459 / 2509
230
1838 / 3169 / 2206
1001
1680 / 2424 / 2258
0
0 / 0 / 0
21182
24941 / 24986 / 29212
4801
/ 6470 / 6310
21001
25756 / 24666 / 28507
Identify
Identify from:
<Top-most layer>
HWurtz- Traffic Labels
Location:
Field
Value
LENGTH 0.29
DIR 0
SPEED 26
SPEED_LOAD 21.04
FUNCL 4
FTYPE 13
ATYPE 2
LANES 4
COUNT 21001
CMPVOL25 23756
CMPVOL35_T 28507
CMPVOL35 24665
TIME 0.67
TIME_LOADE 0.83
DESCRIPTIO
Identified 1 feature
Segment 2
Drawing
Arial
10
Start
2:21 PM



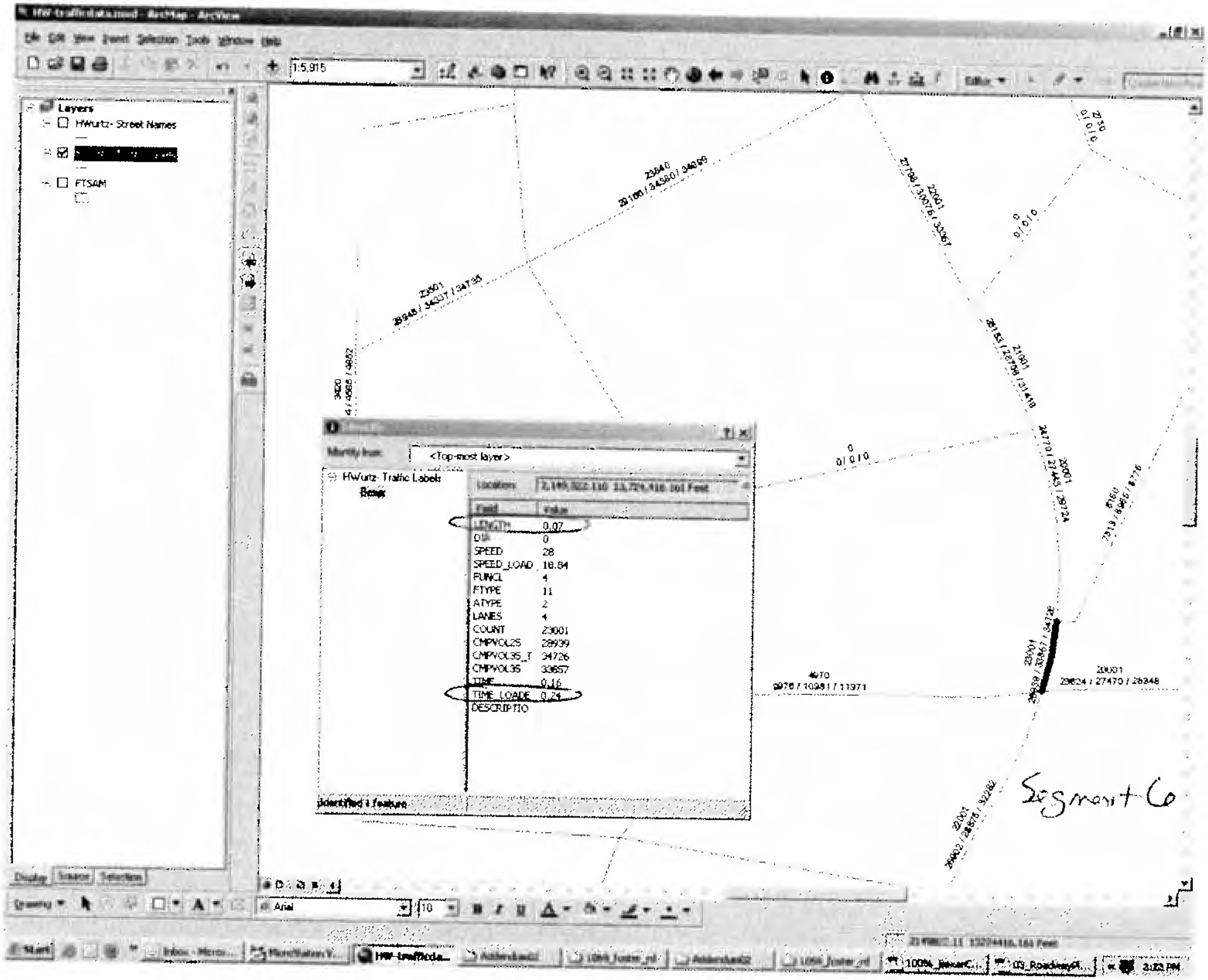
Layers
HWurtz- Street Names
FTSAM
1:5,915
501
2091 / 3469 / 2500
200
1838 / 3169 / 2206
1001
1840 / 2424 / 2256
0
0 / 0 / 0
21,152
24344 / 24935 / 29212
Segment 3
4501
0 / 8470 / 8310
21,001
25796 / 24696 / 28807
24974 / 26224 / 29968
<Top-most layer>
HWurtz- Traffic Labels
LENGTH 0.36
CAP 0
SPEED 26
SPEED_LOAD 21.1
FUNCL 4
FTYPE 13
ATYPE 2
LANES 4
COUNT 21152
CMPVOL25 24344
CMPVOL35_T 29212
CMPVOL35 24935
TIME 0.83
TIME_LOADE 1.03
DESCRIPTIO
Identified 1 feature
Arial
10
2:22 PM

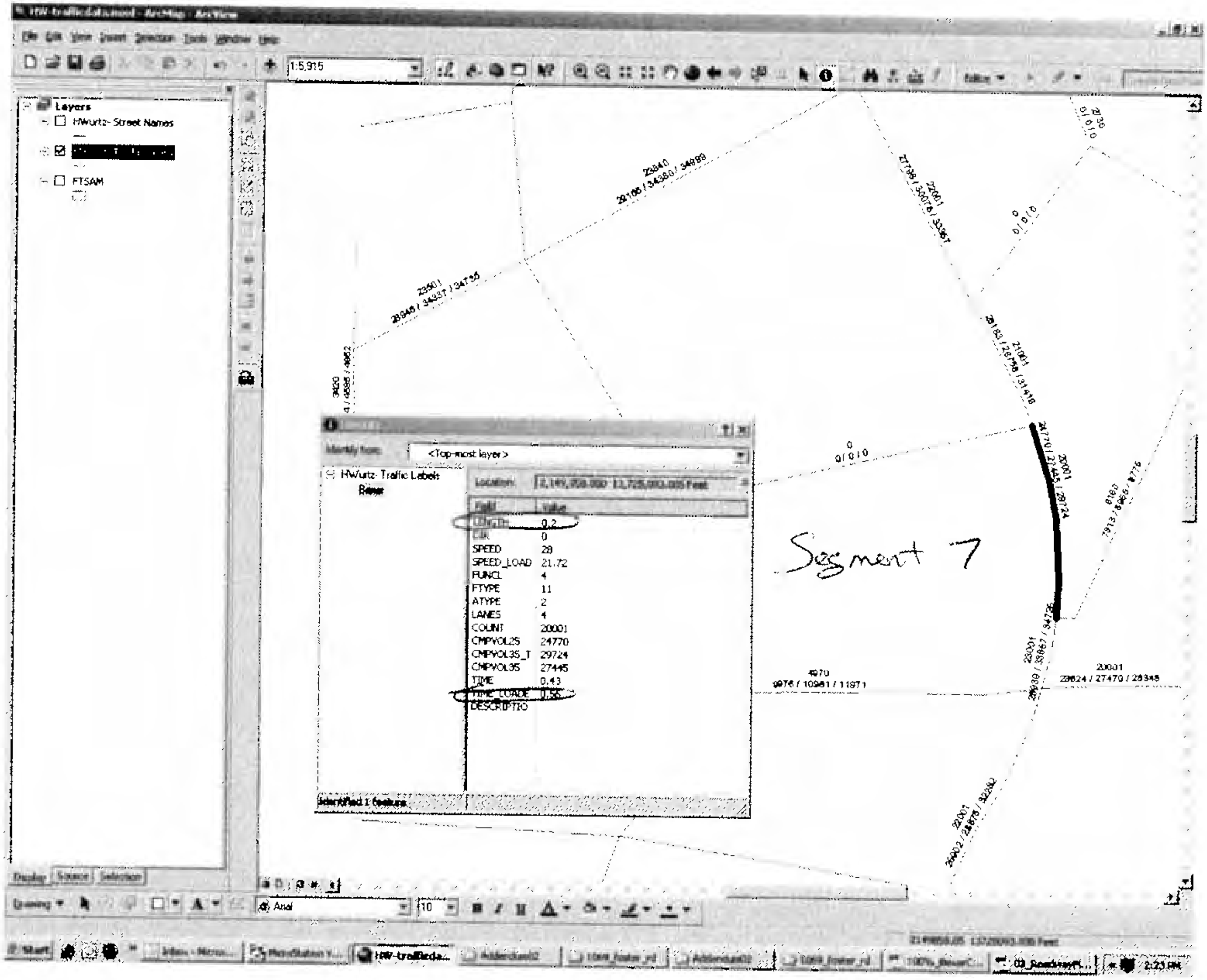


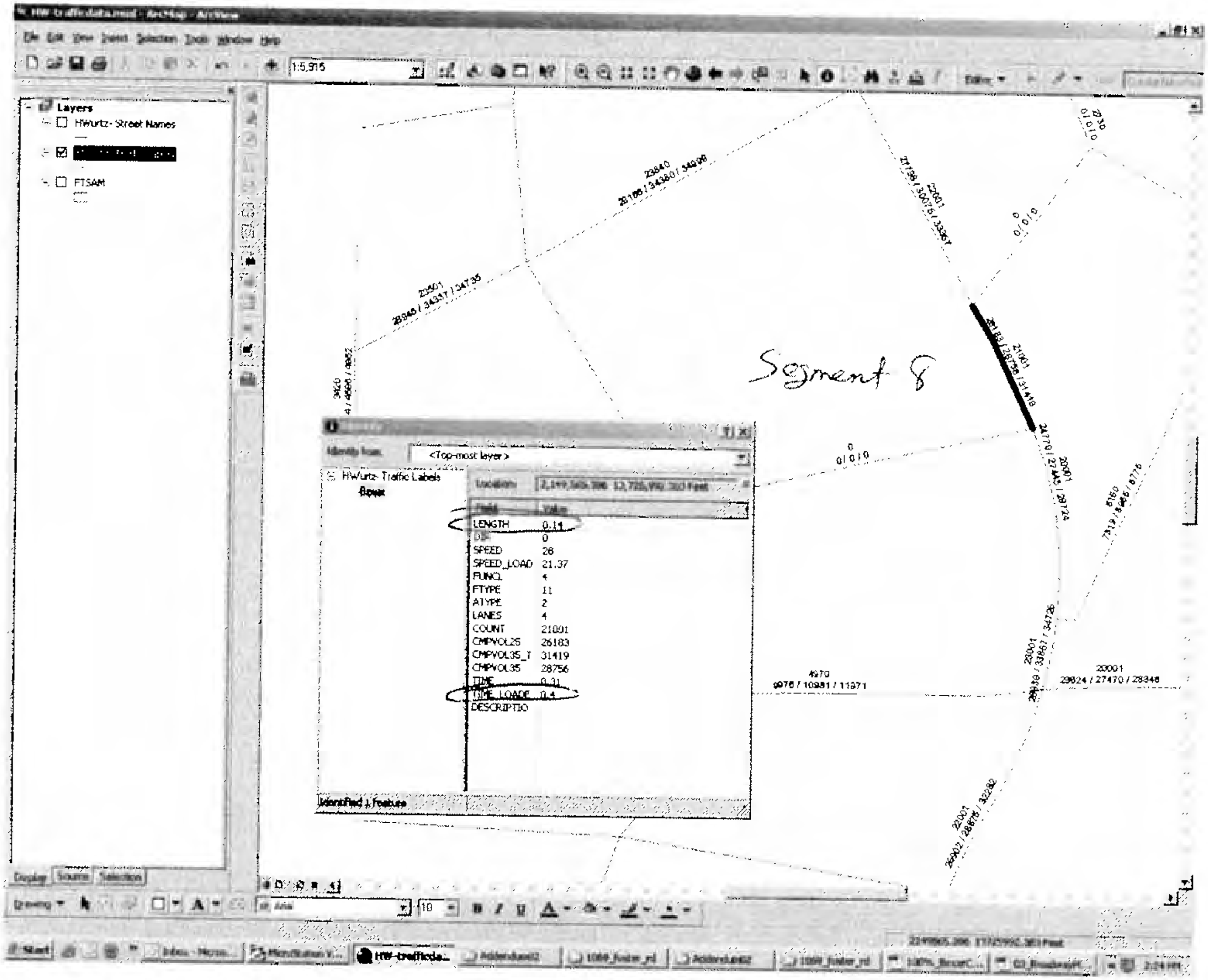
Layers
HWurtz- Street Names
FTSAM
<Top-most layer>
HWurtz- Traffic Labels
LENGTH 0.16
DIR 0
SPEED 26
SPEED_LOAD 19.58
FUNCL 4
FTYPE 13
ATYPE 2
LANES 4
COUNT 22250
CMPVOL25 26712
CMPVOL35_T 32054
CMPVOL35 28404
TIME 0.36
TIME_LOADE 0.48
DESCRIPTIO
4501
6587 / 7433 / 7904
4970
9976 / 10981 / 11971
0
0 / 0 / 0
22250
26712 / 28404 / 32054
21162
24644 / 24936 / 29212
4501
5641 / 5785 / 6849
4501
5250 / 6470 / 6310
Segment 4

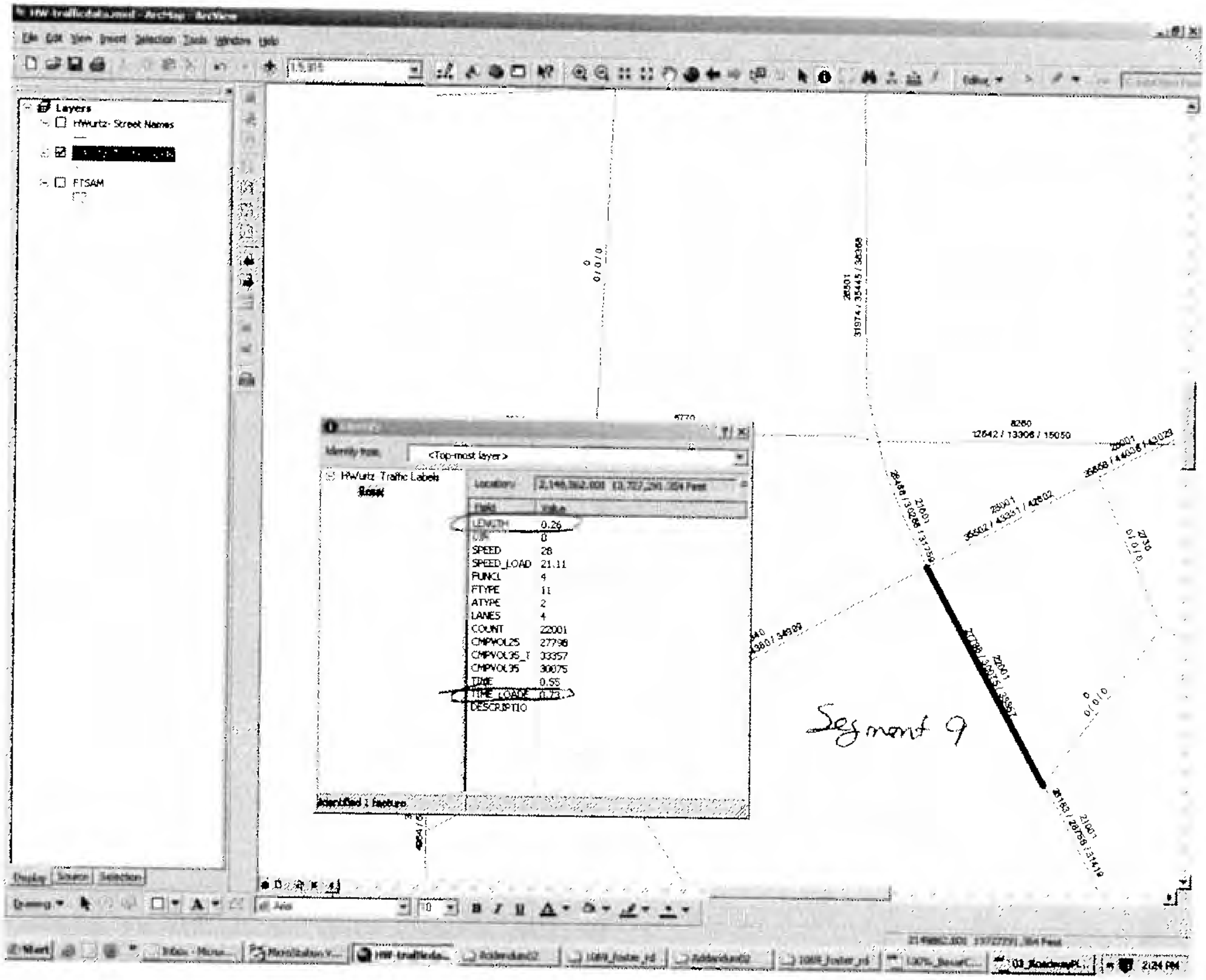


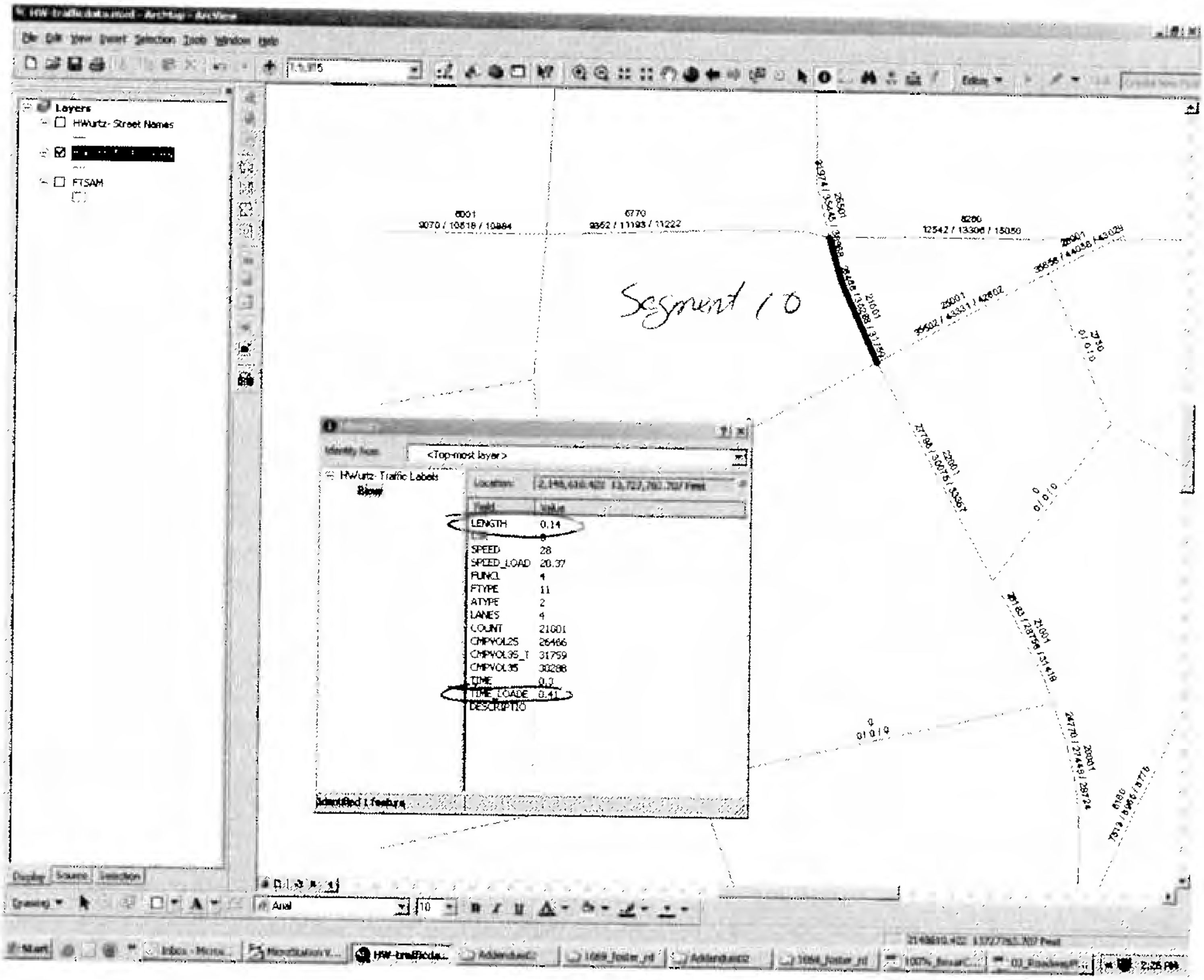
Layers
HWurtz- Street Names
FTSAM
1:5,915
<Top-most layer>
HWurtz- Traffic Labels
Field
Value
LENGTH 0.24
SPEED 26
SPEED_LOAD 19.31
FUNCL 4
FTYPE 13
ATYPE 2
LANES 4
COUNT 22001
CMPVOL25 26902
CMPVOL35_T 32282
CMPVOL35 28875
TIME 0.55
TIME_LOADE 0.73
DESCRIPTIO
4501
6587 / 7433 / 7904
4170
9976 / 10981 / 11971
22001
26902 / 28875 / 32282
22250
28712 / 23404 / 32064
21162
24844 / 24936 / 29212
4501
5541 / 5785 / 6649
4501
5259 / 5470 / 6310
Segment 5

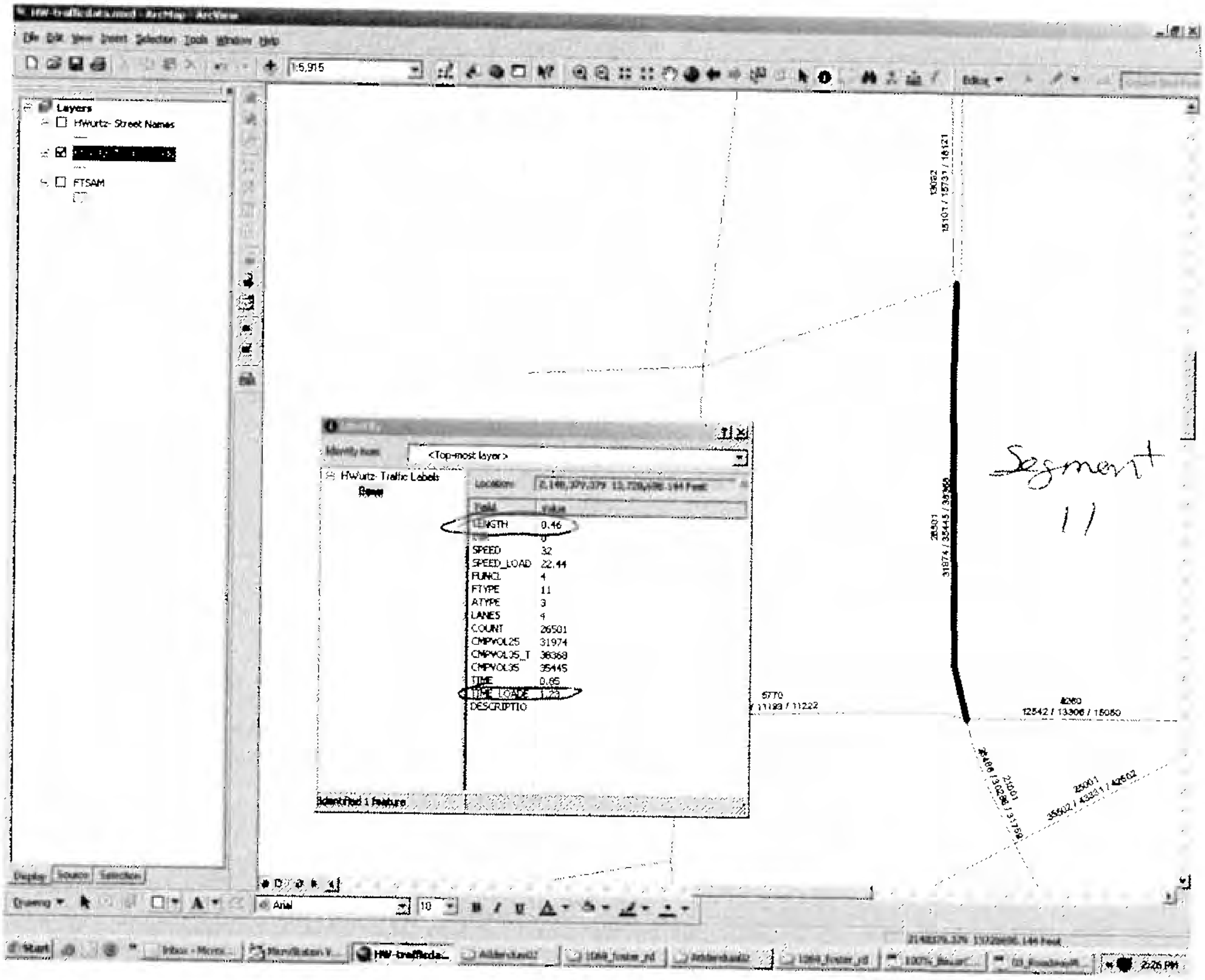

HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
Identify
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location: 2,149,322.110 13,724,418.161 Feet
Field Value
LENGTH 0.07
DIR 0
SPEED 28
SPEED_LOAD 18.84
FUNCL 4
FTYPE 11
ATYPE 2
LANES 4
COUNT 23001
CMPVOL25 28939
CMPVOL35_T 34726
CMPVOL35 33657
TIME 0.16
TIME_LOADE 0.24
DESCRIPTIO
Identified 1 feature
23840
29180 / 34580 / 34899
23001
29948 / 34337 / 34735
27798 / 30076 / 33367
0 / 0 / 0
28153 / 28798 / 31418
24770 / 27445 / 28724
0 / 0 / 0
4970
9976 / 10981 / 11971
23001
29624 / 27470 / 28348
28939 / 33657 / 34726
22001
26902 / 28878 / 32282
7919 / 8966 / 8776
Segment 6
Drawing
Arial
10
Start
3:23 PM

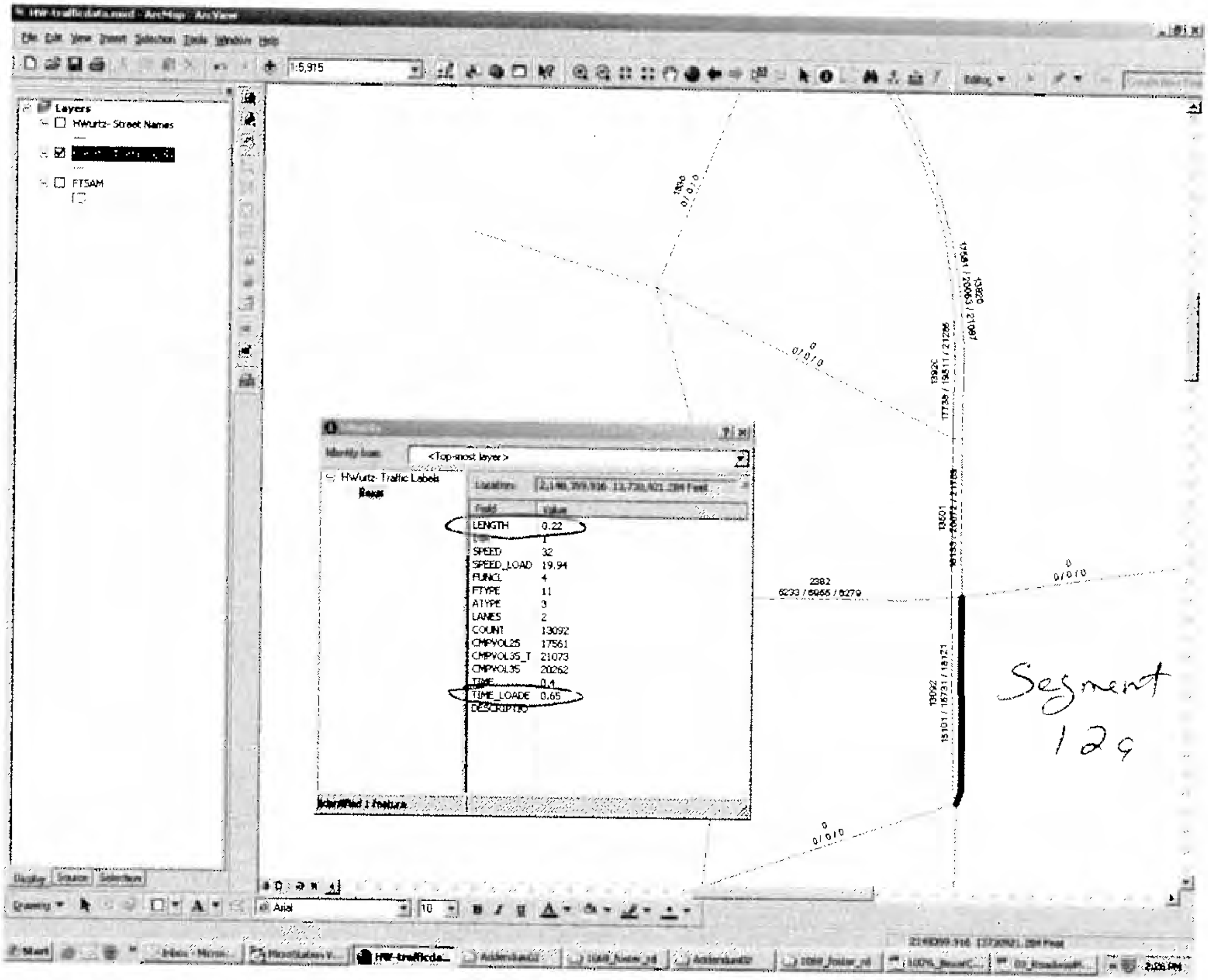

Layers
HWurtz- Street Names
FTSAM
1:5,915
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Field
Value
SPEED 28
SPEED_LOAD 21.72
FUNCL 4
FTYPE 11
ATYPE 2
LANES 4
COUNT 20001
CMPVOL25 24770
CMPVOL35_T 29724
CMPVOL35 27445
TIME 0.43
TIME_LOADE
DESCRIPTIO
Identified 1 feature
Segment 7
23840
29166 / 34380 / 34899
23501
28848 / 34337 / 34735
20001
24770 / 27445 / 29724
21001
28183 / 28758 / 31418
22001
27736 / 30078 / 33367
4970
9976 / 10981 / 11971
20001
29624 / 27470 / 28348
23001
28939 / 33867 / 34736
22001
26902 / 28876 / 32282
8160
7913 / 8965 / 8776
0
0 / 0 / 0
Arial
10
2:23 PM

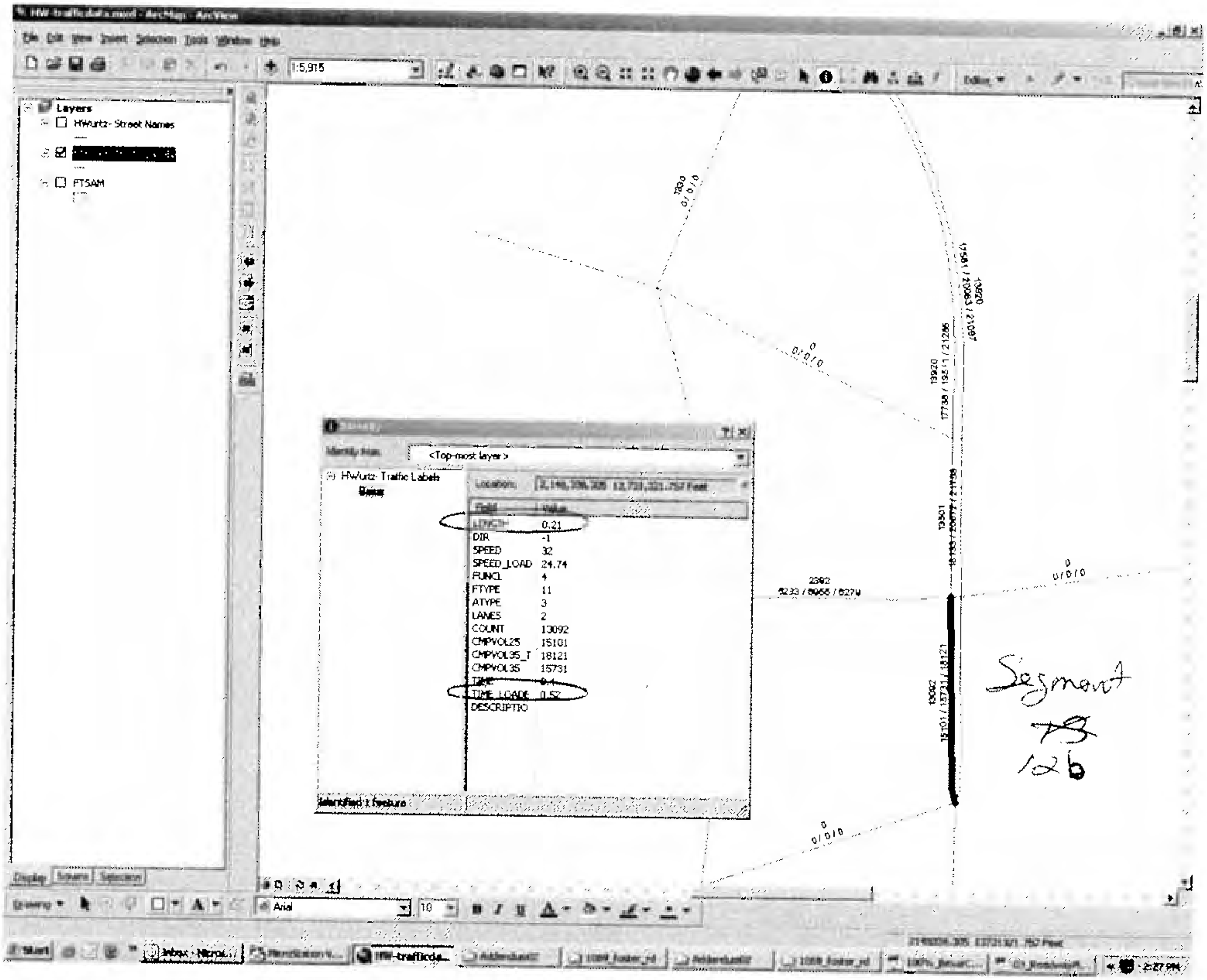

HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location:
Field Value
LENGTH 0.14
SPEED 28
SPEED_LOAD 21.37
FUNCL 4
FTYPE 11
ATYPE 2
LANES 4
COUNT 21001
CMPVOL25 26183
CMPVOL35_T 31419
CMPVOL35 28756
TIME 0.31
TIME_LOADE 0.4
DESCRIPTIO
Identified 1 Feature
Segment 8
23840
23501
22001
21001
20001
23001
4970
8160
0 / 0 / 0
Display Source Selection
Drawing
Arial
10
Start

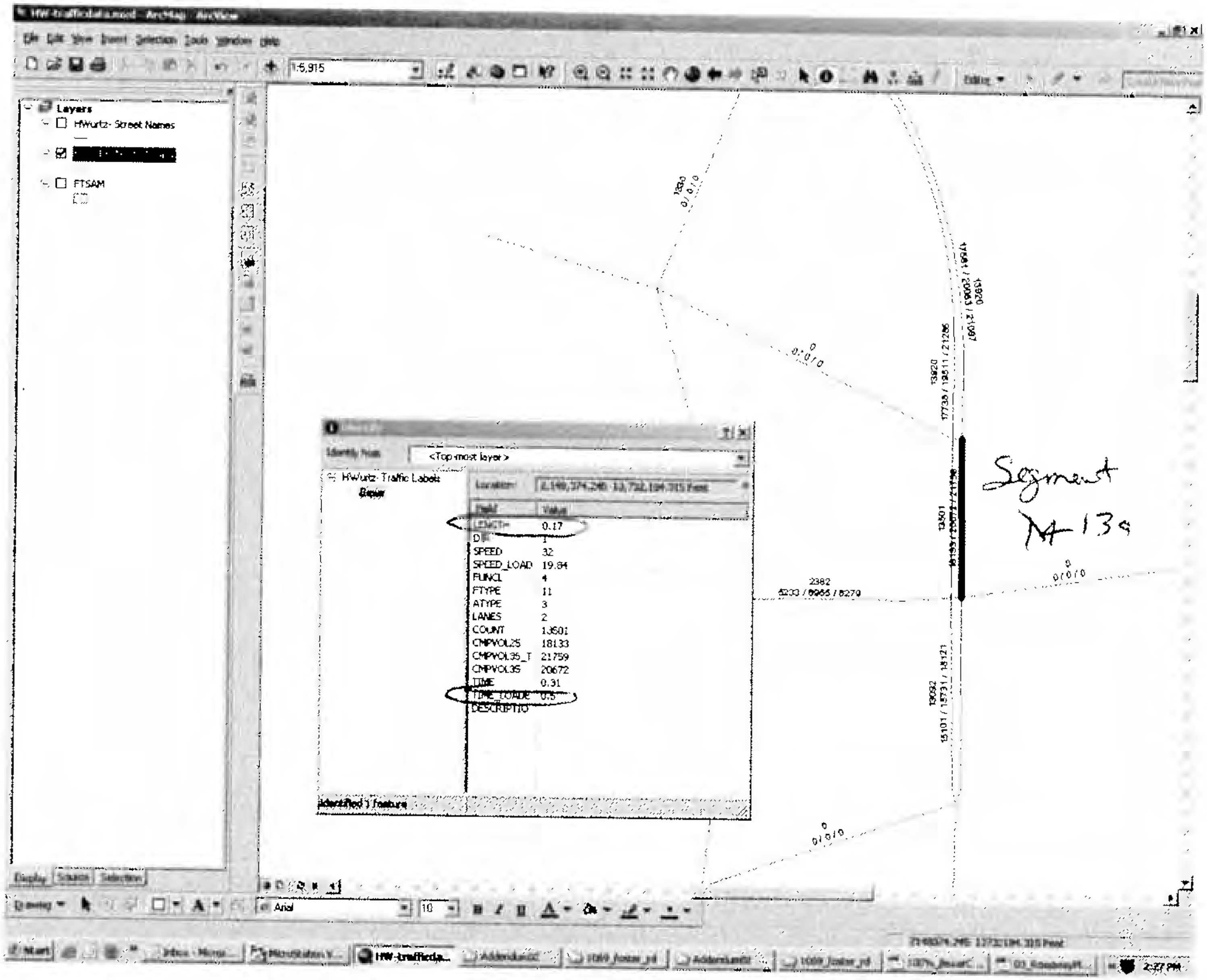

HW trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
Layers
HWurtz- Street Names
FTSAM
Identify
Identify from: <Top-most layer>
HWurtz Traffic Labels
Location: 2,146,562.000 13,707,290.384 Feet
Field Value
LENGTH 0.26
SPEED 28
SPEED_LOAD 21.11
FUNCL 4
FTYPE 11
ATYPE 2
LANES 4
COUNT 22001
CMPVOL25 27798
CMPVOL35_T 33357
CMPVOL35 30075
TIME 0.55
TIME_LOADE 0.73
DESCRIPTIO
Identified 1 feature
0
0 / 0 / 0
26501
31974 / 35445 / 38368
8260
12642 / 13906 / 15050
21001
28488 / 30266 / 31759
29001
35502 / 43351 / 42602
22001
27798 / 33357
21001
28163 / 28756 / 31419
Segment 9
Drawing
Arial
10
Start
2:24 PM

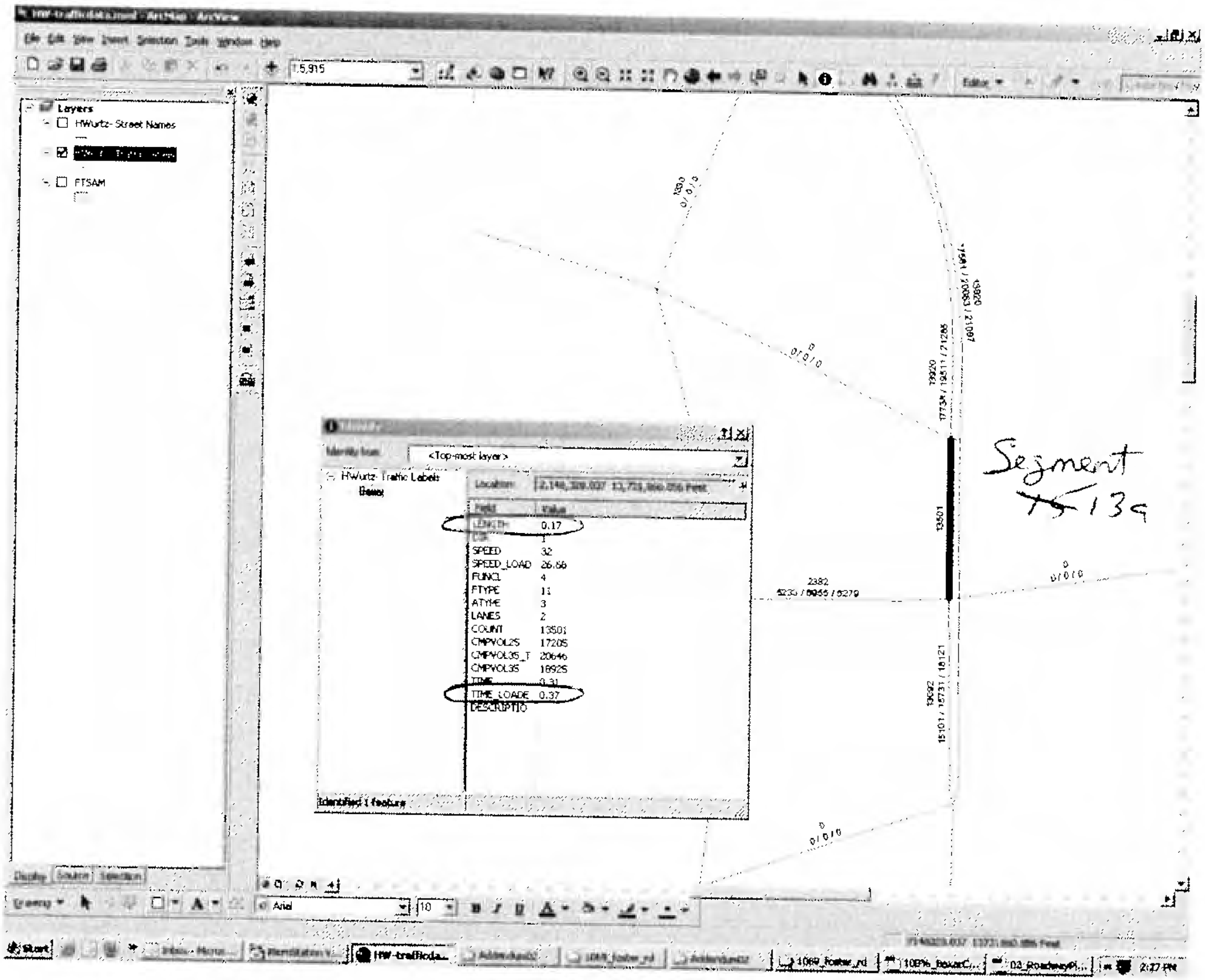

Layers
HWurtz- Street Names
FTSAM
8001
9070 / 10618 / 10884
6770
9352 / 11193 / 11222
8280
12542 / 13306 / 15050
Segment 10
21001
25001
22001
<Top-most layer>
HWurtz- Traffic Labels
LENGTH 0.14
SPEED 28
SPEED_LOAD 20.37
FUNCL 4
FTYPE 11
ATYPE 2
LANES 4
COUNT 21001
CMPVOL25 26466
CMPVOL35_T 31759
CMPVOL35 30288
TIME 0.3
TIME_LOADE 0.41
DESCRIPTIO
Arial
2:25 PM


HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
<Top-most layer>
HWurtz- Traffic Labels
Field
Value
LENGTH 0.46
SPEED 32
SPEED_LOAD 22.44
FUNCL 4
FTYPE 11
ATYPE 3
LANES 4
COUNT 26501
CMPVOL25 31974
CMPVOL35_T 38368
CMPVOL35 35445
TIME 0.86
TIME_LOADE 1.23
DESCRIPTIO
Identified 1 feature
13062
15101 / 15731 / 16121
26501
31874 / 35445 / 38368
5770
11193 / 11222
4260
12542 / 13306 / 15060
21001
26486 / 30286 / 31759
25001
35502 / 43331 / 42602
Segment 11
Drawing
Arial
10
Start
2:26 PM

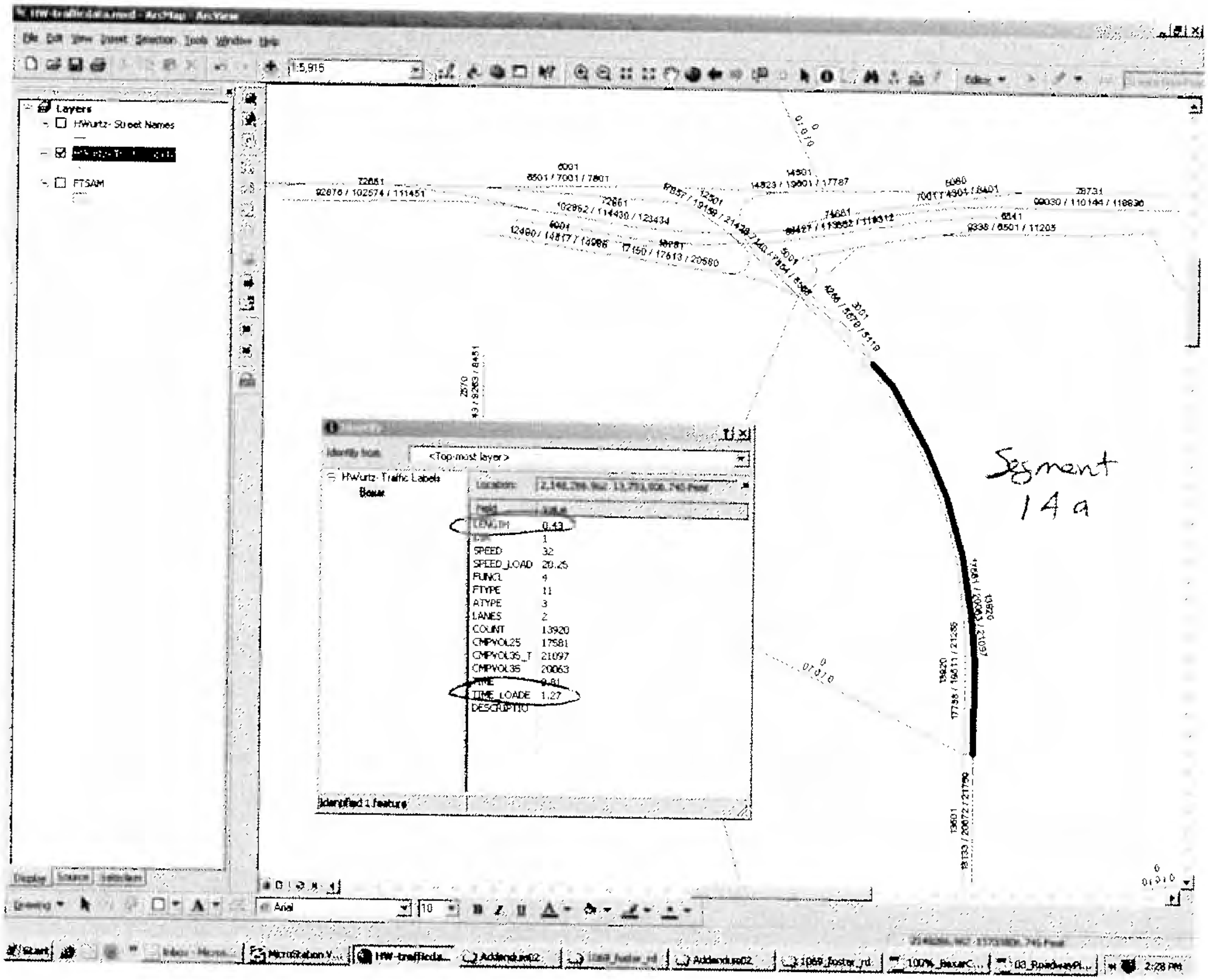

HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
Identify
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location:
Field Value
LENGTH 0.22
SPEED 32
SPEED_LOAD 19.94
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13092
CMPVOL25 17561
CMPVOL35_T 21073
CMPVOL35 20262
TIME 0.4
TIME_LOADE 0.65
DESCRIPTIO
13092
15101 / 18731 / 18121
13501
13920
17738 / 19811 / 21286
13820
2382
6233 / 6965 / 6279
0/0/0
Segment 129
Drawing
Arial
10


HW-trafficdata.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:5,915
Layers
HWurtz- Street Names
FTSAM
Identify
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location: 2,146,396.305 12,733,321.757 Feet
Field Value
LENGTH 0.21
DIR -1
SPEED 32
SPEED_LOAD 24.74
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13092
CMPVOL25 15101
CMPVOL35_T 18121
CMPVOL35 15731
TIME 0.4
TIME_LOADE 0.52
DESCRIPTIO
Identified 1 feature
13920
17738 / 19511 / 21286
13920
17581 / 20063 / 21087
13501
18133 / 20072 / 21159
13092
15101 / 15731 / 18121
2392
5233 / 8966 / 6279
0
0 / 0 / 0
Segment
78
126
Drawing
Arial
10
Start
2:27 PM

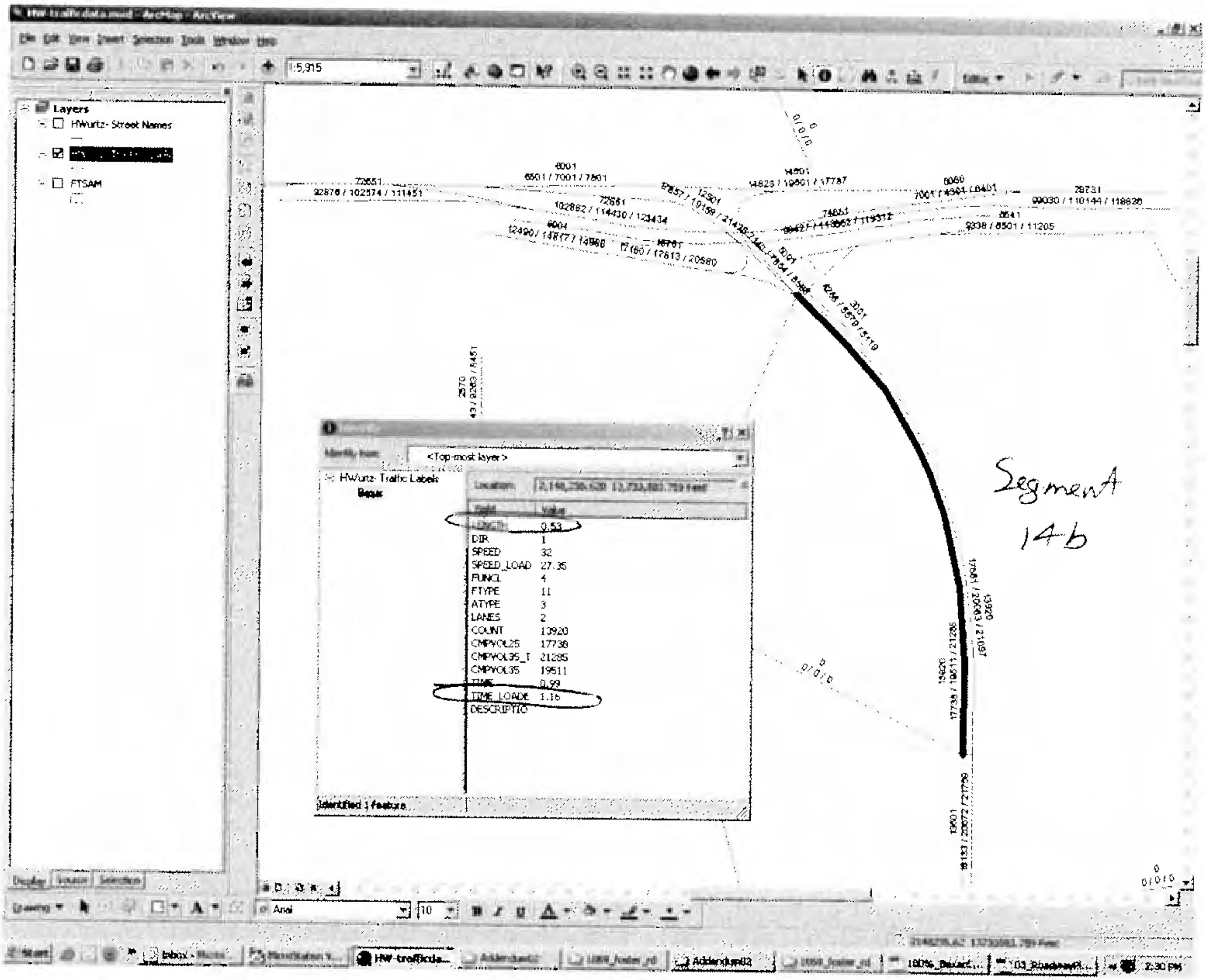

HW-trafficdata.mxd - ArcMap - ArcView
1:5,915
Layers
HWurtz- Street Names
FTSAM
Identify
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location:
Field
Value
LENGTH 0.17
DIR 1
SPEED 32
SPEED_LOAD 19.84
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13501
CMPVOL25 18133
CMPVOL35_T 21759
CMPVOL35 20672
TIME 0.31
TIME_LOADE 0.5
DESCRIPTIO
Identified 1 feature
2382
5233 / 6965 / 8279
13092
15101 / 15731 / 18121
13501
13920
17735 / 19511 / 21286
17581 / 20083 / 21097
1330
0 / 0 / 0
Segment
M-13a
Arial
10
2:27 PM



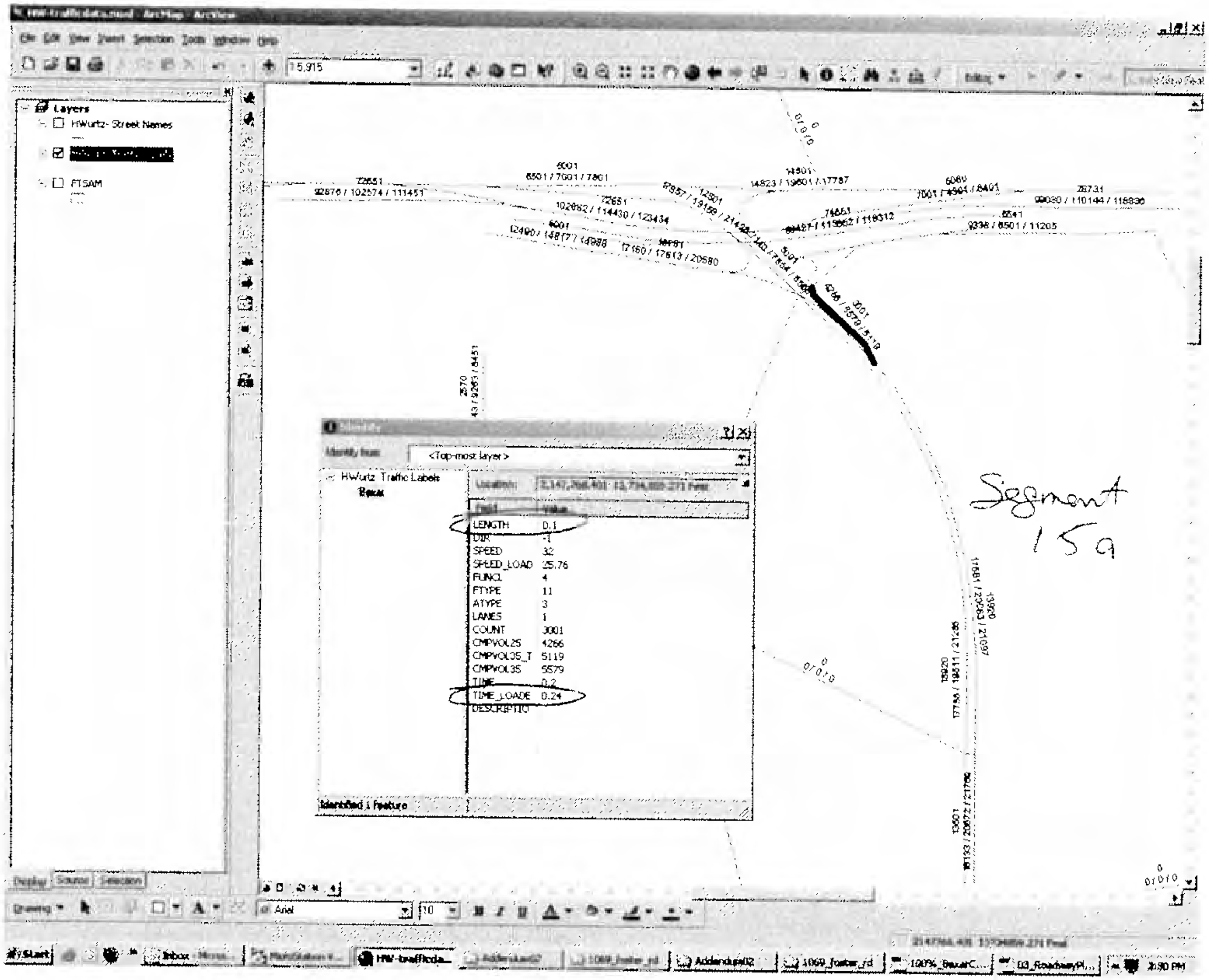
Layers
HWurtz- Street Names
FTSAM
1:5,915
Identify from: <Top-most layer>
HWurtz- Traffic Labels
Location:
Field
Value
LENGTH 0.17
SPEED 32
SPEED_LOAD 26.66
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13501
CMPVOL25 17205
CMPVOL35_T 20646
CMPVOL35 18925
TIME 0.31
TIME_LOADE 0.37
DESCRIPTIO
Identified 1 feature
13501
13092
15101 / 15731 / 18121
13920
17734 / 19511 / 21288
13820
17581 / 20063 / 21097
2382
5230 / 6955 / 6279
0/0/0
Segment 139
Arial
2:27 PM



Layers
HWurtz- Street Names
FTSAM
Identify from: <Top-most layer>
HWurtz- Traffic Labels
LENGTH 0.43
SPEED 32
SPEED_LOAD 20.25
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13920
CMPVOL25 17581
CMPVOL35_T 21097
CMPVOL35 20063
TIME_LOADE 1.27
DESCRIPTIO
Identified 1 feature
13920
17758 / 19511 / 21285
13601
18133 / 20672 / 21750
Segment 14a



Layers
HWurtz- Street Names
FTSAM
1:5,915
HWurtz- Traffic Labels
<Top-most layer>
LENGTH 0.53
DIR 1
SPEED 32
SPEED_LOAD 27.35
FUNCL 4
FTYPE 11
ATYPE 3
LANES 2
COUNT 13920
CMPVOL25 17738
CMPVOL35_T 21285
CMPVOL35 19511
TIME 0.99
TIME_LOADE 1.16
DESCRIPTIO
Identified 1 feature
13920
17738 / 19511 / 21285
13601
18133 / 20072 / 21759
Segment 14b
2:30 PM


Layers
HWurtz- Street Names
FTSAM
<Top-most layer>
HWurtz Traffic Labels
LENGTH 0.1
DIR 1
SPEED 32
SPEED_LOAD 25.76
FUNCL 4
FTYPE 11
ATYPE 3
LANES 1
COUNT 3001
CMPVOL25 4266
CMPVOL35_T 5119
CMPVOL35 5579
TIME 0.2
TIME_LOADE 0.24
DESCRIPTIO
Identified 1 feature
Segment 159

Planning Analysis Worksheet

Highway Harry Wurzbach
From/To Fitzsimmons to Burr
Analyst
Analysis Year 2025
Date 1-5-11

INPUT DATA

(1)

Segment 2

Total AADT Volume 23756 (vpd)

Speed Limit 40 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ←→	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 23756 x .10 x .60 = 1425 vph

Per lane volume for: LOS

4-Lane Highway = 1425 vph/2 = 713 C

~~6-Lane Highway = vph/3 =~~

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

		Free Flow Speed = 60 mph					Free-Flow Speed = 50 mph				
		Percent Trucks					Percent Trucks				
Terrain	LOS	0	5	10	15	20	0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

45 40 (5) 925 820

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst [illegible] Date 1-5-11
From/To CC to Kitliman Analysis Year 2025

INPUT DATA

(2)

Segment 5

Total AADT Volume 26902 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ←→	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D   DDHV = 26902 x .10 x .60 = 1614 vph

Per lane volume for: LOS

4-Lane Highway = 1614 vph/2 = 807 C

6-Lane Highway = ______ vph/3 = ______ ______

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

		Free Flow Speed = 60 mph					Free-Flow Speed = 50 mph				
		Percent Trucks					Percent Trucks				
Terrain	LOS	0	5	10	15	20	0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

Handwritten margin notes:

45	40
(5)	
390	340
660	580
925	820
1110	990

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst [illegible] Date 1-5-11
From/To CC to Austin Hwy Analysis Year 2025

INPUT DATA

(3)

Segment 9

Total AADT Volume 27798 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *	Suburban	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 27798 x .1 x .6 = 1668 vph

Per lane volume for: LOS

4-Lane Highway = 1668 vph/2 = 834 C

6-Lane Highway = ______ vph/3 = ______ ______

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

		Free Flow Speed = 60 mph					Free-Flow Speed = 50 mph					45
		Percent Trucks					Percent Trucks					
Terrain	LOS	0	5	10	15	20	0	5	10	15	20	(5)
Level	A	590	580	570	550	540	490	470	460	450	440	
	B	990	970	940	920	900	810	790	770	750	740	
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030	
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230	
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550	
Rolling	A	590	540	500	460	420	490	440	410	370	350	A 390
	B	990	900	830	760	710	810	740	680	620	580	B 660
	C	1360	1240	1130	1050	970	1130	1030	950	870	810	C 925
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960	D 1110
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220	
Mountain	A	590	480	400	340	300	490	390	320	280	240	
	B	990	790	660	570	500	810	650	540	460	410	
	C	1360	1090	910	780	680	1130	910	760	650	570	
	D	1620	1300	1080	930	810	1350	1080	900	770	680	
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860	

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst Date 1-5-11
From/To Eisenhower to CC Analysis Year 2025

INPUT DATA

* 4

Segment 11

Total AADT Volume 31974 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ◄──►	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 31974 x .1 x .6 = 1918 vph

Per lane volume for: LOS

4-Lane Highway = 1918 vph/2 = 960 C

6-Lane Highway = ____ vph/3 = ____ ____

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

Free Flow Speed = 60 mph / Free-Flow Speed = 50 mph 45

Terrain	LOS	60 mph: 0	5	10	15	20	50 mph: 0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

(Percent Trucks) (5) — handwritten beside Rolling C row: 925

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach
From/To Fort Sam to Burr
Analyst
Date 1-5-11
Analysis Year 2035

INPUT DATA

(1)

Total AADT Volume 24665 (vpd)

Speed Limit 40 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D   DDHV = 24665 x .1 x .6 = 1480 vph

Per lane volume for: LOS

4-Lane Highway = 1480 vph/2 = 740 C

6-Lane Highway = ____ vph/3 = ____ ____

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

		Free Flow Speed = 60 mph					Free-Flow Speed = 50 mph				
		Percent Trucks					Percent Trucks				
Terrain	LOS	0	5	10	15	20	0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

40 (5) ~820

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst [signature] Date 1-5-11
From/To CC to Rittiman Analysis Year 2035

INPUT DATA

(2)

Total AADT Volume 28875 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ◄──►	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 28875 x .1 x .6 = 1733 vph

Per lane volume for:

			LOS
4-Lane Highway =	1733 vph/2 =	867	C
6-Lane Highway =	____ vph/3 =	____	____

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

Free Flow Speed = 60 mph / Free-Flow Speed = 50 mph (45; 157)

Terrain	LOS	60 mph: 0	5	10	15	20	50 mph: 0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810 (925)
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

Percent Trucks column headings (0, 5, 10, 15, 20) apply to each speed group.

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst [illegible] Date 1-5-11
From/To [illegible] to Austin Hwy Analysis Year 2035

INPUT DATA

(3)

Total AADT Volume 30075 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ◄──►	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 30075 x .1 x .6 = 1804 vph

Per lane volume for: LOS

4-Lane Highway = 1804 vph/2 = 902 C

6-Lane Highway = ____ vph/3 = ____ ____

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

Free Flow Speed = 60 mph | Free-Flow Speed = 50 mph 45

Percent Trucks | Percent Trucks (5)

Terrain	LOS	0	5	10	15	20	0	5	10	15	20
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

925 (handwritten beside Rolling C row)

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Planning Analysis Worksheet

Highway Harry Wurzbach Analyst [illegible] Date 1-5-11
From/To Eisenhower to CC Analysis Year 2035

INPUT DATA

R (4)

Total AADT Volume 35445 (vpd)

Speed Limit 45 (mph)

Terrain (L, R, M) R

Facility Environment *

	Suburban ◄──►	Rural
K	0.10	0.15
D	0.60	0.65

Truck Percentage 5

* Average values and do not necessarily reflect typical local conditions.

ANALYSIS

DDHV** = AADT x K x D DDHV = 35445 x .1 x .6 = 2127 vph

Per lane volume for: LOS

4-Lane Highway = 2127 vph/2 = 1064 C

6-Lane Highway = ____ vph/3 = ____ ____

** Be sure all values match the analysis period, (e.g. commute, weekend)

LEVEL OF SERVICE

Free Flow Speed = 60 mph; Free-Flow Speed = 50 mph (45)

Terrain	LOS	60 mph: 0	5	10	15	20	50 mph: 0	5	10	15	20
		Percent Trucks					Percent Trucks				
Level	A	590	580	570	550	540	490	470	460	450	440
	B	990	970	940	920	900	810	790	770	750	740
	C	1360	1330	1290	1260	1240	1130	1110	1080	1050	1030
	D	1620	1580	1540	1510	1470	1350	1320	1290	1260	1230
	E	1890	1840	1800	1760	1720	1710	1670	1630	1590	1550
Rolling	A	590	540	500	460	420	490	440	410	370	350
	B	990	900	830	760	710	810	740	680	620	580
	C	1360	1240	1130	1050	970	1130	1030	950	870	810
	D	1620	1470	1350	1250	1160	1350	1230	1130	1040	960
	E	1890	1720	1580	1450	1350	1710	1550	1430	1320	1220
Mountain	A	590	480	400	340	300	490	390	320	280	240
	B	990	790	660	570	500	810	650	540	460	410
	C	1360	1090	910	780	680	1130	910	760	650	570
	D	1620	1300	1080	930	810	1350	1080	900	770	680
	E	1890	1510	1260	1080	950	1710	1370	1140	980	860

15 925

Base Assumptions: All heavy vehicles are trucks.
Lane widths = 12 ft.
Lateral clearance > 6 ft.

PHF = 0.90
Access points = 20 per mile, each side.
Divided highway

Field Study 1-6-11
START TIME 12:00pm, RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or ~~Case~~ # PUJ679_RUN_NB_Noon_110106 Date: 1-6-11

Eduardo A Castillo P.E. Prepared by: [signature] P.E.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					87	0.81	33.5	B
2	0.29	I	40					28	0.29	37.3	A
3	0.36	I	45					26	0.36	49.8	A
4	0.16	I	45					17	0.16	33.9	B
5	0.24	I	45					36	0.24	24.0	C
6	0.07	I	45					10	0.07	25.2	C
7	0.20	I	45					20	0.20	36.00	A
8	0.14	I	45					14	0.14	36.0	A
9	0.26	I	45					44	0.26	21.3	D
10	0.14	I	45					75	0.14	6.7	~~B~~ F
11	0.46	I	45					46	0.46	36.0	A
12	0.22	I	45					18	0.22	44.0	A
13	0.17	I	45					33	0.17	18.5	D
14	0.43	I	45					33	0.43	46.9	A
15	0.10	I	45					63	0.10	5.7	F

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 550
Grand Sum of Length (y) = 4.05

$\frac{3600*(Y)}{(X)} = 26.50$

LOS = C

Field Study 1-6-11
START TIME 12:35pm, RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or Case # PU1679_RVN_ND_New_110106 Date: 1-6-11

ART SPD = 3600 (Sum of Length) / Sum of Time

Eduardo A. Castillo P.E. Prepared by: [signature] EC

Seg-ment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					107	0.81	27.3	C
2	0.29	I	40					30	0.29	34.8	B
3	0.36	I	45					34	0.36	38.1	A
4	0.16	I	45					14	0.16	41.14	A
5	0.24	I	45					45	0.24	19.2	D
6	0.07	I	45					9	0.07	28	B
7	0.20	I	45					18	0.20	40	A
8	0.14	I	45					14	0.14	36	A
9	0.26	I	45					25	0.26	37	A
10	0.14	I	45					71	0.14	7.1	F
11	0.46	I	45					42	0.46	39.4	A
12	0.22	I	45					41	0.22	19.3	D
13	0.17	I	45					34	0.17	18.0	D
14	0.43	I	45					29	0.43	53.4	A
15	0.10	I	45					81	0.10	4.4	F

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 594
Grand Sum of Length(y) = 4.05

$$\frac{3600 * (y)}{(x)} = 24.5$$

LOS = ~~B~~ C

Field Study

START TIME 1:30pm, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or Case # PV1679_RUN NB_N... Date: 1-6-11

Eduardo A. Castillo PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					90	0.81	32.4	
2	0.29	I	40					30	0.29	34.8	
3	0.36	I	45					30	0.36	43.2	
4	0.16	I	45					13	0.16	44.3	
5	0.24	I	45					90	0.04	9.6	
6	0.07	I	45					8	0.07	31.5	
7	0.20	I	45					17	0.20	42.3	
8	0.14	I	45					12	0.14	42.0	
9	0.26	I	45					25	0.26	37.4	
10	0.14	I	45					71	0.14	7.1	
11	0.46	I	45					39	0.46	42.5	
12	0.22	I	45					31	0.22	25.5	
13	0.17	I	45					29	0.17	21.1	
14	0.43	I	45					26	0.43	59.5	
15	0.10	I	45					37	0.10	9.7	

a Use Table 11-4 and multiply segment length

b From Worksheet for Summary of Arterial Intersection Delay Estimates

c See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 548

Grand Sum of Length (y) = 4.05

$\frac{3600 * (y)}{(x)} = 26.6$

LOS = E

Field Study

START TIME 12:15pm RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South -bound

File or ~~Case~~ # PU 1679-RUN-SB -NOON Date: 1-6-11

Eduardo A. Castillo P.E. Prepared by: [signature] PE

$$\text{ART SPD} = \frac{3600\,(\text{Sum of Length})}{\text{Sum of Time}}$$

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					75	0.81	38.9	A
2	0.29	I	40					28	0.29	37.3	A
3	0.36	I	45					33	0.36	39.3	A
4	0.16	I	45					17	0.16	33.9	B
5	0.24	I	45					25	0.04	34.6	B
6	0.07	I	45					10	0.07	25.2	C
7	0.20	I	45					17	0.20	42.4	A
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					23	0.26	40.7	A
10	0.14	I	45					14	0.14	36.0	A
11	0.46	I	45					30	0.46	55.2	A
12	0.22	I	45					21	0.22	37.7	A
13	0.17	I	45					29	0.17	21.1	D
14	0.43	I	45					47	0.43	32.9	B
15	0.10	I	45					14	0.10	25.7	C

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time(x)= 396

Grand Sum of Length(y)= 4.05

$$\frac{3600 * (y)}{(x)} = 36.8$$

LOS = A

Field Study

START TIME 1:00pm RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or ~~Case~~ # PU1679-RUN-SB -NOON Date: 1-6-11

Eduardo A. Castillo P.E. Prepared by [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					81	0.81	36.0	A
2	0.29	I	40					26	0.29	40.2	A
3	0.36	I	45					29	0.36	44.7	A
4	0.16	I	45					14	0.16	41.1	A
5	0.24	I	45					23	0.04	37.6	A
6	0.07	I	45					61	0.07	4.1	F
7	0.20	I	45					17	0.20	42.4	A
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					100	0.26	9.4	F
10	0.14	I	45					16	0.14	31.5	B
11	0.46	I	45					134	0.46	12.4	F
12	0.22	I	45					17	0.22	46.6	A
13	0.17	I	45					23	0.17	26.6	C
14	0.43	I	45					28	0.43	55.3	A
15	0.10	I	45					14	0.10	25.7	C

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time(X) = 596

Grand Sum of Length(Y) = 4.05

$\frac{3600 * (Y)}{(X)} = 24.5$

LOS = C

Field Study

START TIME 1:45pm, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or ~~Case~~ # PU1679-RUN-SB-NOON Date: 1-6-11

Eduardo A. Castillo, P.E. Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					83	0.81	35.1	A
2	0.29	I	40					28	0.29	37.3	A
3	0.36	I	45					26	0.36	49.8	A
4	0.16	I	45					25	0.16	23.04	C
5	0.24	I	45					19	0.24	45.5	A
6	0.07	I	45					27	0.07	9.3	F
7	0.20	I	45					14	0.20	51.4	A
8	0.14	I	45					88	0.14	5.7	F
9	0.26	I	45					23	0.26	40.7	A
10	0.14	I	45					40	0.14	12.6	F
11	0.46	I	45					30	0.46	55.2	A
12	0.22	I	45					29	0.22	27.3	C
13	0.17	I	45					55	0.17	11.13	F
14	0.43	I	45					55	0.43	28.1	B
15	0.10	I	45					17	0.10	21.2	D

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 559

Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 26.1$$

LOS = C

Field Study

START TIME 4:50pm RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or Case # UP1679_SB_EVEN Date: 1-6-11

Eduardo A. Castillo PE Prepared by: [signature] P.E.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					79	0.81	36.9	A
2	0.29	I	40					25	0.29	41.8	A
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					13	0.16	44.3	A
5	0.24	I	45					22	0.24	39.3	A
6	0.07	I	45					16	0.07	15.8	E
7	0.20	I	45					17	0.20	42.4	A
8	0.14	I	45					14	0.14	36.0	A
9	0.26	I	45					38	0.26	24.6	C
10	0.14	I	45					14	0.14	36.0	A
11	0.46	I	45					39	0.46	42.5	A
12	0.22	I	45					15	0.22	52.8	A
13	0.17	I	45					28	0.17	21.9	C
14	0.43	I	45					31	0.43	49.9	A
15	0.10	I	45					16	0.10	22.5	C

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 397
Grand Sum of Length(y) = 4.05

$$\frac{3600 * (y)}{(x)} = 36.7$$

LOS = A

Field Study

START TIME 5:15pm, RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or ~~Case~~ # UP1679_SB_EVEN Date: 1-6-11

Eduardo A. Castillo PE Prepared by: [signature] DC

ART SPD = $\frac{3600 \text{ (Sum of Length)}}{\text{Sum of Time}}$

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					86	0.81	33.9	B
2	0.29	I	40					33	0.29	31.6	B
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					16	0.16	36.0	A
5	0.24	I	45					21	0.04	41.1	A
6	0.07	I	45					7	0.07	36.0	A
7	0.20	I	45					18	0.20	40.0	A
8	0.14	I	45					14	0.14	36.0	A
9	0.26	I	45					42	0.26	22.3	C
10	0.14	I	45					14	0.14	36.0	A
11	0.46	I	45					103	0.46	16.1	E
12	0.22	I	45					21	0.22	37.7	A
13	0.17	I	45					35	0.17	17.5	D
14	0.43	I	45					41	0.43	37.8	A
15	0.10	I	45					16	0.10	22.5	C

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 497
Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 29.3$$

LOS = B

Field Study

START TIME 5:40pm, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South -bound

File or ~~Case~~ # PU1679-SB-EVEN Date: 1-6-11

Eduardo A. Castillo PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					87	0.81	33.5	B
2	0.29	I	40					49	0.29	21.3	D
3	0.36	I	45					33	0.36	39.27	A
4	0.16	I	45					16	0.16	36	A
5	0.24	I	45					23	0.24	37.6	A
6	0.07	I	45					8	0.07	31.5	B
7	0.20	I	45					18	0.20	40.0	A
8	0.14	I	45					13	0.14	40.0	A
9	0.26	I	45					33	0.26	28.4	B
10	0.14	I	45					13	0.14	38.8	A
11	0.46	I	45					49	0.46	33.8	B
12	0.22	I	45					22	0.22	36.0	A
13	0.17	I	45					34	0.17	18.0	D
14	0.43	I	45					40	0.43	38.7	A
15	0.10	I	45					16	0.10	22.5	C

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 454
Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 32.1$$

LOS = B

Field Study

START TIME 5:05 pm RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or Case # PU/679_NB_EVEN Date: 1-6-17

Eduardo A. Castillo PE Prepared by: [signature] PE.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					79	0.81	36.9	A
2	0.29	I	40					27	0.29	38.7	A
3	0.36	I	45					74	0.36	17.5	D
4	0.16	I	45					79	0.16	7.3	F
5	0.24	I	45					182	0.24	4.7	F
6	0.07	I	45					9	0.07	28.0	B
7	0.20	I	45					19	0.20	37.9	A
8	0.14	I	45					14	0.14	36.0	A
9	0.26	I	45					31	0.26	30.2	B
10	0.14	I	45					36	0.14	14.0	E
11	0.46	I	45					44	0.46	37.6	A
12	0.22	I	45					26	0.22	30.5	B
13	0.17	I	45					31	0.17	19.7	D
14	0.43	I	45					99	0.43	15.6	E
15	0.10	I	45					150	0.10	2.4	F

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 900
Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 16.2$$

LOS = E

Field Study

START TIME 5:25 , RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or ~~Case~~ # PU 1679_NB_EVEN Date: 1-6-11

Eduardo A. Castillo PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					77	0.81	37.9	A
2	0.29	I	40					25	0.29	41.8	A
3	0.36	I	45					63	0.36	20.6	D
4	0.16	I	45					47	0.16	12.3	F
5	0.24	I	45					58	0.24	14.9	E
6	0.07	I	45					10	0.07	25.2	C
7	0.20	I	45					19	0.20	37.9	A
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					26	0.26	36.0	A
10	0.14	I	45					94	0.14	5.4	F
11	0.46	I	45					38	0.46	43.6	A
12	0.22	I	45					50	0.22	15.8	E
13	0.17	I	45					26	0.17	23.5	C
14	0.43	I	45					65	0.43	23.8	C
15	0.10	I	45					72	0.10	5	F

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 683

Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 21.3$$

LOS = D/C

Field Study

START TIME 5:50, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North-bound

File or Case # PV1679_NB_EVEN Date: 1-6-11

Eduardo A. Castillo, P.E. Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					91	0.81	32.0	B
2	0.29	I	40					30	0.29	34.8	B
3	0.36	I	45					52	0.36	24.9	C
4	0.16	I	45					17	0.16	33.9	B
5	0.24	I	45					36	0.24	24.0	C
6	0.07	I	45					9	0.07	28.5	B
7	0.20	I	45					21	0.20	34.3	B
8	0.14	I	45					15	0.14	33.6	B
9	0.26	I	45					91	0.26	10.3	F
10	0.14	I	45					108	0.14	4.7	F
11	0.46	I	45					44	0.46	37.6	A
12	0.22	I	45					26	0.22	30.5	B
13	0.17	I	45					30	0.17	20.4	D
14	0.43	I	45					36	0.43	43.0	A
15	0.10	I	45					15	0.10	24.0	C

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 621
Grand Sum of Length (y) = 4.05
3600 * (y) / (x) = 23.5
LOS = C

Field Study

START TIME 7:15Am, RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South -bound

File or Case # UP1672 SB - Morning Date: 1-10-11

Eduardo A. Castillo P.E. Prepared by: [signature] P.E.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					77	0.81	37.9	A
2	0.29	I	40					28	0.29	37.3	A
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					17	0.16	33.9	B
5	0.24	I	45					25	0.24	34.6	B
6	0.07	I	45					75	0.07	3.4	F
7	0.20	I	45					21	0.20	34.3	B
8	0.14	I	45					16	0.14	31.5	B
9	0.26	I	45					47	0.26	19.9	D
10	0.14	I	45					15	0.14	33.6	B
11	0.46	I	45					82	0.46	20.2	D
12	0.22	I	45					24	0.22	33.0	B
13	0.17	I	45					48	0.17	12.8	F
14	0.43	I	45					49	0.43	31.6	B
15	0.10	I	45					18	0.10	20.0	D

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 572

Grand Sum of Length (y) = 4.05

$\frac{3600 * (y)}{(x)} = 25.5$

LOS = C

Field Study

START TIME 7:38 AM RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or ~~Case~~ # UP1679-SB-Morn Date: 1-10-11

Eduardo A. Castillo, PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					77	0.81	37.9	A
2	0.29	I	40					25	0.29	41.8	A
3	0.36	I	45					34	0.36	38.1	A
4	0.16	I	45					15	0.16	38.4	A
5	0.24	I	45					24	0.24	36.0	A
6	0.07	I	45					62	0.07	4.1	F
7	0.20	I	45					18	0.20	40.0	A
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					70	0.26	13.4	E
10	0.14	I	45					14	0.14	36.0	A
11	0.46	I	45					45	0.46	36.8	A
12	0.22	I	45					23	0.22	34.4	B
13	0.17	I	45					52	0.17	11.8	F
14	0.43	I	45					48	0.43	32.3	B
15	0.10	I	45					16	0.10	22.5	C

a Use Table 11-4 and multiply segment length

b From Worksheet for Summary of Arterial Intersection Delay Estimates

c See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 536

Grand Sum of Length(y) = 4.05

$$\frac{3600 * (y)}{(x)} = 27.2$$

LOS = C

Field Study

START TIME 8:04 Am, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I South-bound

File or Case # VP1679-SB-morn Date: 1-10-11

Eduardo A. Castillo PE Prepared by: [signature] P.E.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					74	0.81	39.4	A
2	0.29	I	40					30	0.29	34.8	B
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					15	0.16	38.4	A
5	0.24	I	45					22	0.24	39.3	A
6	0.07	I	45					28	0.07	9.0	F
7	0.20	I	45					21	0.20	34.3	B
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					69	0.26	13.6	E
10	0.14	I	45					12	0.14	42.0	A
11	0.46	I	45					38	0.46	43.6	A
12	0.22	I	45					23	0.22	34.4	B
13	0.17	I	45					46	0.17	13.3	E
14	0.43	I	45					46	0.43	33.7	B
15	0.10	I	45					15	0.10	24.0	C

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 482

Grand Sum of Length(y) = 4.05

$\frac{3600 * (y)}{(x)} = 30.2$

LOS = B

Field Study

START TIME 7:27AM RUN 1

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or ~~Case~~ # UP1679_SB_MORNIN Date: 1-10-11

Eduardo A. Castillo PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					77	0.81	37.9	A
2	0.29	I	40					25	0.29	41.8	A
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					13	0.16	44.3	A
5	0.24	I	45					20	0.24	43.2	A
6	0.07	I	45					7	0.07	36.0	A
7	0.20	I	45					16	0.20	42.4	A
8	0.14	I	45					12	0.14	42.0	A
9	0.26	I	45					61	0.26	15.3	E
10	0.14	I	45					14	0.14	36.00	A
11	0.46	I	45					38	0.46	43.6	A
12	0.22	I	45					37	0.22	21.4	D
13	0.17	I	45					43	0.17	14.2	E
14	0.43	I	45					48	0.43	32.25	B
15	0.10	I	45					27	0.10	13.3	E

[a] Use Table 11-4 and multiply segment length
[b] From Worksheet for Summary of Arterial Intersection Delay Estimates
[c] See upper right corner of the Table for the Equation
Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 468
Grand Sum of Length(y) = 4.05

$$\frac{3600 * (y)}{(x)} = 31.2$$

LOS = B

Field Study

START TIME 7:50AM RUN 2

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or Case # UP1679 -SD-morning Date: 1-10-11

Eduardo A. Castillo PE Prepared by: [signature] PE

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					89	0.81	32.8	B
2	0.29	I	40					29	0.29	36.00	A
3	0.36	I	45					37	0.36	35.0	A
4	0.16	I	45					13	0.16	44.3	A
5	0.24	I	45					90	0.24	9.6	F
6	0.07	I	45					11	0.07	22.9	C
7	0.20	I	45					18	0.20	40.0	A
8	0.14	I	45					12	0.14	42.0	A
9	0.26	I	45					22	0.26	42.5	A
10	0.14	I	45					55	0.14	9.2	F
11	0.46	I	45					39	0.46	42.5	A
12	0.22	I	45					42	0.22	18.9	D
13	0.17	I	45					66	0.17	9.3	F
14	0.43	I	45					63	0.43	24.6	C
15	0.10	I	45					105	0.10	3.4	F

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time (x) = 691

Grand Sum of Length (y) = 4.05

$$\frac{3600 * (y)}{(x)} = 21.1$$

LOS = D

Field Study

START TIME 8:15AM, RUN 3

COMPUTATION OF ARTERIAL LOS WORKSHEET

Arterial: I North -bound

File or ~~Case~~ # UP1679-B-mornin Date: 1-10-11

Eduardo A. Castillo P.E. Prepared by: [signature] P.E.

ART SPD = 3600 (Sum of Length) / Sum of Time

Segment	Length (mi)	Arterial Class	Free Flow Speed (mph)	Section	Running Time[a] (sec)	Intersec. Total Delay[b]	Other Delay (sec)	Sum of Time by Section	Sum of Length by Section	Arterial SPD[c] (mph)	Arterial LOS by Section
1	0.81	I	35					72	0.81	40.5	A
2	0.29	I	40					25	0.29	41.8	A
3	0.36	I	45					30	0.36	43.2	A
4	0.16	I	45					12	0.16	48.0	A
5	0.24	I	45					24	0.04	36.0	A
6	0.07	I	45					10	0.07	25.2	C
7	0.20	I	45					19	0.20	37.9	A
8	0.14	I	45					13	0.14	38.8	A
9	0.26	I	45					22	0.26	42.5	A
10	0.14	I	45					44	0.14	11.5	F
11	0.46	I	45					35	0.46	47.3	A
12	0.22	I	45					18	0.22	44.0	A
13	0.17	I	45					28	0.17	21.9	D
14	0.43	I	45					31	0.43	49.9	A
15	0.10	I	45					18	0.10	20.0	D

[a] Use Table 11-4 and multiply segment length

[b] From Worksheet for Summary of Arterial Intersection Delay Estimates

[c] See upper right corner of the Table for the Equation

Note: Round delay estimates to one decimal place

Grand Sum of Time(x) = 401

Grand Sum of Length(y) = 4.05

$\frac{3600 * (y)}{(x)} = 36.4$

LOS = A

Date 1/6/2011

TIME BEGAN 12:00

Run No Noon

Harry Wurzbach

Direction NB

(1)

Segment		Length (mi)	RUN 1 12:00 Time 1 (min)	RUN 2 12:35 Time 2 (min)	RUN 3 1:30 Time 3 (min)
1	Scott Rd to Burr Rd	0.81	1:27	1.47	1:30.4
2	Burr Rd to Garraty Rd	0.29	.28	.30	0:30.4
3	Garraty Rd to Ivy Ln	0.36	.26	.39	0:29.7
4	Ivy Ln to Wiltshire Ave	0.16	.17	.14	0:13.0
5	Wiltshire Ave to Rittiman	0.24	.36	.45	1:30.4
6	Rittiman to Corinne Dr	0.07	.10	.9	0:08.4
7	Corinne Dr to Timberlane Dr	0.20	.20	.18	0:16.9
8	Timberlane Dr to Northeast Pkwy	0.14	.14	.14	0:12.0
9	Northeast Pkwy to Austin Hwy	0.26	.44	.25	0:25.4
10	Austin Hwy to Eisenhauer Rd	0.14	1.15	1.11	1:13
11	Eisenhauer Rd to Dovehaven Dr	0.46	.46	.42	0:38.9
12	Dovehaven Dr to Urban Crest Dr	0.22	.18	.41	0:31.0
13	Urban Crest Dr to Oak Dell	0.17	.33	.34	0:29.2
14	Oak Dell to Cripple Creek St	0.43	.33	.29	0:26.2
15	Cripple Creek St to Dalewood	0.10	1.03	1.21	0:37.4

FILE - [illegible] - SB - Noon

1-6-11

12:00

Noon

Direction SB

Harry Worebach

Segment		Length (mi)	Time 1 (min) 12:15	Time 2 (min) 1:00	Time 3 (min) 1:45
1	Scott Rd to Burr Rd	0.81	1.15	1:21.5	1:22.6
2	Burr Rd to Garraty Rd	0.29	:28	26.1	29.1
3	Garraty Rd to Ivy Ln	0.36	:33	29.3	25.6
4	Ivy Ln to Wiltshire Ave	0.16	:17	13.6	24.6
5	Wiltshire Ave to Rittiman	0.24	:28	22.9	18.7
6	Rittiman to Corinne Dr	0.07	:10	1:00.9	27.4
7	Corinne Dr to Timberlane Dr	0.20	:17	17.0	13.6
8	Timberlane Dr to Northeast Pkwy	0.14	:13	13.1	1:27.9
9	Northeast Pkwy to Austin Hwy	0.26	:25	1:40.0	22.6
10	Austin Hwy to Eisenhauer Rd	0.14	:14	0:16.0	40.0
11	Eisenhauer Rd to Dove Haven Dr	0.46	:30	2:13.7	1:23 19.8
12	Dove Haven Dr to Urban Crest Dr	0.22	:21	16.7	25.7
13	Urban Crest Dr to Oak Dale	0.17	:29	23.4	54.5
14	Oak Dale to Cripple Creek St	0.43	:47	26.4	17.3
15	Cripple Creek St to Dalewood	0.10	:14	13.5	12.0

File NW16M-IND-Even

NB 1-6-11

EVENING

(3)

Harry Wurzbach

Segment		Length (mi)	Time 1 (min)	Time 2 (min)	Time 3 (min)
			5:05	5:25	5:50
1	Scott Rd to Burr Rd	0.81	1:19.0	1:17.3	1:30.9
2	Burr Rd to Garraty Rd	0.29	26.7	24.6	29.5
3	Garraty Rd to Ivy Ln	0.36	1:14.0	1:02.4	51.7
4	Ivy Ln to Wiltshire Ave	0.16	1:19.3	47.0	16.8
5	Wiltshire Ave to Rittiman	0.24	3:01.8	58.3	36.1
6	Rittiman to Corinne Dr	0.07	8.8	9.7	8.4
7	Corinne Dr to Timberlane Dr	0.20	18.4	18.9	20.4
8	Timberlane Dr to Northeast Pkwy	0.14	13.4	12.9	14.3
9	Northeast Pkwy to Austin Hwy	0.26	30.4	25.6	1:30.9
10	Austin Hwy to Eisenhauer Rd	0.14	35.5	1:33.6	1:47.6
11	Eisenhauer Rd to Dovenhaven Dr	0.46	43.8	38.1	43.4
12	DoveHaven Dr to Urban Crest Dr	0.22	25.7	50.4	26.3
13	Urban Crest Dr to Oakdell	0.17	30.3	25.8	30.1
14	Oakdell Ave to Cripple Creek St	0.43	1:38.8	1:04.5	36.4
15	Cripple Creek St to Dalewood	0.10	2:29.6	1:11.9	15.1

File: [illegible]

SB 4:50

1-6-11 EVENING

(4)

Harry Wurzbach

Segment		Length (mi)	Time 1 (min) 4:50	Time 2 (min) 5:15	Time 3 (min) 5:40
1	Scott Rd to Burr Rd	0.81	1:18.9	1:25.9	1:26.4
2	Burr Rd to Garraty Rd	0.29	24.9	32.7	49.2
3	Garraty Rd to Ivy Ln	0.36	30.1	29.7	32.6
4	Ivy Ln to Wiltshire Ave	0.16	12.8	15.7	16.3
5	Wiltshire Ave to Rittiman	0.24	21.6	20.6	22.5
6	Rittiman to Corinne Dr	0.07	15.4	6.6	7.9
7	Corinne Dr to Timberlane Dr	0.20	16.6	17.4	18.1
8	Timberlane Dr to Northeast Pkwy	0.14	13.9	14.0	12.8
9	Northeast Pkwy to Austin Hwy	0.26	37.4	42.1	1:33.1
10	Austin Hwy to Eisenhower Rd	0.14	14.0	14.3	13.2
11	Eisenhower Rd to Doverhaven Dr	0.46	39.3	1:43.0	48.4
12	Doverhaven Dr to Urban Crest Dr	0.22	15.2	21.0	21.8
13	Urban Crest Dr to Oak Dell	0.17	27.5	35.0	33.6
14	Oak Dell to Cripple Creek St	0.43	31.0	40.3	39.8
15	Cripple Creek St to Dalewood	0.10	13.9	13.4	15.1

File UPKO 14_SB_Morning

(5)

NB 1-10-11

MORNING

Harry Worebach

Segment		Length (mi)	Time1 (min)	Time2 (min)	Time3 (min)
			OUTSIDE LANE	INSIDE LANE	BOTH
			7:27	7:50	8:15
1	Scott Rd to Burr Rd	0.81	1:17.2	1:29.3	1:12.1
2	Burr Rd to Garraty Rd	0.29	24.5	29.2	21.8
3	Garraty Rd to Ivy Ln	0.36	30.1	37.3	29.9
4	Ivy Ln to Wiltshire Ave	0.16	13.2	12.6	12.2
5	Wiltshire Ave to Rittimen	0.24	20.3	1:29.7	24.1
6	Rittimen to Corinne Dr	0.07	6.8	10.9	9.6
7	Corinne Dr to Timberlane Dr	0.20	16.0	19.0	18.8
8	Timberlane Dr to Northeast Pkwy	0.14	11.7	12.0	12.5
9	Northeast Pkwy to Austin Hwy	0.26	1:00.6	21.2	21.6
10	Austin Hwy to Eisenhower Rd	0.14	14.2	55.0	43.7
11	Eisenhower Rd to DoveHaven Dr	0.46	38.1	39.0	35.2
12	DoveHaven Dr to Urban Crest Dr	0.22	36.7	42.0	17.6
13	Urban Crest Dr to Oakdale	0.17	42.9	1:06.2	27.4
14	Oakdale to Cripple Creek St	0.43	47.6	1:03.2	30.6
15	Cripple Creek St to Dalewood	0.10	26.7	1:44.7	17.9

FILE: [illegible]

SB 1-10-11

MORNING

Harry Worebach

Segment		Length (mi)	Time 1 (min) OUTSIDE LANE 7:15	Time 2 (min) INSIDE LANE 7:38	Time 3 (min) BOTH 8:04
1	Scott Rd to Burr Rd	0.81	1:17.3	1:16.6	1:13.8
2	Burr Rd to Garraty Rd	0.29	27.8	25.0	29.9
3	Garraty Rd to Ivy Ln	0.36	29.6	33.8	30.3
4	Ivy Ln to Wiltshire Ave	0.16	16.5	14.7	15.1
5	Wiltshire Ave to Rittiman	0.24	24.4	24.1	21.4
6	Rittiman to Corinne Dr	0.07	1:14.8	1:12.0	28.0
7	Corinne Dr to Timberlane Dr.	0.20	21.1	18.3	21.3
8	Timberlane Dr to Northeast Pkwy	0.14	15.5	12.7	12.9
9	Northeast Pkwy to Austin Hwy	0.26	47.1	1:09.4	1:08.7
10	Austin Hwy to Eisenhauer Rd	0.14	15.0	14.1	12.2
11	Eisenhauer Rd to DoveHaven Dr	0.46	1:21.7	45.2	37.8
12	DoveHaven Dr to Urban Crest Dr	0.22	24.0	22.5	23.0
13	Urban Crest Dr to Oak [illegible]	0.17	47.7	52.4	45.8
14	Oak [illegible] to Cripple Creek St	0.43	48.6	48.3	45.8
15	Cripple Creek St to Dalewood	0.10	17.2	15.6	14.9

SB

Harry Wurzbach

Segment		Length (mi)	Time 1 (min) 4:12	Time 2 (min) 4:32	Time 3 (min)
1	Scott Rd to Burr Rd	0.81	1:17.	1:16.4	
2	Burr Rd to Garraty Rd	0.29	26.6	46.1	
3	Garraty Rd to Ivy Ln	0.36	1:06.0	26.5	
4	Ivy Ln to Wiltshire Ave	0.16	33.6	13.1	
5	Wiltshire Ave to Rittiman	0.24	32.8	21.6	
6	Rittiman to Corinne Dr	0.07	37.1	48.1	
7	Corinne Dr to Timberlane Dr.	0.20	27.3	42.0	
8	Timberlane Dr to Northeast Pkwy	0.14	12.2	13.0	
9	Northeast Pkwy to Austin Hwy	0.26	23.9	1:34.5	
10	Austin Hwy to Eisenhauer Rd	0.14	13.2	14.1	
11	Eisenhauer Rd to Doverhaven Dr	0.46	46.1	2:27.0	
12	DoverHaven Dr to Urban Crest Dr	0.22	17.1	19.3	
13	Urban Crest Dr to Oak Dowell	0.17	21.9	37.2	
14	Oak Dowell to Cripple Creek St	0.43	48.6	40.5	
15	Cripple Creek St to Dalewood	0.10	12.1	15.1	

NB

Harry Wurzbach

Segment		Length (mi)	4:20 Time1 (min)	4:46 Time2 (min)	Time3 (min)
1	Scott Rd to Burr Rd	0.81	1:15.9	1:09.2	
2	Burr Rd to Garraty Rd	0.29	27.4	28.9	
3	Garraty Rd to Ivy Ln	0.36	51.3	41.7	
4	Ivy Ln to Wiltshire Ave	0.16	38.8	1:04.8	
5	Wiltshire Ave to Rittiman	0.24	2:07.6	1 53.4	
6	Rittiman to Corinne Dr	0.07	9.6	10.8	
7	Corinne Dr to Timberlane Dr.	0.20	19.3	17.0	
8	Timberlane Dr to Northeast Pkwy	0.14	14.1	12.0	
9	Northeast Pkwy to Austin Hwy	0.26	23.1	54.3	
10	Austin Hwy to Eisenhauer Rd	0.14	1:54.1	1:09.3	
11	Eisenhauer Rd to Dovenhaven Dr	0.46	40.2	38.9	
12	DoveHaven Dr to Urban Crest Dr	0.22	24.5	33.3	
13	Urban Crest Dr to OakDell	0.17	40.6	21.9	
14	OakDell to Cripple Creek St	0.43	33.2	27.9	
15	Cripple Creek St to Dalewood	0.10	39.7	47.3	

APPENDIX G
DRAINAGE DATA / ANALYSIS

Culvert Analysis Results for A1

Box
Concrete
5ft x 6ft Box
Rise = 5.000
Span = 6.000
Number Of Barrels = 1
Length = 128.019
Slope = 0.016
Upstream Invert = 720.000
Downstream Invert = 718.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
224.000	725.560	725.560	725.560	718.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
224.000	17.795	2.098	3.512	0.004	0.016

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
224.000	224.000	0.000	725.560

Number of Overtopping Points = 51

X	Y
0.000	730.321
6.000	730.137
12.000	729.947
18.000	729.784
24.000	729.640
30.000	729.496
36.000	729.350
42.000	729.205
48.000	729.059
54.000	728.913

Ex (8+10+130)/27 = 38.27

60.000	728.767
66.000	728.625
72.000	728.484
78.000	728.343
84.000	728.208
90.000	728.075
96.000	727.947
102.000	727.831
108.000	727.746
114.000	727.538
120.000	727.228
126.000	726.917
132.000	726.607
138.000	726.297
144.000	726.000
150.000	726.000
156.000	726.000
162.000	726.000
168.000	726.000
174.000	726.000
180.000	726.000
186.000	726.000
192.000	726.000
198.000	726.000
204.000	726.000
210.000	726.000
216.000	726.000
222.000	726.000
228.000	726.000
240.000	726.000
246.000	726.000
252.000	726.000
264.000	726.000
270.000	726.000
276.000	726.000
282.000	726.000
288.000	726.000
294.000	726.000
300.000	726.000

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
224.000	718.000

Culvert Analysis Results for B1

Box
Concrete
5ft x 5ft Box
Rise = 5.000
Span = 5.000
Number Of Barrels = 1
Length = 106.755
Slope = 0.005
Upstream Invert = 698.000
Downstream Invert = 697.500
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
153.000	702.786	702.786	702.786	698.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
153.000	10.411	2.939	3.076	0.004	0.005

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
153.000	153.000	0.000	702.786

Number of Overtopping Points = 51

X	Y
0.000	710.234
6.000	710.105
12.000	709.972
18.000	709.876
24.000	709.810
30.000	709.733
36.000	709.656
42.000	709.579
48.000	709.502
54.000	709.424

Cx
(9 x 8 x 108)/27 = 256 cy

60.000	709.347
66.000	709.269
72.000	709.192
78.000	709.114
84.000	709.037
90.000	708.959
96.000	708.882
102.000	708.805
108.000	708.728
114.000	708.651
120.000	708.573
126.000	708.496
132.000	708.419
138.000	708.342
144.000	708.264
150.000	708.187
156.000	708.110
162.000	708.033
168.000	707.882
174.000	707.531
180.000	707.180
186.000	706.829
192.000	706.479
198.000	706.128
204.000	706.149
210.000	706.385
216.000	706.620
222.000	706.856
228.000	707.091
234.000	707.326
240.000	707.562
246.000	707.797
252.000	707.979
258.000	708.000
264.000	708.000
270.000	708.000
276.000	708.000
282.000	708.000
288.000	708.000
294.000	708.000
300.000	708.000

Tailwater Definition - User Supplied Tailwater Elevations

Discharge Tailwater

--------- ---------

Culvert Analysis Results for C1

Box
Concrete
5ft x 10ft Box
Rise = 5.000
Span = 10.000
Number Of Barrels = 1
Length = 73.971
Slope = 0.014
Upstream Invert = 685.000
Downstream Invert = 684.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
295.000	689.663	689.663	689.663	684.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
295.000	17.046	1.731	3.002	0.003	0.014

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
295.000	295.000	0.000	689.663

Number of Overtopping Points = 41

X	Y
0.000	692.685
5.000	692.622
10.000	692.565
15.000	692.519
20.000	692.475
25.000	692.431
30.000	692.387
35.000	692.343
40.000	692.299
45.000	692.255

CX (8 x 13 x 74)/27 = 293 CY

50.000	692.212
55.000	692.170
60.000	692.128
65.000	692.086
70.000	692.044
75.000	692.014
80.000	691.951
85.000	691.785
90.000	691.680
95.000	691.574
100.000	691.782
105.000	691.952
110.000	692.000
115.000	692.000
120.000	692.000
125.000	692.000
130.000	692.000
135.000	692.000
140.000	692.000
145.000	692.000
150.000	692.000
155.000	692.000
160.000	692.000
165.000	692.000
170.000	692.000
175.000	692.000
180.000	692.000
185.000	692.000
190.000	692.000
195.000	692.000
200.000	692.000

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
295.000	684.000

Culvert Analysis Results for D1

Box
Concrete
5ft x 6ft Box
Rise = 5.000
Span = 6.000
Number Of Barrels = 4
Length = 80.544
Slope = 0.012
Upstream Invert = 687.000
Downstream Invert = 686.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
700.000	691.625	691.625	691.625	686.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
700.000	15.314	1.905	2.979	0.004	0.012

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
700.000	700.000	0.000	691.625

Number of Overtopping Points = 41

X	Y
0.000	692.000
5.000	692.000
10.000	692.000
15.000	692.000
20.000	692.000
25.000	692.000
30.000	692.000
35.000	692.000
40.000	692.000
45.000	692.000

50.000	692.000
55.000	692.000
60.000	692.000
65.000	692.000
70.000	692.000
75.000	692.000
80.000	692.000
85.000	692.000
90.000	692.000
95.000	692.029
100.000	692.095
105.000	692.162
110.000	692.229
115.000	692.296
120.000	692.362
125.000	692.429
130.000	692.496
135.000	692.563
140.000	692.629
145.000	692.696
150.000	692.763
155.000	692.829
160.000	692.896
165.000	692.963
170.000	693.030
175.000	693.096
180.000	693.163
185.000	693.230
190.000	693.297
195.000	693.363
200.000	693.430

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
700.000	686.000

Culvert Analysis Results for E1

Box
Concrete
4ft x 8ft Box
Rise = 4.000
Span = 8.000
Number Of Barrels = 3
Length = 111.566
Slope = 0.009
Upstream Invert = 710.000
Downstream Invert = 709.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
399.000	713.167	713.167	713.167	708.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
399.000	11.942	1.392	2.048	0.003	0.009

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
399.000	399.000	0.000	713.167

Number of Overtopping Points = 41

X	Y
0.000	714.757
5.000	714.718
10.000	714.682
15.000	714.647
20.000	714.614
25.000	714.587
30.000	714.548
35.000	714.490
40.000	714.433
45.000	714.375

2x(7x28x115)/27 = 475 cy

50.000	714.317
55.000	714.259
60.000	714.201
65.000	714.144
70.000	714.086
75.000	714.028
80.000	714.000
85.000	714.000
90.000	714.000
95.000	714.000
100.000	714.000
105.000	714.000
110.000	714.000
115.000	714.000
120.000	713.807
125.000	713.587
130.000	713.368
135.000	713.197
140.000	713.218
145.000	713.239
150.000	713.262
155.000	713.286
160.000	713.310
165.000	713.338
170.000	713.390
175.000	713.500
180.000	713.611
185.000	713.721
190.000	713.831
195.000	713.941
200.000	714.000

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
399.000	708.000

Culvert Analysis Results for F1

Box
Concrete
6ft x 7ft Box
Rise = 6.000
Span = 7.000
Number Of Barrels = 2
Length = 94.785
Slope = 0.011
Upstream Invert = 719.000
Downstream Invert = 718.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
546.000	724.618	724.618	724.618	718.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
546.000	16.162	2.413	3.616	0.004	0.011

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
546.000	546.000	0.000	724.618

Number of Overtopping Points = 51

X	Y
0.000	728.000
6.000	728.000
12.000	728.000
18.000	728.000
24.000	728.000
30.000	728.000
36.000	728.000
42.000	728.000
48.000	728.000
54.000	728.000

60.000	728.000
66.000	728.000
72.000	727.993
78.000	727.741
84.000	727.629
90.000	727.582
96.000	727.542
102.000	727.411
108.000	727.248
114.000	727.085
120.000	726.922
126.000	726.759
132.000	726.596
138.000	726.433
144.000	726.270
150.000	726.108
156.000	726.000
162.000	726.000
168.000	726.000
174.000	726.000
180.000	726.000
186.000	726.000
192.000	726.000
198.000	726.000
204.000	726.000
210.000	726.000
216.000	726.000
222.000	726.000
228.000	726.000
234.000	726.000
240.000	726.000
246.000	726.000
252.000	726.000
258.000	725.808
264.000	725.722
270.000	725.618
276.000	725.510
282.000	725.400
288.000	725.290
294.000	725.179

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
546.000	718.000

Culvert Analysis Results for F1

Box
Concrete
6ft x 8ft Box
Rise = 6.000
Span = 8.000
Number Of Barrels = 1
Length = 94.785
Slope = 0.011
Upstream Invert = 719.000
Downstream Invert = 718.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
430.566	726.200	726.200	726.200	718.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
430.566	18.121	2.970	4.482	0.003	0.011

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
546.000	430.566	115.434	726.200

Number of Overtopping Points = 51

X	Y
0.000	728.000
6.000	728.000
12.000	728.000
18.000	728.000
24.000	728.000
30.000	728.000
36.000	728.000
42.000	728.000
48.000	728.000
54.000	728.000

60.000	728.000
66.000	728.000
72.000	727.993
78.000	727.741
84.000	727.629
90.000	727.582
96.000	727.542
102.000	727.411
108.000	727.248
114.000	727.085
120.000	726.922
126.000	726.759
132.000	726.596
138.000	726.433
144.000	726.270
150.000	726.108
156.000	726.000
162.000	726.000
168.000	726.000
174.000	726.000
180.000	726.000
186.000	726.000
192.000	726.000
198.000	726.000
204.000	726.000
210.000	726.000
216.000	726.000
222.000	726.000
228.000	726.000
234.000	726.000
240.000	726.000
246.000	726.000
252.000	726.000
258.000	725.808
264.000	725.722
270.000	725.618
276.000	725.510
282.000	725.400
288.000	725.290
294.000	725.179
300.000	725.068

Tailwater Definition - User Supplied Tailwater Elevations

Discharge Tailwater 546.000 718.000

Culvert Analysis Results for G1

Box
Concrete
5ft x 7ft Box
Rise = 5.000
Span = 7.000
Number Of Barrels = 3
Length = 97.907
Slope = 0.010
Upstream Invert = 702.000
Downstream Invert = 701.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
555.600	706.323	706.323	706.323	702.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
555.600	14.253	1.856	2.792	0.003	0.010

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
555.600	555.600	0.000	706.323

Number of Overtopping Points = 41

X	Y
0.000	707.806
5.000	707.777
10.000	707.749
15.000	707.721
20.000	707.692
25.000	707.664
30.000	707.636
35.000	707.608
40.000	707.580
45.000	707.552

50.000	707.524
55.000	707.496
60.000	707.468
65.000	707.440
70.000	707.412
75.000	707.384
80.000	707.357
85.000	707.329
90.000	707.301
95.000	707.273
100.000	707.246
105.000	707.219
110.000	707.191
115.000	707.164
120.000	707.136
125.000	707.109
130.000	707.082
135.000	707.057
140.000	707.035
145.000	707.013
150.000	706.992
155.000	706.972
160.000	706.953
165.000	706.932
170.000	706.911
175.000	706.891
180.000	706.871
185.000	706.852
190.000	706.831
195.000	706.812
200.000	706.792

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
555.600	702.000

Culvert Analysis Results for G1

Box
Concrete
5ft x 6ft Box
Rise = 5.000
Span = 6.000
Number Of Barrels = 2
Length = 97.907
Slope = 0.010
Upstream Invert = 702.000
Downstream Invert = 701.000
N value = 0.012
Entrance KE value = 0.400

Culvert Discharge	MAX HW	Inlet HW	Outlet HW	Tailwater Elev.
490.861	707.345	707.345	707.345	702.000

Culvert Discharge	Outlet Velocity	Uniform Depth	Critical Depth	Critical Slope	Friction Slope
490.861	17.340	2.359	3.397	0.004	0.010

Overtopping Definition - Overtopping Profile Supplied

Discharge	Culvert Discharge	Overtopping Discharge	Headwater
555.600	490.861	64.739	707.345

Number of Overtopping Points = 41

X	Y
0.000	707.806
5.000	707.777
10.000	707.749
15.000	707.721
20.000	707.692
25.000	707.664
30.000	707.636
35.000	707.608
40.000	707.580
45.000	707.552

50.000	707.524
55.000	707.496
60.000	707.468
65.000	707.440
70.000	707.412
75.000	707.384
80.000	707.357
85.000	707.329
90.000	707.301
95.000	707.273
100.000	707.246
105.000	707.219
110.000	707.191
115.000	707.164
120.000	707.136
125.000	707.109
130.000	707.082
135.000	707.057
140.000	707.035
145.000	707.013
150.000	706.992
155.000	706.972
160.000	706.953
165.000	706.932
170.000	706.911
175.000	706.891
180.000	706.871
185.000	706.852
190.000	706.831
195.000	706.812
200.000	706.792

Tailwater Definition - User Supplied Tailwater Elevations

Discharge	Tailwater
555.600	702.000

SECTION 4.0

Drainage

Introduction

This section provides criteria for performing drainage design and guidance on what standards the drainage design shall conform to. It is not the intent of this manual to instruct the design engineer in the usage or applicability of these criteria. Engineering training, experience, and judgment must be used in the performance of drainage design tasks. The means and methods used in completing the design are under the direction of the design engineer, who will be required to submit design calculation summaries as part of the plan submittals during the various phases of the design. The drainage calculation results will be required in the plan of record. Drainage calculation summary formats are included in this section of the manual.

The Unified Development Code (UDC) is the basic reference for drainage design, although it does not address some drainage design items in sufficient detail. The TxDOT Hydraulic Design Manual has been referenced to cover some of these areas. Note that the city requires designs to conform to different storm frequencies than TxDOT does.

The drainage design criteria reference the documents listed below. These reference documents are not duplicated in order to avoid discrepancies that may develop as these references are updated.

- *City of San Antonio Unified Development Code Article 5, Division 2, section 35-504and Appendix F*
  To view the code:
  http://www.municode.com/Resources/gateway.asp?pid=14228&sid=43
  To buy the code: https://secure.municode.com/munistore/productspage.asp
- *City of San Antonio Storm Water Design Manual*
  http://www.sanantonio.gov/publicworks/stormwater/index.asp
- *TxDOT (Texas Department of Transportation) Hydraulic Design Manual*
  http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm
- San Antonio River Authority, *Regional modeling standards for Hydrology and Hydraulic Modeling*
  http://www.bexarfloodfacts.org
- U.S. DOT FHWA (Department of Transportation, Federal Highway Administration) Hydraulic Engineering Circular No. 5, *Hydraulic charts for the selection of highway culverts*
  http://www.fhwa.dot.gov/engineering/hydraulics/pubs/hec/hec05.pdf
- *Open Channel Hydraulics* by Ven Te Chow, McGraw-Hill, 1959, ISBN: 978-0070107762.
- U.S. DOT FHWA Hydraulic Engineering Circular No. 14, *Hydraulic design of energy dissipators for culverts and channels*
  http://www.fhwa.dot.gov/engineering/hydraulics/pubs/hec/hec14SI.pdf

Table 1 depicts the sections of drainage design and the appropriate document and section to reference for specific design criteria and guidance.

Table 1
References

Topic	Item	Document	Section or Chapter
Hydrology	Method of computing runoff	UDC	2.1c
	< 640 acres	UDC	2.1c
	≥ 640 acres	UDC	2.1c
	Time of concentration	UDC	2.1c
	Runoff coefficients	UDC	2.1c
	Runoff intensities-	UDC	2.1c
	SCS curve numbers	UDC	2.1c
	Percent impervious cover	UDC	2.1c
	Design rainfall	UDC	2.1c
	Routing of runoff	UDC	2.1c
	Manning's n value	UDC	2.1c
Floodplain Analysis	Establish design surface elevation		
	Limits of study, downstream impact	UDC	2.2b
	System criteria	UDC	2.2b
	Three development conditions to analyze	UDC	2.2b
	Existing	UDC	2.2b
	Proposed	UDC	2.2b
	Ultimate	UDC	2.2b
	Stream channel planning consideration	TxDOT	7
	Stream stability issues	TxDOT	7
	Regional modeling standards for hydrology and hydraulic modeling	SARA / BRWM	
Hydraulics			
Channels and Improved Watercourses			
	Watercourse to remain unobstructed	UDC	2.3.1h
	Channel modifications	UDC	2.3.1h
	Maintenance	UDC	2.3.1h
	Multiple uses	UDC	2.3.1h
	Velocity criteria	UDC	2.3.1h
	Retard spacing	UDC	2.3.1h
	Concrete lined channels	UDC	2.3.1h
	Vegetated earth channels	UDC	2.3.1h
Bridges	Introduction	TxDOT	9
	Planning and location considerations	TxDOT	9
	Bridge hydraulic considerations	TxDOT	9
	Hydraulics of bridge openings	TxDOT	9
	Single and multiple opening designs	TxDOT	9
	Bridge scour	TxDOT	9
	Flood damage prevention	TxDOT	9
	Risk assessment	TxDOT	9

Topic	Item	Document	Section or Chapter
	Appurtenances	TxDOT	9
Culverts	Introduction	TxDOT	8
	Design considerations	TxDOT	8
	Hydraulic operation of channels	TxDOT	8
	Improved inlets	TxDOT	8
	Velocity protection and control devices	TxDOT	8
Streets	Streets	UDC	2.3.4g
	Primary and secondary arterial streets	UDC	2.3.4g
	Local "B" and collector streets	UDC	2.3.4g
	Local "A" streets	UDC	2.3.4g
	Alleys	UDC	2.3.4g
	Traditional street design	UDC	2.3.4g
	All-weather crossings	UDC	2.3.4g
	Dangerous conditions on crossings during floods	UDC	2.3.4g
	Street velocities and capacities	UDC	2.3.4g
Storm Sewers	Storm sewers	UDC	2.3.5i
	Junction loss		
	Inlets and openings	UDC	2.3.5i
	Drop curb openings—side walk does not abut curb	UDC	2.3.5i
	Curb or drop inlets	UDC	2.3.5i
	Grate inlets	UDC	2.3.5i
	Curb opening inlets	UDC	2.3.5i
Erosion and Stabilization	Roadside channel design	TxDOT	7
	Introduction	TxDOT	13
	Soil erosion control considerations	TxDOT	13
	Inspection and maintenance of erosion control measures	TxDOT	13

Design Criteria

The City of San Antonio, Bexar County, and the San Antonio River Authority (SARA) have an agreement of understanding to address common flooding and drainage issues. These three agencies, along with 19 suburban communities, have formed the Bexar Regional Watershed Management (BRWM) partnership. A BRWM technical committee agreed on and adopted regional modeling standards, which are to be used when modeling flood plains and watercourses.

The BRWM has produced a number of hydrologic and hydraulic models of major watercourses in Bexar County. These studies are based on regional modeling standards and can be used for detailed planning purposes. Study data can be found at http://www.bexarfloodfacts.org. Prior to using these models, coordination is required to determine applicability to a specific project. The BRWM hydrologic models will be discussed with city staff during scoping meetings, and their applicability and degree of usage will be specified in the design summary report.

Hydrology

The UDC lays out the methodology to use in establishing project hydrologic values.

Areas that are smaller than those portions of the watershed shown in BRWM studies should be analyzed individually by the design engineer using the methodology outlined in the UDC.

Flood Plain Analysis

BRWM hydraulic models may be used if determined to be applicable.

The TxDOT Hydraulic Design Manual, Chapter 7, Section 2, *Stream Channel Planning Consideration,* and Section 4, *Stream Stability Issue,s* are referenced for additional information.

Projects may require a Letter of Map Revision (LOMR), a Conditional Letter of Map Revision (CLOMR), a Flood Plain Development permit, and/or other permits. These requirements will be discussed in the DSR at the initial scoping meeting. The permits and plans shall be developed in accordance with applicable state and local requirements.

Hydraulics

The hydraulic design for each project can be divided into five areas of concern: channels and improved watercourses, bridges, culverts, streets, and storm sewers

Channels and Improved Watercourses

Channels and improved watercourses will be designed using the criteria outlined in the UDC.

Bridges

Bridges will be analyzed in conjunction with flood plain analysis or channels and improved watercourses. Refer to the UDC for hydrology and hydraulic modeling and to the TxDOT *Hydraulic Design Manual,* Chapter 9, *Bridges*. Scour calculations will be required on all new and existing structures. Scour must be calculated for the 1 percent annual chance storm (100-year ultimate) and the lesser of the overtopping flow or the 0.2 percent annual chance storm (500-year).

Culverts

Culverts may be designed by hand or using available software. The design will follow the approach in the TxDOT *Hydraulic Design Manual,* Chapter 8, *Culverts,* and U.S. DOT FHWA Hydraulic Engineering Circular No. 5, Hydraulic charts for the selection of highway culverts. Minimum culvert velocities shall be as specified in the TxDOT *Hydraulic Design Manual.*

The decision between constructing a culvert or a bridge requires an evaluation of initial cost, maintenance, and environmental and operations considerations. Generally, culverts that span a distance of 30 to 50 feet could be replaced with a span bridge.

Streets

Streets are used for drainage conveyance in San Antonio. The limitations are outlined in the UDC. The design engineer will provide calculation data showing that velocities are acceptable and ponding widths are within limits. The pavement design shall consider the effects of water inundation at sags and low areas.

Storm Sewers

Refer to the UDC for criteria on storm sewer design. The preference of the city is to use curb inlets, combination curb and grate inlets, or a 4-way inlet. Grate inlets should be used only under isolated situations and only with the specific approval of Storm Water engineering staff.

Junction losses can have a significant effect in the design of storm sewers and should be considered in the design. Historically, the city has used *Pressure Changes at Storm Drain Junctions*, Engineering Bulletin No. 41, University of Missouri (Sangster, Wood, Smerdon, and Bossy, 1958), commonly called the "Missouri Charts." This publication may be used, although other options are available for the designer to use, including several computer storm sewer design programs that contain options to calculate junction losses.

Junction boxes or manholes, as appropriate, shall be used to join multiple lines and at locations of change in grade or alignment. The riser portion of a junction may be placed on the top of a box culvert for this purpose, with the inclusion of sufficient details and standard drawings.

When connecting proposed storm sewers with existing storm sewers, the beginning water-surface elevation needs to be identified. Use existing plan information when available. The starting water-surface elevation shall be documented in the design summary report and determined by the design engineer with concurrence from the Storm Water Department.

Conduit Strength and Durability

Concrete pipe class can be determined using Table 1 and 2 from the City of San Antonio Standard Specifications for Public Works Construction. Reinforced concrete pipe is the preferred drainage conveyance in pipe systems. Corrugated metal pipe and HDPE (high-density polyethylene) pipe shall be considered on a case-by-case basis in non-roadway areas.

Erosion and Stabilization

The UDC addresses acceptable channel surfaces for various velocity conditions. The design must minimize channel erosion. The designer should consider grass, concrete retards, or concrete riprap lining as the standard surfaces for channels.

In special circumstances, and with approval for a single project application, the design engineer may consider erosion control mats in conjunction with vegetative control to line channels. The design must consider operation and maintenance practices and the durability of the specified mat and vegetative control. Some of these special circumstances could be the protection of outlets and outfalls and the lining of improved channels. These concepts should be discussed during the scoping and preliminary meetings to determine project requirements and appropriateness.

Rock riprap may also be used in special circumstances, and with approval for a single project application. The design must follow applicable HEC (Hydrologic Engineering Center) guidelines. Abutments, slopes, and other bridge features are appropriate areas. Use of rock riprap should be discussed during the scoping and preliminary meetings to determine project requirements and appropriateness.

The Storm Water Pollution Prevention Plan (SW3P) will address erosion control and stabilization methods to be used during construction of the project. Best management practices (BMP) will address those design concepts that can best manage erosion control and stabilization when the project is completed.

Plan Submittal Requirements

Table 2 lists the plan requirements for various project phases.

Table 2
Drainage Plan Submittal Requirements

	PER	40%	70%	95%	Bld Documents
Hydrology					
Drainage area map	x	x	x	x	x
Discharge calculations	x	x	x	x	x
Flood Plain Analysis					
Plan of watercourse	x	x	x	x	x
Profile of:					
Existing ground		x	x	x	x
Proposed invert		x	x	x	x
Water surface elevations		x	x	x	
Cross sections		x	x	x	
HEC-RAS detailed calculation	x	x	x	x	x
HEC-RAS summary	x	x	x	x	x
Hydraulics					
Channels and Improved Watercourses					
Plan show watercourse		x	x	x	x
Proposed sections		x	x	x	x
Plan and Profile sheets			x	x	x
Details:		x	x	x	x
Concept		x			
Final			x	x	x
Hydraulic computation sheet			x	x	x
HGL/EGL (storm water set only)			x	x	x

	PER	40%	70%	95%	Bid Documents
Bridges					
Location	(1)	(1)	(1)	(1)	(1)
Layout	(1)	(1)	(1)	(1)	(1)
Sizing		x			
Hydraulic analysis		x	x		
Scour analysis			x	x	x
Hydraulic data sheet		x	x	x	x
Culverts					
Layout	x	x			
Plan and profile sheets		x	x	x	x
Details:					
Concept		x			
Final			x	x	x
Hydraulic data sheet		x	x	x	x
Streets					
Hydraulic computation sheet			x		
Storm Sewers					
System layout	x	x			
Plan and profile sheets			x	x	x
Inlet sections			x	x	x
Details:					
Concept		x			
Final			x	x	x
Hydraulic computation sheet			x	x	x
HGL/EGL			x	x	
Erosion and Stabilization					
SW3P			x	x	x
SW3P details			x	x	x
SW3P narrative			x	x	x
BMP	x	x			(2)
Outlet stabilization	(2)	(2)	included in drng		
Outfall stabilization	(2)	(2)	details		
(1) include in roadway plans					
(2) include in drainage plans					

Calculation Submittal Requirements

Table 3 lists the calculation requirements for the various project phases.

Include a CD of applicable calculations with each submittal. HEC-RAS (Hydraulic Engineering Center River Analysis System), Microsoft Excel, and other common digital file formats are preferred. Paper calculations shall also be in PDF (Portable Document Format). Calculations shall include an index and must be in the order listed below.

Table 3
Calculation Submittal Requirements

	PER	40%	70%	95%	Bid Documents
Hydrology					
Discharges for areas < 640 acres	x	x	x	x	
Discharges for areas > 640 acres	x	x	x	x	
Time of concentration		x	x	x	
SCS curve numbers		x	x	x	
Percent impervious cover		x	x	x	
Frequency of coincident occurrence			x	x	
Floodplain analysis					
HEC-RAS analysis:	x	x	x	x	
Existing	x	x	x	x	
Proposed	x	x	x	x	
Ultimate	x	x	x	x	
Hydraulics					
Channels and Improved Watercourses					
HEC-RAS analysis		x	x	x	
Manning's Equation		x	x	x	
Bridges					
HEC-RAS analysis		x	x	x	
Scour calculations		x	x	x	
Culverts					
Tail water calculations			x	x	
Culvert sizing		x	x	x	
Energy dissipation			x	x	
Soil stabilization (if required)			x	x	
Streets					
Street velocities and capacities		x	x	x	
Storm Sewers					
Conveyance calculations			x	x	
Inlets sizing			x	x	
Discharge summary			x	x	
Tail water calculations			x	x	
Energy dissipation			x	x	
Soil stabilization (if required)			x	x	
Erosion and Stabilization			x	x	x
SW3P Sizing Calculations			x	x	x

Design by Frequency Selection

Table 4 shows the frequencies to which various drainage elements shall be designed.

Table 4
Facility Design Frequencies

Improvement Type	Design Frequency 5E	10	25E	25U	50	100E	100U	500E
Hydraulics								
Channels and Improved Watercourses:								
Drainage area less than 100 acres			x	x				
Drainage area greater than 100 acres	x		x	x		x	x	
Bridges:			x	x		x	x	
Scour						x	x	x
Analyze the lower of overtopping flow or 500 year								
Culverts:								
Drainage area less than 100 acres			x	x			(1)	
Drainage area greater than 100 acres						x	x	
Streets:								
Local "A":								
Curb full	x							
Within ROW			x	X				
Local "B" and collector:								
Curb full			x	X				
Primary and Secondary Arterial:								
Max depth of 0.30 feet			x	X				
Passable lane (10 ft.) each direction			x	X				
Storm Sewers:								
Inlets:								
Desirable			x	x				
Drain line:								
Drainage area less than 100 acres			x	x				
Drainage area greater than 100 acres						x	x	
Erosion and Stabilization:								
SW3P	x							
BMP:								
Drainage area less than 100 acres			x	x				
Drainage area greater than 100 acres						x	x	
Outlet stabilization	same as structure or channel							
Outfall stabilization	same as structure or channel							
E = Existing U = Ultimate								

(1) Check "Dangerous Conditions on Crossing during Floods," UDC figure 504-2, table 504.

Plan Sheet Formats

The design and data shall be presented on various plan sheets. Example sheets with a minimum level of content are included in this manual to show how the design and calculations shall be presented. The design engineer should use judgment as to whether additional information will need to be included and shown.

Drainage Area Maps

The information presented on the drainage area map should include: watershed identification code (from regional modeling standards), overall watershed boundary, project sub-boundaries, project drainage area identification symbology, flow arrows, outfall(s), and 2-foot contours from COSA GIS mapping or survey data. Also show discharge calculations, including time of concentration. At a minimum, show areas, discharge values, and time of concentrations, with full calculations shown on the second sheet. See figure 4–1.

Interior Drainage Area Map(s)

Some projects may benefit from interior drainage area maps, showing smaller areas that drain to specific inlets. Demonstrate calculations as described for the Drainage Area Map, described above. See figure 4–2.

Plan of Watercourse

Used with floodplain analyses. Show plan of the watercourse in the study reach, location of cross-sections used in the analysis, existing and proposed topographic features that affect the study, and FEMA and ultimate 100-year flood plain delineations, as agreed to in the project scoping meetings.

Hydraulic Data Sheets

These sheets can be used to show summary calculations for bridges, culverts, and natural and improved watercourses. In addition to the summary data, include the method and program used for the calculation and the frequency(s) used in the calculations. See Figures 4–3 and 4–4.

Hydraulic Computation Sheets

Storm sewer calculations are shown on these sheets, divided into discharge calculations, conveyance calculations, and inlet hydraulics calculations. This information may fit on one sheet or may need multiple sheets on larger projects. See figure 4–5.

Plan and Profile Sheets

Various components of the drainage design will need to be shown on plan and profile sheets. The hydraulic grade line and energy grade line (HGL/EGL) must be shown on the sheets during the design phases of the project. For clarity the EGL/HGL will be shown only on a designated set of plans submitted to Storm Water and these lines must be in color or highlighted in color. Turn off the HGL/EGL on the final construction documents to avoid confusion during construction. See figures 4–6, 4–7, and 4–8.

Standard Details

COSA has a number of standard details that may be used, for example, Standard Specifications for Public Works Construction. TxDOT has standard details for culverts, headwalls, curb inlets and extensions, and other drainage items that may also be used. Any modifications to standard details must be called out on the standard sheets and be sealed by a Texas professional engineer.

Drainage Details

Details designed for the project, but not included in standard details, shall be shown on drainage detail sheets. These details are typically drawn to scale and show plan, section(s), and perspective views as needed.

Drainage Cross Sections

Cross sections will be needed for channel and watercourse projects. Show existing ground, proposed improvements, and design basis water-surface elevations. For proposed channels, cross sections will be provided at 50-foot intervals and as needed. For natural watercourses, sections will be shown at the intervals used in the HEC-RAS model. Storm sewer improvements will be shown on the roadway cross sections. Show flow arrow at ROW where it may not be clear whether adjacent areas are draining into or away from the project. See figure 4–9.

Inlet Sections

Storm sewer laterals shall be shown on section views similar to cross sections. Include HGL/EGL lines on these sections. See instructions in the plan and profile sheet section of this manual and figure 4–10. An example of how HGL and EGL data are to be presented is shown in figures 7, 8, and 10.

Storm Water Pollution Prevention Plan

This plan will be of sufficient scale to show project features that need protection during construction. Project complexity will dictate how many sheets will be needed to convey the prevention plan to the contractor and the inspection representatives. Some projects will need the SW3P to follow the construction phasing plan. The plan shall include contours, flow arrows, existing topographic features, proposed improvements as appropriate, proposed devises, notes, and instructions. In addition, this plan must be developed in accordance with applicable state and local requirements.

Storm Water Pollution Prevention Narrative

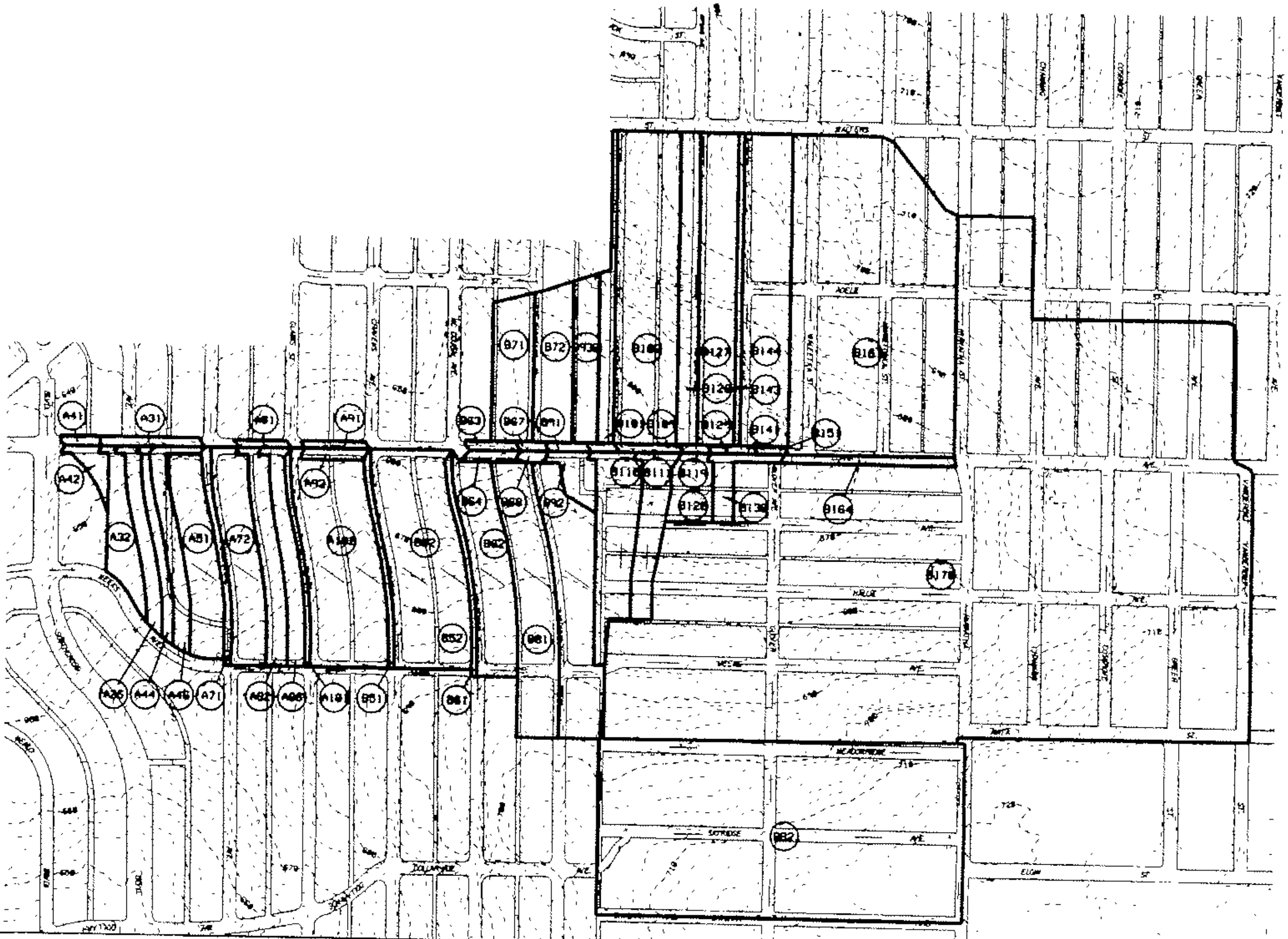
A standard narrative sheet has been prepared by the city and shall be filled out with the appropriate project information.

Storm Water Pollution Prevention Details

Some projects will need additional engineering details that are not shown in the standard SW3P details provided by COSA and TxDOT. The engineer shall present these details with the SW3P or on separate detail sheets if needed.

This page intentionally left blank.

No	Comp Area acres	Comp C	Tc Used	Discharge for Individual: Existing I25 in/hr	Existing Q25 cfs	Ultimate I25 in/hr	Ultimate Q25 cfs	Time of Concentration: Reach 1 L Ft	Reach 1 Vel fps	Reach 2 L Ft	Reach 2 Vel fps	Reach 3 L Ft	Reach 3 Vel fps	Tc	Overland Flow: Overland L Ft	Overland Slope %	Tc	Total Tc minutes
A26	1.03	0.67	15	4.48	3.09	6.71	4.64											



SCALE: 1" = 400'

LEGEND

WATERSHED CODE - XXXXXX

Figure 4-1
Page 4-13

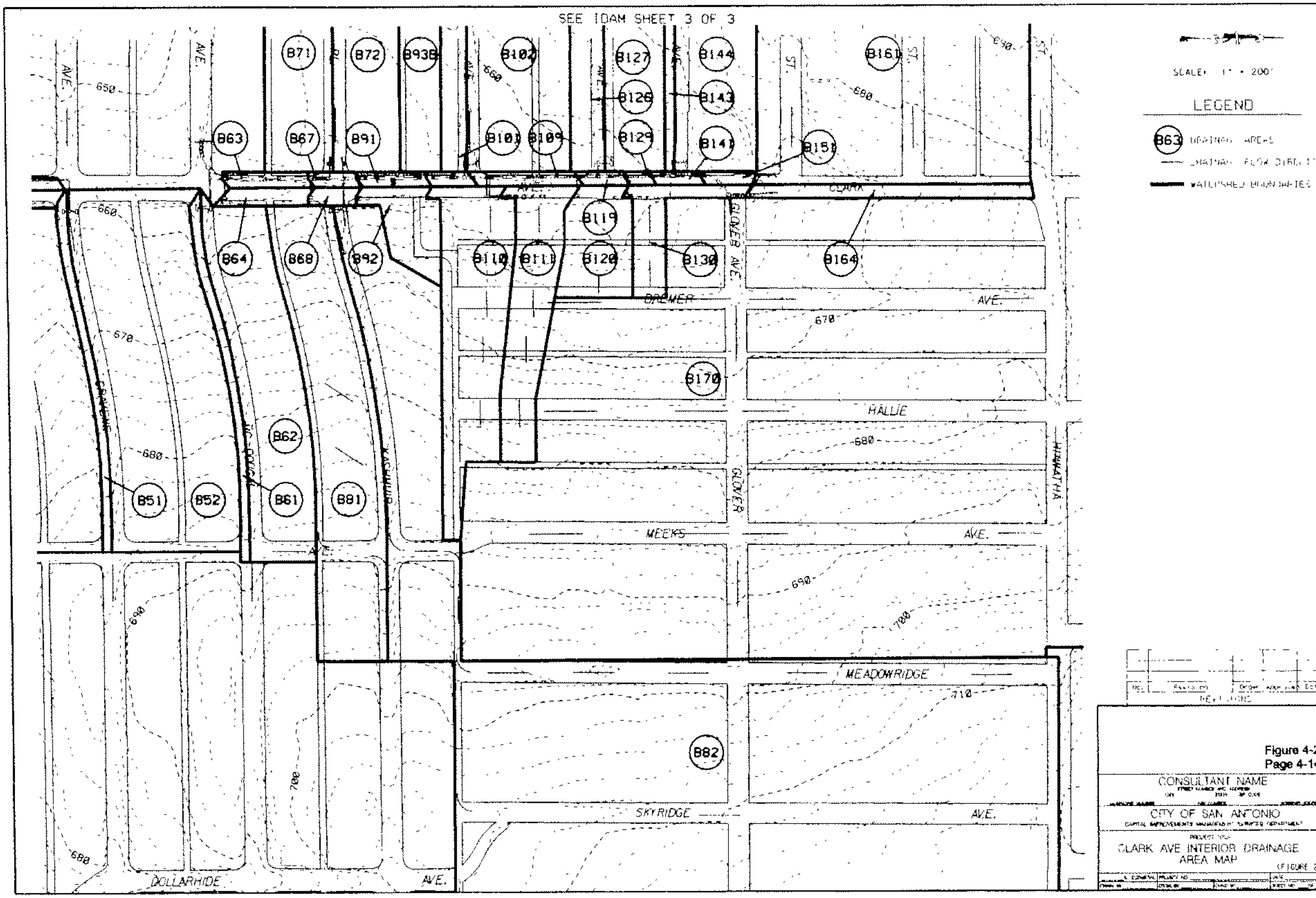
CONSULTANT NAME

CITY OF SAN ANTONIO

CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

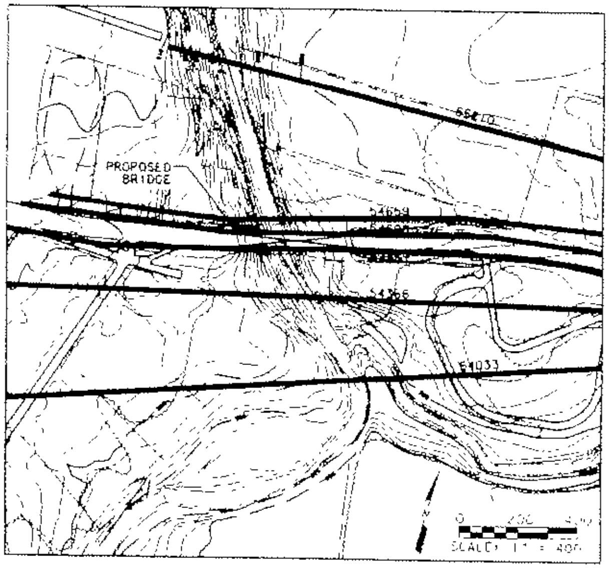
CLARK AVE.
DRAINAGE AREA MAP
(FIGURE 1)

MBT FILES/f1-dam-pln-01.dgn 6/19/2008 1:29:04 PM



/MBI FILES f2 idam pln 02 dgn 6/19/2008 3:31:28 PM

HEC-RAS CROSS SECTION LAYOUT (SALADO CREEK)



HEC-RAS OUTPUT

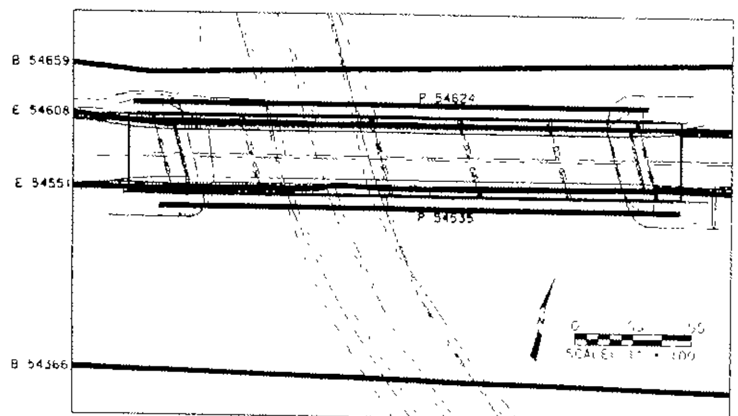
EXISTING

River Sta	Prof	Q (cfs)	Min EL	W.S. EL	Crit W.S.	E.G. Elev	E.G. Slope	Vel	Flow A	Top W	F no
55210	Q100	27800	572.00	593.11	584.10	593.68	0.002455	6.22	5709.74	1411.15	0.29
55210	Q25	20297	572.00	591.11	582.31	591.59	0.002229	5.62	3675.08	572.80	0.28
54659	Q100	27600	571.90	591.29	585.32	591.96	0.004262	6.68	4845.24	1214.62	0.37
54659	Q25	20297	571.90	589.33	583.51	588.96	0.004162	6.32	3290.79	506.32	0.38
54608	Q100	27800	571.85	590.89	584.56	591.63	0.009970	6.95	3971.88	1218.96	0.38
54608	Q25	20297	571.85	589.04	582.95	589.63	0.009491	5.17	3286.67	362.14	0.36
54578.5		Bridge									
54551	Q100	27800	571.80	590.77	584.38	591.52	0.004148	6.97	3957.85	1285.73	0.37
54551	Q25	20297	571.80	588.96	582.79	589.54	0.003467	6.12	3313.37	679.72	0.38
54366	Q100	27600	571.60	590.58	583.42	590.79	0.001847	4.18	9132.40	1867.22	0.25
54366	Q25	20297	571.60	588.56	581.69	588.85	0.002292	4.80	5893.37	1861.27	0.28
54033	Q100	27600	571.70	590.64	583.96	590.67	0.000076	0.78	21846.86	2301.77	0.04
54033	Q25	20297	571.70	588.70	582.81	588.72	0.000074	0.70	17862.49	2072.55	0.04

PROPOSED ULTIMATE

River Sta	Prof	Q (cfs)	Min EL	W.S. EL	Crit W.S.	E.G. Elev	E.G. Slope	Vel	Flow A	Top W	F no
55210	Q100U	27800	568.70	593.93	582.69	594.26	0.003020	5.10	7262.40	1630.53	0.23
55210	Q25U	20297	568.70	592.15	580.70	592.48	0.002980	4.75	4631.42	913.17	0.27
54659	Q100U	27600	566.00	591.22	584.38	591.80	0.005015	6.27	5004.23	1182.95	0.34
54659	Q25U	20297	566.00	589.38	582.01	589.88	0.006671	6.68	3545.12	508.89	0.34
54624	Q100U	27600	568.20	590.92	584.07	591.53	0.007912	6.34	4598.01	1251.50	0.34
54624	Q25U	20297	568.20	589.06	582.31	589.58	0.005160	5.85	3487.00	364.38	0.33
54579.5		Bridge									
54535	Q100U	27600	568.80	590.80		591.32	0.005642	5.57	5527.42	1325.12	0.29
54535	Q25U	20297	568.80	589.02		589.54	0.007551	5.84	3602.29	706.29	0.33
54366	Q100U	27600	567.60	590.57	582.99	590.78	0.001422	4.30	8126.92	1641.28	0.23
54366	Q25U	20297	567.60	588.36	581.24	588.86	0.001891	4.78	5850.69	1662.32	0.27
54033	Q100U	27800	570.30	590.64	584.05	590.67	0.000075	0.78	21644.29	2303.71	0.04
54033	Q25U	20297	570.30	588.70	582.98	588.72	0.000073	0.72	17780.10	2072.55	0.04

BRIDGE DETAIL PROPOSED & EXISTING SECTIONS



B: CROSS SECTION EXISTING & PROPOSED
E: CROSS SECTION EXISTING
P: CROSS SECTION PROPOSED

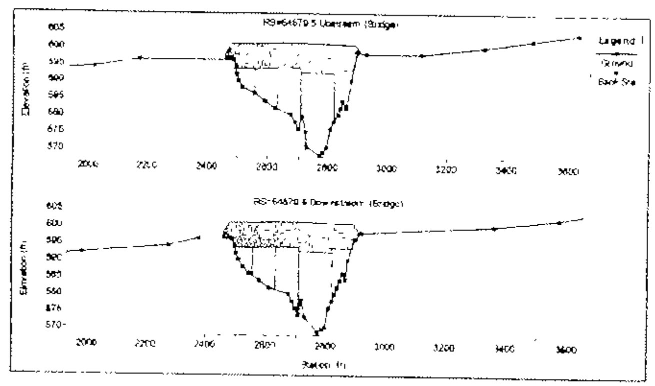


Figure 4-3
Page 4-15

CONSULTANT NAME

CITY OF SAN ANTONIO
CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE
HYDRAULIC DATA SHEET
(FIGURE 3)

.../MBI FILES/E3-HYD-01.dgn 6/19/2008 1:57:34 PM

CULVERT 5

HYDRAULIC DATA FOR STRUCTURES UNDER 1500 CFS

(PIPES, PIPE ARCHES & BOX CULVERTS)

	STATION	FREQ. (YEAR)	Q (cfs)	ALLOW HW (Elev)	OUTLET CHANNEL W	SS	n	SLOPE (ft/ft)	TW (Elev)	SIZE, LENGTH AND DESCRIPTION	SLOPE (ft/ft)	Ke	HW (Elev)	VEL OUT (fps)	REMARKS
EXISTING	56+06.00	Q (DES)	48	1284.02	24.5	100	0.035	0.0667	1280.17	2 - 5 x 3 x 70 MBC	0.0101	0.50	1282.19	7.33	
		100	71						1280.22				1282.65	8.24	
PROPOSED		10 (DES)	48		24.5	100	0.035		1280.10	2 - 5 x 3 x 77.87 MBC		0.20	1282.09	7.33	
		(A)	71						1280.19				1282.52	8.24	

EXISTING CULVERT ANALYSIS

Culvert Summary	(Existing Design Storm)		
Computed Headwater	1282.19ft	Discharge	48 cfs
Inlet Control HW Elev.	1282.20ft	Tailwater Elevation	1280.17ft
Outlet Control HW Elev.	1282.19ft	Control Type	Entrance Control
Headwater Depth/Height	0.57		
Grades			
Length	70 ft	Constructed Slope	0.010286ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.55ft
Flow Regime	Supercritical	Critical Depth	0.89ft
Velocity Downstream	7.33ft/s	Critical Slope	0.003843ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.5	Entrance Loss	0.27ft
Inlet Control			
Inlet Type	90 and 15° wingwall flares		30 ft°
K	0.061	HDS 5 Chart	8
M	0.75	HDS 5 Scale	2
C	0.04	Equation Form	1
Y	0.8		

Culvert Summary	(Existing Design Storm)		
Computed Headwater	1282.65ft	Discharge	71 cfs
Inlet Control HW Elev.	1282.58ft	Tailwater Elevation	1280.22ft
Outlet Control HW Elev.	1282.65ft	Control Type	Entrance Control
Headwater Depth/Height	0.63		
Grades			
Length	70 ft	Constructed Slope	0.010286ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.84ft
Flow Regime	Supercritical	Critical Depth	1.16ft
Velocity Downstream	8.24ft/s	Critical Slope	0.003827ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.5	Entrance Loss	0.29ft
Inlet Control			
Inlet Type	90 and 15° wingwall flares		30 ft°
K	0.061	HDS 5 Chart	8
M	0.75	HDS 5 Scale	2
C	0.04	Equation Form	1
Y	0.8		

PROPOSED ULTIMATE CULVERT ANALYSIS

Culvert Summary	(Proposed Design Storm)		
Computed Headwater	1282.09ft	Discharge	48 cfs
Inlet Control HW Elev.	1282.09ft	Tailwater Elevation	1280.10ft
Outlet Control HW Elev.	1282.05ft	Control Type	Inlet Control
Headwater Depth/Height	0.49		
Grades			
Length	78 ft	Constructed Slope	0.010181ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.65ft
Flow Regime	Supercritical	Critical Depth	0.89ft
Velocity Downstream	7.33ft/s	Critical Slope	0.003843ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.2	Entrance Loss	0.09ft
Inlet Control			
Inlet Type	90° headwall w 3/4 inch chamfers		30 ft°
K	0.515	HDS 5 Chart	10
M	0.667	HDS 5 Scale	1
C	0.0375	Equation Form	2
Y	0.79		

Culvert Summary	(Proposed Design Storm)		
Computed Headwater	1282.52ft	Discharge	71 cfs
Inlet Control HW Elev.	1282.52ft	Tailwater Elevation	1280.19ft
Outlet Control HW Elev.	1282.48ft	Control Type	Inlet Control
Headwater Depth/Height	0.63		
Grades			
Length	78 ft	Constructed Slope	0.010181ft/ft
Hydraulic Profile			
Slope Type	Steep	Normal Depth	0.84ft
Flow Regime	Supercritical	Critical Depth	1.16ft
Velocity Downstream	8.24ft/s	Critical Slope	0.003827ft/ft
Section			
Section Material	Concrete	Span	5 ft
Section Size	5 x 3 ft	Rise	3 ft
Number Sections	2		
Outlet Control			
Ke	0.2	Entrance Loss	0.12ft
Inlet Control			
Inlet Type	90° headwall w 3/4 inch chamfers		30 ft°
K	0.515	HDS 5 Chart	10
M	0.667	HDS 5 Scale	1
C	0.0375	Equation Form	2
Y	0.79		

CULVERT ANALYSIS USING (SHOW PROGRAM USED)

No.	Revision	Drawn	Approved	Date

REVISIONS

Figure 4-4
Page 4-16

CONSULTANT NAME

CITY OF SAN ANTONIO

CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE
CULVERT NO 5
HYDRAULIC DATA SHEET
(FIGURE 4)

.../MBT FILES/E1-HDSCULV05.dgn 07/07/2005 1:43:50 PM

CONVEYANCE

US Node	DS Node	Actual Length	Hyd Length	N Value	Slope	No. Bbl	Span	Rise	Fs	Sof U.S.	Sof D.S.	Inv U.S.	Inv D.S.	Unif Dep	Unif Vel	Act Vel D.S.	Act Dep U.S.	Act Dep D.S.	HGL U.S.	HGL D.S.	EGL U.S.	EGL D.S.	Sum Tc	Sum Q	Sum Area	Avg C Value	Rain I	Junction Loss
Line A																												
A15	A10	22.22	24.72	0.013	0.23	1	n/a	3.5	0.011	624.35	624.30	620.86	620.80	3.50	11.97	1.67	3.50	3.50	627.01	626.70	629.12	628.81	17.15	112.22	28.25	0.88	5.38	0.18
Line B																												
B57	B50	11.39	11.39	0.013	15.28	1	n/a	2	0.153	648.74	647.00	646.74	645.00	0.23	12.20	0.14	1.00	0.26	647.74	645.26	647.74	646.87	15.01	2.38	6.33	0.67	6.71	0.52

INLET HYDRAULICS

ID	Station	Type	Profile Type	Q	Cap	By Pass Flow	By Pass Flow cfs	By Pass Node ID	Inlet Curb Length	Inlet Length Reqd	Computed Ponded Width	Computed Ponded Depth	St slope	gutter Depth
A26	34+32.00	Curb	On Grade	3.98	3.98		0.83	A32	20	17.65	12.37	0.25	1.30	0.21
A31	35+00.94	Curb	On Grade	1.71	1.88	0.93			10	9.85	9.08	0.16	1.30	0.21
A32	35+00.94	Curb	On Grade	4.09	3.15	0.92			10	18.38	12.57	0.25	1.30	0.21
A44	33+53.50	Curb	On Grade	2.17	1.29	0.88		A26	5	11.83	9.93	0.20	1.30	0.21
A48	32+95.00	Curb	On Grade	3.91	3.91		0.11	A44	20	18.75	12.22	0.24	1.49	0.21
A51	32+36.00	Grate	Sag	8.79	3.48				n/a	n/a		0.58	n/a	n/a
A71	10+51.40	Curb	Sag	2.08	4.15				10	13.09	9.78	0.20	n/a	0.21
A72	10+52.14	Curb	Sag	8.06	20.32				10	13.09	24.20	0.48	n/a	0.21
A81	29+73.00	Curb	On Grade	0.68	0.68				10	5.04	0.26	0.13	1.49	0.21
A82	29+66.58	Curb	On Grade	5.84	5.73	0.11	0.98	A46	20	24.15	14.05	0.28	1.48	0.21
A89	28+76.00	Curb	On Grade	4.06	3.08	0.98		A82	10	18.76	12.23	0.25	1.49	0.21
A91	27+10.37	Curb	On Grade	0.65	0.65				10	5.99	6.79	0.14	1.49	0.21
A92	27+08.92	Curb	On Grade	1.30	1.30				10	8.29	7.97	0.16	1.49	0.21
A101	10+61.66	Curb	Sag	1.44	4.15				10	13.09	7.66	0.15	n/a	0.21
A102	10+52.29	Curb	Sag	16.64	20.32				10	13.09	30.90	0.62	n/a	0.21
B51	10+51.83	Curb	Sag	1.60	4.15				10	13.09	8.22	0.16	n/a	0.21
B52	10+52.05	Curb	Sag	17.68	11.06				10	13.09	34.05	0.66	n/a	0.21

DISCHARGE

				Discharge for Individual Areas			
				Existing		Ultimate	
No.	Comp Area acres	Comp C	Tc Used	I25 in/hr	Q25 cfs	I25 in/hr	Q25 cfs
A20	1.03	0.67	15	4.48	3.09	6.71	4.64
A31	0.33	0.96	10	5.41	1.71	8.07	2.56
A32	1.36	0.67	15	4.48	4.08	6.71	6.11
A41	0.13	0.96	10	5.41	0.70	8.07	1.04
A42	0.41	0.96	10	5.41	2.12	8.07	3.16
A44	0.72	0.67	15	4.48	2.17	6.71	3.25
A48	1.27	0.67	15	4.48	3.81	6.71	5.70
A51	2.43	0.67	10	5.41	8.79	8.07	13.11
A71	0.57	0.67	10	5.41	2.08	8.07	3.10
A72	2.69	0.67	15	4.48	8.06	6.71	12.08
A81	0.13	0.96	10	5.41	0.68	8.07	1.01
A82	1.62	0.67	15	4.48	4.85	6.71	7.27
A89	1.35	0.67	15	4.48	4.06	6.71	6.08
A91	0.16	0.96	10	5.41	0.65	8.07	1.28
A92	0.25	0.96	10	5.41	1.30	8.07	1.94
A101	0.40	0.67	10	5.41	1.44	8.07	2.16
A102	5.89	0.67	15	4.48	17.66	6.71	26.48
B51	0.44	0.67	10	5.41	1.60	8.07	2.39
B52	5.89	0.67	15	4.48	17.68	6.71	26.40

INLETS DESIGNED FOR Q_5
TRUNK DESIGNED FOR Q_{25}
STORM SEWER CALCULATION PERFORMED IN " ________ " (SHOW PROGRAM USED).

REVISIONS

Figure 4-5
Page 4-17

CONSULTANT NAME

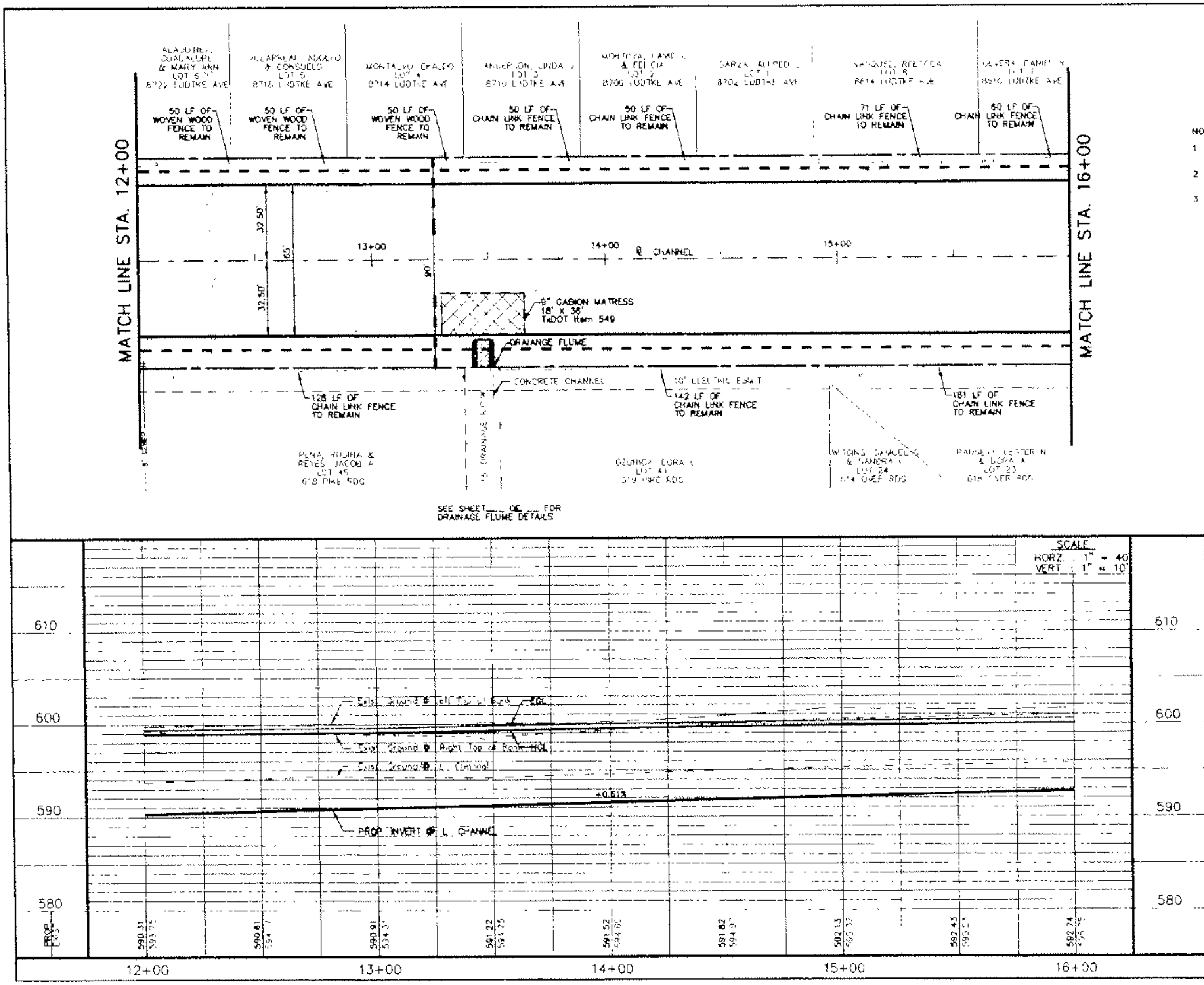
CITY OF SAN ANTONIO

CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

PROJECT TITLE

CLARK AVE HYDRAULIC COMPUTATION SYTEM A

FIGURE 5.1



NOTES:

1. REFER TO PROJECT LAYOUT/ COORDINATE CONTROL PLAN FOR HORIZONTAL ALIGNMENT DATA
2. REFER TO CHANNEL CROSS SECTIONS FOR MORE INFORMATION
3. THE INFORMATION SHOWN ON THIS DRAWING CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OR HER OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.

REVISIONS

Figure 4-6
Page 4-18

CONSULTANT NAME

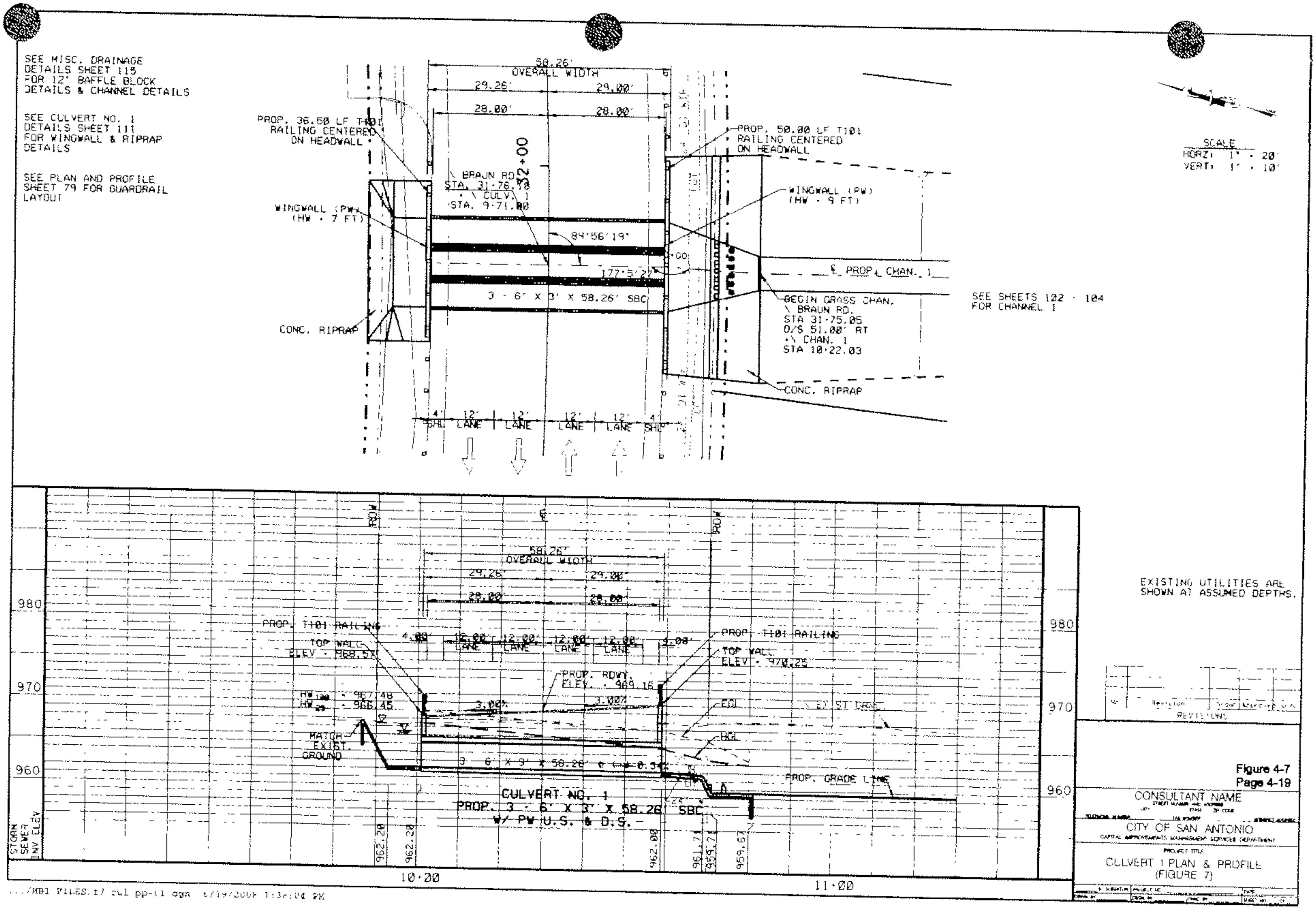
CITY OF SAN ANTONIO

CAPITAL IMPROVEMENTS MANAGEMENT SERVICES DEPARTMENT

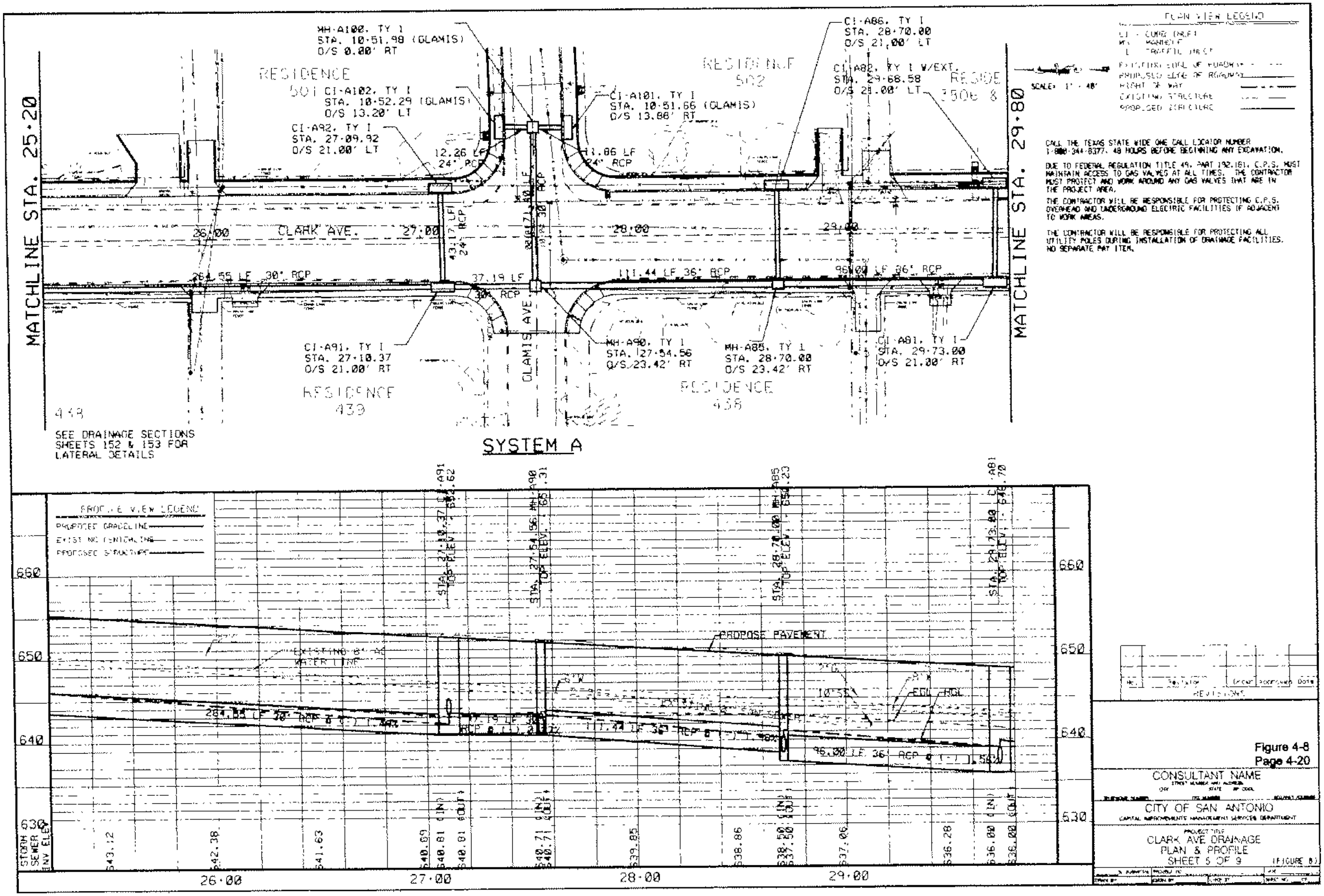
PROJECT TITLE

PLAN & PROFILE
STA.12+00 to STA 16+00
(FIGURE 6)

.. \HBJ FILES\f6-CHAN-PP-04.dgn 6.19.2008 1:37 10 PM



.../HB1 FILES/t7 cul pp-t1 dgn 6/19/2006 1:38:04 PM



.../MBI FILES/ER-drn-pp-05.dgr 6/19/2008 1:39:04 PM

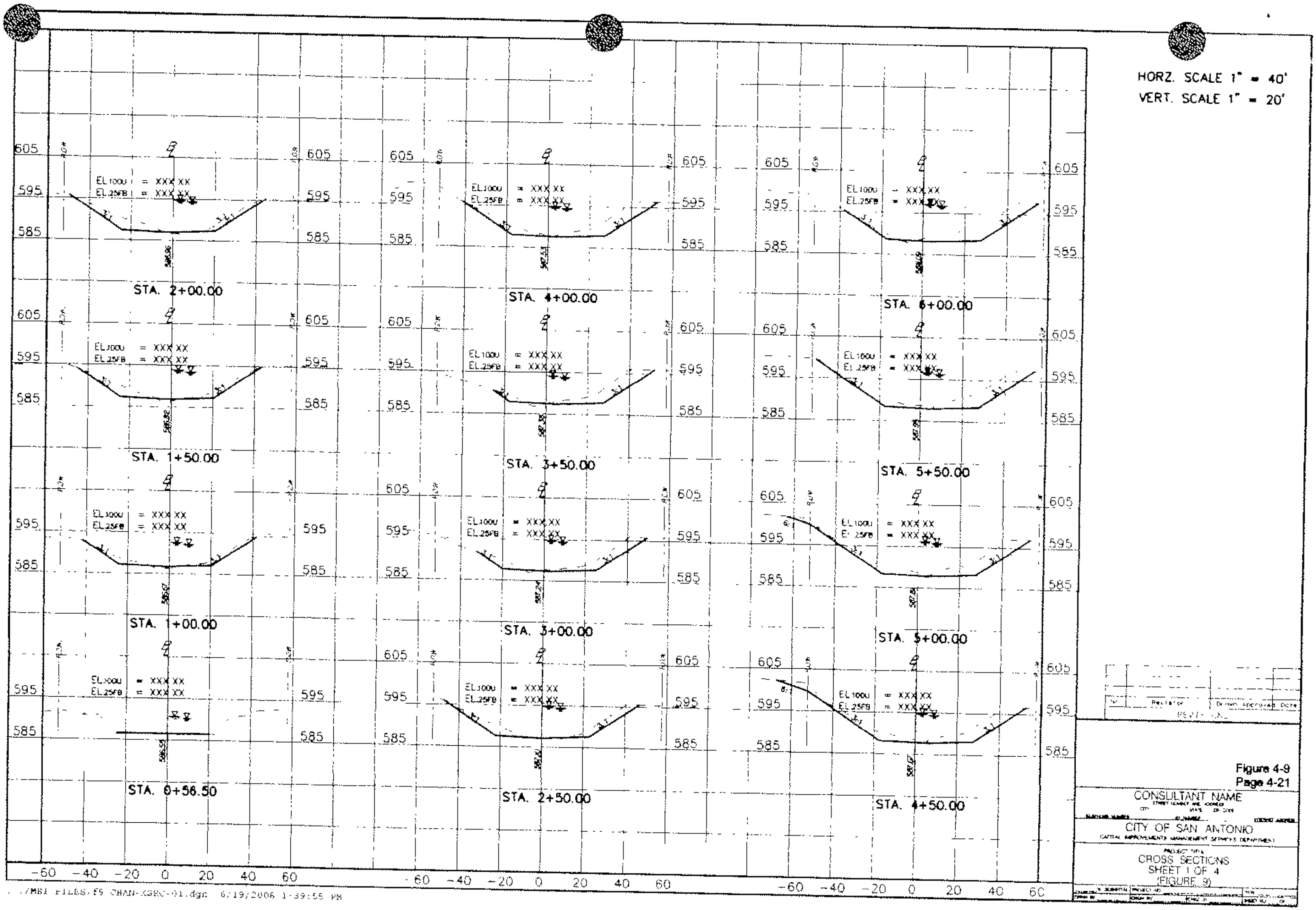
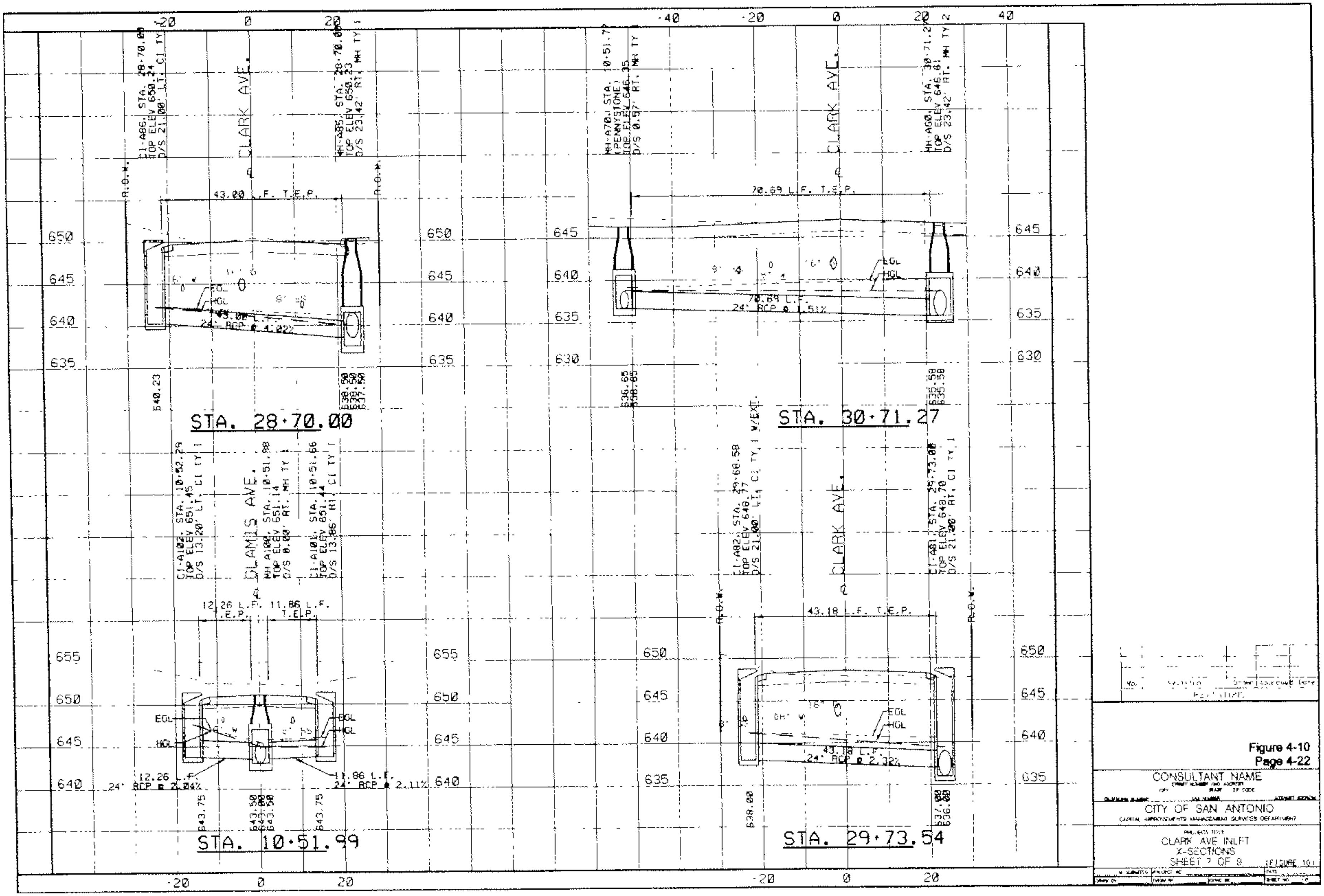


Figure 4-9
Page 4-21


STA. 28·70.00
STA. 30·71.27
STA. 10·51.99
STA. 29·73.54
CLARK AVE.
CLAMILS AVE.
43.00 L.F. T.E.P.
70.69 L.F. T.E.P.
43.18 L.F. T.E.P.
24" RCP @ 1.02%
24" RCP @ 1.51%
24" RCP @ 2.32%
24" RCP @ 2.11%
24" RCP @ 2.04%
EGL
HGL
R.O.W.
Figure 4-10
Page 4-22
CONSULTANT NAME
CITY OF SAN ANTONIO
CLARK AVE INLET
X-SECTIONS
SHEET 7 OF 8

1-17-11

[signature] PE

Time of Concen

A1

124.3AC

$t = \frac{3652}{60(1.1)}$

$t = 55$ min

$S = \frac{804.17 - 720}{3652}$

$S = 2.3\%$

$V = 1.1$

B1

68.9 AC

$t = \frac{2847}{60(1.2)}$

$t = 40$ min

$S = \frac{789 - 698}{2847} = \frac{91}{x}$

$S = 3.2\%$

C1

272.65 AC

$t = \frac{6226}{60(.9)}$

$t = 115$ min

$S = \frac{804 - 686}{6226}$

$S = 1.9\%$

D1

597.96 AC

$t = \frac{10517}{60(1.7)}$

$t = 103$ min

$S = \frac{828 - 690}{10517}$

$S = 1.3\%$

E1

103.31 AC

$t = \frac{2605}{60(3)}$

$t = 15 \approx (14.4)$

$S = \frac{786 - 710}{2605}$

$S = 2.9$

F1

202.73 AC

$t = \frac{4105}{60(2.4)}$

$t = 29$ min

$S = \frac{797 - 720}{4105}$

$S = 1.9$

G1

[illegible].11 AC

$t = \frac{8208}{60(1.8)}$

$t = 76$

$S = \frac{828 - 702}{8208}$

$S = 1.5$

H1

$t = \frac{3557}{60([illegible])} = 30$ min

$S = \frac{791 - 702}{3557} = 2.5$

APPENDIX H
ENVIRONMENTAL DATA

PROGRAMATIC CATEGORICAL EXCLUSION

Fort Sam Houston Transportation Projects

Harry Wurzbach Highway

At Burr Road
CSJ: 0915-12-471

At Winans Road
CSJ: 0915-12-470

And

At Rittiman Road
CSJ: 0915-12-480

Bexar County, Texas

Federal Highway Administration

And

Texas Department of Transportation

November 2010

TABLE OF CONTENTS

EXHIBITS

TABLES

APPENDICES

I. Proposed Action

A. Existing Facility

Harry Wurzbach Highway, which is functionally classified as an urban principal arterial, extends from Old Austin Road to IH 410, a distance of approximately four miles. The roadway is a major north-south travel corridor that provides access to Fort Sam Houston, the cities of Terrell Hills, Alamo Heights, Olmos Park and to IH 410. Additional major east-west travel corridors found in the area are Eisenhauer Road, Austin Highway, Rittiman Road, Winans Road, and Burr Road. The posted speed limit within these limits is 45 miles per hour and the existing 2010 average daily traffic is approximately 14,469 vehicles per day.

From Old Austin Road to Rittiman Road a distance of approximately 2.0 miles, Harry Wurzbach Highway consists of a four lane undivided rural roadway with shoulders while from Rittiman Road to IH 10, a distance of approximately 2.0 miles, Harry Wurzbach Highway consists of a four lane divided rural roadway with shoulders. project corridor for the proposed intersection improvements is located on the northeast side of San Antonio in Bexar County, Texas. The proposed intersection improvements would be constructed along Harry Wurzbach Highway from Raphial Drive to Byrnes Drive at the intersections of Harry Wurzbach Highway at Burr Road, Harry Wurzbach Highway at Winans Road, and Harry Wurzbach Highway at Rittiman Road. The land use in the project area is predominantly urban residential with several vacant properties and there are a few businesses interspersed and adjacent to the residences. The area surrounding the proposed project has been developed with both commercial and residential properties with most of the commercial properties located along major travel corridors. Fort Sam Houston is located along the east side of Harry Wurzbach Highway and is near the proposed intersection improvements. The total length of the project is approximately 1.4 miles. See **Exhibit 1 – Vicinity Map, Exhibit 2 – Site Location Map, Exhibit 3 – Topographic Map and Exhibit 4A-C – Aerial Map,** for the project location and limits. In addition see **Appendix A** for photographs of the existing conditions and the project area.

The existing Harry Wurzbach Highway urban roadway at Burr Road consists of four 12 foot wide travel lanes and two variable width shoulders. The existing Right-of-Way (ROW) varies from 70 feet to 75 feet wide and the existing easement varies from 33 feet to 35 feet wide. Burr Road is a 27 foot wide roadway consisting of one 13 foot wide travel lane and one 14 foot wide travel lane within a 60 foot wide existing ROW. See **Exhibit 5A** for the **Existing Typical Section**.

The existing Harry Wurzbach urban roadway at Winans Road consists of four 12 foot wide travel lanes and variable width shoulders with an 85 foot wide existing ROW. The easement varies from 0 feet to 38 feet wide. Winans Road from Harry Wurzbach to approximately 58.44 east of Harry Wurzbach is a 107 foot wide roadway consisting of two 13 foot wide travel lanes and two 12 foot wide travel lanes divided by a variable width center island. Winans Road from approximately 58.44 east of Harry Wurzbach to approximately 948.5 feet east of Harry Wurzbach is a 27 foot wide roadway consisting of one 13 foot wide travel lane and one 14 foot wide travel lane within a 60 foot wide existing ROW. See **Exhibit 5B** for the **Existing Typical Section**

The existing Harry Wurzbach urban roadway south of Rittiman Road consists of two 12 foot wide southbound travel lanes, three 13 foot wide northbound travel lanes, and shoulders that vary from 0 to 28 feet wide divided by a grass median that varies from 0 to 32 feet wide. The existing ROW varies from 80 to 220 feet wide and the easement varies from 40 to 180 feet wide. The existing Harry Wurzbach roadway north of Rittiman Road consists of two 14 foot wide northbound travel lanes, four 12 foot wide southbound travel lanes divided by a grass median that varies from 0 to 34 feet wide within a 170 foot wide existing ROW. The existing Rittiman roadway east of Harry Wurzbach is a 72 foot roadway consisting of two 11 foot wide eastbound travel lanes, four 12.5 foot wide westbound travel lanes, and 4 foot wide sidewalks along both sides of the roadway. The existing ROW varies from 58 to 245 feet wide. The existing Rittiman roadway west of Harry Wurzbach is a 65 foot roadway consisting of three 13 foot wide eastbound travel lanes, two 13 foot wide westbound travel lanes, and 4 foot wide sidewalks along both sides of the roadway within a 72 foot existing ROW. See **Exhibits 5C-D** for the **Existing Typical Sections.**

A series of inlets and pipes provide drainage for storm water run-off for the entire project area.

B. Proposed Facility

The proposed action would make intersection improvements at the following intersections: Harry Wurzbach at Burr Road, Harry Wurzbach at Winans Road, and Harry Wurzbach at Rittiman Road.

The proposed improvements to Harry Wurzbach at Burr Road include:

- Removal of the channelized right turn from the southbound approach on Harry Wurzbach;
- Addition of a left turn lane with 100 feet of storage to the northbound approach on Harry Wurzbach; and
- Construction of an additional left turn lane with 100 feet of storage to the eastbound approach on Burr Road. This would result in Burr Road consisting of one left-only lane and one left-right shared lane. See **Exhibit 6A** for a **Proposed Typical Section**.

The proposed improvements to Harry Wurzbach at Winans Road include:

- Addition of a 12 foot wide left turn lane with 300 feet of storage to the southbound approach on Harry Wurzbach;
- Addition of a westbound lane on Winans Road that would begin 1000 feet before the intersection;
- The approach of Winans Road at Harry Wurzbach would be widened to allow for three 11 foot wide lanes: two right turn lanes and one left turn lane with 200 feet of storage.
- Addition of overlap phase for westbound right turn movement on Winans Road. See **Exhibit 6B** for a **Proposed Typical Section.**
-

The proposed improvements to Harry Wurzbach south of Rittiman Road include:

- Construction of an additional northbound through lane that begins 800 feet before the intersection;
- Extension of the existing right turn lane to accommodate 400 feet of storage;
- Addition of a 600 foot long southbound receiving lane with a 200 foot long taper.

Exhibit 6C for a **Proposed Typical Section.**

The proposed improvements to Harry Wurzbach north of Rittiman Road include:

- The addition of a reversible southbound through/left turn lane with 300 feet of storage;
- Extension of the existing southbound left turn lane to accommodate 300 feet of storage;
- Addition of a northbound receiving lane with a 200 foot long taper. **Exhibit 6D** for a **Proposed Typical Section.**

The proposed improvements to Rittiman Road east of Harry Wurzbach include:

- Extension of the left turn lanes to accommodate 500 feet of storage;
- Extension of the right turn lane storage bay to accommodate 250 feet of storage. **Exhibit 6E** for a **Proposed Typical Section.**

C. Project Funding

The proposed intersection improvements are included in the approved 2008-2011 State Transportation Improvement Program (STIP) as funding Category 7, Metro Mobility, and would be 80% federally funded and 20% funded by the City of San Antonio. The proposed three intersection improvements are estimated to cost a total of $12,575,760. The project is currently scheduled to be let in September of 2010. Copies of the STIP are included in **Appendix B**. **Table 1** provides a cost summary of each intersection.

Table 1: Cost Summary of the Proposed Project

CSJ	Intersection Location	Estimated Total Project Cost
0915-12-471	Harry Wurzbach at Burr Road	$1,338,590
0915-12-470	Harry Wurzbach at Winans Road	$1,581,970
0915-12-480	Harry Wurzbach at Rittiman Road	$9,655,200
Total Cost		$12,575,760

D. Need and Purpose

The proposed project is needed due to increased traffic and congestion at the intersections of Harry Wurzbach at Burr Road, Harry Wurzbach at Winans Road and Harry Wurzbach at Rittiman Road. The purpose of the proposed project is to improve safety, improve traffic congestion, and improve traffic flow.

E. Alternatives

Only one "Build" Alternative was considered for this project. The "Build" alternative would construct intersection improvements at the intersections of Harry Wurzbach Road at Burr Road, Harry Wurzbach Road at Winans Road, and Harry Wurzbach Road at Rittiman Road.

The Build Alternative is the preferred alternative because it is the only alternative that adequately addresses the need and purpose of the proposed action. The No-Build alternative was also considered but was not identified as the preferred alternative because it does not meet the stated need and purpose of the project.

F. Right-of-Way

The existing right-of-way (ROW) width along Harry Wurzbach varies from a minimum of 70 feet to a maximum of 220 feet from Burr Road to Rittiman Road. The existing easement width along Harry Wurzbach varies from a minimum of 0 feet to a maximum of 180 feet from Burr Road to Rittiman Road. The existing ROW of Burr Road at Harry Wurzbach is 60 feet wide. The existing ROW of Winans Road from approximately 58.44 east of Harry Wurzbach to approximately 948.5 feet east of Harry Wurzbach is 60 feet wide. The existing ROW of Rittiman Road at Harry Wurzbach varies from a minimum of 72 feet to a maximum of 246 feet. At this time it has not been determined if the proposed improvements will require additional ROW. Should additional ROW be required the environmental document will be revised accordingly.

Utilities such as water lines, sewer lines, gas lines, telephone cables, electrical lines, cable television, fiber optics and other subterranean and aerial utilities would require adjustment. The adjustment and relocation of any utilities would be performed so that there would be no substantial interruptions of service. TxDOT would be responsible for the adjustment and relocation of all TxDOT utilities. Other utilities within TxDOT ROW would be relocated by the appropriate utility company, while utilities requiring relocation that are outside of TxDOT ROW would be eligible for reimbursement.

No farms or non-profit organizations will be displaced. Because the additional ROW required is developed and urbanized, the proposed project is exempt from the requirements of the Farmland Protection Policy Act (FPPA) and requires no coordination with the Natural Resources Conservation Service (NRCS). A Farmland Conversion Impact Rating form (Form AD-1006) will not be required since this project is located within an urban area zoned for commercial and residential development.

All negotiations will be conducted without regard to race, color, religion, sex, or national origin. The acquisition of properties and the relocation program will be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

II. Surrounding Area

A. Natural Setting and Land Use

The project site is located in the Blackland Prairie, Edwards Plateau, and South Texas Brush Country Natural Regions of Texas as currently designated by TPWD. The 1984 TPWD map, *Vegetation Types of Texas*, indicates that the project site is specifically located in the "Urban" vegetation type. Field investigations indicate that the project site is specifically located in an urban area and consistent with the "Urban" designation.

The proposed project area is located entirely within the urban city limits of San Antonio, Texas on the northeast side of San Antonio. The area surrounding the proposed project has been developed with both commercial and residential areas. The land use in the study area is predominantly urban\residential. Most of the commercial properties are located along major streets. There are a few businesses interspersed and adjacent to the residences. Additionally Fort Sam Houston is located along the east side of Harry Wurzbach.

III. Specific Areas of Environmental Concern

Project alternatives were considered for the proposed improvements, including the "No-Build Alternative." All alternatives were considered under the assumption that the preferred alternative(s) would fulfill the need and purpose for the project.

A. Socioeconomic Resources

a. Social/Economic

The impacts to economic, environmental, and social attributes of the project area resulting from the proposed project are expected to be minimal. Local and regional economic growth will be the determining factor in the future development in these areas.

b. Environmental Justice

Executive Order (EO) 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low- Income Populations" requires each Federal agency to "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations." FHWA has identified three fundamental principles of environmental justice:

1. To avoid, minimize or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations;
2. To ensure full and fair participation by all potentially affected communities in the transportation decision-making process;
3. To prevent the denial of, reduction in or significant delay in the receipt of benefits by minority populations and low-income populations.

Disproportionately high and adverse human health or environmental effects are defined by FHWA as adverse effects that:

1. Are predominately borne by a minority population and/or a low-income population or
2. Will be suffered by the minority population and/or low-income population and are appreciably more severe or greater in magnitude than the adverse effects that will be suffered by the non-minority population and/or non-low-income population.

A minority population is defined as a group of people and/or a community experiencing common conditions of exposure or impact that consists of persons classified by the U.S. Bureau of the Census as Black or African-American; Asian; American Indian or Alaska Native; Native Hawaiian or other Pacific Islander; Hispanic or Latino; or other non-white persons, including those persons of two or more races. A low-income population is defined as a population whose median household income is at or below the U.S. Department of Health and Human Service (HHS) poverty guidelines. The HHS poverty guideline for a family of four in the United States in 2009 is $22,050 (U.S. Department of Health and Human Services, 2009).
The proposed project would not cause disproportionately high and adverse human health or environmental effects, including social and economic effects on the area's minority population as defined by Executive Order 12898. Construction of the proposed project is located along Harry Wurzbach Road with careful consideration being given to safety and accessibility.

In this document, Block Group 1 (BG) Census Tract (CT) 1201, BG 1 CT 1202, BG 1 CT 1204, BG 2 CT 1204, BG 7 CT 1205.01, and BG 1 CT 1206 were used as the regional threshold to identify potential minority populations within proposed project limits that may be affected by the proposed improvements. CT 1201, CT 1202, CT 1204, CT 1205.01, and CT 1206 were used as the regional threshold to identify low-income populations with the limits of the project which may be affected by the proposed improvements.

Table 2 A-F includes all persons who identified with the racial categories of Black or African American, American Indian, or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, some other race, or two or more races and Hispanic or Latino in the 2000 Census.

Table 2-A: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 1000	4,726	2,535	884	**53.6%**
Block 1001	0	0	0	0%
Block Group 1 Census Tract 1201 (Threshold)	5,508	2,798	936	50.8%

Table 2-B: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 1000	57	9	9	**15.8%**
Block Group 1 Census Tract 1202 (Threshold)	922	75	58	8.1%

Table 2-C: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 1000	104	97	94	**93.3%**
Block 1001	45	12	10	**26.7%**
Block Group 1 Census Tract 1204 (Threshold)	775	191	172	24.6%

Table 2-D: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 2000	82	18	14	22.0%
Block 2012	57	14	12	**24.6%**
Block 2020	44	1	1	2.3%
Block 2021	30	13	13	**43.3%**
Block Group 2 Census Tract 1204 (Threshold)	932	217	188	23.3%

Table 2-E: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 7012	0	0	0	0%
Block 7013	0	0	0	0%
Block Group 7 Census Tract 1205.01 (Threshold)	782	449	335	57.4%

Table 2-F: Racial Minority and Hispanic or Latino Populations within the Project Area

Geographic Type	Total Population	Minority Population[1]	Hispanic or Latino Population[2]	Percent Minority
Block 1006	284	228	65	**80.3%**
Block 1008	35	14	13	40.0%
Block Group 1 Census Tract 1206 (Threshold)	869	535	326	61.6%

Source: 2000 Census
[1]Total persons reporting in non-white racial categories, including Black or African American, American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, some other race, or two or more races.
[2]Total persons reporting as Hispanic, Latino, or of Spanish ethnic origin. As race and ethnic origin are two separate and distinct concepts, these persons may be of any race.

As shown in **Table 2 A-F**, minority populations exist in the project area. There are no distinct neighborhoods, ethnic groups, or other specific groups directly adjacent to Harry Wurzbach. As a result, the proposed project would not affect, separate, or isolate any distinct neighborhoods, ethnic groups, or other specific groups. The proposed improvements would not restrict access to any existing public or community services, businesses, commercial areas or employment centers. No changes in travel patterns are anticipated as a result of the proposed project. No displacements or relocations would occur due to this project.

Table 3 A-E includes the total number of low-income populations and median household income within the project area.

Table 3-A: Low-Income Population

Geographic Type	Total Population	Population Below Poverty Level	Percent in 1999 Below Poverty Level	Median Household Income in 1999
BG 1 CT 1201	3,494	210	6.0%	$45,185
CT 1201 (Threshold)	3,494	210	6.0%	$45,185

Table 3-B: Low-Income Population

Geographic Type	Total Population	Population Below Poverty Level	Percent in 1999 Below Poverty Level	Median Household Income in 1999
BG 1 CT 1202	753	35	4.6%	$63,796
CT 1202 (Threshold)	5,715	1,511	26.4%	$29,052

Table 3-C: Low-Income Population

Geographic Type	Total Population	Population Below Poverty Level	Percent in 1999 Below Poverty Level	Median Household Income in 1999
BG 1 CT 1204	749	106	14.2%	$65,714
BG 2 CT 1204	966	103	10.7%	$47,098
CT 1204 (Threshold)	5,019	236	4.7%	$79,295

Table 3-D: Low-Income Population

Geographic Type	Total Population	Population Below Poverty Level	Percent in 1999 Below Poverty Level	Median Household Income in 1999
BG 7 CT 1205.01	805	48	6.0%	$44,234
CT 1205.01 (Threshold)	7,719	938	12.2%	$34,789

Table 3-E: Low-Income Population

Geographic Type	Total Population	Population Below Poverty Level	Percent in 1999 Below Poverty Level	Median Household Income in 1999
BG 1 CT 1206	893	216	24.2%	$32,361
CT 1206 (Threshold)	6,147	833	13.6%	$34,277

As noted in **Table 3 A-E** the total percentage of low-income population for the project area is lower than the threshold of 50%. The median household income in the project area is higher than the 2009 U.S. Department of Health and Human Services poverty threshold of $22,050.

c. Community Impacts

No minority or low-income populations would be adversely impacted by the proposed project as determined above. The proposed project would benefit all populations in the surrounding community, increase safety, improve functionality, and provide better access to emergency vehicles. The proposed project would be beneficial to all populations within the study area because it would provide smoother traffic flow for area motorists. Therefore, no environmental justice or low-income populations would be disproportionately impacted, and the requirements of EO 12898, on Environmental Justice are satisfied.

d. Limited English Proficiency

Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," requires agencies to examine the services they provide, identify any need for services to those with Limited English Proficiency (LEP), and develop and implement a system to provide those services so that LEP persons can have meaningful access them.

A review of the U.S. Census data revealed five census tracts (CT 1201, CT 1202, CT 1204, CT 1205.01, and CT 1206) being located within the project study area. In order to determine potential LEP populations being located within the project study area, block group data for each census tract were analyzed. **Table 4** lists the census data for "Ability to Speak English" for the population five years of age and over in the project area. Results of a field reconnaissance (windshield survey) indicate that no non-English signs, advertisements, or other posted information is present in the proposed project area. Reasonable steps would be taken during the public involvement process to ensure that LEP populations have access to project information. As a result of the aforementioned, the requirements of EO 13166 are satisfied.

Table 4: Limited English Proficiency (LEP) Populations

Geographic Type	Total Population	Percent of Adult Speakers Who Speak English Less than "Very Well"			
		Spanish Language Speakers	Other Indo European Language Speakers	Asian and Pacific Island Language Speakers	Other Language Speakers
Block Group 1 Census Tract 1201	5,030	3.4%	0.4%	1.5%	0.1%
Block Group 1 Census Tract 1202	831	1.7%	0%	0%	0%
Block Group 1 Census Tract 1204	698	10.0%	0%	0%	0%
Block Group 2 Census Tract 1204	823	3.4%	1.5%	0%	0%
Block Group 7 Census Tract 1205.01	796	6.7%	0%	0%	0%
Block Group 1 Census Tract 1206	825	0%	0%	2.2%	0%

Data Source: United States Census 2000 (Table P19) for persons age 5 and older.
* The data on ability to speak English represent the Census respondent's own perception about his ability to speak English (United States Census 2000 Metadata).

B. Section 4(f) Resources

Under Section 4(f) of the 1966 Transportation Act, projects which impact or use public parks, recreation areas, wildlife or waterfowl refuges and historic sites, must perform a 4(f) evaluation. The proposed project would not require the use of nor substantially impair the purposes of any publicly owned land from a public park, recreational area, wildlife and waterfowl refuge lands or a publicly or privately owned historic sites of national, state or local significance; therefore, a section 4(f) evaluation would not be required.

C. Cultural Resources

Cultural resources are structures, buildings, archeological sites, districts (a collection of related structures, buildings, and/or archeological sites), cemeteries and objects. Both federal and state laws require consideration of cultural resources during project planning. At the federal level, NEPA and the National Historic Preservation Act (NHPA) of 1966, among others, apply to transportation projects such as this one. In addition, state laws such as the Antiquities Code of Texas apply to these projects. Compliance with these laws often requires consultation with the Texas Historical Commission/Texas State Historic Preservation Officer and/or federally-recognized tribes to determine the project's effects on cultural resources. Review and coordination of this project followed approved procedures for compliance with federal and state laws.

a. Historic Properties

A review of the National Register of Historic Places (NRHP), the list of State Archeological Landmarks (SAL), and the list of Recorded Texas Historic Landmarks (RTHL) indicated that no historically significant resources have been previously documented within the area of potential effects (APE). It has been determined through consultation with the State Historic Preservation Officer (SHPO) that the APE for the proposed project is the current ROW. A site visit revealed that there are several historic-age resources (built prior to 1965), located within Project APE. TxDOT historians have determined none of historic-age resources are NRHP eligible
Pursuant to Stipulation V "Undertakings with No Potential to Affect Historic Resources" of the First Amended Programmatic Agreement Regarding the Implementation of Transportation Undertakings (PA-TU) between the Federal Highway Administration (FHWA), the Texas State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, and the Texas Department of Transportation (TxDOT) and the Memorandum of Understanding (MOU).

b. Archeological Resources

Existing agreements for compliance with applicable cultural resource laws define this project as a type that has no potential to adversely affect archeological resources. No consultation with the Texas Historical Commission/Texas State Historic Preservation Officer or other groups was required.

D. Vegetation

As required in the 1998 Memorandum of Understanding (MOU) between TxDOT and the Texas Parks and Wildlife Department (TPWD), the vegetation in the project area was characterized using *The Vegetation Types of Texas* (TPWD, 1984). The project site is located in the Blackland Prairie, Edwards Plateau, and South Texas Brush Country Natural Regions of Texas as currently designated by TPWD. The 1984 TPWD map, *Vegetation Types of Texas*, indicates that the project site is specifically located in the "Urban" vegetation type. Field investigations indicate that the project site is specifically located in an urban area and consistent with the "Urban" designation.

a. Outside ROW

Land use outside of the ROW is a mixture of commercial, residential and urban land. The type of vegetation outside the ROW is consistent with the "Urban" vegetation type. The project is located in an urban setting within San Antonio city limits. Land adjacent to the ROW for the proposed project is a mixture of commercial, industrial, and residential properties. Habitat outside of the ROW has been extensively disturbed by the urban impact of commercial and residential development.

b. Fence line

Fence line vegetation present in the project area typically consists of mixed grasses, trees and shrubs. Young immature and mature trees such as cedar elm (*Ulmus crassifolia*), mesquite (*Prosopis glandulosa*), huisache (*Acacia smallii*), pecan (*Carya illinoinensis*), chinaberry (*Melia azedarach*), and live oak (*Quercus virginiana)*, dominate the fence line along the project corridor. The average diameter at breast height (dbh) along the fence line ranges from 20.32 cm to 25.4 cm (8 to 10 inches).

c. Existing ROW

Existing vegetation in the existing project ROW consists of primarily of grass groundcover. Dominant groundcover vegetation consists of bufflegrass (*Cenchrus ciliaris*), Bermuda grass (*Cynodon dachylon*), Kleberg's bluestem (*Dichanthium annulatum*), bushy bluestem (*Andropogon glomeratus*), whorled dropseed (*Sporobolus pyramidatus*), longtom (*Paspalum lividum*), silverleaf nightshade (*Solanum elaeagnifolium*), and *Mimosa* sp. No trees are present within the existing ROW.

d. New ROW and New Easements

New ROW and easement requirements are currently undetermined for the proposed project.

e. Unusual Vegetation and Special Habitat Features

No unusual vegetation features or special habitat features as described in the TxDOT-TPWD Memorandum of Agreement (MOA) were observed within the project limits.

f. Vegetation Impacts

The project area is an approximate total of 17.5 acres. The proposed improvements would permanently disturb approximately 2.22 acres of vegetation consisting of primarily of grass groundcover and would not require the removal of trees. Avoidance and minimization efforts would be made to preserve as much groundcover along the project corridor as possible. No fence line vegetation would be impacted by the proposed improvements.

In accordance with Provision (4) (A) (ii) of the MOA between TxDOT and TPWD, habitats given consideration for non-regulatory mitigation during project planning include the following:

1. habitat for federal candidate species (impacted by the project) if mitigation would assist in the prevention of the listing of the species,
2. rare vegetation series (S1, S2, or S3) that also locally provide habitat for a state-listed species,
3. all vegetation communities listed as S1 or S2, regardless of whether or not the series in question provide habitat for state-listed species,
4. bottomland hardwoods, native prairies, and riparian sites, and
5. any other habitat feature considered locally important that the TxDOT District chooses to consider.

The existing vegetation within the project corridor does not meet the above criteria for non-regulatory mitigation; therefore, compensatory mitigation is not proposed. The project area does not include critical habitat for any federal candidate species, rare vegetation series, bottomland hardwoods, or native prairies.

The project would result in minimal impacts to vegetation. COSA has provided minimum tree protection guidelines to allow for every effort to preserve the existing vegetation within the project limits.

In compliance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping, landscaping would be limited to seeding and replanting of the right-of-way with native species of grasses, shrubs, or trees. Soil disturbance would be minimized to ensure that invasive species would not establish the right-of-way.

To comply with the Migratory Bird Treaty, USFWS recommends vegetation disturbances potentially associated with constructions activities be conducted so as to avoid the general nesting period from mid February through the end of September, or that those proposed for disturbance be surveyed first for nesting birds, in order to avoid impacts to any migratory species. COSA will comply with USFWS recommendations and will take measures to avoid the take of migratory birds, their occupied nests, eggs, or young.

E. Water Resources

a. Edwards Aquifer

This project is not located over the Edwards Aquifer Recharge or Contributing Zones; therefore, the Edwards Aquifer Rules do not apply. The project does not cross any public water supply. See **Exhibit 7** for the **Edwards Aquifer Map**.

b. Threatened and Impaired Waters

Runoff from this project would discharge into unlisted tributaries that are within five miles upstream of Segment 1910 of Salado Creek which is listed as impaired for aquatic life use and contact recreation use impairments due to impaired macrobenthos communities and impaired fish communities on the 2008 Texas Commission on Environmental Quality's (TCEQ) Clean Water Act Section 303(d) list. This project is not expected to contribute the constituent of concern to the impaired water body. A Storm water Pollution Prevention Plan (SW3P) would be implemented prior to the start of construction.

c. U.S. Army Corps of Engineers Jurisdictional Waters

An analysis of United States Geological Survey (USGS) topographic maps, FEMA maps, the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Maps, field reconnaissance, revealed a tributary to Salado Creek located within the project area. However, the proposed project would not result in impacts to this tributary or any potentially jurisdictional waters of the U.S., including wetlands. Executive Order 11990 on wetlands does not apply because no wetlands will be impacted. This project would not result in the placement of temporary or permanent dredge or fill materials into jurisdictional waters of the U.S., including wetlands or other special aquatic sites; therefore, a Section 404 permit would not be required. The project would not require a U.S. Army Corps of Engineer (USACE) Section 404 Permit; therefore, Section 401 Certification would not be required.

This project does not involve work in or over a navigable water of the U.S., therefore Section 10 of the Rivers and Harbors Act does not apply.

d. Texas Pollution Discharge Elimination System (TPDES) Requirements

This project would include five or more acres of earth disturbance. TxDOT would comply with the Texas Commission on Environmental Quality's (TCEQ) Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit (CGP). A Storm Water Pollution Prevention Plan (SW3P) would be implemented, and a construction site notice would be posted on the construction site. A Notice of Intent (NOI) would be required.

This project is located within the boundaries of the Phase II, San Antonio Urbanized Area Municipal Separate Storm Sewer System, and would comply with the applicable MS4 requirements.

Measures would be taken to prevent or correct erosion that may develop during construction. All temporary erosion controls, such as silt fences and rock berms, would be in compliance with TxDOT Standard Specifications and would be in place, according to the construction plans, prior to commencement of construction related activities and inspected on a regular basis.

e. Floodplain

Executive Order 11988 Floodplain Management requires agencies take actions to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. The project is located within the City of San Antonio and Bexar County, which are regular participants in the National Flood Insurance Program.

The project is not located within a Federal Emergency Management Agency (FEMA) designated 100-year floodplain. The hydraulic design for this project would be in accordance with current

FHWA and TxDOT design policies. The facility would permit the conveyance of the 100-year flood, inundation of the roadway being acceptable, without causing significant damage to the roadway, stream, or other property. The proposed project would not increase the base flood elevation to a level that would violate applicable floodplain regulations or ordinances. Coordination with the local Floodplain Administrator would not be required. See **Exhibit 8** for a **Floodplain Map**.

f. Wild and Scenic Rivers

The Wild and Scenic Rivers Act, as amended, describes those river segments designated or eligible to be included in the Wild and Scenic Rivers System. Under section 5(d) (1), the Department of Interior (DOI) National Park Service (NPS) River and Trail Conservation Assistance Program (RTCA) within NPS's National Center for Recreation and Conservation (NCRC) maintains a Nationwide Rivers Inventory (NRI) of river segments that appear to qualify for inclusion in the National Wild and Scenic River System but which have not been designated as a Wild and Scenic River or studied under a Congressional authorized study. The President's 1979 Environmental Message Directive on Wild and Scenic Rivers (August 2, 1979) directs federal agencies to avoid or mitigate adverse effects on rivers identified in the NRI as having potential for designation under the Wild and Scenic Rivers Act. The August 11, 1980 Council on Environmental Quality (CEQ) Memorandum on Procedures for Interagency Consultation requires federal agencies to consult with the NPS when proposals may effect a river segment included in the NRI.

There are no river segments listed on the NRI located near the project area; therefore, the Wild and Scenic Rivers Act is not applicable and no coordination with NPS is required.

F. Soils and Farmland

a. Soils

According to the *Soil Survey of Bexar County, Texas*, land in the vicinity of the proposed project consists of soils in the Austin-Tarrant, Lewisville-Houston Black terrace, Venus-Frio-Trinity soil associations.

The Austin-Tarrant association is characterized as moderately deep and very shallow clayey soils over chalk and marl. Austin soils have a dark grayish-brown, limy surface layer that is silty clay in texture and 16 to 30 inches thick. The subsoil is firm, pale-brown silty clay; it has fine, subangular blocky structure. About 50 percent of this association consists of Austin soils. Tarrant soils have a dark-colored surface layer that is gravelly clay loam in texture and about 8 inches thick. The substratum is about 12 inches of fragmented, platy chalk. Cracks and crevices in this layer are filled with grayish-brown, fine textured soil material. The underlying material consists of alternate beds of hard and soft, white chalk. About 30 percent of this association consists of Tarrant soils. Minor parts of this association consist of about 8 percent Brackett soils, 4 percent Stephen soils, 6 percent Houston soils and Houston-Black soils, and 2 percent Sumter soils.

The Lewisville-Houston Black, terrace association is characterized as deep, calcareous clayey soils in old alluvium. Lewisville soils are deep, moderately permeable, dark brown to dark grayish-brown, crumbly clays. The surface layer is about 25 inches thick. The subsurface layer ranges from dark brown to reddish brown; it has fine, blocky structure. In places the substratum contains beds of gravel. About 45 percent of this association consists of Lewisville soils. Houston-Black terrace soils have a surface layer consisting of dark gray to black, slowly permeable clay which is about 45 to 60 inches thick. The substratum ranges from reddish yellow to light gray in color and contains some gravel below a depth of 6 feet. About 40 percent of this association consists of Houston-Black terrace soils. Minor parts of this association consist of about 4 percent Venus soils, 4 percent Patrick soils, 3 percent Frio soils, 2 percent Trinity soils, and 2 percent Houston soils.

The Venus-Frio-Trinity association is characterized as deep, calcareous soils on bottom lands and terraces. Venus soils have a friable, grayish-brown, strongly calcareous surface layer that is clay loam or loam in texture and 7 to 20 inches thick. These soils mostly occur as low terraces that are not subject to overflow. Approximately 45 percent of the association consists of Venus soils. Frio soils, which are occasionally flooded, have a friable, dark grayish-brown to grayish-brown, calcareous surface layer that is clay loam in texture and about 20 inches thick. Frio soils make up about 20 percent of the association. Trinity soils are deep, dark-colored, calcareous, slowly permeable clays that are developing in clayey alluvium. Trinity soils are generally 48 to 60 inches thick. About 15 percent of the Venus-Frio-Trinity soil association consists of Trinity soils. Minor parts of this association consist of about 7 percent Karnes soils, 5 percent Lewisville soils, 3 percent Gullied land, and 5 percent Patrick soils.

The following soil type was identified within the project limits:

- **Houston Black Series**

The Houston Black series consists of clayey soils that are deep, dark gray to black, calcareous, and nearly level to strongly sloping. The surface layer is very dark grey to black, mildly alkaline, about 38 inches thick, and from clay to gravelly clay in texture. The subsurface layer, which is about 12 inches thick, is gray or dark gray clay and has some grayish-brown or olive-brown streaks. The underlying material is very pale brown, calcareous clay or marl and has mottles of olive-brown and gray. Houston-Black soils are have slow to rapid surface drainage. The available water capacity of Houston-Black soils is good. Generally, these soils are cultivated; grain, sorghum, and corn are the main crops. The main limitations of the Houston-Black soils are water erosion hazards.

Houston Black gravelly clay, 1 to 3 percent slopes (HuB) and Houston Black gravelly clay, 3 to 5 percent slopes (HuC) are the specific soils types located in the project area. **Exhibit 9 – Soil Map**, depicts the soils as mapped by the Natural Resources Conservation Service (NRCS) in the *Soil Survey*. The parenthetical letters following the soil name reflects the soil identification found on **Exhibit 9 – Soil Map**.

The local NRCS and the National Technical Committee on Hydric Soils (NTCHS) do not list Houston Black gravelly clay, 1 to 3 percent slopes (HuB) or Houston Black gravelly clay, 3 to 5 percent slopes (HuC) as a hydric soil.

b. Farmland

The Farmland Protection Policy Act (FPPA) regulates Federal actions with the potential to convert farmland to non-agricultural use. As this project is within the urban boundary of the City of San Antonio, the proposed project is exempt from the requirements of the Farmland Protection Policy Act (FPPA) and requires no coordination with the National Resources Conservation Service (NRCS).

G. Traffic Noise Impacts

The proposed project would not be on new location; or substantially alter the horizontal or vertical alignment; or increase the number of through-traffic lanes; therefore, a Traffic Noise Analysis is not required.

Additionally, this project is not classified as a Type I or Type II project therefore; a traffic noise analysis is not required by the Federal Highway Administration Regulation 23 CFR 772 or TxDOT's 1996 Guidelines for Analysis and Abatement of Highway Traffic Noise.

H. Hazardous Materials

A visual survey of the project limits and surrounding area was conducted to evaluate the potential for the involvement of hazardous waste/substances from adjacent properties onto the existing ROW. Additionally, the following regulatory databases were reviewed: TCEQ's Petroleum Storage Tank (PST) and Leaking Petroleum Storage Tank (LPST) Registry; Texas Superfund Registry (SPL) and State Voluntary Clean-up; the Environmental Protection Agency's (EPA) National Priority List (NPL); the Texas Railroad Commission (RRC); Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS); Emergency Response Notification System (ERNS); municipal solid waste landfills (MSWLF); and Resource Conservation and Recovery Act (RCRA). During the site visit, no surface evidence or possible sources of hazardous contamination were identified surrounding or adjacent to the project limits.

A Phase I ESA was conducted by Weston Solutions, Inc. in conformance with ASTM E 1527-05. The Phase I ESA revealed existing and former underground storage tanks (UST), LPST, and dry cleaner sites located adjacent to the proposed project. The following is the summary of the Recognized Environmental Concerns (REC) identified adjacent to the proposed project:

<u>Harry Wurzbach and Rittiman Road</u>

- Express Alterations and Cleaners at 2423 Harry Wurzbach: Active dry cleaner
- Pawn Shop at 2403 Harry Wurzbach: former UST site dating back to 1970.
- Valero Gasoline Station at 2315 Harry Wurzbach: Active UST site and closed LPST site. Former UST site dating back to 1956.

- Panda Inn at 2201 Harry Wurzbach: Former UST site and closed LPST site. Former UST dating back to 1970.
- C's Quality Laundry Service at 2113 Harry Wurzbach: Active dry cleaner. Former dry cleaner dating back to 1970.
- Church's Chicken at 1001 Rittiman Road: Former UST site dating back to 1961.

<u>Harry Wurzbach and Burr Road</u>

- Chevron Service Station at 1118 Harry Wurzbach: Active UST site and closed LPST site. Former UST site dating back to 1956. Location of a 10-gallon gasoline spill in February 2008.
- El Bohio Lunch Buffet at 1127 Harry Wurzbach: Former dry cleaner dating back to 1956.
- Lone Star Lavender Florist at 1131 Harry Wurzbach: Former dry cleaner dating back to 1970.
- Back to Basics Barber Shop at 1133 Harry Wurzbach: Former dry cleaner dating back to 1992.
- Kims Alterations and Cleaning at 1155 Harry Wurzbach: Active dry cleaner

Former dry cleaner sites and UST/former auto station sites were identified with 1/8 mile from the proposed project to the northeast and west of the Harry Wurzbach at Rittiman Road intersection. These sites are regarded at RECs with respect to the proposed project, as undocumented releases may have migrated and impacted the proposed project. The following is a summary of the RECs identified within 1/8 mile from the proposed project:

- Vacant Clothing Store at 923 Rittiman: Former dry cleaner
- Carvers, Sudden, and Alape Cleaner at 927 Rittiman: Former dry cleaner dating back to 1970. (This address could not be located, may be part of 923 Rittiman.)
- Kim Tran Restaurant (former Slater White) at 118 Corinne Drive: Former dry cleaner dating back to 1956.
- Diamond Express at 2446 and 2448 Harry Wurzbach: Former UST site and auto repair and services station dating back to 1986.
- Remaining sited identified during the records review include two UST sites and one auto repair and service station dating back to 1986. Due to the distance of these sites from the proposed project, there is a low potential for releases associated with these sites to impact the proposed project and are not considered imminent RECs.

The Phase I ESA concluded that it is not known if documented or undocumented releases of petroleum hydrocarbons or solvents may have migrated and impacted the proposed project. Subsurface sampling of soil and groundwater, if present, is recommended to evaluate potential environmental conditions for the identified RECs.

The assessment also included a review of readily available oil and gas information obtained from the Railroad Commission of Texas. No oil or gas wells were noted within or near the project limits. No pipeline easements are located in or transect the project limits.

Texas Asbestos Health Protection Rules (25 TAC 295.61) require a survey for asbestos containing material (ACM) and a 10 working day, pre-demolition notification prior to the renovation or demolition of any public structure. The Texas Department of State Health Services (DSHS) has determined that span bridges are public structures. No public structures as defined by the DSHS would be renovated or demolished; therefore, an asbestos survey would not be required.

If hazardous substances/wastes are encountered unexpectedly during construction, appropriate measures for proper management of the contamination would be initiated in accordance with all applicable federal, state, and local regulations.

I. Visual

Aesthetic values would be emphasized on this project. It has always been the policy of TxDOT to build visually pleasing travel ways, coupling beauty with their functional capability. The aesthetic effect of this project would be equal to or better than the existing roadway.

J. Threatened and Endangered Species

Table 5 summarizes species which are listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) or the Texas Parks and Wildlife Department (TPWD), and their federal and state status and project effect. Each of these species is considered by these agencies as having the potential to occur in Bexar County.

Information from the Texas Natural Diversity Database (NDD), which is maintained by TPWD, was reviewed for a 1.5 mile radius of the proposed project limits on September 16, 2009 in order to assess the potential for endangered or threatened species to occur within the project limits. No known occurrences of endangered or threatened species have been documented near the proposed project location. The NDD search results are included in **Appendix C**. See **Exhibit 10** for a **Karst Zone Map**.

The project does not contain potential habitat for any state threatened and endangered species. The project would have no effect to federally listed species, or critical habitat.

Table 5: State and Federally Listed Threatened/ Endangered Species in Bexar County, Texas and Project Effect 2009

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Cascade Caverns salamander (*Eurycea latitans complex*) **ST**	Endemic; subaquatic; found in springs and caves in Medina River, Guadalupe River, and Cibolo Creek watersheds within Edwards Aquifier area.	No	No Impact	No springs or aquatic cave habitat are present in or adjacent to the project area. Project would have no impact.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Comal blind salamander (*Eurycea tridentifera*) **ST**	Endemic; troglophilic; found in springs and waters of caves in Bexar and Comal counties.	No	No Impact	No springs or aquatic cave habitat are present in or adjacent to the project area. Project would have no impact.
Texas salamander (*Eurycea neotenes*) **SOC**	Endemic; troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; restricted to Helotes and Leon Creek drainages.	No	No Impact	No springs or aquatic cave habitat are present in or adjacent to the project area. Project would have no impact.
American peregrine falcon (*Falco peregrinus anatum*) **FDL, SE**	Year-round resident and local breeder in west Texas, nests in tall cliff eyries; also migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.	No	No Effect	Could migrate over area, but would not be expected to be impacted. Project would have no effect.
Black-capped vireo (*Vireo atricapilla*) **FE, SE**	Typically occur in areas with thin soil and limestone bedrock that support scrubby vegetation dominated by broad-leaved shrubs. Shin oak (*Quercus sinuata var. breviloba*) or evergreen sumac (*Rhus virens*), and mountain laurel (*Sophora secundiflora*) are usually common in areas occupied by vireos in central Texas. Foliage volume generally high; relatively open upper canopy layer; territories typically range in size from about 2 to 4 acres.	No	No Effect	Suitable habitat for use by this species was not found on this site. Project would have no effect.
Golden-cheeked warbler (*Dendroica crysoparia*) **FE, SE**	Live oak/ Ashe juniper woodlands; mature Ashe juniper and high canopy closure needed for nesting material; broad-leafed deciduous species such as lacey oak (*Quercus glaucoides*) and Texas Oak (*Quercus buckleyi*) necessary for insect prey; range usually 6 to 20 acres. Restricted to habitats in Hill Country and on Edwards Plateau.	No	No Effect	Suitable habitat for use by this species was not found on this site. Project would have no effect.
Interior least tern (*Sterna antillarum athalassos*) **FE, SE**	Shorebird that forages over large rivers and nests on open expanses of sand or gravel on islands in the river and sometimes on man-made structures.	No	No Effect	Within project limits there is no typical vegetation or landscapes used for resting or feeding areas. Suitable habitat for use by this species was not found on this site. Project would have no effect.
Mountain Plover (*Charadrius montanus*) **SOC**	Breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Arctic peregrine falcon (*Falco peregrinus tundrius*) **FDL**	Potential migrant; the Texas Gulf Coast is the only spring staging area for this bird's migration in the Western Hemisphere. Prefers cliffs and bluffs, usually near rivers or lakes in Arctic tundra (nesting); coastlines and mountains (winter).	No	No Effect	Could migrate over area, but would not be expected to be affected.
Peregrine Falcon (*Falco peregrinus*) **FDL, ST**	Subspecies (F P tundris) potential migrant through most of the state, winters along coast; subspecies (F p anatum) resident, nests in west Texas.	No	No Effect	Could migrate over area, but would not be expected to be impacted. Project would have no effect.
Western Burrowing Owl (*Athene cunicularia hypugaea*) **SOC**	Open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
White-faced Ibis (*Plegadis chihi*) **ST**	Prefers freshwater marshes, sloughs, and irrigated rice fields, but would attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Whooping crane (*Grus Americana*) **FE, SE**	Potential migrant; during migration occasionally uses marshes, river bottoms, potholes, prairies, and croplands; critical habitat on Texas Coast at Aransas National Wildlife Refuge.	No	No Effect	Very rare migrant over the eastern third of the Edwards Plateau Region. May fly over area during migration, but no impacts expected. No suitable habitat exists within or adjacent to ROW. Project would have no effect.
Wood stork (*Mycteria Americana*) **ST**	Forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including saltwater; usually roosts communally in tall snags, sometimes associated with other wading birds (i.e. active heronries). Breeds in Mexico; formerly nested in Texas, but no breeding records since 1960.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Zone-tailed hawk (*Buteo albonotatus*) **ST**	Arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, often near watercourses, and wooded canyons and tree-lined rivers along middle slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Guadalupe bass (*Micropterus treculii*) **SOC**	Endemic to perennial streams of the Edward's Plateau region; introduced in Nueces River system.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Toothless blindcat (*Trogloglanis pattersoni*) **ST**	Troglobitic, blind catfish endemic to the San Antonio pool of the Edwards Aquifer occurring in the deep portions of the aquifer over the Balcones Fault Zone (1,350 to 2,000 feet below the surface).	No	No Impact	Species occupies underground aquifer habitat in the Balcones Fault Zone near the freshwater/saline water interface. No such habitat occurs in the project area. Project would have no impact.
Widemouth blindcat (*Satan eurystomus*) **ST**	Troglobitic, blind catfish endemic to the San Antonio pool of the Edwards Aquifer occurring in the deep portions of the aquifer (over 300 meters below the surface).	No	No Impact	Species occupies underground aquifer habitat. No such habitat occurs in the project area. Project would have no impact.
Black bear (*Ursus americanus*) **FT/SA (in historic range, NL elsewhere in Texas), ST**	Within historical range of Louisiana Black Bear in eastern Texas, inhabits bottomland hardwoods and large tracts of undeveloped forested areas.	No	No Effect	No suitable bottomland hardwoods or large tracts of undeveloped forested areas exists within or adjacent to ROW. Project would have no effect.
Cave myotis bat (*Myotis velifer*) **SOC**	Colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (Hirundo pyrrhonota) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave Panhandle during winter; opportunistic insectivore.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Ghost-faced bat (*Mormoops megalophylla*) SOC	Colonially roosts in caves, crevices, abandoned mines, and buildings; insectivorous; breeds late winter-early spring; single offspring born per year.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Gray wolf (*Canis lupus*) **FE, SE**	Extirpated; formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands.	No	No Effect	Suitable habitat for use by this species was not found on this site. Project would have no effect.
Plains spotted skunk (*Spilogale putorius interrupta*) **SOC**	Catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Red wolf (*Canis rufus*) **FE, SE**	Extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies.	No	No Effect	Suitable habitat for use by this species was not found on this site. Project would have no effect.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Indigo snake (*Drymarchon corais*) **ST**	Primarily a resident of Mexico, occurs peripherally in South Texas. Mesquite-grassland savannah will only support indigo snake populations where there is adequate moisture, such as in areas near streams, ponds, resacas, and windmill seeps. Drought-sensitive reptile intimately associated with water.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Spot-tailed earless lizard (*Holbrookia lacerate*) **SOC**	Central and southern Texas and adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Texas garter snake (*Thamnophis sirtalis annectens*) **SOC**	Wet or moist microhabitats are conducive to the species occurrence, but not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Texas horned lizard (*Phrynosoma cornutum*) **ST**	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soils may vary in texture from sandy to rocky. Diet consists primarily of harvester ants (*Pogonomyrmex* sp.) and their distribution is tied closely with their ant prey.	No	No Impact	Vegetation in the open areas of the project area consists of thick grass and forb cover rather than the bunchgrass and cactus normally occurring in the horned lizard's habitat. Suitable habitat for use by this species was not found on this site. Project would have no impact.
Texas tortoise (*Gopherus berlandieri*) **ST**	Open brush with a grass understory is preferred; open grass and bare ground are avoided; when inactive occupies shallow depressions at base of bush or cactus, sometimes in underground burrows.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Timber/canebrake rattlesnake (*Crotalus horridus*) **ST**	Swamps, floodplains, upland pine and deciduous woodlands, riparian zones with much leaf litter, abandoned farmland, and limestone bluffs. Prefers dense ground cover.	No	No Impact	Suitable habitat for use by this species was not found on this site. Project would have no impact.
Nine karst invertebrate species **FE**	Subterranean spaces in karst with stable temperatures, high humidity (near saturation), and suitable substrates (such as spaces between and underneath rocks suitable for forage and shelter.)	No	No Effect	The project is located in Karst 5, which are areas that do not contain endangered invertebrates. Project would have no effect.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Texas Blind Salamander (*Typhlomolge rathbuni*) FE	Endemic to the underground water system of the limestone caverns of the Edwards Plateau. It spends its life in complete darkness. It is sensitive to changes of water quality and thus susceptible to groundwater pollutants.	No	No Effect	Project not located over Edwards Aquifer; therefore project would not effect species.
Fountain Darter (*Etheostoma fonticola*) FE	Prefers clear, quiet backwaters with a profuse bottom growth of aquatic plants and matted algae. It is found in the San Marcos and Comal rivers.	No	No Effect	Project not located over Edwards Aquifer. No effect.
Sam Marcos Gambusia (*Gambusia georgei*) FE	Prefers the quiet backwaters, adjacent to the main thrust of the river current. Its primary habitat requirements appear to be clean and clear water of a constant temperature. The bottom is muddy but generally unsilted.	No	No Effect	Project not located over Edwards Aquifer. No effect.
Comal Springs Riffle Beetle (*Heterelmis comalensis*) FE	Occurs in the gravel substrate and shallow riffles in string runs. Usual water depth is 2 to 10 centimeters.	No	No Effect	Project not located over Edwards Aquifer. No effect.
Comal Springs Bryopid Beetle (*Stygoparnus comalensis*) FE	Occur primarily in flowing, uncontaminated waters. Found in the Spring run 2 at Comal Springs and runs 3 and 4 at Comal and from Fern Bank Springs.	No	No Effect	Project not located over Edwards Aquifer. No effect.
Peck's Cave Amphipod (*Stygobromus pecki*) FE	Occur in crevices in rock and gravel near the three largest orifices of Comal Springs on the west side of Landa Park in Comal County.	No	No Effect	Project not located over Edwards Aquifer. No effect.
San Marcos Salamander (*Eurycea nana*) FT	Found in shallow alkaline springs carved out of limestone with sand and gravel substrates. Pools and streambeds are often punctuated with large limestone boulders. Aquatic vegetation is profuse, and the pool surfaces are covered with moss and thick mats of coarse, blue-green algae.	No	No Effect	Project not located over Edwards Aquifer. No effect.
Creeper (squawfoot) (*Strophitus undulatus*) **SOC**	Small to large streams, prefers gravel or gravel and mud in flowing water; Colorado, Guadalupe, San Antonio, Nueces (historic), and Trinity (historic) River basins.	Yes	May Impact	Project is located in the San Antonio River basin. Project may impact but not adversely.
False spike mussel (*Quincuncina mitchelli*) **SOC**	Substrates of cobble and mud, with water lilies present; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins.	No	No Impact	Suitable habitat was not found within the project limits.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Golden orb (*Quadrula aurea*) **SOC**	Sand and gravel in some locations and mud at others; intolerant of impoundment in most instances; Guadalupe, San Antonio, and Nueces River basins.	Yes	May Impact	Project is located in the San Antonio River basin. Project may impact but not adversely.
Mimic cavesnail (*Phreatodrobia imitata*) **SOC**	Subaquatic; only known from two wells penetrating the Edwards Aquifer.	No	No Impact	Project not located over Edwards Aquifer. No effect.
Pistolgrip (*Tritogonia verrucosa*) **SOC**	Stable substrate, rock, hard mud, silt, and soft bottoms, often buried deeply; east and central Texas, Red through San Antonio River basins.	Yes	May Impact	Project is located in the San Antonio River basin; however adverse impacts are not anticipated.
Rock pocketbook (*Arcidens confragosus*) **SOC**	Mud, sand, and gravel substrates of medium to large rivers in standing or slow flowing water, may tolerate moderate currents and some reservoirs, east Texas, Red through Guadalupe River basins.	No	No Impact	Suitable habitat was not found within the project limits.
Texas fatmucket (*Lampsilis bracteata*) **SOC**	Streams and rivers on sand, mud, and gravel substrates; intolerant of impoundment; broken bedrock and course gravel or sand in moderately flowing water; Colorado and Guadalupe River basins.	No	No Impact	Suitable habitat was not found within the project limits.
Texas pimpleback (*Quadrula petrina*) **SOC**	Mud, gravel, and sand substrates, generally in areas with slow flow rates; Colorado and Guadalupe River basins.	No	No Impact	Suitable habitat was not found within the project limits.
Big red sage *(Salvia pentstemonoides)* **SOC**	Texas endemic; moist to seasonally wet, steep limestone outcrops on seeps within canyons or along creek banks; occasionally on clayey to silty soils of creek banks and terraces, in partial shade to full sun; basal leaves conspicuous for much of the year, flowering June-October.	No	No Impact	Suitable habitat was not found within the project limits.
Bracted twistflower *(Streptanthus bracteatus)* **SOC**	Texas endemic; shallow, well-drained gravelly clays and clay loams over limestone in oak juniper woodlands and associated openings, on steep to moderate slopes an in canyon bottoms; several known soils include Tarrant, Brackett, or Speck over Edwards, Glen Rose, and Walnut geologic formations; populations fluctuate widely from year to year, depending on winter rainfall; flowering mid April-late May, fruit matures and foliage withers by early summer.	No	No Impact	Suitable habitat was not found within the project limits.

Species	Species Habitat Description	Habitat Present	Effect/ Impact	Pertinent Information
Correll's false dragon-head *(Physostegia correllii)* **SOC**	Wet, silty clay loams on streamsides, in creek beds, irrigation channels and roadside drainage ditches; or seepy, mucky, sometimes gravelly soils along riverbanks or small islands in the Rio Grande; or underlain by Austin chalk limestone along gently flowing spring-fed creek in central Texas; flowering May-September.	No	No Impact	Suitable habitat was not found within the project limits.
Elmendorf's onion *(Allium elmendorfii)* **SOC**	Texas endemic; grassland openings in oak woodlands on deep, loose, well-drained sands; in Coastal Bend on Pleistocene barrier island ridges and Holocene Sand Sheet that support live oak woodlands; to the north it occurs in post oak-black hickory-live oak woodlands over Queen City and similar Eocene formations; one anomalous specimen found on Llano Uplift in wet pockets of granite loam; flowering March-April, May.	No	No Impact	Suitable habitat was not found within the project limits.
Hill Country wild-mercury *(Argythamnia aphoroides)* **SOC**	Texas endemic; mostly in bluestem-grama grasslands associated with plateau live oak woodlands on shallow to moderately deep clays and clay loams over limestone on rolling uplands, also in partial shade of oak-juniper woodlands in gravelly soils on rocky limestone slopes; flowering April-May with fruit persisting until midsummer.	No	No Impact	Suitable habitat was not found within the project limits.
Parks' jointweed *(Polygonella parksii)* **SOC**	Texas endemic; mostly found on deep, loose, whitish sand blowouts (unstable, deep, xeric, sandhill barrens) in Post Oak Savanna landscapes over the Carrizo and Sparta formations; also occurs in early successional grasslands, along right-of-ways, and on mechanically disturbed areas; flowering June-late October or September-November.	No	No Impact	Suitable habitat was not found within the project limits.
Sandhill woollywhite *(Hymenopappus carrizoanus)* **SOC**	Texas endemic; disturbed or open areas in grasslands and post oak woodlands on deep sands derived from the Carrizo Sand and similar Eocene formations; flowering April-June.	No	No Impact	Suitable habitat was not found within the project limits.

USFWS Status

FE	Federal Endangered
FT	Federal Threatened
FC	Federal Candidate
FDL	Federal- De-listed
NL	Not listed
FT/SA	Federal Threatened due to similarity of appearance
PDL	Proposed De-listed
FP/T	Federal Proposed Threatened

TPWD Status

SE	State Endangered
ST	State Threatened
SOC	Species of Concern

K. Air Quality and Transportation Planning

The proposed project is consistent with the San Antonio – Bexar County Metropolitan Planning Organization (MPO) 2030 Metropolitan Transportation Plan (MTP) and the approved 2008-2011 State Transportation Improvement Program (STIP). Refer to **Appendix B** for copies of the STIP.

a. National Ambient Air Quality Standards

This project is not an added motor vehicle capacity project and based upon previous analyses of similar projects, carbon monoxide levels associated with this project would be well below the National Ambient Air Quality Standards (NAAQS) and therefore, a separate analysis is not necessary. The San Antonio area (3 counties: Bexar, Comal, and Guadalupe) has been classified as an ozone early action compact attainment area under the federal 8-hour ozone national ambient air quality standards; therefore, requirements such as transportation conformity do not apply in the area.

b. Carbon Monoxide Traffic Air Quality Analysis

Generally, intersection improvement projects are considered exempt from a Traffic Air Quality Analysis (TAQA) because they are intended to enhance traffic safety and improve traffic flow. The proposed action would not add capacity to an existing facility. Current and future emissions should continue to follow existing trends not being affected by this project. Due to the nature of this project, further carbon monoxide analysis was not required.

c. Mobil Source Air Toxic (MSAT)

This project will not result in any meaningful changes in traffic volumes, vehicle mix, location of existing roadways, or any other factor that would cause a substantial increase in emissions impacts relative to the existing conditions. As such, TxDOT/FHWA have determined that this project will generate minimal air quality impacts for Clean Air Act criteria pollutants and has not been linked with any special Mobile Source Air Toxics (MSAT) concerns. Consequently, this project is exempt from analysis for MSATs.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSATs to decline significantly over the next 20 years. Even after accounting for a projected 64% increase in VMT, FHWA predicts MSATs will decline in the range of 57 to 87% from a baseline year of 2000 to 2020 based on the current vehicle and fuel regulations in effect. These reductions will reduce the background level of MSATs as well as the possibility of even minor MSAT emission increases from this project.

d. Construction Emissions

During the construction phase of this project there can be temporary increases in air pollutant emissions from construction activities, equipment, and related vehicles. The primary construction related emissions are particulate matter (fugitive dust) from site preparation and construction and non-road mobile source air toxics (MSAT) from construction equipment and vehicles. The primary MSAT emission related to construction is diesel particulate matter from diesel powered construction equipment and vehicles.

These emissions are temporary in nature (only occurring during actual construction) and it is not reasonably possible to estimate impacts from these emissions due to limitations of the existing models. However, the potential impacts of particulate matter emissions will be minimized by using fugitive dust control measures such as covering or treating disturbed areas with dust suppression techniques, sprinkling, covering loaded trucks, and other dust abatement controls, as appropriate. The MSAT emissions will be minimized by measures to encourage use of EPA required cleaner diesel fuels, limits on idling, increasing use of cleaner burning diesel engines, and other emission limitation techniques, as appropriate.

However, considering the temporary and transient nature of construction related emissions as well as the mitigation actions to be utilized, it is not anticipated that emissions from construction of this project will have any significant impact on air quality in the area.

L. Construction Impacts

No adverse construction related air quality, noise, or water quality impacts are expected. Measures to reduce dust, construction noise, and erosion would be included in the plans and specifications for the proposed action. When feasible, the work sequence would be developed to maintain access to adjoining properties during construction. Other items in the contract would be designed to protect the safety of the project area residents and construction workers.

There are no railroad crossings with the proposed project limits and therefore, a railroad agreement will not be required for this work.

There are no airports within 20,000 feet of the project and therefore, an Airway-Highway permit will not be required.

IV. Permits/Commitments

Under the Build Alternative, the TPDES General Permit for Construction Activities requires that a Notice of Intent be filed with TCEQ stating that TxDOT would have a Storm Water Pollution Prevention Plan in place during construction of this project.

The Contractor would take appropriate measures to prevent, minimize, and control the spill of hazardous materials in staging areas. All materials being removed and/or disposed of by the Contractor would be done in accordance with State and Federal laws and by approval of the Engineer.

In the unlikely event that evidence of archeological deposits is encountered during construction, work in the immediate area would cease and TxDOT archeological staff would be contacted to initiate accidental discovery procedures under the provisions of the Programmatic Agreement between TxDOT, THC, FHWA, and the Advisory Council on Historic Preservation and the Memorandum of Understanding between TxDOT and the THC.

V. Public Involvement

An opportunity for a public hearing would be not be required because the proposed project would not add capacity, would not required the acquisition of significant amounts of right of way, would not substantially change the layout or function of the connecting roadways or of the facility being improved, and would not otherwise causes a substantial social, economic, or environmental effect.

VI. Exhibits / Figures / Coordination

Exhibits are included at the end of the text of the PCE and include:

Exhibit 1:	Vicinity Map
Exhibit 2:	Location Map
Exhibit 3:	USGS Topographic Map
Exhibit 4 A-C:	Aerial Maps
Exhibit 5A-D:	Existing Typical Sections
Exhibit 6A-E:	Proposed Typical Sections
Exhibit 7:	Edwards Aquifer Map
Exhibit 8:	Floodplain Map
Exhibit 9:	Soil Map
Exhibit 10:	Karst Zone Map

The following appendices are included in the PCE:

Appendix A	Photographs
Appendix B	STIP Project Page
Appendix C	Natural Diversity Database Search

VII. PCE Determination

The proposed action meets the criteria for a Programmatic Categorical Exclusion (PCE) as defined in the Programmatic Agreement for the Review and Approval of NEPA Categorically Excluded Transportation Projects (PA), executed by the Texas Division of the Federal Highway Administration (FHWA) and the Texas Department of Transportation (TxDOT) on October 26, 2004.

APPENDIX I
COST ESTIMATES

S&B INFRASTRUCTURE
PRELIMINARY ESTIMATE

COUNTY: Bexar
HIGHWAY: **Harry Wurzbach**
CSJ: 0
LENGTH: 3.608 MI
TRAFFIC: 0 ADT
TIP Categor 0
Roadway Classification:

LOCATION (SEE ATTACHED MAP)

FROM: **Scott Rd (Fort Sam Houston Entrance Gate)**
TO: **Dalewood (South of 410)**

BEG STA:	16+00.00	BEG MP.:	0
END STA:	191+50.00	END MP:	0
LENGTH:	19,050.00 FT		3.608 MI

RECONSTRUCT EXISTING (X) NEW LOCATION ( ) EXIST ROW WIDTH:

LAYMAN'S DESCRIPTION OF PROPOSED WORK:

EXISTING IMPROVEMENTS:

PROJECT COST

GRADING	$	11,280,740.00
SMALL DRAINAGE STRUCT (CULV)	$	2,661,500.00
LARGE STRUCT	$	-
SUBGRADE/ EXIST BASE TREATMENT	$	1,122,670.63
HOT MIX.	$	7,479,700.00
CONCRETE PAVING.	$	576,186.00
SURFACE	$	2,523,230.00
TRAFFIC SIGNALS (5@$180,000EA)	$	900,000.00
MOBILIZATION (11%)	$	2,919,800.00
LANDSCAPING & AESTHETICS	$	6,000,000.00
IRRIGATION	$	1,000,000.00
ILLUMINATION	$	4,000,000.00
SUB-TOTAL (Construction Bid Items).	$	40,463,826.63
E&C Costs	$	8,093,173.37
CONSTRUCTION TOTAL	$	48,557,000.00
ROW COST	$	1,250,000.00
Utility - Underground Conversion - Median	$	844,000.00
Utility - Underground Conversion - ROW	$	7,410,000.00
Project Subtotal	$	58,061,000.00
ALTERNATIVE 1	$	8,656,000.00
TOTAL PROJECT	**$**	**66,717,000.00**

PREPARED BY: ______________________________

Harry Wurzbach

GRADING ITEMS

ITEMS	DESCRIPTION	QUANTITY	UNIT	PRICE	COST
100.1	Mobilization	-	LS	$ -	$ -
100.2	Insurance & Bond	1	LS	$ 1,110,000.00	$ 1,110,000
101.1	Pre ROW	1	LS	$ 1,480,000.00	$ 1,480,000
104.1	Excavation (Rdwy & Chan)	34079	CY	$ 8.00	$ 272,632
107.1	Embankment (Dens Cont)(TY C)	10029	CY	$ 15.00	$ 150,435
103.1	Remove Concrete Curb	10000	LF	$ 3.00	$ 30,000
103.3	Remoing Concrete Sidewalk & Driveways	5000	SF	$ 3.00	$ 15,000
515	Furnish & Place Topsoil (Cl 2) (4 IN)	4444	CY	$ 24.00	$ 106,656
516.2	St. Augustine Sodding	40000	SY	$ 5.00	$ 200,000
106.1	Culvert Excavation & Backfill	1680	CY	$ 14.00	$ 23,520
307.1	Retaining Walls	310	CY	$ 633.00	$ 196,230
505.1	Riprap	10000	SY	$ 59.00	$ 590,000
530.1	Barricades, Signs and Traffic Handling	1	LS	$ 1,110,000.00	$ 1,110,000
504.1	Concrete Median	12,800	SY	$ 115.00	$ 1,472,000
500.4	Conc Curb & Gutter	38,100	LF	$ 14.00	$ 533,400
500.1	Conc Curb	38,100	LF	$ 12.00	$ 457,200
503.2	Portland Cement Conc Driveway-Commercial	8350	SY	$ 73.00	$ 609,550
502.1	CONCRETE SIDEWALKS 6ft	25,400	SY	$ 35.00	$ 889,000
531	Relocate Roadside Signs	100	EA	$ 201.00	$ 20,100
666	Refl Pav Mrk TY 1 (W) (4 IN) (Sld)	76,200	FT	$ 0.25	$ 19,050
666	Refl Pav Mrk TY 1 (Y) (4 IN) (Sld)	38,100	FT	$ 0.25	$ 9,525
666	Refl Pav Mrk TY 1 (Y) (4 IN (Brk)	4,350	FT	$ 0.25	$ 1,088
666	Refl Pav Mrk TY II (W) (4 IN) (Sld)	76,200	FT	$ 0.12	$ 9,144
666	Refl Pav Mrk TY II (Y) (4 IN) (Sld)	38,100	FT	$ 0.12	$ 4,572
666	Refl Pav Mrk TY II (Y) (4 IN) (Brk)	4,350	FT	$ 0.12	$ 522
672	Rais Pav Mrk Cl B (Refl) Ty II-A-A	2,469	EA	$ 2.88	$ 7,111
680	Temp Traffic Signal	7	EA	$ 100,000.00	$ 700,000
5004	Miscellaneous SW3P Items	5%	LS	$ -	$ 1,264,001

\

TOTAL GRADING COSTS $ 11,280,740

* Check current prices

SMALL DRAINAGE STRUCTURE ITEMS

ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	COST
					$ -
309.1	Conc Box Culv (5 FT x 5 FT)	20	LF	$ 316.25	$ 6,325.00
309.1	Conc Box Culv (6 FT x 5 FT)	100	LF	$ 391.00	$ 39,100.00
309.1	Conc Box Culv (7 FT x 5 FT)	273	LF	$ 402.50	$ 109,882.50
309.1	Conc Box Culv (7 FT x 6 FT)	212	LF	$ 431.25	$ 91,425.00
309.1	Conc Box Culv (8 FT x 4 FT)	354	LF	$ 376.05	$ 133,121.70
309.1	Conc Box Culv (10 FT x 6 FT)	20	LF	$ 598.00	$ 11,960.00
401.1	RC Pipe (Class III) (24 IN)	6600	FT	$ 77.05	$ 508,530.00
401.1	RC Pipe (Class III) (30 IN)	5184	FT	$ 100.05	$ 518,659.20
401.1	RC Pipe (Class III) (36 IN)	4204	FT	$ 123.05	$ 517,302.20
401.1	RC Pipe (Class III) (42 IN)	1696	FT	$ 97.75	$ 165,784.00
401.1	RC Pipe (Class III) (48 IN)	133	FT	$ 120.75	$ 16,059.75
465	Inlet (Compl) (Curb)	108	EA	$ 2,300.00	$ 248,400.00
307.1	Wingwall (MCW-P) (H = 7 to 9 FT)	284	CY	$ 1,038.45	$ 294,919.80
xx					

TOTAL DRAINAGE ITEM COST $ 2,661,500

*Check current prices

TYPICAL SECTION

STABILIZATION OF SUBGRADE

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
16+00.00	50+40.00	3440	72	27520	0	27520
50+40.00	55+40.00	500	77.5	4306	0	4306
55+40.00	57+80.00	240	83	2213	0	2213
57+80.00	62+50.00	470	77.5	4047	0	4047
62+50.00	103+00.00	4050	72	32400	0	32400
88+00.00	110+00.00	2200	60	14667	0	14667
110+00.00	131+00.00	2100	60	14000	0	14000
131+00.00	191+50.00	6050	60	40333	0	40333
All Intersections						4251
		TOTAL AREA				**143737**

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
Stabilization of Exist Material	Treatment	Unit Wt =110.0 lbs/cf				
143737	**6**	N/A	143737	SY	$ 4.60	$ 661,191.73
Stabilization of Exist. Material -	Lime or Cement				0	
143737	6	8%	2846	TON	$ 162.15	$ 461,478.90

TOTAL SUBGRADE EXIST. TRTMNT COST $ 1,122,671

BASE ITEMS

TYPICAL SECTION

HOT MIX

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
16+00.00	50+40.00	3440	72	27520	0	27520
50+40.00	55+40.00	500	77.5	4306	0	4306
55+40.00	57+80.00	240	83	2213	0	2213
57+80.00	62+50.00	470	77.5	4047	0	4047
62+50.00	103+00.00	4050	72	32400	0	32400
88+00.00	110+00.00	2200	60	14667	0	14667
110+00.00	131+00.00	2100	60	14000	0	14000
131+00.00	191+50.00	6050	60	40333	0	40333
All Intersections						4251
		TOTAL AREA				143737

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
143737	9	0	143737.3	SY	$ 37.95	$ 5,454,831.80
143737	3	0	143737.3	SY	$ 14.09	$ 2,024,899.68

TOTAL BASE COST $ 7,479,700.00

CONCRETE PAVING

BUS STOP CONCRETE PAVING

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	LOCATIONS (EA)	TOTAL AREA (SY)
0+0.00	2+00.00	200	12	267	26	6942
0+0.00	0+0.00	0	77.5	0	0	0
0+0.00	0+0.00	0	83	0	0	0
0+0.00	0+0.00	0	60.67045455	0	0	0
		TOTAL AREA				6942

TOTAL AREA SY	DEPTH (IN)	DESCRIPTION	QUANTITY	UNIT	PRICE	COST
6942	12	CONC PAVING (CONT REINF)	6942	SY	$ 83.00	$ 576,186.00
						$ -
				TOTAL ACP COST		$ 576,186.00

TOTAL CONC PAV COST $ 576,186.00

*Check current prices

SURFACE

EMULSION & SEAL COAT

	Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
	16+00.00	50+40.00	3440	72	27520	0	27520
	50+40.00	55+40.00	500	77.5	4306	0	4306
	55+40.00	57+80.00	240	83	2213	0	2213
EMULSION	57+80.00	191+50.00	19050	60.67045455	128419	0	128419
SEAL COAT	16+00.00	50+40.00	3440	72	27520	0	27520
	50+40.00	55+40.00	500	77.5	4306	0	4306
	55+40.00	57+80.00	240	83	2213	0	2213
	57+80.00	191+50.00	19050	60.67045455	128419	0	128419
	TOTAL AREA		TOTAL AREA				162458

1st & 2nd COURSE	TOTAL AREA (SY)	RATE		QUANTITY	UNIT	PRICE	COST
ONE COURSE SURF TREAT							
ASPHALT	**162458**	0.28	GAL/SY	45488	GAL	$ 6.00	$ 272,928.00
AGGR	162458	**114**	SY/CY	1425	CY	$ 167.00	$ 237,975.00
		0			TOTAL SEAL COAT & EMULSION		$ 510,903.00

HOT MIX

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
16+00.00	50+40.00	3440	72	27520	0	27520
50+40.00	55+40.00	500	77.5	4306	0	4306
55+40.00	57+80.00	240	83	2213	0	2213
57+80.00	62+50.00	470	77.5	4047	0	4047
62+50.00	103+00.00	4050	72	32400	0	32400
88+00.00	110+00.00	2200	60	14667	0	14667
110+00.00	LANDSCAPIN	2100	60	6000000	0	14000
131+00.00	191+50.00	6050	60	40333	0	40333
All Intersections						4251
		TOTAL AREA				143737

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
143737	**3**	0 .	143737.3	SY	$ 14.00	$ 2,012,322.67
				TOTAL ACP COST		$ 2,012,322.67

TOTAL SURFACE COST $ 2,523,230

*Check current prices

Harry Wurzbach

Location Description/Parcel	Beg Sta	End Sta	Length Ft	Exist Width	Prop Width	Area Parcel	Cost $/AC	Total
1			0	0	0	1	$ 250,000.00	$ 250,000.00
2			0	0	0	1	$ 250,000.00	$ 250,000.00
3			0	0	0	1	$ 250,000.00	$ 250,000.00
4			0	0	0	1	$ 250,000.00	$ 250,000.00
5			0	0	0	1	$ 250,000.00	$ 250,000.00
			0			0	$ 250,000.00	$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -

TOTAL ROW COST **$ 1,250,000.00**

7

S&B INFRASTRUCTURE
PRELIMINARY ESTIMATE
ALTERNATIVE 1

COUNTY: Bexar
HIGHWAY: **Harry Wurzbach @ Austin Hwy Alternat**
CSJ: 0
LENGTH: 1.312 MI
TRAFFIC: 0 ADT
TIP Categor 0
Roadway Classification:

LOCATION (SEE ATTACHED MAP)

FROM: **Scott Rd (Fort Sam Houston Entrance Gate)**
TO: **Dalewood (South of 410)**

BEG STA:	16+00.00	BEG MP.:	0
END STA:	131+00.00	END MP:	0
LENGTH:	6,926.00 FT		1.312 MI

RECONSTRUCT EXISTING (X) NEW LOCATION ( ) EXIST ROW WIDTH:

LAYMAN'S DESCRIPTION OF PROPOSED WORK:

EXISTING IMPROVEMENTS:

PROJECT COST

GRADING	$	2,919,970.00
SMALL DRAINAGE STRUCT (CULV)	$	701,500.00
LARGE STRUCT	$	1,606,600.00
SUBGRADE/ EXIST BASE TREATMENT	$	10,887.74
HOT MIX	$	72,500.00
CONCRETE PAVING	$	-
SURFACE	$	120,280.00
TRAFFIC SIGNALS (Add'l 4@$180,000EA)	$	720,000.00
MOBILIZATION (11%)	$	676,700.00
LANDSCAPING		
IRRIGATION		
ILLUMINATION		
SUB-TOTAL (Construction Bid Items)	$	6,828,437.74
E&C Costs	$	1,365,562.26
CONSTRUCTION TOTAL	$	8,194,000.00
ROW COST	$	462,000.00
Alternate 1 Total	**$**	**8,656,000.00**

PREPARED BY: ______________________

Harry Wurzbach @ Austin Hwy Alternative

GRADING ITEMS

ITEMS	DESCRIPTION	QUANTITY	UNIT	PRICE	COST
104.1	Excavation (Rdwy & Chan)	70811	CY	$ 8.00	$ 566,488
107.1	Embankment (Dens Cont)(TY C)	7031	CY	$ 15.00	$ 105,465
307.1	Retaining Walls	2904	CY	$ 633.00	$ 1,838,232
500.4	Conc Curb & Gutter	3,143	LF	$ 14.00	$ 44,002
500.1	Conc Curb	3,143	LF	$ 12.00	$ 37,716
502.1	CONCRETE SIDEWALKS 6ft	904	SY	$ 35.00	$ 31,640
666	Refl Pav Mrk TY 1 (W) (4 IN) (Sld)	4,279	FT	$ 0.25	$ 1,070
666	Refl Pav Mrk TY 1 (W) (4 IN) (Brk)	436	FT	$ 0.25	$ 109
666	Refl Pav Mrk TY 1 (Y) (4 IN) (Sld)	2,548	FT	$ 0.25	$ 637
666	Refl Pav Mrk TY 1 (Y) (4 IN (Brk)	535	FT	$ 0.25	$ 134
666	Refl Pav Mrk TY II (W) (4 IN) (Sld)	4,279	FT	$ 0.12	$ 513
666	Refl Pav Mrk TY II (W) (4 IN) (Brk)	436	FT	$ 0.12	$ 52
666	Refl Pav Mrk TY II (Y) (4 IN) (Sld)	2,548	FT	$ 0.12	$ 306
666	Refl Pav Mrk TY II (Y) (4 IN) (Brk)	535	FT	$ 0.12	$ 64
672	Rais Pav Mrk Cl B (Refl) Ty II-A-A	166	EA	$ 2.88	$ 478
672	Rais Pav Mrk Cl B (Refl) Ty I-C	44	EA	$ 2.88	$ 127
5004	Miscellaneous SW3P Items	5%	LS	$ -	$ 300,750

\

TOTAL GRADING COSTS $ 2,927,780

* Check current prices

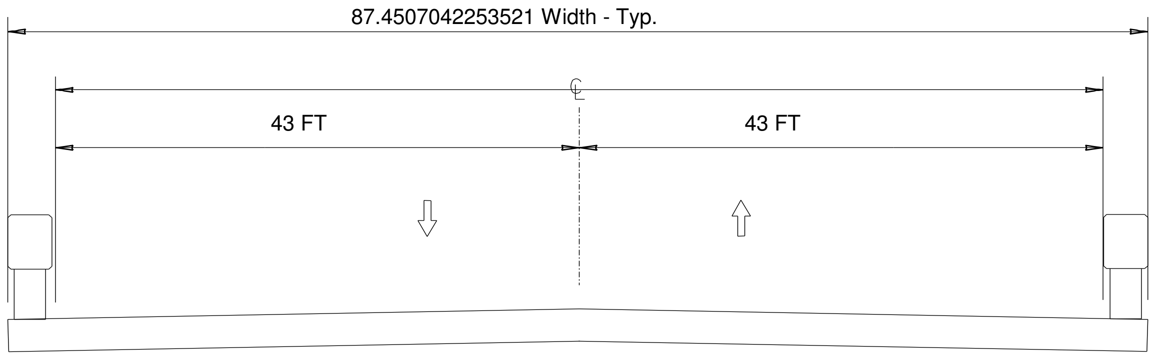
SMALL DRAINAGE STRUCTURE ITEMS					
ITEM	DESCRIPTION	QUANTITY	UNIT	PRICE	COST
					$ -
309.1	Conc Box Culv (6 FT x 6 FT)	300	LF	$ 391.00	$ 117,300.00
401.1	RC Pipe (D-Load) (24 IN)	600	FT	$ 77.05	$ 46,230.00
401.1	RC Pipe (D-Load) (30 IN)	600	FT	$ 100.05	$ 60,030.00
401.1	RC Pipe (D-Load) (36 IN)	900	FT	$ 123.05	$ 110,745.00
464	RC Pipe (D-Load) (42 IN)	900	FT	$ 97.75	$ 87,975.00
465	Inlet (Compl) (Curb)	20	EA	$ 2,300.00	$ 46,000.00
230.1	Flexible Pavement Structure Repair (12.5")	1,950	SY	$ 119.60	$ 233,220.00
413.1	Flowable Backfill (Low Strength)(3' depth)	1,617	CY	$ 96.60	$ 156,202.20
xx					

TOTAL DRAINAGE ITEM COST $ 857,700

*Check current prices

Harry Wurzbach @ Austin Hwy Alternative

BRIDGE ITEMS



TYPICAL SECTION

LENGTH (FT)	213
AVG WIDTH (F	87.45070423
AREA (FT)	18627

STRUCTURE NUMBER **0-0-0-0 Bridge Cat 1 Summary**

DESCRIPTION	QUANTITY	UNIT	PRICE	COST
Bridge Area	18627	SF	$86.25	$1,606,578.75
Prestressed Beams		FT	$0.00	$0.00
Riprap		CY	$0.00	$0.00
Bridge Rail		FT	$0.00	$0.00
Armor Joint Repair		FT		$0.00
Structure Costs				**$1,606,578.75**

TOTAL COST $1,606,600

*Check current prices

TYPICAL SECTION

STABILIZATION OF SUBGRADE

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
109+76.00	131+00.00	2124	0	0	0	0
109+76.00	131+00.00	2124	0	0	0	0
0+0.00	2+71.00	271	38	1144	250	1394
0+0.00	122+26.00	0	41.09090909	0	0	0
		TOTAL AREA				**1394**

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
Stabilization of Exist Material Treatment		Unit Wt =110.0 lbs/cf				
1394	**6**	N/A	1394	SY	$ 4.60	$ 6,412.40
Stabilization of Exist. Material - Lime or Cement					0	
1394	6	8%	27.6	TON	$ 162.15	$ 4,475.34

TOTAL SUBGRADE EXIST. TRTMNT COST $ 10,888

BASE ITEMS

TYPICAL SECTION

HOT MIX

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
109+76.00	131+00.00	2124	0	0	0	0
109+76.00	131+00.00	2124	0	0	0	0
0+0.00	2+71.00	271	38	1144	250	1394
0+0.00	122+26.00	0	41.09090909	0	0	0
		TOTAL AREA				1394

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
1394	9	0	1394.0	SY	$ 37.95	$ 52,902.30
1394	3	0	1394.0	SY	$ 14.09	$ 19,637.98

TOTAL BASE COST $ 72,500.00

Harry Wurzbach @ Austin Hwy Alternative

SURFACE

EMULSION & SEAL COAT

	Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
	109+76.00	131+00.00	2124	0	0	0	0
	109+76.00	131+00.00	2124	0	0	0	0
	0+0.00	2+71.00	271	38	1144	250	1394
EMULSION	0+0.00	122+26.00	6713	41.09090909	30649	0	30649
SEAL COAT	109+76.00	131+00.00	2124	0	0	0	0
	109+76.00	131+00.00	2124	0	0	0	0
	0+0.00	2+71.00	271	38	1144	250	1394
	0+0.00	122+26.00	6713	41.09090909	30649	0	30649
	TOTAL AREA		TOTAL AREA				32043

1st & 2nd COURSE	TOTAL AREA (SY)	RATE		QUANTITY	UNIT	PRICE	COST
EMULSION	32043	0.00	GAL/SY	0	GAL	$ 1.00	$ -
ONE COURSE SURF TREAT							
ASPHALT	32043	0.28	GAL/SY	8972	GAL	$ 6.00	$ 53,832.00
AGGR	32043	114	SY/CY	281	CY	$ 167.00	$ 46,927.00

0

TOTAL SEAL COAT & EMULSION $ 100,759.00

HOT MIX

Beg Sta	End Sta	LENGTH (FT)	WIDTH (FT)	RDWY AREA (SY)	INTRSCT AREA (SY)	TOTAL AREA (SY)
109+76.00	131+00.00	2124	0	0	0	0
109+76.00	131+00.00	2124	0	0	0	0
0+0.00	2+71.00	271	38	1144	250	1394
0+0.00	122+26.00	0	41.09090909	0	0	0
		TOTAL AREA				1394

TOTAL AREA SY	DEPTH (IN)	RATE	QUANTITY	UNIT	PRICE	COST
1394	3	0 .	1394.0	SY	$ 14.00	$ 19,516.00

TOTAL ACP COST $ 19,516.00

TOTAL SURFACE COST $ 120,280

*Check current prices

Harry Wurzbach @ Austin Hwy Alternative

$/SF	$/AC
$ 1.00	$ 43,560.00

Location Description	Beg Sta	End Sta	Length Ft	Exist Width	Prop Width	Area AC	Cost $/AC	Total
			0	0	0	0.483	$ 580,000.00	$ 280,140.00
			0	0	0	0.234	$ 580,000.00	$ 135,720.00
			0	0	0	0.08	$ 580,000.00	$ 46,400.00
			0	0	0	0	$ 580,000.00	$ -
			0	0	0	0	$ 580,000.00	$ -
			0			0	$ 580,000.00	$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -
			0			0		$ -

TOTAL ROW COST **$ 462,260.00**