DocuSign Envelope ID: 06FF2996-64DC-4846-A457-080DAB79EFC2

100% SUBMITTA

FEDERAL AID PROJECT NO.			
STP 2B23(207)TAPS			
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		1

INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. STP 2B23(207)TAPS
PROJECT CSJ: 0979-01-027

CITY OF LA MARQUE
MAIN STREET / FM 519 SIDEWALK

GALVESTON COUNTY

DESIGN SPEED = N/A
A.D.T. (2021)= 8,126
A.D.T. (2041)= 11,376

NET LENGTH OF ROADWAY = 8,296.75 FT.= 1.571 MI.
NET LENGTH OF BRIDGE = 0.00 FT.= 0.000 MI.
NET LENGTH OF PROJECT = 8,296.75 FT.= 1.571 MI.

LIMITS: ALONG FM 519 FROM IH-45 TO SH-3

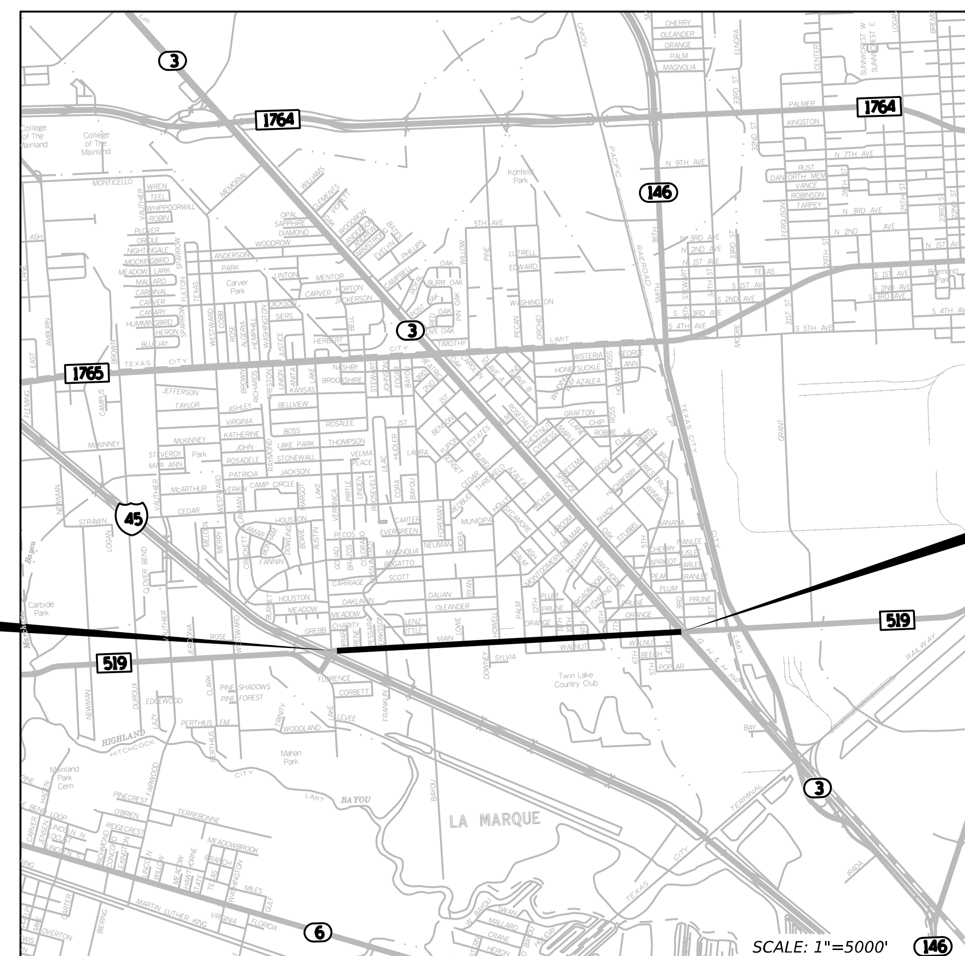
FOR THE CONSTRUCTION OF SIDEWALK IMPROVEMENTS
CONSISTING OF CONSTRUCTION OF 6' SIDEWALKS AND HC RAMPS ADJACENT TO BOTH SIDES OF MAIN STREET (FM 519)
AND INSTALLATION OF CROSSWALKS, PROPER SIGNAGE, EARLY WARNING SIGNS AND PEDESTRIAN FLASHERS

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

REGISTER ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED

TDLR PROJECT NO. TABS2024000042

BEGIN PROJECT
CSJ: 0979-01-027
FM 519 STA 612+06.69
N = 13701536.59
E = 3250071.007



END PROJECT
CSJ: 0979-01-027
FM 519 STA 695+03.44
N = 13701930.27
E = 3253354.963

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER
2/12/2024

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

Texas Department of Transportation
(C) 2023

RECOMMENDED FOR LETTING: 3/14/2024
DocuSigned by:
Richard Mancilla
AE214A3FDA804AE...
PROJECT MANAGER

APPROVED FOR LETTING BY: 3/20/2024
DocuSigned by:
Brett McLeod, P.E.
FE9C2D7C24E5432D...
FOR DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 23, 2023)

DATE: 2/12/2024 9:35:02 PM
FILE: ...\FM 519 TITLE SHEET.dgn

2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

100% SUBMITTAL

CK:
DW:
CK:
DN:

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (*) HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

FOROUD MORADI SARMEIDANI, P.E. 107929

STATE OF TEXAS · FOROUD MORADI SARMEIDANI · 107929 · LICENSED · PROFESSIONAL ENGINEER

F. M. Moradi

2/12/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (**) HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

RANDY W. HARRIS, P.E. 93663

STATE OF TEXAS · RANDY W. HARRIS · 93663 · LICENSED · PROFESSIONAL ENGINEER

Randy W. Harris, PE

2/12/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (***) HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

ANGELITO D. ESQUIVEL, P.E. 94976

STATE OF TEXAS · ANGELITO D. ESQUIVEL · 94976 · LICENSED · PROFESSIONAL ENGINEER

2/12/2024

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A (****) HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

LACEY L. HEBERT, P.E. 134840

STATE OF TEXAS · LACEY L. HEBERT · 134840 · LICENSED · PROFESSIONAL ENGINEER

2/12/2024

Lacey L Hebert PE

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INDEX OF SHEETS

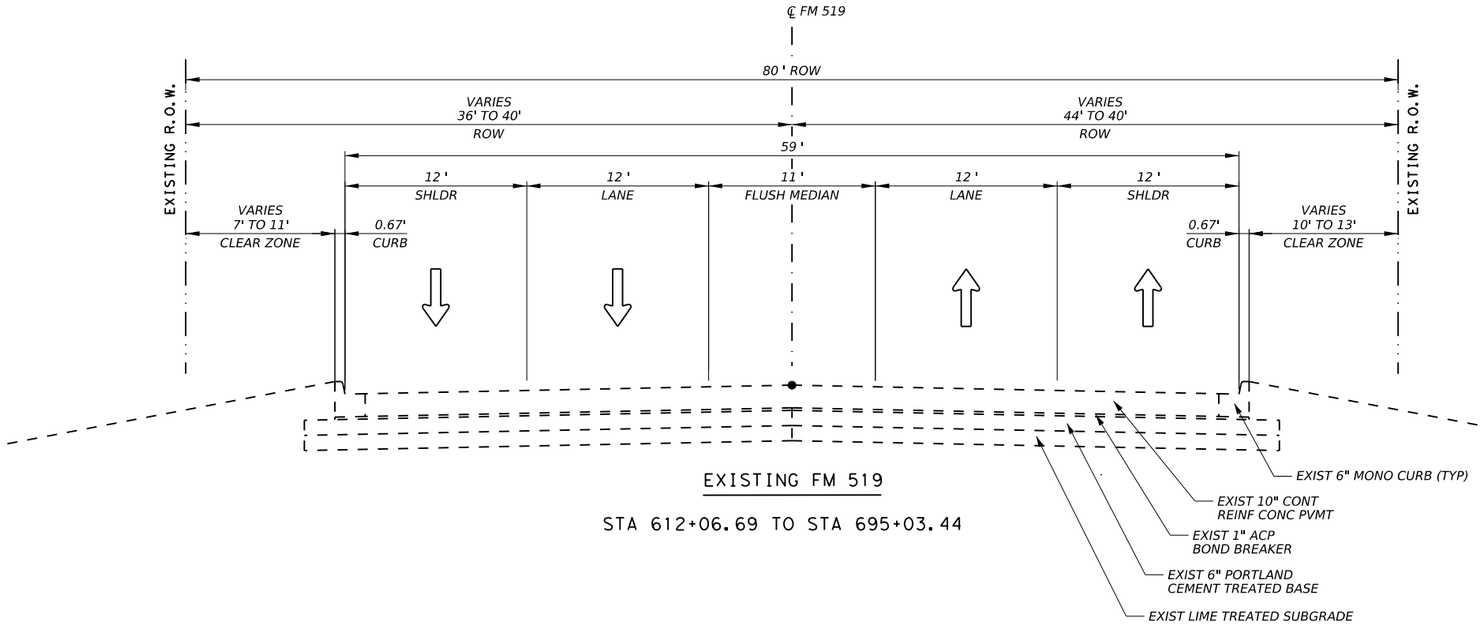
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		2

DATE: 2/12/2024 9:35:28 PM
FILE: ...11. General\FM 519 INDEX.dgn

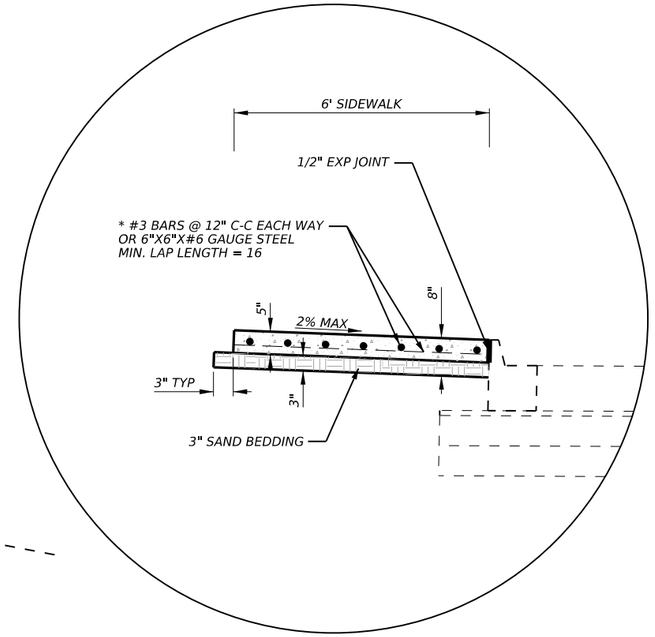
100% SUBMITTAL

CK:
DW:
CK:
DW:



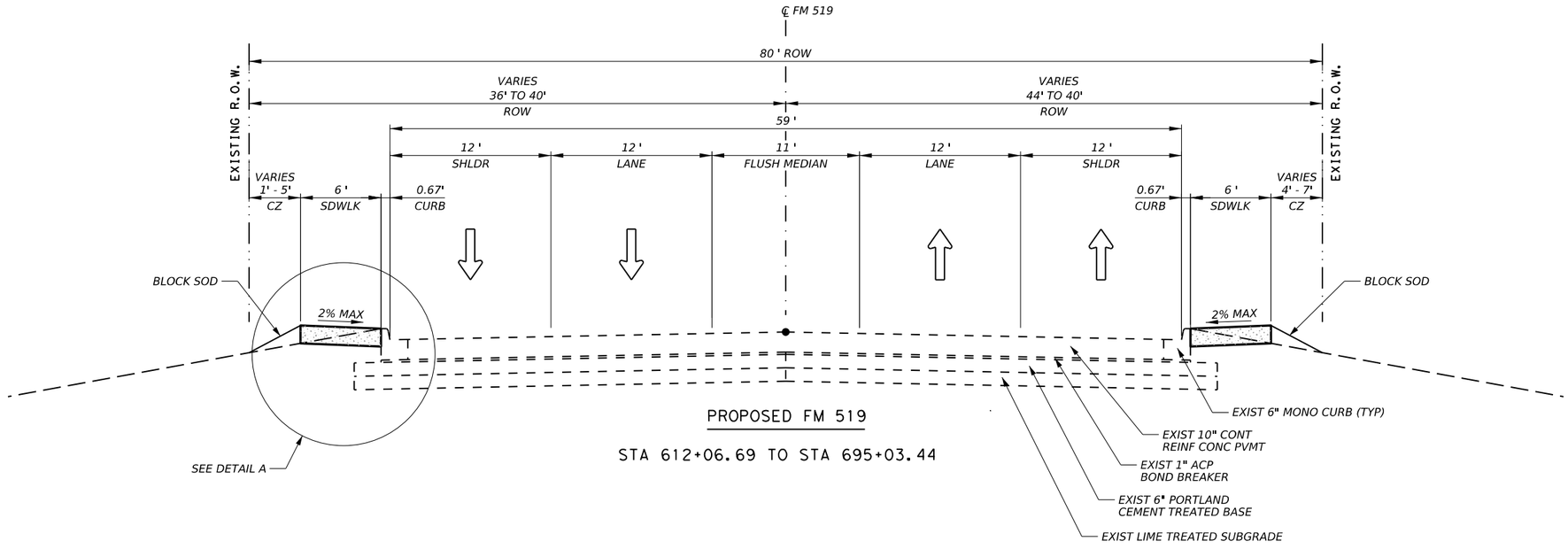
EXISTING FM 519

STA 612+06.69 TO STA 695+03.44



DETAIL A

NOTE: FOR 5' SIDEWALK
USE 1 LESS LONG. BAR



PROPOSED FM 519

STA 612+06.69 TO STA 695+03.44

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

TYPICAL SECTIONS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		3

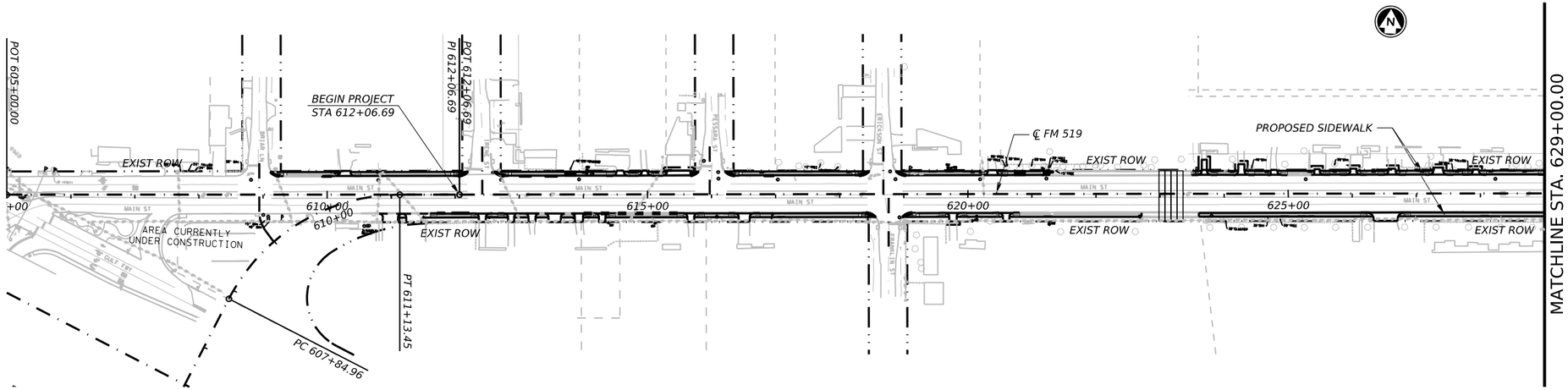
DATE: 9/11/2023 4:32:36 PM
FILE: ...\FM 519 TYP SECTIONS.dgn

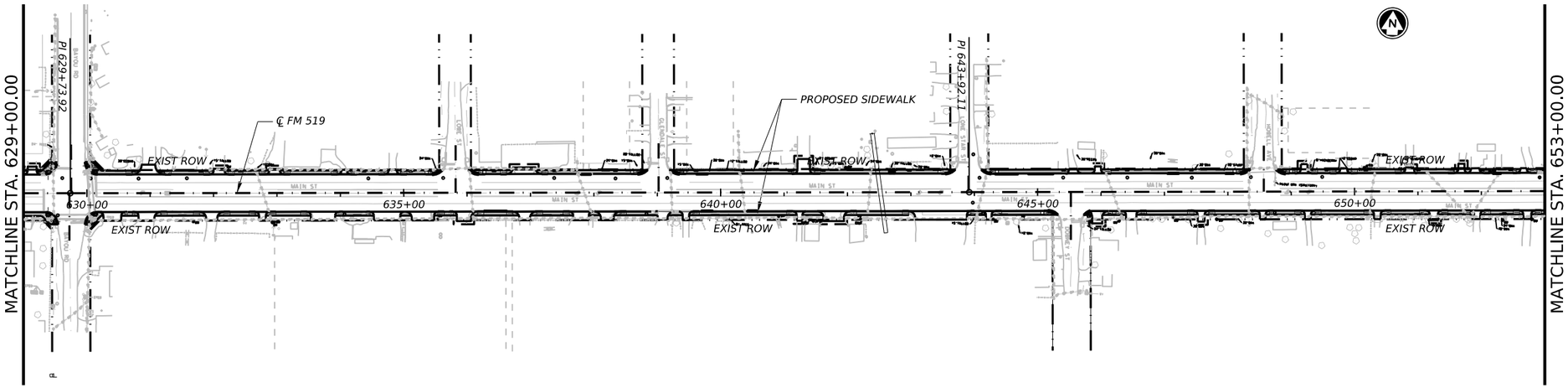
100% SUBMITTAL

DW	CK
DW	CK

LEGEND

PROPOSED SIDEWALK CONSTR





0 100 200
SCALE IN FEET

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROJECT LAYOUT
BEGIN TO STA 653+00

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		4

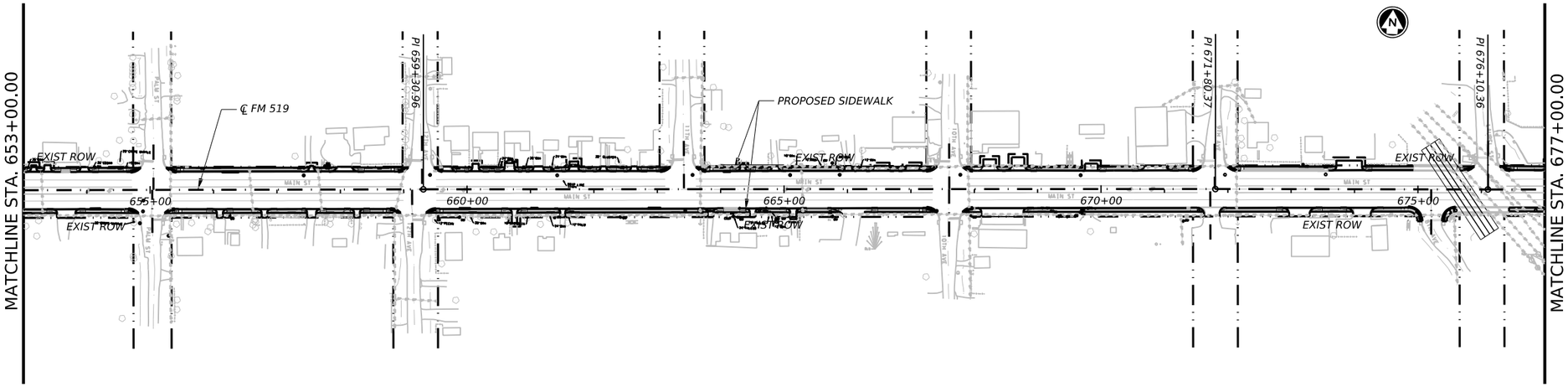
DATE: 9/11/2023 4:33:07 PM
FILE: ...\1. General\FM 519 PL_01.dgn

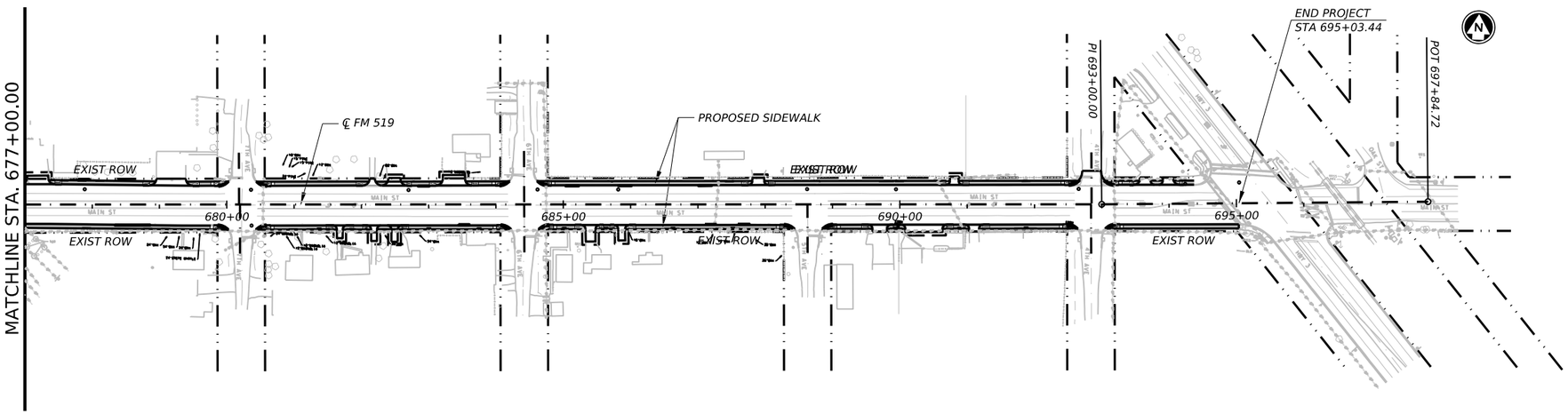
100% SUBMITTAL

DW	CK
DW	CK

LEGEND

PROPOSED SIDEWALK CONSTR





0 100 200
SCALE IN FEET

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)618-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROJECT LAYOUT
STA 653+00 TO END

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		5

DATE: 9/11/2023 4:33:31 PM
FILE: ...\1. General\FM 519 PL 02.dgn

General Notes:

General:

Area Engineer contact information for this project follows:

Area Engineer: David Lazaro, P.E.
Phone: 409-978-2505 email: david.lazaro@txdot.gov
Assistant Area Engineer: Joel Clarke, P.E.
Phone: 409-978-2505 email: joel.clarke@txdot.gov

Submit any questions about this project via the Letting Pre-Bid Q&A web page, located at:

https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

The Letting Pre-Bid Q&A web page for each project can be accessed by scrolling or filtering the dashboard using the controls on the left side to navigate to the project. Hover over the blue hyperlink of the project to view the Q&A and click on the link in the window that pops up.

Large files with relevant project documentation, such as Geotech reports, As-Built plans, and cross-sections will continue to be provided on the following FTP site:

Index of /pub/txdot-info/Pre-Letting Responses/Houston District (state.tx.us) or

https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/Houston%20District/

If fixed features require, the governing slopes shown may vary between the limits shown and to the extent determined by the Engineer.

Notify the Engineer immediately if discrepancies are discovered in the horizontal control or the benchmark data.

Contractor to coordinate with adjacent illumination project contractor and Area Office for CSJ 0979-01-029 (Install Safety Lighting along FM 519 in La Marque) letting in August 2024.

The following standard detail sheets are modified:

Modified Standards

TS-FD-12 (MOD)

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

GENERAL NOTES **Sheet**

County: Galveston **Control:** 0979-01-027

Highway: FM 519

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Stencil the National Bridge Inventory (NBI) number on each existing bridge shown on these plans. The NBI number is shown above the title block for each bridge layout.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

Right of way parcels or utility adjustments shown to be unclear on the plans but not listed on the special provisions will have no effect on construction.

Make requests for additional soil information for this project at the Area Engineer's office.

Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list.

Perform electrical work in conformance with the National Electrical Code (NEC) and the Department's standard sheets.

The Contractor may make the electrical grounding connections and permissible splices using the thermal fusion process, Cadweld, ThermOweld, or approved equal, instead of bolted connections and splices.

The Area Engineer will arrange with the Contractor, an inspection of the completed electrical systems for the highway lighting systems before final acceptance for compliance with plans and specifications. The inspection will be made with personnel from the electrical section of the Department's District Transportation Operations Office. The city's electrical division personnel will also inspect lighting systems within the city limits. Portions of the work found to be deficient during this inspection will not be accepted.

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at http://www.dot.state.tx.us/GSD/purchasing/supps.htm) and the materials pre-qualified for illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

Mow the grass and weeds within the project limits a maximum of 3 times a year as directed. This work is subsidiary to the various bid items.

Mark stations every 100 ft. and maintain the markings for the project duration. Remove the station markings at the completion of the project. This work is subsidiary to the various bid items.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

Tricycle Type	Truck Type - 4 Wheel
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945

Tricycle Type	Truck Type - 4 Wheel
Elgin Pelican	Mobile TE-3 Mobile TE-4 Murphy 4042

General: Traffic Control and Construction

Schedule construction operations such that preparing individual items of work follows in close sequence to constructing storm drains in order to provide as little inconvenience as practical to the businesses and residents along the project.

If relocating mailboxes, place them with the post firmly in the ground at nearby locations. Upon completing the project, the Engineer will locate the final mailbox placement. Perform this work in accordance with the requirements of the Item, "Mailbox Assemblies," except for measurement and payment. This work is subsidiary to the various bid items.

If fences cross construction easements shown on the plans and work is required beyond the fences, remove and replace the fences as directed. This work and the materials are subsidiary to the various bid items.

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

General: Utilities

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or causes damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3283 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662, or by e-mailing the Department's Houston District Traffic Signal Operations Office at: HOU-LocateRequest@txdot.gov, to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

Notify the Engineer at least 48 hours before constructing junction boxes at storm drain and utility intersections.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

Perform electrical work in conformance with the National Electrical Code (NEC) and Department's standard sheets.

Before beginning any underground work, notify the City of Houston's Chief Inspector, Public Works and Engineering, to establish the locations of any existing electrical systems for lighting facilities within the limits of this project.

Item 5: Control of Work

The cross-section data provided above is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the data with the appropriate plans, specifications, and estimates for the projects.

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 2

2014 Construction Specification Required Shop/Working Drawing Submittals - Consultant Generated Plans

GENERAL NOTES **Sheet**

County: Galveston **Control:** 0979-01-027

Highway: FM 519

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	D	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	D	WD
403	Temporary Special Shoring	Y	N	Y	D	WD
420	Formwork/Falsework	Y	N	Y	D	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	D	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	D	SD
425	Prestr Concr Sheet Piling	Y	Y	N	D	SD
425	Prestr Concr Beams	Y	Y	N	D	SD
425	Prestr Concr Bent	Y	Y	N	D	SD
426	Post Tension Details	Y	Y	N	D	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	D	SD
441	Bridge Protective Assembly	Y	Y	N	D	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	D	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	D	SD
441	Steel Bearings	Y	Y	N	D	SD
441	Steel Bent	Y	Y	N	D	SD
441	Steel Diaphragms	Y	Y	N	D	SD
441	Steel Finger Joint	Y	Y	N	D	SD
441	Steel Plate Girder	Y	Y	N	D	SD
441	Steel Tub-Girders	Y	Y	N	D	SD
441	Erection Plans, including Falsework	Y	N	Y	D	WD
449	Sign Structure Anchor Bolts	Y	Y	N	D	SD
450	Railing	Y	Y	N	D	SD
462	Concrete Box Culvert	Y	Y	N	D	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	D	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	D	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	D	SD
467	Pre-cast Safety End Treatments	Y	Y	N	D	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	D	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	D	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	D	SD
627	Treated Timber Poles	Y	Y	N	D	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	D	SD
647	Large Roadside Sign Supports	Y	Y	Y	D	SD

650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	D	SD
650	Sign Structures	Y	Y	N	D	SD
680	Installation of Highway Traffic Signals	Y	Y	N	D	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	D	SD
684	Traffic Signal Cables	Y	Y	N	D	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	D	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	D	SD
687	Pedestal Pole Assemblies	Y	Y	N	D	SD
688	Detectors	Y	Y	N	D	SD
784	Repairing Steel Bridge Members	Y	Y	Y	D	WD
SS	Prestr Concr Crown Span	Y	Y	N	D	SD
SS	Sound Barrier Walls	Y	Y	Y	D	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	D	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	D	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	D	SD
SS	VIVDS System for Signals	Y	Y	N	D	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

D – Consultant: Submit to Engineer of Record at foroud.moradi@atkinsrealis.com	
TMS – Traffic Management System	
Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Item 6: Control of Materials

To comply with the latest provisions of the Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the Contractor must submit an original of the TxDOT Construction Material Buy America Certification Form for items classified as construction materials. This form is not required for materials classified as a manufactured product.

GENERAL NOTES **Sheet**

County: Galveston **Control:** 0979-01-027

Highway: FM 519

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

Do not initiate activities in a Project Specific Location (PSL), associated with a U.S. Army Corps of Engineers (USACE) permit area, that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include those pertaining to, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The permit area includes the waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Assume responsibility for consultations with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of consultations or approvals from the USACE before initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self-determination has been made that the PSL is non-jurisdictional or if proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The Contractor is solely responsible for documenting any determinations that their activities do not affect a USACE permit area. Maintain copies of their determinations for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, before hauling any excavation from or hauling any embankment to a USACE permit area by either 1 or 2 below:

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, "Excavation" is used for permanent or temporary fill (under the Item, "Embankment") within a USACE permit area.
   b. Suitable embankment (under the Item, "Embankment") from within the USACE permit area is used as fill within a USACE evaluated area.

c. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of at a location approved within a USACE evaluated area.

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. The Item, "Embankment" used for temporary or permanent fill within a USACE permit area.
   b. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is 1.52 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental, work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

The nesting / breeding season for migratory birds is February 15 through September 30.

Conduct any tree removal outside of the migratory bird nesting season. If this is not possible due to scheduling, then exercise caution to remove only those trees with no active nests. Do not destroy nests on structures or in trees within the project limits during the nesting / breeding season.

Take measures to prevent the building of nests on any structures or trees within the project limits throughout the duration of the construction if work / removal will be performed during the nesting / breeding season. This can be accomplished by application of bird repellent gel, netting by hand every 3 to 4 days, or any other non-threatening method approved by the Houston District Environmental Section. Obtain this approval well in advance of the planned use. Contact the Houston District Environmental Section at 713-802-5244. The cost of this work is subsidiary to the various bid items.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a 5-day workweek in accordance with Section 8.3.1.1.

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays or convenience delays is 90 days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

Item 100: Preparing Right of Way

Clean existing ditches under fill sections of undesirable materials including grass, muck, and trash. Perform this work in accordance with the Construction section of the Item, "Preparing Right of Way." This work is subsidiary to this bid Item.

The Item, "Preparing Right of Way" will be measured for payment only in those designated areas shown on the plans. Preparing right of way necessary to perform construction that is outside designated areas is subsidiary to this bid Item.

Remove abandoned utilities that are in conflict with the new utilities, at no expense to the Department.

Reestablish and maintain right of way stakes after completing the right of way preparation activities and until the new utilities are in place.

Remove and assume ownership of the existing ground mounted signs within the limits of roadway construction unless otherwise noted or directed. This work is subsidiary to the Item, "Preparing Right of Way."

Item 104: Removing Concrete

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

Item 110: Excavation

If manipulating the excavated material requires moving the same material more than once to accomplish the desired results, the excavation is measured and paid for only once regardless of the manipulation required.

Transition the ditch grades and channel bottom widths at structure locations. Use only approved channel excavation in the embankment.

The total excavation quantity shown on the plans includes the quantity for excavating to 2 ft. behind the back of the proposed curb.

Item 132: Embankment

If salvaged base is used for the embankment material, break it into small pieces to achieve the required density and to facilitate placing in the embankment. Obtain approval of the material before placing in the embankment.

Furnish Type C material with a maximum Liquid Limit (LL) of 65, a minimum Plasticity Index (PI) of 5, and composed of suitable earth material such as loam, clay, or other materials that form a suitable embankment.

The embankment material used on the project which has a Liquid Limit exceeding 45 will be tested for Liquid Limits at the rate of one test per 20,000 cu. yd. or per total quantity less than 20,000 cu. yd., unless otherwise directed. Only use material that passes the above tests.

For unpaved areas, provide a finished grade with the top 4 in. capable of sustaining vegetation. Use fertile soil that is easily cultivated, free from objectionable material and highly resistant to erosion. Topsoil work is paid under the Item, "Topsoil."

Furnish material with a maximum Liquid Limit (LL) of 65.

Item 161: Compost
Item 162: Sodding for Erosion Control
Item 166: Fertilizer
Item 168: Vegetative Watering

Refer to the "Fertilizer, Seed, Sod, Straw, Compost, and Water" plan sheet for material specifications, application rates, and for watering requirements.

Item 204: Sprinkling

Perform subsidiary sprinkling as required under various other items in accordance with the Item, "Sprinkling."

Sprinkling for dust control is subsidiary to the various bid items.

Item 210: Rolling

Use a medium pneumatic roller meeting the requirements of Item 210 as directed. This work is subsidiary to the various bid items. On every asphalt shot, use a minimum of 3 pneumatic rollers or as directed. Use approved rolling patterns. Successive asphalt shots will not be allowed until acceptable rolling has been accomplished on the preceding asphalt shot.

Item 360: Concrete Pavement

Where the pavement curb is left off for a later tie, provide the dowels or the tie bars as indicated on the paving detail sheets. The dowel bars and tie bars are subsidiary to the various bid items.

Repair portions of the concrete pavement surfaces that are damaged while in a plastic state before that area receives permanent pavement markings and opens to traffic. Perform repairs that are structurally equivalent to and cosmetically uniform with the adjacent undamaged areas. Do not repair by grouting onto the surface.

Equip the batching plants to proportion by weight, aggregates and bulk cement, using approved proportioning devices and approved automatic scales.

For mono curb, the curb height transitions will be paid at the contract unit price of the larger curb height in the transition. The 2.5-in. laydown curbs for driveways will be paid at the unit price bid for the Item, "Conc Curb (Mono) (Ty II)."

High-early strength cement may be used for frontage road and city street intersection construction.

Do not use limestone dust of fracture as fine aggregate.

If the concrete design requires greater than 5.5 sacks of cementitious material per cubic yard, obtain written approval. If placing concrete pavement mixes from April 1 to October 31, inclusive, use Mix Design Option 1 as specified in Section 421.4.2.6.1.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

Complete the entire Fast Track Concrete construction process, from the time the Fast Track Work Area is closed to traffic, to the time the Fast Track Work Area is opened to traffic. The Fast Track operation includes, but is not limited to, traffic control, existing pavement and subgrade removal, preparation of subgrade, placement of steel, placement of Fast Track concrete pavement, cure time, striping, etc.
Unless otherwise directed in writing, provide Class HES concrete with a minimum average flexural strength of 425 psi or a minimum average compressive strength of 3,000 psi in 16 hours.

When directed in writing, open the pavement to traffic before the minimum requirements have been attained.

When needed, place and remove forms in accordance with Section 360.4.5, except do not remove forms until at least 6 hours after concrete has been placed. The time for the form removal may be extended with the direction of the Engineer if weather or other conditions make it advisable.

Items 360, 420, and 421: All Concrete Items

For the Department's concrete cylinder split samples, transport the test cylinders to the Houston District Laboratory located at 7600 Washington Avenue in Houston, or to the appropriate Area Laboratory, when applicable. Transporting the test cylinders is subsidiary to the various bid items.

Item 400: Excavation and Backfill for Structures

Plugging existing pipe culverts is subsidiary to the various bid items.

If Recycled Cement Treatment (Type D) is included in the plans, the following additional requirements apply:

1. Use only approved sand, crushed concrete, or salvaged base free from deleterious matter, as aggregate for cement-stabilized backfill.
2. Provide crushed concrete or salvaged base backfill material in accordance with the Item, "Cement Treatment (Plant-Mixed) (Type D)" (base or crushed concrete), except the recycled Type D material must not contain Reclaimed Asphalt Pavement (RAP).
3. For backfill material below the spring line of pipes, use cement-stabilized sand rather than Recycled Type D backfill material.
4. For the cement-stabilized sand backfill, use a minimum of 7 percent of hydraulic cement based on the dry weight of backfill material. The cement content for the crushed concrete and salvaged base is specified in the Item, "Cement Treatment (Plant-Mixed) (Type D)."

5. Place and compact the stabilized backfill material using a gradation that provides a dense mass without segregating and is impervious to passing of water.

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 423: Retaining Walls

Provide an exposed aggregate surface finish on retaining walls unless otherwise shown on the plans.

Provide and maintain positive drainage away from the earth wall system, including the leveling pad, for the contract duration.

Item 462: Concrete Box Culverts and Drains
Item 464: Reinforced Concrete Pipe

Concrete collars are subsidiary to the various bid items except for those specified on the plans for stage construction, which are paid for under the Item, "Concrete Substructures" as "Cl C Conc (Collar)."

Rubber gaskets are required for concrete pipe joints except for connections of safety end treatments, driveway culverts, and joints between the existing pipes and extensions.

Known locations of existing stub-outs are shown on the plans, but these stub-outs may be in a different position or condition. Delays, inconveniences, or additional work required will not be a basis for additional compensation.

Provide leave-outs or holes in the proposed storm drain structures and pipes for drainage during interim construction. This work is subsidiary to the various bid items.

The flowline elevations of side road structures are based on the proposed ditches. Field-verify these elevations and adjust them as necessary to meet the field conditions. Before placing these structures, prepare and submit for approval, the data (revised elevation, alignment, length, etc.) for the adjusted structures.

If groundwater is encountered while installing the storm drain system, install a suitable dewatering system to facilitate construction of the storm drains. The costs for materials and labor required to install and maintain this system are subsidiary to the Item, "Reinforced Concrete Pipe."

Item 465: Junction Boxes, Manholes, and Inlets

If required on the plans, build manholes and inlets to stage 1 construction, cover with temporary pavement, and complete in a later phase of construction. This temporary covering and pavement are subsidiary to the various bid items.

Construct manholes and inlets in graded areas, first to an elevation at least 4 in. above the top of the highest entering pipe and cover with a wooden cover. Complete the construction of such manholes and inlets to the finished elevation when completing the grading work for such manholes and inlets. Adjust the final elevation, if required, since this elevation is approximate.

Construct manholes and inlets in paved areas to an elevation so their temporary wooden covers are flush with the surface of the base material.

Do not leave excavations or trenches open overnight.

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

Coordinate and schedule the work with the appropriate Metro representative if requiring access to the High Occupancy Vehicle lanes.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	9:00 AM - 3:00 PM	Not Permitted	5:00 AM - 9:00 AM 3:00 PM - 7:00 PM
Tuesday	9:00 AM - 3:00 PM	Not Permitted	5:00 AM - 9:00 AM 3:00 PM - 7:00 PM
Wednesday	9:00 AM - 3:00 PM	Not Permitted	5:00 AM - 9:00 AM 3:00 PM - 7:00 PM
Thursday	9:00 AM - 3:00 PM	Not Permitted	5:00 AM - 9:00 AM 3:00 PM - 7:00 {PM
Friday	9:00 AM - 3:00 PM	Not Permitted	5:00 AM - 9:00 AM 3"00 PM - 7:00 PM
Saturday	As approved by the Engineer	Not Permitted	As approved by the Engineer
Sunday	As approved by the Engineer	Not Permitted	As approved by the Engineer

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events.

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

The use of hay bales is not permitted as Storm Water Pollution Prevention Plan (SWP3) measures.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

Schedule the seeding or sodding work as soon as possible. The project schedule provides for a vegetation management plan.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

Item 529: Concrete Curb, Gutter, and Combined Curb and Gutter
Item 530: Intersections, Driveways, and Turnouts
Item 531: Sidewalks

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

For driveways and turnouts, coarse aggregate Grade No. 3 through No. 8 conforming to the gradation requirements specified in the Item, "Hydraulic Cement Concrete" will be permitted.

For reinforcing steel in sidewalks and pedestrian ramps, use No. 4 bars at a maximum 18 in. spacing center-to-center in both directions.

Item 618: Conduit

When backfilling bore pits, ensure that the conduit is not damaged during installation or due to settling backfill material. Compact select backfill in 3 equal lifts to the bottom of the conduit; or if using sand, place it 2 in. above the conduit. Ensure backfill density is equal to that of the existing soil. Prevent material from entering the conduit.

GENERAL NOTES **Sheet**

County: Galveston **Control:** 0979-01-027

Highway: FM 519

Construct bore pits a minimum of 5 ft. from the edge of the base or pavement. Close the bore pit holes overnight.

Unless otherwise shown on the plans, install underground conduit a minimum of 24 in. deep. Install the conduit in accordance with the latest National Electrical Code (NEC) and applicable Department standard sheets. Place conduit under driveways or roadways a minimum of 24 in. below the pavement surface.

If using casing to place bored conduit, the casing is subsidiary to the conduit.

If placing the conduit under existing pavement to reach the service poles, bore the conduit in place and extend it a minimum distance of 5 ft. beyond the edge of shoulder or the back of curb.

Item 620: Electrical Conductors

Test each wire of each cable or conductor after installation. Incomplete circuits or damage to the wire or the cable are cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department. Also test the replacement cable after installation.

When pulling cables or conductors through the conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant recommended by the cable manufacturer.

Ensure that circuits test clear of faults, grounds, and open circuits.

Split bolt connectors are allowed only for splices on the grounding conductors.

For Roadside Flashing Beacon Assemblies (Item 685) and Pedestal Pole Assemblies (Item 687) within the project, provide single-pole breakaway disconnects as shown on the Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Item 685. For underground (hot) conductors, install a breakaway connector with a dummy fuse (slug). Provide dummy fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

For electrical licensing and electrical certification requirements for this project, see Item 7 of the Standard Specifications and any applicable special provisions to Item 7.

Item 624: Ground Boxes

The ground box locations are approximate. Alternate ground box locations may be used as directed, to avoid placing in sidewalks or driveways.

Ground metal ground box covers. Bond the ground box cover and ground conductors to a ground rod located in the ground box and to the system ground.

Ground the existing metal ground box covers as shown on the latest standard sheet ED (4)-14.

During construction and until project completion, provide personnel and equipment necessary to remove ground box lids for inspection. Provide this assistance within 24 hours of notification.

Construct concrete aprons in accordance with the latest standard sheet ED (4)-14. Make the depth of the concrete apron the same as the depth of the ground box.

Item 628: Electrical Services

Verify and coordinate the electrical service location with the engineering section of the appropriate utility district or company.

Identify the electrical service pole with an address number assigned by the Utility Service Provider. Provide 2-in. numerals visible from the highway. Provide numbers cut out aluminum figures nailed to wood poles or painted figures on steel poles or service cabinets.

Item 644: Small Roadside Sign Assemblies

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 656: Foundations for Traffic Control Devices

Using ready mix concrete for sign foundations is optional.

Item 677: Eliminating Existing Pavement Markings and Markers

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

Item 678: Pavement Surface Preparation for Markings

GENERAL NOTES **Sheet**

County: Galveston **Control:** 0979-01-027

Highway: FM 519

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On new concrete pavement or on existing concrete pavement when placing a new stripe on a new location, remove the curing compounds and contamination from the pavement surface by flail milling or as directed. In addition, air-blast the surface with compressed air just before placing the new stripe.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

Clearly mark or highlight on the shop drawings the items being furnished for this project.

Furnish labor, tools, equipment, and materials as shown on the plans and specifications for a complete and operating signal installation.

Allow the electrical work to be inspected by the City. Complying with the provisions and requirements of the City electrical ordinance is not required. Such inspection does not make the City a party to this contract.

Provide continuous conductors without splices from signal controller to signal heads. Route the conductors for luminaires to the service enclosure. Splices or attachments to the terminal block in the access compartment of the mast arm pole are not permitted except for the luminaire cable.

Abrasions to the conductor insulation caused while pulling cable for the traffic signal system are cause for immediate rejection. Remove and replace the entire damaged cable at no expense to the Department.

When pulling cables or conductors through conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant as recommended by the cable manufacturer.

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

Wrap signal heads with dark plastic or suitable material to conceal the signal faces from the time of installation until placing into operation. Do not use burlap.

Furnish signal heads from the same manufacturer.

Use Type B (high intensity prismatic) or Type D (diamond grade) retroreflective sheeting for signs mounted under or adjacent to the signal heads.

Furnish and attach compression type connectors. Install the connectors with a compression mechanical release hand-crimping tool to each individual conductor before making connections to the terminal strips.

Furnish solid conductors for traffic signal cable.

The Contractor may use ready mix concrete.

Apply membrane curing on concrete work in accordance with Section 420.4.10.3, "Membrane Curing."

The standard 4.5-in. galvanized pipe type poles, except the breakaway type, are subject only to the Engineer's inspection for their acceptance. Mill test reports or documentation will not be required.

Item 682: Vehicle and Pedestrian Signal Heads

Install two set screws on vehicle signal head mounting hardware fittings.

Item 686: Traffic Signal Pole Assemblies (Steel)

For a steel mast arm or steel strain pole assembly, hold the anchor bolts and conduits rigidly in place with a welded steel template.

Leave a minimum of one full diameter thread exposed on each anchor bolt securing a signal pole.

Set the anchor bolts for the steel strain poles so that two are in compression and two are in tension.

Use a Texas Cone Penetrometer reading of 10. The drilled shaft length is from the surface elevation to the bottom of the drilled shaft. Provide an additional length of the pole foundation from the surface level to the roadway level, if required for unusual locations. Provide the drilled shaft depth regardless of the length of the pole foundation. The pole foundation depth from the surface level to the roadway level is a maximum of 4 ft., or as approved.

Locate traffic signal pole assembly foundations a minimum of 4 ft. from the roadway curb or pavement edge, or as shown on the plans.

Place steel strain poles at a 10 ft. desirable minimum distance from the roadway curb or pavement edge.

After the traffic signal pole assembly is plumb and the nuts are tight, tack-weld each anchor bolt nut in two places to its washer. Tack-weld each washer to the base plate in two places. Do not

weld components to the bolt. Perform tack-welding in accordance with the Item, "Steel Structures." After tack-welding, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.5, "Repairs."

The Department may test the anchor bolts using ultrasonic methods for traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 688: Pedestrian Detectors and Vehicle Loop Detectors

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

Provide a black tube loop detector wire as specified in the "International Municipal Signal Association, Inc." (IMSA) Specifications.

At intersections where a minimum of 10 ft. spacing between adjacent accessible pedestrian signal units is not possible, provide each accessible pedestrian pushbutton with the following features: a pushbutton locator tone, a tactile arrow, a speech walk message for the walking person indication and a speech pushbutton information message.

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

Item 6306: Video Imaging Vehicle Detection System

Furnish the cable to operate the Video Imaging Vehicle Detection System (VIVDS) in accordance with the manufacturer's recommendations or purchase it from the same manufacturer as the VIVDS equipment.

Supply VIVDS equipment that can process up to a maximum of 6 camera inputs per intersection. Additional equipment to accommodate up to 6 camera inputs is subsidiary to the various bid items. No extra compensation will be allowed for additional equipment needed to make the VIVDS equipment fully operational under this Item.

Supply a laptop computer and a video monitor as described in this Special Specification Item.

Detector zone videotaping for this project will not be required.

VIVDS devices covered under the Department's Purchasing Special Specification T.O.-6291 (http://www.dot.state.tx.us/gsd/purchasing/supps.htm#divspecs) will also be allowed for use.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0979-01-027 **DISTRICT** Houston **COUNTY** Galveston
HIGHWAY FM 519

			CONTROL SECTION JOB		**0979-01-027**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00183322**		
			COUNTY		**Galveston**		
			HIGHWAY		**FM 519**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	82.960		82.960	
	100-6006	PREP ROW (TREE)(LESS THAN 24" DIA)	EA	8.000		8.000	
	100-6007	PREP ROW (TREE)(GREATER THAN 24" DIA)	EA	10.000		10.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	857.000		857.000	
	132-6001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	CY	501.000		501.000	
	161-6009	EROSION CONTROL COMPOST	CY	308.800		308.800	
	162-6002	BLOCK SODDING	SY	1,968.000		1,968.000	
	166-6001	FERTILIZER	AC	0.890		0.890	
	168-6001	VEGETATIVE WATERING	MG	48.200		48.200	
	400-6005	CEM STABIL BKFL	CY	74.000		74.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	16.000		16.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	256.000		256.000	
	403-6001	TEMPORARY SPL SHORING	SF	1,280.000		1,280.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	62.000		62.000	
	423-6008	RETAINING WALL (CAST - IN - PLACE)	SF	4,496.000		4,496.000	
	442-6007	STR STEEL (MISC NON - BRIDGE)	LB	4,129.600		4,129.600	
	450-6048	RAIL (HANDRAIL)(TY B)	LF	296.000		296.000	
	462-6002	CONC BOX CULV (3 FT X 3 FT)	LF	47.000		47.000	
	462-6004	CONC BOX CULV (4 FT X 3 FT)	LF	209.000		209.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	4.000		4.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	20.000		20.000	
	465-6005	JCTBOX(COMPL)(PJB)(3FTX3FT)	EA	1.000		1.000	
	465-6130	INLET (COMPL)(PSL)(FG)(3FTX5FT-3FTX5FT)	EA	3.000		3.000	
	471-6003	GRATE & FRAME	EA	74.000		74.000	
	479-6002	ADJUSTING INLETS	EA	1.000		1.000	
	496-6002	REMOV STR (INLET)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	5.000		5.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	11.000		11.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	11,740.000		11,740.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	11,740.000		11,740.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	998.000		998.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	1,290.000		1,290.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	2,288.000		2,288.000	
	529-6005	CONC CURB (MONO) (TY II)	LF	614.000		614.000	
	529-6011	CONC CURB (DOWEL)	LF	3,353.000		3,353.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)	SY	3,176.000		3,176.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0979-01-027 **DISTRICT** Houston **COUNTY** Galveston
HIGHWAY FM 519

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0979-01-027**			
		PROJECT ID		**A00183322**			
		COUNTY		**Galveston**			
		HIGHWAY		**FM 519**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	531-6002	CONC SIDEWALKS (5")	SY	7,245.000		7,245.000	
	531-6004	CURB RAMPS (TY 1)	EA	8.000		8.000	
	531-6005	CURB RAMPS (TY 2)	EA	2.000		2.000	
	531-6013	CURB RAMPS (TY 10)	EA	49.000		49.000	
	560-6001	MAILBOX INSTALL-S (TWG-POST) TY 1	EA	79.000		79.000	
	560-6002	MAILBOX INSTALL-D (TWG-POST) TY 1	EA	4.000		4.000	
	560-6003	MAILBOX INSTALL-M (TWG-POST) TY 1	EA	4.000		4.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	215.000		215.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	250.000		250.000	
	618-6058	CONDT (PVC) (SCH 80) (4")	LF	25.000		25.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	475.000		475.000	
	620-6011	ELEC CONDR (NO.4) BARE	LF	15.000		15.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	25.000		25.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	815.000		815.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	6.000		6.000	
	624-6028	REMOVE GROUND BOX	EA	6.000		6.000	
	628-6188	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	49.000		49.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA	2.000		2.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	1.000		1.000	
	644-6034	IN SM RD SN SUP&AM TYS80(1)SA(U-1EXT)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	48.000		48.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	785.000		785.000	
	666-6182	REFL PAV MRK TY II (W) 24" (SLD)	LF	785.000		785.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")	LF	250.000		250.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	120.000		120.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	785.000		785.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1.000		1.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	8.000		8.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2.000		2.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	8.000		8.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	4.000		4.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	8.000		8.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	2.000		2.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	8.000		8.000	
	682-6049	BACKPLATE W/REFL BRDR(4 SEC)	EA	2.000		2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0979-01-027 **DISTRICT** Houston **COUNTY** Galveston
HIGHWAY FM 519

			CONTROL SECTION JOB		**0979-01-027**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00183322**		
			COUNTY		**Galveston**		
			HIGHWAY		**FM 519**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	682-6060	BACKPLATE W/REFL BRDR(3 SEC)	EA	8.000		8.000	
	684-6007	TRF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF	1,275.000		1,275.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	1,275.000		1,275.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	2,075.000		2,075.000	
	686-6027	INS TRF SIG PL AM(S)1 ARM(24')LUM	EA	1.000		1.000	
	686-6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA	2.000		2.000	
	686-6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	1.000		1.000	
	687-6001	PED POLE ASSEMBLY	EA	6.000		6.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	8.000		8.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	1.000		1.000	
	1004-6001	TREE PROTECTION	EA	67.000		67.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	60.000		60.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000	
	6062-6034	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-I-U	EA	2.000		2.000	
	6306-6009	VIVDS PROSR SYS (INSTALL ONLY)	EA	1.000		1.000	
	6306-6010	VIVDS CAM ASSY (INSTALL ONLY)	EA	4.000		4.000	
	6306-6012	VIVDS CABLING (INSTALL ONLY)	LF	845.000		845.000	
	18	CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		ITS: CONTRACTOR FORCE ACCOUNT WORK PARTICIPATING	LS	1.000		1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

100% SUBMITTAL

CSC
DWG
CSC
DWG

ROADWAY SUMMARY

ITEM NO. DESC. CODE			100 6002	100 6006	100 6007	110 6001 *	132 6001	132 6005 *	423 6008	450 6048	529 6005	529 6011	531 6002	531 6004	531 6005	531 6013	560 6001	560 6002	560 6003
PLAN SHEET NO.	BEGINNING STATION	ENDING STATION	PREPARING ROW	PREP ROW (TREE)(LESS THAN 24" DIA)	PREP ROW (TREE)(GREATER THAN 24" DIA)	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(ORD COMP)(TY A)	EMBANKMENT (FINAL)(ORD COMP)(TY C)	RETAINING WALL (CAST - IN - PLACE)	RAIL (HANDRAIL) (TY B)	CONC CURB (MONO) (TY II)	CONC CURB (DOWEL)	CONC SIDEWALKS (5")	CURB RAMPS (TY 1)	CURB RAMPS (TY 2)	CURB RAMPS (TY 10)	MAILBOX INSTALL-S (TWG-POST) TY 1	MAILBOX INSTALL-D (TWG-POST) TY 1	MAILBOX INSTALL-M (TWG-POST) TY 1
			STA	EA	EA	CY	CY	CY	SF	LF	LF	LF	SY	EA	EA	EA	EA	EA	EA
SHEET 1 OF 8	BEGIN	620+00.00	7.93	1		81	51	51	258.8	28	106	226	863			9	6		
SHEET 2 OF 8	620+00.00	632+00.00	12.00		2	55	72	72	814.6	56		569	1120	8			8		
SHEET 3 OF 8	632+00.00	644+00.00	12.00	2	2	60	72	72	768.7	44	104	642	1024			5	5		2
SHEET 4 OF 8	644+00.00	656+00.00	12.00	4	4	105	72	72	804.7	48	121	569	1036			9	14		
SHEET 5 OF 8	656+00.00	668+00.00	12.00	1	2	63	72	72	725.6	68	95	464	911			8	22	1	1
SHEET 6 OF 8	668+00.00	680+00.00	12.00			82	72	72	472.9	12	52	411	949		2	6	9	3	1
SHEET 7 OF 8	680+00.00	692+00.00	12.00			93	72	72	650.5	40	136	472	1184			8	15		
SHEET 8 OF 8	692+00.00	END	3.03			27	18	18					158			4			
PROJECT TOTAL			82.96	8	10	566	501	501	4495.8	296	614	3353	7245	8	2	49	79	4	4

* FOR CONTRACTOR'S INFORMATION ONLY. SUBSIDIARY TO PERTINENT BID ITEMS.

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 7

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		8

DATE: 2/12/2024 9:35:53 PM
FILE: ...\FM 519 SUMMARY QTYS.dgn

100% SUBMITTAL

CK:
DW:
CK:
DN:

SUMMARY OF INTERSECTIONS AND DRIVEWAYS

PLAN SHEET NO.	DRWY #	STATION	LT/RT	DECRIPTION	SIDEWALK LOCATION	Grade % G1	Grade % G2	DIMENSIONS FOR DRIVEWAY & SIDE STREETS RADIUS (LT)	RADIUS (RT)	W	L	ITEM 104 6017 REMOVING CONC (DRIVEWAYS)	ITEM 530 6025 DRIVEWAYS (CONC) (FAST TRACK)
								FT	FT	FT	FT	SY	SY
1	1	608+94.21	LT	BRIAR LN	BACK OF CURB	1.5		25	25				
1	REMOVE	610+01.08	LT	PRIVATE	BACK OF CURB	1.5							
1	2	610+28.67	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.18	6	6	16	8		15
1	3 - PREV PROJ	611+17.19	RT	COMMERCIAL	BACK OF CURB								
1	REMOVE	611+68.20	RT	RESIDENTIAL	BACK OF CURB								
1	REMOVE	612+07.64	RT	RESIDENTIAL	BACK OF CURB								
1	4	612+41.53	RT	RESIDENTIAL	BACK OF CURB	1.5	-2.56	6	6	11	13		17
1	5	612+42.21	LT	IRENE ST	RAMP/CRSWLK			25	25				
1	6	612+87.45	RT	RESIDENTIAL	BACK OF CURB	1.5	-0.46	6	6	9	13		15
1	REMOVE	613+09.31	LT	RESIDENTIAL	BACK OF CURB			6	6				
1	6A	613+19.81	RT	RESIDENTIAL	BACK OF CURB	1.5	0.84	6	6	11	13		17
1	REMOVE	613+49.87	LT	PRIVATE	BACK OF CURB								
1	7	613+55.23	RT	PRIVATE	BACK OF CURB	1.5	0.79	6	6	19	13		30
1	8	613+92.99	RT	PRIVATE	BACK OF CURB	1.5	-1.75	6	FLARE	13	13		19
1	8A	614+29.16	RT	RESIDENTIAL	BACK OF CURB	1.5	2.47	6	6	10	13		8
1	9	614+57.51	LT	RESIDENTIAL	BACK OF CURB	1.5	3.22	6	6	11	8		11
1	10	614+96.89	LT	RESIDENTIAL	BACK OF CURB	1.5	-4.31	6	6	9	8		9
1	11	615+47.34	LT	COMMERCIAL	BACK OF CURB	1.5	0.86	10	FLARE	37	8	31	31
1	12	615+67.57	RT	PRIVATE	BACK OF CURB	1.5	3.2	6	6	10	13		17
1	13	615+97.15	LT	PESSARA ST	RAMP/CRSWLK			25	25				
1	14	616+50.96	RT	RESIDENTIAL	BACK OF CURB	1.5	-0.97	6	6	17	13		27
1	REMOVE	616+89.55	LT	PRIVATE									
1	15	618+68.16	LT	ERICKSON ST	RAMP/CRSWLK			25	25				
1	16	618+76.31	RT	FRANKLIN ST	RAMP/CRSWLK			25	25				
1	17	619+76.79	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	12	13	13	19
2	18	620+39.69	LT	RESIDENTIAL	BACK OF CURB	1.5	3.31	6	6	15	8		14
2	18A	620+59.72	RT	PRIVATE	BACK OF CURB	1.5	-1.54	6	6	10	13		16
2	19	623+69.15	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	8	23	12	22
2	20	624+26.87	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	17	10	20
2	20A	624+78.31	LT	PRIVATE	BACK OF CURB	1.5	4.19	FLARE	6	10	8		9
2	21	625+45.07	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	FLARE	6	8	9	1	9
2	22	626+01.75	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	9	9	10	12
2	23	626+51.98	RT	COMMERCIAL	BACK OF CURB	1.5	-0.16	10	10	37	13	64	59
2	24	626+62.00	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	11	9		13
2	25	627+34.19	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	16	11		21
2	26	627+93.03	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	9	8		10
2	27	629+13.87	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	14	12	9	22
2	28	629+72.53	RT	BAYOU RD	RMP/CRSWLK +			25	25				
2	29	629+75.32	LT	BAYOU RD	RMP/CRSWLK +			25	25				
2	30	630+40.23	RT	COMMERCIAL	BACK OF CURB	1.5	-2.41	10	10	28	14		44
2	31	630+94.07	RT	COMMERCIAL	BACK OF CURB	1.5	2.4	10	10	25	18		41
2	32	630+97.43	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	21	15		47
2	33	631+96.61	RT	COMMERCIAL	BACK OF CURB	1.5	0.46	10	10	18	14		32
3	34	632+08.60	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	17	9		18
3	35	632+77.01	RT	COMMERCIAL	BACK OF CURB	1.5	-4.77	10	10	11	14		18
3	35A	633+93.83	LT	COMMERCIAL	BACK OF CURB	1.5	-12	10	10	17	8		17
3	36	633+72.72	RT	COMMERCIAL	BACK OF CURB	1.5	-5.78	10	10	28	14		60
3	36A	634+08.02	LT	COMMERCIAL	BACK OF CURB	1.5	-5.05	10	10	6	7		8
3	37	634+73.67	RT	COMMERCIAL	BACK OF CURB	1.5	-2.08	10	10	42	14		65
3	37A	634+83.11	LT	PRIVATE	BACK OF CURB	1.5	9.59	6	6	13	7		12
3	38	635+30.18	RT	COMMERCIAL	BACK OF CURB	1.5	-4.55	10	10	35	14	52	57
3	39	635+81.94	LT	LOWE ST	RAMP/CRSWLK			25	25				
3	40	635+94.90	RT	PRIVATE	BACK OF CURB	1.5	-6.5	6	10	22	15	35	40
3	REMOVE	636+39.60	RT	PRIVATE	BACK OF CURB								
3	41	636+89.99	LT	COMMERCIAL	BACK OF CURB	1.5	8	10	10	36	10		45
3	42	636+90.82	RT	PRIVATE	BACK OF CURB	1.5	-4.46	10	10	17	14	30	30
3	43	637+79.63	RT	COMMERCIAL	BACK OF CURB	1.5	-1.76	10	10	25	14	38	39
3	REMOVE	637+87.42	LT	RESIDENTIAL	BACK OF CURB								
3	44	638+21.03	RT	COMMERCIAL	BACK OF CURB	1.5	-0.28	10	10	20	14		36
3	45	639+02.15	LT	GLENDALE ST	RAMP/CRSWLK			25	25				
3	46	639+08.30	RT	COMMERCIAL	BACK OF CURB	1.5	2.50	10	10	16	14		26
3	47	639+45.05	RT	RESIDENTIAL	BACK OF CURB	1.5	-4.92	6	6	10	13		17
3	REMOVE	639+70.60	LT	PRIVATE	BACK OF CURB								
3	REMOVE	639+78.03	RT	PRIVATE	BACK OF CURB								
3	REMOVE	640+49.36	RT	RESIDENTIAL	BACK OF CURB								
3	48	641+24.39	RT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	9	15	2	16
3	49	641+31.32	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	10	10	20	23		52
3	50	641+78.35	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	32	15	7	60
3	51	643+47.48	RT	COMMERCIAL	BACK OF CURB	1.5	-6.07	10	10	82	14		126
3	52	643+91.03	LT	LONE STAR	RAMP/CRSWLK			25	25				
4	53	644+22.87	RT	RESIDENTIAL	BACK OF CURB	1.5	-1.52	6	6	9	13		15
4	REMOVE	644+48.94	LT	COMMERCIAL	BACK OF CURB								
4	REMOVE	645+04.98	LT	COMMERCIAL	BACK OF CURB								
4	54	645+52.36	RT	DOWNEY DR	RAMP/CRSWLK			25	25				
4	54A	645+57.81	LT	RESIDENTIAL	BACK OF CURB	1.5	2.2	FLARE	6	13	7		12
4	55	645+93.93	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	FLARE	6	16	19		37
4	56	645+95.14	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	11		13
4	57	646+47.58	RT	RESIDENTIAL	BACK OF CURB	1.5	-4.94	6	6	16	13		26
4	REMOVE	647+13.85	LT	PRIVATE	BACK OF CURB								
4	58	647+57.88	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	11	17		22
4	REMOVE	648+05.09	LT	PRIVATE	BACK OF CURB								
4	59	648+55.07	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	9	13		15
4	60	648+56.76	LT	HOWELL AVE	RAMP/CRSWLK			25	25				
4	60A	649+12.96	LT	PRIVATE	BACK OF CURB	1.5	-6.5	6	6	10	14		18
4	61	649+26.27	RT	PRIVATE	BACK OF CURB	1.5	-4.82	6	6	9	13		16
4	62	649+82.87	LT	RESIDENTIAL	BACK OF CURB	1.5	2.51	6	6	11	7	9	11
4	63	650+35.91	RT	RESIDENTIAL	BACK OF CURB	1.5	-2.48	6	6	10	13	19	17
4	64	650+86.94	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	FLARE	14	8	17	14
4	65	651+24.82	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	13	15	25	23

SUMMARY OF INTERSECTIONS AND DRIVEWAYS CONT.

PLAN SHEET NO.	DRWY #	STATION	LT/RT	DECRIPTION	SIDEWALK LOCATION	Grade % G1	Grade % G2	DIMENSIONS FOR DRIVEWAY & SIDE STREETS RADIUS (LT)	RADIUS (RT)	W	L	ITEM 104 6017 REMOVING CONC (DRIVEWAYS)	ITEM 530 6025 DRIVEWAYS (CONC) (FAST TRACK)
								FT	FT	FT	FT	SY	SY
4	66	651+68.59	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	14		17
4	67	651+90.51	LT	RESIDENTIAL	BACK OF CURB	1.5	9.2	6	6	14	7	13	13
4	68	651+93.43	RT	RESIDENTIAL	BACK OF CURB	1.5	-5.81	6	6	10	13		16
4	REMOVE	652+24.56	LT	RESIDENTIAL	BACK OF CURB								
4	70	652+66.74	RT	PRIVATE	BACK OF CURB	1.5	-1.79	6	6	10	7		10
4	71	652+72.45	LT	COMMERCIAL	BACK OF CURB	1.5	7.84	10	10	12	13		20
4	72	653+15.35	LT	COMMERCIAL	BACK OF CURB	1.5	8.95	10	10	8	10		11
4	73	653+38.16	LT	COMMERCIAL	BACK OF CURB	1.5	8	10	10	10	10	12	13
4	74	653+67.46	RT	COMMERCIAL	BACK OF CURB	1.5	3.17	10	10	29	13		45
4	75	653+96.36	LT	COMMERCIAL	BACK OF CURB	1.5	-4.09	10	10	12	7		12
4	REMOVE	654+12.88	RT	COMMERCIAL	BACK OF CURB								
4	76	655+03.36	RT	PALM ST	RAMP/CRSWLK			25	25				
4	77	655+05.15	LT	PALM ST	RAMP/CRSWLK			25	25				
5	78	656+09.84	RT	RESIDENTIAL	BACK OF CURB	1.5	0.58	6	6	10	13	15	16
5	REMOVE	656+26.54	LT	PRIVATE	BACK OF CURB								
5	79	656+80.03	RT	RESIDENTIAL	BACK OF CURB	1.5	0.35	6	6	8	13		14
5	80	657+54.58	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	FLARE	6	14	13	25	22
5	81	657+54.61	RT	RESIDENTIAL	BACK OF CURB	1.5	-0.35	6	6	8	9		9
5	82	658+06.37	LT	RESIDENTIAL	BACK OF CURB	1.5	0.19	6	6	23	7		23
5	83	658+26.09	RT	RESIDENTIAL	BACK OF CURB	1.5	-3.4	6	6	9	13		15
5	84	659+13.26	LT	12TH AVE	RAMP/CRSWLK			25	25				
5	85	659+28.91	RT	12TH AVE	RAMP/CRSWLK			25	25				
5	86	659+68.72	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.04	FLARE	6	15	7	10	13
5	REMOVE	659+95.86	RT	RESIDENTIAL	BACK OF CURB								
5	87	660+13.32	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	12		15
5	88	660+66.94	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	15	13	8	23
5	89	660+74.65	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	8	23		23
5	REMOVE	661+05.54	RT	RESIDENTIAL	BACK OF CURB								
5	90	661+12.29	LT	RESIDENTIAL	BACK OF CURB	1.5	3.52	6	6	15	7		14
5	91	661+50.85	RT	RESIDENTIAL	BACK OF CURB	1.5	-1.18	6	6	8	13		13
5	92	661+68.38	LT	RESIDENTIAL	BACK OF CURB	1.5	9.5	6	6	14	15	24	24
5	93	662+15.00	LT	RESIDENTIAL	BACK OF CURB	1.5	-0.37	6	6	9	7		9
5	94	662+63.58	LT	RESIDENTIAL	BACK OF CURB	1.5	8.19	6	6	10	7	8	9
5	REMOVE	662+94.90	RT	PRIVATE	BACK OF CURB								
5	95	663+41.97	LT	11TH AVE	RAMP/CRSWLK			25	25				
5	96	663+84.04	RT	RESIDENTIAL	BACK OF CURB	1.5	-0.62	6	6	9	13		15
5	REMOVE	664+14.17	LT	PRIVATE	BACK OF CURB								
5	96A	664+35.92	LT	PRIVATE	BACK OF CURB	1.5	8.5	6	6	8	10		10
5	97	664+50.44	RT	RESIDENTIAL	BACK OF CURB	1.5	-0.8	6	6	9	13		15
5	98	664+86.06	LT	RESIDENTIAL	BACK OF CURB	1.5	1.38	6	6	10	7		10
5	99	665+14.67	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	17		21
5	100	666+01.25	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	FLARE	6	11	7		10
5	101 - EXIST	666+07.62	RT	COMMERCIAL	BACK OF CURB								
5	102	666+51.40	LT	COMMERCIAL	BACK OF CURB	1.5	5.73	10	10	20	8		19
5	103	667+02.64	LT	COMMERCIAL	BACK OF CURB	1.5	0.1	10	10	19	8		18
5	104	667+60.32	RT	10TH AVE	RAMP/CRSWLK			25	25				
5	105	667+60.53	LT	10TH AVE	RAMP/CRSWLK			25	25				
6	106	668+24.25	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	20	18		44
6	107	668+44.54	RT	COMMERCIAL	BACK OF CURB	1.5	0.31	10	10	66	13		101
6	108	668+69.20	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	20	21		50
6	108A-EXIST	669+39.37	RT	COMMERCIAL	BACK OF CURB								
6	109	669+87.54	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	FLARE	FLARE	20	11	25	25
6	110	670+85.56	LT	COMMERCIAL	BACK OF CURB	1.5	-4.28	10	10	34	7		32
6	111	671+72.36	RT	9TH AVE	RAMP/CRSWLK			25	25				
6	112	671+79.45	LT	9TH AVE	RAMP/CRSWLK			25	25				
6	113	673+13.03	RT	COMMERCIAL	BACK OF CURB	1.5	6.12	10	10	32	13	51	52
6	114	673+91.29	LT	COMMERCIAL	BACK OF CURB	1.5	6.5	10	10	40	15	68	70
6	115	674+11.68	RT	COMMERCIAL	BACK OF CURB	1.5	-3.82	10	10	28	13	42	46
6	116	675+20.86	RT	8TH AVE	RAMP/CRSWLK			25	25				
6	117	676+10.59	LT	8TH AVE	RAMP/CRSWLK			25	25				
6	118	677+19.25	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	32	13	43	49
6	REMOVE	678+59.89	RT	PRIVATE	BACK OF CURB								
6	119	679+17.45	LT	COMMERCIAL	BACK OF CURB	1.5	5.39	10	10	44	10	56	54
7	120	680+18.20	LT	7TH AVE	RAMP/CRSWLK			25	25				
7	121	680+19.58	RT	7TH AVE	RAMP/CRSWLK			25	25				
7	122	681+67.93	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	8	19		19
7	123	682+16.27	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.11	6	6	8	11	15	14
7	124	682+18.76	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	9	23		24
7	125	682+49.00	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	24		28
7	125A	682+49.00	LT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	18	11		28
7	REMOVE	683+01.09	LT	PRIVATE	BACK OF CURB								
7	126	683+37.53	LT	RESIDENTIAL		1.5	-6.5	6	6	33	15	58	62
7	REMOVE	683+52.29	RT	RESIDENTIAL	BACK OF CURB								
7	127	684+41.82	LT	6TH AVE	RAMP/CRSWLK			25	25				
7	128	684+41.98	RT	6TH AVE	RAMP/CRSWLK			25	25				
7	REMOVE	685+13.27	LT	PRIVATE									
7	129	685+40.36	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	15	24		41
7	130	685+86.65	RT	RESIDENTIAL	BACK OF CURB	1.5	-6.5	6	6	10	23		28
7	REMOVE	685+91.60	LT	PRIVATE									
7	REMOVE	687+10.71	LT	COMMERCIAL									
7	REMOVE	687+18.52	RT	PRIVATE									
7	REMOVE	687+68.06	RT	PRIVATE									
7	131	687+89.85	LT	COMMERCIAL	BACK OF CURB	1.5	-6.5	10	10	18	11		23
7	132	688+62.75	RT	5TH AVE	BACK OF CURB			25	25				
7	133	689+69.57	RT	COMMERCIAL	BACK OF CURB	1.5	-2.56	10	10	22	10		25
7	134	690+35.90	RT	COMMERCIAL	BACK OF CURB	1.5	-4.68	10	10	55	11		68
7	135	690+80.96	LT	FENCE	BACK OF CURB	1.5	-5.39	6	6	13	12		19
7	136	691+10.25	RT	COMMERCIAL	BACK OF CURB	1.5	-3.71	10	10	14	10		18
8	137	692+84.12	RT	4TH AVE	BACK OF CURB			25	25				
8	138	692+84.78	LT	4TH AVE	BACK OF CURB			25	25	28	22		89
8	139	693+64.81	LT	COMMERCIAL	BACK OF CURB	1.5	0.92	10	10	16	11		22
8	140	693+98.61	LT	COMMERCIAL	BACK OF CURB	1.5	-0.97	10	10	15	11		21
PROJECT TOTALS												857	3176

DRIVEWAYS SHOWN WITH "REMOVE" INDICATE THAT THE DRIVEWAY MAY BE ABANDONED AND WILL REQUIRE COORDINATION / DIRECTION FROM TxDOT FOR REMOVAL AND C/C REPLACMENT.

DATE: 2/12/2024 9:36:21 PM
FILE: ...\FM 519 QTY DRIVEWAY.dgn

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF INTERSECTION & DRIVEWAY QUANTITIES

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		9

100% SUBMITTAL

CK:
DW:
CK:
DW:

PORTABLE CHANGEABLE MESSAGE SIGN SUMMARY	
ITEM NO. DESC. CODE	6001 6001
LOCATION	PORTABLE CHANGEABLE MESSAGE SIGN
	DAY
2 SIGNS FOR 30 DAYS EA.	60
PROJECT TOTAL	60

DATE: 2/12/2024 9:36:50 PM
FILE: ...\FM 519 SUMMARY QTYS.dgn

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF PCMS QUANTITIES

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		10

100% SUBMITTAL

CS:
DW:
CS:
DW:

SUMMARY OF DRAINAGE QUANTITIES

ITEM NO. DESC. CODE			400 6002	400 6005	400 6009	402 6001	403 6001	462 6002	462 6004	464 6003	464 6005	465 6005	465 6130	471 6003	479 6002	496 6002	496 6007
SHEET NO.	BEGINNING STATION	ENDING STATION	STRUCT EXCAV (BOX) *	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	CONC BOX CULV (3 FT X 3 FT)	CONC BOX CULV (4 FT X 3 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	JCTBOX (COMPL) (PJB) (3FTX3FT)	INLET (PSL)(FG) (3FTX5FT-3FTX5FT)	GRATE & FRAME	ADJUSTING INLETS	REMOV STR (INLET)	REMOV STR (PIPE)
			CY	CY	CY	LF	SF	LF	LF	LF	LF	EA	EA	EA	EA	EA	LF
SHEET 1 OF 8	BEGIN	620+00												7			
SHEET 2 OF 8	620+00	632+00	93	22		89	445	47	42		2			14			
SHEET 3 OF 8	632+00	644+00												11			
SHEET 4 OF 8	644+00	656+00												12			
SHEET 5 OF 8	656+00	668+00	48	13		38	190		38		8		1	17			
SHEET 6 OF 8	668+00	680+00	54	11		36	180		36		4		1	3			
SHEET 7 OF 8	680+00	692+00	144	25	8	93	465		93		3	1		10	1		
SHEET 8 OF 8	692+00	END		3	8					4	3		1			2	5
PROJECT TOTAL			339	74	16	256	1280	47	209	4	20	1	3	74	1	2	5

* FOR CONTRACTOR'S INFORMATION ONLY

DATE: 9/11/2023 4:36:22 PM
FILE: ...\FM 519 SUMMARY QTYS.dgn

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF DRAINAGE QUANTITIES

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		11

100% SUBMITTAL

CSJ
DFW
CSJ
DFW

SUMMARY OF TRAFFIC SIGNAL

ITEM	DESC CODE	DESCRIPTION	UNIT	TOTAL
416	6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	62.00
618	6053	CONDT (PVC) (SCH 80) (3")	LF	215.00
618	6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	250.00
618	6058	CONDT (PVC) (SCH 80) (4")	LF	25.00
620	6007	ELEC CONDR (NO.8) BARE	LF	475.00
620	6011	ELEC CONDR (NO.4) BARE	LF	15.00
620	6012	ELEC CONDR (NO.4) INSULATED	LF	25.00
621	6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	815.00
624	6010	GROUND BOX TY D (162922)W/APRON	EA	6.00
624	6028	REMOVE GROUND BOX	EA	6.00
628	6188	ELC SRV TY D 120/240 070(NS)SS(E)SP(O)	EA	1.00
680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1.00
		* CONTROLLER, FULL ACTUATED W/ CABINET	EA	1.00
		* CONTROLLER FOUNDATION	EA	1.00
		* 18" CONTROLLER'S BASE EXTENSION	EA	1.00
		* LED, RDWY LUMINAIRE (0.25kW EQ)	EA	4.00
		* "FM 519" (54" x 18")	EA	2.00
		* "BAYOU RD" (72" x 18")	EA	2.00
		* ROD, 5/8" X 10' "COPPER-CLAD" GROUND (CONTROLLER ONLY)	EA	1.00
		* DETECTOR UNIT (DUAL CHANNEL)	EA	1.00
		* DETECTOR CARD RACK (8 SLOT & 4 SLOT)	EA	1.00
		* MAST ARM DAMPNERS	EA	1.00
		* GPS COMMUNICATION UNIT	EA	1.00
680	6004	REMOVING TRAFFIC SIGNALS	EA	1.00
682	6001	VEH SIG SEC (12 IN) LED (GRN)	EA	8.00
682	6002	VEH SIG SEC (12 IN) LED (GRN ARW)	EA	2.00
682	6003	VEH SIG SEC (12 IN) LED (YEL)	EA	8.00
682	6004	VEH SIG SEC (12 IN) LED (YEL ARW)	EA	4.00
682	6005	VEH SIG SEC (12 IN) LED (RED)	EA	8.00
682	6006	VEH SIG SEC (12 IN) LED (RED ARW)	EA	2.00
682	6018	PED SIG SEC LED (COUNTDOWN)	EA	8.00
682	6049	BACK PLATE W/ REFL BRDR (4 SEC)	EA	2.00
682	6060	BACK PLATE W/ REFL BRDR (3 SEC)	EA	8.00
684	6007	TRF SIG CBL (TY A) (12 AWG) (2 CONDR)	EA	1275.00
684	6009	TRF SIG CBL (TY A) (12 AWG) (4 CONDR)	EA	1275.00
684	6012	TRF SIG CBL (TY A) (12 AWG) (7 CONDR)	EA	2075.00
686	6027	INS TRF SIG PL AM(S)1 ARM(24')LUM	EA	1.00
686	6043	INS TRF SIG PL AM(S)1 ARM(40')LUM	EA	2.00
686	6047	INS TRF SIG PL AM(S)1 ARM(44')LUM	EA	1.00
687	6001	PED POLE ASSEMBLY	EA	6.00
688	6001	PED DETECT PUSH BUTTON (APS)	EA	8.00
		* SIGN, PEDESTRIAN PUSH BUTTON (SYMBOL TYPE)(9" X 15")(R10-3e)	EA	8.00
688	6003	PED DETECTOR CONTROLLER UNIT	EA	1.00
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.00
6062	6034	ITS RADIO (DUAL)(5 GHZ/5 GHZ)-I-U	EA	2.00
		* ITS POWER SUPPLY	EA	1.00
		* ITS RADIO ETHERNET COMM/CABLE	LF	300.00
6306	6009	VIVDS PROSR SYS (INSTALL ONLY)	EA	1.00
6306	6010	VIVDS CAM ASSY (INSTALL ONLY)	EA	4.00
6306	6012	VIVDS CABLING (INSTALL ONLY)	LF	845.00
**	**	VIVDS EQUIPMENT	EA	4.00

* MATERIAL SUBSIDIARY TO PERTINENT ITEMS

** ** TO BE PAID FOR WITH FORCE ACCOUNT.
CONTRACTOR SHALL CONTACT TXDOT AT (713-866-7101) TO COORDINATE THE ORDERING OF THE VIVDS EQUIPMENT

SUMMARY OF SIGNING QUANTITIES

ITEM NO. DESC. CODE	ITEM 644				
	644-6001	644-6027	644-6030	644-6034	644-6076
PLAN SHEET NO.	IN SM RD SN SUP&AM TY 10BWG(1) SA (P)	IN SM RD SN SUP&AM TYS80 (1)SA (P)	IN SM RD SN SUP&AM TYS80 (1) SA (T)	IN SM RD SN SUP&AM TYS80 (1) SA (U-1 EXT)	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA
SHEET 1 OF 8	10				7
SHEET 2 OF 8	6	2			8
SHEET 3 OF 8	5				4
SHEET 4 OF 8	6				5
SHEET 5 OF 8	6				6
SHEET 6 OF 8	5				5
SHEET 7 OF 8	9				9
SHEET 8 OF 8	2		1	1	4
TOTAL	49	2	1	1	48

SUMMARY OF PAVEMENT MARKING QUANTITIES

ITEM NO. DESC. CODE	666-6048	666-6182	677-6005	677-6007	678-6008
PLAN SHEET NO.	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY II (W) 24" (SLD)	ELIM EXT PAV MRK & MRKS (12")	ELIM EXT PAV MRK & MRKS (24")	PAV SURF PREP FOR MRK (24")
	LF	LF	LF	LF	LF
SHEET 1 OF 1	785	785	250	120	785
TOTAL	785	785	250	120	785

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)819-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519
AT BAYOU RD

SUMMARY OF TRAFFIC SIGNAL, SIGNING & PAVEMENT MARKING QUANTITIES

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		12

DATE: 2/12/2024 9:36:53 PM
FILE: ...\FM 519 SUMMARY QTYS.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:

EROSION CONTROL SUMMARY						
ITEM NO. DESC. CODE		506 6038	506 6039	506 6040	506 6041	506 6043
PLAN SHEET NO.	LOCATION	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
		LF	LF	LF	LF	LF
	CSJ: 0979-01-027					
1 OF 8	BEGIN TO 620+00	1495	1495	178	150	328
2 OF 8	620+00 TO 632+00	1575	1575	120	180	300
3 OF 8	632+00 TO 644+00	1610	1610	110	200	310
4 OF 8	644+00 TO 656+00	1700	1700	150	230	380
5 OF 8	656+00 TO 668+00	1675	1675	178	250	428
6 OF 8	668+00 TO 680+00	1565	1565	122	80	202
7 OF 8	680+00 TO 692+00	1695	1695	110	200	310
8 OF 8	692+00 TO END	425	425	30		30
PROJECT TOTALS		11740	11740	998	1290	2288

DATE: 2/12/2024 9:36:55 PM
FILE: ...\FM 519 SUMMARY QTYS.dgn

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF EROSION CONTROL QUANTITIES

SHEET 6 OF 7

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		13

100% SUBMITTAL

CK:
DW:
CK:
DW:

LANDSCAPING SUMMARY

ITEM NO. DESC. CODE		110 6003 *	161 6009	162 6002	166 6001	168 6001	442 6007	1004 6001
PLAN SHEET NO.	LOCATION	EXCAVATION (SPECIAL)	EROSION CONTROL COMPOST	BLOCK SODDING	FERTILIZER	VEGETATIVE WATERING	STR STEEL (MISC NON - BRIDGE)	TREE PROTECTION
		CY	CY	SY	AC	MG	LB	EA
	CSJ: 0979-01-027							
1 OF 8	BEGIN TO 620+00		1.4	243	0.057	0.7	1101.2	1
2 OF 8	620+00 TO 632+00	0.8	93.4	268	0.214	15.8	1927.1	22
3 OF 8	632+00 TO 644+00	0.5	17.0	282	0.094	3.6	734.2	5
4 OF 8	644+00 TO 656+00	1.4	107.3	287	0.189	13.0	367.1	18
5 OF 8	656+00 TO 668+00	1.6	47.4	282	0.174	11.5		16
6 OF 8	668+00 TO 680+00			255	0.053			
7 OF 8	680+00 TO 692+00	0.3	42.3	285	0.095	3.6		5
8 OF 8	692+00 TO END			66	0.014			
PROJECT TOTALS		4.6	308.8	1968	0.890	48.2	4129.6	67

* FOR CONTRACTOR'S INFORMATION ONLY.

DATE: 2/12/2024 9:37:21 PM
FILE: ...\FM 519 QTY LANDSCAPING.dgn

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF LANDSCAPING QUANTITIES

SHEET 7 OF 7

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		14

100% SUBMITTAL

DN: | CK: | DW: | CK:

SUMMARY OF SMALL SIGNS

644 - INS SM RD SN SUP & AM — TYPE OF MOUNT

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNSCTYPE A	6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6009 10BWG (1) SB (P) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6040 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6064 IN BRIDGE MNT CLEARANCE SGN
1	1	R2-1	SPEED LIMIT 35	30" X 36"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	W14-1	DEAD END	30" X 30"		X	1																		
	4	W12-2	LOW CLEARANCE 15'-11"	36" X 36"		X	1																		
	5	M3-2	EAST	24" X 12"		X	1																		
		M1-6F	FARM ROAD 519	24"X 24"		X																			
	6	R1-1	STOP	30" X 30"		X	1																		
	7	W14-1	DEAD END	30" X 30"		X	1																		
	8	R1-1	STOP	30" X 30"		X	1																		
	9	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	10	R1-1	STOP	30" X 30"		X	1																		
2	1	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	2	S1-1	SCHOOL PEDESTRIAN CROSSING	36" X 36"		X	1																		
	3	S1-1	SCHOOL PEDESTRIAN CROSSING	36" X 36"		X	1																		
	4	D9-11	LA MARQUE POLICE DEPT	36" X 24"		X									1										
		D9-11	CITY HALL	36" X 24"		X																			
		D9-11	LIBRARY	18" X 6"		X																			
		D5-5aTPL	ARROW	18" X 6"		X																			
	5	D9-11	LA MARQUE POLICE DEPT	36" X 24"		X									1										
		D9-11	CITY HALL	36" X 24"		X																			
		D9-11	LIBRARY	18" X 6"		X																			
		D5-5aTPL	ARROW	18" X 6"		X																			
	6	S1-1	SCHOOL PEDESTRIAN CROSSING	36" X 36"		X	1																		
	7	S1-1	SCHOOL PEDESTRIAN CROSSING	36" X 36"		X	1																		
	8	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
3	1	S1-1	SCHOOL PEDESTRIAN CROSSING	36" X 36"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	R1-1	STOP	30" X 30"		X	1																		
	4	W14-1	DEAD END	30" X 30"		X	1																		
	5	R1-1	STOP	30" X 30"		X	1																		
4	1	W14-1	DEAD END	30" X 30"		X	1																		
	2	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	3	R1-1	STOP	30" X 30"		X	1																		
	4	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	5	R1-1	STOP	30" X 30"		X	1																		
	6	R1-1	STOP	30" X 30"		X	1																		
5	1	R1-1	STOP	30" X 30"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	4	R1-1	STOP	30" X 30"		X	1																		
	5	R1-1	STOP	30" X 30"		X	1																		
	6	R1-1	STOP	30" X 30"		X	1																		
6	1	R1-1	STOP	30" X 30"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	R1-1	STOP	30" X 30"		X	1																		
	4	M1-6F	FARM ROAD 519	24"X 24"		X	1																		
	5	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
7	1	R1-1	STOP	30" X 30"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	R1-1	STOP	30" X 30"		X	1																		
	4	R1-1	STOP	30" X 30"		X	1																		
	5	R2-1	SPEED LIMIT 40	30" X 36"		X	1																		
	6	M1-6F	FARM ROAD 519	24"X 24"		X	1																		
		M3-4	WEST	24" X 12"		X																			
	7	R1-1	STOP	30" X 30"		X	1																		
	8	W10-1	GRADE CROSSING ADVANCE WARNING	36" X 36"		X	1																		
	9	M1-6T	3 TEXAS	24"X 24"		X	1																		
		M2-1	JUNCTION	21" X 15"		X																			
8	1	R1-1	STOP	30" X 30"		X	1																		
	2	R1-1	STOP	30" X 30"		X	1																		
	3	D1-2	<LEFT> DICKINSON	90" X 30"		X											1								
			GALVESTON <RIGHT>			X																			
	4	M3-2	EAST	24" X 12"		X														1					
		M1-6F	FARM ROAD 519	24"X 24"		X																			
		M6-3	AUXILIARY SIGN <STRAIGHT>	21" X 15"		X																			
		M3-1	NORTH	24" X 12"		X																			
		M1-6T	3 TEXAS	24"X 24"		X																			
		M6-1	AUXILIARY SIGN <LEFT>	21" X 15"		X																			
		M3-3	SOUTH	24" X 12"		X																			
		M1-6T	3 TEXAS	24"X 24"		X																			
		M6-1	AUXILIARY SIGN <RIGHT>	21" X 15"		X																			

GENERAL NOTES:

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKS(TY A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

3

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG; NO. F-474

Texas Department of Transportation

FM 519

SUMMARY OF SMALL SIGNS (SOSS)

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		15

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.

11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

DATE:
FILE:

SHEET 1 OF 12

Texas Department of Transportation

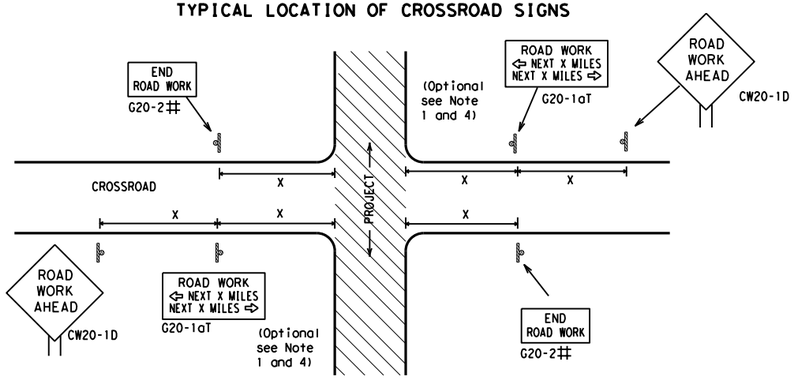
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	GALVESTON		16
5-10 5-21				

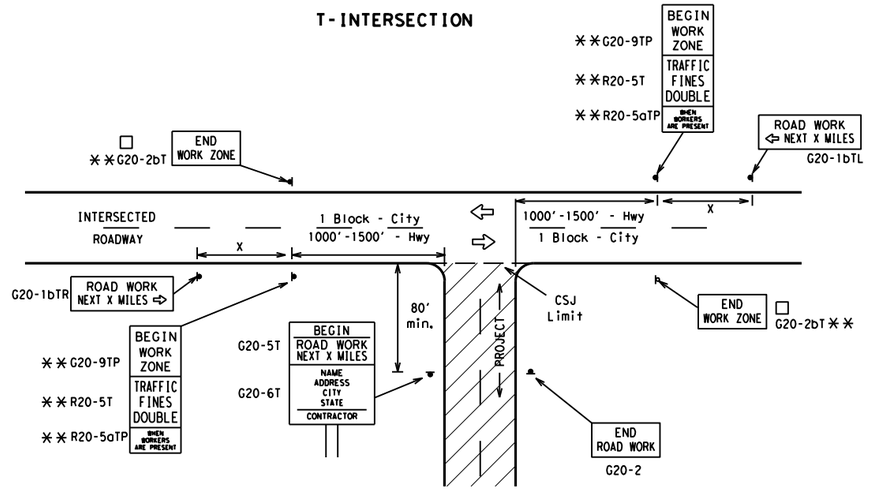
TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign △ Spacing "X"
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
*	*[3]

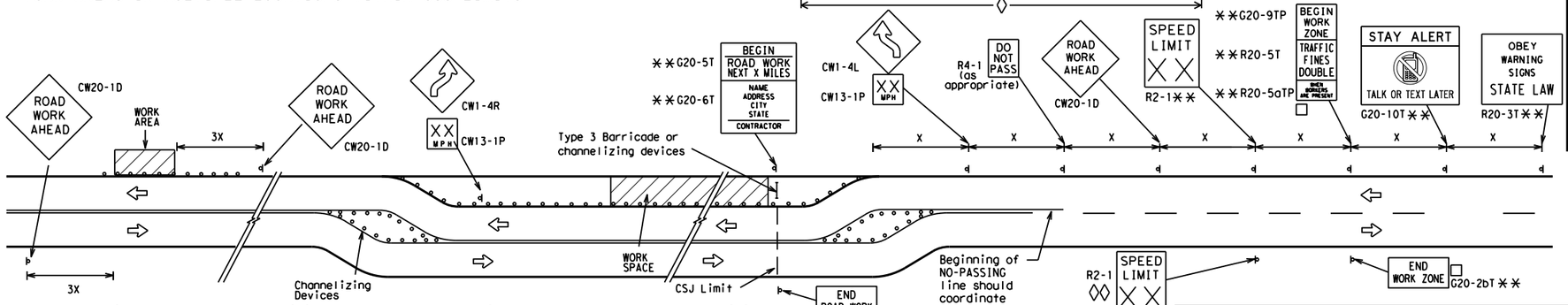
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

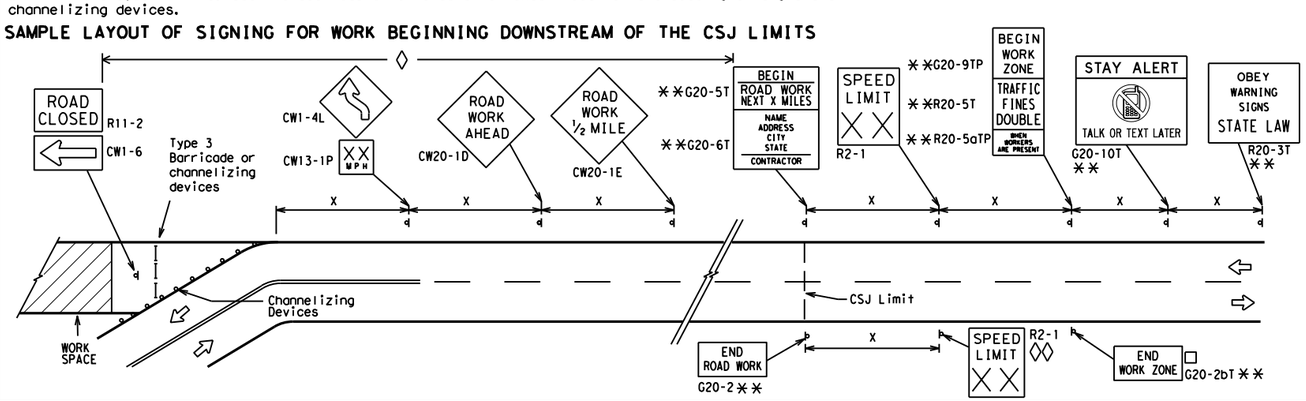
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

□ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

◊ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

◊◊ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND	
⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		17

DATE:
FILE:

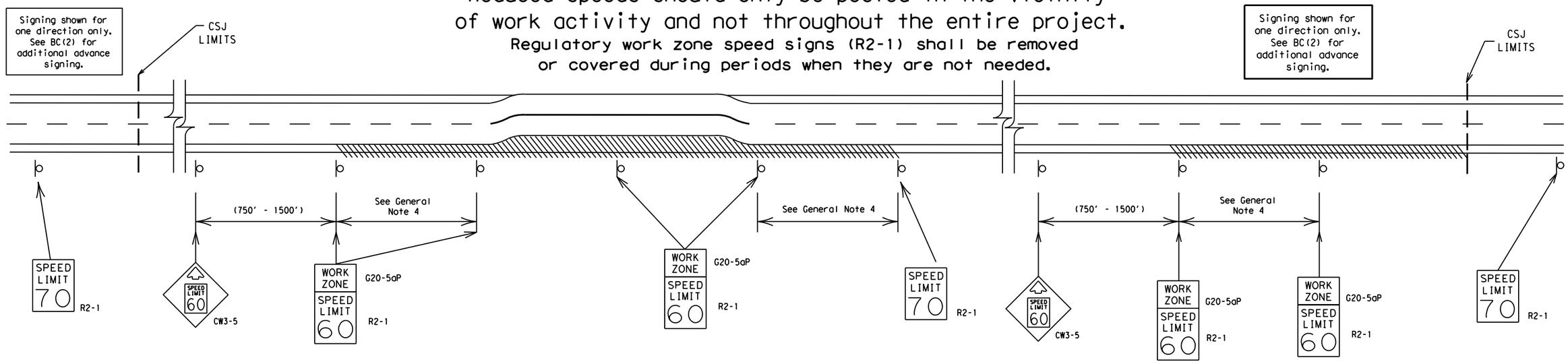
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation | Traffic Safety Division Standard

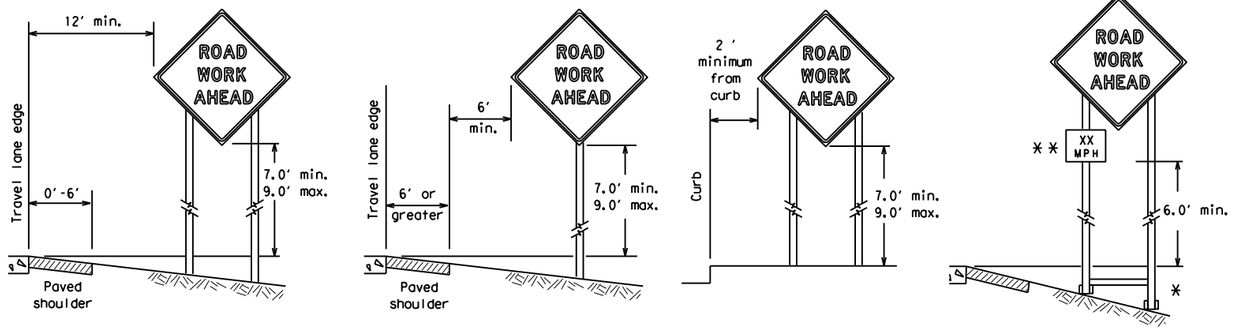
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		18

DATE:
FILE:

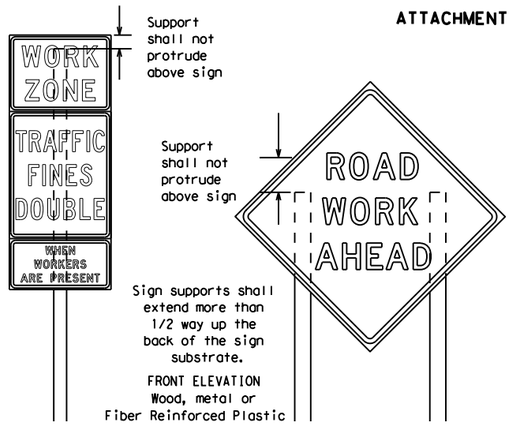
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



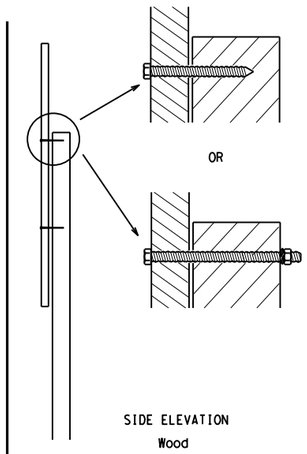
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

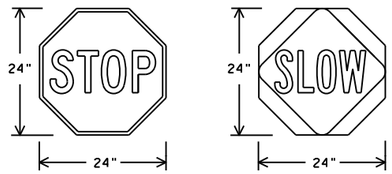
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation

Traffic Safety Division Standard

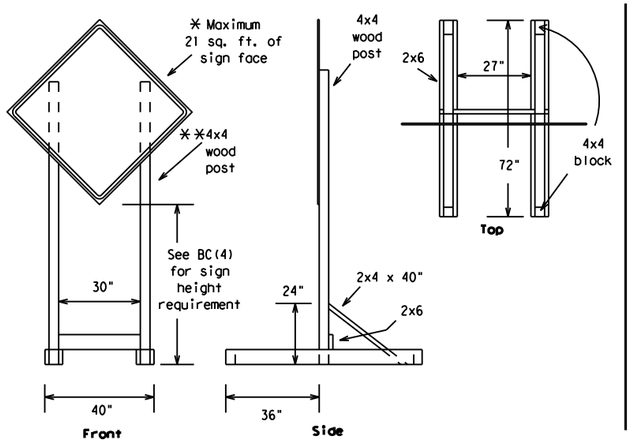
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

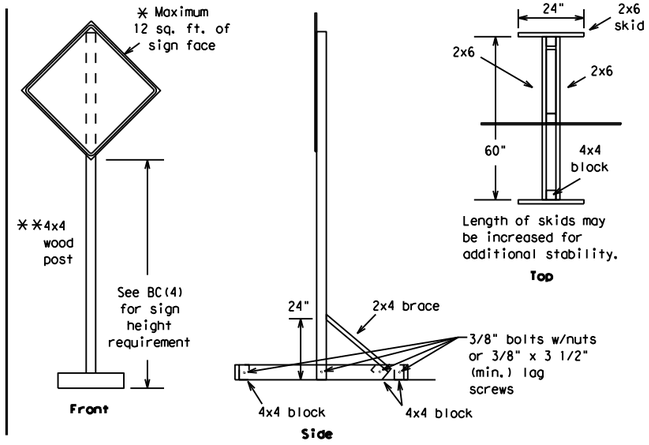
BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		19

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

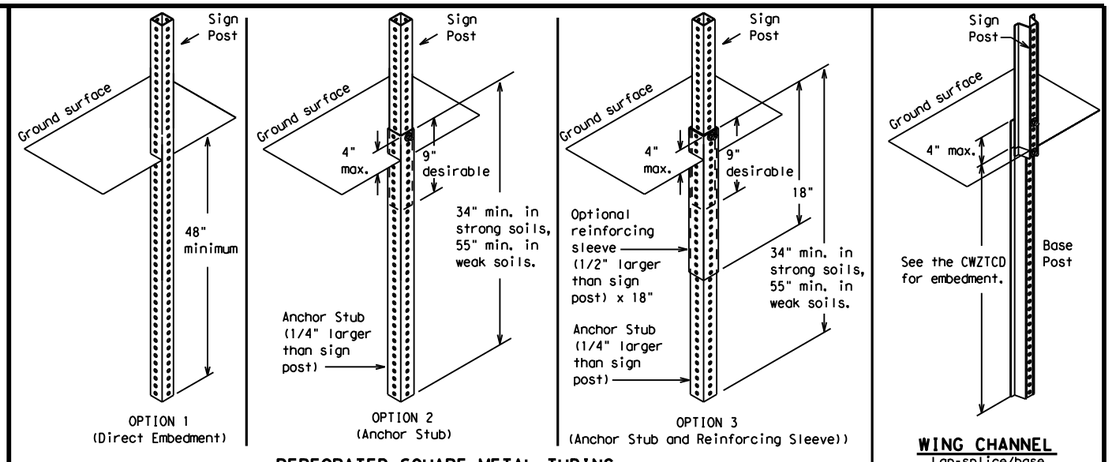
DATE:
FILE:





SKID MOUNTED WOOD SIGN SUPPORTS

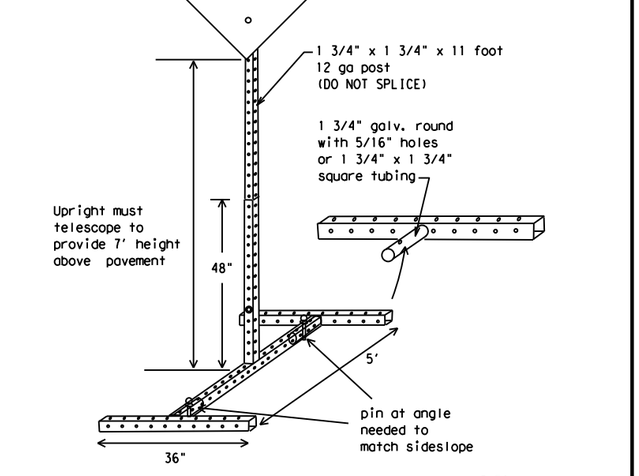
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

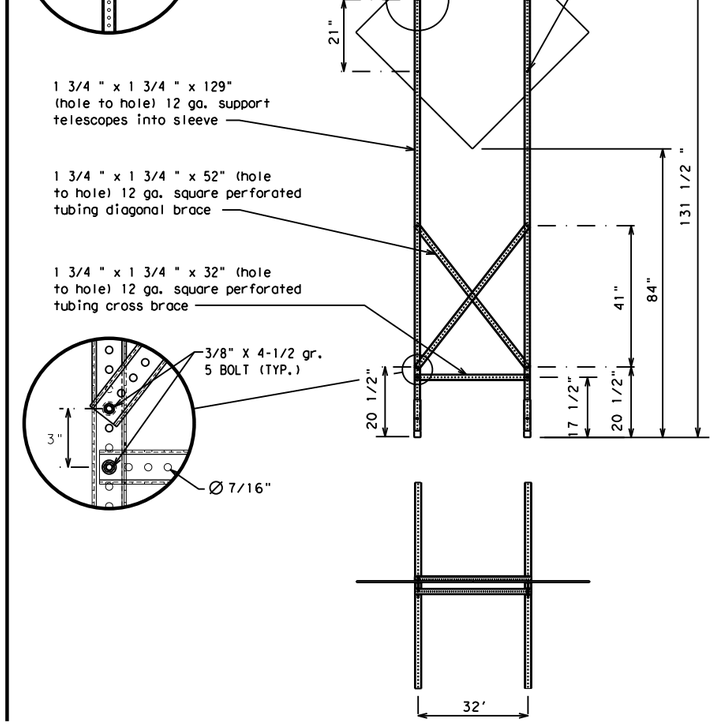


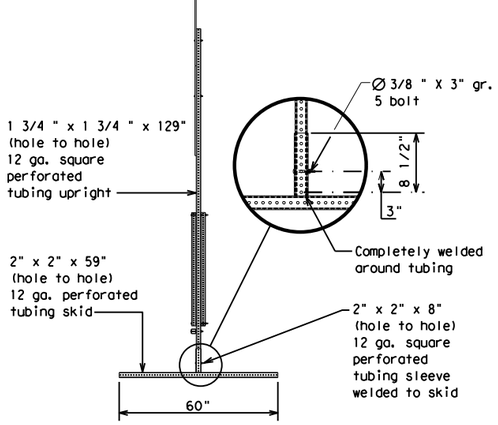
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

* See BC(4) for definition of "Work Duration."

** Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		20

DATE:
FILE:

WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation ≠ IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

- FREEWAY CLOSED X MILE
- FRONTAGE ROAD CLOSED
- ROAD CLOSED AT SH XXX
- SHOULDER CLOSED XXX FT
- ROAD CLSD AT FM XXXX
- RIGHT LN CLOSED XXX FT
- RIGHT X LANES CLOSED
- RIGHT X LANES OPEN
- CENTER LANE CLOSED
- DAYTIME LANE CLOSURES
- NIGHT LANE CLOSURES
- I-XX SOUTH EXIT CLOSED
- VARIOUS LANES CLOSED
- EXIT XXX CLOSED X MILE
- EXIT CLOSED
- RIGHT LN TO BE CLOSED
- MALL DRIVEWAY CLOSED
- X LANES CLOSED TUE - FRI
- XXXXXXXX BLVD CLOSED

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

- AT FM XXXX
- BEFORE RAILROAD CROSSING
- NEXT X MILES
- PAST US XXX EXIT
- XXXXXXX TO XXXXXXX
- US XXX TO FM XXXX

Warning List

- SPEED LIMIT XX MPH
- MAXIMUM SPEED XX MPH
- MINIMUM SPEED XX MPH
- ADVISORY SPEED XX MPH
- RIGHT LANE EXIT
- USE CAUTION
- DRIVE SAFELY
- DRIVE WITH CARE

** Advance Notice List

- TUE-FRI XX AM- X PM
- APR XX-XX X PM-X AM
- BEGINS MONDAY
- BEGINS MAY XX
- MAY X-X XX PM - XX AM
- NEXT FRI-SUN
- XX AM TO XX PM
- NEXT TUE AUG XX
- TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Safety Division Standard

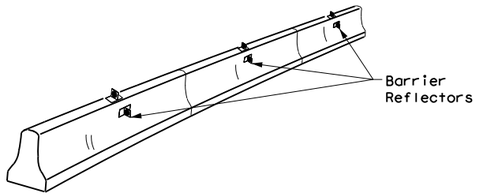
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		21

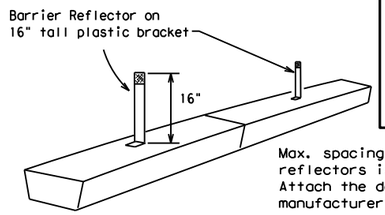
DATE:
FILE:

1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



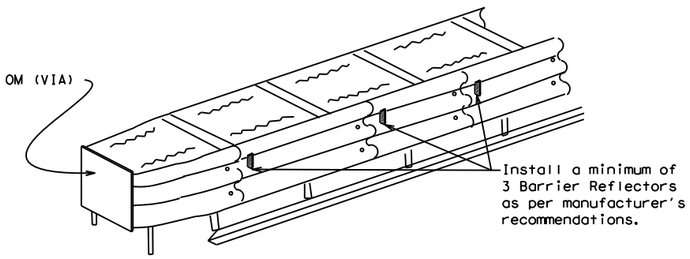
CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

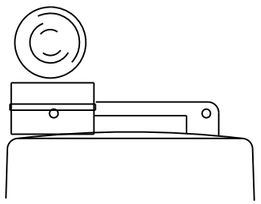
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

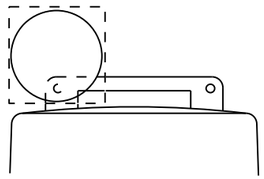
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

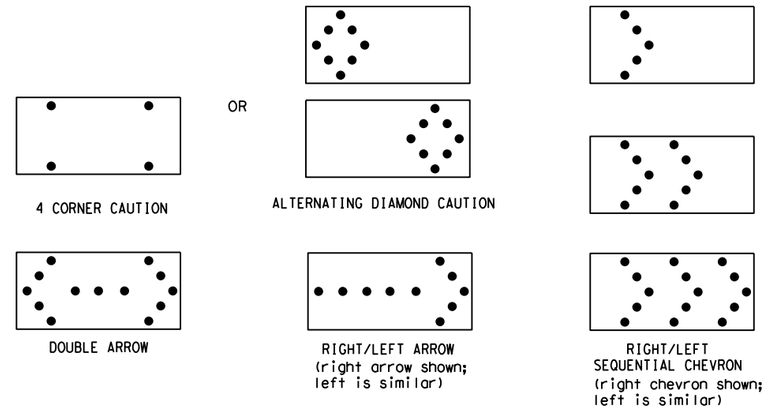
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		22

TOT

DATE:
FILE:

GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

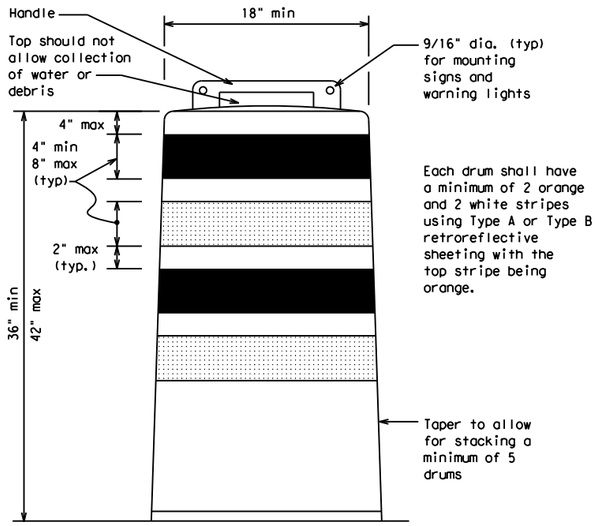
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

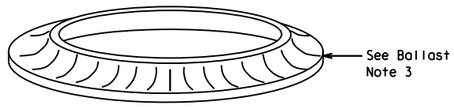
RETROREFLECTIVE SHEETING

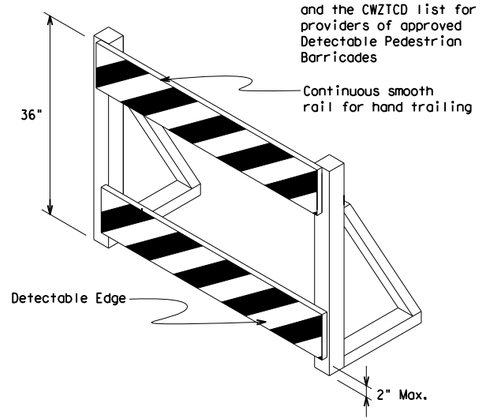
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

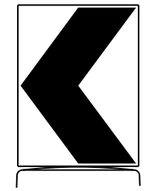




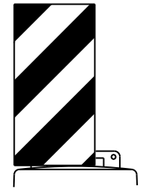


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

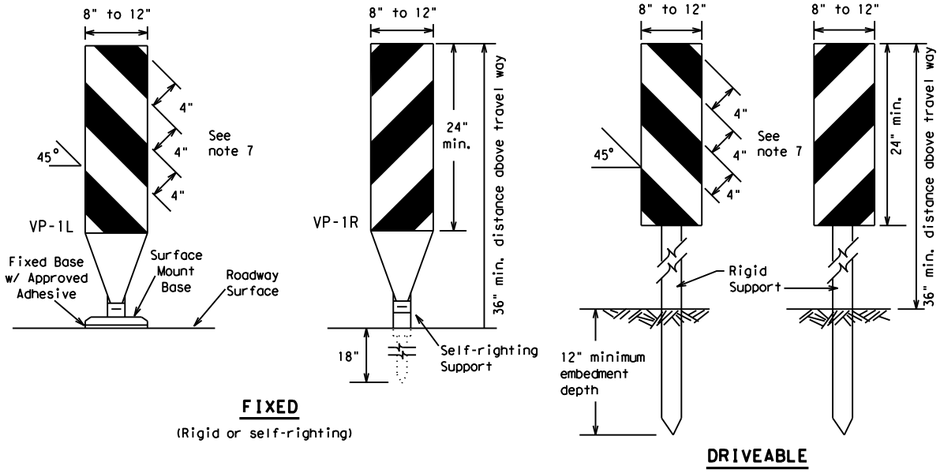
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	HOU	GALVESTON		23
7-13				

102

DATE:
FILE:



FIXED
(Rigid or self-righting)

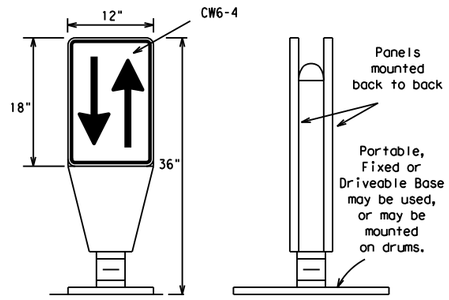
DRIVEABLE

(Rigid or self-righting)

PORTABLE

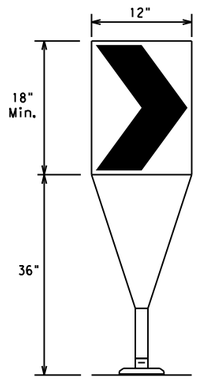
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



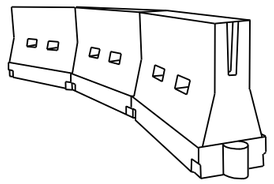
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

** Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

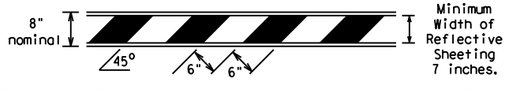
BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		24

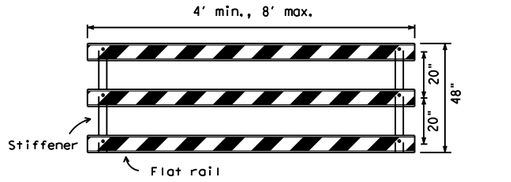
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



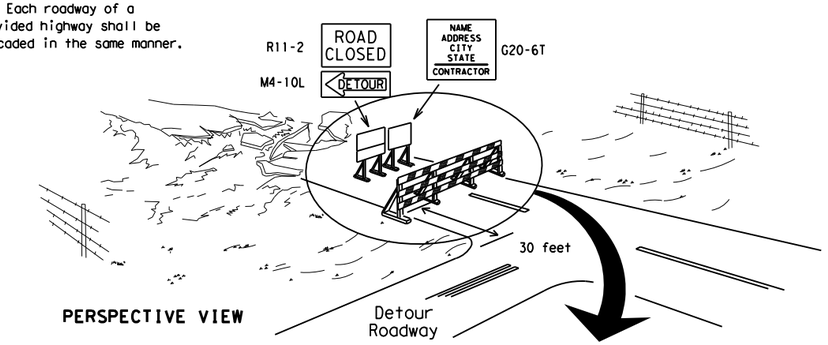
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

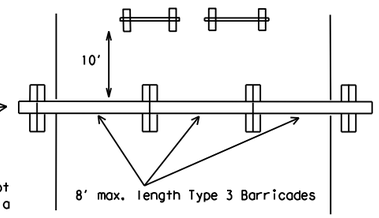
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

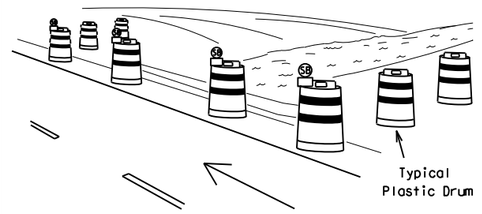
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

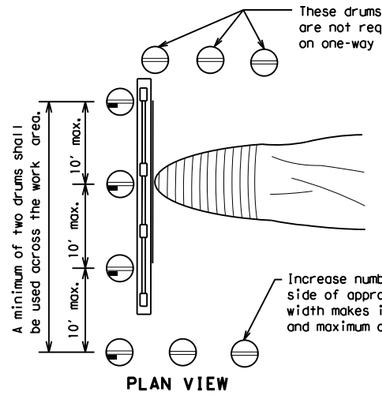
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

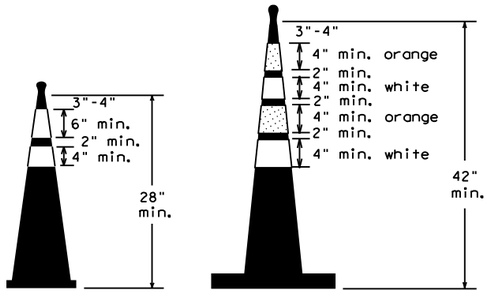
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



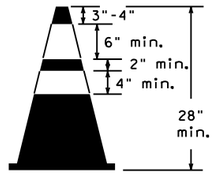
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

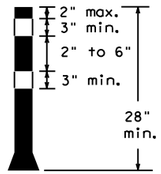
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

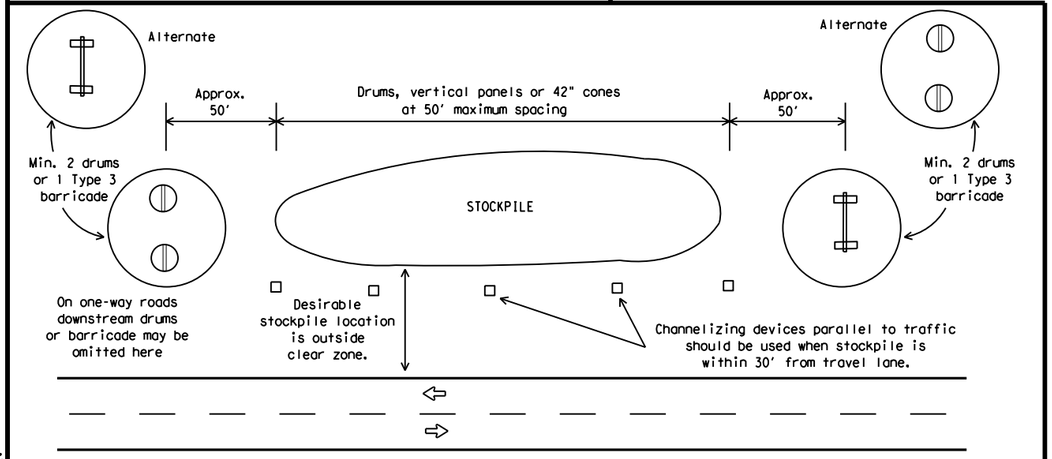


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

DATE:
FILE:

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	GALVESTON		25

104

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

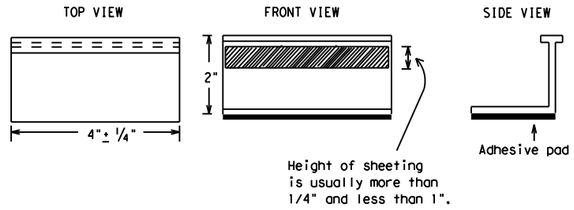
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

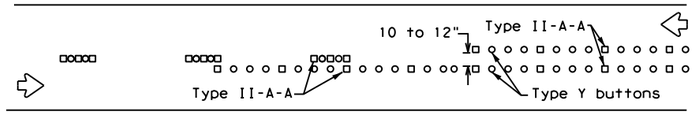
BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	GALVESTON		26
11-02 8-14				

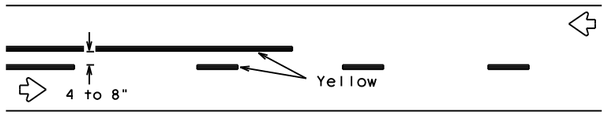
DATE:
FILE:

PAVEMENT MARKING PATTERNS

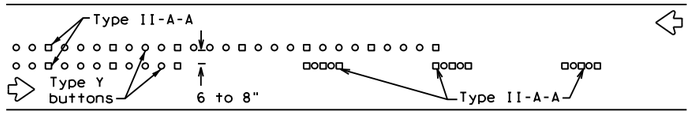
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



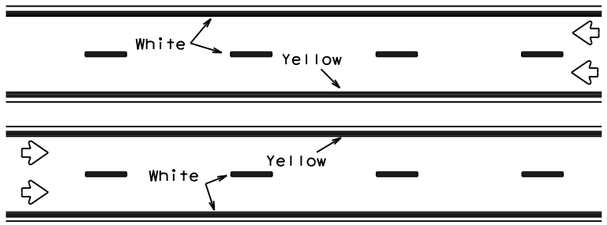
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



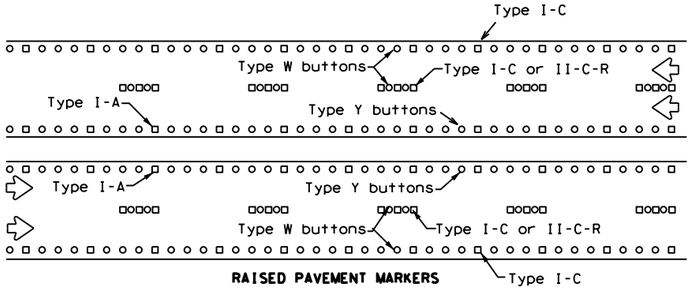
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



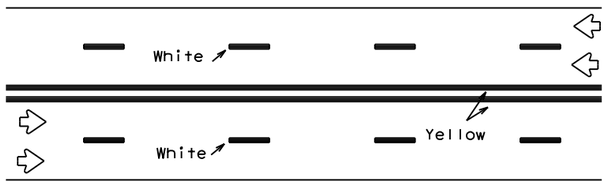
REFLECTORIZED PAVEMENT MARKINGS



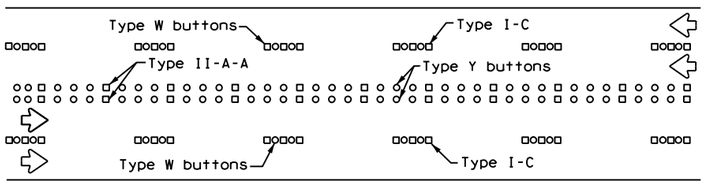
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



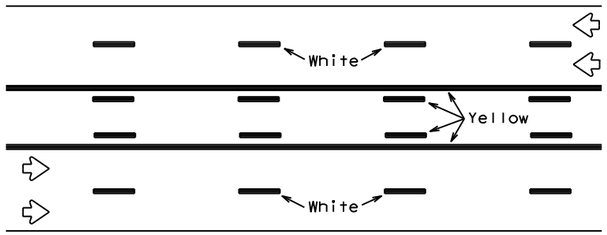
REFLECTORIZED PAVEMENT MARKINGS



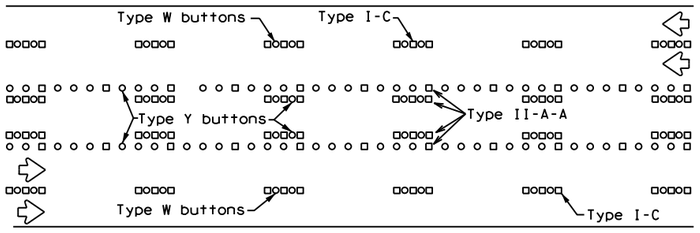
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

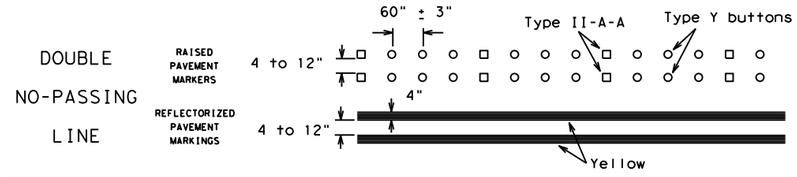
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

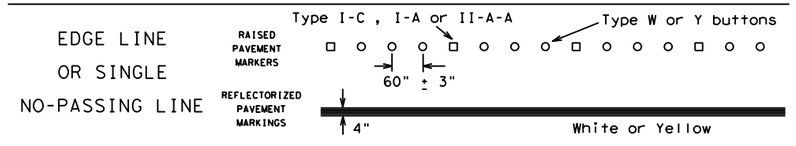
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

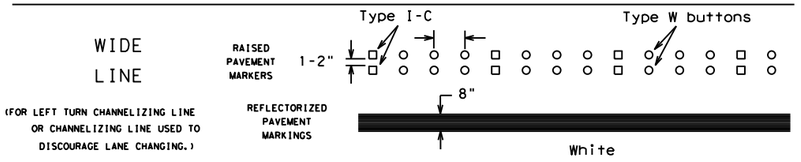


EDGE LINE OR SINGLE NO-PASSING LINE



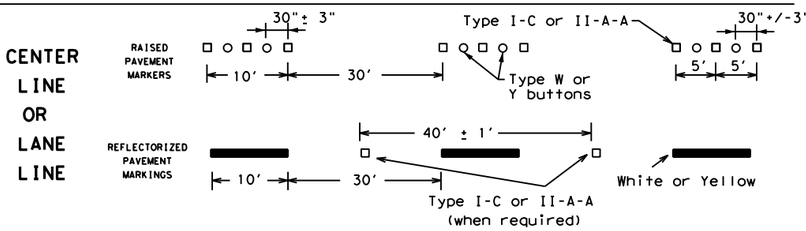
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

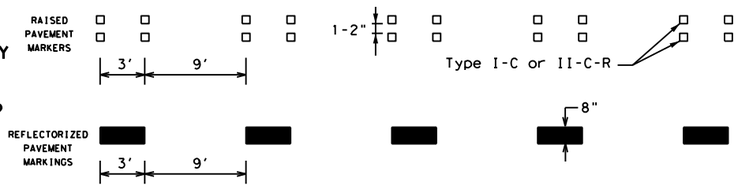


BROKEN LINES

CENTER LINE OR LANE LINE

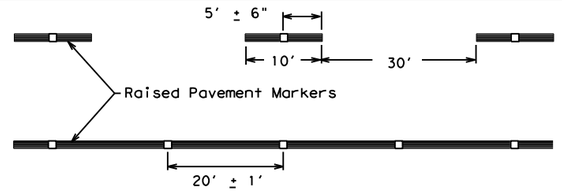


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Safety Division Standard

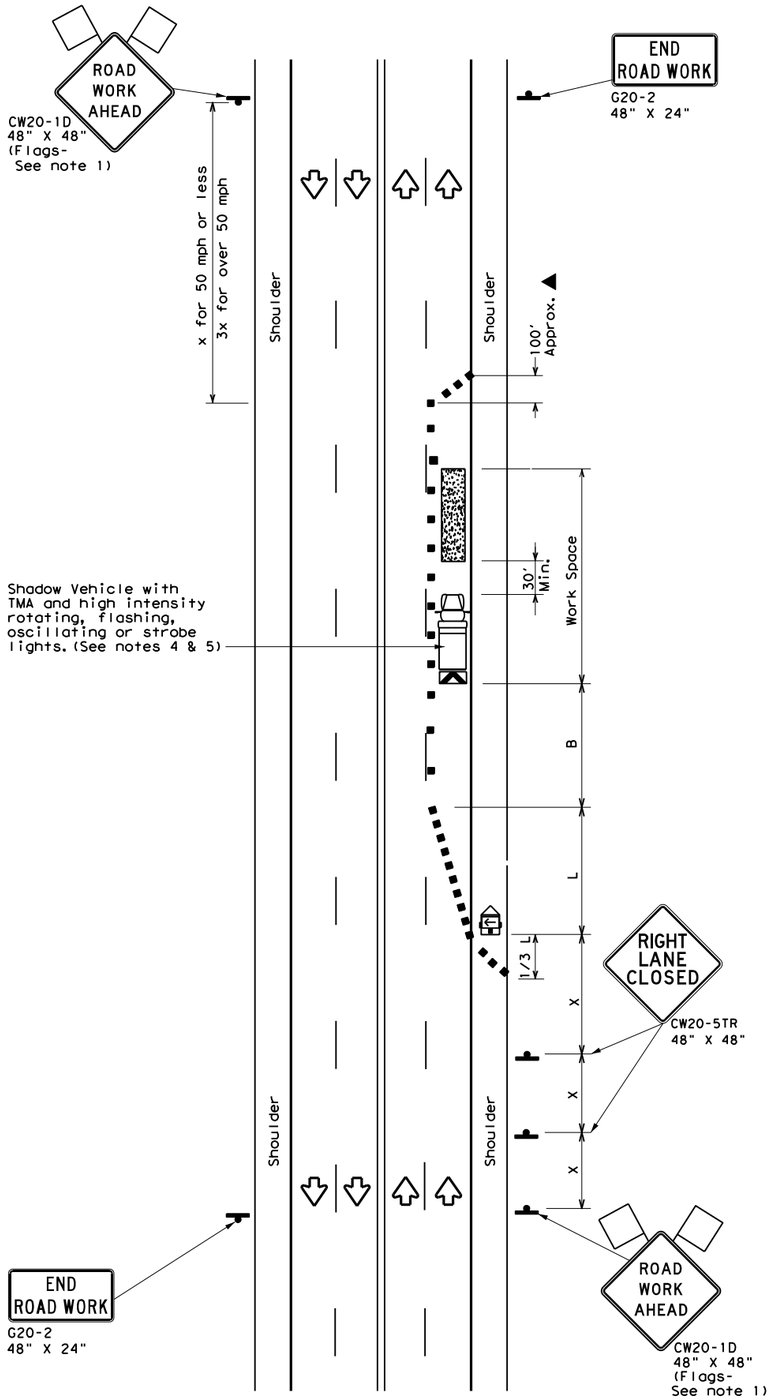
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		27

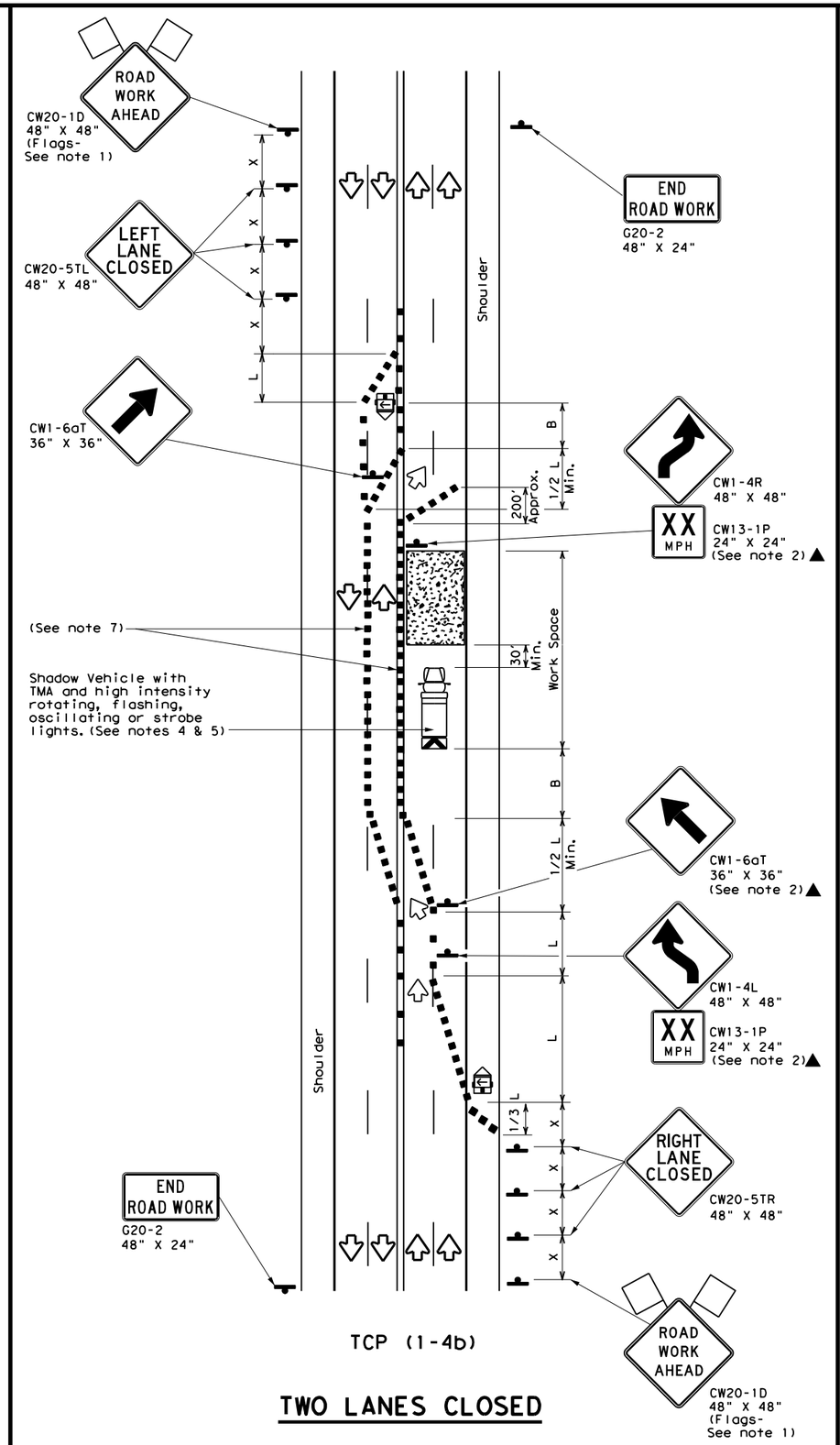
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only
** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

6. If this TCP is used for a left lane closure , CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

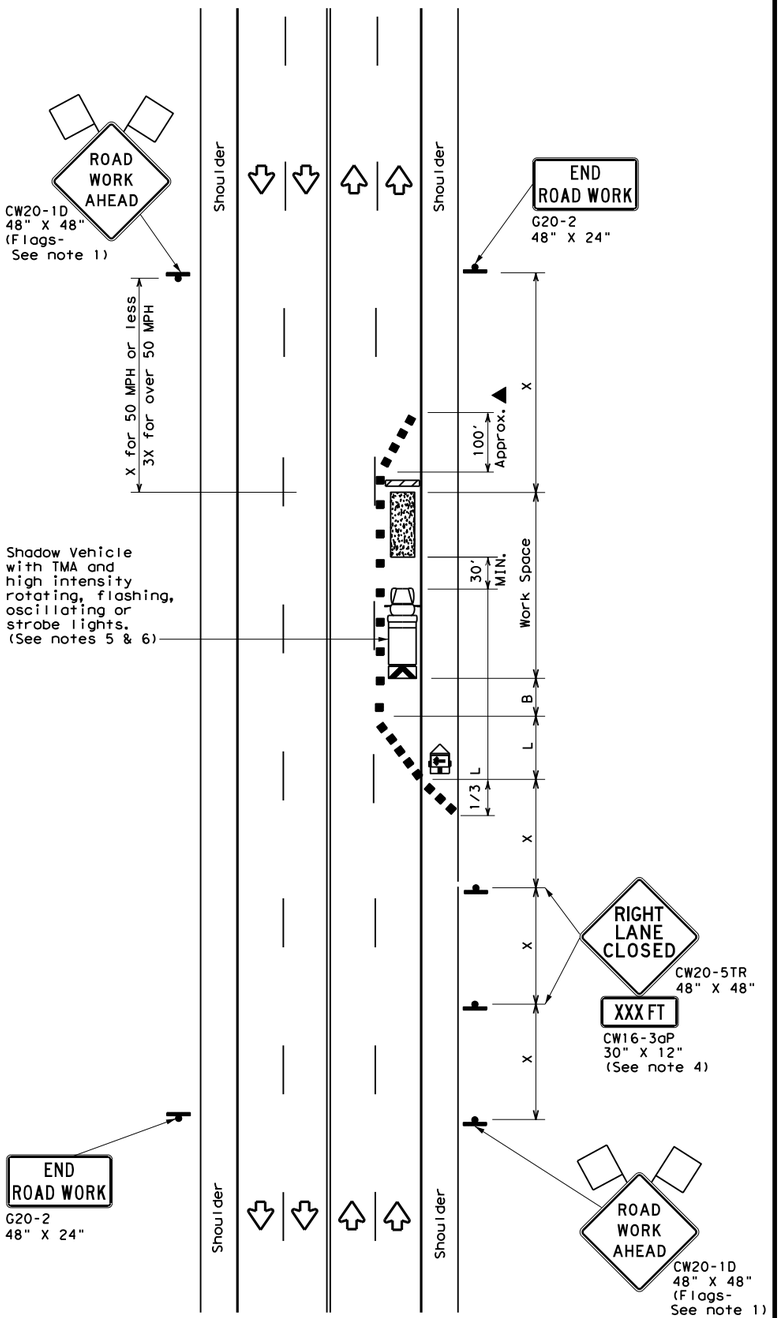
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

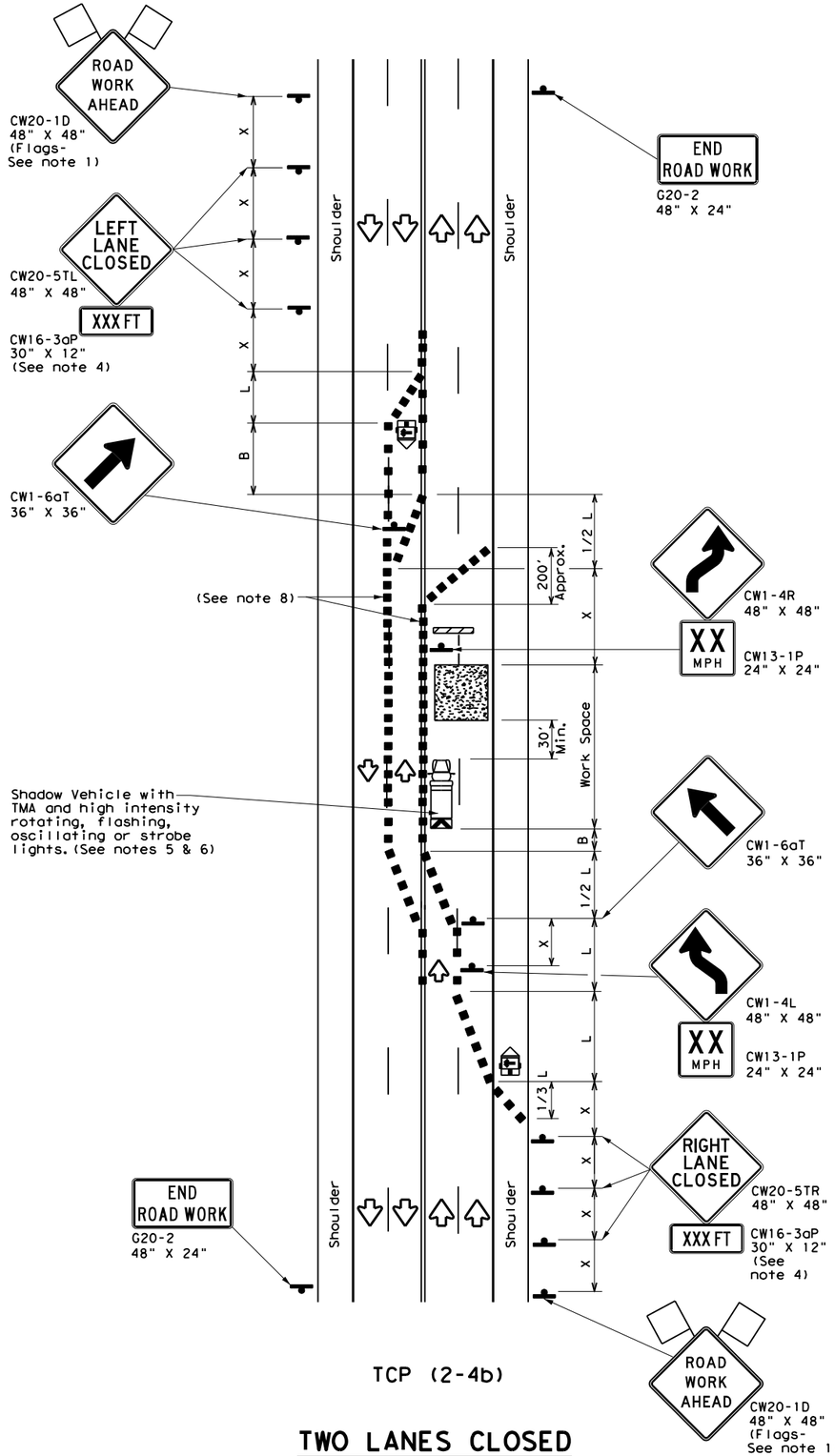
FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	GALVESTON		28
1-97 2-18				

DATE:
FILE:



TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓	✓	

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED"signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

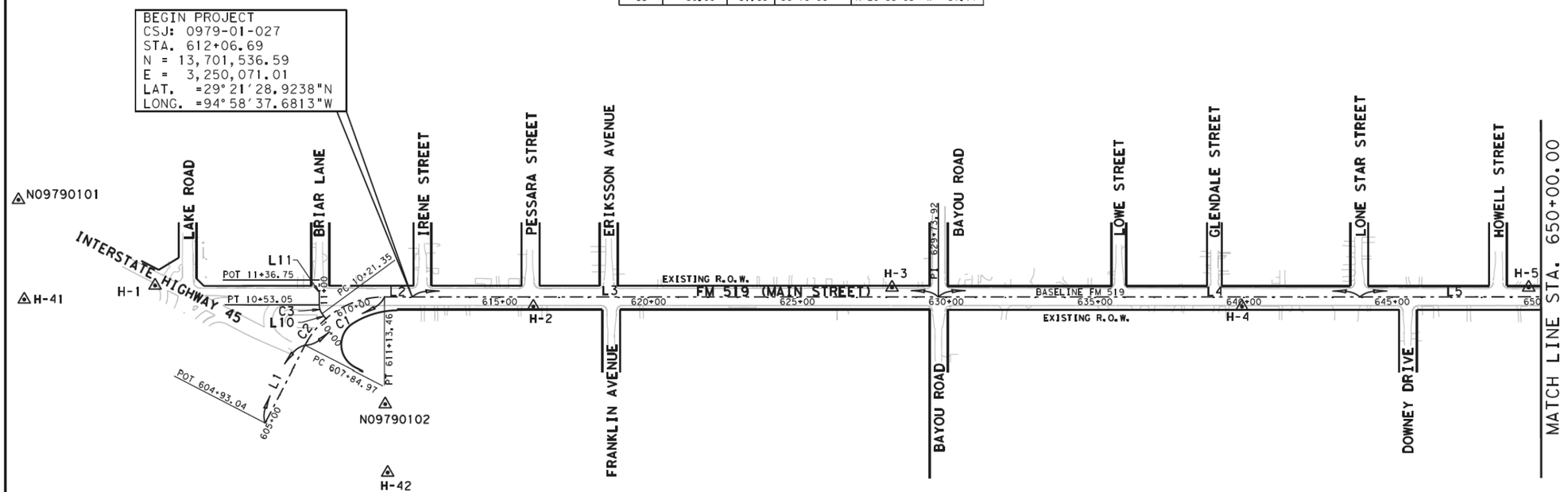
TCP(2-4)-18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	HOU	GALVESTON		29
4-98 2-18				

TIE TO TXDOT IH 45 CSJ 0500-04-104 CONTROL										
PUBLISHED INFORMATION				MEASURED INFORMATION				COMPARISON		
TXDOT RTN VRS: NAD83/1993 ADJUSTMENT & NAVD88				TXDOT RTN VRS: NAD83/1993 ADJUSTMENT & NAVD88				(PUBLISHED - MEASURED)		
MARK NO.	GRID NORTHING	GRID EASTING	ELEVATION	PT. NO.	GRID NORTHING	GRID EASTING	ELEVATION	NORTHING	EASTING	ELEVATION
*H-41	13,699,685.07	3,248,734.06	12.75′	91	13,699,685.08	3,248,347.17	12.74′	-0.01′	0.07′	0.01′
*H-42	13,699,164.59	3,249,997.45	7.13′	92	13,699,164.62	3,249,594.19	7.14′	-0.03′	0.04′	-0.01′

*HELD

CURVE DATA				
CURVE	RADIUS	LENGTH	Δ	CHORD
C1	300.00′	328.49′	62°44′12"	N 55°58′14" E 312.32′
C2	300.00′	113.85′	21°44′38"	N 35°28′29" E 113.17′
C3	50.00′	31.69′	36°19′06"	N 20°53′05" W 31.17′



NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTHAMERICAN DATUM OF 1983 (NAD 83), 1993 ADJUSTMENT. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. TXDOT PRIMARY SURVEY CONTROL POINTS H-41 AND H-42 FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR HORIZONTAL CONTROL. HORIZONTAL SURVEY METHOD: TXDOT RTN VRS AND BASE & ROVER RTK.
3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. TXDOT PRIMARY SURVEY CONTROL POINTS H-41/12.75′ AND H-42/7.13′ FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR VERTICAL CONTROL. VERTICAL SURVEY METHOD: DIGITAL LEVELING.
5. UNIT OF MEASURE: U.S. SURVEY FEET.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.
SURVEY DATE: OCTOBER, 2022

STATE OF TEXAS REGISTERED HONG YANG 6557 PROFESSIONAL LAND SURVEYOR

6/22/23

HONG YANG DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6557

CONTROL MONUMENT INVERSE			
FROM	BEARING	DISTANCE	TO
H-41	N 06°04′13"W	335.34′	N09790101
H-42	N 04°47′51"W	229.94′	N09790102
N09790101	S 60°37′01"E	541.78′	H-1
H-1	S 65°35′36"E	868.95′	N09790102
N09790102	N 54°03′12"E	594.86′	H-2
H-2	N 84°13′50"E	1,206.48′	H-3
H-3	S 89°36′01"E	1,177.62′	H-4
H-4	N 83°27′04"E	966.44′	H-5
H-5	N 89°56′51"E	1,377.94′	H-6

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N 24°36′08" E	291.93′
L2	N 87°20′20" E	93.24′
L3	N 87°15′59" E	1,767.23′
L4	N 87°16′27" E	1,418.19′
L5	N 87°13′55" E	1,538.86′
L10	N 39°02′38" W	21.35′
L11	N 02°43′32" W	83.70′

CONTROL MONUMENTATION						
POINT NO.	NORTHING (Y)	EASTING (X)	ELEVATION	STATION	OFFSET	DESCRIPTION
N09790101	13,701,799.49	3,248,734.06	11.28′	N/A	N/A	SET TXDOT ALUMINUM CAP STAMPED "N09790101" IN CONCRETE
N09790102	13,701,174.61	3,249,997.45	8.24′	607+34.61	329.27′	SET TXDOT ALUMINUM CAP STAMPED "N09790102" IN CONCRETE
H-1	13,701,533.67	3,249,206.15	10.63′	607+31.64	-539.68′	SET TXDOT ALUMINUM CAP STAMPED "H-1" IN CONCRETE
H-2	13,701,523.82	3,250,479.05	7.71′	616+13.64	32.22′	SET TXDOT ALUMINUM CAP STAMPED "H-2" IN CONCRETE
H-3	13,701,645.10	3,251,679.39	6.41′	628+18.42	-31.68′	SET TXDOT ALUMINUM CAP STAMPED "H-3" IN CONCRETE
H-4	13,701,636.88	3,252,856.99	6.99′	639+94.29	32.55′	SET TXDOT ALUMINUM CAP STAMPED "H-4" IN CONCRETE
H-5	13,701,747.11	3,253,817.12	8.33′	649+58.60	-31.47′	SET TXDOT ALUMINUM CAP STAMPED "H-5" IN CONCRETE

0 200 400
SCALE: 1"=200′ (22" x 34" SHEET)
SCALE: 1"=400′ (11" x 17" SHEET)

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

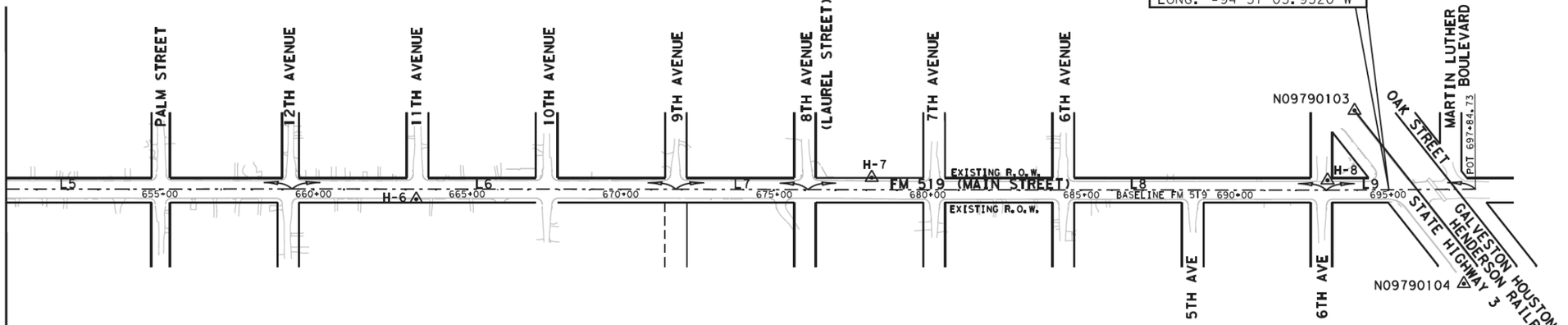
LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPLS Registration No. 10019100

FM 519
SURVEY CONTROL INDEX SHEET

PAGE 1 OF 2

FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS	STP 2B23(207)TAPS				FM 519
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
12	GALVESTON	0979	01	027		30

S:\2022\220152\CADD\Survey Control Map\MRF09790102*Survey Control Index*1.dgn



END PROJECT
CSJ: 0979-01-027
STA. 695+03.44
N = 13,701,930.46
E = 3,258,358.39
LAT. =29°21'29.9900"N
LONG. =94°57'03.9320"W

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTHAMERICAN DATUM OF 1983 (NAD 83), 1993 ADJUSTMENT. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. TXDOT PRIMARY SURVEY CONTROL POINTS H-41 AND H-42 FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR HORIZONTAL CONTROL. HORIZONTAL SURVEY METHOD: TXDOT RTN VRS AND BASE & ROVER RTK.
3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. TXDOT PRIMARY SURVEY CONTROL POINTS H-41/12.75' AND H-42/7.13' FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR VERTICAL CONTROL. VERTICAL SURVEY METHOD: DIGITAL LEVELING.
5. UNIT OF MEASURE: U.S. SURVEY FEET.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION. SURVEY DATE: OCTOBER, 2022

STATE OF TEXAS REGISTERED HONG YANG 6557 PROFESSIONAL LAND SURVEYOR

6/22/23

HONG YANG DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6557

CONTROL MONUMENT INVERSE			
FROM	BEARING	DISTANCE	TO
H-5	N 89°56'51"E	1,377.94'	H-6
H-6	N 84°32'17"E	1,484.73'	H-7
H-7	N 87°36'38"E	1,485.75'	H-8
H-8	N 18°24'57"E	243.41'	N09790103
N09790103	S 35°04'49"E	664.46'	N09790104

LINE TABLE		
LINE	BEARING	DISTANCE
L5	N 87°13'55" E	1,538.86'
L6	N 87°18'58" E	1,249.41'
L7	N 87°25'36" E	429.99'
L8	N 87°19'21" E	1,689.63'
L9	N 86°52'40" E	484.72'

CONTROL MONUMENTATION						
POINT NO.	NORTHING (Y)	EASTING (X)	ELEVATION	STATION	OFFSET	DESCRIPTION
H-6	13,701,748.37	3,255,195.06	9.66'	663+35.04	33.22	SET TXDOT ALUMINUM CAP STAMPED "H-6" IN CONCRETE
H-7	13,701,889.70	3,256,673.05	8.17'	678+18.03	-39.59	SET TXDOT ALUMINUM CAP STAMPED "H-7" IN CONCRETE
H-8	13,701,951.64	3,258,157.51	7.23'	693+04.01	-32.09	SET TXDOT ALUMINUM CAP STAMPED "H-8" IN CONCRETE
N09790103	13,702,182.58	3,258,234.41	5.90'	693+93.37	-258.50	SET TXDOT ALUMINUM CAP STAMPED "N09780103" IN CONCRETE
N09790104	13,701,638.81	3,258,616.29	4.37'	697+45.07	305.26	SET TXDOT ALUMINUM CAP STAMPED "N09780104" IN CONCRETE

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

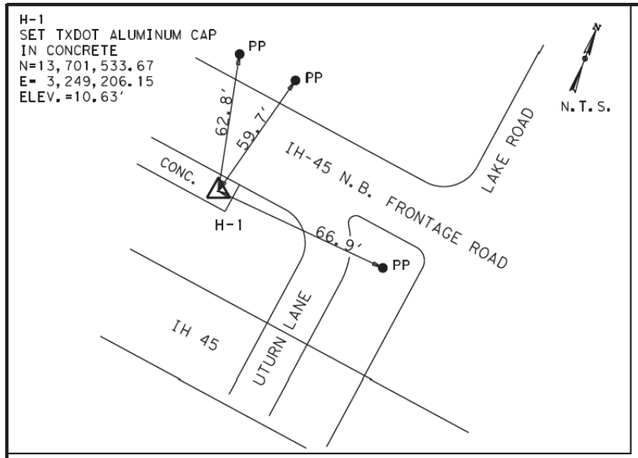
0 200 400
SCALE: 1"=200' (22" x 34" SHEET)
SCALE: 1"=400' (11" x 17" SHEET)

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPLS Registration No. 10019100

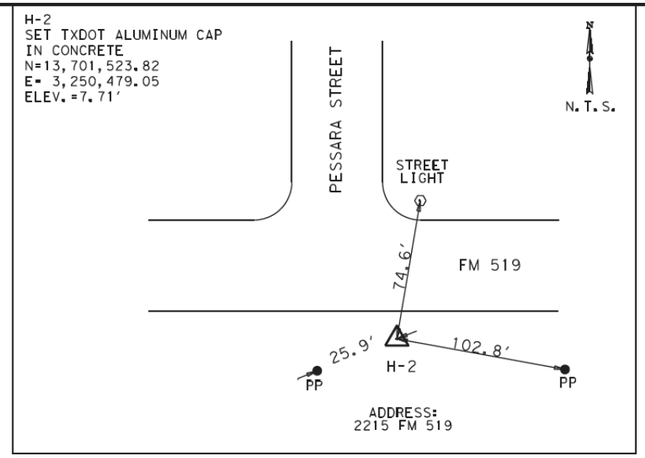
FM 519
SURVEY CONTROL INDEX SHEET

FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS	STP 2B23(207)TAPS				FM 519
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
12	GALVESTON	0979	01	027		31

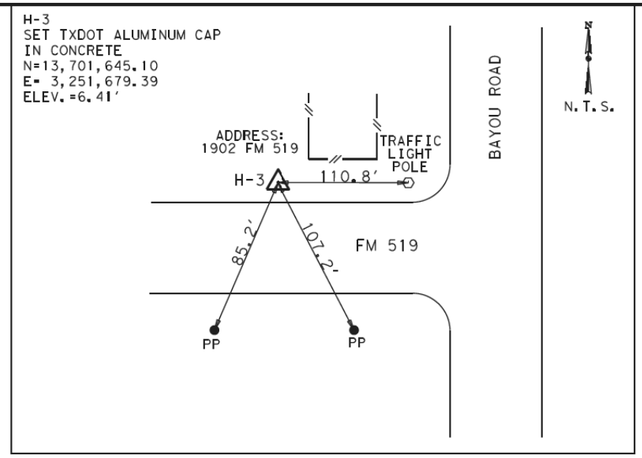
S:\2022\2220152\CADD\Survey Control Map\MRF0979010 27*Survey Control Index*2.dgn



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL NORTH ALONG IH-45 NB FRONTAGE RD, APPROXIMATELY 100 FEET TO THE MONUMENT ON THE LEFT



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 1,100 FEET TO THE MONUMENT ON THE RIGHT.



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 0.45 MILE TO THE MONUMENT ON THE LEFT.

NOTES:

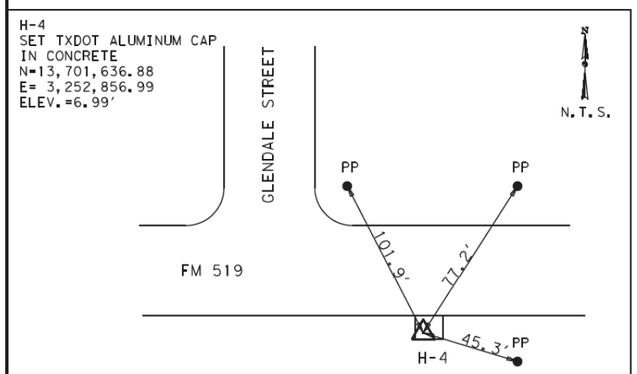
1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTHAMERICAN DATUM OF 1983 (NAD 83), 1993 ADJUSTMENT. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. TXDOT PRIMARY SURVEY CONTROL POINTS H-41 AND H-42 FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR HORIZONTAL CONTROL. HORIZONTAL SURVEY METHOD: TXDOT RTN VRS AND BASE & ROVER RTK.
3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. TXDOT PRIMARY SURVEY CONTROL POINTS H-41/12.75' AND H-42/7.13' FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR VERTICAL CONTROL. VERTICAL SURVEY METHOD: DIGITAL LEVELING.
5. UNIT OF MEASURE: U.S. SURVEY FEET.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION. SURVEY DATE: OCTOBER, 2022

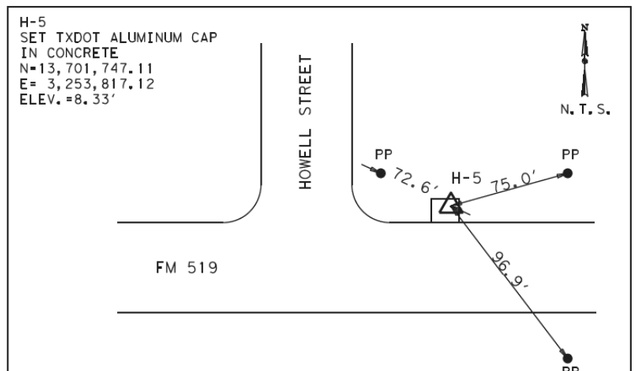
STATE OF TEXAS
REGISTERED
HONG YANG
6557
PROFESSIONAL
LAND SURVEYOR

6/22/23

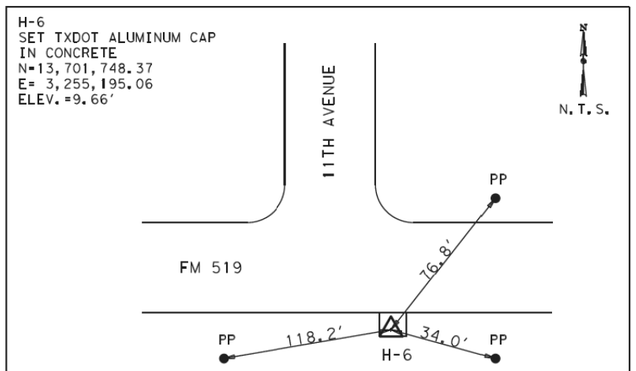
HONG YANG — DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6557



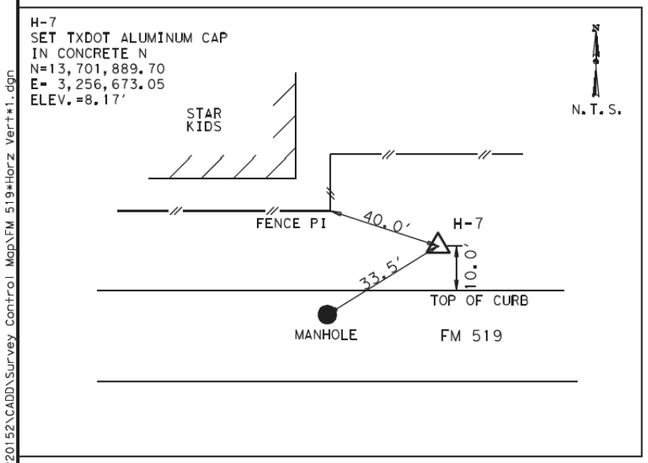
FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 0.65 MILE TO THE MONUMENT ON THE RIGHT.



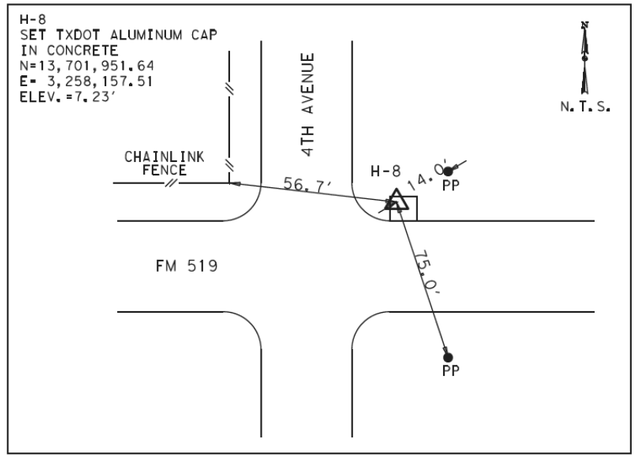
FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 0.85 MILE TO THE MONUMENT ON THE LEFT.



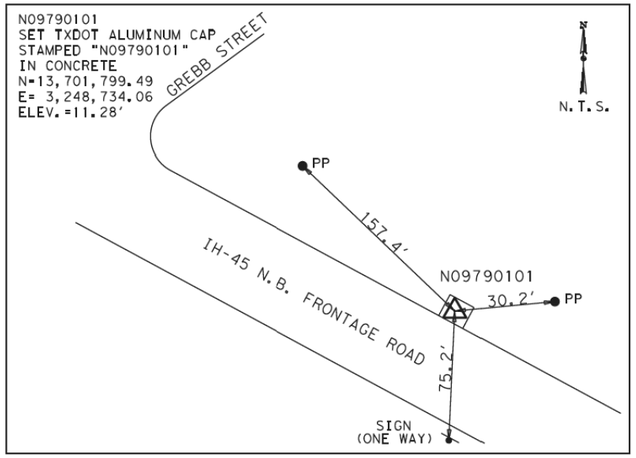
FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 1.1 MILE TO THE MONUMENT ON THE RIGHT.



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 1.4 MILE TO THE MONUMENT ON THE RIGHT.



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL EAST ALONG FM 519, APPROXIMATELY 1.65 MILE TO THE MONUMENT ON THE LEFT.



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FM 519, TRAVEL NORTH ALONG IH-45 NB FRONTAGE RD, APPROXIMATELY 650 FEET TO THE MONUMENT ON THE RIGHT.

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

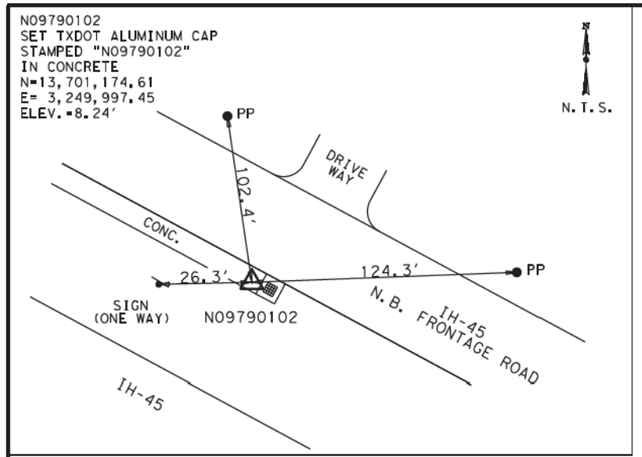
Texas Department of Transportation

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPLS Registration No. 10019100

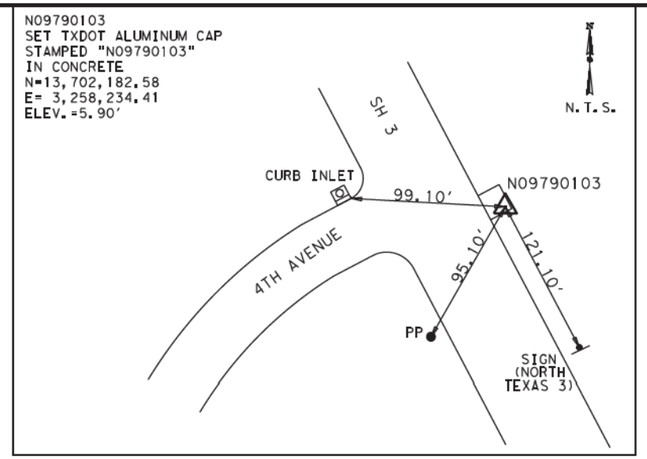
FM 519
HORIZONTAL & VERTICAL CONTROL SHEET

FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.				HIGHWAY NO.
6	TEXAS	STP 2B23(207)TAPS				FM 519
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
12	GALVESTON	0979	01	027		32

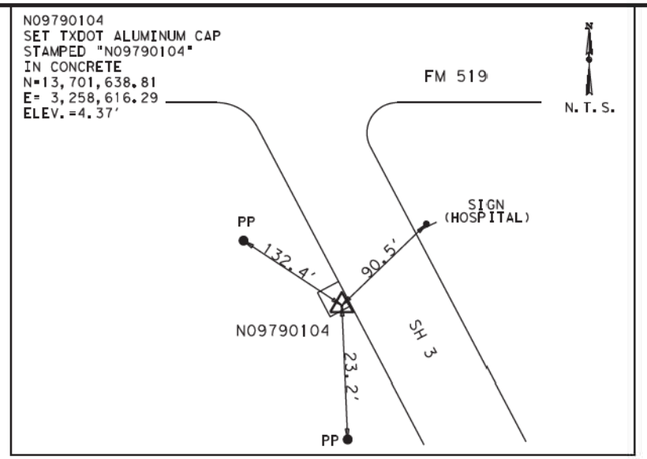
S:\2022\220152\CADD\Survey Control Map\FM 519*Horz Vert*1.dgn



FROM THE INTERSECTION OF IH-45 NB FRONTAGE RD AND FRANKLIN ST, TRAVEL NORTH ALONG IH-45 NB FRONTAGE RD, APPROXIMATELY 800 FEET TO THE MONUMENT ON THE LEFT.



FROM THE INTERSECTION OF SH-3 AND FM 519, TRAVEL NORTH ALONG SH-3, APPROXIMATELY 300 FEET TO THE MONUMENT ON THE RIGHT.



FROM THE INTERSECTION OF SH-3 AND FM 519, TRAVEL SOUTH ALONG SH-3, APPROXIMATELY 400 FEET TO THE MONUMENT ON THE RIGHT.

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTHAMERICAN DATUM OF 1983 (NAD 83), 1993 ADJUSTMENT. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00013.
2. TXDOT PRIMARY SURVEY CONTROL POINTS H-41 AND H-42 FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR HORIZONTAL CONTROL. HORIZONTAL SURVEY METHOD: TXDOT RTN VRS AND BASE & ROVER RTK.
3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
4. TXDOT PRIMARY SURVEY CONTROL POINTS H-41/12.75' AND H-42/7.13' FOR IH 45 CSJ NO. 0500-04-104 WERE RECOVERED AND HELD FOR VERTICAL CONTROL. VERTICAL SURVEY METHOD: DIGITAL LEVELING.
5. UNIT OF MEASURE: U.S. SURVEY FEET.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION. SURVEY DATE: OCTOBER, 2022

STATE OF TEXAS
REGISTERED
HONG YANG
6557
PROFESSIONAL
LAND SURVEYOR

6/22/23

HONG YANG DATE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6557

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

Texas Department of Transportation

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPLS Registration No. 10019100

FM 519
HORIZONTAL & VERTICAL CONTROL SHEET

FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
6	TEXAS	STP 2B23(207)TAPS			FM 519
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
12	GALVESTON	0979	01	027	33

S:\2022\2220152\CADD\Survey Control Map\FM 519+Horz Vert+2.dgn

100% SUBMITTAL

CC:
DW:
CC:
DW:

Horizontal Alignment Review Report

Report Created: Thursday, December 29, 2022
Time: 4:03:22 PM

Project: Default
Description:
File Name: c:\pw_work\atknatx01\wsatkins_rydb6500\dms91601\FM 519_GEOM_ALIGN.dgn
Last Revised: 12/29/2022 15:45
Note: All units in this report are in feet unless specified otherwise.

Alignment Name: BL CL-FM 519
Alignment Description:
Alignment Style: Alignment\Baseline

		Station	Northing	Easting
Element: Linear				
POT	( )	600+00.00 R1	13700792.85	3249216.552
PC	( )	602+81.75 R1	13700937.16	3249458.539
	Tangential Direction:	N59°11'25.01"E		
	Tangential Length:	281.75		
Element: Circular				
PC	( )	602+81.75 R1	13700937.16	3249458.539
PI	( )	603+90.72 R1	13700992.97	3249552.133
CC	( )		13701237.77	3249279.273
PT	( )	604+93.04 R1	13701092.05	3249597.5
	Radius:	350		
	Delta:	34°35'17.21" Left		
	Degree of Curvature (Arc):	16°22'12.80"		
	Length:	211.287		
	Tangent:	108.973		
	Chord:	208.093		
	Middle Ordinate:	15.823		
	External:	16.572		
	Back Tangent Direction:	N59°11'25.01"E		
	Back Radial Direction:	S30°48'34.99"E		
	Chord Direction:	N41°53'46.41"E		
	Ahead Radial Direction:	S65°23'52.20"E		
	Ahead Tangent Direction:	N24°36'07.80"E		
Element: Linear				
PT	( )	604+93.04 R1	13701092.05	3249597.5
PC	( )	607+84.96 R1	13701357.48	3249719.034
	Tangential Direction:	N24°36'07.80"E		
	Tangential Length:	291.926		
Element: Circular				
PC	( )	607+84.96 R1	13701357.48	3249719.034
PI	( )	609+67.86 R1	13701523.77	3249795.175
CC	( )		13701232.59	3249991.8
PT	( )	611+13.45 R1	13701532.26	3249977.871
	Radius:	300		
	Delta:	62°44'12.41" Right		
	Degree of Curvature (Arc):	19°05'54.94"		
	Length:	328.489		
	Tangent:	182.894		
	Chord:	312.323		
	Middle Ordinate:	43.849		
	External:	51.365		
	Back Tangent Direction:	N24°36'07.80"E		
	Back Radial Direction:	S65°23'52.20"E		
	Chord Direction:	N55°58'14.00"E		
	Ahead Radial Direction:	S02°39'39.79"E		
	Ahead Tangent Direction:	N87°20'20.21"E		
Element: Linear				
PT	( )	611+13.45 R1	13701532.26	3249977.871
PI	( )	612+06.69 R1	13701536.59	3250071.007
	Tangential Direction:	N87°20'20.21"E		
	Tangential Length:	93.236		
Element: Linear				
PI	( )	612+06.69 R1	13701536.59	3250071.007
PI	( )	629+73.92 R1	13701620.87	3251836.225
	Tangential Direction:	N87°15'58.99"E		
	Tangential Length:	1767.229		

Horizontal Alignment Review Report

Report Created: Thursday, December 29, 2022
Time: 4:03:22 PM

Project: Default
Description:
File Name: c:\pw_work\atknatx01\wsatkins_rydb6500\dms91601\FM 519_GEOM_ALIGN.dgn
Last Revised: 12/29/2022 15:45
Note: All units in this report are in feet unless specified otherwise.

Element: Linear				
PI	( )	612+06.69 R1	13701536.59	3250071.007
PI	( )	629+73.92 R1	13701620.87	3251836.225
	Tangential Direction:	N87°15'58.99"E		
	Tangential Length:	1767.229		
Element: Linear				
PI	( )	629+73.92 R1	13701620.87	3251836.225
PI	( )	643+92.11 R1	13701688.32	3253252.811
	Tangential Direction:	N87°16'26.60"E		
	Tangential Length:	1418.19		
Element: Linear				
PI	( )	643+92.11 R1	13701688.32	3253252.811
PI	( )	659+30.96 R1	13701762.64	3254789.872
	Tangential Direction:	N87°13'55.20"E		
	Tangential Length:	1538.856		
Element: Linear				
PI	( )	659+30.96 R1	13701762.64	3254789.872
PI	( )	671+80.37 R1	13701821.14	3256037.908
	Tangential Direction:	N87°18'57.92"E		
	Tangential Length:	1249.407		
Element: Linear				
PI	( )	671+80.37 R1	13701821.14	3256037.908
PI	( )	676+10.36 R1	13701840.45	3256467.469
	Tangential Direction:	N87°25'35.97"E		
	Tangential Length:	429.994		
Element: Linear				
PI	( )	676+10.36 R1	13701840.45	3256467.469
PI	( )	693+00.00 R1	13701919.38	3258155.258
	Tangential Direction:	N87°19'20.60"E		
	Tangential Length:	1689.634		
Element: Linear				
PI	( )	693+00.00 R1	13701919.38	3258155.258
POT	( )	697+84.72 R1	13701945.78	3258639.263
	Tangential Direction:	N86°52'40.19"E		
	Tangential Length:	484.725		

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

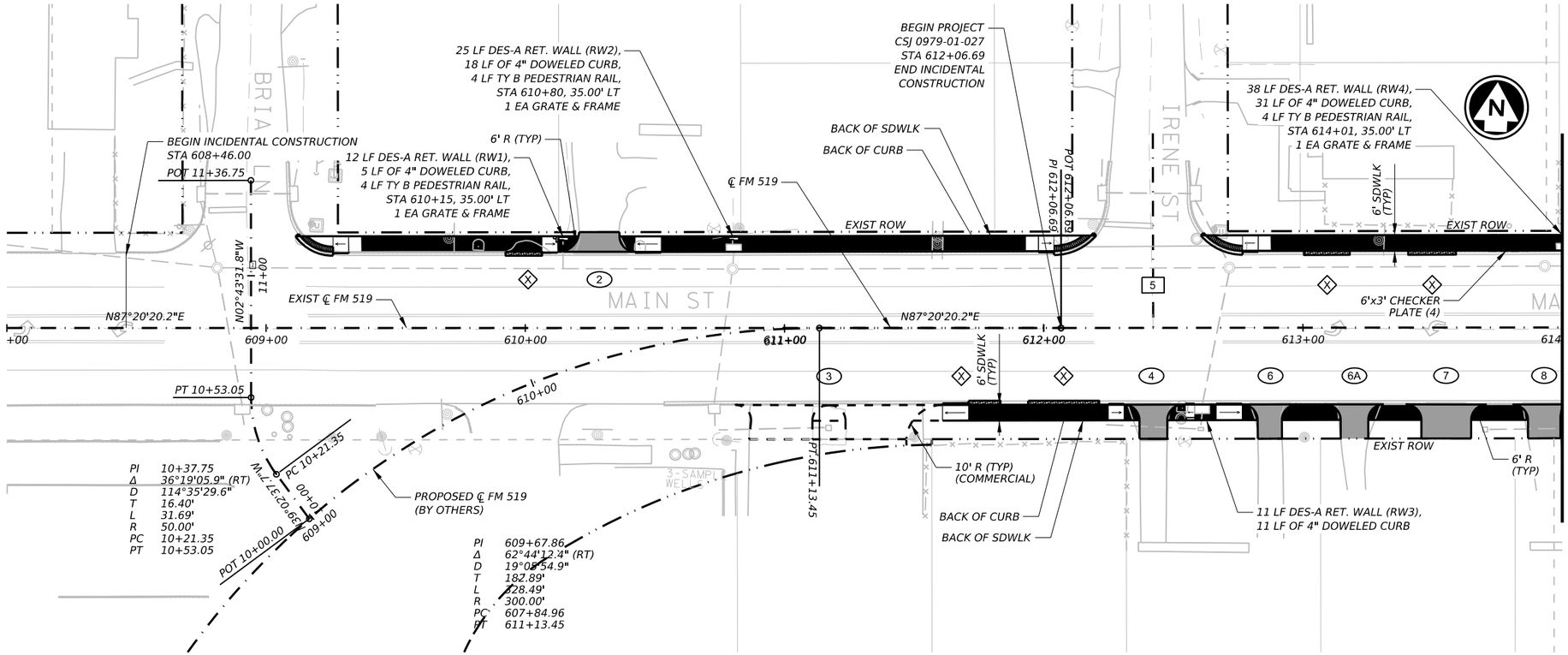
HORIZONTAL ALIGNMENT DATA

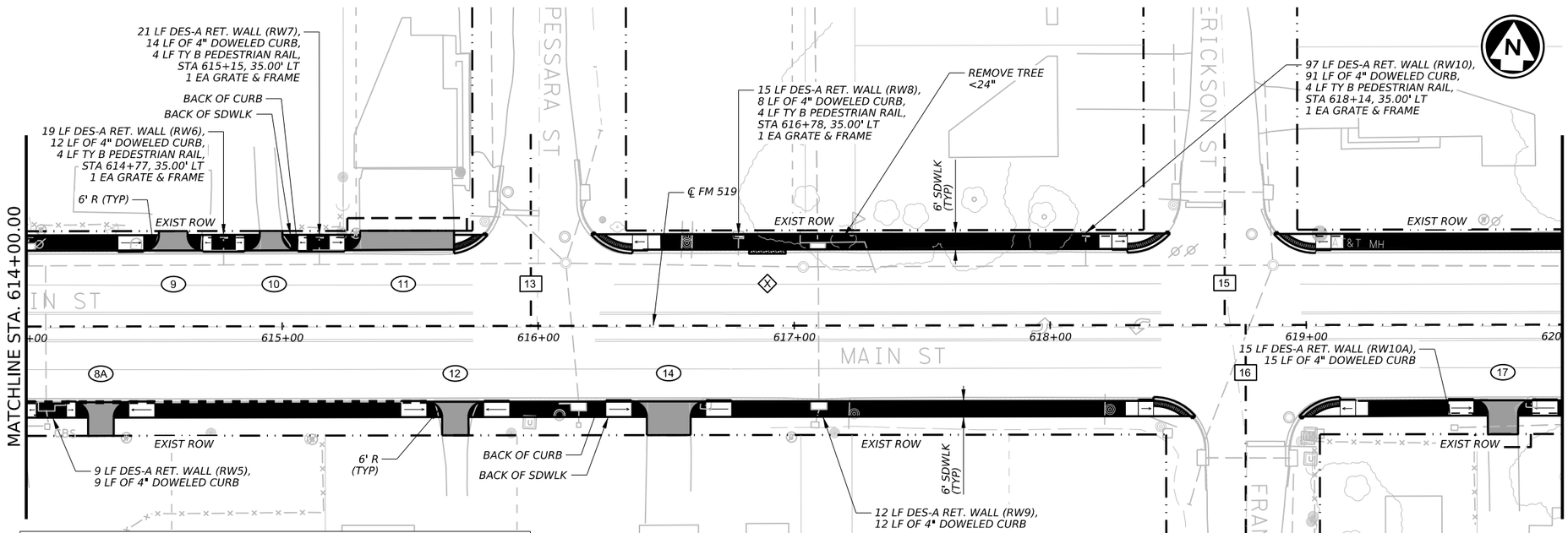
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		34

DATE: 9/11/2023 4:49:02 PM
FILE: ...\FM 519 HORIZ DATA.dgn

100% SUBMITTAL





LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	258.8	SF
450 6048	RAIL (HANDRAIL)(TY B)	28	LF
529 6005	CONC CURB (MONO) (TY II)	106	LF
529 6011	CONC CURB (DOWEL)	226	LF
531 6002	CONC SIDEWALKS (5")	863	SY
531 6013	CURB RAMPS (TY 10)	9	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	6	EA

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

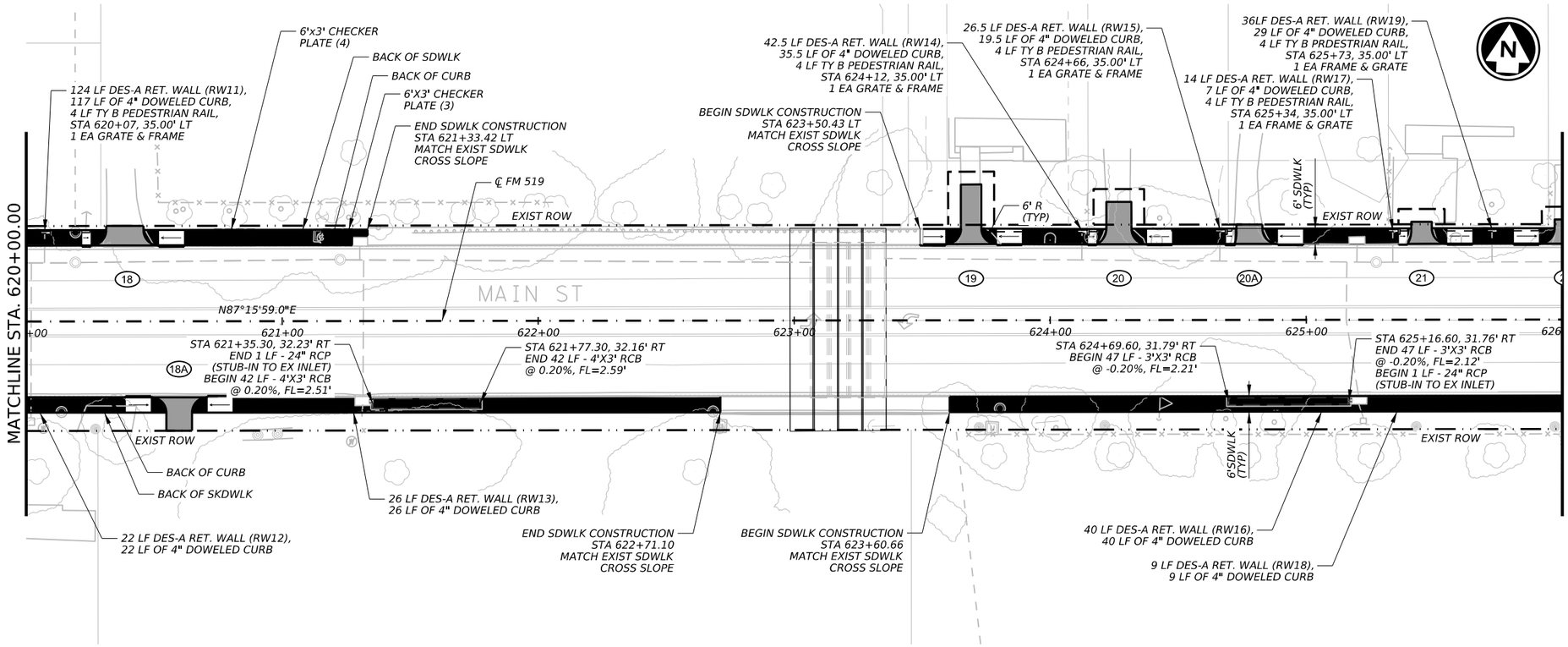
SIDEWALK PLAN
BEGIN TO STA 620+00

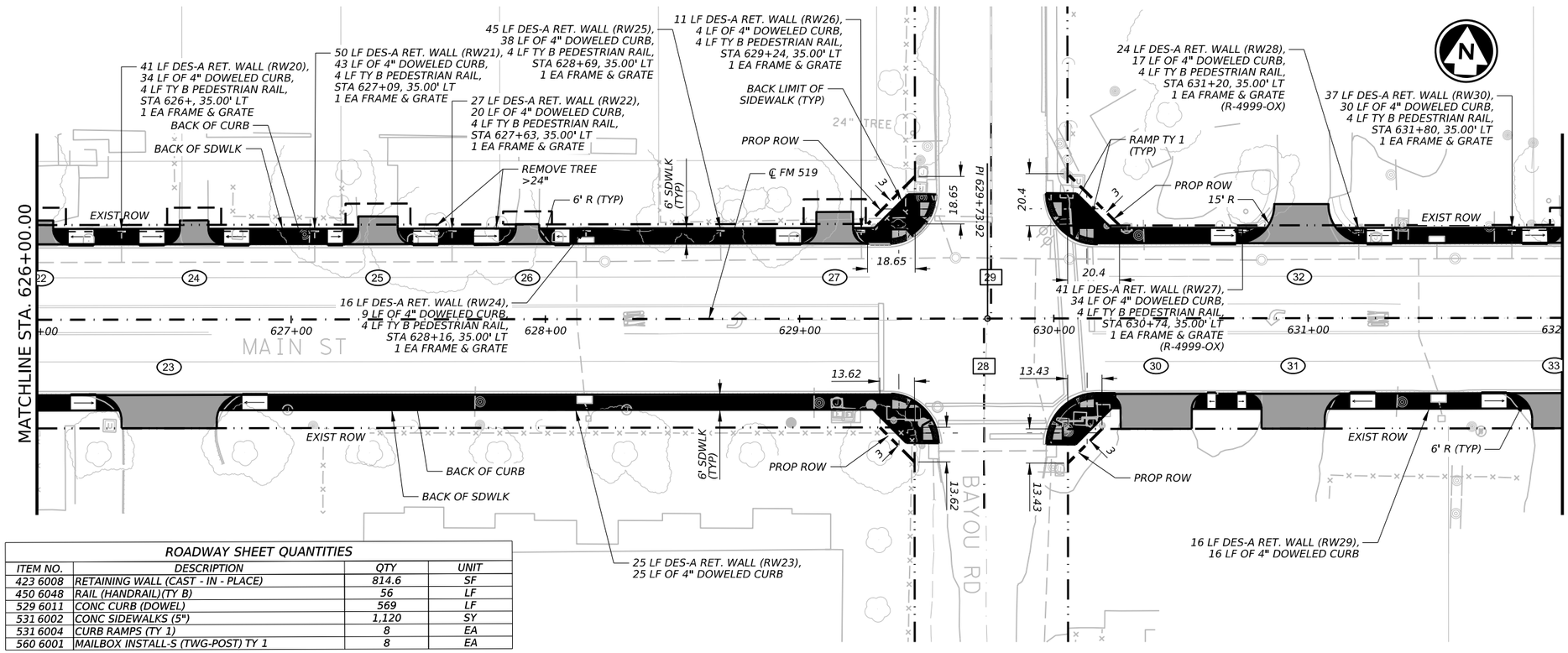
SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		35

DATE: 3/5/2024 3:02:36 PM
FILE: ...\3 Roadway\FM 519 SWPL 01.dgn

100% SUBMITTAL





LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	814.6	SF
450 6048	RAIL (HANDRAIL)(TY B)	56	LF
529 6011	CONC CURB (DOWEL)	569	LF
531 6002	CONC SIDEWALKS (5")	1,120	SY
531 6004	CURB RAMPS (TY 1)	8	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	8	EA

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)616-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

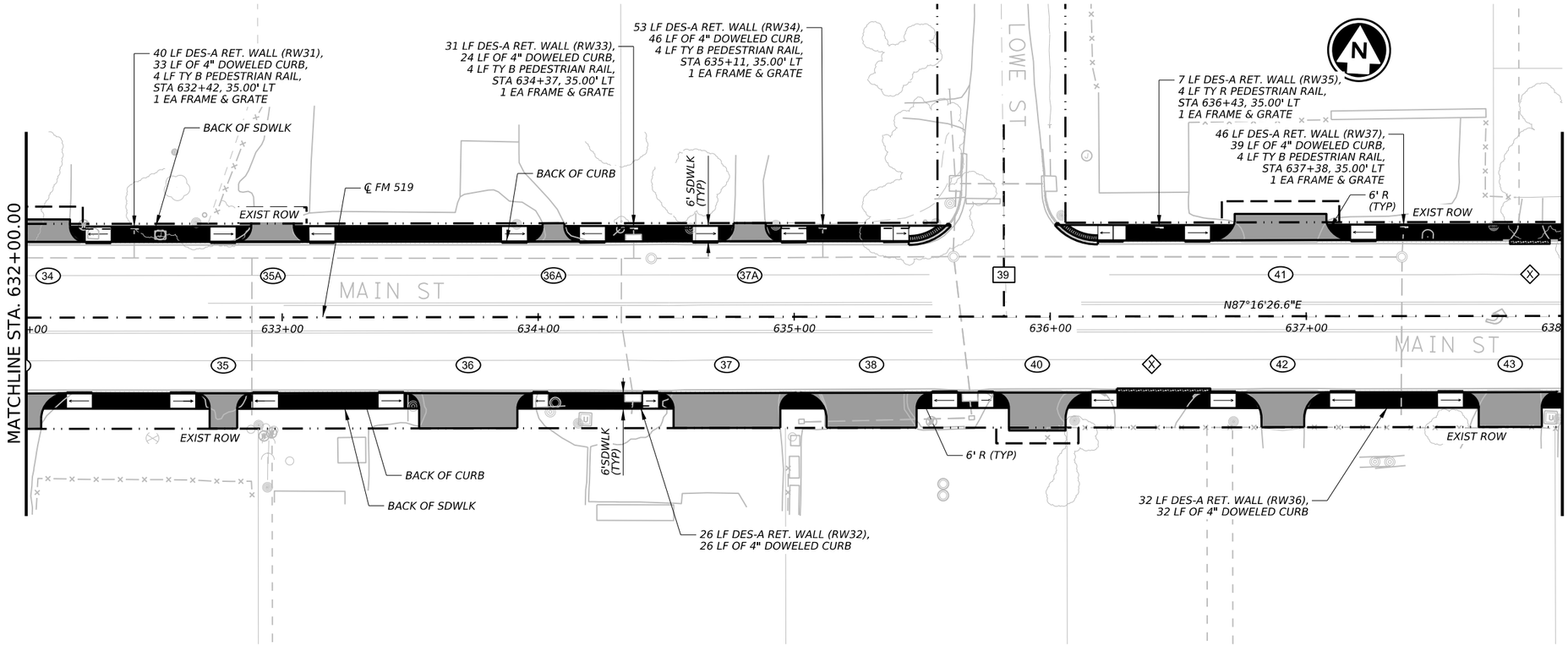
SIDEWALK PLAN
STA 620+00 TO STA 632+00

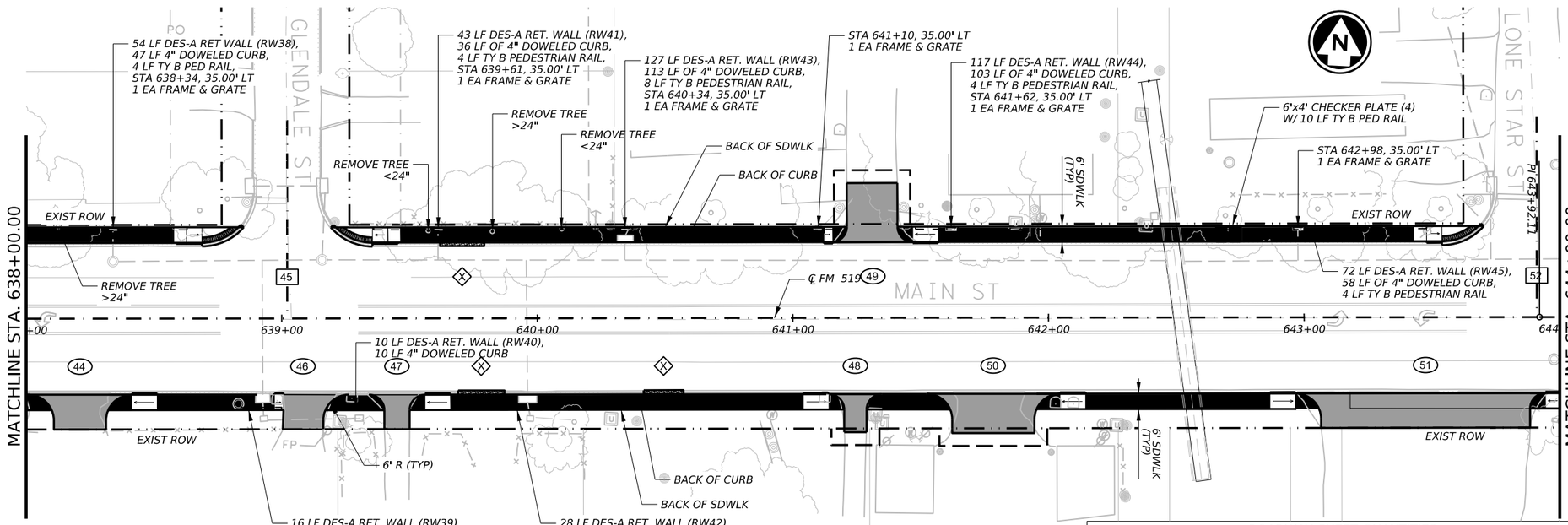
SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		36

DATE: 3/5/2024 2:54:22 PM
FILE: ...\3 Roadway\FM 519 SWPL 02.dgn

100% SUBMITTAL





LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	768.7	SF
450 6048	RAIL (HANDRAIL)(TY B)	44	LF
529 6005	CONC CURB (MONO) (TY II)	104	LF
529 6011	CONC CURB (DOWEL)	642	LF
531 6002	CONC SIDEWALKS (5")	1,024	SY
531 6013	CURB RAMPS (TY 10)	5	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	5	EA
560 6003	MAILBOX INSTALL-M (TWG-POST) TY 1	2	EA

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)616-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SIDEWALK PLAN
STA 632+00 TO STA 644+00

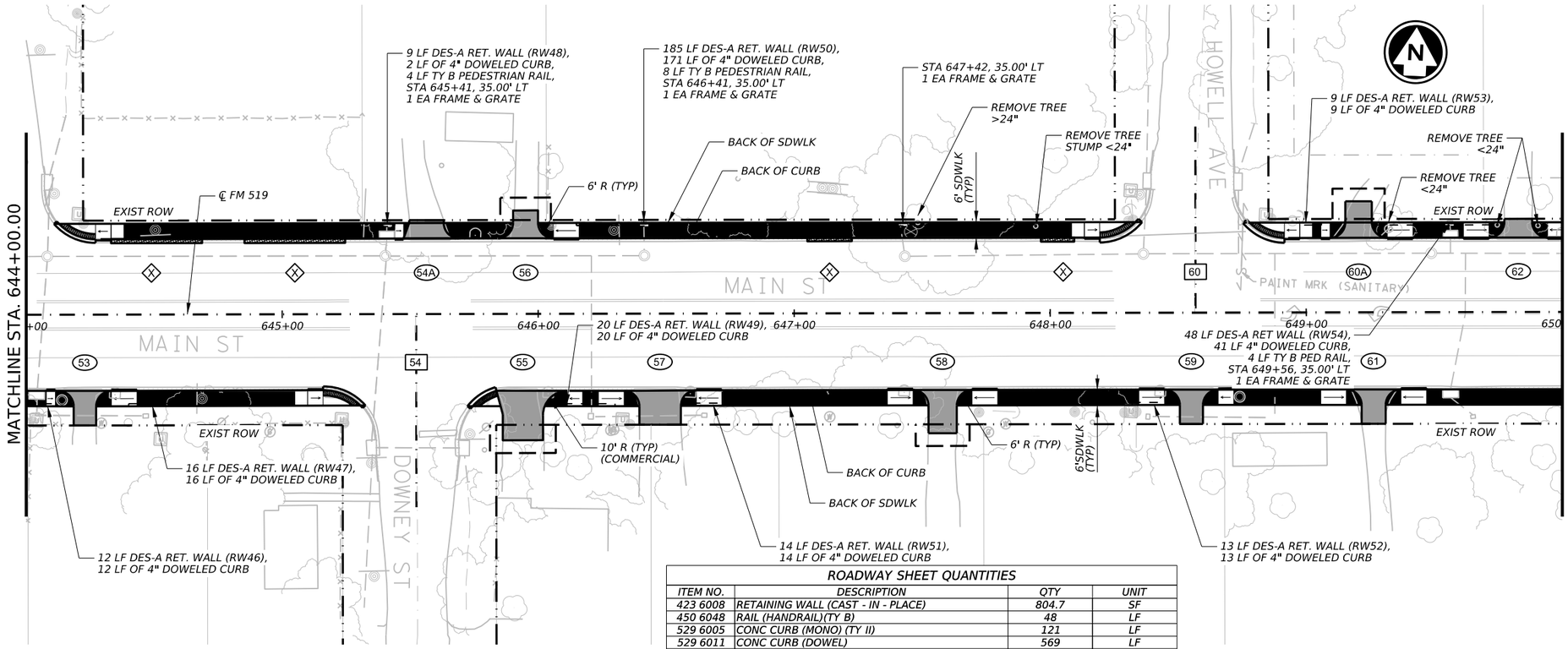
SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		37

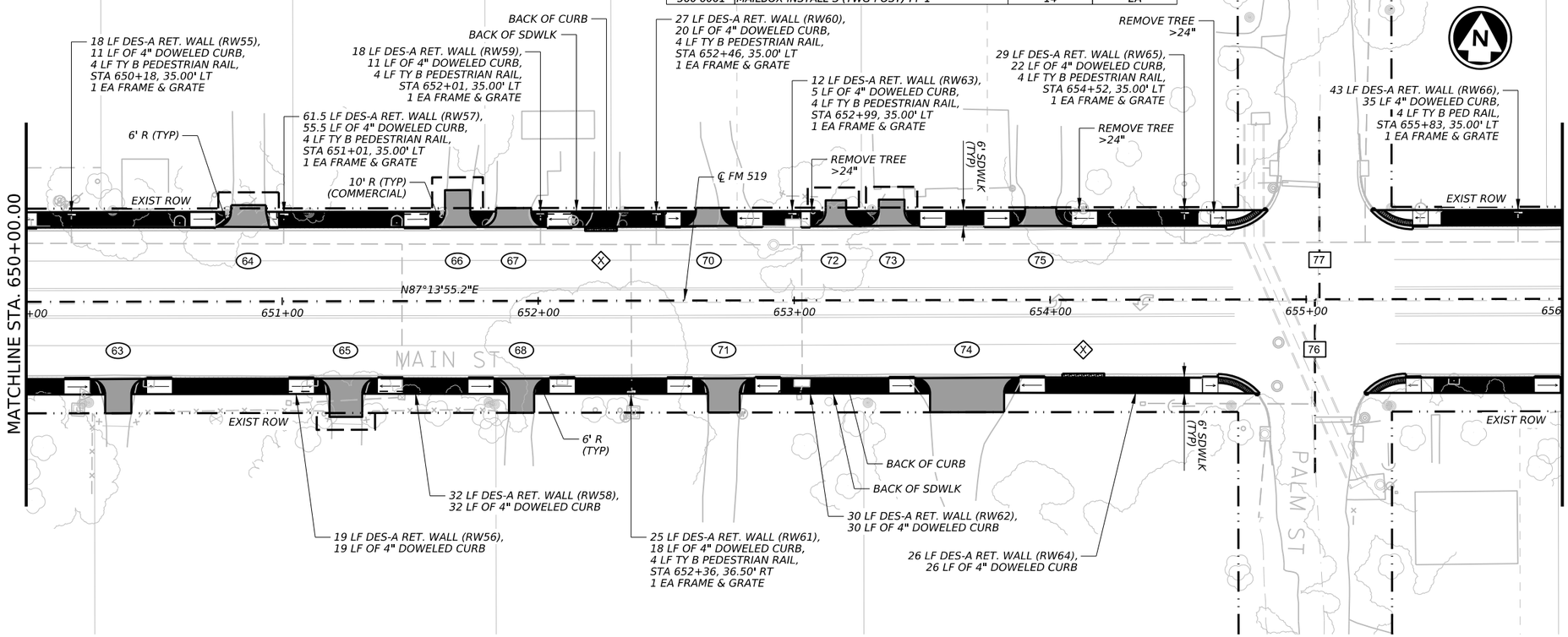
DATE: 3/5/2024 2:54:50 PM
FILE: ...\3 Roadway\FM 519 SWPL 03.dgn

100% SUBMITTAL

CK DW CK DW



ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	804.7	SF
450 6048	RAIL (HANDRAIL)(TY B)	48	LF
529 6005	CONC CURB (MONO) (TY II)	121	LF
529 6011	CONC CURB (DOWEL)	569	LF
531 6002	CONC SIDEWALKS (5")	1,036	SY
531 6013	CURB RAMPS (TY 10)	9	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	14	EA



LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SIDEWALK PLAN
STA 644+00 TO STA 656+00

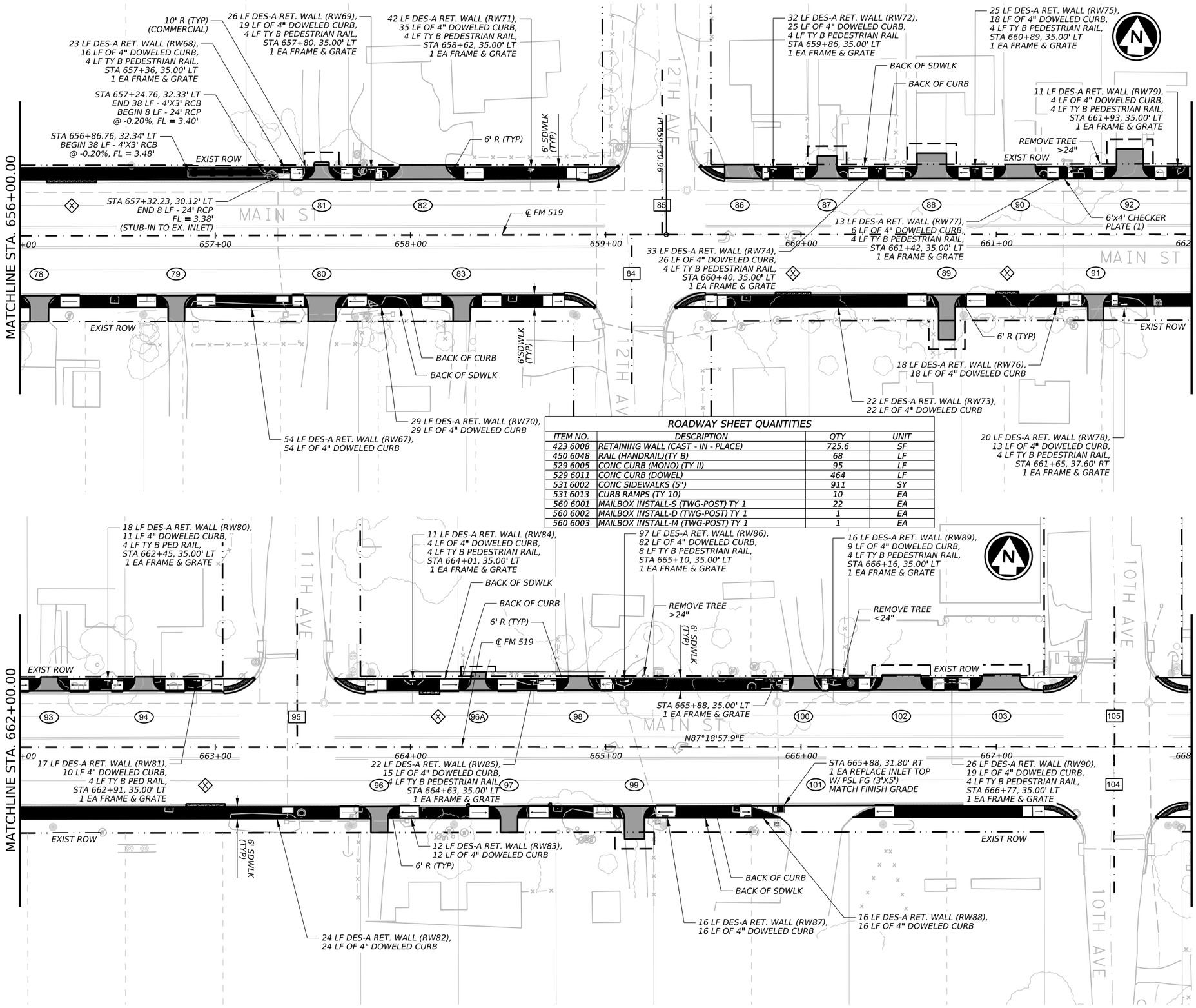
SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		38

DATE: 3/5/2024 2:55:17 PM
FILE: ...\3 Roadway\FM 519 SWPL 04.dgn

100% SUBMITTAL

CK DW CK DW



ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	725.6	SF
450 6048	RAIL (HANDRAIL)(TY B)	68	LF
529 6005	CONC CURB (MONO) (TY II)	95	LF
529 6011	CONC CURB (DOWEL)	464	LF
531 6002	CONC SIDEWALKS (5")	911	SY
531 6013	CURB RAMPS (TY 10)	10	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	22	EA
560 6002	MAILBOX INSTALL-D (TWG-POST) TY 1	1	EA
560 6003	MAILBOX INSTALL-M (TWG-POST) TY 1	1	EA

LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

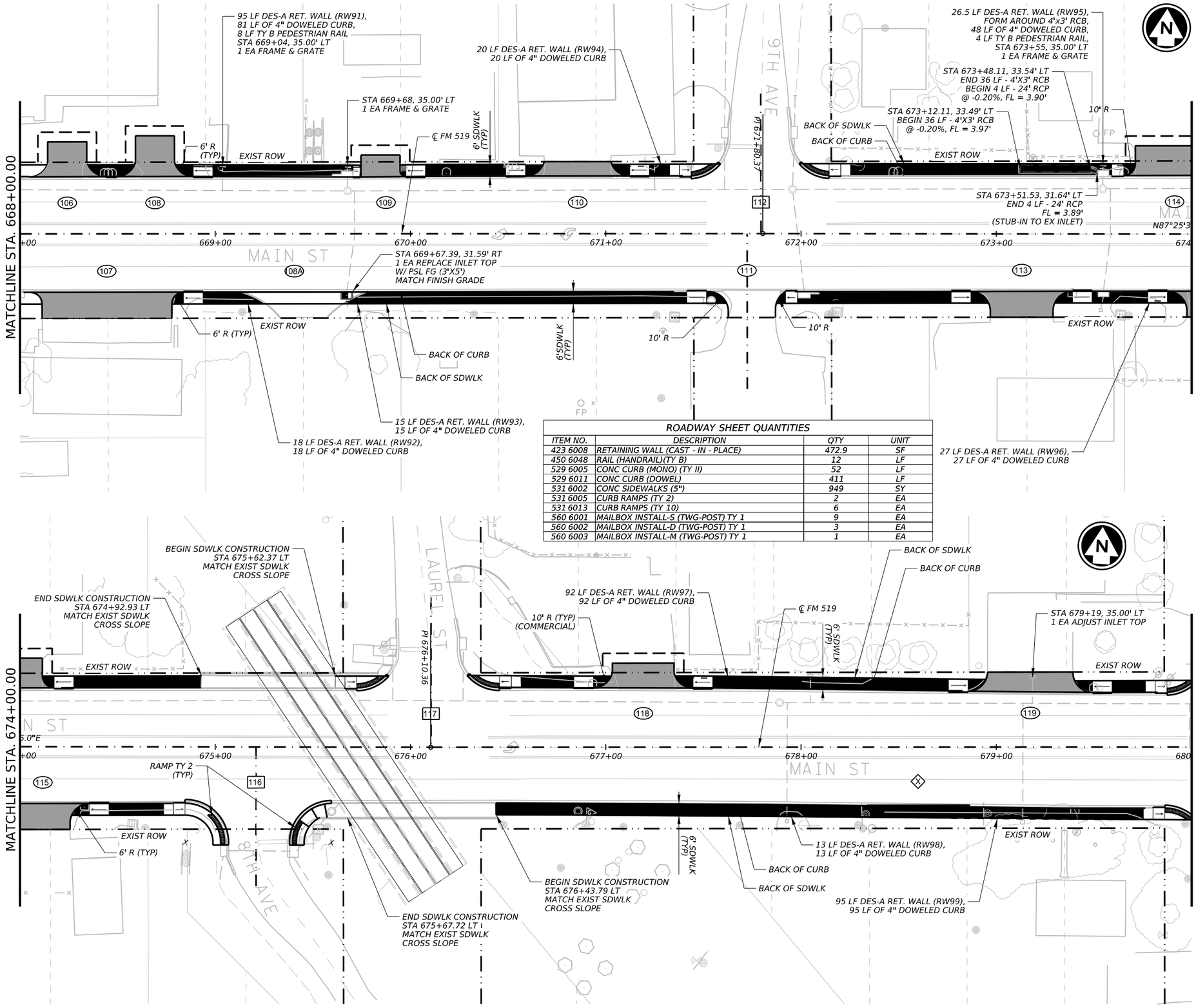
SIDEWALK PLAN
STA 656+00 TO STA 668+00

SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		39

DATE: 3/5/2024 2:55:44 PM
FILE: ...\3. Roadway\FM 519 SWPL 05.dgn

100% SUBMITTAL



ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	472.9	SF
450 6048	RAIL (HANDRAIL)(TY B)	12	LF
529 6005	CONC CURB (MONO) (TY II)	52	LF
529 6011	CONC CURB (DOWEL)	411	LF
531 6002	CONC SIDEWALKS (5")	949	SY
531 6005	CURB RAMPS (TY 2)	2	EA
531 6013	CURB RAMPS (TY 10)	6	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	9	EA
560 6002	MAILBOX INSTALL-D (TWG-POST) TY 1	3	EA
560 6003	MAILBOX INSTALL-M (TWG-POST) TY 1	1	EA

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)816-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

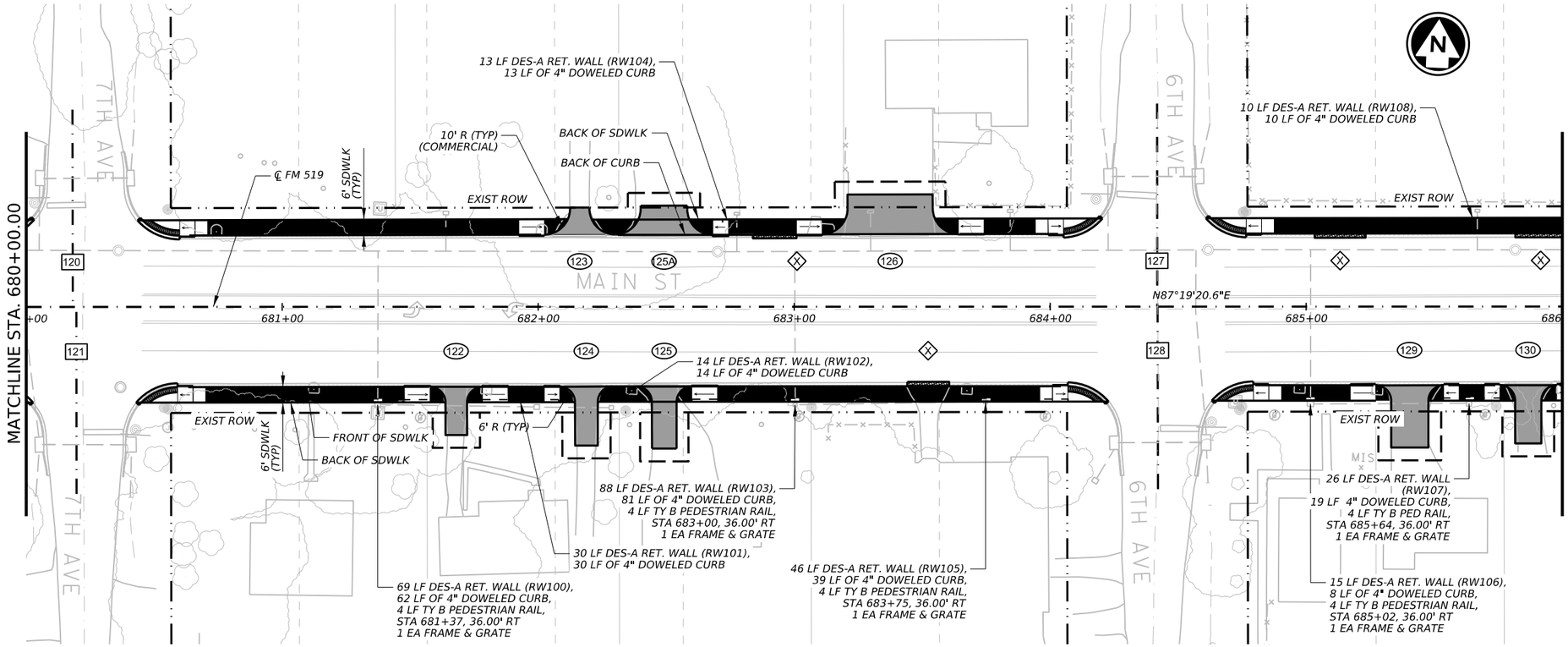
SIDEWALK PLAN
STA 668+00 TO STA 680+00

SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		40

DATE: 3/5/2024 2:56:19 PM
FILE: ...\3. Roadway\FM 519 SWPL 06.dgn

100% SUBMITTAL



LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA (TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

ROADWAY SHEET QUANTITIES

ITEM NO.	DESCRIPTION	QTY	UNIT
423 6008	RETAINING WALL (CAST - IN - PLACE)	650.5	SF
450 6048	RAIL (HANDRAIL)(TY B)	40	LF
529 6005	CONC CURB (MONO) (TY II)	136	LF
529 6011	CONC CURB (DOWEL)	472	LF
531 6002	CONC SIDEWALKS (5")	1,184	SY
531 6013	CURB RAMPS (TY 10)	8	EA
560 6001	MAILBOX INSTALL-S (TWG-POST) TY 1	15	EA

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)616-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

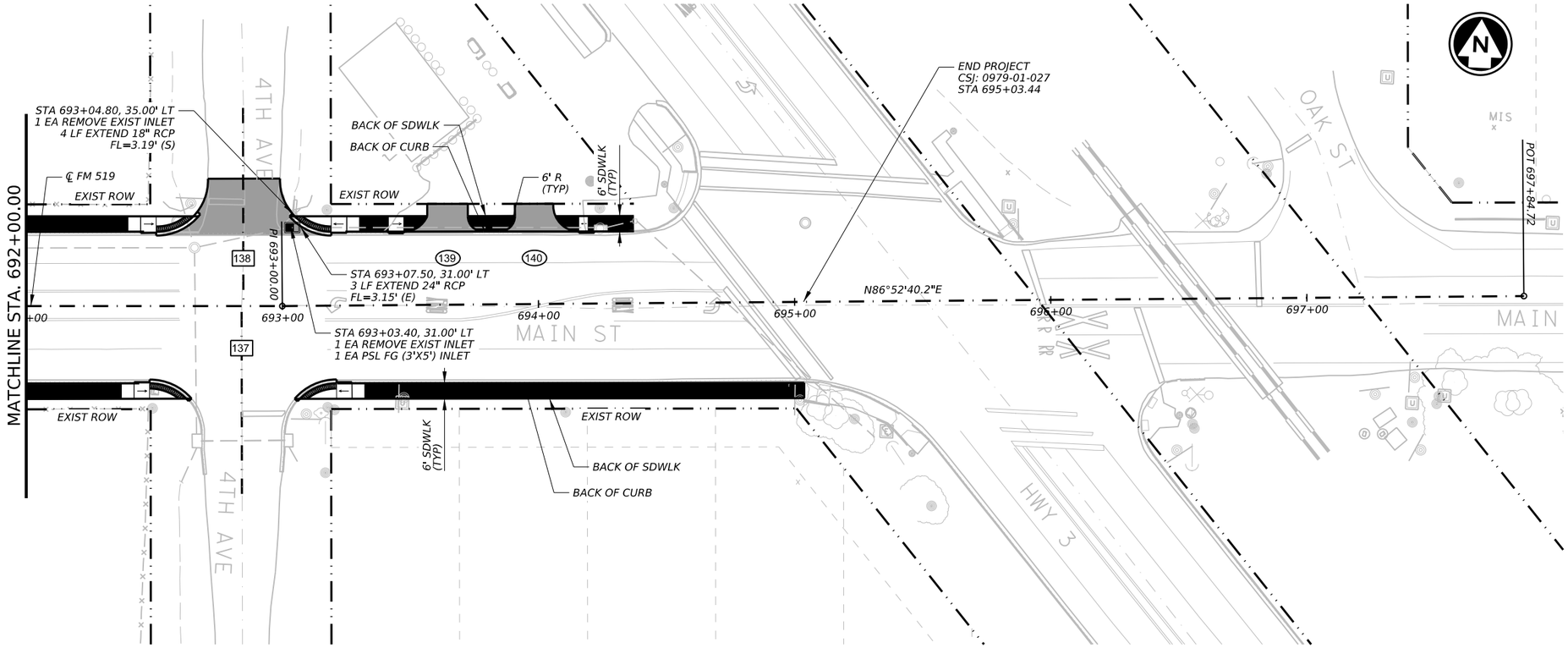
SIDEWALK PLAN
STA 680+00 TO STA 692+00

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		41

DATE: 3/5/2024 2:56:56 PM
FILE: ...\3 Roadway\FM 519 SWPL 07.dgn

100% SUBMITTAL



LEGEND

- EXISTING ROW
- PROPOSED ROW
- PROPOSED TCLA(TEMPORARY CONST LICENSING AGREEMENT)
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- PROPOSED ADA RAMP
- PROPOSED SIDEWALK INCLINE
- PROPOSED STEEL COVER PLATE
- PROPOSED HAND RAIL
- DRIVEWAY #
- SIDE STREET #
- ABANDON DRIVEWAY #
- MAILBOX

NOTES:

1. SEE "HORIZONTAL ALIGNMENT DATA" AND "PROJECT LAYOUT" FOR MORE INFORMATION.
2. SEE SUMMARY OF INTERSECTION & DRIVEWAYS QUANTITIES" FOR ADDITIONAL INFORMATION.
3. MINOR ADJUSTMENTS TO HORIZONTAL LOCATION OF SIDEWALK MAY BE MADE TO AVOID CONFLICTS WITH UTILITIES (POWER POLES, WATE METERES, ETC), AS APPROVED BY THE ENGINEER.
4. UTILITIES SHOWN ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. ALL RAMPS ARE TYPE 10 UNLESS NOTED OTHERWISE.
6. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

0 25 50
SCALE IN FEET

ROADWAY SHEET QUANTITIES			
ITEM NO.	DESCRIPTION	QTY	UNIT
531 6002	CONC SIDEWALKS (5")	158	SY
531 6013	CURB RAMPS (TY 10)	4	EA

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SIDEWALK PLAN
STA 692+00 TO END

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		42

DATE: 3/5/2024 2:57:32 PM
FILE: ...\3 Roadway\FM 519 SWPL 08.dgn

100% SUBMITTAL

CK: DW: CK: DW:

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW1	LT	610+10.80	35.4	8.82	8.15	
		610+12.88	35.4	8.77	7.05	2.5
		610+12.88	34.08	8.75	7.05	2.3
		610+16.39	34.09	8.70	7.05	5.9
		610+16.39	35.4	8.72	7.05	2.2
		610+19.80	35.4	8.71	7.69	4.6
RW2	LT	610+76.00	35.4	8.94	7.99	
		610+78.54	35.4	8.95	6.95	3.7
		610+78.54	34.2	8.93	6.93	2.4
		610+82.04	34.2	8.94	6.93	7.0
		610+82.04	35.5	8.96	6.95	2.6
		610+98.00	35.5	8.89	8.07	22.5
RW3	RT	612+55.00	35.6	8.18	7.51	
		612+58.18	35.6	8.44	7.30	2.9
		612+61.63	35.6	8.44	7.40	3.7
		612+64.00	35.6	8.44	7.65	2.2
		612+65.00	35.6	8.45	7.83	0.7
RW4	LT	613+88.07	35.6	8.00	7.44	
		613+92.50	35.6	8.01	7.34	2.7
		613+95.00	35.6	8.01	7.18	1.9
		613+98.38	35.6	8.02	6.71	3.6
		613+99.46	35.6	8.02	6.27	1.7
		613+99.46	34.3	8.02	6.27	2.3
		614+02.98	34.3	7.94	6.28	6.0
		614+02.98	35.6	7.94	6.28	2.2
		614+09.40	35.6	7.83	6.93	8.2
RW5	RT	614+02.70	35.6	7.91	7.24	
		614+03.84	35.6	8.00	7.25	4.6
		614+07.26	35.6	8.00	7.12	3.5
		614+11.90	35.6	7.95	7.16	6.7
RW6	LT	614+73.45	35.6	7.76	7.09	
		614+74.40	35.6	7.76	6.95	0.7
		614+75.40	34.3	7.71	6.50	1.0
		614+78.90	34.3	7.76	6.46	4.4
		614+78.90	35.6	7.78	6.67	1.6
		614+81.00	35.6	7.69	7.02	1.9
RW7	LT	615+06.15	35.6	7.02	6.35	
		615+09.70	35.6	7.32	6.65	2.4
		615+12.86	35.6	7.49	6.21	3.1
		615+12.86	34.3	7.47	6.21	1.6
		615+16.23	34.3	7.63	6.17	4.6
		615+16.23	35.6	7.65	6.17	1.9
		615+18.42	35.6	7.64	6.89	2.4
		615+24.50	35.6	7.34	6.67	4.3
RW8	LT	616+74.08	35.8	7.10	6.43	
		616+76.50	35.8	7.07	6.04	2.1
		616+76.50	34.5	7.05	6.04	1.3
		616+79.90	34.5	7.01	6.08	3.3
		616+79.90	35.8	7.03	6.08	1.2
		616+83.00	35.8	6.86	6.19	2.5
RW9	RT	617+01.90	35.6	7.14	6.47	
		617+06.37	35.6	7.12	6.23	3.5
		617+13.90	35.6	6.49	6.34	3.9
RW10	LT	617+36.00	35.8	6.97	6.30	
		617+58.00	35.8	6.99	6.19	16.1
		617+70.00	35.8	7.02	6.00	10.9
		618+08.60	35.8	7.15	6.15	38.9
		618+12.08	35.8	7.15	5.82	4.1
		618+12.08	34.5	7.13	5.82	1.7
		618+15.60	34.5	7.12	5.85	4.5
		618+15.60	35.8	7.14	5.85	1.7
		618+24.09	35.8	7.14	6.25	9.2
		618+30.00	35.8	6.65	5.98	4.6
RW10A	RT	619+50.00	35.6	6.87	5.76	
		619+55.33	35.6	6.85	6.23	4.6
		619+65.33	35.6	6.56	5.89	6.4
RW11	LT	619+04.00	35.6	6.61	5.94	
		619+09.79	35.6	7.09	6.02	5.0
		619+49.94	35.6	6.89	5.87	41.8
		620+05.80	35.6	6.67	4.93	77.1
		620+05.80	34.3	6.65	4.93	2.3
		620+09.25	34.3	6.63	4.97	5.8
		620+09.25	35.6	6.65	4.97	2.2
		620+21.76	35.6	6.64	5.69	16.4
		620+25.00	35.6	6.37	5.70	2.6
RW12	RT	619+87.96	35.6	6.39	5.72	
		619+98.20	35.6	6.69	4.83	12.9
		620+06.36	35.6	6.66	4.83	15.0
		620+09.90	35.6	6.66	5.92	4.6

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW13	RT	621+17.90	35.7	6.25	5.18	
		621+33.17	35.7	6.27	4.63	20.6
		621+43.90	35.7	6.32	5.43	13.5
RW14	LT	623+79.00	35.6	6.29	5.63	
		623+89.20	35.6	6.59	5.13	10.9
		624+00.00	35.6	6.52	4.97	16.3
		624+08.29	35.6	6.50	4.78	13.5
		624+10.46	35.6	6.50	4.43	4.1
		624+10.71	35.6	6.49	4.39	0.5
		624+10.71	34.2	6.47	4.11	3.1
		624+14.20	34.2	6.47	4.11	8.2
		624+14.20	35.6	6.49	4.11	3.3
		624+18.50	35.6	6.13	5.47	6.5
RW15	LT	624+47.50	35.7	6.33	5.54	
		624+47.80	35.7	6.33	5.55	0.2
		624+62.67	35.7	6.29	5.12	14.5
		624+64.66	35.7	6.30	4.46	3.0
		624+64.66	34.4	6.28	4.17	2.6
		624+68.20	34.4	6.20	4.17	7.3
		624+68.20	35.7	6.22	4.17	2.7
		624+71.00	35.7	6.08	5.41	3.8
RW16	RT	624+87.90	35.8	6.19	5.26	
		625+00.00	35.8	6.20	5.14	12.0
		625+23.43	35.8	6.13	4.93	26.5
		625+27.90	35.8	6.19	5.00	5.4
RW17	LT	625+28.28	35.7	6.19	5.36	
		625+32.20	35.7	6.24	4.52	5.0
		625+32.20	34.3	6.22	4.43	2.5
		625+35.70	34.4	6.16	4.85	5.4
		625+35.70	35.7	6.18	4.85	1.7
		625+36.11	35.7	6.14	5.06	0.5
		625+39.60	35.7	5.85	5.18	3.0
RW18	RT	625+30.90	35.8	6.19	5.09	
		625+35.70	35.8	6.21	5.23	5.0
		625+39.90	35.8	6.23	5.29	4.0
RW19	LT	625+55.00	35.7	6.02	5.35	
		625+65.05	35.7	6.31	5.17	9.1
		625+70.85	35.7	6.32	4.81	7.7
		625+70.85	34.4	6.30	4.66	2.0
		625+74.35	34.4	6.30	4.62	5.8
		625+74.35	35.7	6.32	4.62	2.2
		625+80.94	35.7	6.33	5.12	9.6
		625+91.00	35.7	6.04	5.37	9.4
RW20	LT	626+12.00	35.7	6.16	5.49	
		626+22.59	35.7	6.47	5.35	9.4
		626+31.54	35.7	6.51	4.84	12.5
		626+31.54	34.4	6.49	4.51	2.4
		626+35.04	34.4	6.50	4.51	6.9
		626+35.04	35.7	6.52	4.51	2.6
		626+50.00	35.7	6.08	5.42	20.0
RW21	LT	626+73.00	35.7	6.18	5.51	
		626+83.65	35.7	6.49	5.18	10.5
		626+90.74	35.7	6.47	5.12	9.4
		627+00.00	35.7	6.38	5.22	11.6
		627+04.23	35.7	6.34	5.26	4.8
		627+07.51	35.7	6.33	5.03	3.9
		627+07.51	34.4	6.33	4.87	1.8
		627+11.01	34.4	6.32	4.87	5.1
		627+11.01	35.7	6.32	4.87	1.9
		627+20.00	35.7	5.88	5.22	9.5
RW22	LT	627+48.00	35.7	5.81	5.14	
		627+57.96	35.7	6.10	5.08	8.4
		627+61.57	35.7	6.07	4.79	4.2
		627+61.57	34.4	6.07	4.71	1.7
		627+65.07	34.4	6.06	4.71	4.8
		627+65.07	35.7	6.06	4.71	1.8
		627+72.00	35.7	5.86	5.19	7.0
RW23	RT	627+99.96	35.7	6.08	5.13	
		628+09.71	35.7	6.11	5.02	10.0
		628+17.56	35.7	6.09	4.53	10.4
		628+24.90	35.7	6.11	4.73	10.8
RW24	LT	628+10.00	35.7	6.14	5.47	
		628+14.40	35.7	6.12	4.99	4.0
		628+14.40	34.4	6.12	4.87	1.5
		628+17.90	34.4	6.11	4.87	4.4
		628+17.90	35.7	6.11	4.87	1.6
		628+23.00	35.7	6.06	5.03	5.8

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW25	LT	628+41.90	35.7	6.13	5.18	
		628+61.93	35.7	6.25	5.27	19.3
		628+67.08	35.7	6.24	4.81	6.2
		628+67.08	34.4	6.22	4.70	1.9
		628+70.58	34.4	6.23	4.70	5.4
		628+70.58	35.7	6.25	4.70	2.0
		628+76.02	35.7	6.27	5.40	6.6
		628+83.90	35.7	6.29	5.49	6.6
RW26	LT	629+22.31	35.7	6.25	5.10	
		629+22.31	34.4	6.23	5.10	1.5
		629+25.81	34.4	6.24	5.10	4.0
		629+25.81	35.7	6.26	5.10	1.5
		629+29.50	35.7	6.35	5.68	3.4
RW27	LT	630+43.90	35.6	6.39	5.72	
		630+50.00	35.6	6.35	5.60	4.3
		630+61.69	35.6	6.21	5.44	8.9
		630+72.41	35.6	5.77	4.28	12.1
		630+72.41	34.3	5.75	4.28	1.9
		630+75.90	34.3	5.71	4.28	5.0
		630+75.90	35.6	5.73	4.28	1.9
		630+81.90	35.6	5.66	4.99	6.3
RW28	LT	631+11.90	35.5	5.54	4.87	
		631+18.07	35.5	5.54	3.97	6.9
		631+18.07	34.1	5.52	3.97	2.2
		631+21.60	34.1	5.52	3.97	5.5
		631+21.60	35.5	5.54	3.97	2.2
		631+32.90	35.5	5.87	5.20	12.6
RW29	RT	631+43.90	35.6	5.87	4.88	
		631+50.00	35.6	5.85	4.88	6.0
		631+53.82	35.6	5.85	4.98	3.5
		631+59.90	35.6	5.86	4.96	5.4
RW30	LT	631+59.90	35.5	5.86	5.19	
		631+68.07	35.5	5.86	5.12	5.7
		631+78.29	35.5	5.87	4.21	12.2
		631+78.29	34.2	5.85	4.21	2.1
		631+81.79	34.2	5.85	4.19	5.8
		631+81.79	35.5	5.87	4.19	2.2
		631+84.13	35.5	5.87	4.71	3.3
		631+93.90	35.5	5.59	4.92	14.2
RW31	LT	632+22.90	35.5	5.69	5.02	
		632+33.23	35.6	5.99	5.03	8.4
		632+36.68	35.5	6.00	4.98	3.4
		632+40.47	35.5	6.02	4.63	4.6
		632+40.47	34.2	6.00	4.63	1.8
		632+43.97	34.2	6.01	4.68	4.7
		632+43.97	35.5	6.03	4.68	1.7
		632+59.90	35.5	6.04	5.27	16.9
RW32	RT	634+19.90	35.8	5.93	4.96	
		634+31.92	35.8	5.98	5.16	10.8
		634+35.28	35.8	5.92	5.13	2.7
		634+37.12	35.8	5.94	4.98	1.6
		634+40.79	35.8	5.95	5.24	3.1
		634+45.90	35.8	5.70	5.03	3.5
RW33	LT	634+31.90	35.5	5.83	5.11	
		634+35.54	35.5	5.85	4.88	3.1
		634+35.54	34.2	5.83	4.50	1.5
		634+39.04	34.2	5.81	4.50	4.6
		634+39.04	35.5	5.83	4.50	1.7
		634+59.90	35.5	5.82	5.15	20.8
RW34	LT	634+94.99	35.5	5.58	4.92	
		635+05.12	35.6	5.88	4.47	10.5
		635+09.26	35.5	5.89	4.59	5.6
		635+09.26	34.2	5.87	4.59	1.7
		635+12.76	34.2	5.88	4.59	4.5
		635+12.76	35.5	5.90	4.59	1.7
		635+19.75	35.5	5.93	4.88	8.3
		635+38.69	35.5	6.03	5.08	19.0
		635+45.00	35.5	5.72	5.06	5.1
RW35	LT	636+40.83	35.6	6.43	3.26	
		636+40.83	34.2	6.41	3.26	4.4
		636+44.33	34.2	6.42	3.26	11.0
		636+44.33	35.6	6.44	3.26	4.4
RW36	RT	637+19.90	35.8	6.61	5.65	
		637+35.69	35.8	6.64	5.43	17.1
		637+51.26	35.8	6.57	5.41	18.4
		637+51.90	35.8	6.55	5.88	0.6
RW37	LT	637+31.90	35.7	6.60	5.93	
		637+36.38	35.7	6.61	4.89	5.3
		637+36.38	34.4	6.59	4.89	2.2
		637+39.88	34.4	6.59	4.89	5.9
		637+39.88	35.7	6.61	4.89	2.2
		637+50.00	35.7	6.58	5.51	14.1
		637+72.00	35.7	6.50	5.75	20.0
		637+74.90	35.7	6.51	5.84	2.1

NOTES:

1. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

RETAINING WALL PROPERTIES

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		43

DATE: 9/11/2023 4:54:33 PM
FILE: ...\FM 519 RET WALL TABLE 01.dgn

100% SUBMITTAL

CK: DW: CK: DW:

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW38	LT	638+11.99	35.7	6.35	5.68	
		638+26.80	35.7	6.27	5.60	9.9
		638+32.22	35.7	6.23	4.76	5.8
		638+32.22	34.4	6.21	4.76	1.9
		638+35.72	34.4	6.18	4.71	5.1
		638+35.72	35.7	6.20	4.71	1.9
		638+39.08	35.7	6.16	5.26	4.0
		638+43.93	35.7	6.14	5.22	4.4
		638+62.90	35.7	6.10	5.43	15.1
RW39	RT	638+83.90	35.8	6.04	5.30	
		638+91.47	35.8	6.14	5.15	6.5
		638+97.01	35.8	6.08	5.31	4.9
		638+99.90	35.8	5.84	5.17	2.1
RW40	RT	639+23.90	35.9	5.72	4.93	
		639+33.90	35.9	5.84	4.93	8.5
RW41	LT	639+35.90	35.6	5.75	5.09	
		639+41.61	35.6	6.23	5.51	4.0
		639+50.00	35.6	6.27	5.57	5.9
		639+59.54	35.6	6.36	5.07	9.5
		639+59.54	34.2	6.36	5.07	1.8
		639+63.04	34.2	6.39	5.07	4.6
		639+63.04	35.6	6.39	5.07	1.8
		639+70.00	35.6	6.46	5.59	7.6
		639+72.00	35.6	6.48	5.81	1.5
		639+75.90	35.6	6.52	5.85	2.6
RW42	RT	639+84.90	35.9	6.40	5.42	
		640+00.00	35.9	6.64	5.57	15.5
		640+12.90	35.9	6.72	5.71	13.4
RW43	LT	639+94.90	35.6	6.71	5.78	
		640+00.00	35.6	6.64	5.73	4.7
		640+12.90	35.6	6.72	5.64	12.8
		640+32.60	35.6	6.84	5.54	23.4
		640+32.60	34.2	6.82	5.54	1.8
		640+36.10	34.2	6.80	5.54	4.4
		640+36.10	35.6	6.82	5.54	1.8
		640+55.00	35.6	6.88	6.16	18.9
		640+95.00	35.6	7.05	6.31	29.2
		641+07.76	35.6	7.19	4.99	18.7
		641+07.76	34.2	7.17	4.99	3.1
		641+11.26	34.2	7.21	4.99	7.7
		641+11.26	35.6	7.23	4.99	3.1
		641+15.90	35.6	6.84	6.18	6.7
RW44	LT	641+47.90	35.7	7.11	5.83	
		641+57.00	35.7	7.38	5.73	13.3
		641+60.14	35.7	7.36	5.04	6.2
		641+60.14	34.3	7.34	5.04	3.2
		641+63.64	34.3	7.39	5.04	8.1
		641+63.64	35.7	7.41	5.04	3.3
		641+69.01	35.7	7.43	6.05	10.1
		642+65.50	35.7	7.91	7.19	101.0
RW45	LT	642+75.00	35.7	7.85	7.18	
		642+80.90	35.7	7.81	7.06	4.2
		642+95.83	35.7	7.56	6.14	16.1
		642+95.83	34.3	7.54	6.14	2.0
		642+99.33	34.3	7.80	6.14	5.3
		642+99.33	35.7	7.82	6.14	2.3
		643+47.90	35.7	7.48	6.70	59.8
RW46	RT	643+99.90	35.7	7.48	6.81	
		644+03.60	35.7	7.46	5.97	4.0
		644+07.77	35.8	7.45	6.50	5.1
		644+11.90	35.8	7.11	6.44	3.3
RW47	RT	644+39.90	35.8	7.46	6.80	
		644+43.26	35.8	7.56	5.73	4.2
		644+55.90	35.8	7.56	6.58	17.8
RW48	LT	645+38.02	35.5	7.72	7.00	
		645+39.40	35.5	7.74	6.13	1.6
		645+39.40	34.2	7.72	6.13	2.1
		645+42.90	34.2	7.77	6.13	5.6
		645+42.90	35.5	7.79	6.13	2.1
		645+44.02	35.5	7.80	7.13	1.3
RW49	RT	646+09.94	36.1	7.77	7.10	
		646+11.33	36.1	7.77	7.10	0.9
		646+17.33	36.1	8.06	5.99	8.2
		646+21.52	36.1	8.09	5.99	8.7
		646+23.43	36.1	8.09	6.14	3.9
		646+29.90	36.1	7.90	7.23	8.5

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW50	LT	646+15.02	35.5	7.97	7.30	
		646+16.05	35.5	8.00	7.12	0.8
		646+22.50	35.5	8.11	7.45	4.9
		646+39.57	35.5	8.28	6.96	16.9
		646+39.57	34.2	8.26	6.96	1.7
		646+43.07	34.2	8.21	6.96	4.5
		646+43.07	35.5	8.23	6.96	1.6
		647+00.00	35.4	8.30	7.24	66.1
		647+40.73	35.4	8.49	6.58	60.3
		647+40.73	34.1	8.47	6.58	2.5
		647+44.23	34.1	8.49	6.60	6.6
		647+44.23	35.4	8.51	6.60	2.5
		647+93.50	35.4	8.18	7.39	66.3
		647+94.00	35.4	8.19	7.52	0.4
RW51	RT	646+59.90	36.04	7.87	7.20	
		646+59.90	36.04	7.87	6.92	0.0
		646+71.75	36.04	8.22	4.79	26.0
		646+73.90	36.04	8.23	6.59	5.5
RW52	RT	648+31.90	36.1	8.08	7.10	
		648+34.54	36.1	8.07	6.50	3.4
		648+44.90	36.1	7.77	6.94	12.4
RW53	LT	648+97.00	35.1	8.25	7.28	
		648+97.59	35.1	8.27	7.28	0.6
		649+06.00	35.1	7.78	7.06	7.2
RW54	LT	649+25.96	35.1	7.85	7.18	
		649+31.71	35.1	7.87	7.20	17.9
		649+41.71	35.1	8.16	7.28	12.2
		649+54.17	35.1	8.05	6.79	13.3
		649+54.17	33.8	8.03	6.79	1.6
		649+57.67	33.8	8.01	6.80	4.3
		649+61.38	35.1	8.03	7.14	3.9
		649+72.02	35.1	7.72	7.21	7.4
RW55	LT	650+11.03	34.9	7.89	7.12	
		650+16.00	34.9	7.91	6.70	4.9
		650+16.00	33.7	7.89	6.70	1.4
		650+19.50	33.7	7.87	6.70	4.1
		650+19.50	35	7.89	6.70	1.5
		650+26.03	34.9	7.86	7.11	6.3
RW56	RT	650+93.90	36.2	7.97	6.95	
		651+02.41	36.2	7.98	5.75	13.8
		651+12.90	36.3	7.67	7.01	16.0
RW57	LT	650+98.99	35	8.19	6.52	
		650+98.99	33.6	8.17	6.52	2.3
		651+02.49	33.6	8.17	6.52	5.8
		651+02.49	35	8.19	6.52	2.3
		651+47.25	34.9	8.22	7.31	57.6
		651+57.03	34.9	7.93	7.27	7.7
RW58	RT	651+37.90	36.3	7.76	7.09	
		651+47.25	36.3	8.03	6.94	8.2
		651+50.00	36.2	7.99	6.89	3.0
		651+69.90	36.3	7.78	6.98	18.9
RW59	LT	651+98.03	35.1	7.68	7.01	
		651+99.10	34.9	7.68	7.01	0.7
		651+99.10	33.6	7.66	7.01	0.9
		652+02.60	33.6	7.66	7.01	2.3
		652+02.60	34.9	7.68	7.01	0.9
		652+13.03	34.9	7.97	7.30	7.0
RW60	LT	652+26.02	34.9	7.59	6.92	
		652+31.40	34.9	7.73	7.06	3.6
		652+44.43	34.9	7.82	6.51	12.9
		652+44.43	33.6	7.80	6.51	1.7
		652+47.93	33.6	7.78	6.51	4.5
		652+47.93	34.9	7.80	6.51	1.7
		652+50.03	34.9	7.79	6.99	2.2
RW61	RT	652+27.90	36.4	7.53	6.73	
		652+34.43	36.4	7.51	5.98	7.6
		652+34.43	35.1	7.49	5.98	2.0
		652+37.93	35.1	7.49	5.76	5.7
		652+37.93	36.4	7.51	5.76	2.3
		652+49.90	36.4	7.53	6.55	16.4
RW62	RT	652+93.90	36.4	7.51	6.84	
		652+94.70	36.4	7.53	6.51	0.7
		653+00.00	36.4	7.57	6.10	6.6
		653+12.00	36.4	7.55	6.32	16.2
		653+23.90	36.4	7.51	6.79	11.6
RW63	LT	652+93.03	34.8	7.58	6.91	
		652+97.48	34.8	7.61	6.67	3.6
		652+97.48	33.5	7.58	6.67	1.2
		653+00.98	33.5	7.62	6.67	3.2
		653+00.98	34.8	7.64	6.67	1.2
		653+02.03	34.8	7.64	6.97	0.9

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW64	RT	654+21.90	36.4	7.76	6.75	
		654+47.90	36.5	7.81	6.64	28.3
RW65	LT	654+32.03	34.9	7.85	7.02	
		654+50.74	34.9	7.81	6.76	17.6
		654+50.74	33.6	7.79	6.76	1.4
		654+54.24	33.6	7.74	6.76	3.5
		654+54.24	34.9	7.76	6.76	1.3
		654+58.03	34.9	7.71	6.97	3.3
RW66	LT	655+72.04	34.8	7.59	6.92	
		655+72.70	34.8	7.59	6.93	0.4
		655+81.05	34.8	7.56	6.19	8.5
		655+81.05	33.5	7.54	6.19	1.8
		655+84.55	34.8	7.55	6.19	4.7
		656+08.00	34.8	7.48	6.19	31.0
		656+12.02	34.8	7.47	6.80	3.9
RW67	RT	656+89.90	36.8	6.83	6.16	
		657+00.34	36.8	7.13	5.94	9.7
		657+15.99	36.8	7.05	5.82	19.0
		657+34.65	36.8	7.12	6.01	21.8
		657+37.44	36.8	7.06	6.01	3.0
		657+39.28	36.8	6.96	5.96	1.9
		657+43.90	36.8	6.74	6.07	3.8
RW68	LT	657+16.01	34.7	7.05	6.38	
		657+33.82	34.7	7.12	5.63	19.2
		657+33.82	33.4	7.10	5.63	1.9
		657+37.32	33.4	7.07	5.75	4.9
		657+37.32	34.7	7.09	5.75	1.7
		657+38.76	34.7	7.15	5.75	2.0
		657+45.03	34.7	6.85	6.18	6.5
RW69	LT	657+64.03	34.7	6.89	6.22	
		657+70.44	34.7	7.20	6.14	5.5
		657+78.15	34.7	7.26	5.75	9.9
		657+78.15	33.3	7.24	5.75	2.1
		657+81.65	33.3	7.28	5.75	5.3
		657+81.65	34.7	7.30	5.75	2.2
		657+81.97	34.7	7.30	5.75	0.5
		657+84.89	34.7	7.06	6.41	3.2
		657+87.03	34.7	7.30	6.47	1.6
RW70	RT	657+76.90	36.8	7.00	5.59	
		657+77.70	36.8	7.02	5.61	1.1
		657+91.81	36.8	7.09	5.57	20.7
		658+05.90	36.8	7.22	5.98	19.4
RW71	LT	658+37.60	34.6	7.40	6.42	
		658+60.10	34.6	7.43	6.26	24.2
		658+60.10	33.3	7.41	6.26	1.5
		658+63.60	33.3	7.42	6.36	3.9
		658+63.60	34.6	7.44	6.36	1.4
		658+77.02	34.6	7.48	6.81	11.7
RW72	LT	659+76.98	34.7	7.86	7.19	
		659+80.15	33.4	7.85	6.47	3.2
		659+83.65	33.4	7.95	6.47	9.5
		659+84.02	33.4	7.95	6.47	0.5
		659+84.02	32.9	7.93	6.47	0.7
		659+87.52	33.4	7.91	6.52	5.0
		659+87.52	34.7	7.93	6.52	1.8
		659+96.28	34.7	7.88	6.52	12.1
		660+02.28	34.7	7.60	6.77	6.6
		660+05.90	34.7	7.58	6.91	2.7
RW73	RT	660+02.00	36.9	7.44	6.17	
		660+05.98	36.9	7.80	6.23	5.6
		660+23.98	36.9	7.88	6.50	26.6
RW74	LT	660+23.98	34.8	7.62	6.95	
		660+34.35	34.8	7.92	6.55	10.5
		660+37.91	34.8	7.94	6.27	5.4
		660+37.91	33.4	7.92	6.27	2.3
		660+41.41	33.4	7.93	6.27	5.8
		660+41.41	34.8	7.95	6.27	2.3
		660+43.35	34.8	7.96	6.33	3.2
		660+53.90	34.8	7.65	6.99	12.1
RW75	LT	660+75.98	34.8	7.94	7.07	
		660+80.54	34.8	7.91	6.96	4.1
		660+86.54	34.8	8.20	6.96	6.5
		660+87.04	34.8	8.20	7.00	0.6
		660+87.04	33.5	8.18	7.00	1.5
		660+91.32	33.5	8.21	7.50	4.1
		660+91.32	34.8	8.23	7.50	0.9
		660+92.54	34.8	8.25	7.36	1.0
		660+97.98	34.8	7.99	7.32	4.2
RW76	RT	661+25.00	36.8	8.30	7.29	
		661+34.00	36.8	8.49	7.28	10.0
		661+37.58	36.8	8.49	7.74	3.5
		661+43.00	36.8	8.23	7.56	3.8

NOTES:

1. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

©2023
Texas Department of Transportation

FM 519

RETAINING WALL PROPERTIES

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		44

DATE: 9/11/2023 4:55:13 PM
FILE: ...\FM 519 RET WALL TABLE 02.dgn

100% SUBMITTAL

CK: DW: CK: DW:

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW77	LT	661+38.97	34.8	8.60	7.93	
		661+39.75	34.8	8.57	7.89	0.5
		661+40.23	34.8	8.58	7.70	0.4
		661+40.23	33.4	8.56	7.70	1.2
		661+43.73	33.4	8.57	7.59	3.2
		661+43.73	34.8	8.59	7.59	1.4
		661+45.12	34.8	8.60	7.94	1.2
		661+48.96	34.8	8.63	7.96	2.6
RW78	RT	661+60.00	36.7	8.46	7.79	
		661+62.34	36.7	8.57	7.33	2.2
		661+63.49	36.7	8.57	7.33	1.4
		661+63.49	35.4	8.57	7.33	1.6
		661+66.99	35.4	8.59	7.30	4.4
		661+66.99	36.7	8.59	7.30	1.7
		661+76.99	36.7	8.66	7.30	13.3
RW79	LT	661+88.98	34.9	8.83	8.16	
		661+90.59	34.9	8.84	8.18	1.1
		661+91.02	34.9	8.85	8.14	0.3
		661+91.02	33.6	8.85	8.14	0.9
		661+94.52	33.6	8.87	7.99	2.8
		661+94.52	34.9	8.87	7.99	1.1
		661+96.90	34.9	8.87	8.06	2.0
RW80	LT	662+38.00	34.9	8.95	8.28	
		662+42.77	34.9	8.98	7.89	4.2
		662+42.77	33.6	8.96	7.89	1.4
		662+46.27	33.6	8.99	7.89	3.8
		662+46.27	34.9	9.01	7.89	1.4
		662+46.76	34.9	9.02	7.92	0.5
		662+53.00	34.9	8.72	8.06	5.5
RW81	LT	662+84.00	35	9.24	8.57	
		662+84.41	35	9.25	8.59	0.3
		662+88.65	35	9.26	8.28	3.5
		662+88.65	33.7	9.26	8.28	1.3
		662+92.15	33.7	9.28	8.32	3.4
		662+92.15	35	9.28	8.32	1.2
		662+98.00	35	9.30	8.61	4.8
RW82	RT	663+22.00	36.6	9.37	8.49	
		663+35.16	36.6	9.42	7.86	16.1
		663+45.99	36.6	9.43	8.52	13.4
RW83	RT	663+92.00	36.5	9.28	8.61	
		663+94.00	36.5	9.28	8.45	1.5
		664+04.00	36.5	9.57	8.74	8.3
RW84	LT	663+98.00	34.9	9.72	9.05	
		663+99.39	34.9	9.72	8.90	1.0
		663+99.39	33.6	9.72	8.90	1.1
		664+02.89	33.6	9.72	8.73	3.2
		664+02.89	34.9	9.72	8.73	1.3
		664+06.00	34.9	9.41	8.74	2.6
RW85	LT	664+56.00	34.9	9.97	9.18	
		664+61.00	34.9	9.95	8.92	4.6
		664+61.00	33.6	9.93	8.92	1.3
		664+64.50	33.6	9.91	8.92	3.5
		664+64.50	34.9	9.93	8.92	1.3
		664+64.84	34.9	9.93	8.92	0.3
		664+75.00	34.9	9.63	8.97	8.5
RW86	LT	665+03.00	35.1	9.99	9.32	
		665+03.30	35.1	10.00	9.33	0.2
		665+07.74	35.1	10.03	8.31	5.3
		665+07.74	33.8	10.01	8.31	2.2
		665+11.24	33.8	10.03	8.12	6.3
		665+11.24	35.1	10.05	8.12	2.5
		665+86.11	35.1	10.44	9.28	115.7
		665+86.11	33.8	10.42	9.28	1.5
		665+89.61	33.8	10.44	9.28	4.0
		665+89.61	35.1	10.46	9.28	1.5
		665+90.38	35.1	10.47	9.41	0.9
		665+94.00	35.1	10.17	9.50	3.1
RW87	RT	665+22.00	36.3	10.32	9.65	
		665+38.00	36.3	10.33	9.10	15.1
		665+35.75	36.3	10.26	9.10	2.7
		665+38.00	36.3	10.26	9.59	2.1
RW88	RT	665+71.00	36.3	10.24	9.57	
		665+74.63	36.3	10.06	9.39	2.4
		665+89.00	36.3	10.06	9.39	9.6
RW89	LT	666+10.00	35.2	10.12	9.45	
		666+14.61	35.2	10.50	9.05	4.9
		666+14.61	33.9	10.50	9.05	1.9
		666+18.11	33.9	10.58	9.07	5.2
		666+18.11	35.2	10.58	9.07	2.0
		666+22.40	35.2	10.58	9.92	4.6
		666+23.01	35.2	10.58	9.91	0.4

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW90	LT	666+66.00	35.2	10.15	9.48	
		666+67.47	35.3	10.15	9.48	1.0
		666+73.47	35.3	10.65	9.71	6.0
		666+75.11	35.3	10.66	9.71	1.6
		666+75.11	33.9	10.64	9.71	1.3
		666+79.51	33.9	10.50	9.63	4.0
		666+79.51	35.3	10.67	9.63	1.3
		666+80.59	35.3	10.68	9.63	1.1
		666+86.59	35.3	10.38	9.72	5.2
		666+89.00	35.3	10.38	9.71	1.6
RW91	LT	668+85.00	35.3	10.74	10.07	
		668+88.81	35.3	10.75	10.08	2.5
		668+98.81	35.3	11.04	9.95	8.8
		669+02.03	35.3	11.02	9.23	4.6
		669+02.03	33.9	11.00	9.23	2.5
		669+05.53	33.9	11.01	9.23	6.2
		669+05.53	35.3	11.01	9.23	2.5
		669+65.61	35.05	10.72	9.58	87.4
		669+66.07	35.04	10.70	9.58	0.5
		669+66.07	33.7	10.70	9.58	1.5
		669+69.57	33.7	10.72	9.58	3.9
		669+69.57	35	10.72	9.58	1.5
		669+70.45	35	10.72	9.85	0.9
		669+73.95	35	10.43	9.76	2.7
RW92	RT	669+00.00	35.9	11.00	10.33	
		669+18.00	35.9	10.93	10.26	12.0
RW93	RT	669+67.00	35.9	10.70	9.37	
		669+76.00	35.9	10.69	9.69	10.5
RW94	LT	671+12.00	35.5	9.75	9.08	
		671+22.27	35.5	10.05	9.38	6.8
		671+25.00	35.5	10.05	7.99	3.7
		671+29.75	35.5	10.05	9.38	6.5
		671+32.00	35.5	10.05	9.38	1.5
RW95	LT	673+11.90	35.9	8.89	8.20	
		673+52.35	35.9	8.65	6.96	48.2
		673+52.79	35.9	8.65	6.94	0.7
		673+52.79	34.6	8.63	6.94	2.2
		673+56.29	34.6	8.62	6.82	6.1
		673+56.29	35.9	8.64	6.82	2.4
		673+56.74	35.9	8.63	6.88	0.8
		673+59.11	35.9	8.65	7.34	3.6
		673+64.90	35.9	8.37	7.70	5.7
RW96	RT	673+61.10	35.3	8.68	8.01	
		673+62.10	35.3	8.68	8.02	0.7
		673+70.00	35.3	8.69	7.72	6.5
		673+77.62	35.3	8.71	7.64	7.8
		673+88.10	35.2	8.40	7.74	9.1
RW97	LT	677+40.00	36.5	8.72	8.05	
		677+44.78	36.4	8.72	7.90	3.6
		677+54.78	36.4	9.01	8.19	8.2
		678+02.69	35.8	8.86	7.65	48.7
		678+31.99	35.5	8.79	8.00	29.3
RW98	RT	677+85.00	35.4	8.91	7.52	
		677+91.85	35.4	8.94	7.30	10.4
		677+97.99	35.6	8.93	7.62	9.1
RW99	RT	678+76.00	36.6	8.25	7.28	
		678+92.78	36.8	8.47	7.11	19.6
		679+71.00	37.3	8.28	7.51	83.7
RW100	RT	680+92.00	37.3	8.34	7.27	
		681+35.55	37.3	8.43	6.77	59.6
		681+35.55	35.9	8.41	6.77	2.3
		681+39.05	35.9	8.41	6.71	5.9
		681+39.05	37.3	8.43	6.71	2.4
		681+40.40	37.3	8.43	6.82	2.3
		681+47.72	37.3	8.42	7.20	10.3
		681+58.00	37.2	8.12	7.45	9.7
RW101	RT	681+78.00	37.2	8.13	7.34	
		681+88.22	37.2	8.43	7.23	10.1
		682+02.34	37.2	8.44	7.10	17.9
		682+08.00	37.2	8.16	7.50	5.7
RW102	RT	682+25.00	37.1	7.50	6.83	
		682+39.00	37.1	7.51	6.84	9.3
RW103	RT	682+60.00	37.1	8.04	7.26	
		682+70.00	37.1	8.33	7.41	8.5
		682+98.43	37.1	8.22	6.51	37.3
		682+98.43	35.8	8.20	6.51	2.2
		683+01.73	35.8	8.19	6.01	6.4
		683+01.93	35.8	8.21	6.01	0.4
		683+01.93	37.1	8.21	6.01	2.9
		683+45.00	37.1	7.81	6.81	68.9

WALL ID	SIDE	STATION	OFFSET (FT)	WALL ELEV TOP	WALL ELEV BOT	AREA (SF)
RW104	LT	682+72.00	34.1	8.42	7.75	
		682+74.26	34.1	8.53	7.64	1.8
		682+78.84	34.1	8.54	7.61	4.2
		682+85.00	34.1	8.31	7.64	4.9
RW105	RT	683+64.00	37.1	8.01	7.08	
		683+73.09	37.1	8.00	6.73	10.0
		683+73.09	35.8	7.98	6.73	1.6
		683+76.59	35.8	7.98	6.69	4.4
		683+76.59	37.1	8.00	6.69	1.7
		684+01.00	37.1	7.97	6.86	29.5
		684+07.00	37.1	7.47	6.80	5.3
RW106	RT	684+96.00	36.7	7.99	7.05	
		684+99.77	36.7	7.99	6.74	4.1
		684+99.77	35.4	7.97	6.74	1.6
		685+03.27	35.4	7.98	6.89	4.1
		685+03.27	36.7	8.00	6.89	1.4
		685+08.00	36.7	8.02	7.33	4.3
RW107	RT	685+53.00	36.7	7.86	7.13	
		685+53.74	36.7	7.86	7.00	0.6
		685+59.74	36.7	8.15	6.79	6.6
		685+61.98	36.7	8.15	6.28	3.6
		685+61.98	35.4	8.13	6.28	2.4
		685+65.48	35.4	8.16	6.41	6.3
		685+65.48	36.7	8.16	6.41	2.3
		685+70.00	36.7	8.16	6.41	7.9
		685+76.00	36.7	7.87	7.20	7.2
RW108	LT	685+63.00	34.6	8.15	6.73	
		685+73.00	34.6	8.17	6.73	14.3
RW109	RT	686+50.00	36.7	8.21	7.13	
		686+61.25	36.7	8.22	6.51	15.6
		686+61.25	35.4	8.20	6.51	2.2
		686+64.75	35.4	8.18	6.64	5.7
		686+64.75	36.7	8.20	6.64	2.0
		686+72.00	36.7	8.17	7.16	9.3
RW110	RT	687+26.00	36.7	7.66	6.76	
		687+50.10	36.7	7.82	6.57	25.9
		687+50.10	35.3	7.80	6.55	1.8
		687+53.60	35.3	7.79	6.54	4.4
		687+53.60	36.7	7.81	6.56	1.8
		687+62.00	36.7	7.45	6.46	9.4
RW111	LT	687+35.00	34.8	8.05	7.15	
		687+50.00	34.8	7.90	7.05	11.1
		687+57.00	34.8	7.85	7.05	5.8
RW112	LT	688+72.00	34.9	7.35	6.68	
		688+75.00	34.9	7.35	6.62	2.1
		688+78.22	34.9	7.36	6.33	2.8
		688+82.00	34.9	7.38	6.71	3.2
RW113	LT	689+69.00	35.1	7.62	6.95	
		689+90.14	35.1	7.69	6.46	20.0
		689+96.79	35	7.68	6.46	8.1
		690+06.00	35	7.74	7.05	8.8
RW114	RT	689+85.00	36.4	7.40	6.73	
		689+86.94	36.4	7.40	6.69	1.3
		689+90.44	36.4	7.69	6.41	3.5
		689+91.55	36.4	7.69	5.87	1.7
		689+91.55	35	7.67	5.87	2.5
		689+95.05	35	7.68	5.81	6.4
		689+95.05	36.4	7.70	5.81	2.6
		689+96.35	36.4	7.71	5.81	2.5
		690+03.00	36.4	7.39	6.72	8.5
RW115	RT	690+79.00	36.4	7.85	6.86	
		690+79.45	36.4	7.85	6.86	0.4
		690+87.24	36.4	7.85	6.32	9.8
		690+87.24	35.1	7.83	6.32	2.0
		690+90.74	35.1	7.85	6.32	5.3
		690+90.74	36.4	7.85	6.32	2.0
		690+91.11	36.4	7.85	6.32	0.6
		690+97.00	36.4	7.56	6.90	6.5
RW116	RT	691+70.00	36.3	7.55	6.78	
		691+85.91	36.2	7.47	5.76	19.7
		691+85.91	34.9	7.45	5.76	2.2
		691+89.41	34.9	7.43	5.97	5.5
		691+89.41	36.2	7.45	5.97	1.9
		692+03.00	36.2	7.38	6.53	15.8
RW117	LT	691+80.00	35	7.51	6.76	
		691+89.12	35	7.44	6.83	10.1
		692+00.00	35	7.42	6.67	7.4
					TOTAL	4495.8

NOTES:

1. SEE RETAINING WALL PROPERTIES AND MISCELLANEOUS DRAINAGE DETAILS FOR ADDITONAL INFORMATION.

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

RETAINING WALL PROPERTIES

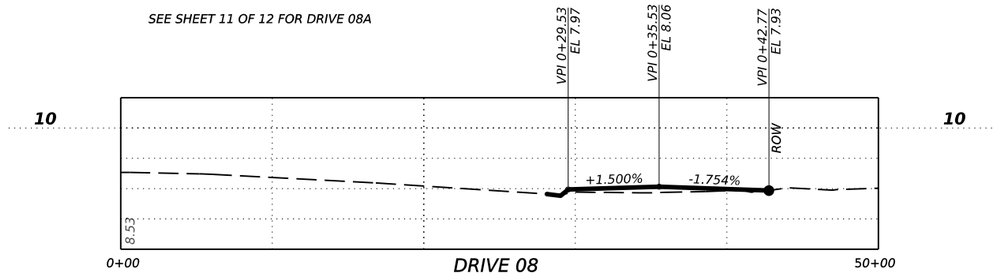
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		45

DATE: 9/11/2023 4:55:53 PM
FILE: ...\FM 519 RET WALL TABLE 03.dgn

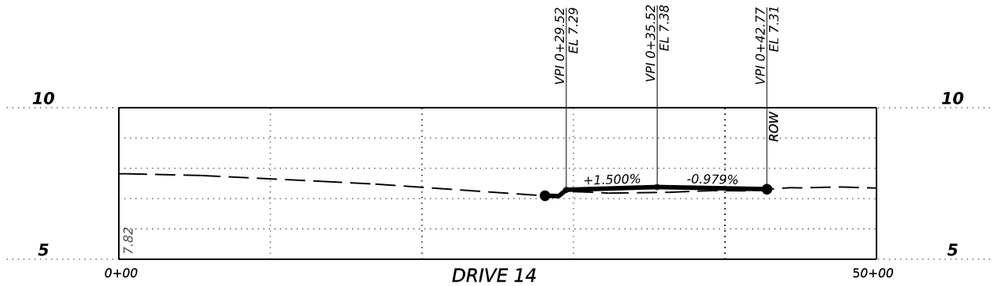
100% SUBMITTAL

DN: | DW: | CK: | DW: | CK:

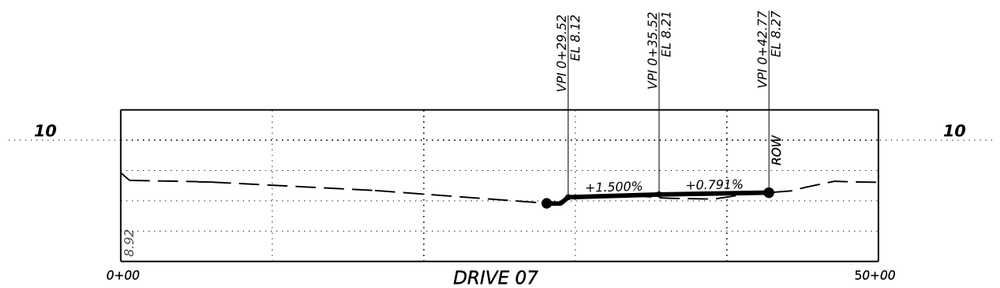
SEE SHEET 11 OF 12 FOR DRIVE 08A



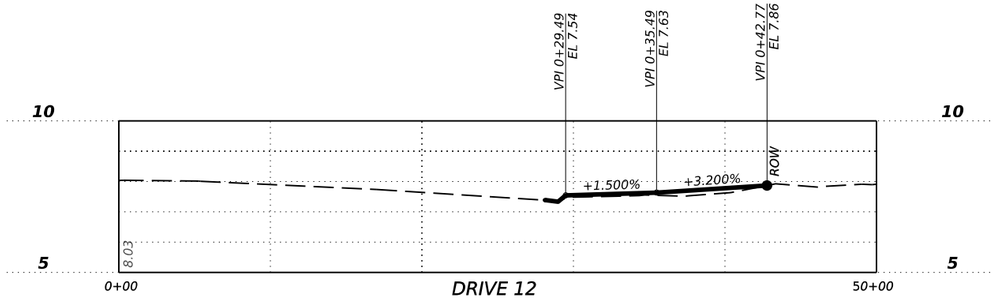
DRIVE 08



DRIVE 14

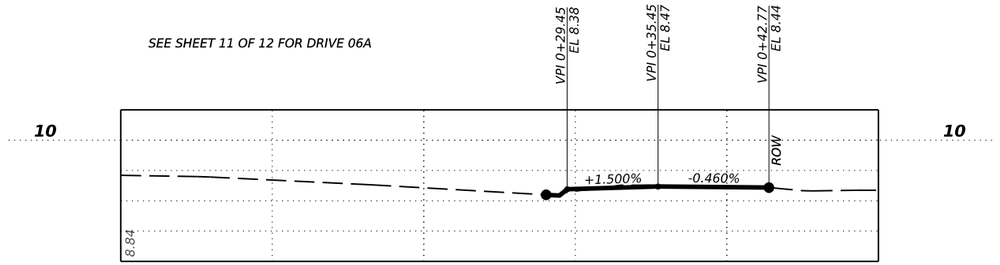


DRIVE 07

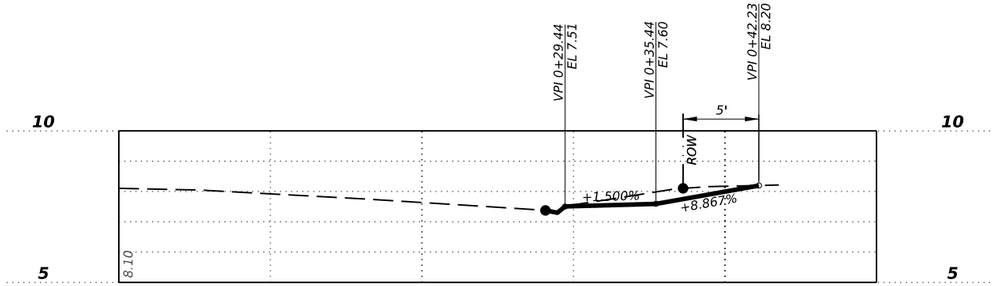


DRIVE 12

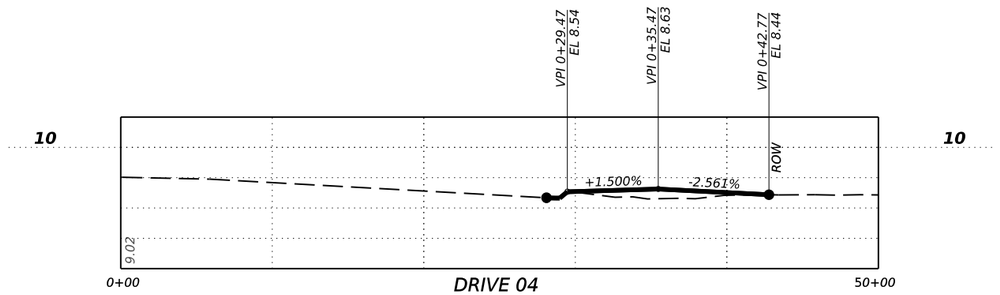
SEE SHEET 11 OF 12 FOR DRIVE 06A



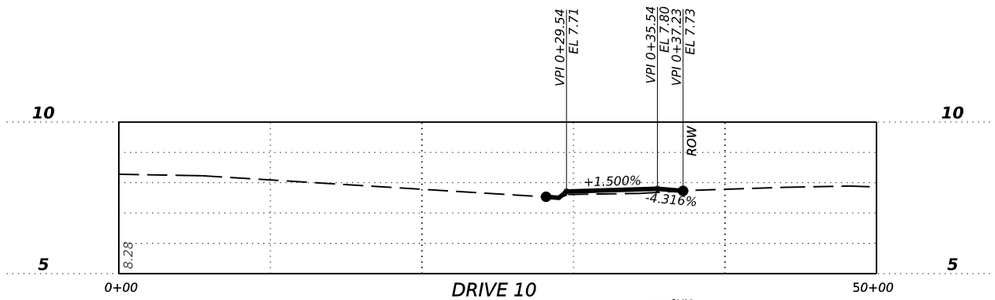
DRIVE 06



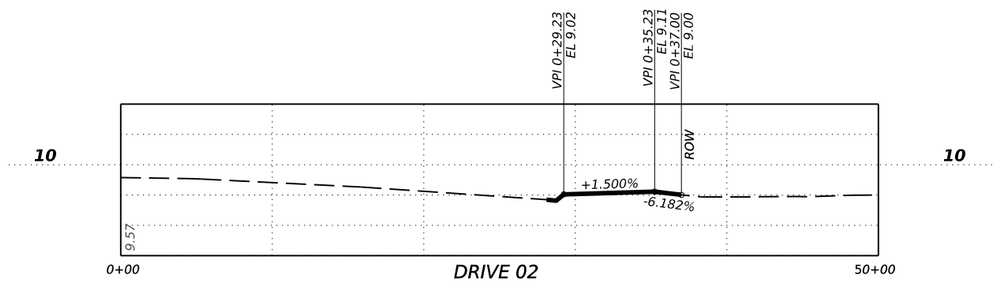
DRIVE 11



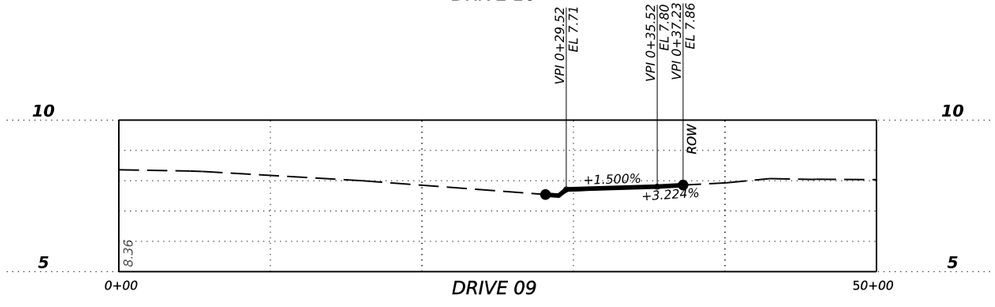
DRIVE 04



DRIVE 10



DRIVE 02



DRIVE 09

DATE: 9/11/2023 6:23:53 PM
FILE: ...\3 Roadway\FM 519 DWYPR 01.dgn

RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

FM 519

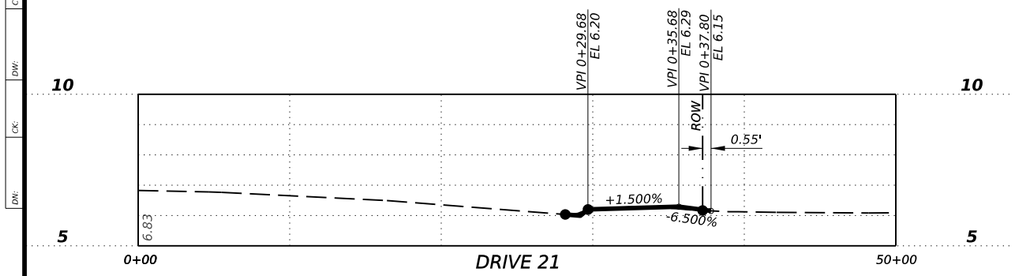
DRIVEWAY PROFILES

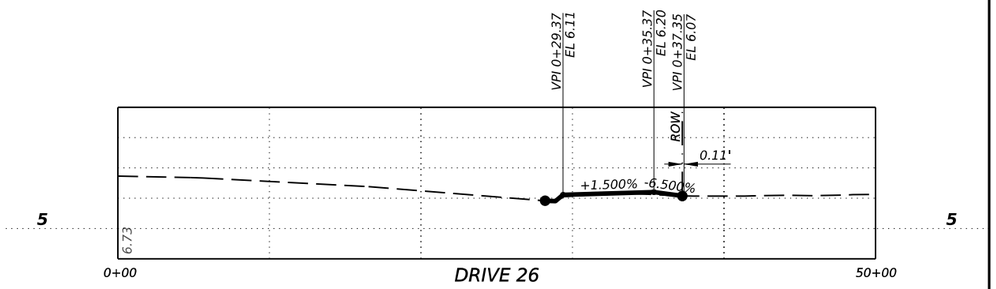
SCALE: 1"=10'H; 1"=5'V SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		46

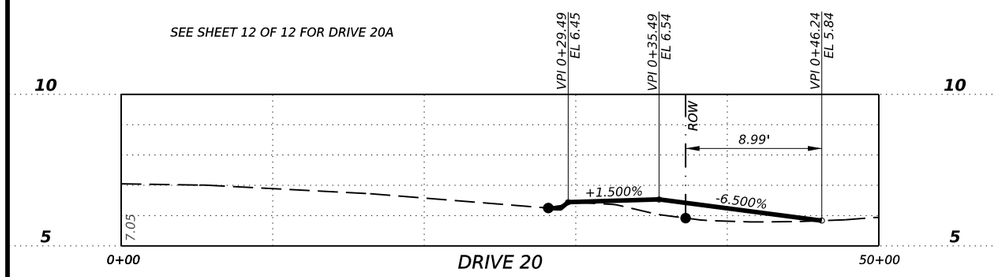
100% SUBMITTAL

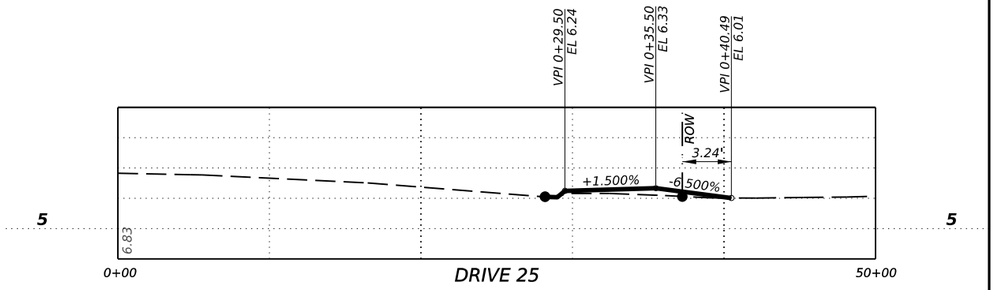
CK: DW: CK: DW:

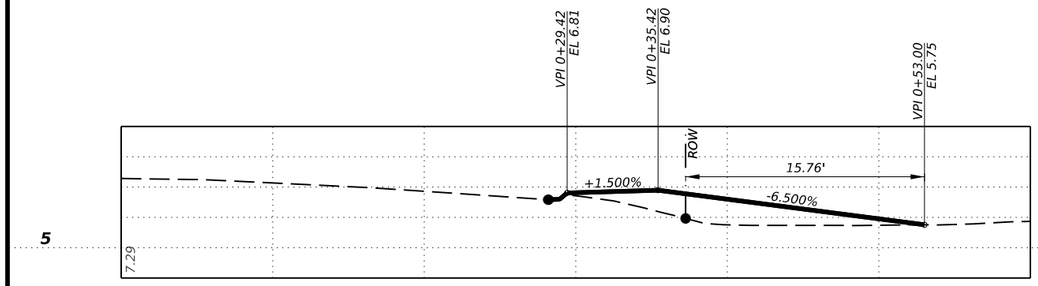


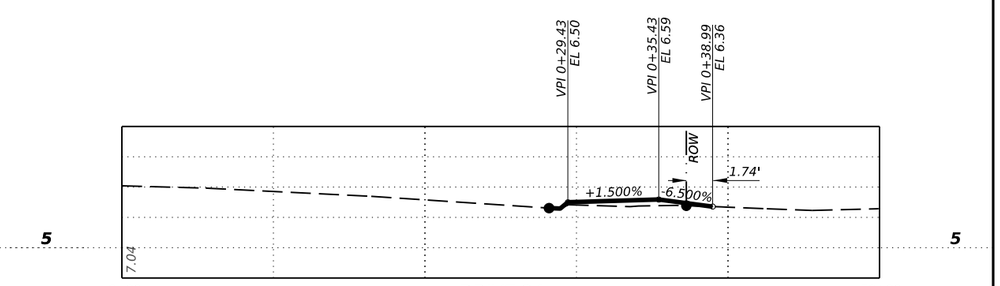


SEE SHEET 12 OF 12 FOR DRIVE 20A

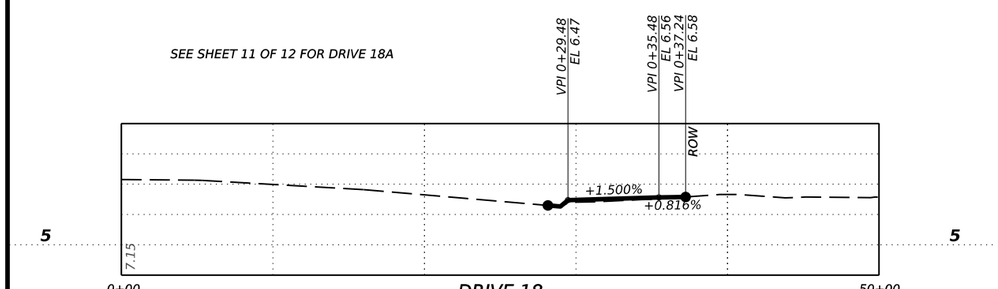


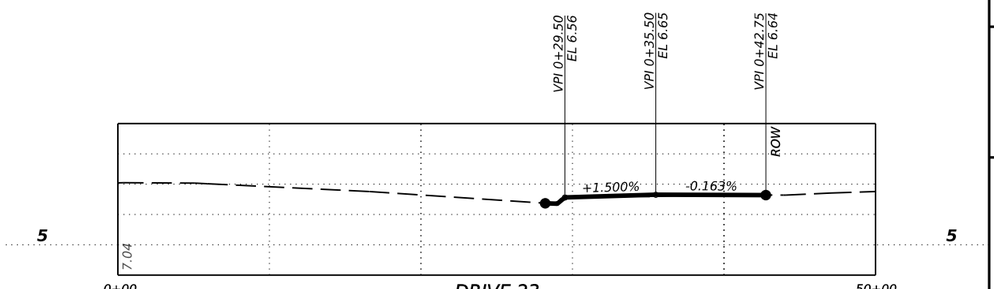


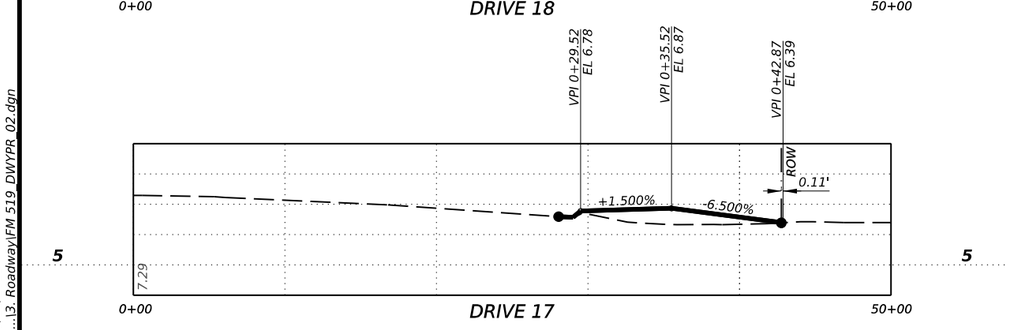


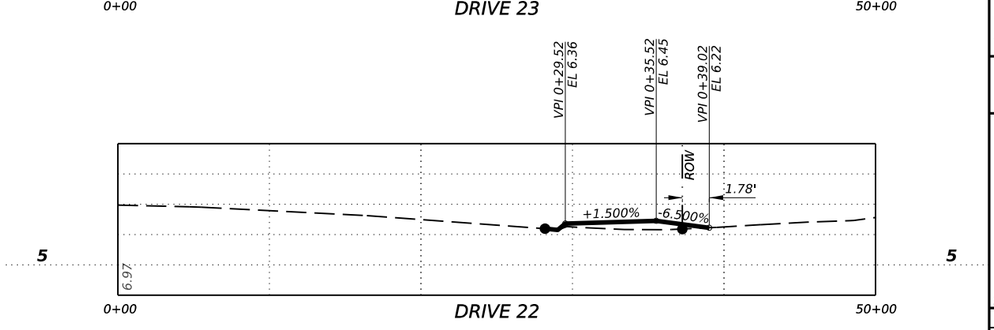


SEE SHEET 11 OF 12 FOR DRIVE 18A









DATE: 9/11/2023 6:25:28 PM
FILE: ...\3 Roadway\FM 519 DWYPR 02.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

FM 519

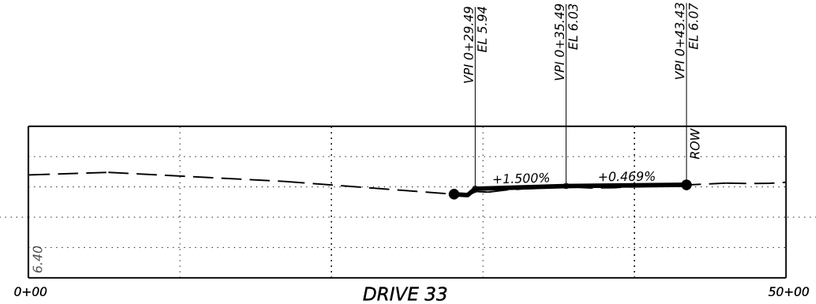
DRIVEWAY PROFILES

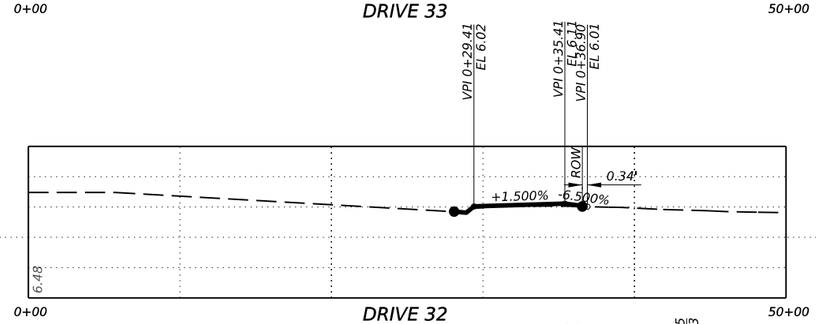
SCALE: 1"=10'H; 1"=5'V SHEET 2 OF 12

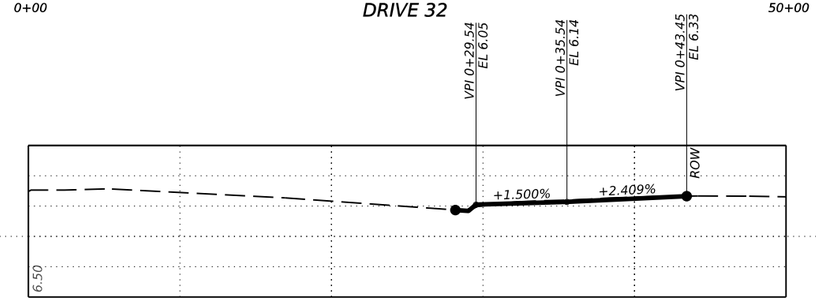
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		47

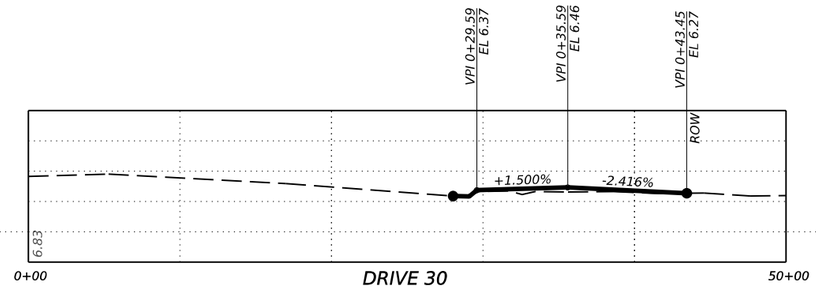
100% SUBMITTAL

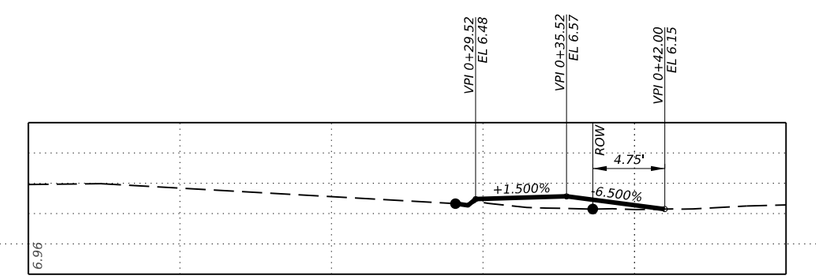
CK
DW
CK
DW

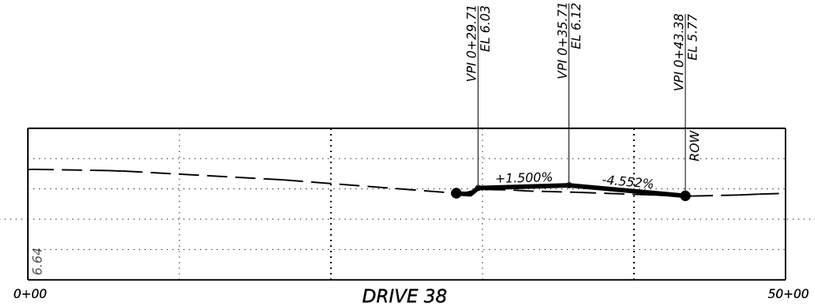




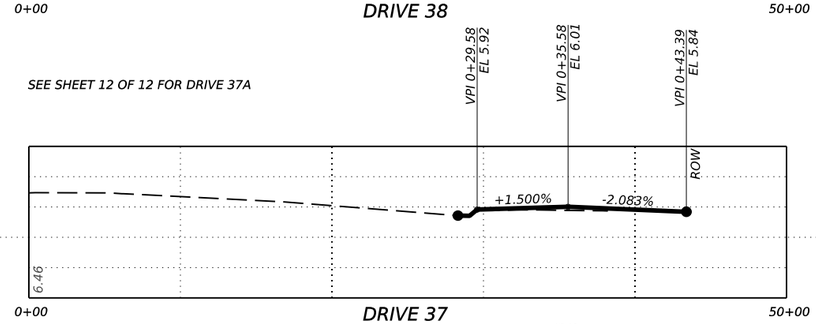




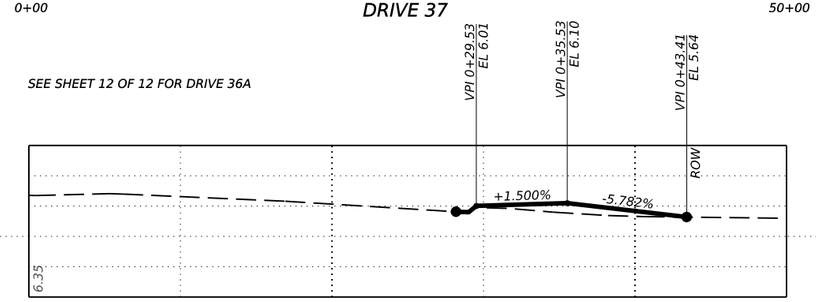




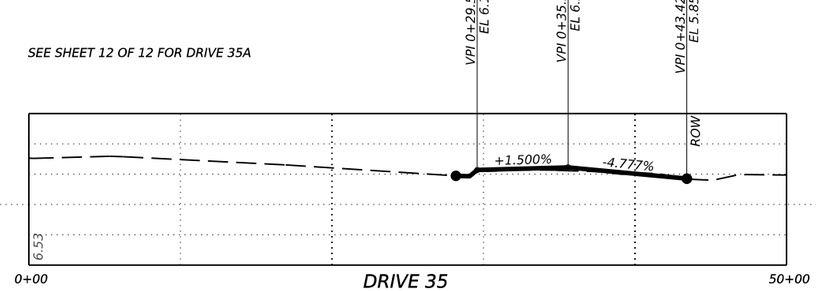
SEE SHEET 12 OF 12 FOR DRIVE 37A

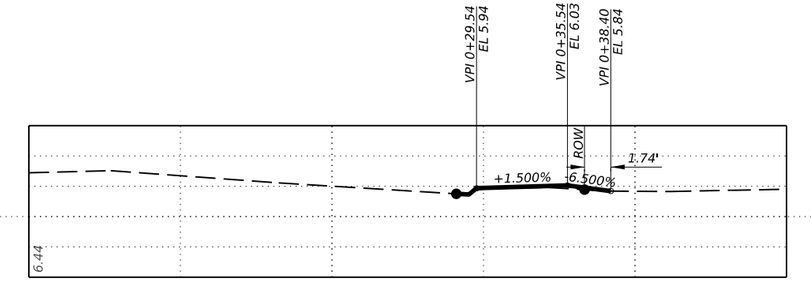


SEE SHEET 12 OF 12 FOR DRIVE 36A



SEE SHEET 12 OF 12 FOR DRIVE 35A





STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, PE 9/11/2023

Texas Department of Transportation

FM 519

DRIVEWAY PROFILES

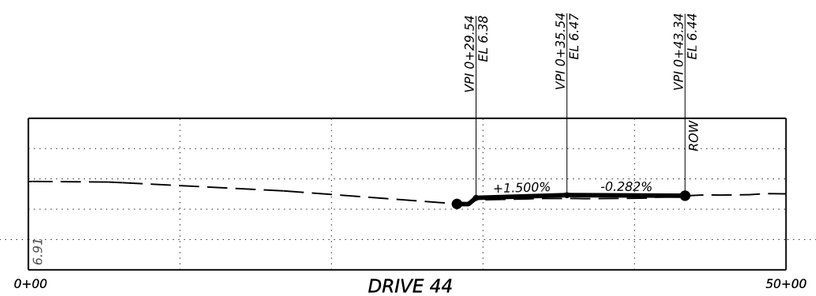
SCALE: 1"=10'H; 1"=5'V SHEET 3 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		48

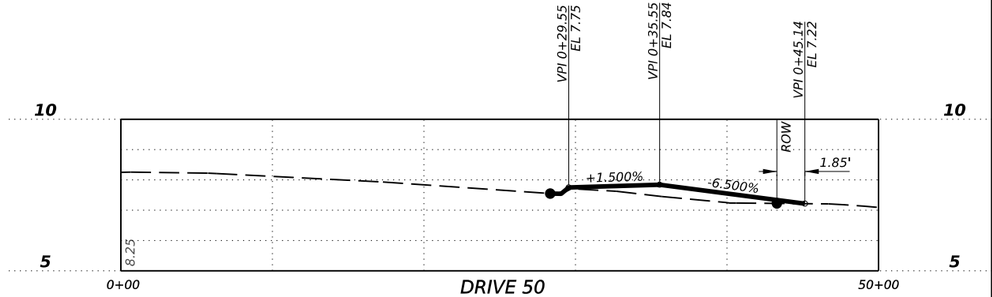
DATE: 9/11/2023 6:27:10 PM
FILE: ...\3. Roadway\FM 519 DWYPR_03.dgn

100% SUBMITTAL

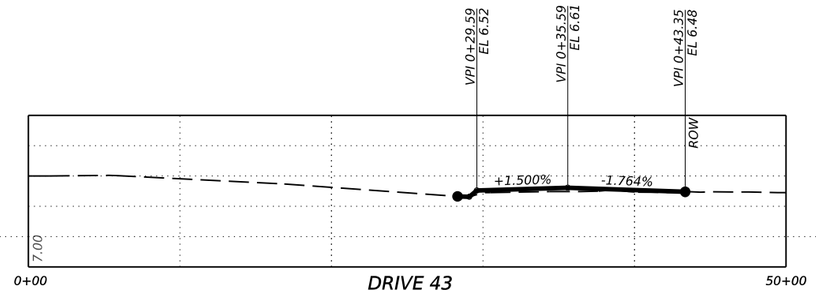
DW: CK: DW: CK:



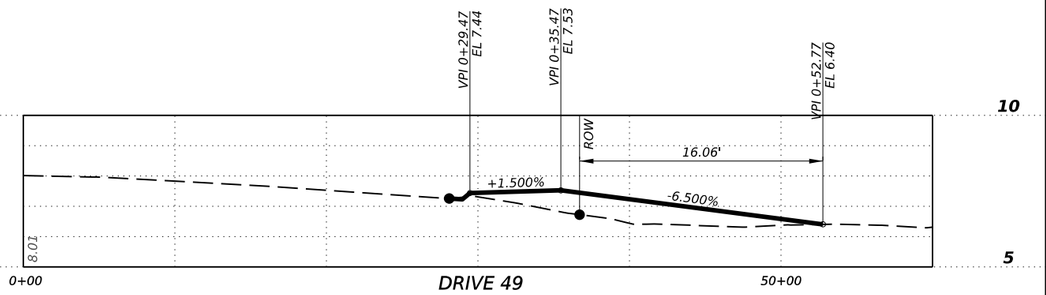
DRIVE 44



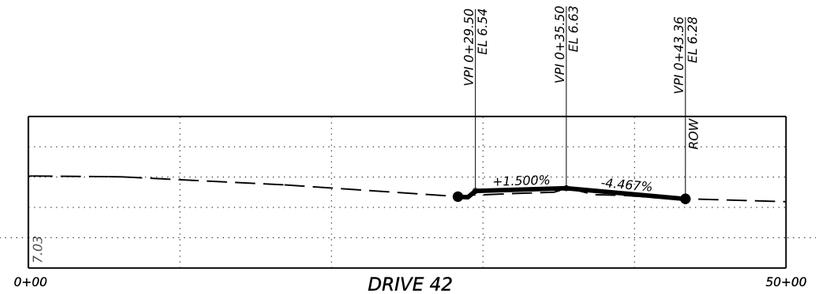
DRIVE 50



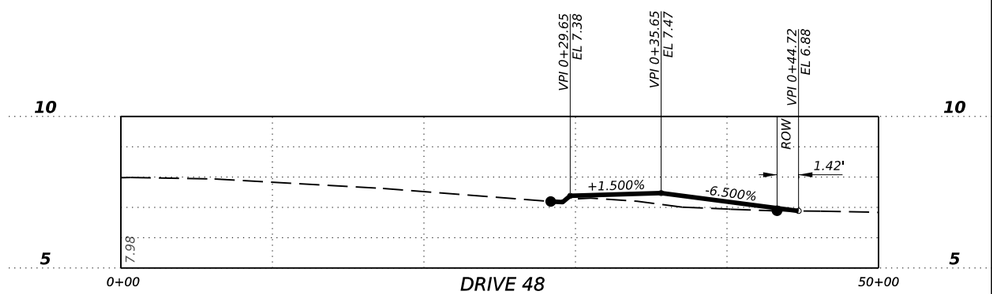
DRIVE 43



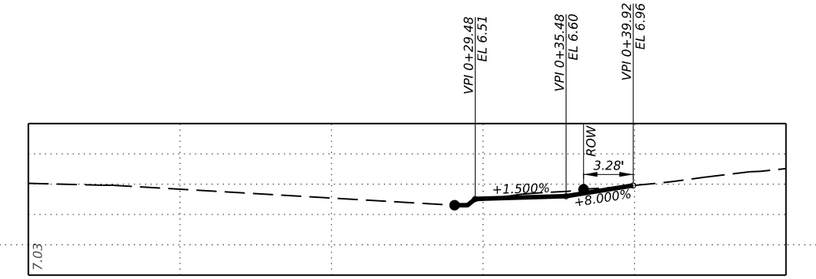
DRIVE 49



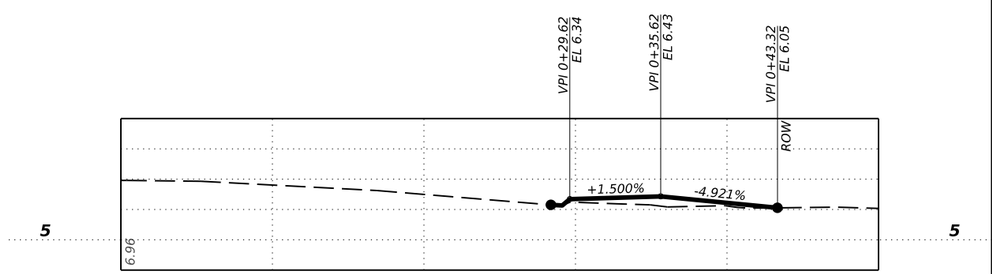
DRIVE 42



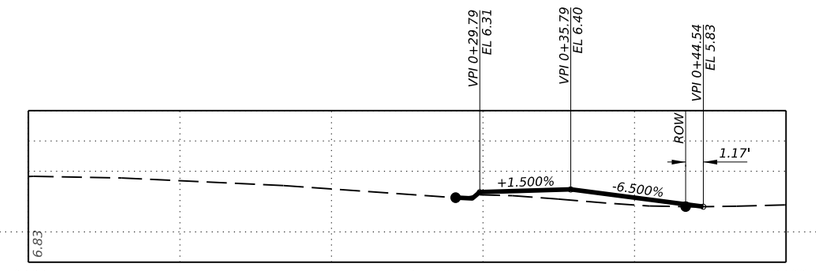
DRIVE 48



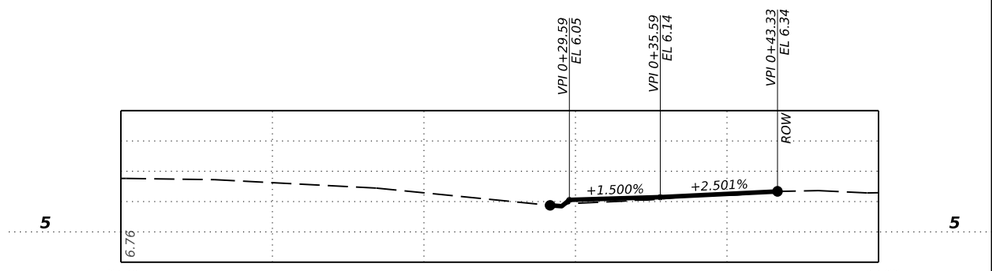
DRIVE 41



DRIVE 47



DRIVE 40



DRIVE 46

DATE: 9/11/2023 6:28:54 PM
FILE: ...\3 Roadway\FM 519 DWYPR 04.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

FM 519

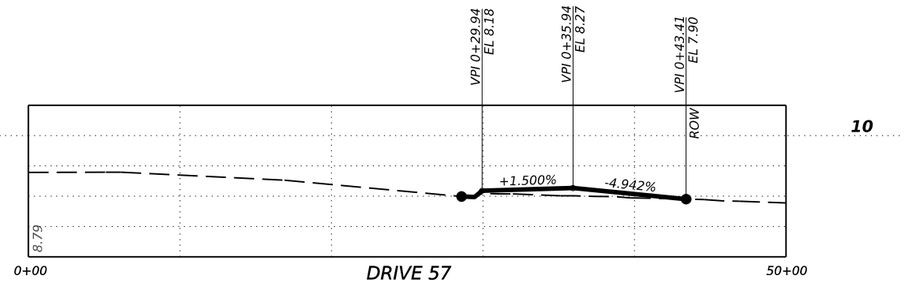
DRIVEWAY PROFILES

SCALE: 1"=10'H; 1"=5'V SHEET 4 OF 12

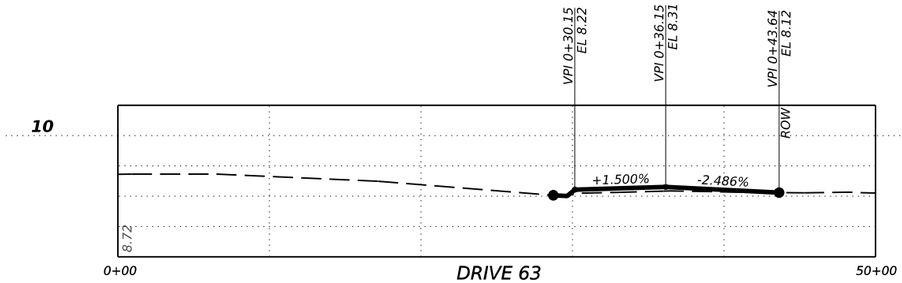
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		49

100% SUBMITTAL

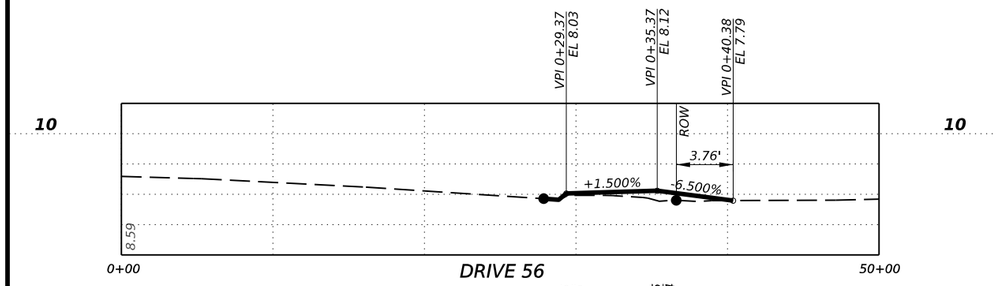
CK:
DW:
CK:
DN:



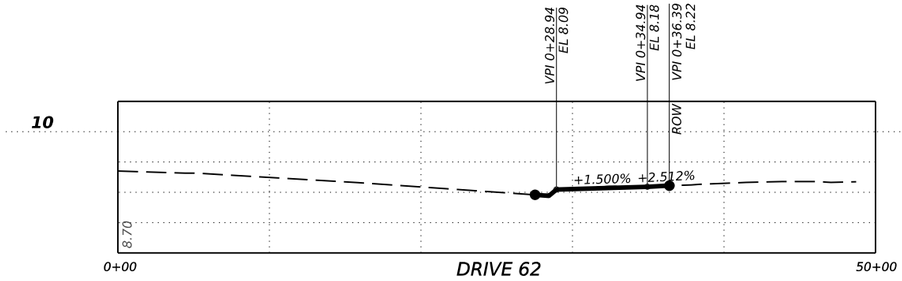
DRIVE 57



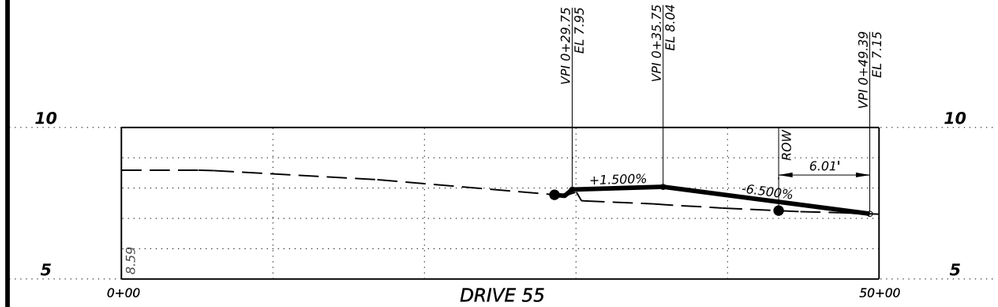
DRIVE 63



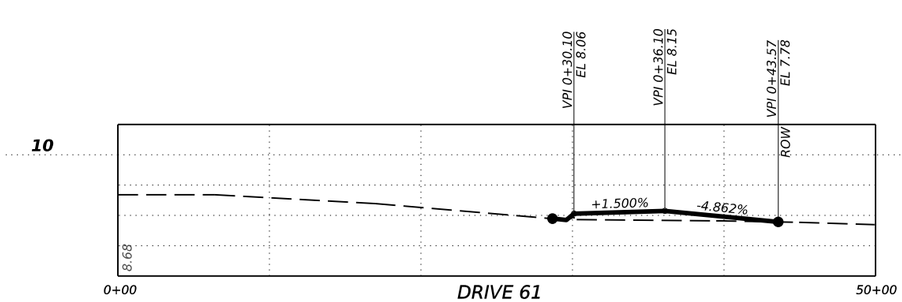
DRIVE 56



DRIVE 62

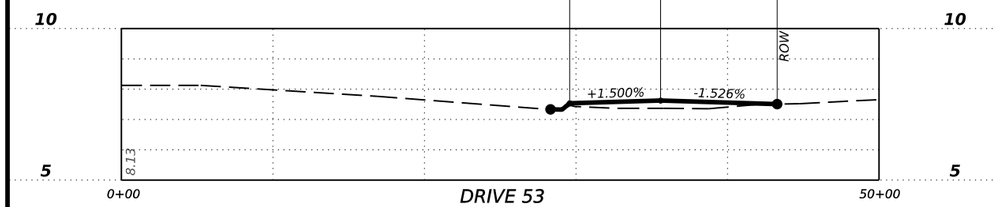


DRIVE 55



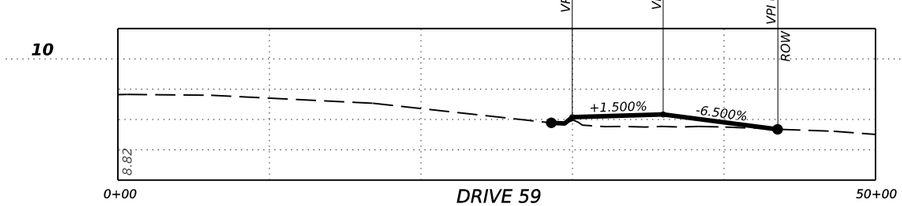
DRIVE 61

SEE SHEET 12 OF 12 FOR DRIVE 54A



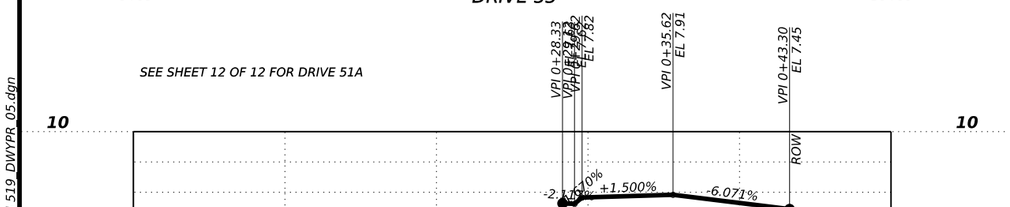
DRIVE 53

SEE SHEET 12 OF 12 FOR DRIVE 60A

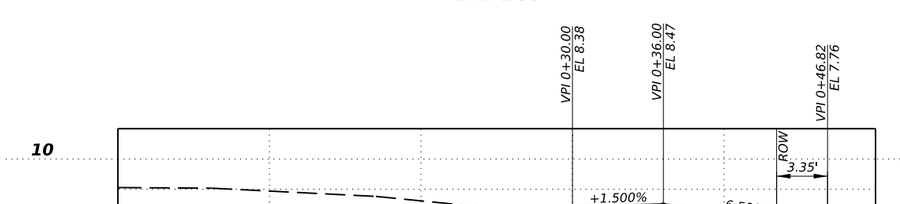


DRIVE 59

SEE SHEET 12 OF 12 FOR DRIVE 51A



DRIVE 51



DRIVE 58

DATE: 9/11/2023 6:30:40 PM
FILE: ...13. Roadway\FM 519 DWYPR 05.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

FM 519

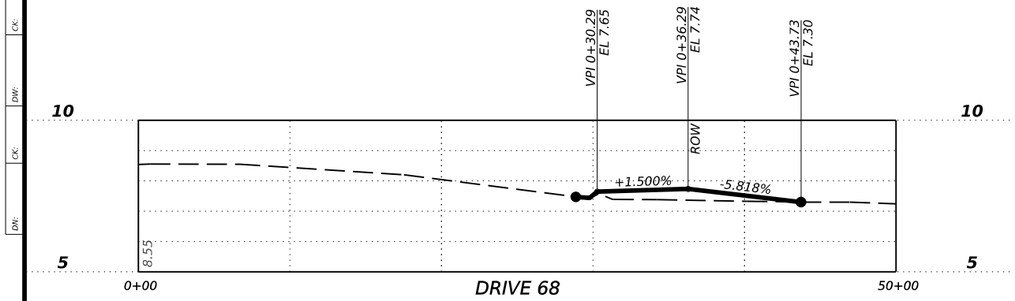
DRIVEWAY PROFILES

SCALE: 1"=10'H; 1"=5'V SHEET 5 OF 12

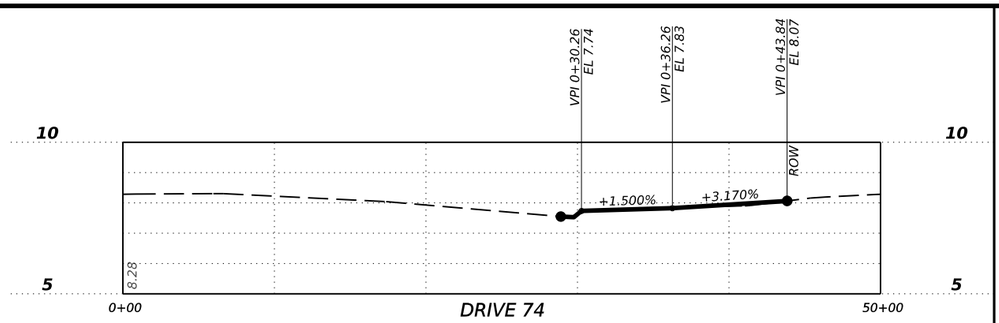
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		50

100% SUBMITTAL

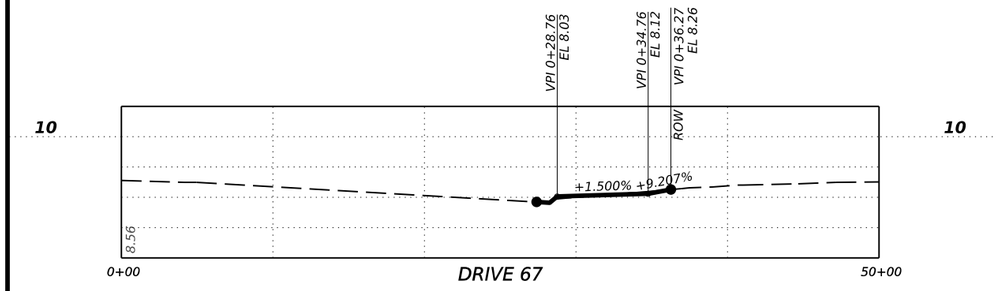
CK
DW
CK
DW



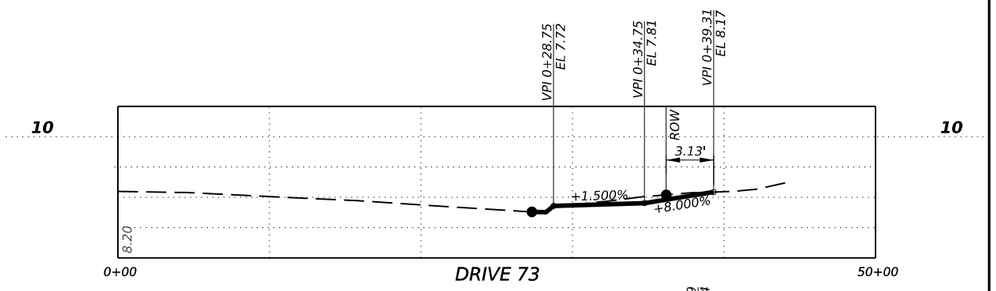
DRIVE 68



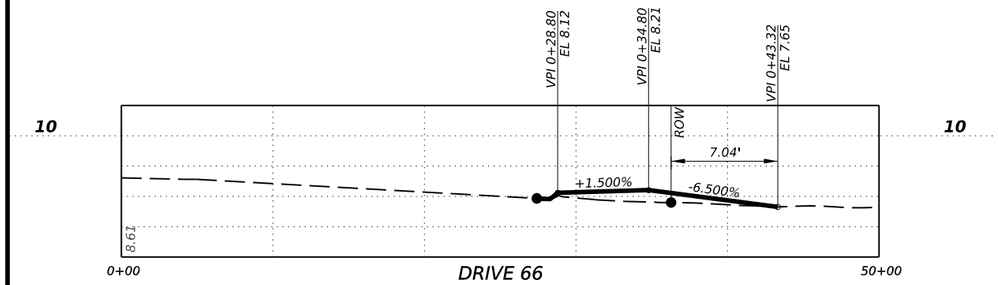
DRIVE 74



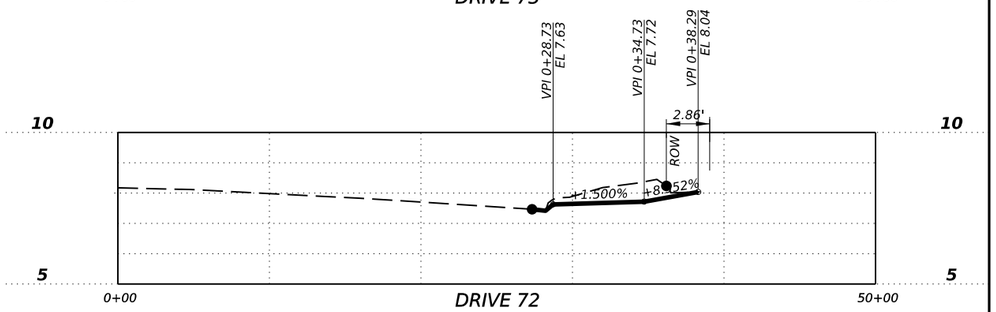
DRIVE 67



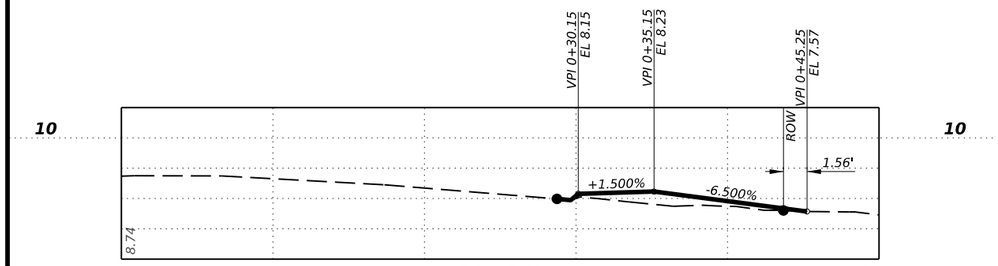
DRIVE 73



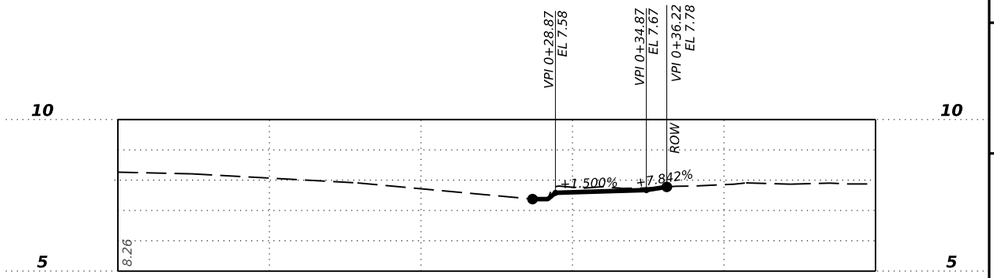
DRIVE 66



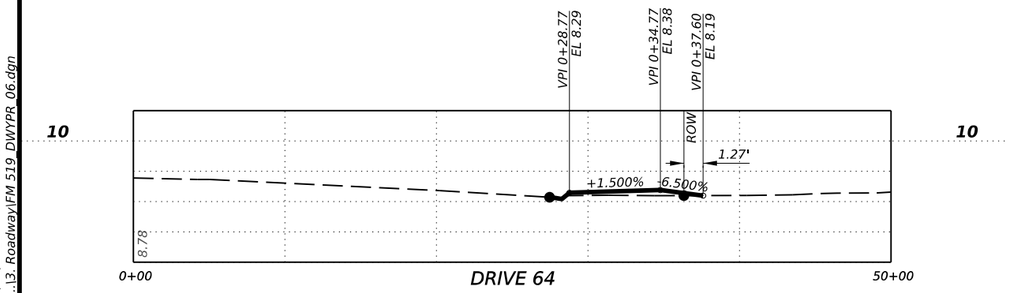
DRIVE 72



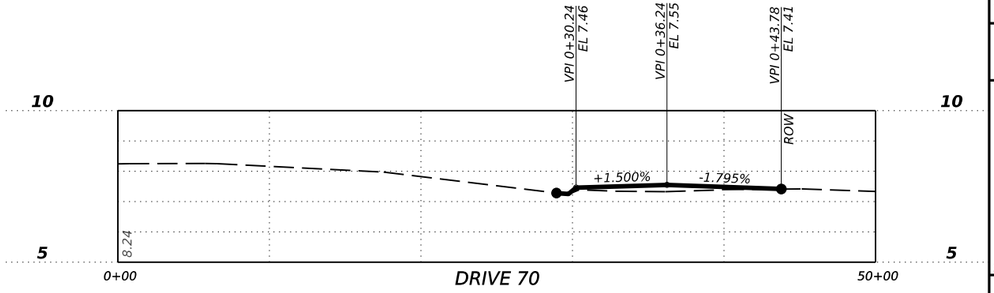
DRIVE 65



DRIVE 71



DRIVE 64



DRIVE 70

DATE: 9/11/2023 6:32:35 PM
FILE: ...13. Roadway\FM 519 DWYPR 06.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

FM 519

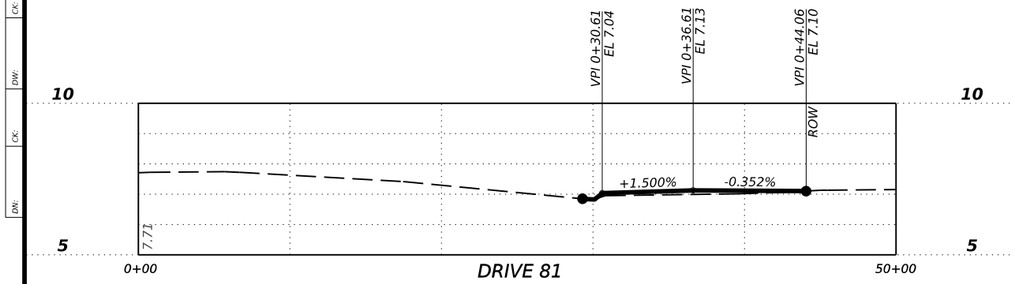
DRIVEWAY PROFILES

SCALE: 1"=10'H; 1"=5'V SHEET 6 OF 12

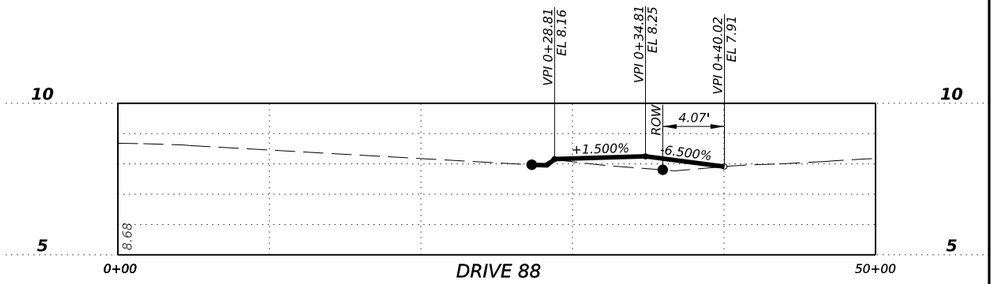
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		51

100% SUBMITTAL

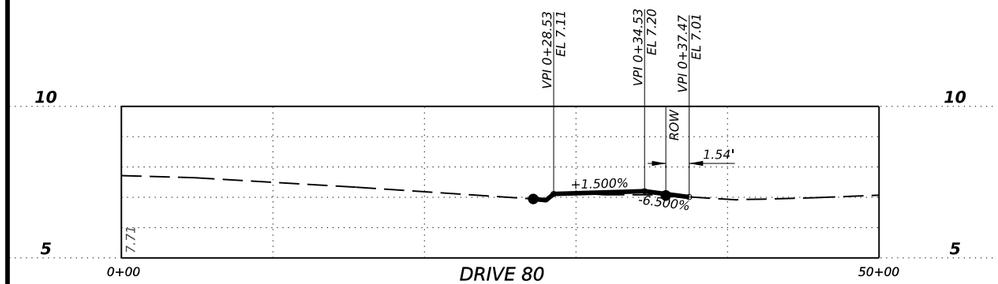
CK:
DW:
CK:
DW:



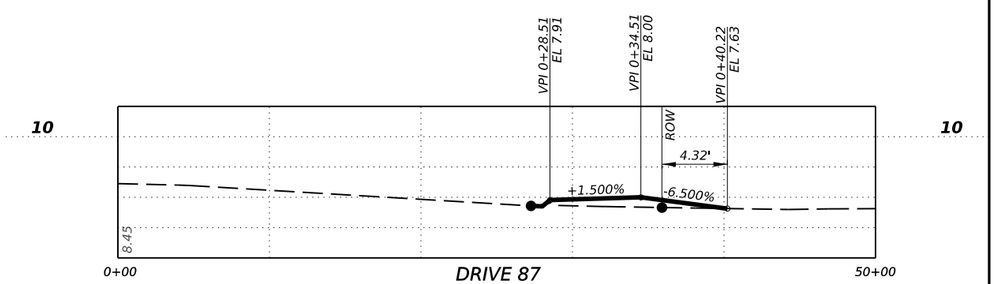
DRIVE 81



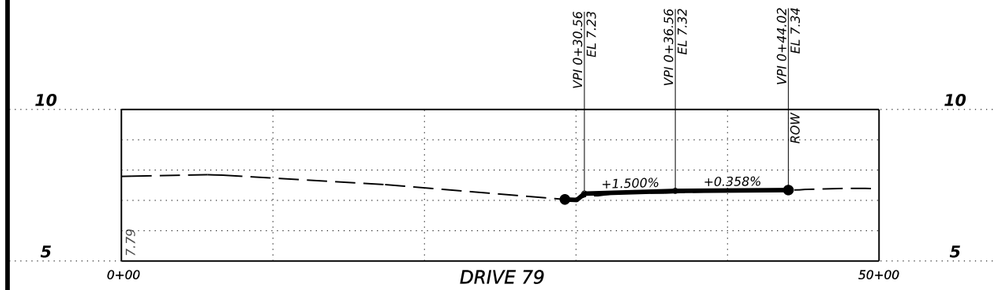
DRIVE 88



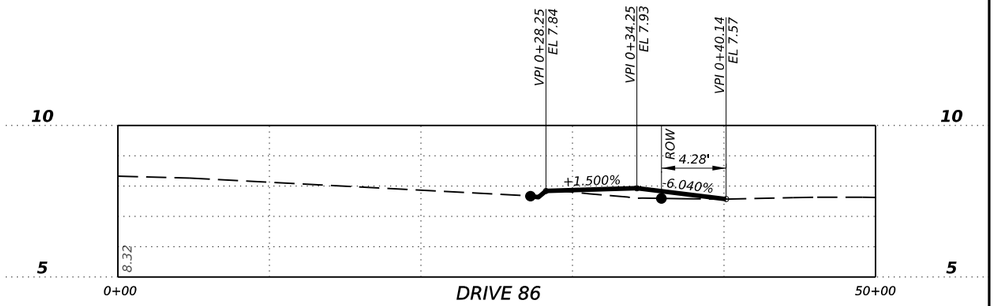
DRIVE 80



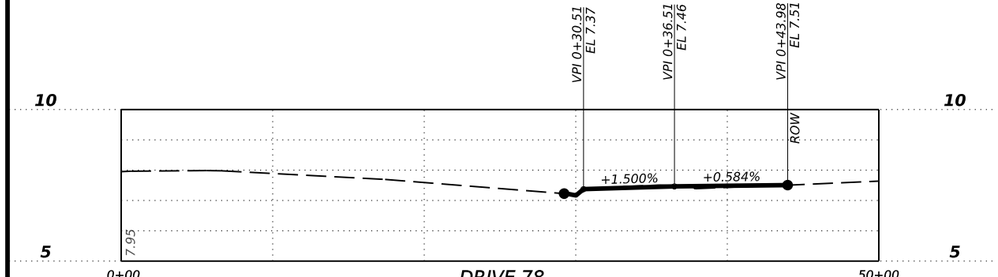
DRIVE 87



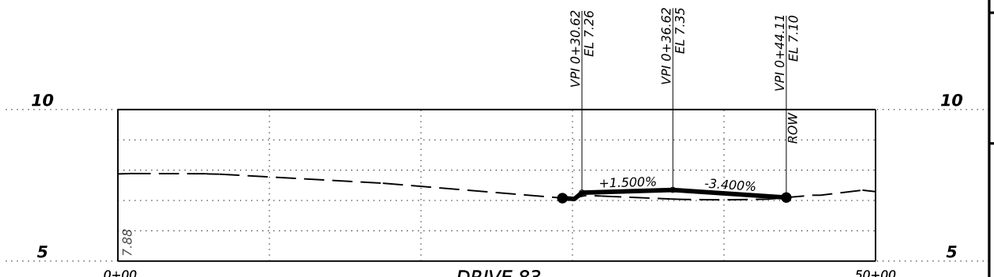
DRIVE 79



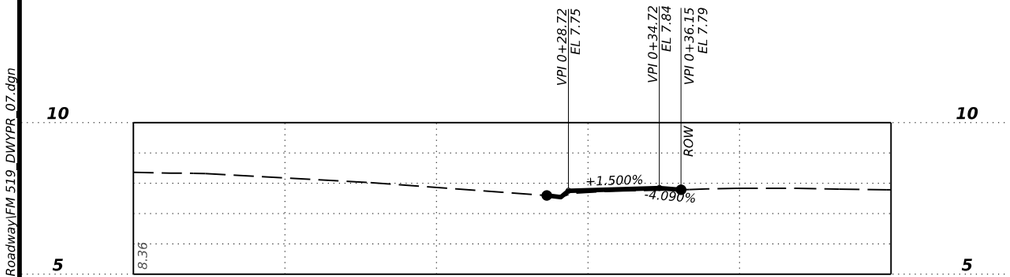
DRIVE 86



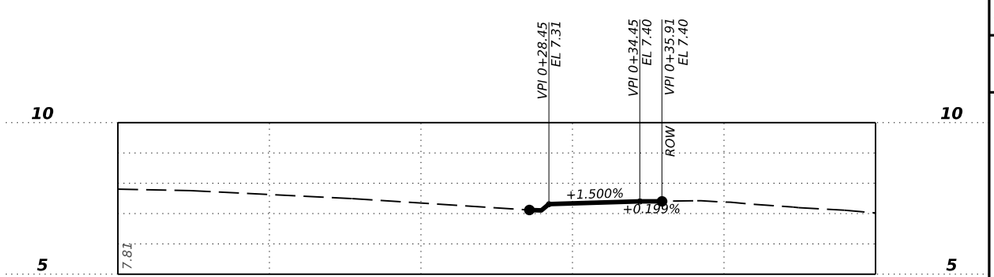
DRIVE 78



DRIVE 83



DRIVE 75



DRIVE 82

DATE: 9/11/2023 6:34:20 PM
FILE: ...\3. Roadway\FM 519 DWYPR 07.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

Texas Department of Transportation

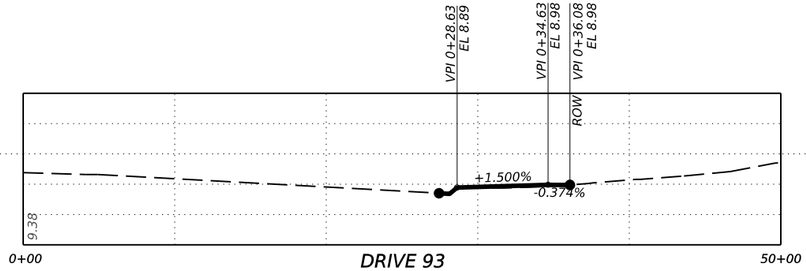
FM 519

DRIVEWAY PROFILES

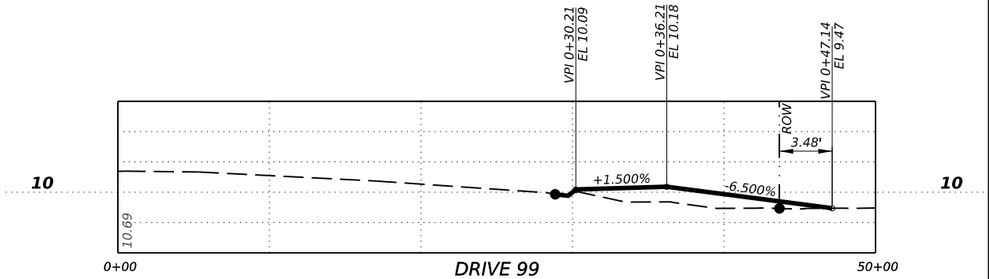
SCALE: 1"=10'H; 1"=5'V SHEET 7 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		52

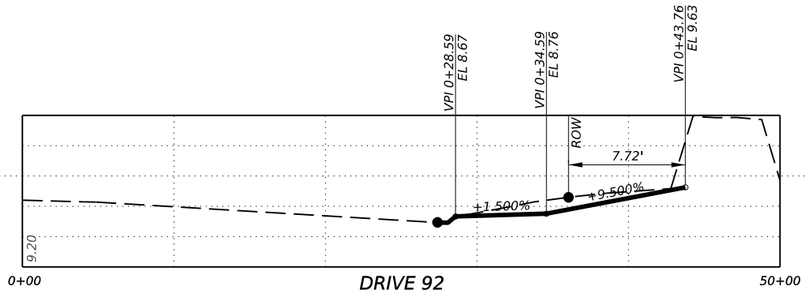
100% SUBMITTAL



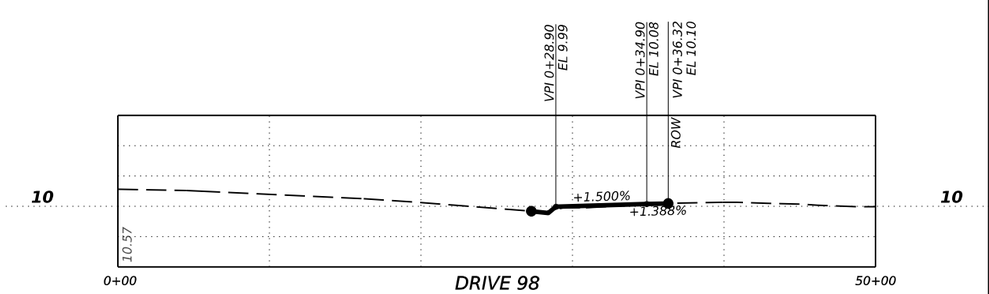
DRIVE 93



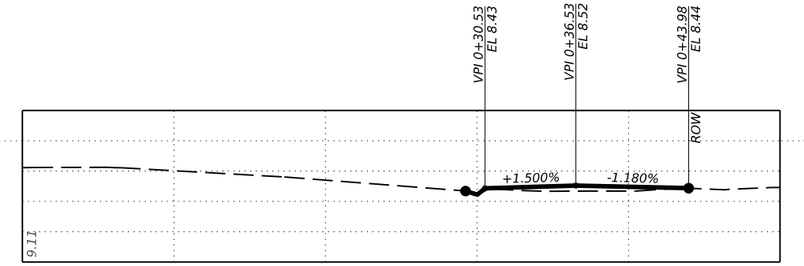
DRIVE 99



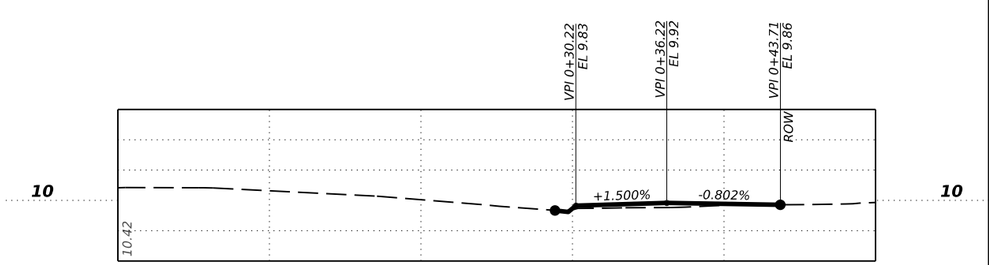
DRIVE 92



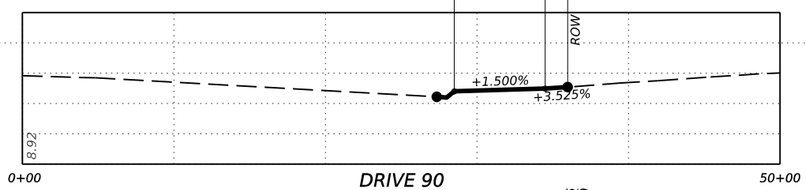
DRIVE 98



DRIVE 91

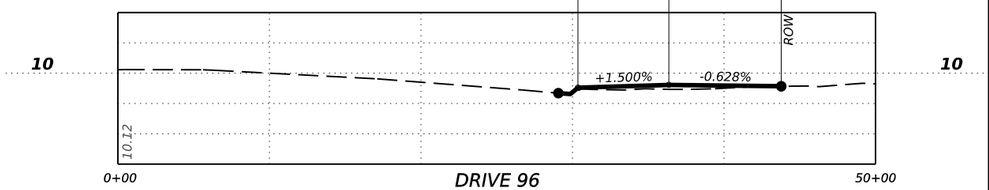


DRIVE 97

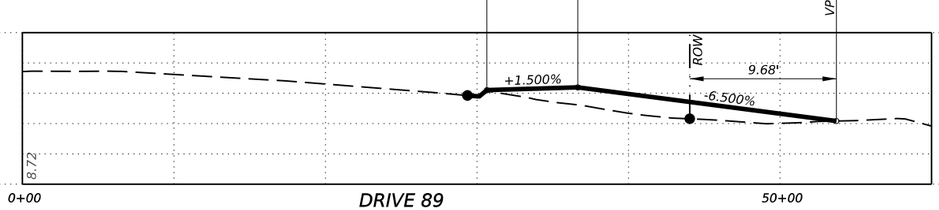


DRIVE 90

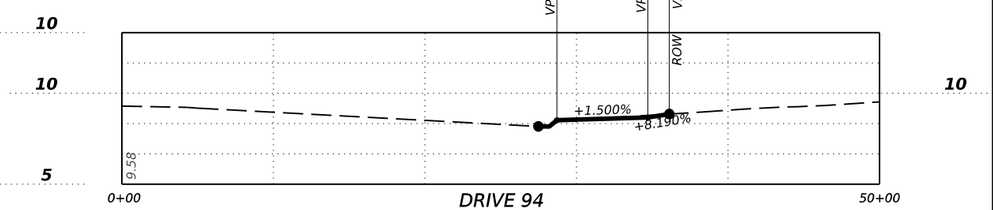
SEE SHEET 12 OF 12 FOR DRIVE 96A



DRIVE 96



DRIVE 89



DRIVE 94

DATE: 9/11/2023 6:36:05 PM
FILE: ...13. Roadway\FM 519 DWYPR 08.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
9/11/2023

Texas Department of Transportation

FM 519

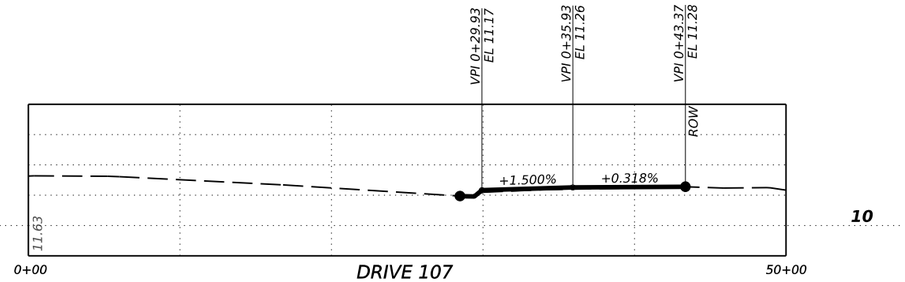
DRIVEWAY PROFILES

SCALE: 1"=10'H; 1"=5'V SHEET 8 OF 12

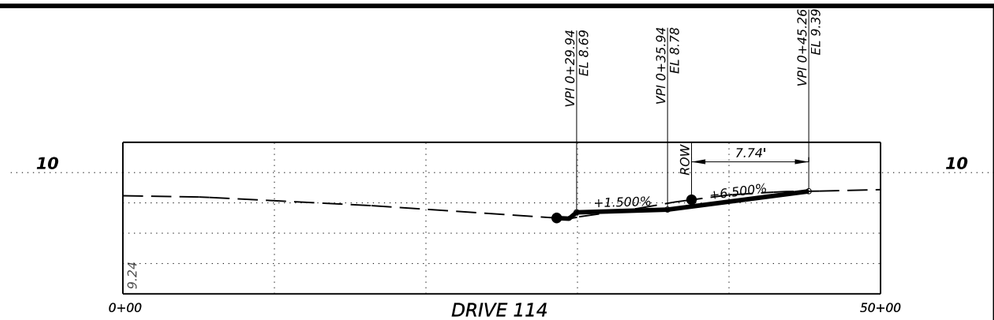
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		53

100% SUBMITTAL

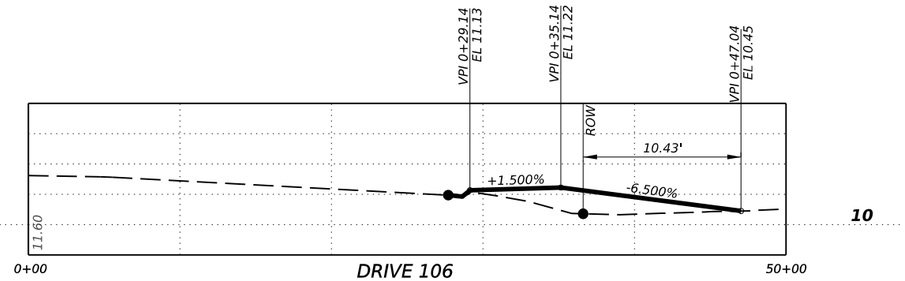
CK:
DW:
CK:
DW:



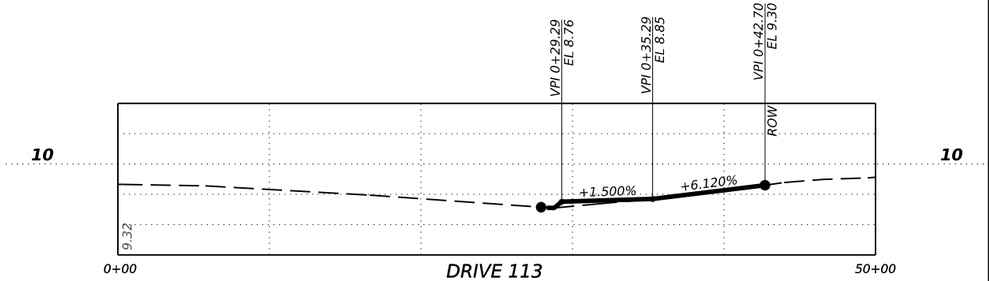
DRIVE 107



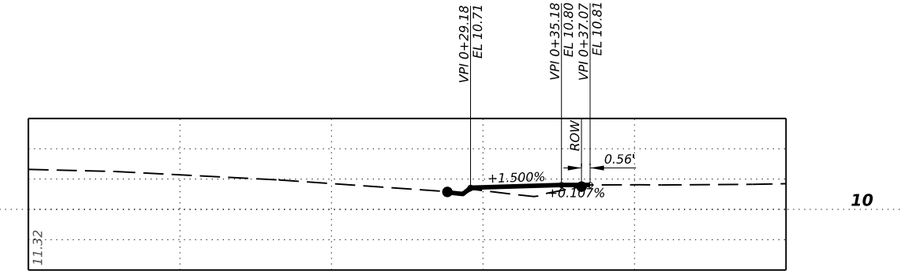
DRIVE 114



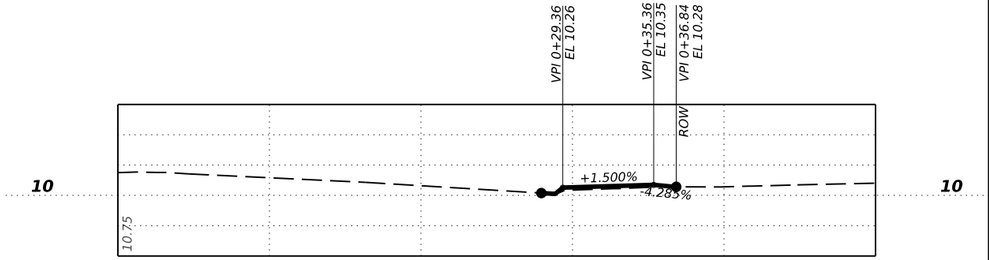
DRIVE 106



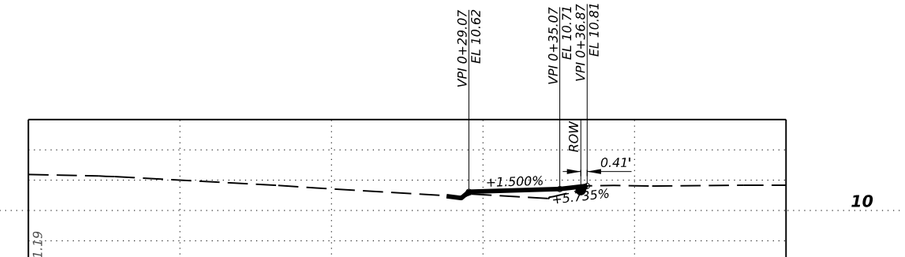
DRIVE 113



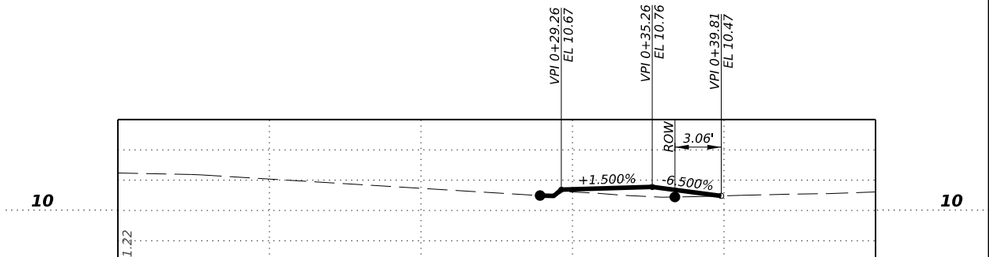
DRIVE 103



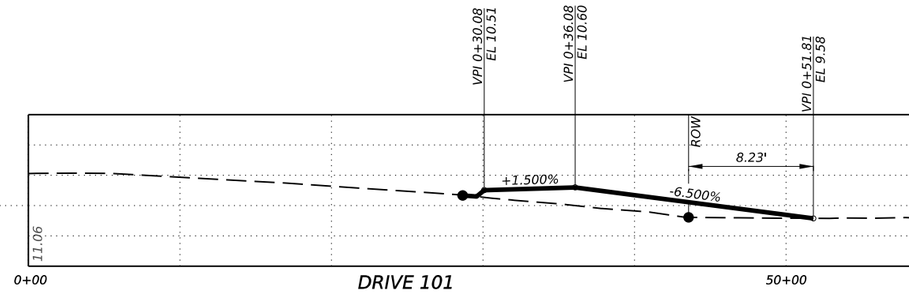
DRIVE 110



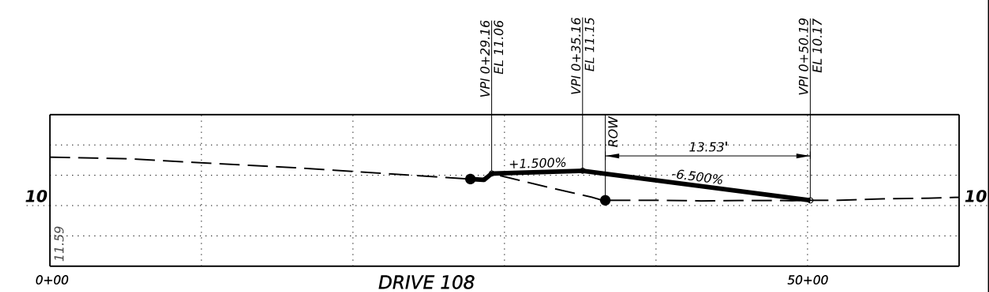
DRIVE 102



DRIVE 109



DRIVE 101



DRIVE 108

DATE: 9/12/2023 10:17:17 AM
FILE: ...\3. Roadway\FM 519 DWYPR 09.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, PE 9/12/2023

Texas Department of Transportation

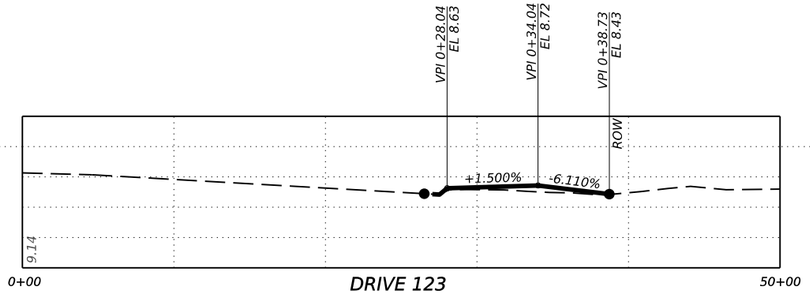
FM 519

DRIVEWAY PROFILES

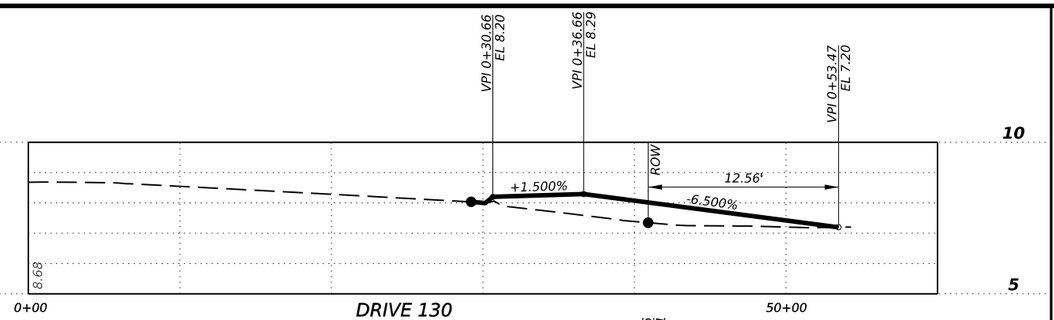
SCALE: 1"=10'H; 1"=5'V SHEET 9 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		54

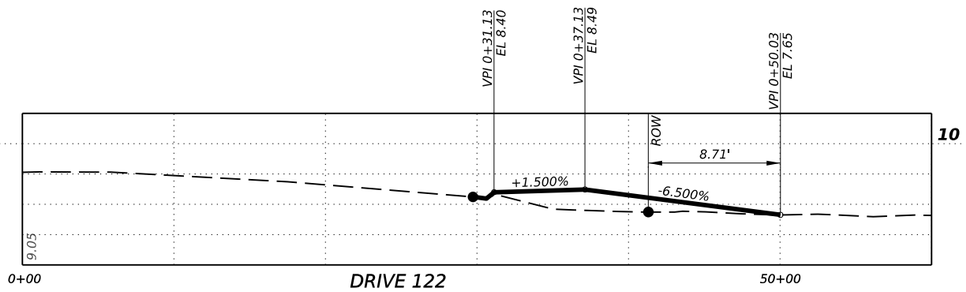
100% SUBMITTAL



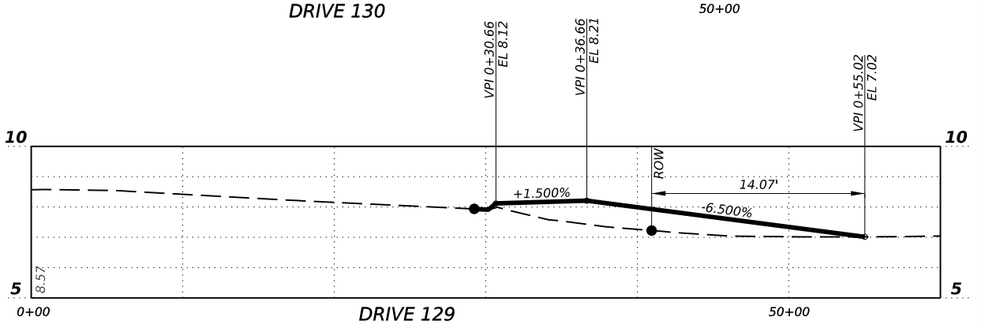
DRIVE 123



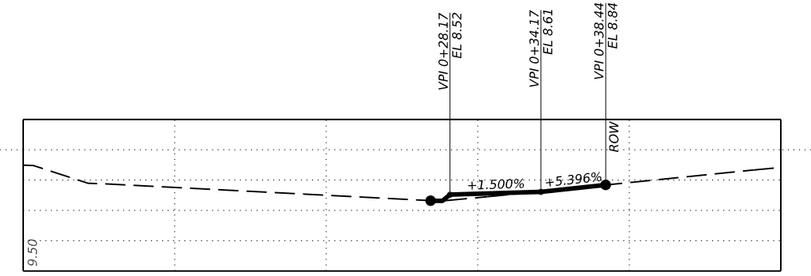
DRIVE 130



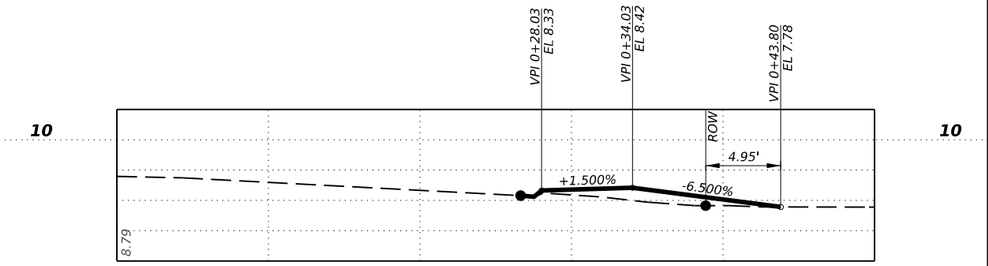
DRIVE 122



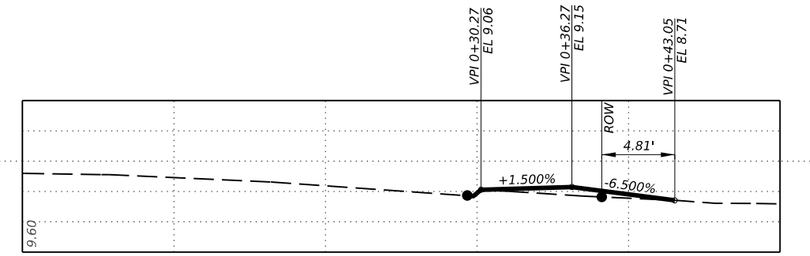
DRIVE 129



DRIVE 119

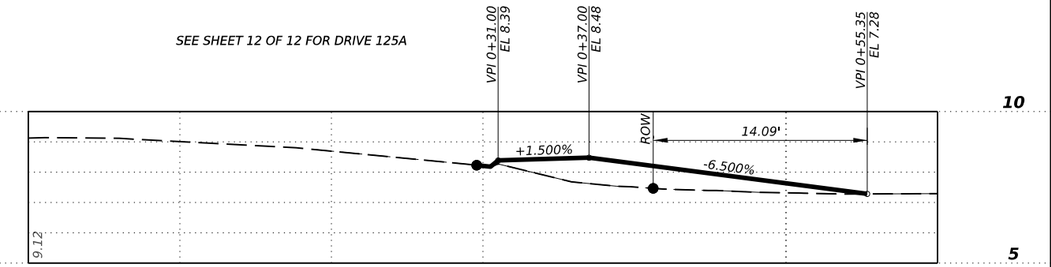


DRIVE 126

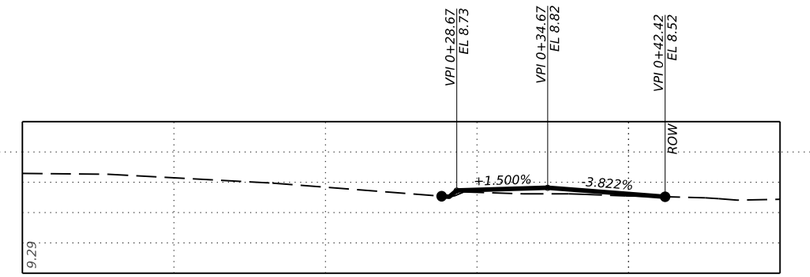


DRIVE 118

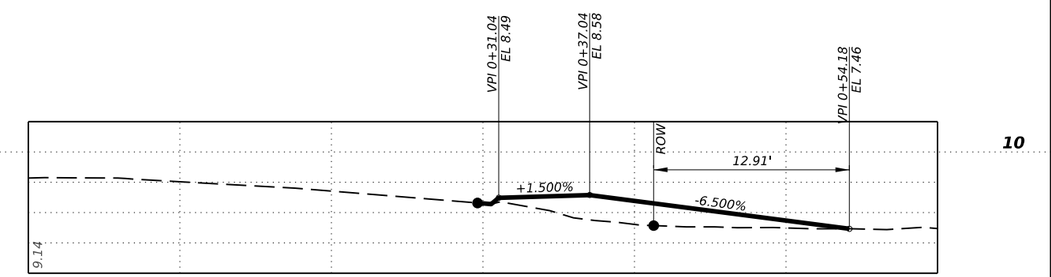
SEE SHEET 12 OF 12 FOR DRIVE 125A



DRIVE 125



DRIVE 115



DRIVE 124

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E.

9/12/2023

Texas Department of Transportation

FM 519

DRIVEWAY PROFILES

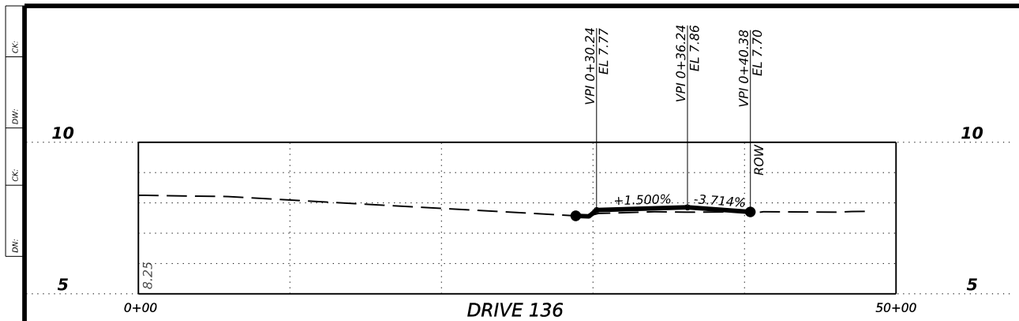
SCALE: 1"=10'H; 1"=5'V SHEET 10 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		55

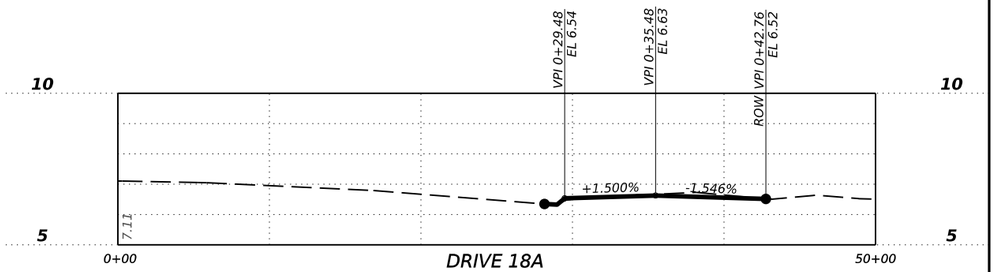
DATE: 9/12/2023 10:17:44 AM
FILE: ...13. Roadway\FM 519 DWYPR 10.dgn

100% SUBMITTAL

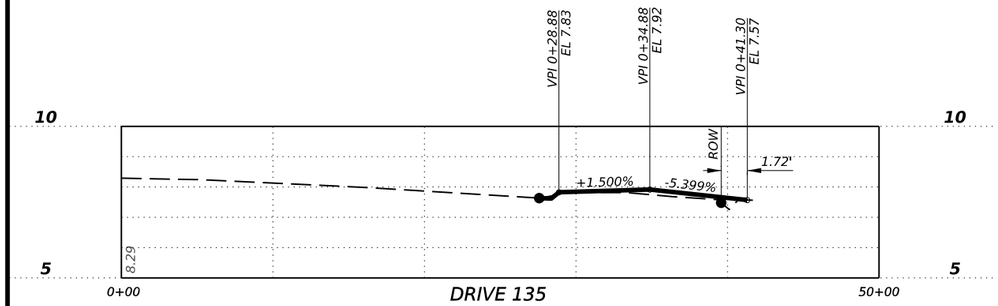
CK:
DW:
CK:
DW:



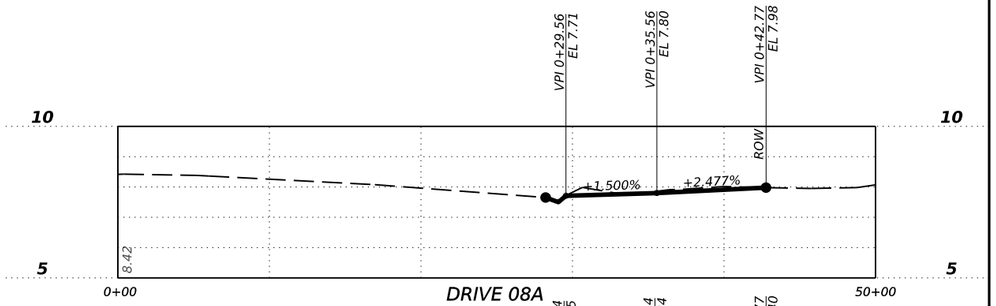
DRIVE 136



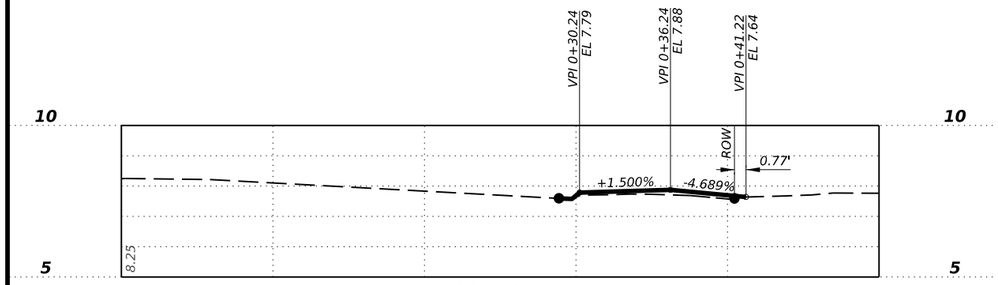
DRIVE 18A



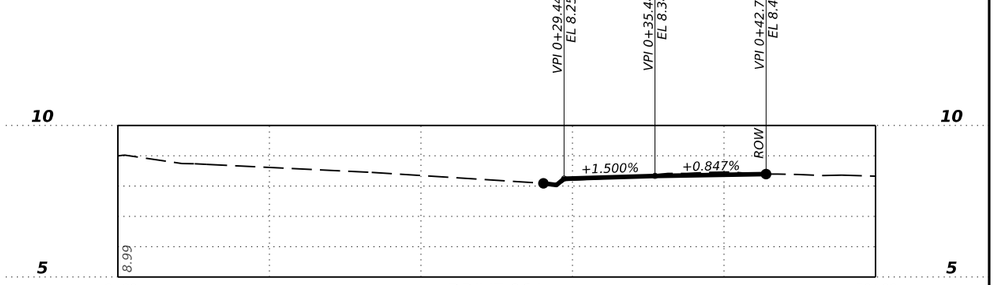
DRIVE 135



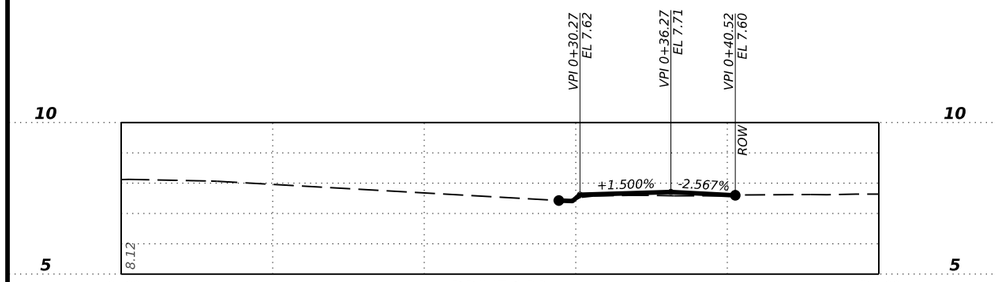
DRIVE 08A



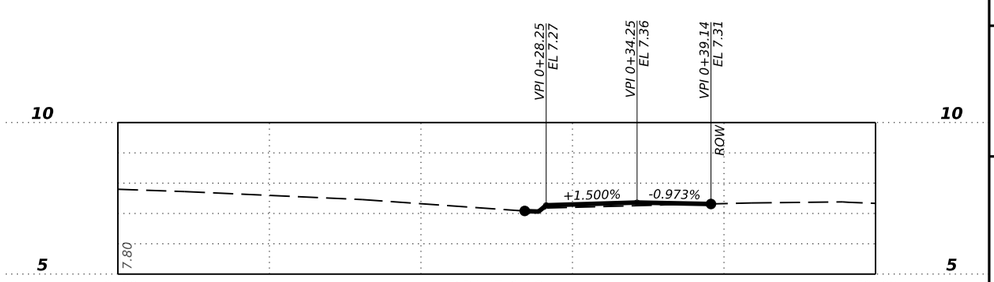
DRIVE 134



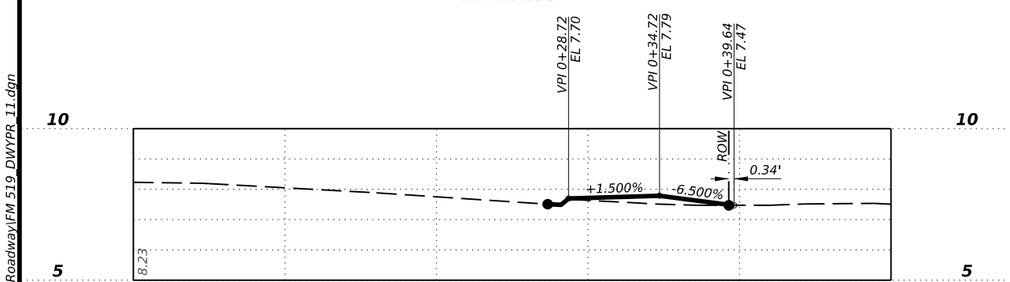
DRIVE 06A



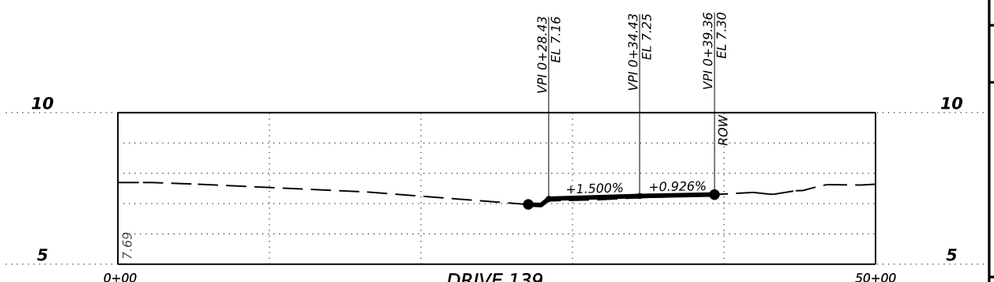
DRIVE 133



DRIVE 140



DRIVE 131



DRIVE 139

DATE: 9/12/2023 10:18:14 AM
FILE: ...\3. Roadway\FM 519 DWYPR_11.dgn

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/12/2023

Texas Department of Transportation

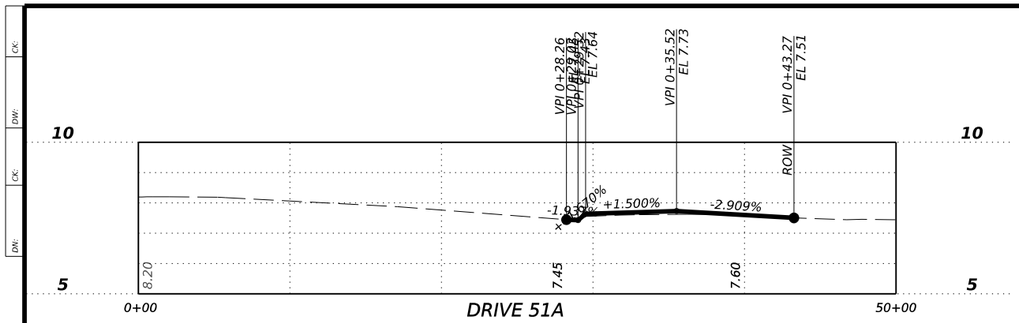
FM 519

DRIVEWAY PROFILES

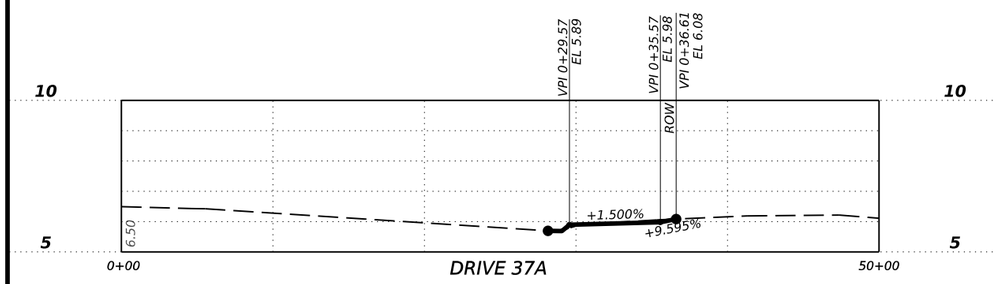
SCALE: 1"=10'H; 1"=5'V SHEET 11 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		56

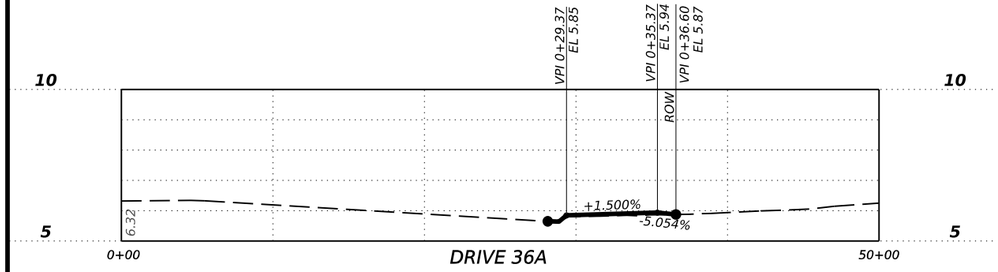
100% SUBMITTAL



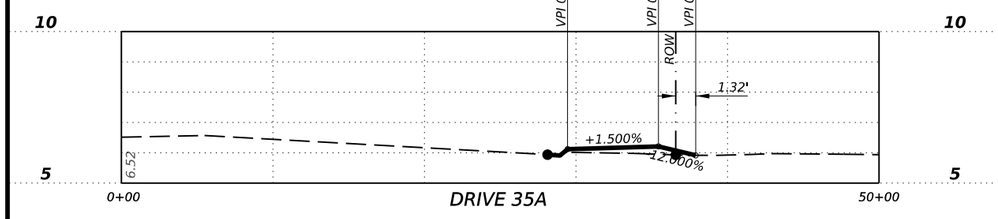
DRIVE 51A



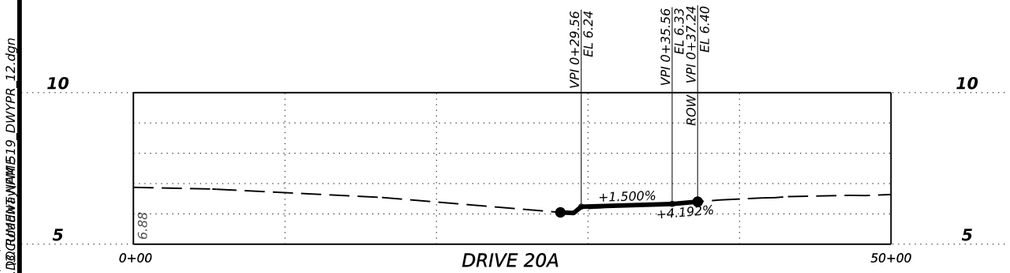
DRIVE 37A



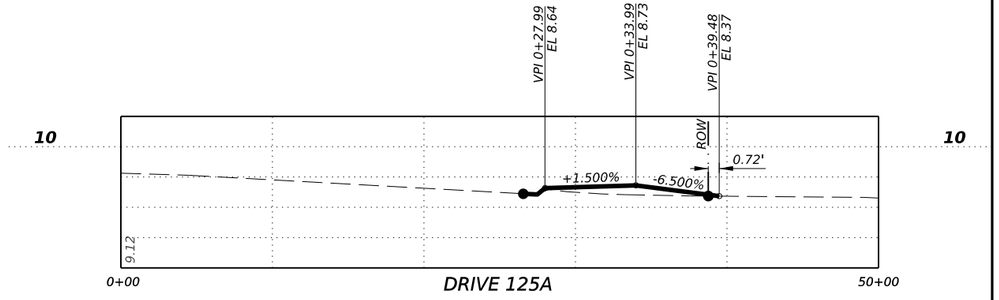
DRIVE 36A



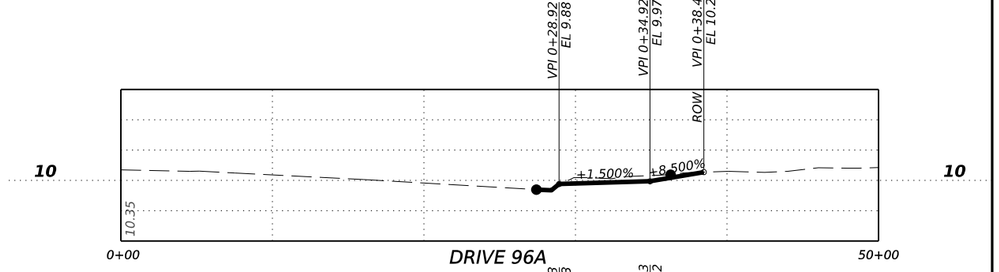
DRIVE 35A



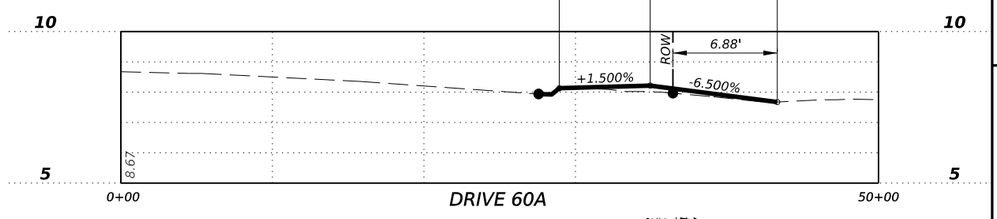
DRIVE 20A



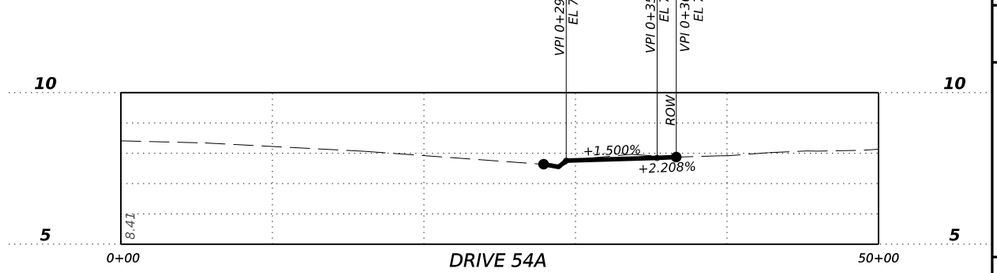
DRIVE 125A



DRIVE 96A



DRIVE 60A



DRIVE 54A

DATE: 9/12/2023 10:18:44 AM
FILE: ...\DRIVEWAYS\519_DWYPR_12.dgn
DGN:
CK:
DW:
CK:

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/12/2023

Texas Department of Transportation

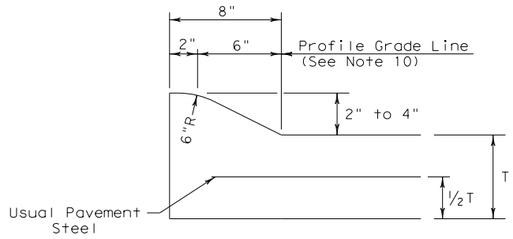
FM 519

DRIVEWAY PROFILES

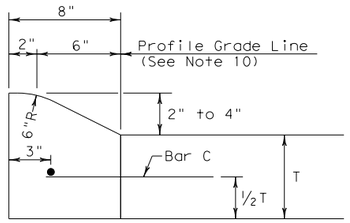
SCALE: 1"=10'H; 1"=5'V SHEET 12 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		57

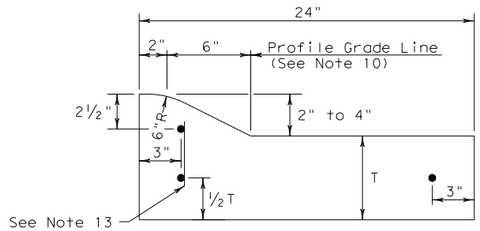
DATE:
FILE:



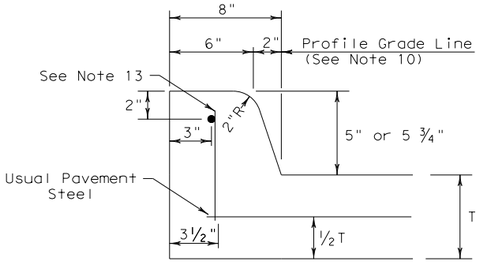
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



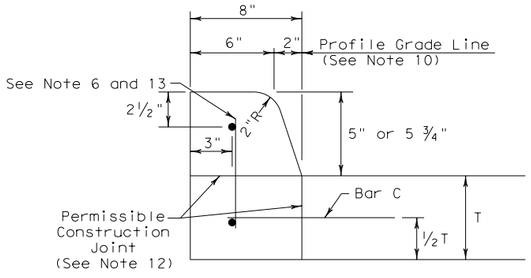
TYPE I CURB
2" - 4" HEIGHT



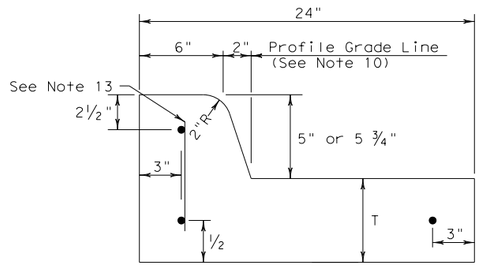
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



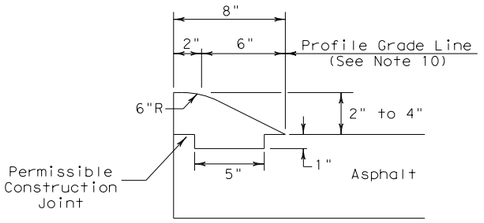
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



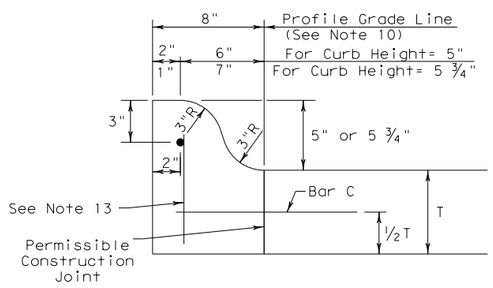
TYPE II CURB
5" - 5 ¾" HEIGHT



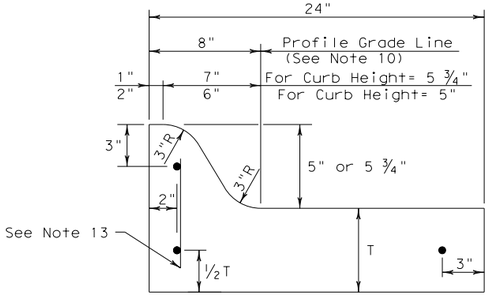
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



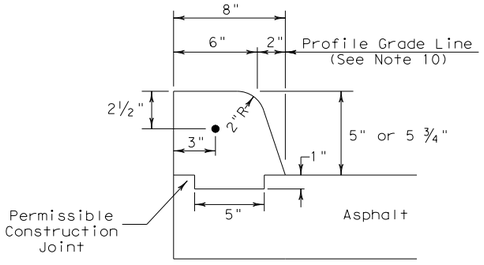
TYPE III CURB (KEYED)
2" - 4" HEIGHT



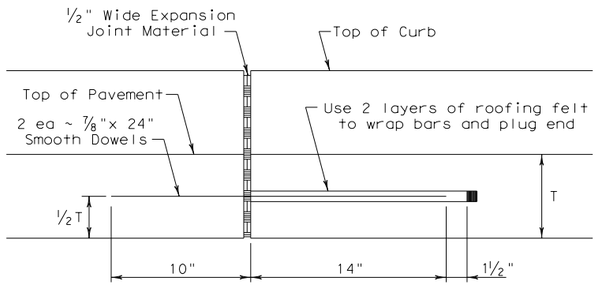
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

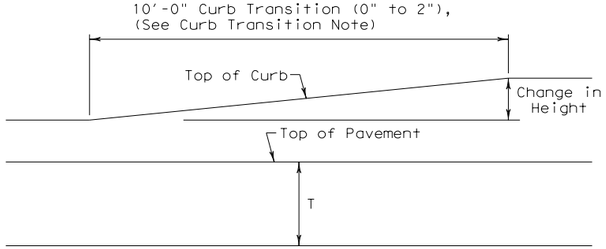


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

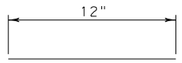


CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.

BAR B



BAR C

Texas Department of Transportation

Design Division Standard

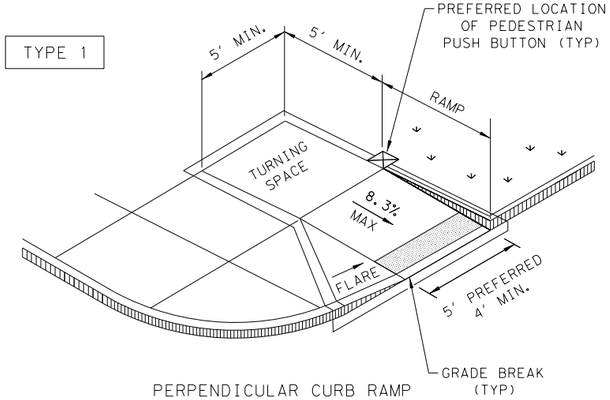
CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT		CK: AN		DW: CS		CK: KM
REVISIONS	CONT	SECT	JOB		HIGHWAY		
	0979	01	027		FM 519		
	DIST	COUNTY				SHEET NO.	
	HOU	GALVESTON				58	

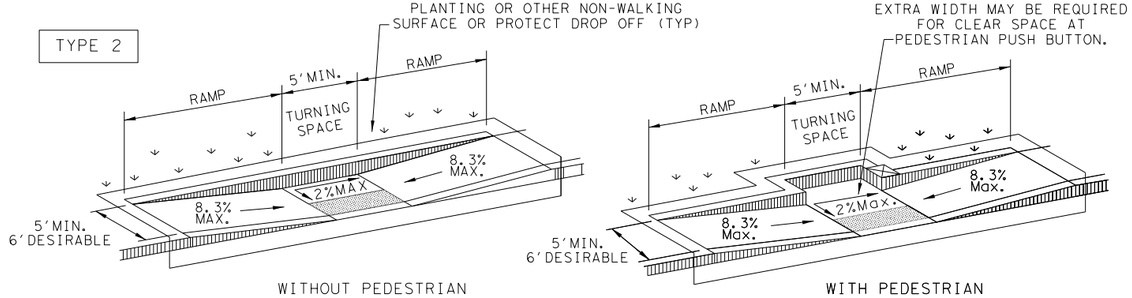
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

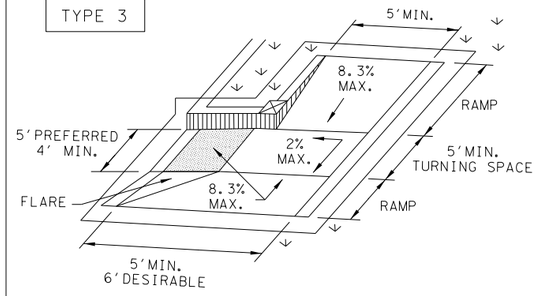


WITHOUT PEDESTRIAN PUSH BUTTON

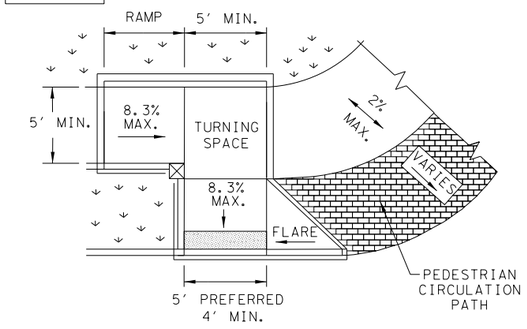
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

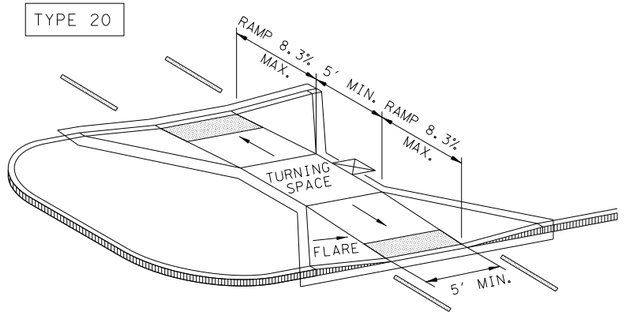


TYPE 6



COMBINATION CURB RAMPS

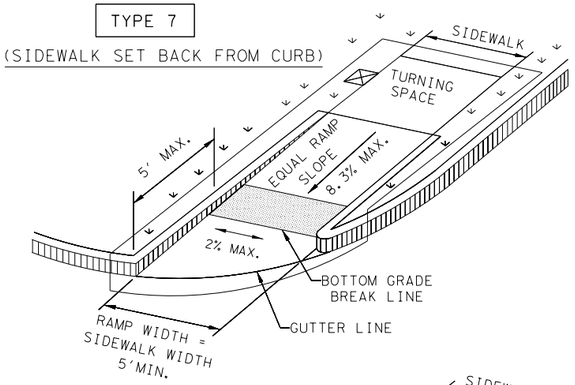
TYPE 20



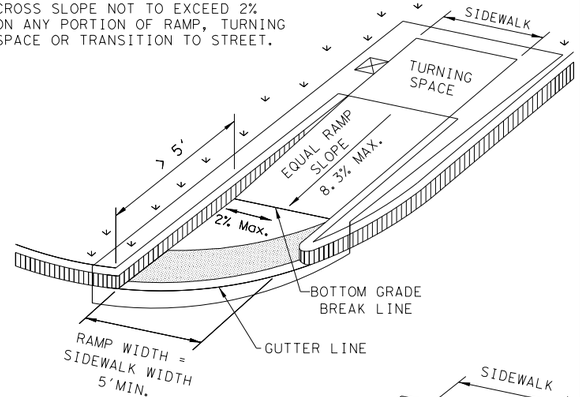
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

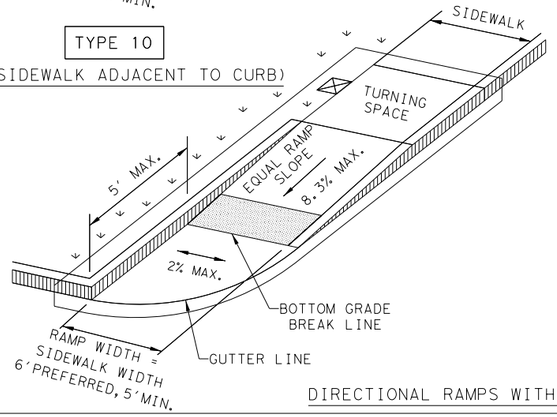


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

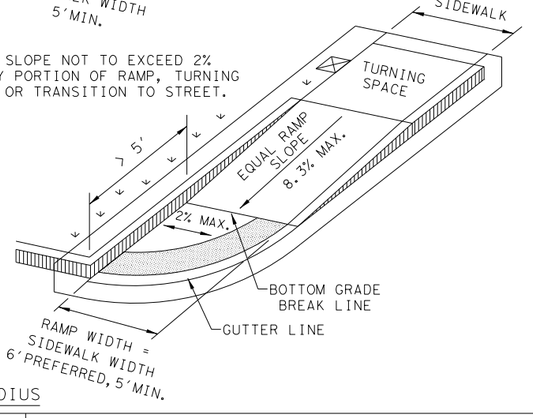


TYPE 10

(SIDEWALK ADJACENT TO CURB)

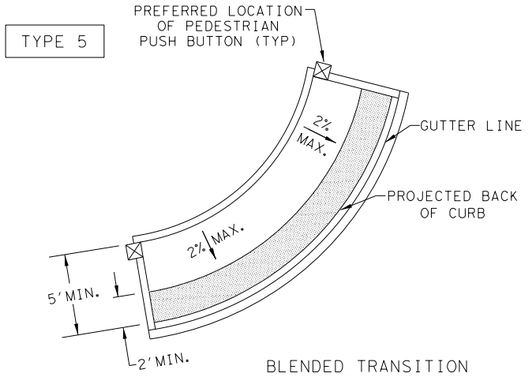


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



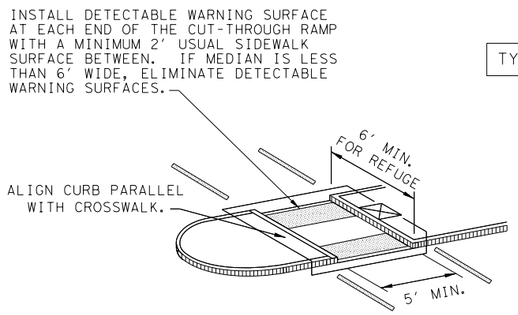
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



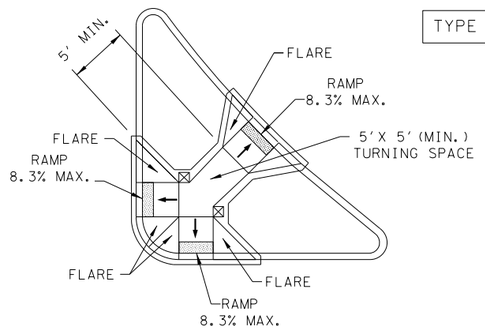
BLENDED TRANSITION
(FLUSH LANDING)

TYPE 21

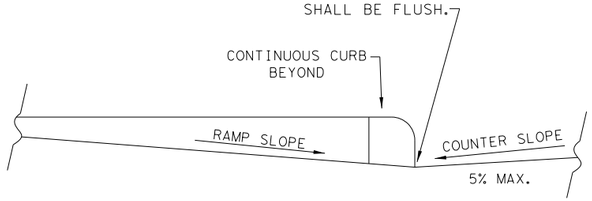


NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
REVISED 08, 2005	DIST	COUNTY		SHEET NO.
REVISED 06, 2012	HOU	GALVESTON		59
REVISED 01, 2018				

DATE:
FILE:

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

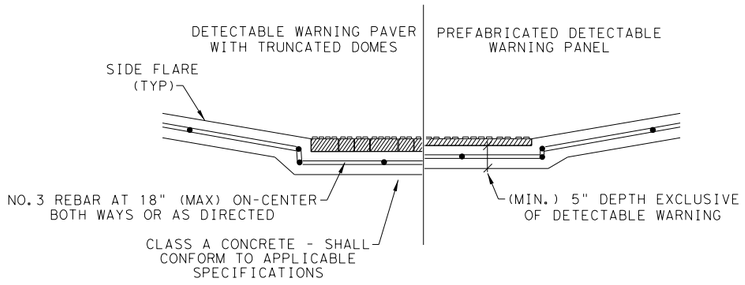
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

SIDEWALKS

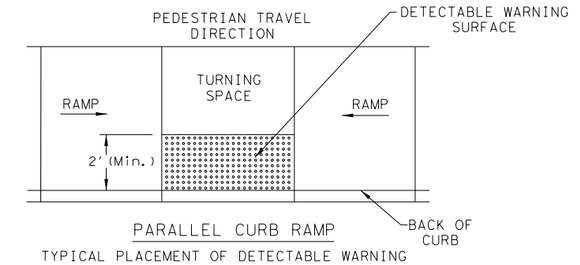
27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.



SECTION VIEW DETAIL

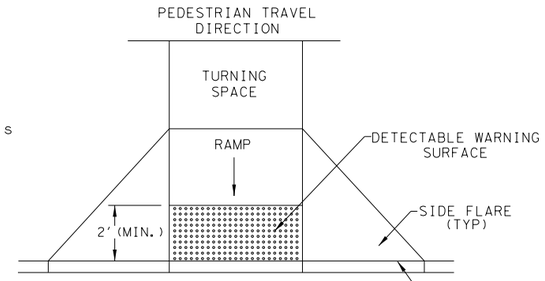
CURB RAMP AT DETECTIBLE WARNINGS

DETECTABLE WARNING SURFACE DETAILS



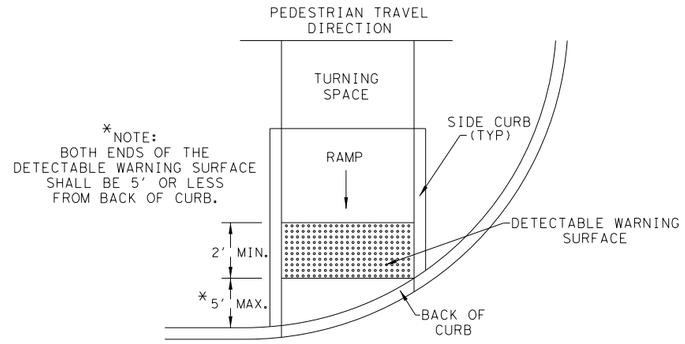
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

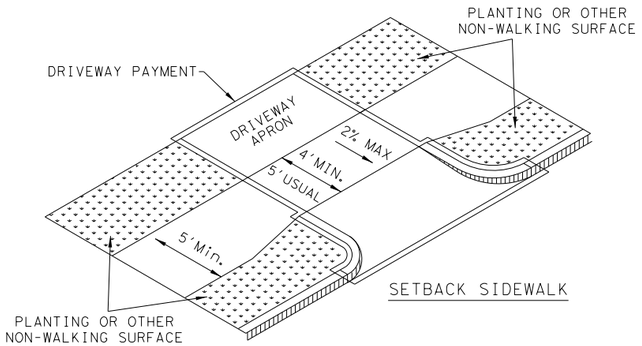
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

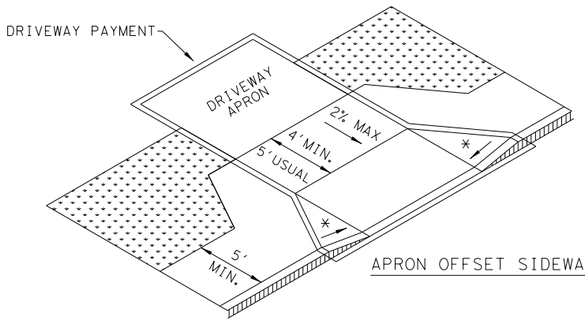
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0979	01	027		FM 519
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	HOU	GALVESTON			60

DATE:
FILE:

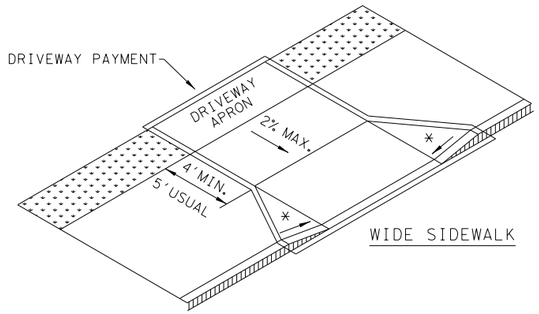
SIDEWALK TREATMENT AT DRIVEWAYS



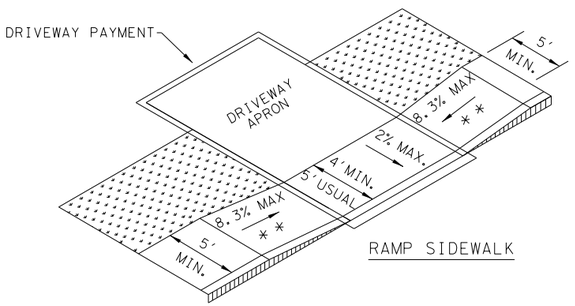
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

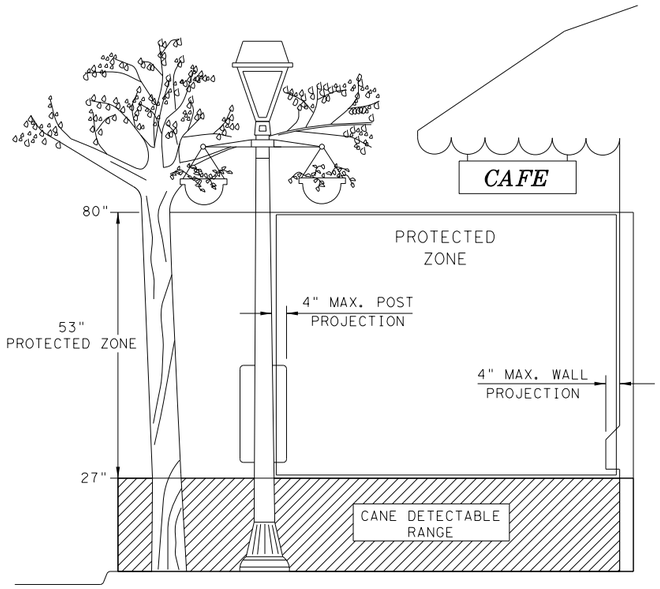


RAMP SIDEWALK

NOTES:

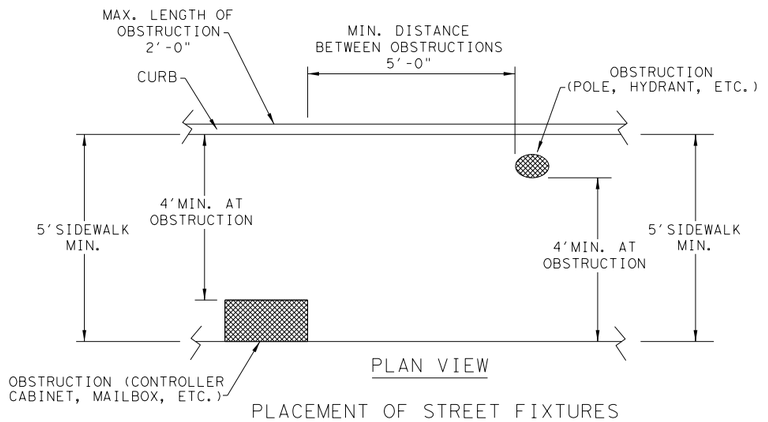
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.



PROTECTED ZONE

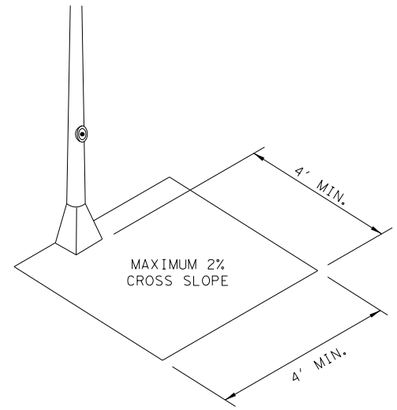
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



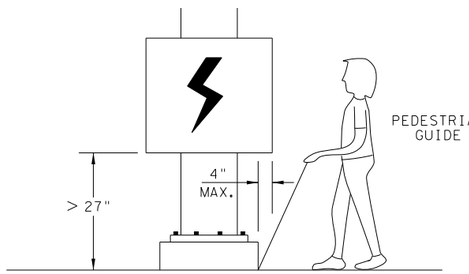
PLAN VIEW

PLACEMENT OF STREET FIXTURES

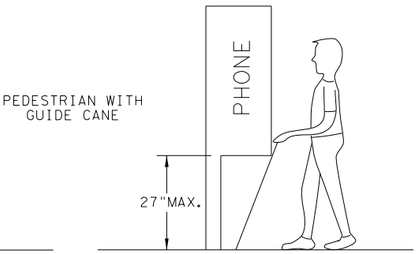
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

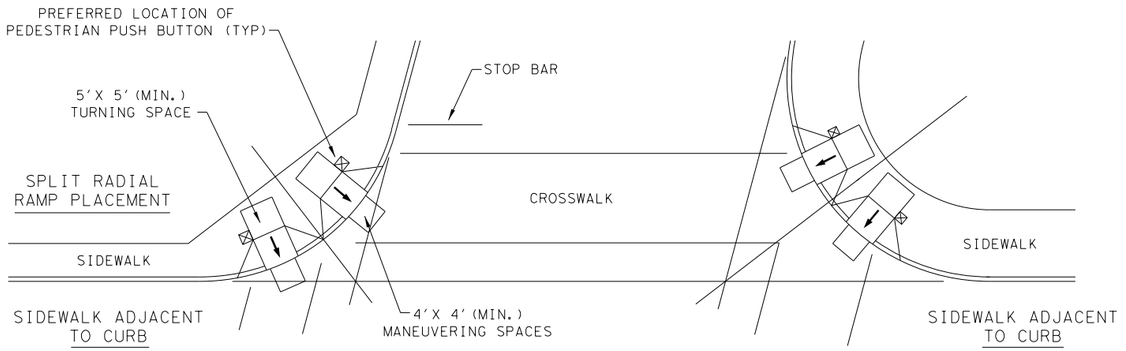
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

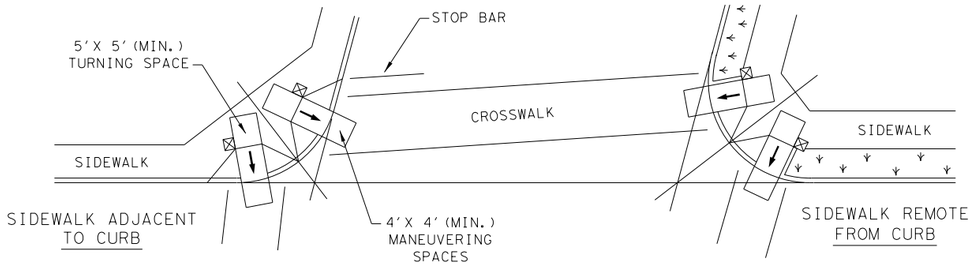
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		61

DATE:
FILE:

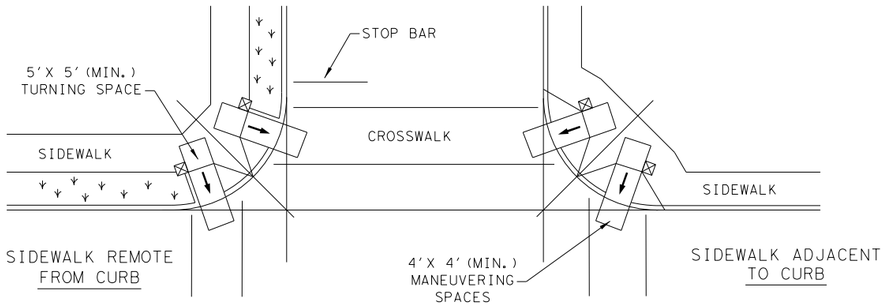
TYPICAL CROSSING LAYOUTS
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



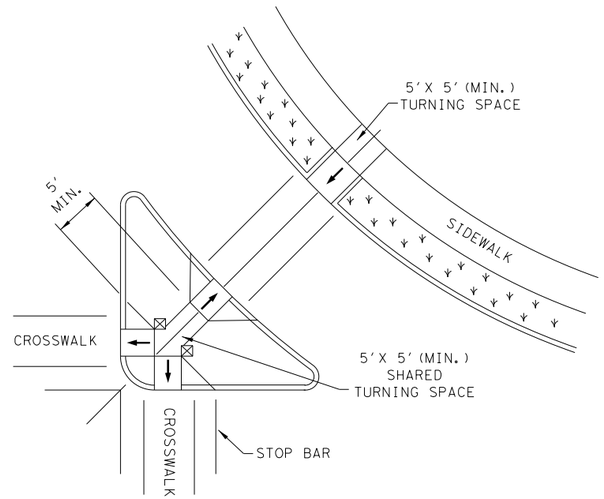
SKEWED INTERSECTION WITH "LARGE" RADIUS



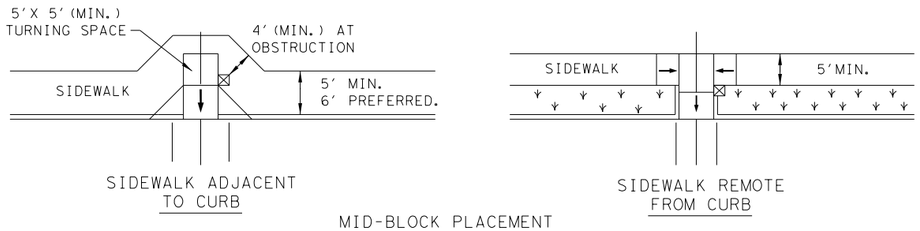
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

SHEET 4 OF 4

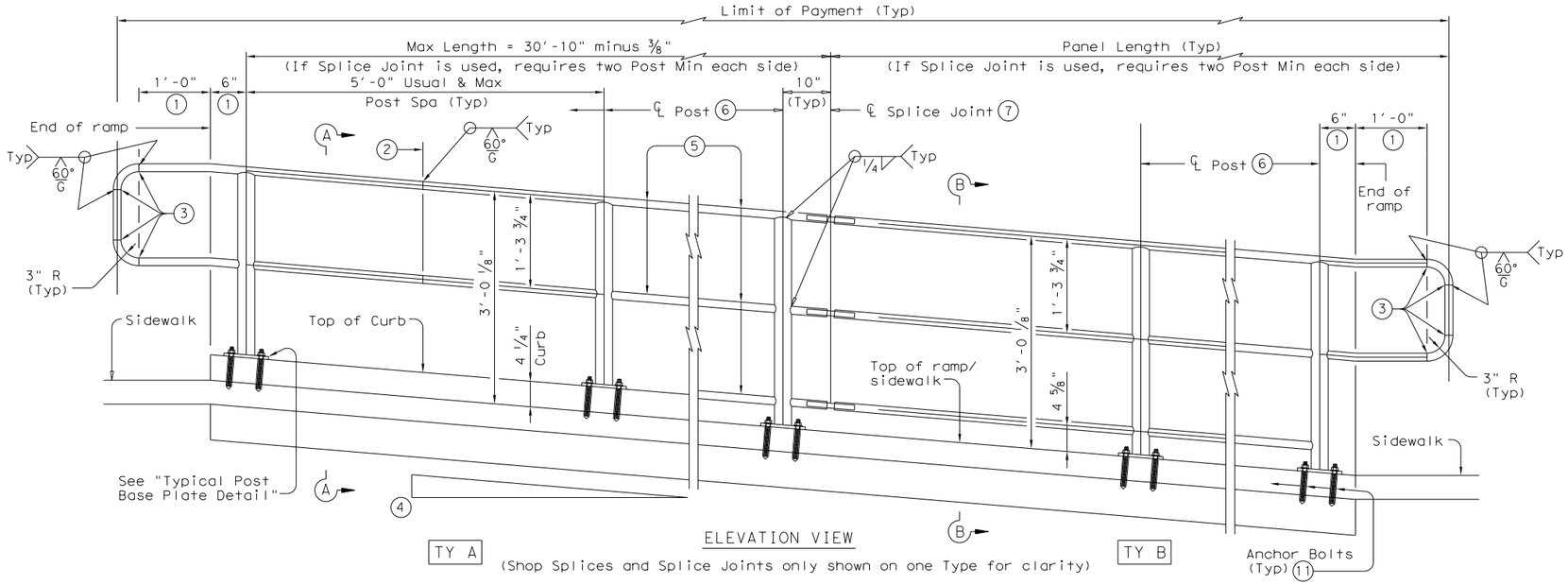
Texas Department of Transportation | Design Division Standard

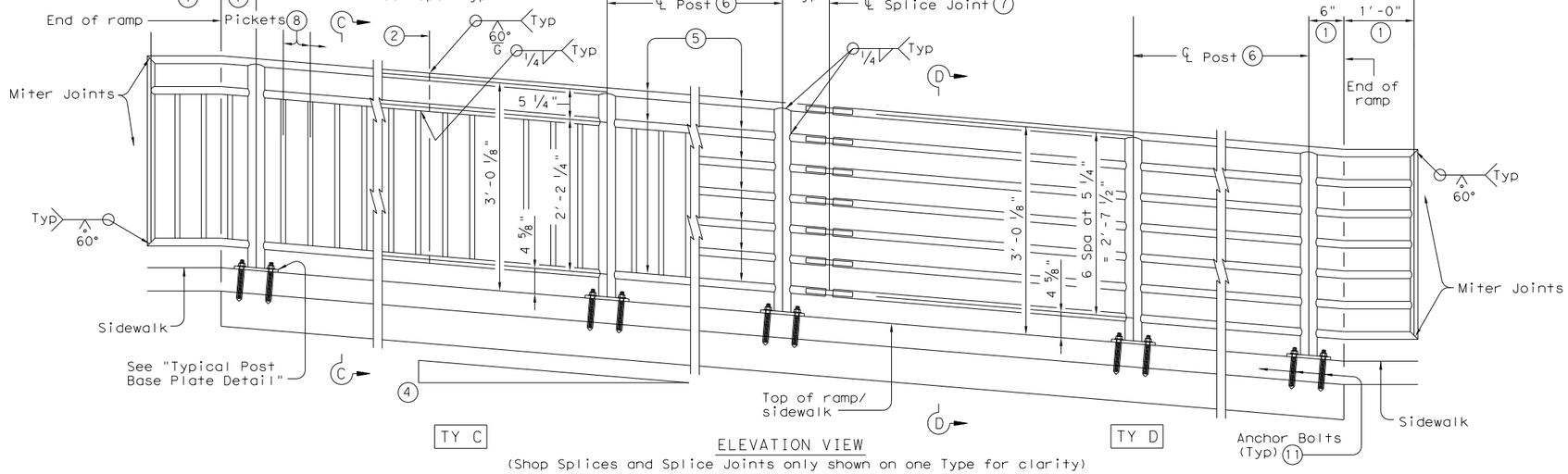
PEDESTRIAN FACILITIES
CURB RAMPS

PED-18

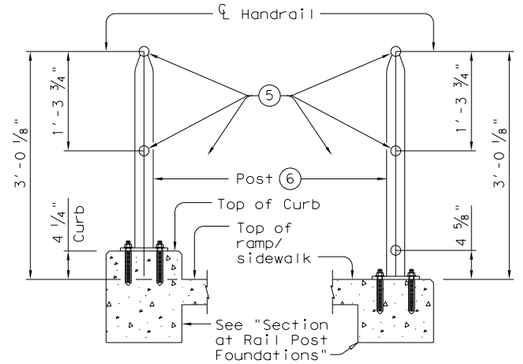
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0979	01	027		FM 519
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	HOU	GALVESTON			62

DATE:
FILE:



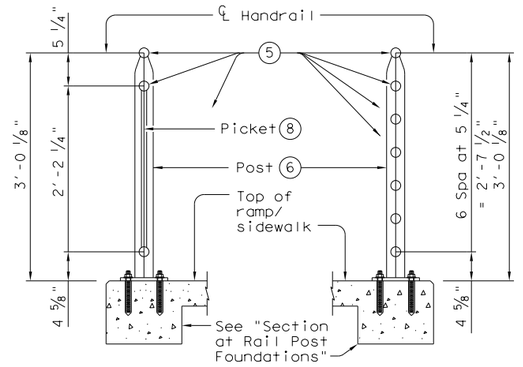


RECOMMENDED USAGE (9) (10)	
Dropoff Height/ Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F



SECTION A-A
(Showing Handrail TY A)

SECTION B-B
(Showing Handrail TY B)



SECTION C-C
(Showing Handrail TY C)

SECTION D-D
(Showing Handrail TY D)

(1) Parallel to ground.

(2) One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

(3) Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

(4) See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.

(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.

(7) See "Handrail Fabrication Details" for Splice Joints.

(8) ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.

(9) When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.

(10) Not to be used on bridges.

(11) See "General Notes" for anchor bolt information.

SHEET 1 OF 3

Texas Department of Transportation

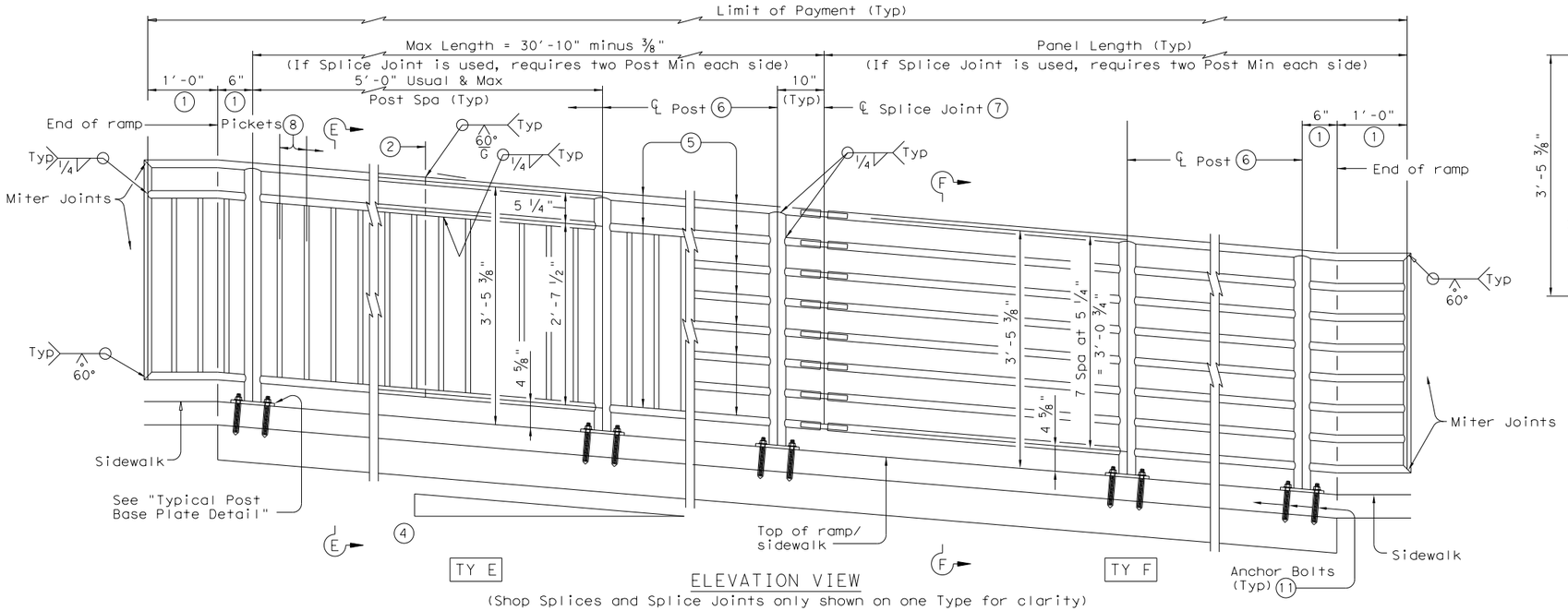
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

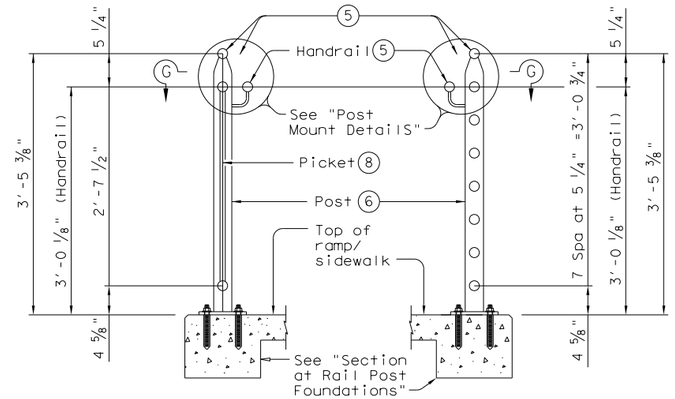
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT Decmeber 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		63

DATE:
FILE:



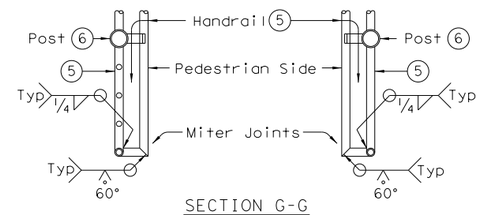
ELEVATION VIEW

(Shop Splices and Splice Joints only shown on one Type for clarity)

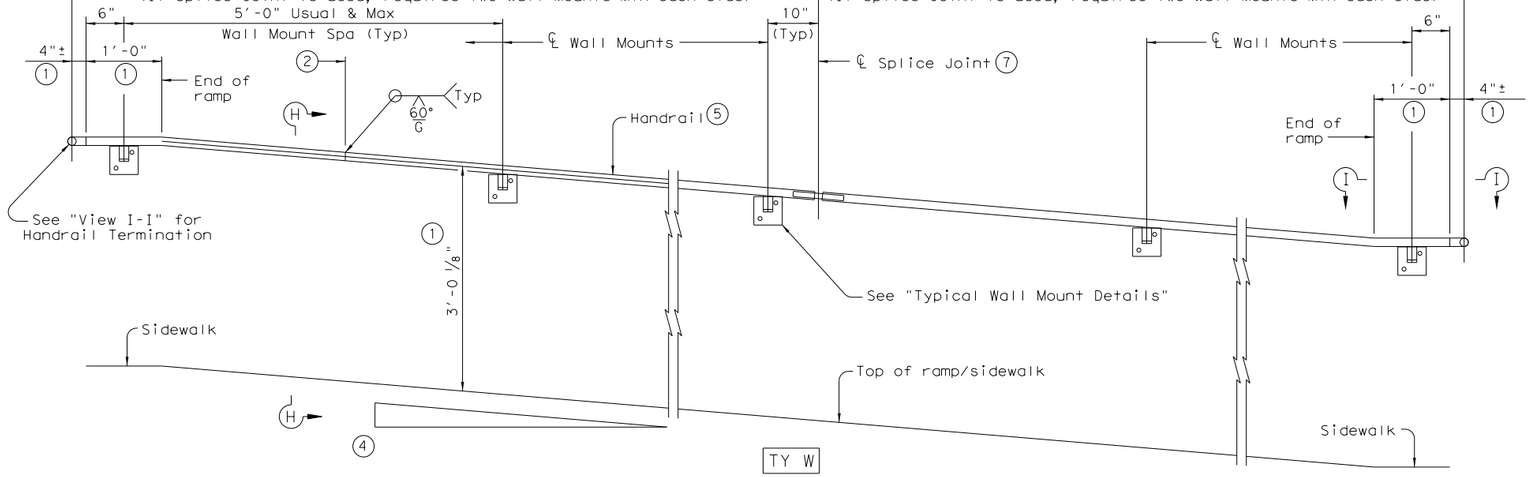


SECTION E-E
(Showing Handrail TY E)

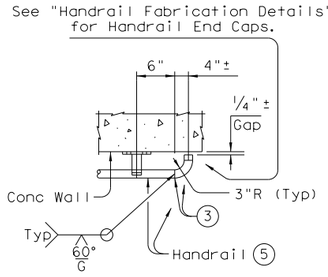
SECTION F-F
(Showing Handrail TY F)



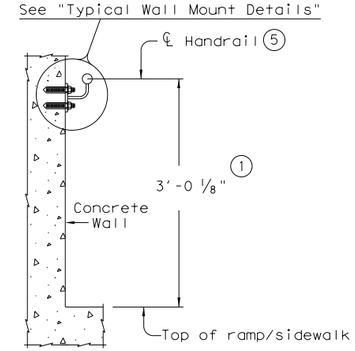
SECTION G-G
(Showing Handrail Termination)



ELEVATION VIEW



VIEW I-I
(Showing Handrail Termination)



SECTION H-H
(Showing Handrail TY W)

(1) Parallel to ground.

(2) One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

(3) Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

(4) See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.

(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.

(7) See "Handrail Fabrication Details" for Splice Joints.

(8) ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.

(11) See "General Notes" for anchor bolt information.

Texas Department of Transportation

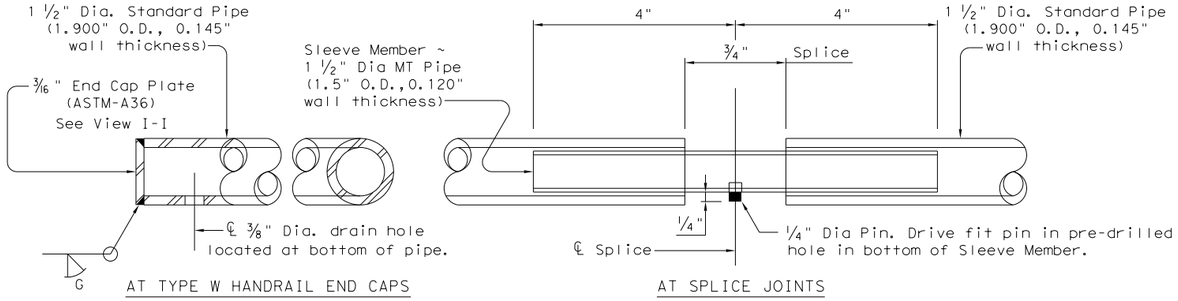
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

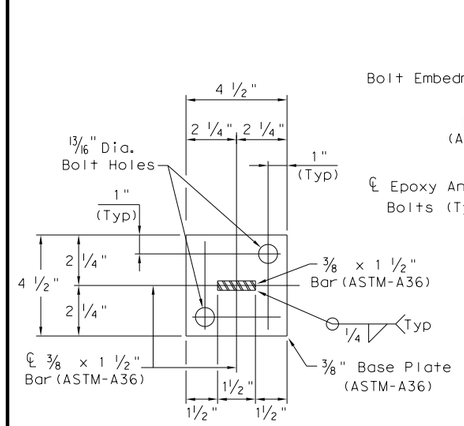
PRD-13

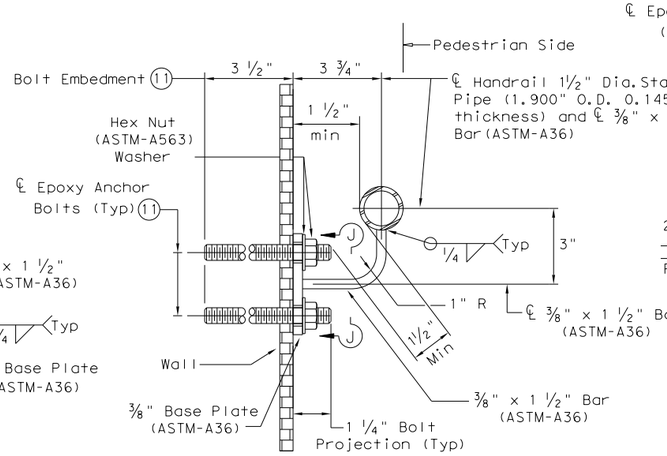
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		64

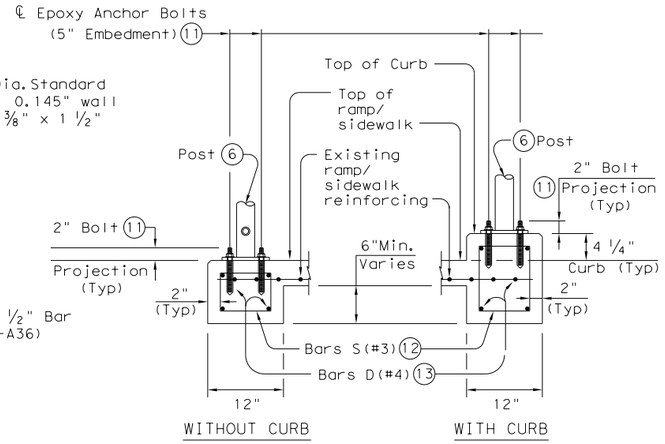
DATE:
FILE:

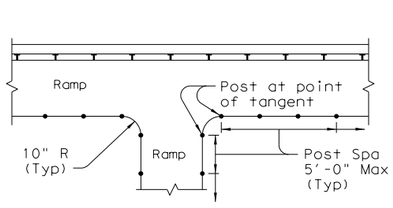


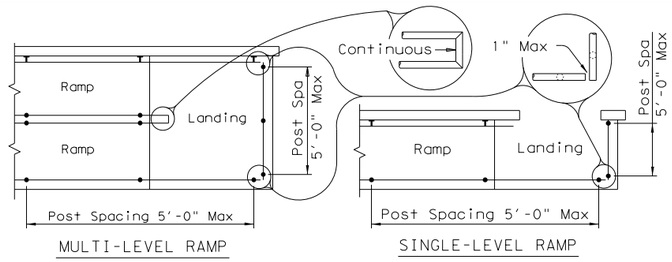
HANDRAIL FABRICATION DETAILS











PLAN SHOWING RAIL AT RAMP CONDITIONS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated ~ #4 = 1'-5" Epoxy coated ~ #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be ⅝" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. ⅝" Dia. threaded rod embedment depth for wall mounts is 3 ½" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately ⅛" by grinding.

TYPICAL WALL MOUNT DETAILS

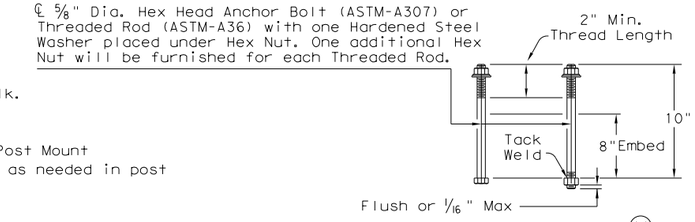
(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

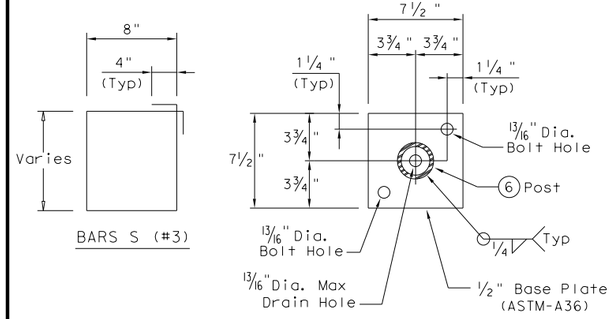
(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diamenter of top rail. Provide holes as needed in post for galvanizing drainage and venting.

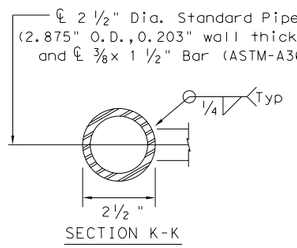
(11) See "General Notes" for anchor bolt information.

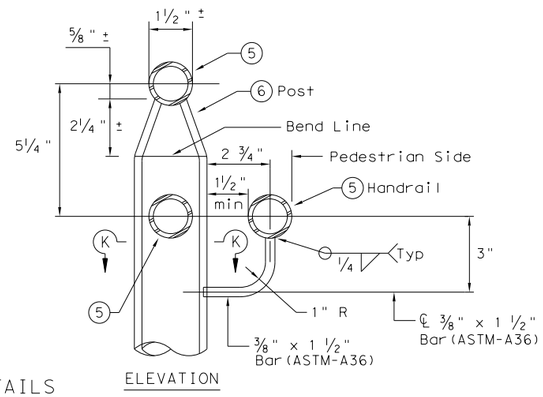
(12) Bars S(#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).

(13) Provide 1 ½" end cover to Bars D(#4) from outside edge of overall length of Ramp/Sidewalk.









POST MOUNT DETAILS

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

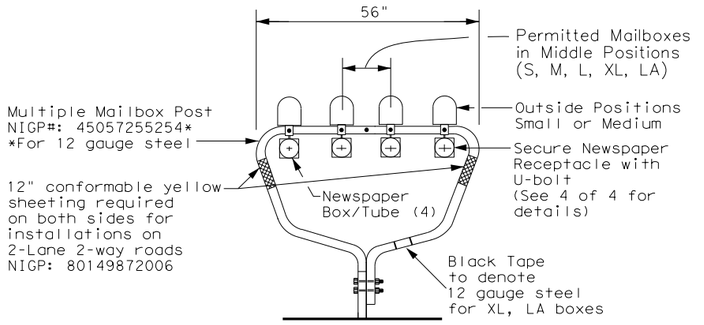
PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		65

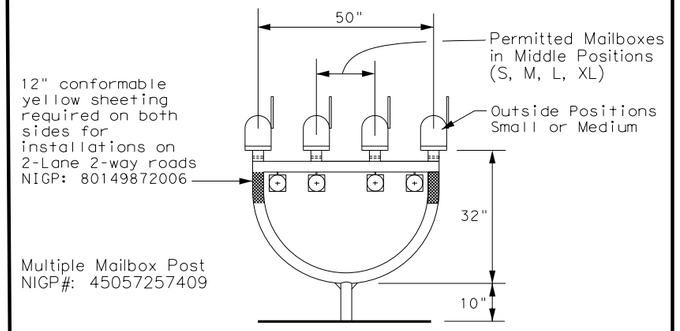
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

TYPE 1 - MULTIPLE



TYPE 4 - MULTIPLE



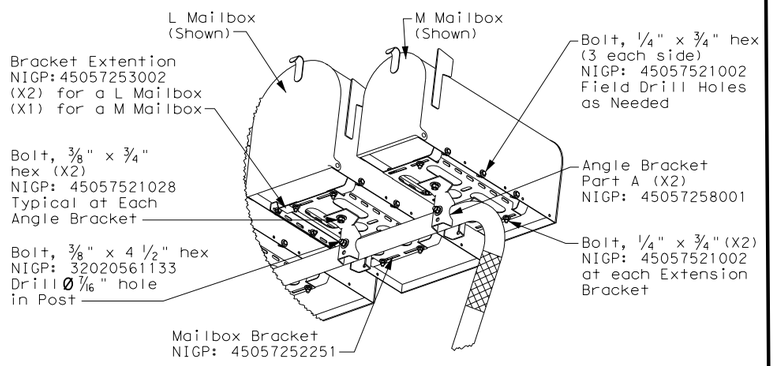
MAILBOX SIZES

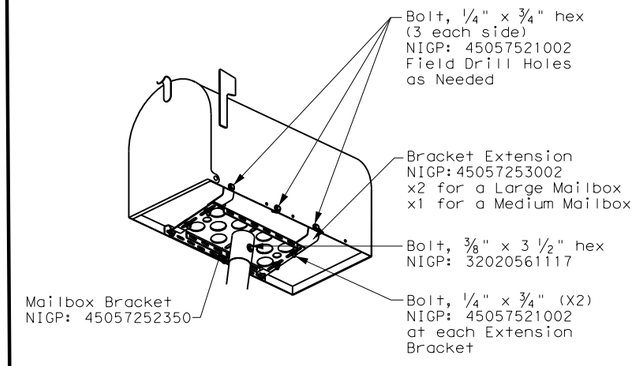
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 ½"	6"	7"	6 LBS
MEDIUM	22 ½" *	8" *	11 ½" *	8 LBS
LARGE	23 ½"	11 ½"	13 ½"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 ½"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

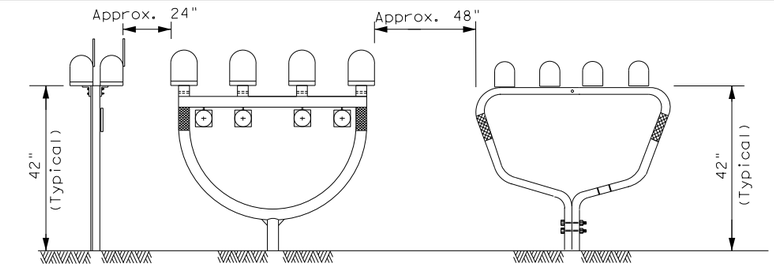
GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



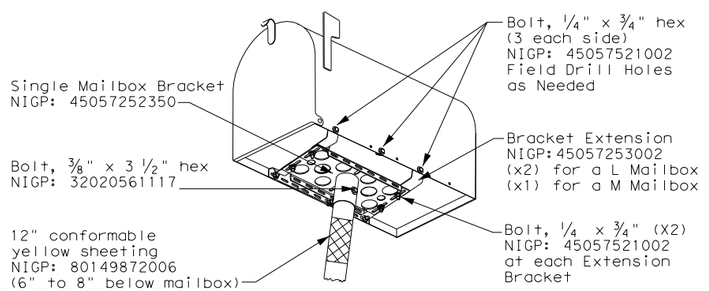


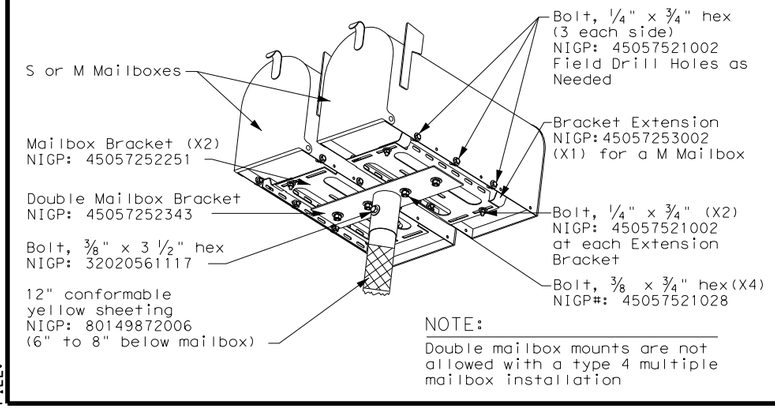
TYPICAL INSTALLATION MEASUREMENTS



NOTE:
Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

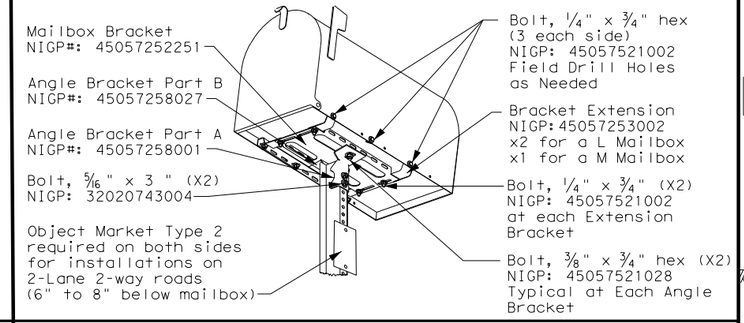
TYPE 2 and 4 - SINGLE/DOUBLE

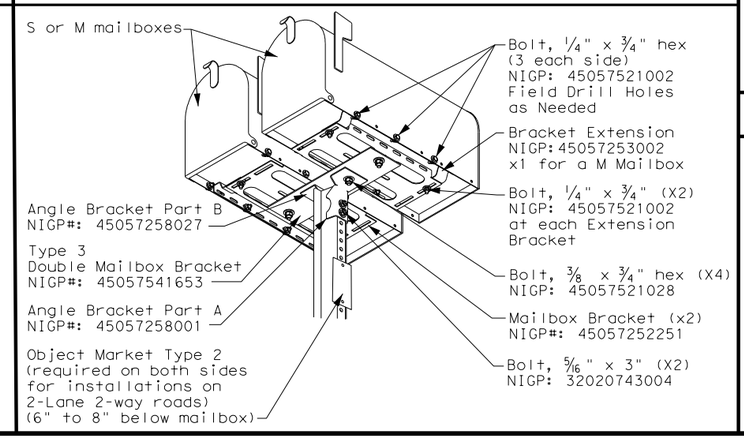




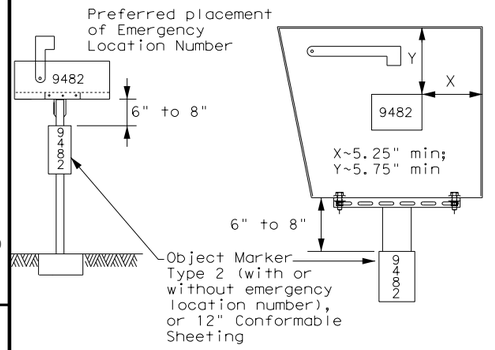
NOTE:
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

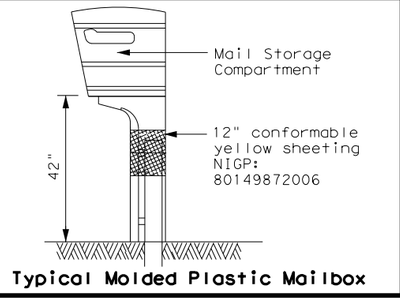


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation
Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

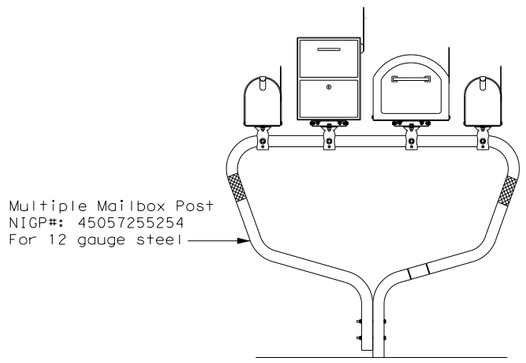
MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		66

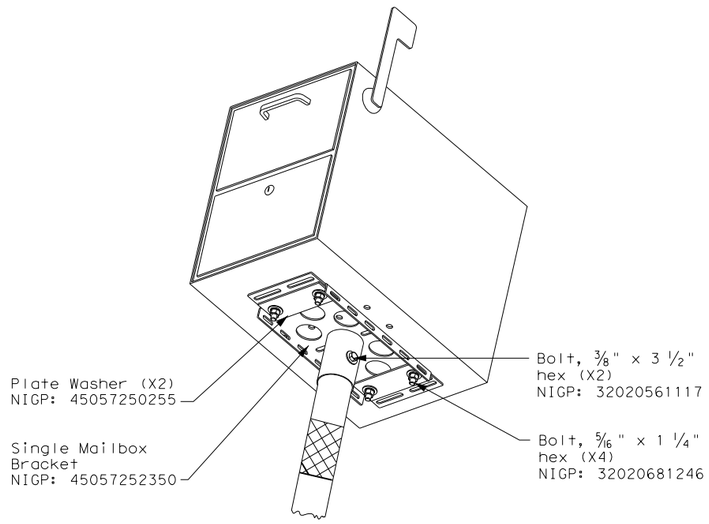
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

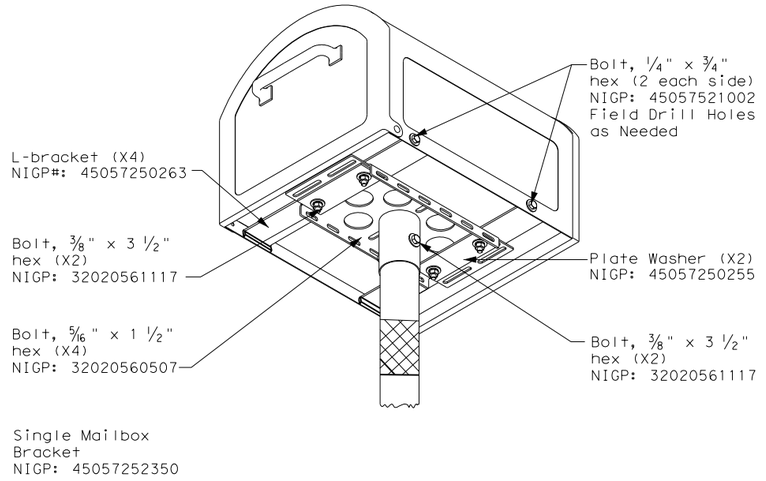
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

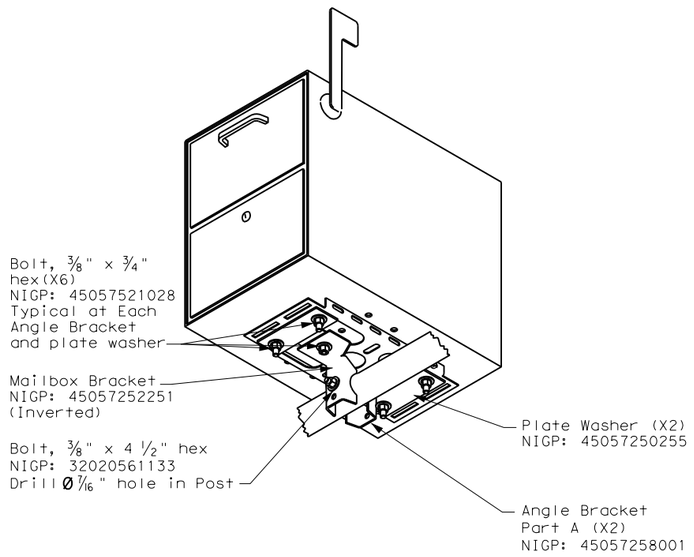


TYPE 2/4 - SINGLE XL MAILBOX

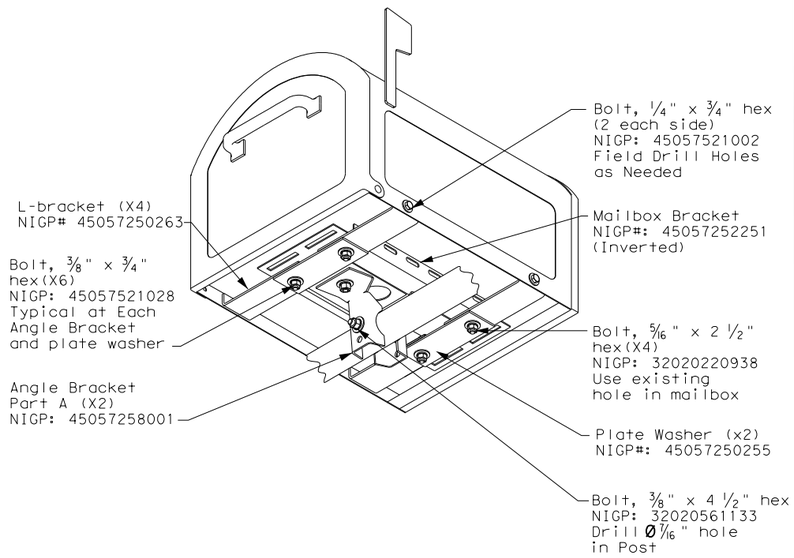


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

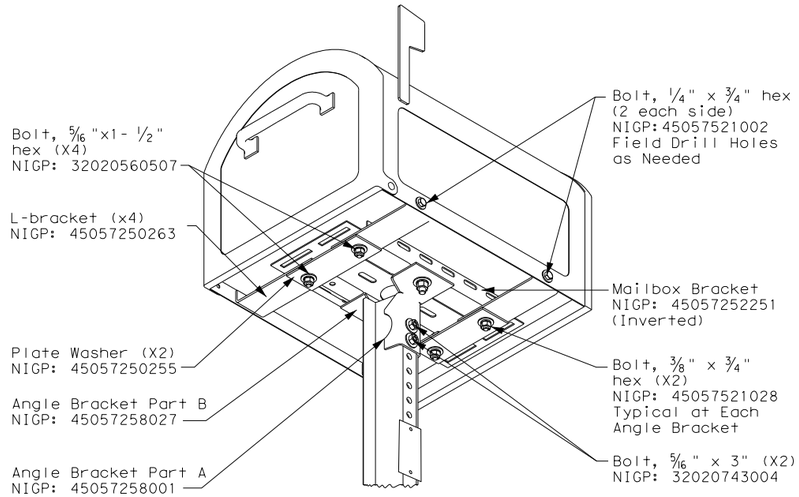
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



SHEET 2 OF 4

Texas Department of Transportation | Maintenance Division Standard

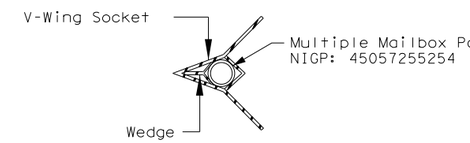
XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

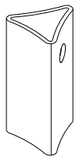
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		67

DATE:
FILE:

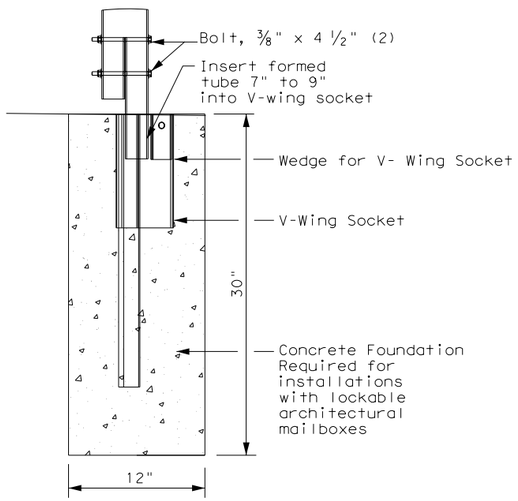
TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage

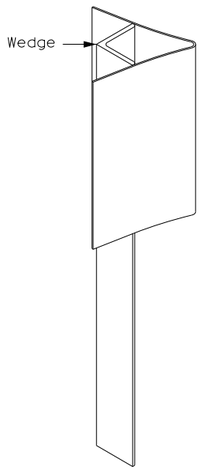


Top View



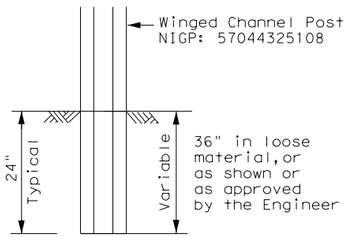
Wedge
NIGP: 45057259009





V-Wing Socket
NIGP: 45057256500

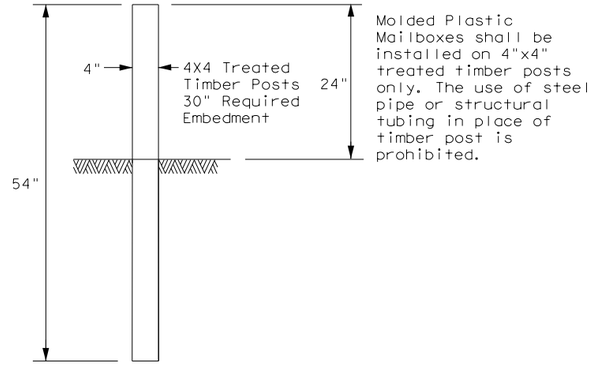
TYPE 3 - SUPPORT/FOUNDATION



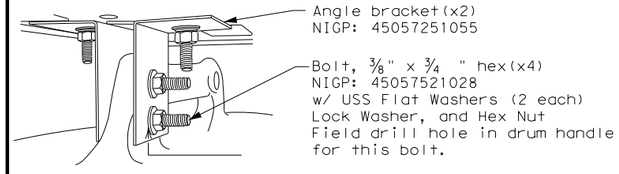
Top View

NOTES:
1. Attach Object Marker(OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



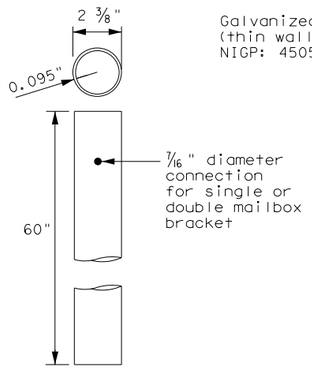
TYPE 6 - TEMPORARY MAILBOX SUPPORT



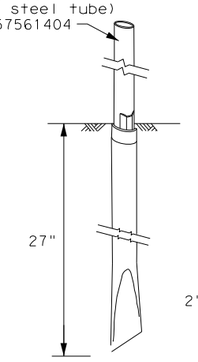
Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

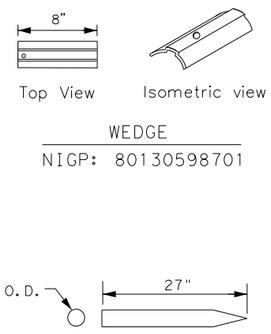
TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



MAILBOX POST

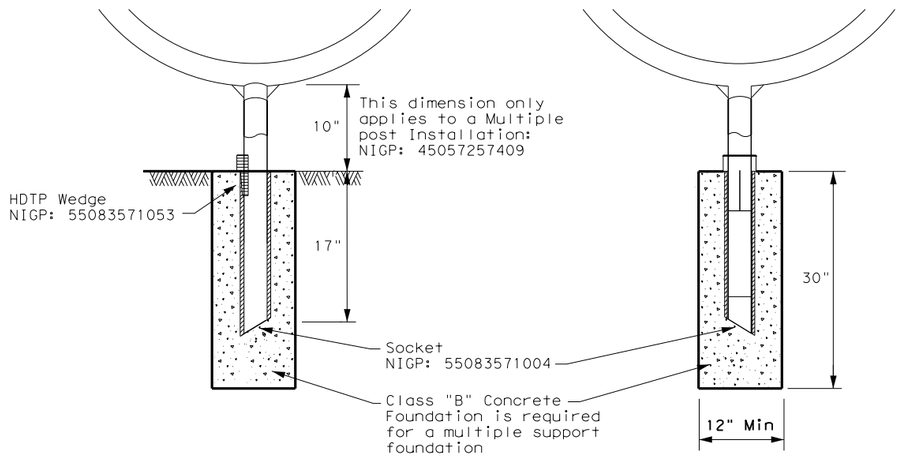


WEDGE ANCHOR
NIGP: 80130238407



WEDGE
NIGP: 80130598701

TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



GENERAL NOTES:
1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

Texas Department of Transportation | Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

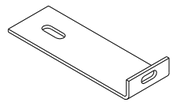
MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		68

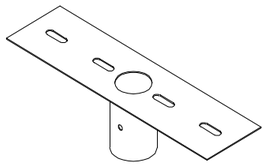
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

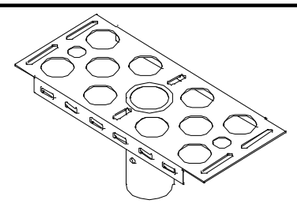
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



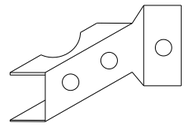
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



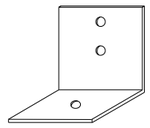
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



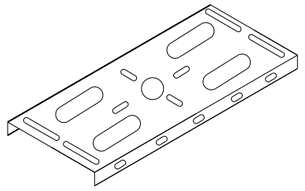
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



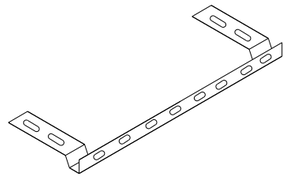
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



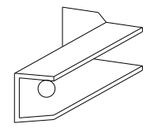
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



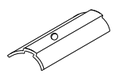
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



NIGP: 45057253002
Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox

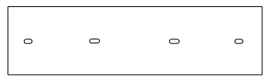


NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double

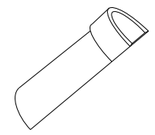


NIGP: 80130598701
Wedge for Type 2

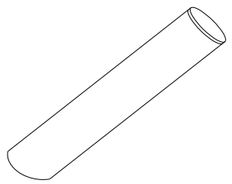
NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes



NIGP: 45057541653
Type 3 double mailbox bracket

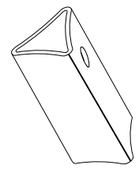


NIGP: 55083571053
Type 4 Mailbox Wedge

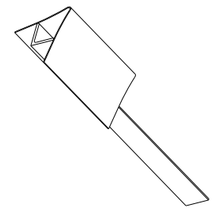


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

SHEET 4 OF 4

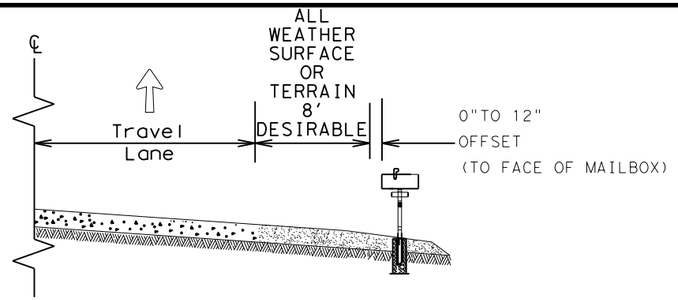
Texas Department of Transportation

Maintenance Division Standard

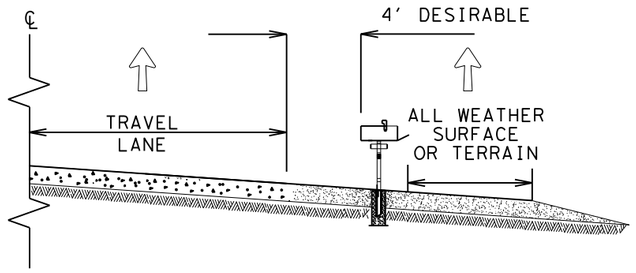
NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

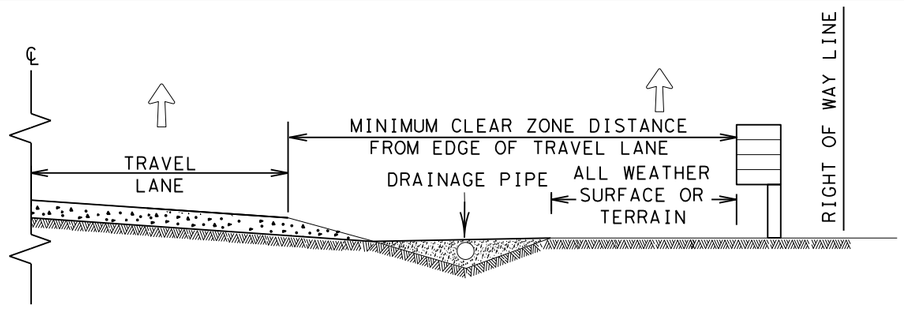
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		69



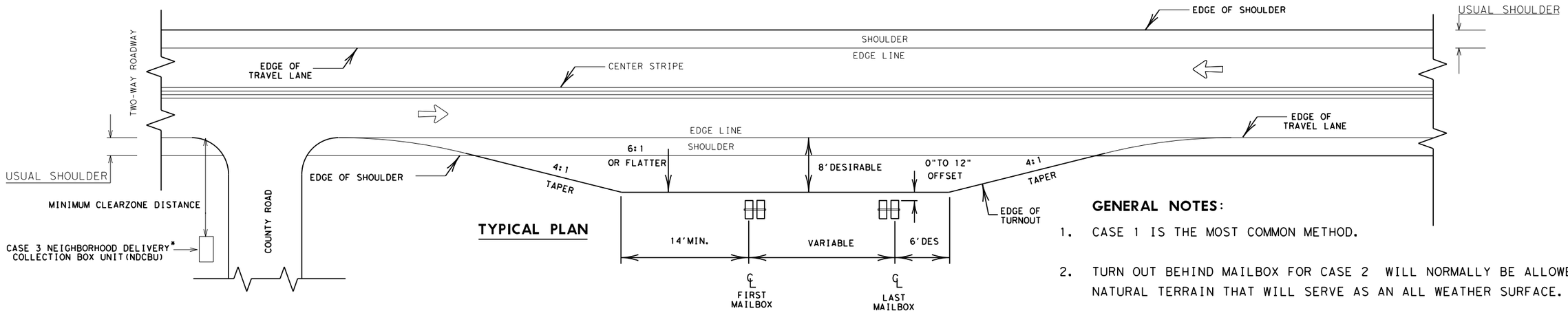
CASE 1. OFF TRAVEL WAY DELIVERY



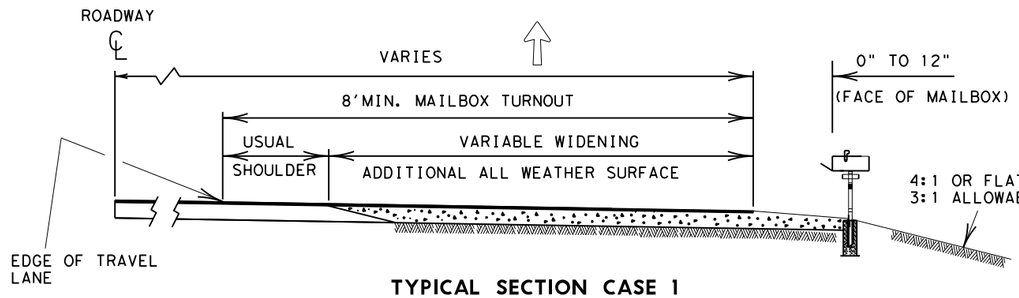
CASE 2. BACK SIDE DELIVERY



CASE 3. DELIVERY NEAR RIGHT OF WAY LINE



TYPICAL PLAN



TYPICAL SECTION CASE 1

GENERAL NOTES:

1. CASE 1 IS THE MOST COMMON METHOD.
2. TURN OUT BEHIND MAILBOX FOR CASE 2 WILL NORMALLY BE ALLOWED FOR NATURAL TERRAIN THAT WILL SERVE AS AN ALL WEATHER SURFACE.
3. ALL WEATHER DRIVEWAYS FOR CASE 3 MAILBOXES LOCATED AT THE RIGHT OF WAY LINE SHOULD NORMALLY BE PLACED IN CONJUNCTION WITH COUNTY ROADS OR OTHER CONNECTING COMMUNITY ROADS OR STREETS. WHEN 3 OR MORE MULTI-RACKS ARE ANTICIPATED, THE USE OF AN NDCBU IS RECOMMENDED. ONLY RURAL PATRONS LOCATED ON STATE MAINTAINED HIGHWAYS MAY HAVE A MAILBOX OR NDCBU SLOT ON TXDOT RIGHT OF WAY.

*NDCBU MAY BE INSTALLED ON COUNTY ROAD ROW WITH APPROVAL OF COUNTY.

MAIL DELIVERY VEHICLE TRAVEL DIRECTION

Texas Department of Transportation

Maintenance Division Standard

Guideline

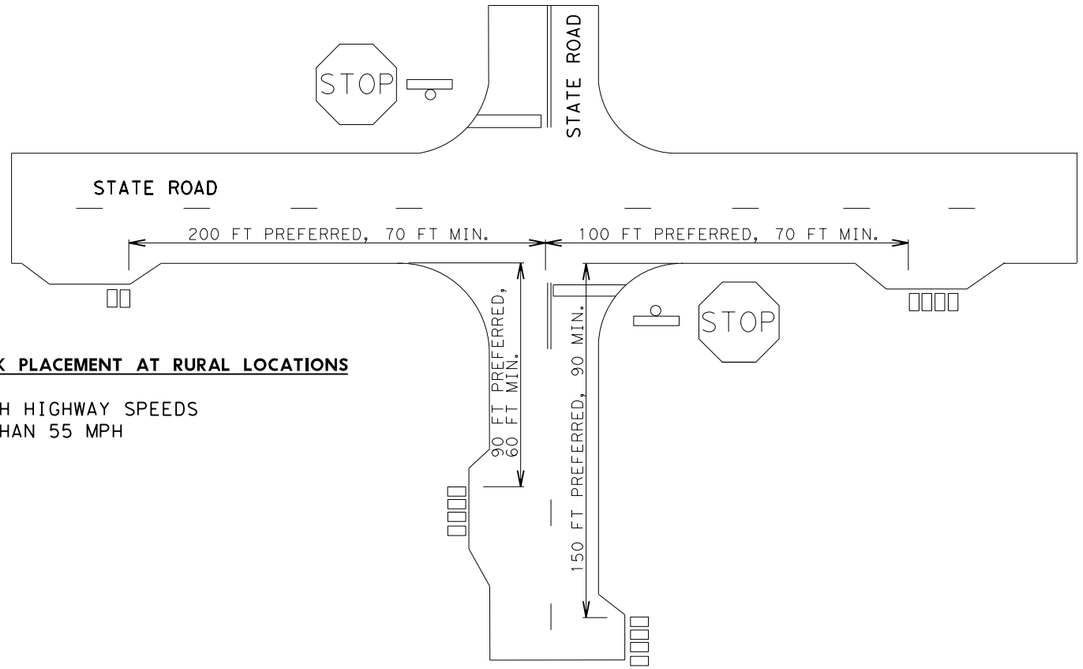
MAILBOX SIDE ROAD PLACEMENT AND TURNOUTS

MBP(1)-22

FILE: MBP-22.DGN	DN: VS		CK:	DW: VS		CK:
© TxDOT OCTOBER 2022	CONT	SECT	JOB		HIGHWAY	
REVISIONS 12/2012 5/2014	0979	01	027		FM 519	
	DIST	COUNTY			SHEET NO.	
	HOU	GALVESTON			70	

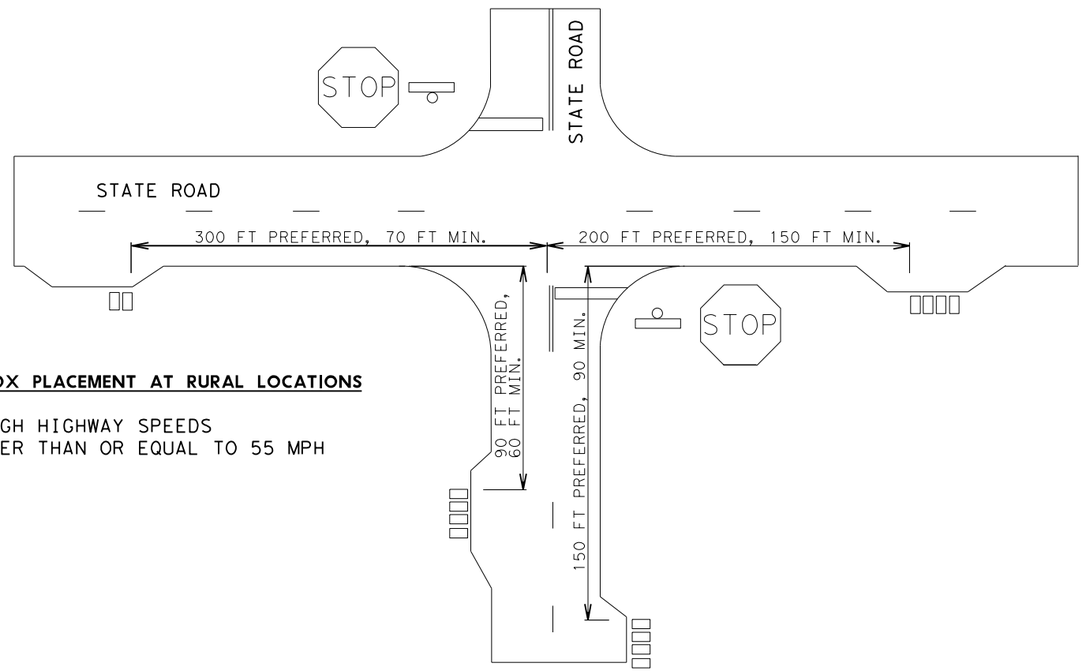
DATE:
FILE:

DATE:
FILE:



MAILBOX PLACEMENT AT RURAL LOCATIONS

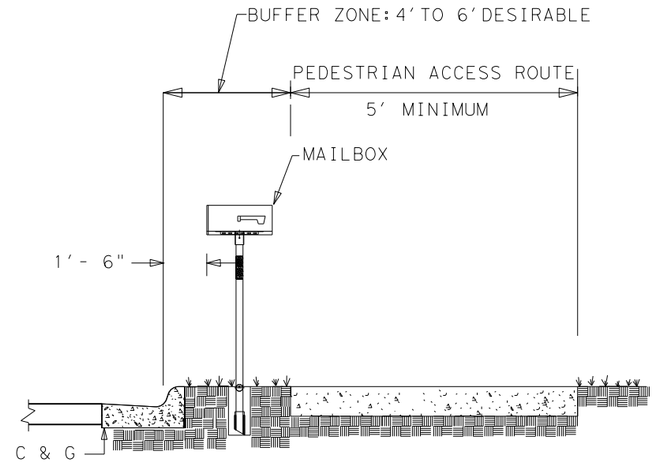
THROUGH HIGHWAY SPEEDS
LESS THAN 55 MPH



MAILBOX PLACEMENT AT RURAL LOCATIONS

THROUGH HIGHWAY SPEEDS
GREATER THAN OR EQUAL TO 55 MPH

CURB AND GUTTER MAILBOX INSTALLATION



NOTES:
1. A NON-TRAVERSABLE SURFACE MUST BE INSTALLED NEAR THE MAILBOX (NATURAL VEGETATION OR OTHER) IN THE BUFFER ZONE. ALTERNATIVELY, A BASE WITH A MINIMUM HEIGHT OF 2.5 INCHES MAY BE INSTALLED SO THAT THE EDGE OF THE MAILBOX DOES NOT EXTEND OUT MORE THAN 4 INCHES HORIZONTALLY BEYOND THE BASE.

2. THE SIDEWALK WIDTH MAY BE REDUCED TO 4 FOOT FOR SHORT DISTANCES AROUND THE MAILBOX IF NEEDED.

3. MAINTAIN A MINIMUM OF 5 FEET BETWEEN OBSTRUCTIONS IN THE PEDESTRIAN ACCESS ROUTE.

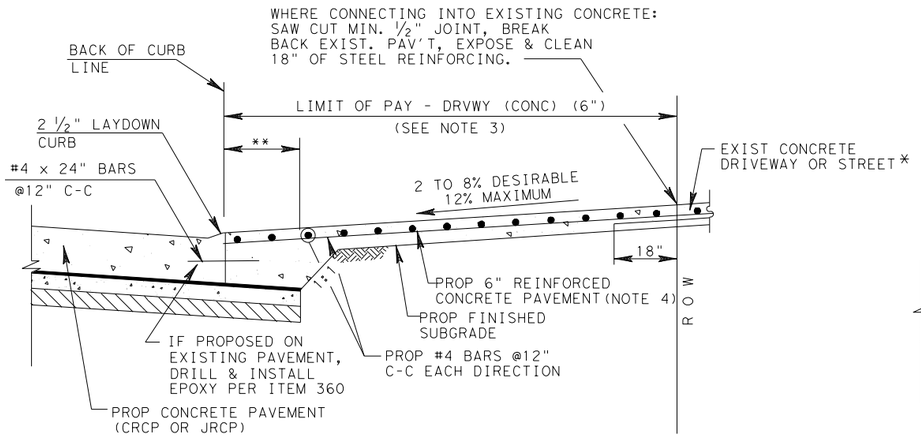
Texas Department of Transportation

Maintenance Division Standard

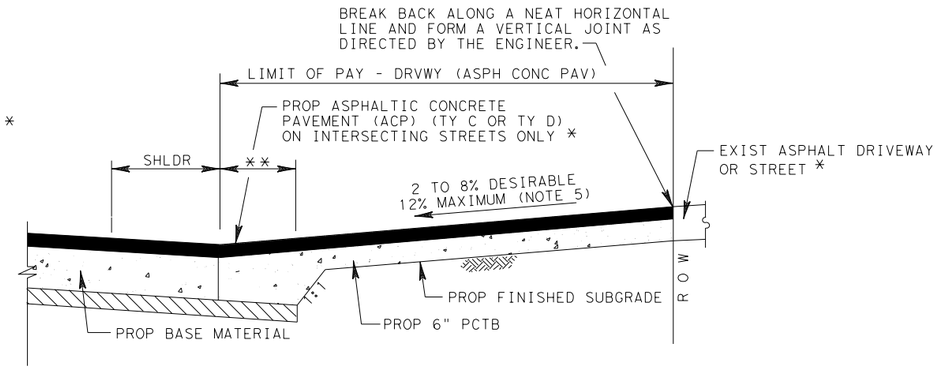
MAILBOX PLACEMENT CURBS & INTERSECTIONS

MBP(2)-22

FILE: MBP-22.DGN	DN: VS		CK:	DW: VS		CK:
	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0979	01	027		FM 519	
12/2012 5/2014	DIST	COUNTY			SHEET NO.	
	HOU	GALVESTON			71	



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE
CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ PCTB AT ASPHALT ROADWAY

NOTES:

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL
   8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

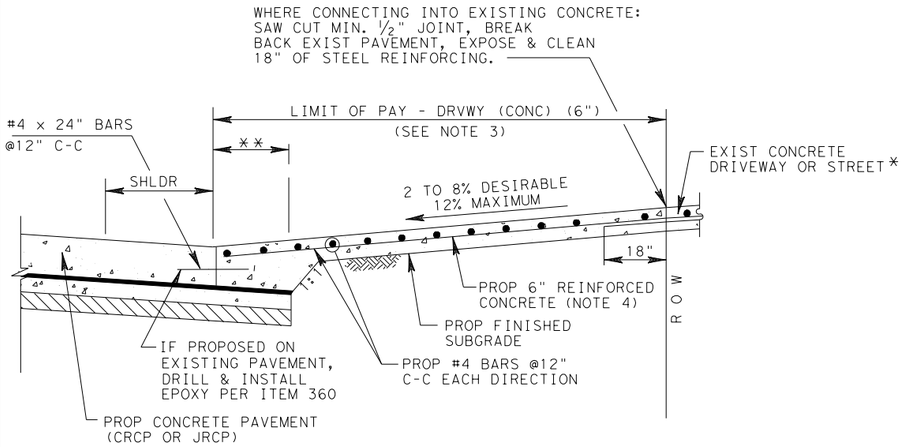
JRCP- JOINTED REINFORCED CONCRETE PAVEMENT

CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

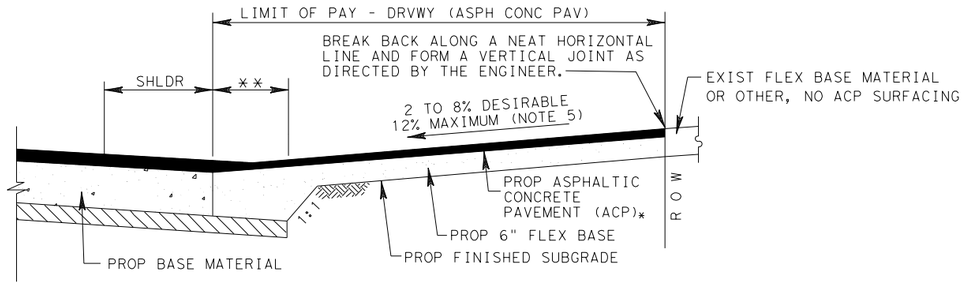
ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

SHEET 1 OF 3

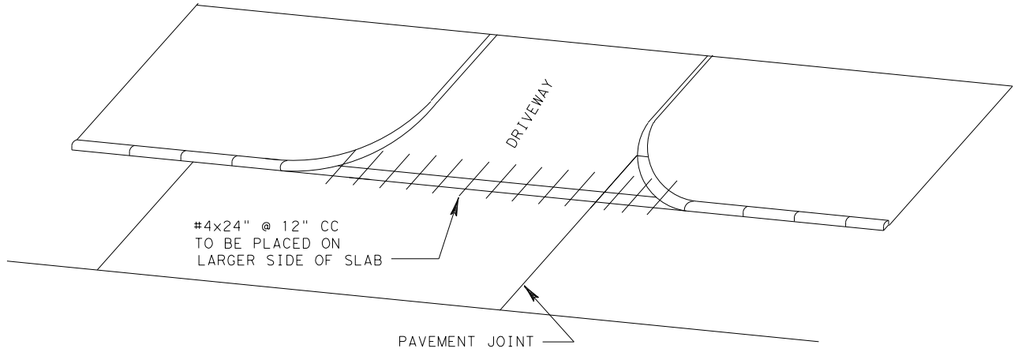
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

DD

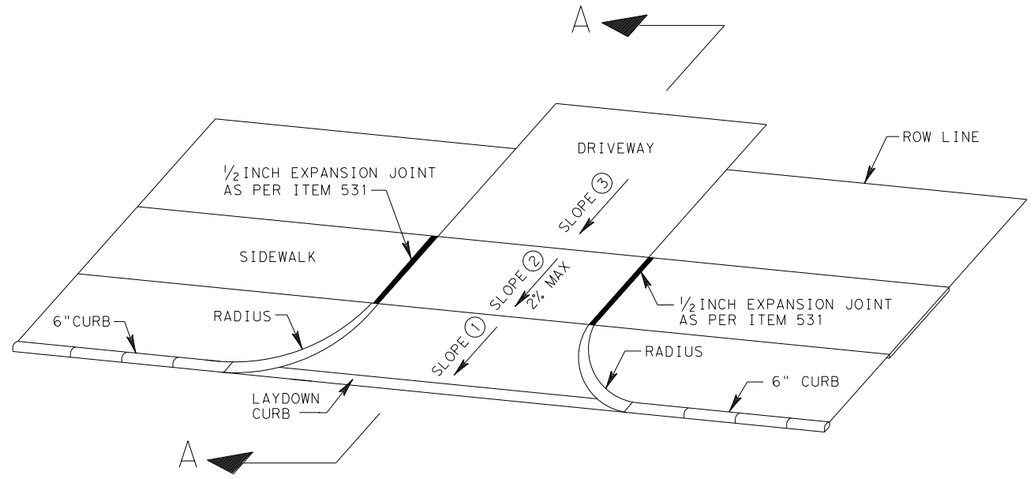
FILE: STDB-8a.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				72
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

STDB8A

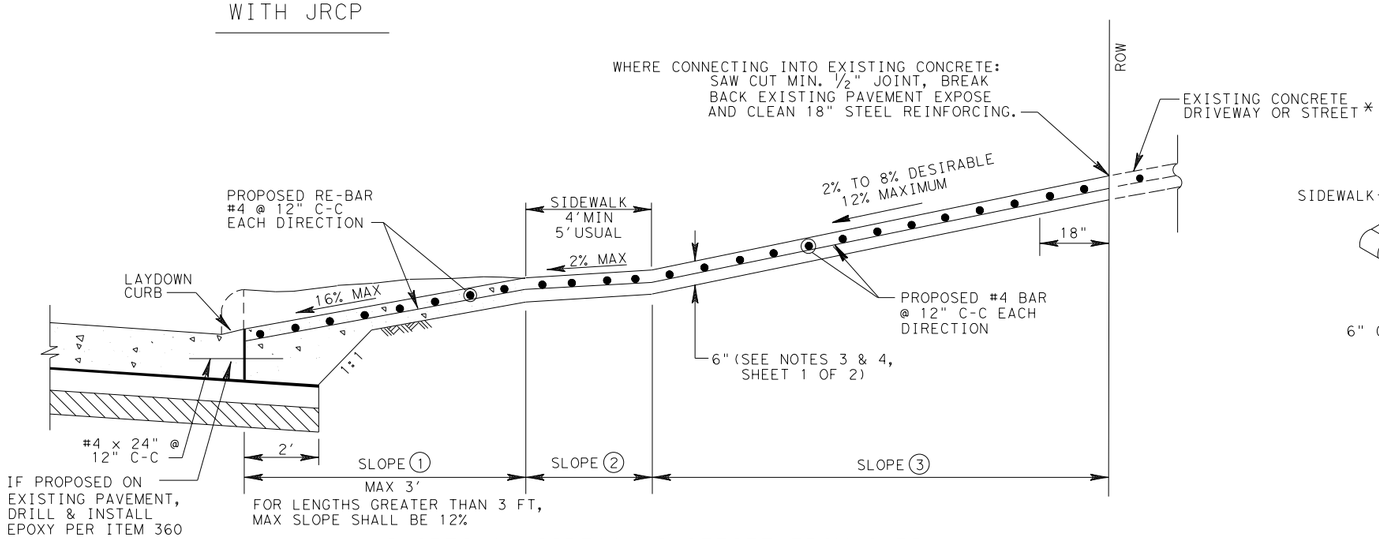


TIE BAR PLACEMENT

WITH JRCP

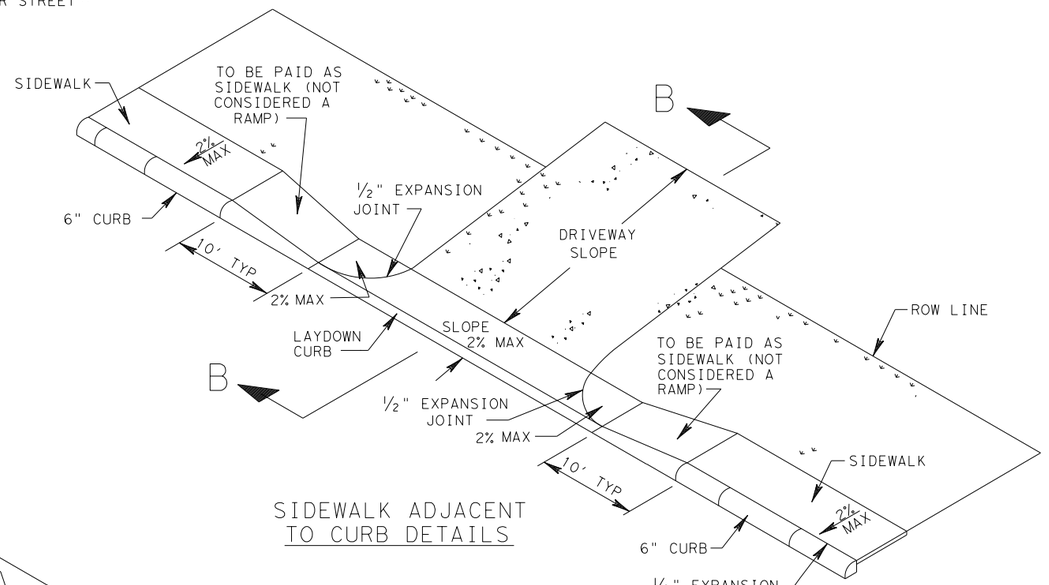


SIDEWALK OFFSET FROM CURB DETAILS

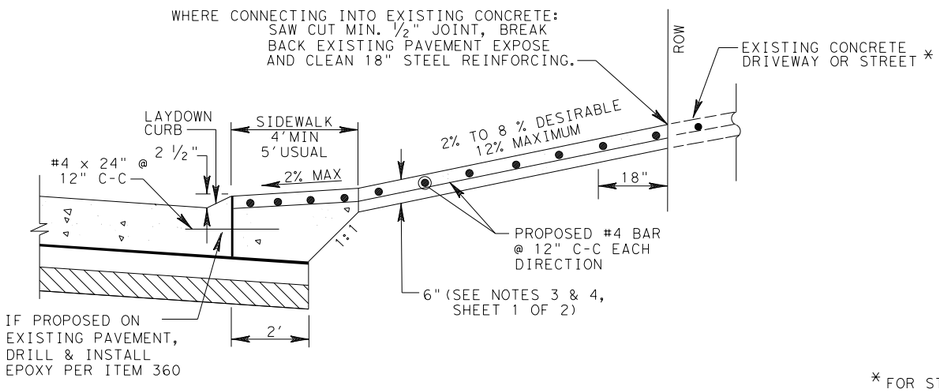


SLOPES W/ SIDEWALKS OFFSET FROM CURB

(SECTION A-A)

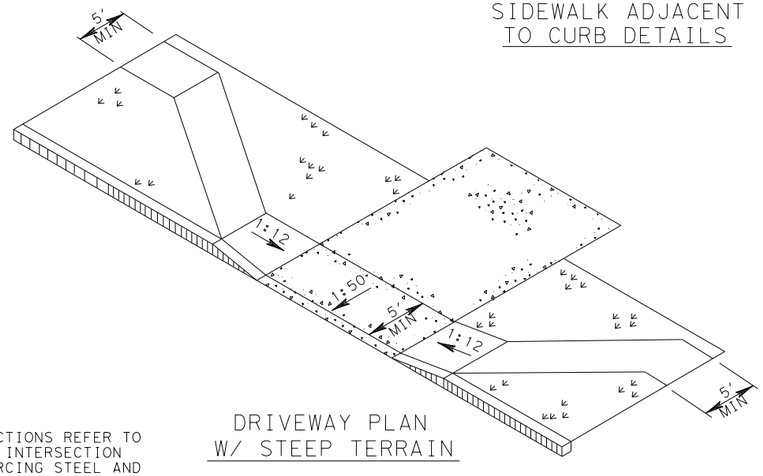


SIDEWALK ADJACENT
TO CURB DETAILS



DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB

(SECTION B-B)



DRIVEWAY PLAN
W/ STEEP TERRAIN

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

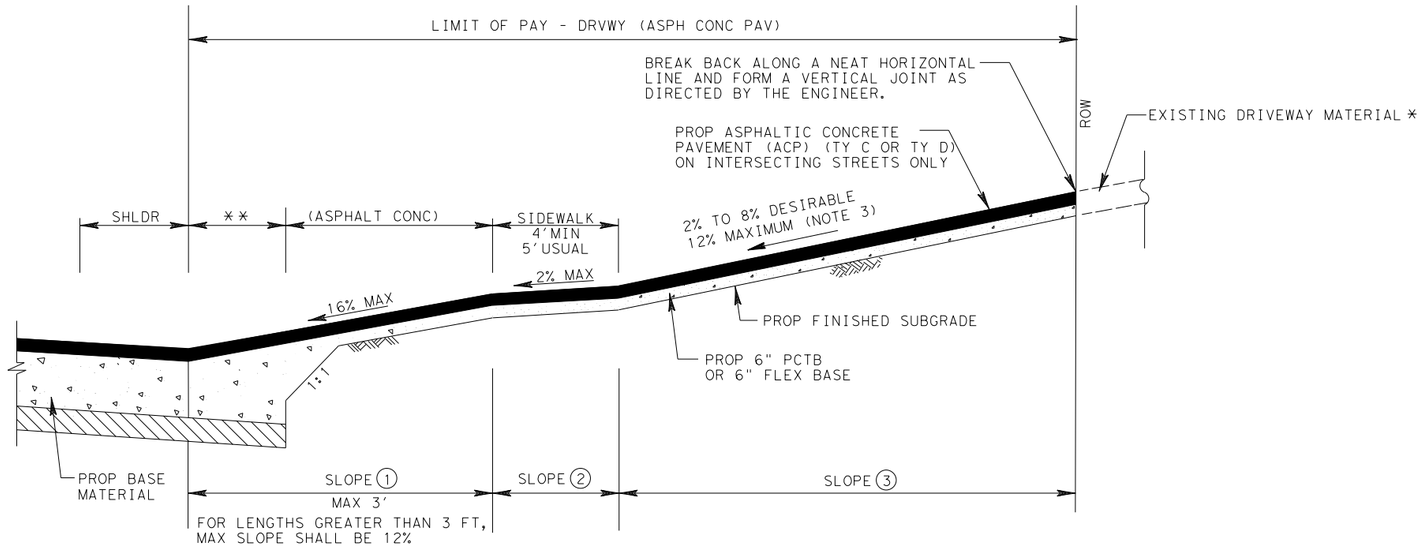
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

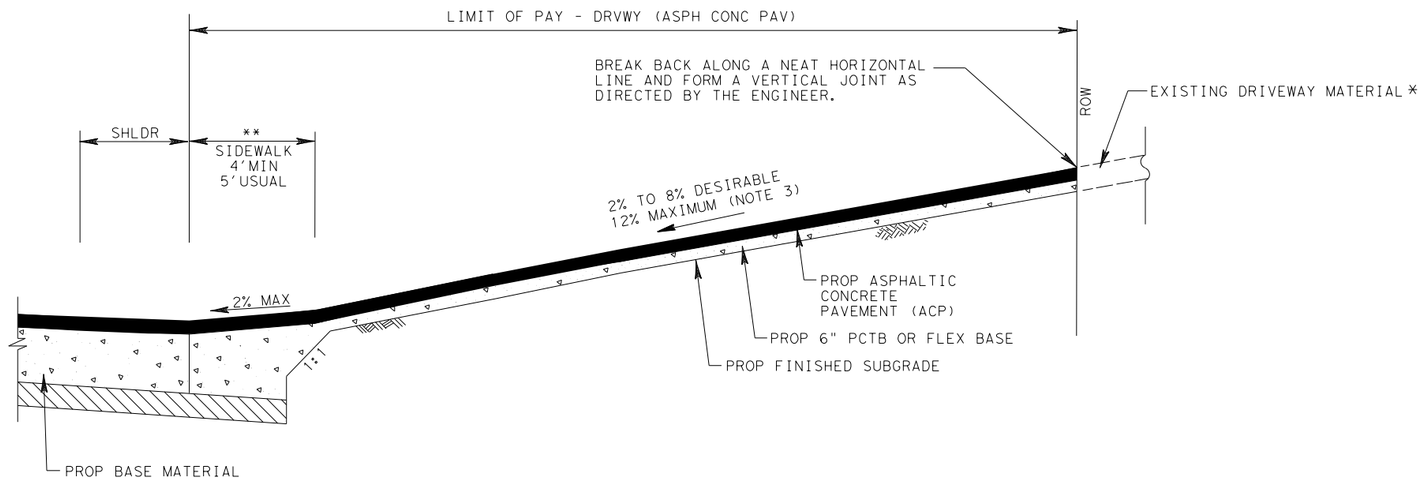
DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:	
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			73
9/09 ADDED NOTE FOR ITEM 360.	COUNTY		CONTROL	SECT	JOB	HIGHWAY
11/15 ADDED NOTE FOR PCTB	GALVESTON		0979	01	027	FM 519

STDB8B



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS OFFSET



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS ADJACENT

NOTES:

1. ALSO SEE SHEET 2 OF 3 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

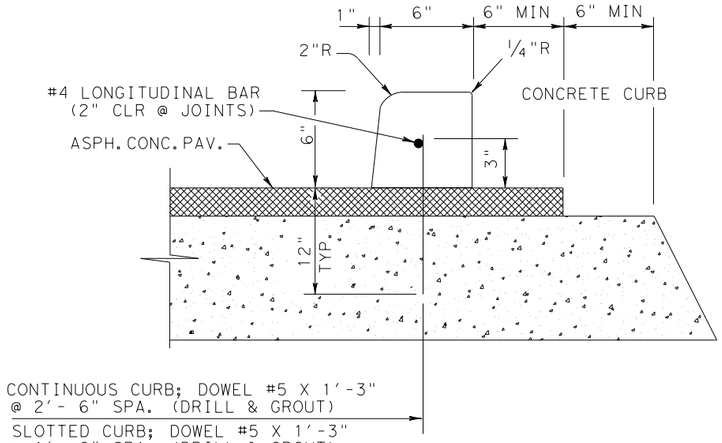
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

DD

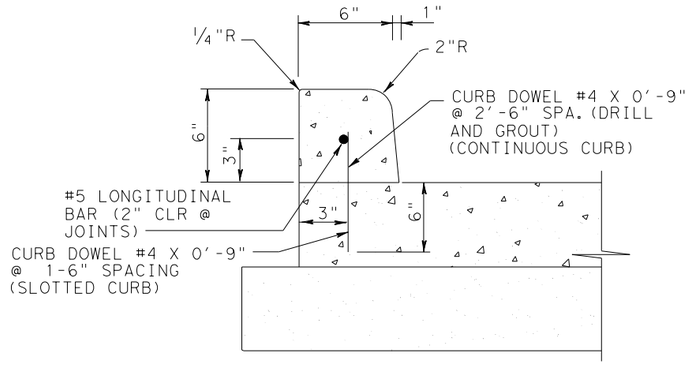
FILE: STDB-8c.dgn	DN:	CK:	DW:	CK:	
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6			74
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	GALVESTON	0979	01	027	FM 519

STDB8C



SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

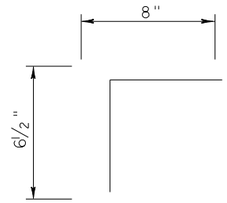
(PAY ITEM 529-6011) - FOR CONTINUOUS



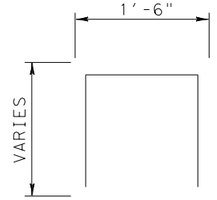
SHOWN ON EXISTING OR PROPOSED
CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

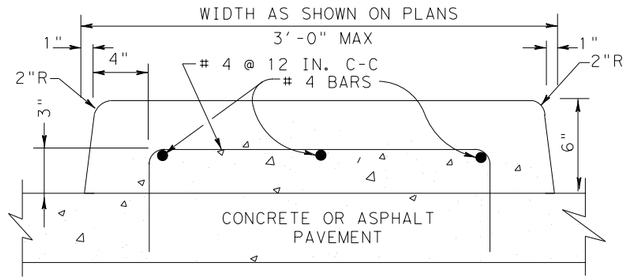
CONCRETE CURB (DOWEL) (6 IN.)



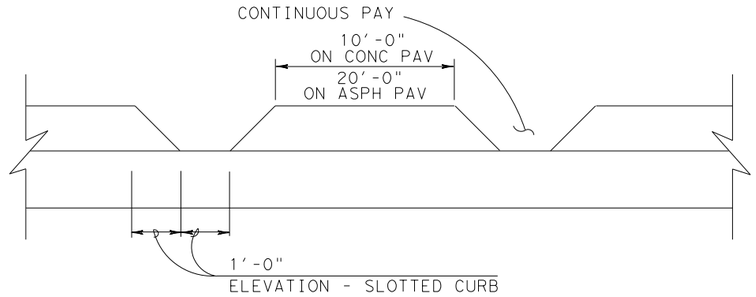
BAR K
#4



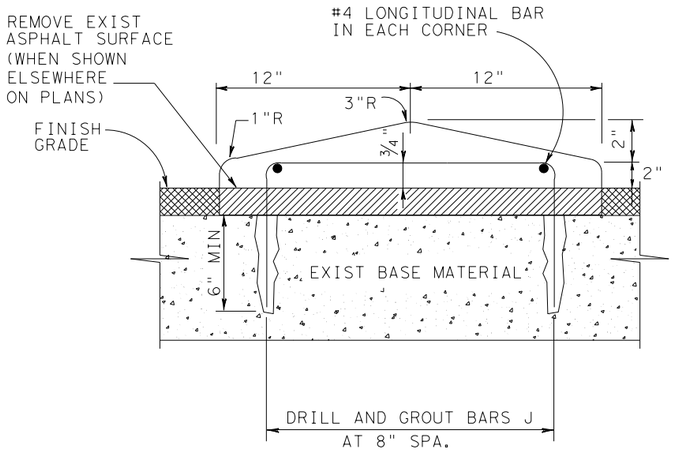
BAR J
#4



ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2

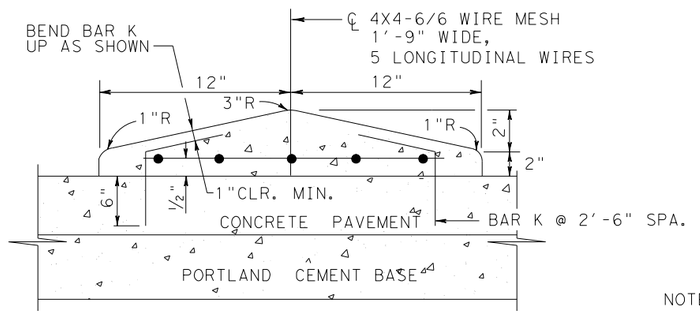


ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.



SHOWN ON EXISTING ACP PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



SHOWN ON EXISTING OR PROPOSED
CONCRETE PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

CONCRETE DIRECTIONAL ISLAND

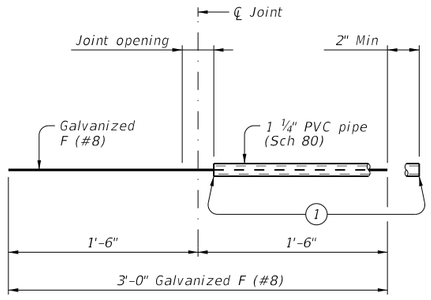
NOTES:

1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

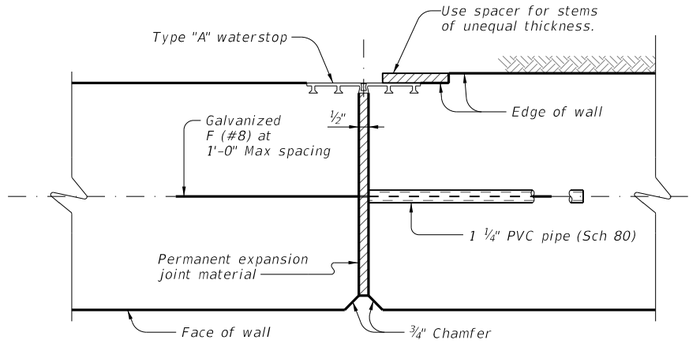
Texas Department of Transportation
Houston District

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS
CC & DID

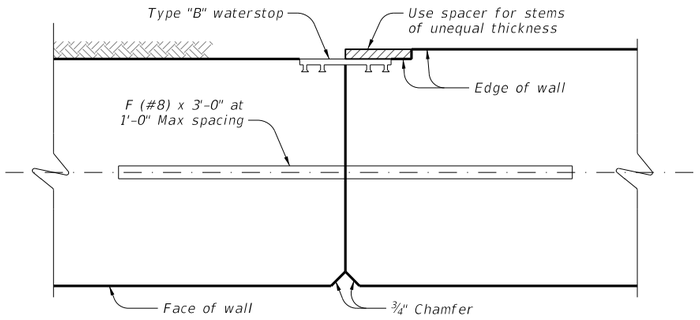
FILE: STDB-9.dgn	DN:	CK:	DW:	CK:
©TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		75
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	GALVESTON	0979	01	027	FM 519



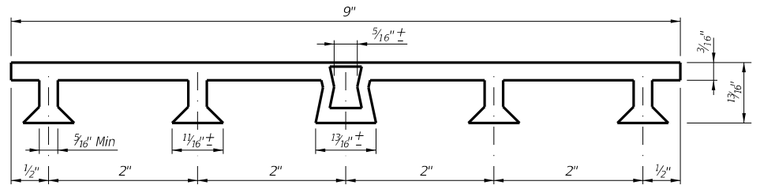
BAR F (#8) ASSEMBLY DETAIL



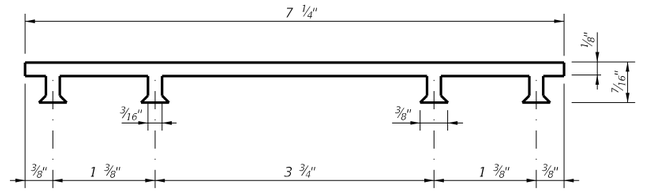
EXPANSION JOINT



CONSTRUCTION JOINT

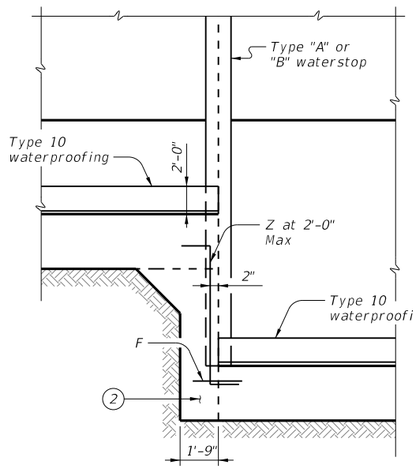


PVC WATERSTOP TYPE "A"

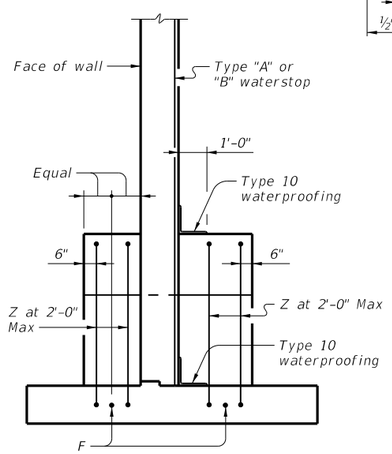


PVC WATERSTOP TYPE "B"

Note: Dimensions and shapes may vary slightly depending on manufacturer.

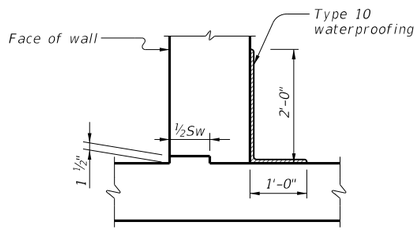


PARTIAL ELEVATION

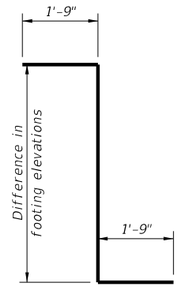


PARTIAL SECTION

SHOWING WATERSTOP AT FOOTING ELEVATION TRANSITION

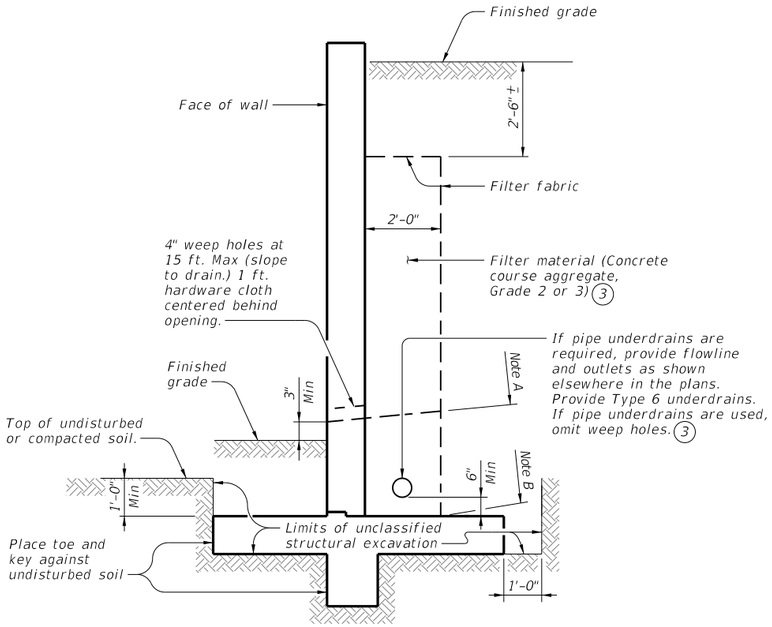


JOINT AND WATERSTOP DETAILS



BARS Z (#5)

(Omit Bars Z when difference in top of footing elevations is less than 2 ft).



DRAINAGE DETAILS AND EXCAVATION DIAGRAM

Note A: Stop coarse aggregate at this level when weep holes are used.

Note B: Use coarse aggregate to here when underdrains are used.

1. Tape ends of 1 ¼" PVC Schedule 80 to prevent concrete or mortar from seeping in.
2. Class C unreinforced concrete when difference in top of footing elevations is less than 2 feet. Omit when Dowel Bars F can be placed between adjacent footings with 4-inch cover top and bottom. Footing elevation difference not to exceed 4 feet.
3. Underdrain pipe to be in accordance with Item 556, "Pipe Underdrains."

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi.)
Provide Grade 60 reinforcing steel.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Walls are designed assuming unit weight of soil = 120 pcf and a friction angle = 30 degrees for foundation and retained soil.

The undisturbed or compacted soil depth in front of walls must not measure less than Kd + Ft + 1 foot as measured upwards from bottom of key.

Retaining walls are detailed to be placed on grades up to 10% with level footing, with no changes in reinforcing steel. Steeper grades can be accommodated by shortening Bars A and Bars B and increasing the length of legs of Bars U by the same amount. No change in quantities will be required.

Retaining walls may be placed on horizontal curves by adjusting lengths of Bars T and Bars H in the footing. Minor revisions to concrete quantities may be required as a result.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

SPREAD FOOTING RETAINING WALL MISCELLANEOUS DETAILS

RW(SF)

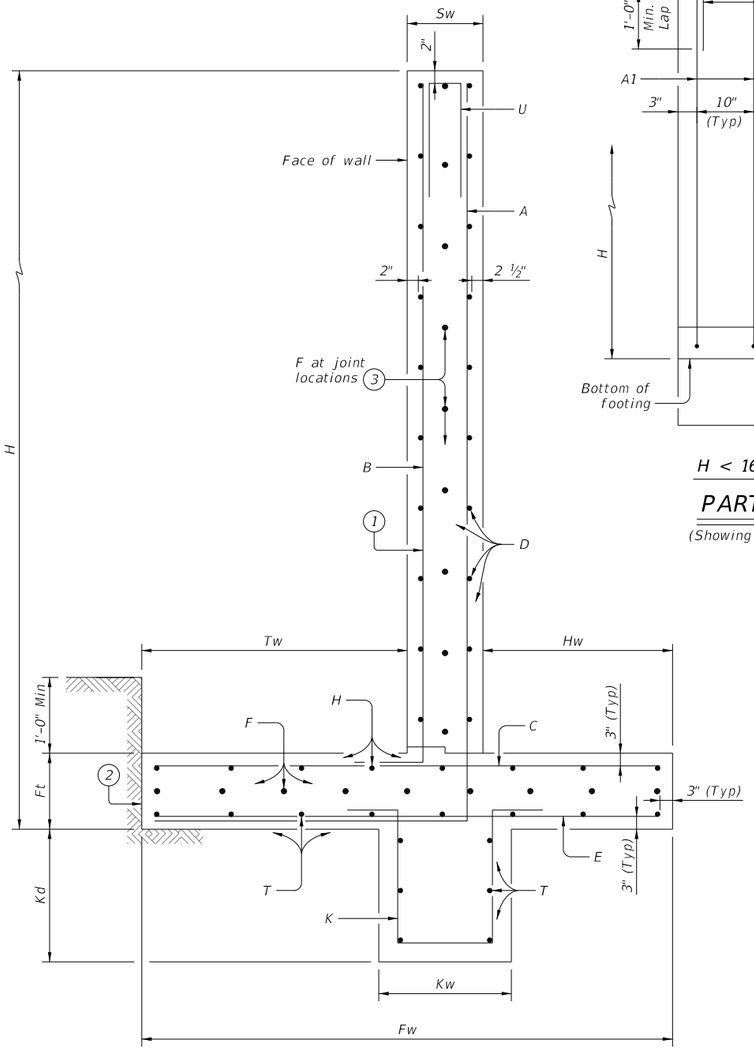
FILE:	DN: TAR	CK: RLE	DW: JER	CK: TAR
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
8-22: Updated underdrain requirements.	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		76

DATE:
FILE:

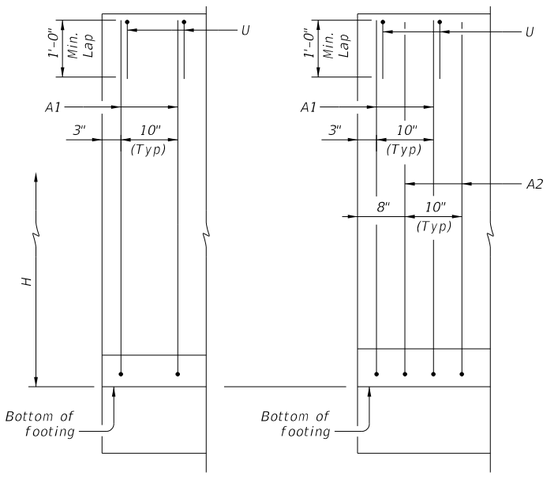
DATE:
FILE:

PROPERTIES / REINFORCING STEEL FOR ONE 32' PANEL (DESIGN A)

Wall Height "H"	WALL DIMENSIONS							MAX SOIL PRESS	Bars A1					Bars A2					Bars B					Bars C					Bars E					Bars K					D (#5) at 12" Max.		Dowel F at 12" Max.		H (#5) at 12" Max.		T (#5) at 12" Max.		U ~ 39 #5 at 10" Max.		QUANTITY FOR ONE 32' PANEL		Wall Height "H"
									No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Size	Spa.	Length	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight	Length	Weight	Conc (CY)	REINF (LB)	
(Ft)	Fw	Tw	Sw	Hw	Ft	Kw	Kd	T/SF																																										(Ft)
2	1'-4"	0'-4"	1'-0"	0'-0"	0'-9"	0'-9"	0'-9"	0.164	39	#4	10"	2'-6"	66						39	#4	10"	2'-2"	57														39	#4	10"	3'-1"	81	6	198	5	41	2	66	2	66	2'-5"	99	3.4	674	2
4	2'-5"	0'-8"	1'-0"	0'-9"	1'-0"	0'-9"	0'-9"	0.287	39	#4	10"	4'-10"	126						39	#4	10"	3'-11"	103	39	#4	10"	1'-11"	50	39	#4	10"	1'-11"	50	39	#4	10"	3'-1"	81	8	263	7	57	3	99	3	99	6'-0"	245	7.1	1173	4
6	3'-6"	1'-2"	1'-0"	1'-4"	1'-0"	0'-9"	0'-9"	0.373	39	#4	10"	7'-4"	192						39	#4	10"	5'-11"	155	39	#4	10"	3'-0"	79	39	#4	10"	3'-0"	79	39	#4	10"	3'-1"	81	12	395	10	81	4	132	4	132	8'-5"	343	10.8	1669	6
8	5'-1"	1'-9"	1'-0"	2'-4"	1'-0"	0'-9"	0'-9"	0.425	39	#4	10"	9'-11"	259						39	#4	10"	7'-11"	207	39	#4	10"	4'-7"	120	39	#4	10"	4'-7"	120	39	#4	10"	3'-1"	81	16	526	14	113	6	198	6	198	8'-5"	343	15.0	2165	8
10	6'-7"	2'-3"	1'-0"	3'-4"	1'-2"	1'-0"	1'-0"	0.513	39	#4	10"	12'-5"	324						39	#4	10"	9'-9"	255	39	#4	10"	6'-1"	159	39	#4	10"	6'-1"	159	39	#4	10"	3'-10"	100	20	658	18	145	8	263	8	263	8'-5"	343	20.8	2669	10
12	8'-4"	2'-10"	1'-1"	4'-5"	1'-4"	1'-3"	1'-3"	0.589	39	#5	10"	15'-1"	614						39	#4	10"	11'-7"	302	39	#5	10"	7'-10"	319	39	#4	10"	7'-10"	205	39	#4	10"	4'-7"	120	24	789	21	169	9	296	9	296	8'-6"	346	28.8	3456	12
14	9'-11"	3'-5"	1'-2"	5'-4"	1'-7"	1'-6"	1'-6"	0.674	39	#6	10"	17'-9"	1040						39	#4	10"	13'-4"	348	39	#6	10"	9'-5"	553	39	#4	10"	9'-5"	246	39	#4	10"	5'-4"	139	28	920	25	201	11	362	11	362	8'-7"	350	38.5	4521	14
16	11'-5"	4'-0"	1'-3"	6'-2"	1'-9"	1'-9"	1'-9"	0.756	39	#6	10"	20'-5"	1196	39	#4	10"	20'-5"	532	39	#4	10"	15'-2"	396	39	#6	10"	10'-11"	640	39	#4	10"	10'-11"	285	39	#4	10"	6'-1"	159	32	1052	28	225	12	395	12	395	8'-8"	353	48.5	5628	16
18	12'-8"	4'-7"	1'-4"	6'-9"	1'-9"	2'-0"	2'-0"	0.830	39	#6	10"	23'-1"	1353	39	#5	10"	23'-1"	939	39	#4	10"	17'-2"	448	39	#7	10"	12'-2"	971	39	#4	10"	12'-2"	318	39	#4	10"	6'-10"	179	36	1183	32	257	14	460	14	460	8'-9"	356	56.7	6924	18
20	14'-4"	5'-2"	1'-6"	7'-8"	2'-0"	2'-0"	2'-0"	0.910	39	#6	10"	25'-10"	1514	39	#6	10"	25'-10"	1514	39	#4	10"	18'-11"	493	39	#7	10"	13'-10"	1103	39	#4	10"	13'-10"	361	39	#4	10"	6'-10"	179	38	1249	34	273	15	493	15	493	8'-11"	363	70.8	8035	20

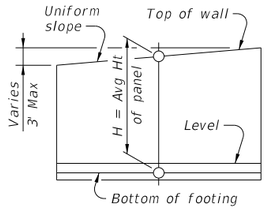


SECTION

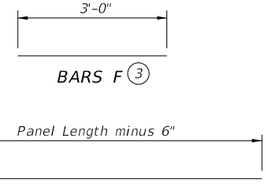


PARTIAL WALL ELEVATIONS

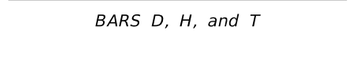
(Showing vertical reinforcing pattern in back face.)



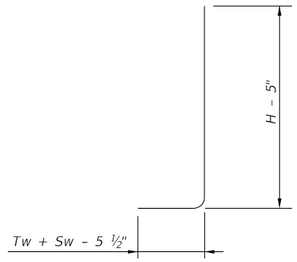
H DEFINITION



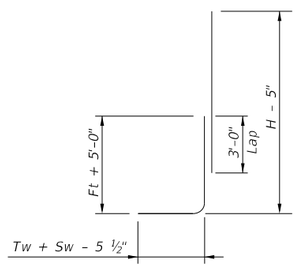
BARS F (3)



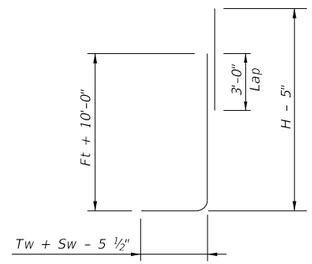
BARS D, H, and T



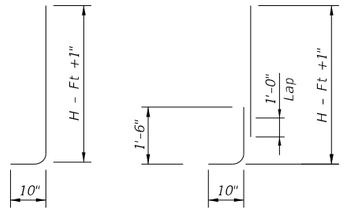
BARS A1 & A2



OPTIONAL BARS A1 (4)

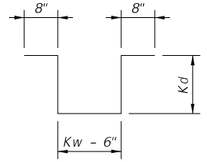


OPTIONAL BARS A2 (4)

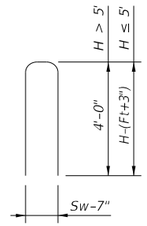


BARS B

OPTIONAL BARS B (4)



BARS K



BARS U

1. Place vertical bars inside of horizontal bars (Typical both faces).
2. Place footing toe against undisturbed soil.
3. See Retaining Wall Miscellaneous Details (RW(SF)) standard for size.
4. Optional bars splices not included in above table.

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi.)
Provide Grade 60 reinforcing steel.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Walls are designed assuming unit weight of soil = 120 pcf and a friction angle = 30 degrees for foundation and retained soil.
See Retaining Wall Miscellaneous Details (RW(SF)) standard for details and notes not shown.
These details provide designs for wall heights of 2 to 20 feet. For heights not shown, round up "H" to determine wall dimensions and reinforcing. (For example, a 9-foot high wall would use the 10-foot high dimensions and reinforcing.)
Quantities are based on "H" being average height of panel.
Retaining walls are designed to be coded as follows on Retaining Wall Layout Sheets:

A - 15 - 32
- 32: Panel length ~ 32 ft. is standard; 28 ft. requires special quantities.
- 15: Average height (H) of panel.
- A: Design A = No surcharge or slope above wall.
  Design B = No surcharge; slopes to 3:1.
  Design C = Traffic surcharge; no slope above wall.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

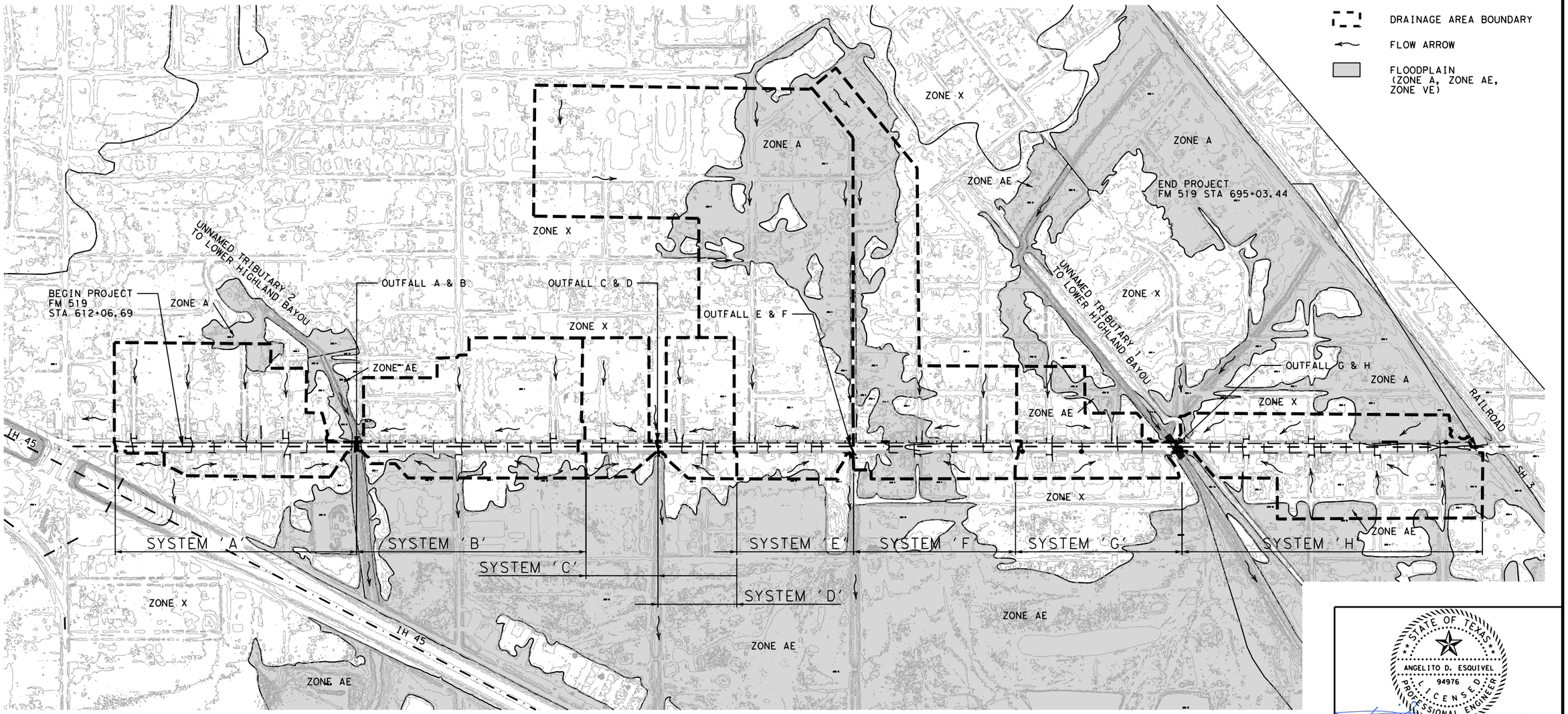
SPREAD FOOTING RETAINING WALL

RW(SFA)

FILE: RW-SFA-22.dgn	DN: TAR	CK: RLE	DW: JER	CK: TAR
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
8-22 Constructability update.	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		77

100% SUBMITTAL

DW: DW: CK: CK:



NOTES AND ASSUMPTIONS:

1. THE PROJECT SHALL CONSTRUCT SIDEWALK ON EXISTING ROADWAY.
2. THE EXISTING ROADWAY WAS CONSTRUCTED IN JUNE 1980.
3. THE DRAINAGE AREA BOUNDARIES WERE DELINEATED USING THE TOPOGRAPHIC SURVEY, ANY DELINEATION BEYOND THE TOPOGRAPHIC SURVEY WERE BASED ON 2018 UPPER COAST LIDAR-1 METER FROM TNRIS. THE OVERALL BASIN FOR EACH SYSTEMS WERE BASED ON THE AS-BUILT PLANS.
4. THE ORIGINAL EXISTING INLETS WERE DESIGNED FOR 2-YEAR STORM EVENT, AND THE EXISTING PIPES WERE DESIGNED FOR 5-YEAR STORM EVENT.
5. IN THIS PROJECT, THE EXISTING INLETS AND EXISTING PIPES SHALL BE ANALYZED FOR 5-YEAR STORM EVENT, WITH NOAA ATLAS 14.
6. THE RUNOFF COMPUTATION WERE BASED ON RATIONAL METHOD ACCORDING TO THE TxDOT HYDRAULIC DESIGN MANUAL, DATED SEPTEMBER 2019.
7. THE EXISTING STORM SEWER SYSTEM MAY NOT MEET THE CURRENT STANDARD CRITERIA, BUT THE PURPOSE OF THE ANALYSIS WAS TO CHECK FOR ANY INCREASE IN THE HYDRAULIC GRADELINE (HGL), INCREASE IN RUNOFF DUE TO CHANGE IN C-VALUE AT SIDEWALK, AND CHECK FOR SPREAD OF WATER PONDING DURING 5-YEAR STORM EVENT.
8. THE ANALYSIS WAS BASED ON THE APPROVED TECHNICAL MEMORANDUM PREPARED BY ATKINS AND APPROVED BY TXDOT ON 7/25/2023.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

OVERALL DRAINAGE AREA MAP LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		78

DATE: 9/11/2023 5:09:53 PM
FILE: ...\FM 519 DAM OVERALL LAYOUT.dgn

100% SUBMITTAL

CK
DW
CK
DW

ZONE X

ZONE A

DRA-2002A
2.27 AC

DRA-2059A
1.86 AC

DRA-2061A
2.20 AC

DRA-2117
1.14 AC

DRA-2142A
1.41 AC

DRA-2145A
1.83 AC

DRA-2005A
1.75 AC

DRA-2002
0.05 AC

DRA-2018
0.12 AC

DRA-2005
0.10 AC

DRA-2061
0.04 AC

DRA-2145
0.04 AC

DRA-2189A
1.23 AC

DRA-2099A
0.08 AC

DRA-2142
0.21 AC

DRA-2157
0.07 AC

DRA-2193
0.07 AC

DRA-2059
0.14 AC

DRA-1059
0.11 AC

DRA-2099
0.09 AC

DRA-2160
0.12 AC

DRA-2189
0.12 AC

BRIAR LANE

IRENE ST

PESSARA ST

ERICKSON ST

BL CL-FM 519

DRA-2014
0.23 AC

DRA-2019
0.58 AC

DRA-2105
0.15 AC

DRA-2123
0.17 AC

DRA-2160A
0.14 AC

DRA-2187
0.15 AC

BEGIN PROJECT
FM 519
STA 612+06.69

FM 519/MAIN ST

608+00 609+00 610+00 611+00 612+00 613+00 614+00 615+00 616+00 617+00 618+00

MATCHLINE STA. 619+00.00

DRA-2009
0.08 AC

DRA-2038
0.15 AC

DRA-2055
0.16 AC

DRA-2085
0.12 AC

DRA-2084
0.64 AC

DRA-2168
0.11 AC

DRA-2049
0.29 AC

DRA-2077
0.36 AC

DRA-2203
0.08 AC

IH-45

DRA-2010
0.04 AC

DRA-2016
0.14 AC

DRA-2015
0.02 AC

DRA-7008
0.13 AC

DRA-2136
0.14 AC

DRA-2135
0.27 AC

DRA-2147
0.26 AC

DRA-2203A
0.60 AC

FRANKLIN ST

ZONE X

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 / 1.82 AC — DRAINAGE AREA ID / AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP BEGIN TO STA 619+00

SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		79

DATE: 9/11/2023 5:10:58 PM
FILE: ...\FM 519 - DRNG-EXDAM-01.dgn

100% SUBMITTAL

CK
DW
CK
DW

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP STA 619+00 TO STA 631+00

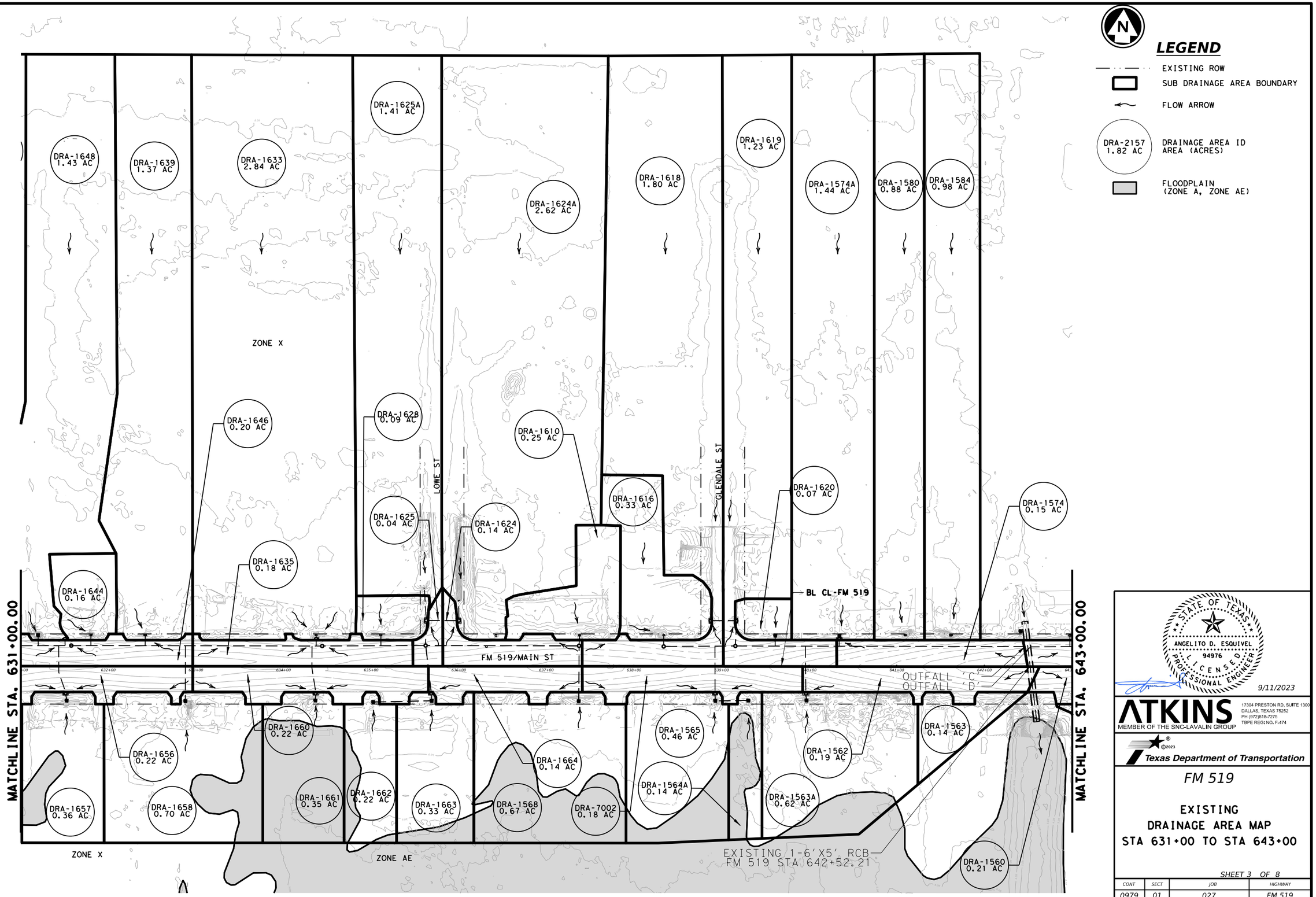
SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		80

DATE: 9/11/2023 5:11:56 PM
FILE: ...\FM 519 - DRNG-EXDAM-02.dgn

100% SUBMITTAL

CK: DW: CK: DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP STA 631+00 TO STA 643+00

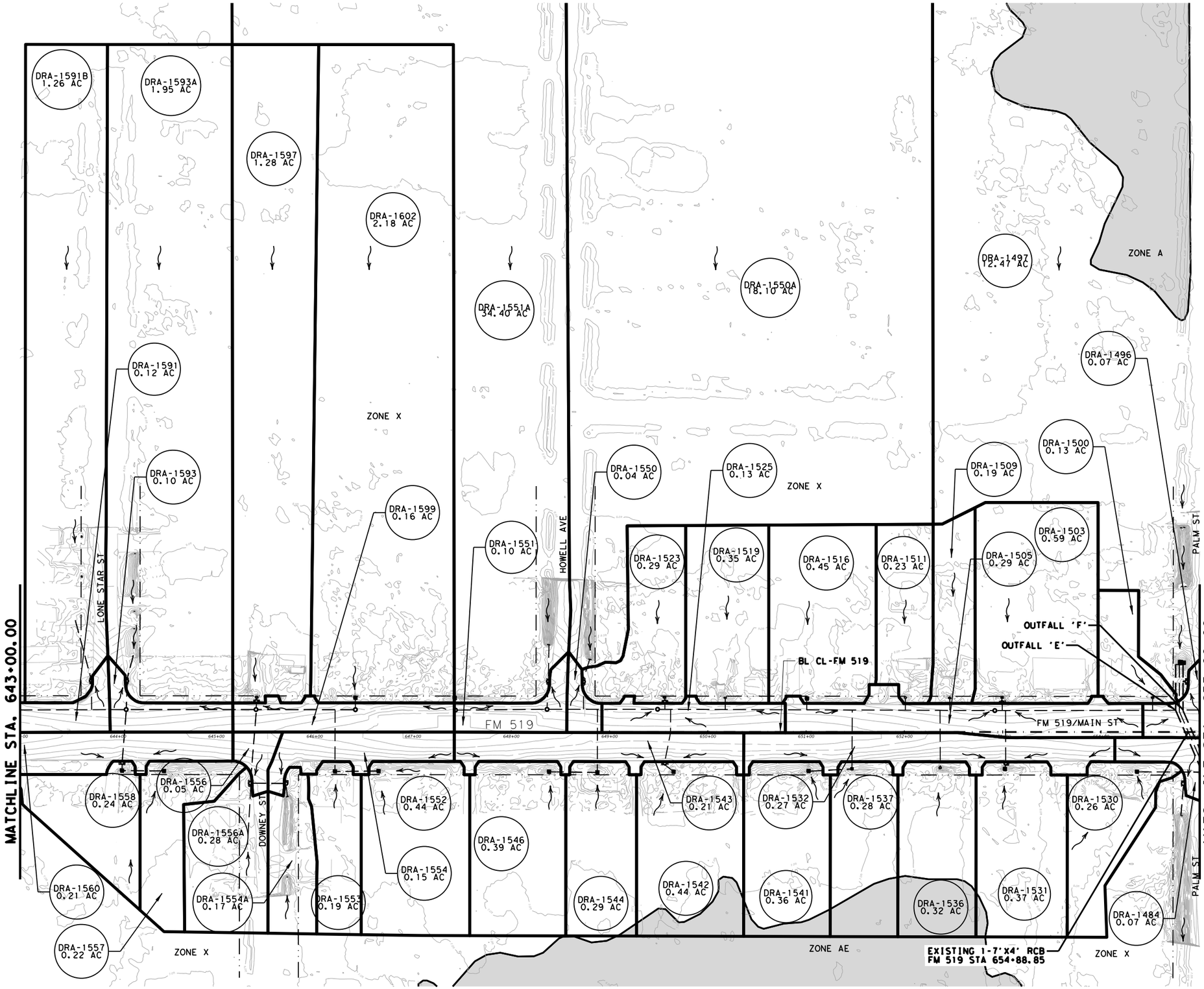
SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		81

DATE: 9/11/2023 5:12:50 PM
FILE: ...\FM 519 - DRNG-EXDAM-03.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

SEE "OVERALL DRAINAGE AREA MAP" FOR OFFSITE LIMITS.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG:NO. F-474

Texas Department of Transportation

FM 519

EXISTING
DRAINAGE AREA MAP
STA 643+00 TO STA 655+00

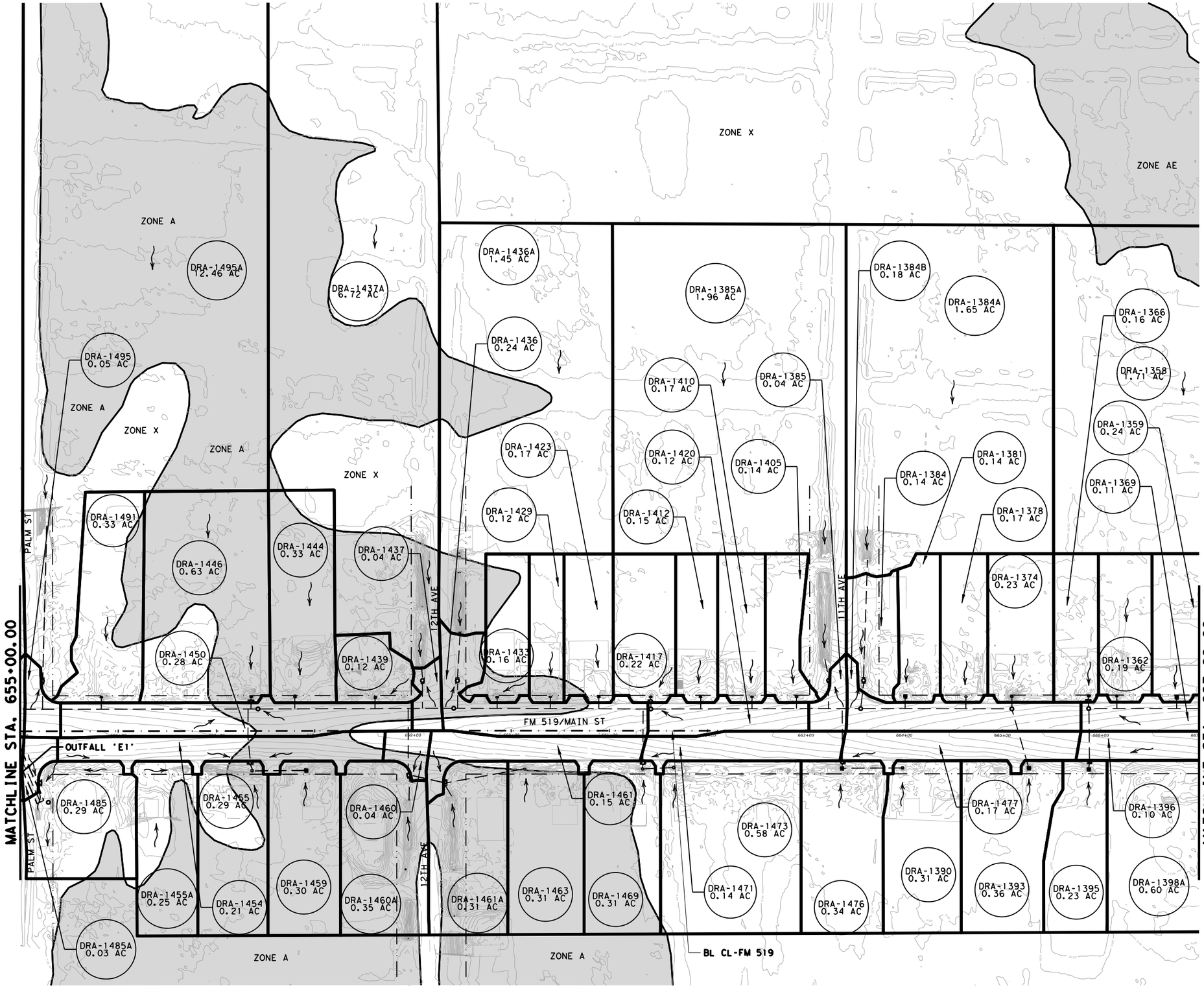
SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		82

DATE: 9/11/2023 5:13:47 PM
FILE: ...\FM 519 - DRNG-EXDAM-04.dgn

100% SUBMITTAL

CK: DW: CK: DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

SEE "OVERALL DRAINAGE AREA MAP" FOR OFFSITE LIMITS.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP STA 655+00 TO STA 667+00

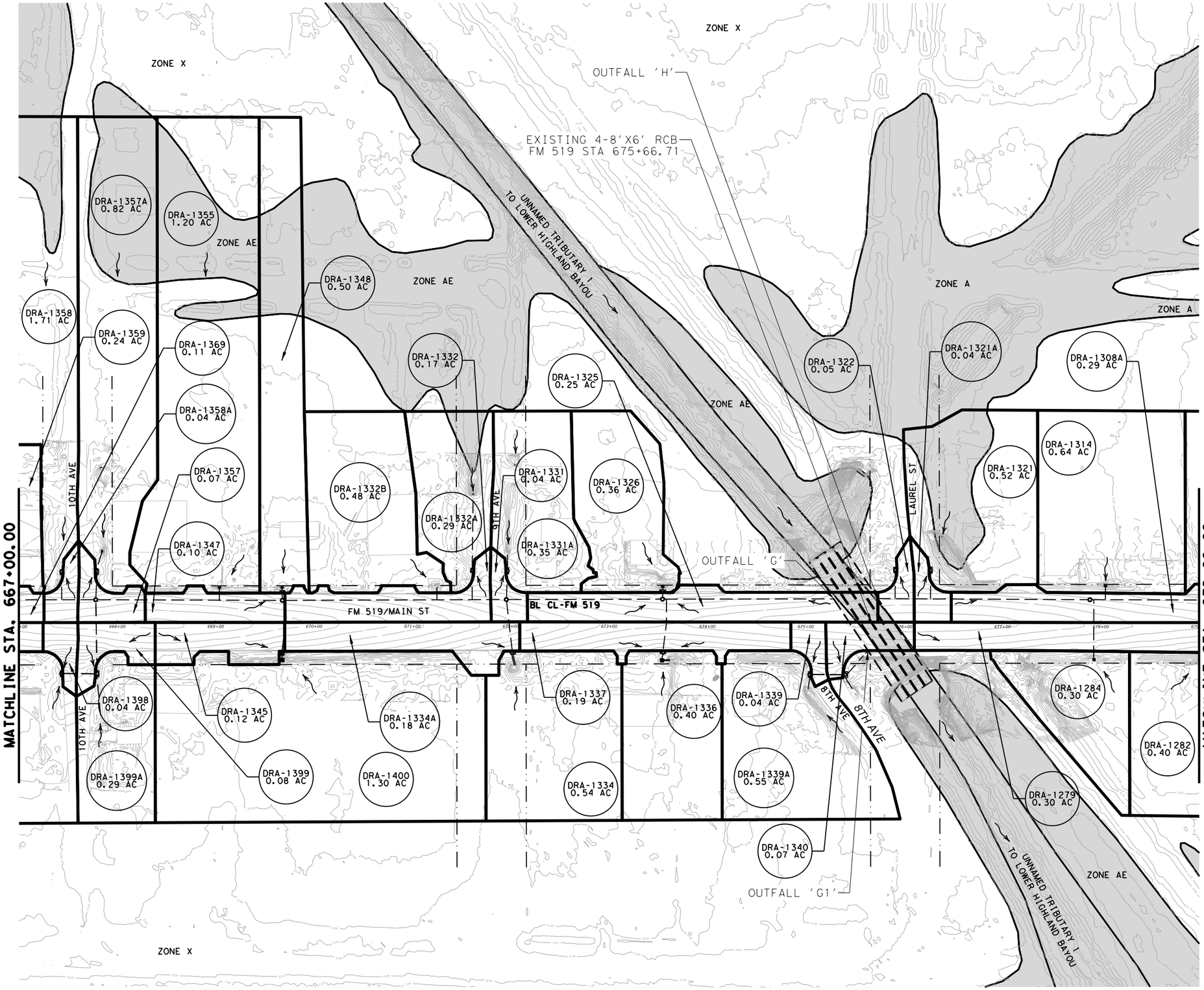
SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		83

DATE: 9/11/2023 5:14:46 PM
FILE: ...\FM 519 - DRNG-EXDAM-05.dgn

100% SUBMITTAL

CK
DW
CK
DW



N

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP STA 667+00 TO STA 679+00

SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		84

DATE: 9/11/2023 5:15:44 PM
FILE: ...\FM 519 - DRNG-EXDAM-06.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

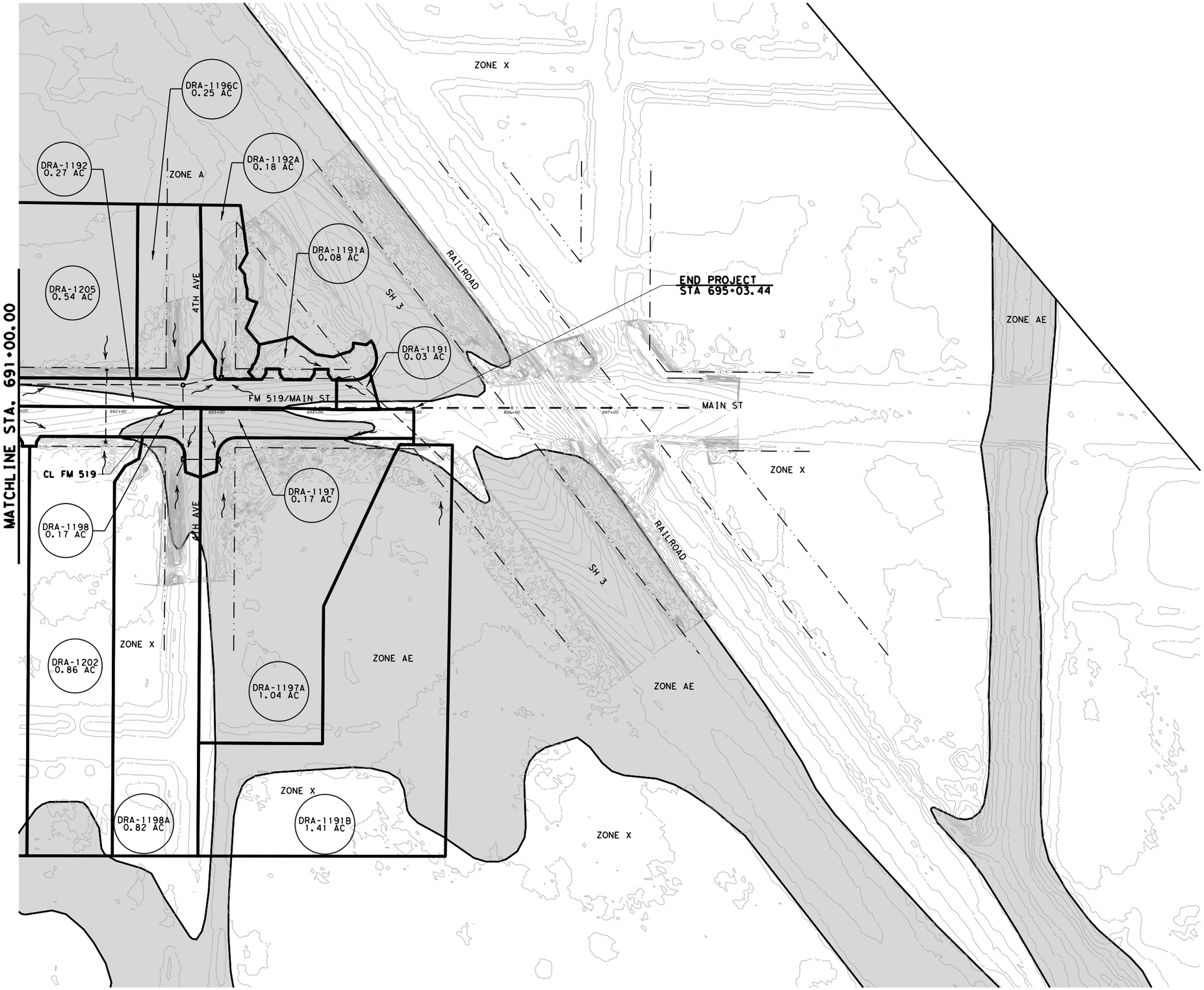
EXISTING DRAINAGE AREA MAP STA 679+00 TO STA 691+00

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		85

DATE: 9/11/2023 5:16:56 PM
FILE: ...\FM 519 - DRNG-EXDAM-07.dgn

100% SUBMITTAL



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

EXISTING DRAINAGE AREA MAP STA 691+00 TO END PROJECT

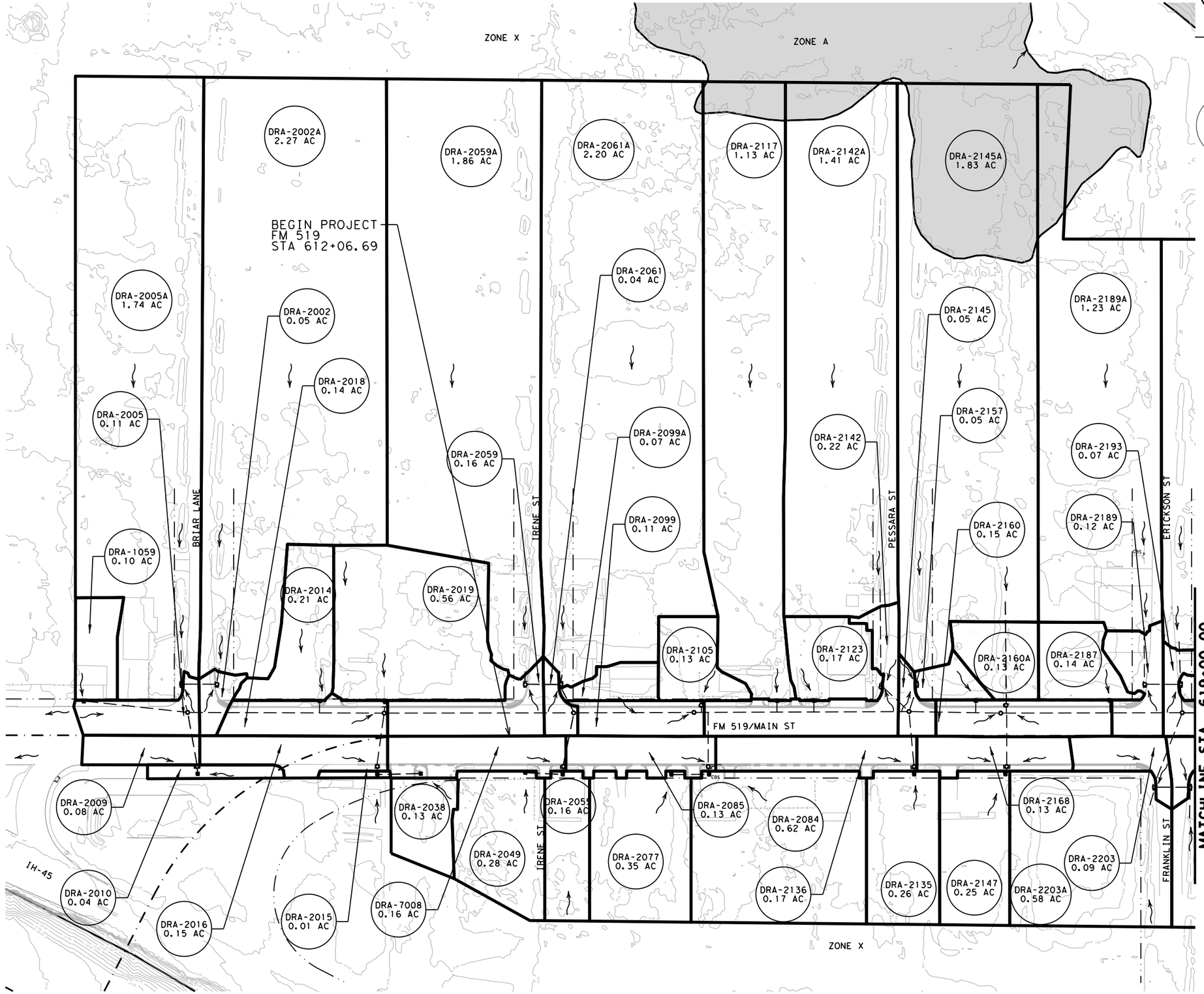
SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		86

DATE: 9/11/2023 5:18:28 PM
FILE: ...\FM 519 - DRNG-EXDAM-08.dgn

100% SUBMITTAL

CK
DW
CK
DW



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 / 1.82 AC — DRAINAGE AREA ID / AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG.NO. F-474

Texas Department of Transportation

FM 519

PROPOSED DRAINAGE AREA MAP BEGIN TO STA 619+00

SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		87

DATE: 9/11/2023 5:20:35 PM
FILE: ...\FM 519 - DRNG-PROAM-01.dgn

100% SUBMITTAL

CK: DW: CK: DW:

DATE: 9/11/2023 5:22:13 PM
FILE: ...\FM 519 - DRNG-PRDAM-02.dgn

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 / 1.82 AC — DRAINAGE AREA ID / AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

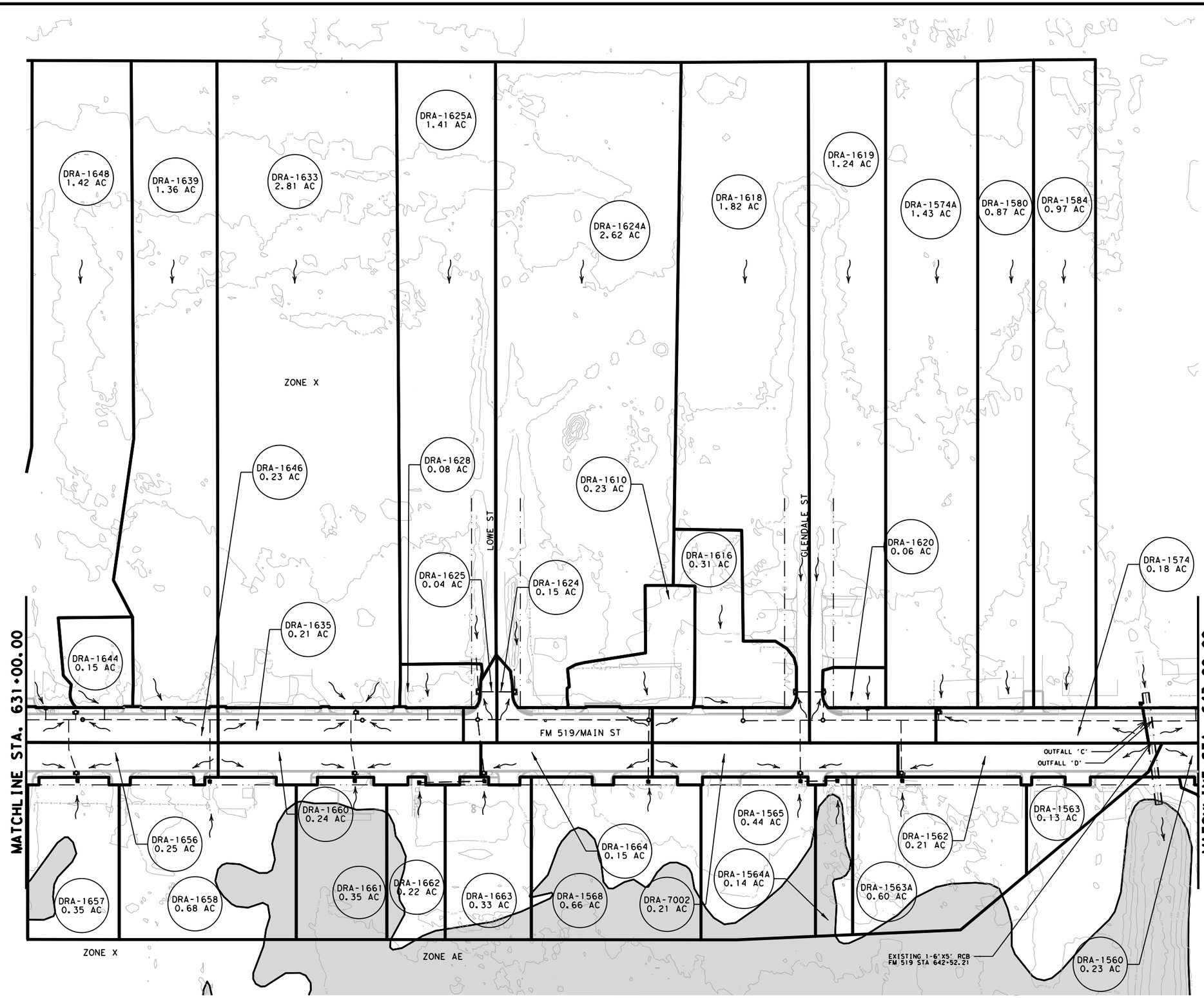
PROPOSED DRAINAGE AREA MAP STA 619+00 TO STA 631+00

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		88

100% SUBMITTAL

CK: DW: CK: DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED
DRAINAGE AREA MAP
STA 631+00 TO STA 643+00

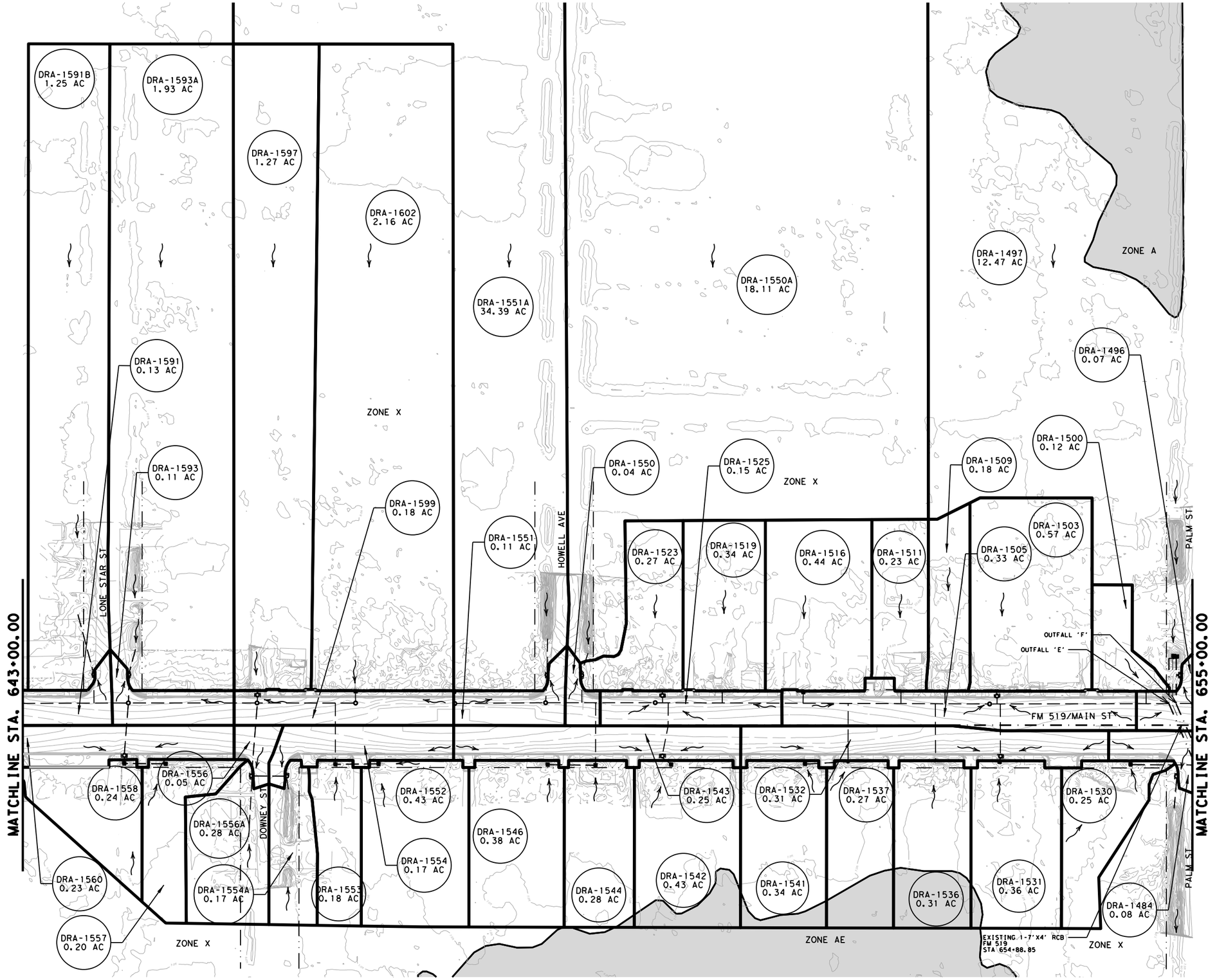
SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		89

DATE: 9/11/2023 5:23:21 PM
FILE: ...\FM 519 - DRNG-PRDAM-03.dgn

100% SUBMITTAL

CK: CK: DW: DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 / 1.82 AC — DRAINAGE AREA ID / AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

SEE "OVERALL DRAINAGE AREA MAP" FOR OFFSITE LIMITS.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG:NO. F-474

Texas Department of Transportation

FM 519

PROPOSED DRAINAGE AREA MAP STA 643+00 TO STA 655+00

SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		90

DATE: 9/11/2023 5:24:24 PM
FILE: ...\FM 519 - DRNG-PROAM-04.dgn

100% SUBMITTAL

CK: DW: CK: DW:

LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

SEE "OVERALL DRAINAGE AREA MAP" FOR OFFSITE LIMITS.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

PROPOSED DRAINAGE AREA MAP STA 655+00 TO STA 667+00

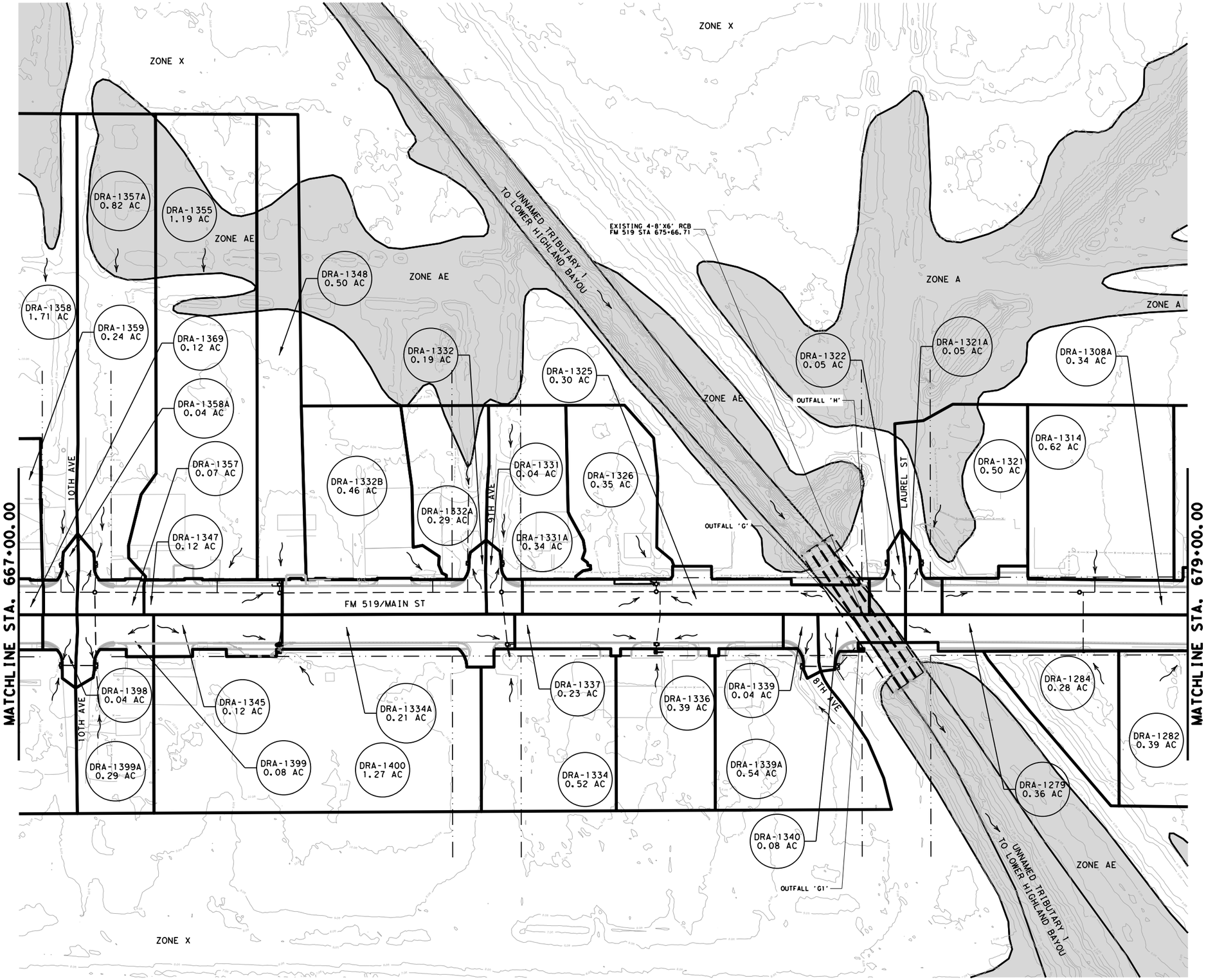
SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		91

DATE: 9/11/2023 5:25:28 PM
FILE: ...\FM 519 - DRNG-PRDAM-05.dgn

100% SUBMITTAL

CK: DW: CK: DW:



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

PROPOSED DRAINAGE AREA MAP STA 667+00 TO STA 679+00

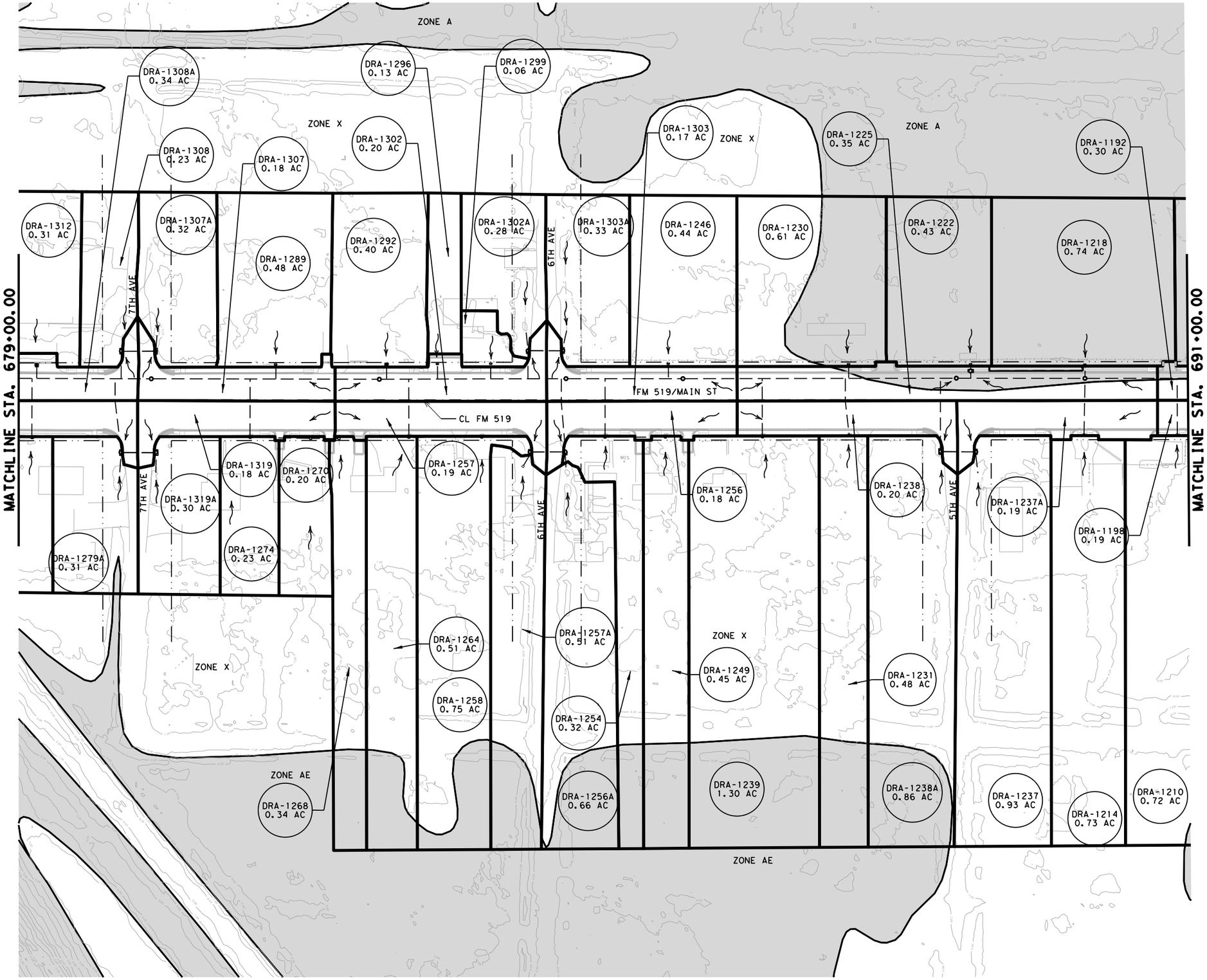
SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		92

DATE: 9/11/2023 5:26:32 PM
FILE: ...\FM 519 - DRNG-PRDAM-06.dgn

100% SUBMITTAL

CK
DW
CK
DW



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

PROPOSED
DRAINAGE AREA MAP
STA 679+00 TO STA 691+00

SHEET 7 OF 8

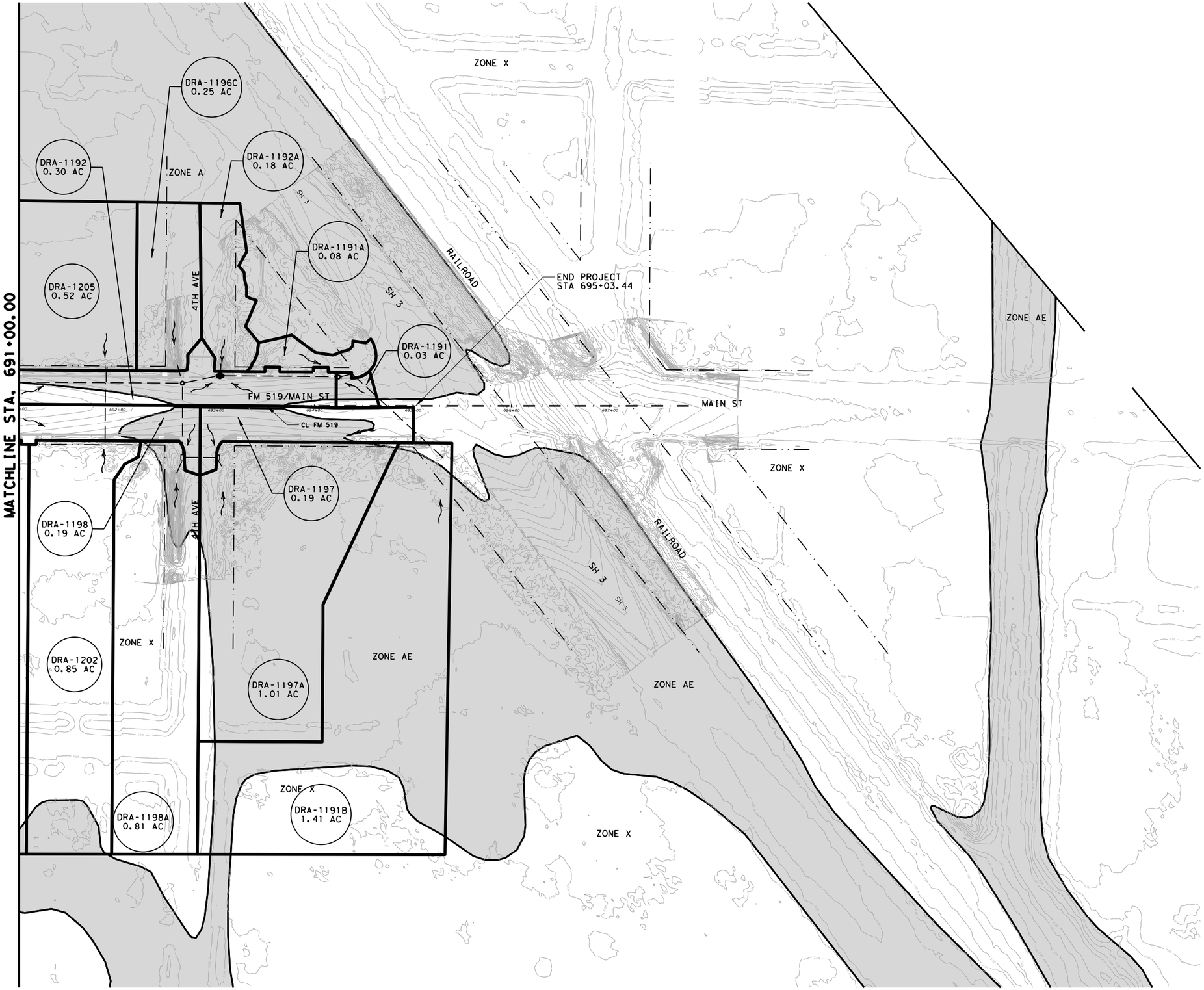
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		93

DATE: 9/11/2023 5:27:37 PM
FILE: ...\FM 519 - DRNG-PRDAM-07.dgn

100% SUBMITTAL

CK: DW: CK: DW:

MATCHLINE STA. 691+00.00



LEGEND

- EXISTING ROW
- SUB DRAINAGE AREA BOUNDARY
- FLOW ARROW
- DRA-2157 1.82 AC — DRAINAGE AREA ID AREA (ACRES)
- FLOODPLAIN (ZONE A, ZONE AE)

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED DRAINAGE AREA MAP STA 691+00 TO END PROJECT

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		94

DATE: 9/11/2023 5:28:44 PM
FILE: ...\FM 519 - DRNG-PRDAM-08.dgn

100% SUBMITTAL

CK
DW
CK
DW

EXISTING RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA	Tc		Composite Area (ac)			C-Value	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE
		Calc	Used	Pav.	Dev.	Res.	Weighted	5-YR	5-YR	100-YR	100-YR
	(acres)	(min)	(min)	C=0.90	C=0.65	C=0.35		(in/hr)	(cfs)	(in/hr)	(cfs)
DRA-1059	0.11	7.70	10.00	0.00	0.00	0.11	0.35	7.19	0.28	12.83	0.50
DRA-2002	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-2002A	2.27	26.00	26.00	0.00	0.00	2.27	0.35	4.79	3.84	8.93	7.15
DRA-2005	0.10	3.80	10.00	0.10	0.00	0.00	0.90	7.19	0.62	12.83	1.11
DRA-2005A	1.75	20.20	20.20	0.00	0.00	1.75	0.35	5.42	3.34	9.98	6.15
DRA-2009	0.08	3.30	10.00	0.08	0.00	0.00	0.90	7.19	0.53	12.83	0.94
DRA-2010	0.04	8.10	10.00	0.00	0.00	0.04	0.35	7.19	0.11	12.83	0.19
DRA-2014	0.23	10.90	10.90	0.00	0.23	0.00	0.65	6.98	1.03	12.50	1.85
DRA-2015	0.02	5.70	10.00	0.00	0.00	0.02	0.35	7.19	0.05	12.83	0.10
DRA-2016	0.14	4.10	10.00	0.14	0.00	0.00	0.90	7.19	0.91	12.83	1.62
DRA-2018	0.12	4.00	10.00	0.12	0.00	0.00	0.90	7.19	0.77	12.83	1.38
DRA-2019	0.58	10.80	10.80	0.00	0.00	0.58	0.35	7.00	1.43	12.54	2.56
DRA-2038	0.15	7.70	10.00	0.00	0.00	0.15	0.35	7.19	0.38	12.83	0.68
DRA-2049	0.29	7.90	10.00	0.00	0.00	0.29	0.35	7.19	0.73	12.83	1.31
DRA-2055	0.16	12.90	12.90	0.00	0.00	0.16	0.35	6.56	0.37	11.84	0.67
DRA-2059	0.14	3.80	10.00	0.14	0.00	0.00	0.90	7.19	0.91	12.83	1.63
DRA-2059A	1.86	19.60	19.60	0.00	0.00	1.86	0.35	5.50	3.61	10.11	6.65
DRA-2061	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.26	12.83	0.47
DRA-2061A	2.20	23.30	23.30	0.00	0.00	2.20	0.35	5.06	3.92	9.39	7.28
DRA-2077	0.36	12.90	12.90	0.00	0.00	0.36	0.35	6.56	0.83	11.84	1.50
DRA-2084	0.65	16.70	16.70	0.00	0.00	0.65	0.35	5.91	1.34	10.78	2.45
DRA-2085	0.12	3.80	10.00	0.12	0.00	0.00	0.90	7.19	0.78	12.83	1.40
DRA-2099	0.09	3.50	10.00	0.09	0.00	0.00	0.90	7.19	0.57	12.83	1.03
DRA-2099A	0.08	5.30	10.00	0.00	0.00	0.08	0.35	7.19	0.21	12.83	0.37
DRA-2105	0.15	4.00	10.00	0.00	0.15	0.00	0.65	7.19	0.69	12.83	1.23
DRA-2117	1.14	16.00	16.00	0.00	0.00	1.14	0.35	6.01	2.41	10.95	4.39
DRA-2123	0.17	6.00	10.00	0.00	0.00	0.17	0.35	7.19	0.43	12.83	0.76
DRA-2135	0.27	9.90	10.00	0.00	0.00	0.27	0.35	7.19	0.69	12.83	1.23
DRA-2136	0.14	4.60	10.00	0.14	0.00	0.00	0.90	7.19	0.92	12.83	1.65
DRA-2142	0.21	4.10	10.00	0.21	0.00	0.00	0.90	7.19	1.36	12.83	2.42
DRA-2142A	1.41	16.10	16.10	0.00	0.00	1.41	0.35	6.00	2.97	10.93	5.42
DRA-2145	0.05	2.10	10.00	0.05	0.00	0.00	0.90	7.19	0.29	12.83	0.52
DRA-2145A	1.83	22.20	22.20	0.00	0.00	1.83	0.35	5.18	3.34	9.59	6.18
DRA-2147	0.26	12.70	12.70	0.00	0.00	0.26	0.35	6.60	0.60	11.90	1.08
DRA-2157	0.07	3.70	10.00	0.00	0.00	0.07	0.35	7.19	0.17	12.83	0.30
DRA-2160	0.13	2.70	10.00	0.13	0.00	0.00	0.90	7.19	0.81	12.83	1.45
DRA-2160A	0.14	3.80	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.63
DRA-2168	0.11	3.00	10.00	0.11	0.00	0.00	0.90	7.19	0.71	12.83	1.27
DRA-2187	0.15	3.90	10.00	0.00	0.00	0.15	0.35	7.19	0.39	12.83	0.70
DRA-2189	0.12	2.30	10.00	0.12	0.00	0.00	0.90	7.19	0.77	12.83	1.38
DRA-2189A	1.23	17.20	17.20	0.00	0.00	1.23	0.35	5.83	2.52	10.65	4.61
DRA-2193	0.07	2.10	10.00	0.07	0.00	0.00	0.90	7.19	0.44	12.83	0.78
DRA-2193A	1.25	15.00	15.00	0.00	0.00	1.25	0.35	6.18	2.72	11.22	4.94
DRA-2203	0.08	2.90	10.00	0.08	0.00	0.00	0.90	7.19	0.53	12.83	0.94
DRA-2203A	0.60	10.60	10.60	0.00	0.00	0.60	0.35	7.05	1.48	12.61	2.66
DRA-2205	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.27	12.83	0.48
DRA-2223	0.31	3.30	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.42
DRA-2236	0.36	11.80	11.80	0.00	0.00	0.36	0.35	6.78	0.86	12.19	1.55
DRA-2242	0.33	13.80	13.80	0.00	0.00	0.33	0.35	6.39	0.75	11.56	1.35
DRA-2256	0.54	12.90	12.90	0.00	0.00	0.54	0.35	6.56	1.26	11.84	2.27
DRA-2258	0.29	5.00	10.00	0.29	0.00	0.00	0.90	7.19	1.86	12.83	3.33
DRA-2277	0.35	11.00	11.00	0.00	0.00	0.35	0.35	6.95	0.86	12.47	1.55
DRA-2277A	0.29	5.10	10.00	0.29	0.00	0.00	0.90	7.19	1.89	12.83	3.37
DRA-7008	0.13	4.30	10.00	0.13	0.00	0.00	0.90	7.19	0.82	12.83	1.46
DRA-1568	0.67	14.10	14.10	0.00	0.00	0.67	0.35	6.34	1.50	11.47	2.72
DRA-1610	0.25	7.40	10.00	0.00	0.25	0.00	0.65	7.19	1.16	12.83	2.08
DRA-1624	0.14	3.70	10.00	0.14	0.00	0.00	0.90	7.19	0.88	12.83	1.58
DRA-1624A	2.62	25.90	25.90	0.00	2.62	0.00	0.65	4.80	8.25	8.95	15.39
DRA-1625	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.28	12.83	0.51
DRA-1625A	1.41	19.00	19.00	0.00	0.00	1.41	0.35	5.58	2.77	10.24	5.09
DRA-1628	0.09	5.30	10.00	0.00	0.00	0.09	0.35	7.19	0.24	12.83	0.42
DRA-1633	2.84	25.30	25.30	0.00	0.00	2.84	0.35	4.86	4.86	9.05	9.05
DRA-1635	0.18	4.20	10.00	0.18	0.00	0.00	0.90	7.19	1.16	12.83	2.07
DRA-1639	1.37	20.00	20.00	0.00	0.00	1.37	0.35	5.45	2.63	10.02	4.84
DRA-1640	0.08	10.00	10.00	0.00	0.00	0.08	0.35	7.19	0.19	12.83	0.34
DRA-1644	0.16	7.40	10.00	0.00	0.00	0.16	0.35	7.19	0.39	12.83	0.70
DRA-1646	0.20	3.50	10.00	0.20	0.00	0.00	0.90	7.19	1.30	12.83	2.32
DRA-1648	1.43	16.20	16.20	0.00	0.00	1.43	0.35	5.98	3.01	10.90	5.48
DRA-1649	1.66	18.60	18.60	0.00	0.00	1.66	0.35	5.63	3.30	10.33	6.04
DRA-1651	0.16	6.30	10.00	0.16	0.00	0.00	0.90	7.19	1.04	12.83	1.87
DRA-1655	0.06	2.00	10.00	0.06	0.00	0.00	0.90	7.19	0.36	12.83	0.64
DRA-1655C	0.47	6.40	10.00	0.00	0.47	0.00	0.65	7.19	2.19	12.83	3.91
DRA-1656	0.22	3.50	10.00	0.22	0.00	0.00	0.90	7.19	1.44	12.83	2.57

PROPOSED RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA	Tc		Composite Area (ac)			C-Value	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE
		Calc	Used	Pav.	Dev.	Res.	Weighted	5-YR	5-YR	100-YR	100-YR
	(acres)	(min)	(min)	C=0.90	C=0.65	C=0.35		(in/hr)	(cfs)	(in/hr)	(cfs)
DRA-1059	0.10	7.70	10.00	0.00	0.00	0.10	0.35	7.19	0.26	12.83	0.47
DRA-2002	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-2002A	2.27	26.00	26.00	0.00	0.00	2.27	0.35	4.79	3.84	8.93	7.15
DRA-2005	0.11	3.80	10.00	0.11	0.00	0.00	0.90	7.19	0.71	12.83	1.28
DRA-2005A	1.74	20.20	20.20	0.00	0.00	1.74	0.35	5.42	3.32	9.98	6.11
DRA-2009	0.08	3.30	10.00	0.08	0.00	0.00	0.90	7.19	0.53	12.83	0.94
DRA-2010	0.04	2.00	10.00	0.00	0.00	0.04	0.35	7.19	0.11	12.83	0.19
DRA-2014	0.21	10.90	10.90	0.00	0.21	0.00	0.65	6.98	0.97	12.50	1.74
DRA-2015	0.01	5.70	10.00	0.00	0.00	0.01	0.35	7.19	0.03	12.83	0.05
DRA-2016	0.15	4.10	10.00	0.15	0.00	0.00	0.90	7.19	0.97	12.83	1.73
DRA-2018	0.14	4.00	10.00	0.14	0.00	0.00	0.90	7.19	0.90	12.83	1.61
DRA-2019	0.56	10.80	10.80	0.00	0.00	0.56	0.35	7.00	1.37	12.54	2.46
DRA-2038	0.13	7.70	10.00	0.00	0.00	0.13	0.35	7.19	0.33	12.83	0.59
DRA-2049	0.28	7.90	10.00	0.00	0.00	0.28	0.35	7.19	0.71	12.83	1.26
DRA-2055	0.16	12.90	12.90	0.00	0.00	0.16	0.35	6.56	0.36	11.84	0.65
DRA-2059	0.16	3.80	10.00	0.16	0.00	0.00	0.90	7.19	1.02	12.83	1.83
DRA-2059A	1.86	19.60	19.60	0.00	0.00	1.86	0.35	5.50	3.61	10.11	6.65
DRA-2061	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.26	12.83	0.47
DRA-2061A	2.20	23.30	23.30	0.00	0.00	2.20	0.35	5.06	3.92	9.39	7.28
DRA-2077	0.35	12.90	12.90	0.00	0.00	0.35	0.35	6.56	0.81	11.84	1.47
DRA-2084	0.62	16.70	16.70	0.00	0.00	0.62	0.35	5.91	1.30	10.78	2.37
DRA-2085	0.13	3.80	10.00	0.13	0.00	0.00	0.90	7.19	0.86	12.83	1.54
DRA-2099	0.11	3.50	10.00	0.11	0.00	0.00	0.90	7.19	0.70	12.83	1.24
DRA-2099A	0.07	5.30	10.00	0.00	0.00	0.07	0.35	7.19	0.17	12.83	0.31
DRA-2105	0.13	4.00	10.00	0.00	0.13	0.00	0.65	7.19	0.63	12.83	1.13
DRA-2117	1.13	16.00	16.00	0.00	0.00	1.13	0.35	6.01	2.40	10.95	4.38
DRA-2123	0.17	6.00	10.00	0.00	0.00	0.17	0.35	7.19	0.42	12.83	0.75
DRA-2135	0.26	9.90	10.00	0.00	0.00	0.26	0.35	7.19	0.66	12.83	1.19
DRA-2136	0.17	4.60	10.00	0.17	0.00	0.00	0.90	7.19	1.09	12.83	1.95
DRA-2142	0.22	4.10	10.00	0.22	0.00	0.00	0.90	7.19	1.45	12.83	2.58
DRA-2142A	1.41	16.10	16.10	0.00	0.00	1.41	0.35	6.00	2.97	10.93	5.42
DRA-2145	0.05	2.10	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-2145A	1.83	22.20	22.20	0.00	0.00	1.83	0.35	5.18	3.34	9.59	6.18
DRA-2147	0.25	12.70	12.70	0.00	0.00	0.25	0.35	6.60	0.58	11.90	1.05
DRA-2157	0.05	3.70	10.00	0.00	0.00	0.05	0.35	7.19	0.14	12.83	0.24
DRA-2160	0.15	4.30	10.00	0.15	0.00	0.00	0.90	7.19	0.99	12.83	1.76
DRA-2160A	0.13	3.80	10.00	0.00	0.00	0.13	0.35	7.19	0.34	12.83	0.60
DRA-2168	0.13	3.00	10.00	0.13	0.00	0.00	0.90	7.19	0.83	12.83	1.49
DRA-2187	0.14	3.90	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.63
DRA-2189	0.12	2.30	10.00	0.12	0.00	0.00	0.90	7.19	0.80	12.83	1.42
DRA-2189A	1.23	17.20	17.20	0.00	0.00	1.23	0.35	5.83	2.52	10.65	4.61
DRA-2193	0.07	2.10	10.00	0.07	0.00	0.00	0.90	7.19	0.45	12.83	0.80
DRA-2193A	1.25	15.00	15.00	0.00	0.00	1.25	0.35	6.18	2.72	11.22	4.94
DRA-2203	0.09	2.90	10.00	0.09	0.00	0.00	0.90	7.19	0.60	12.83	1.06
DRA-2203A	0.58	10.60	10.60	0.00	0.00	0.58	0.35	7.05	1.44	12.61	2.57
DRA-2205	0.04	8.10	10.00	0.04	0.00	0.00	0.90	7.19	0.28	12.83	0.50
DRA-2223	0.29	3.30	10.00	0.00	0.00	0.29	0.35	7.19	0.75	12.83	1.33
DRA-2236	0.35	11.80	11.80	0.00	0.00	0.35	0.35	6.78	0.84	12.19	1.50
DRA-2242	0.32	13.80	13.80	0.00	0.00	0.32	0.35	6.39	0.72	11.56	1.31
DRA-2256	0.51	12.90	12.90	0.00	0.00	0.51	0.35	6.56	1.19	11.84	2.15
DRA-2258	0.33	5.00	10.00	0.33	0.00	0.00	0.90	7.19	2.17	12.83	3.88
DRA-2277	0.34	5.10	10.00	0.00	0.00	0.34	0.35	7.19	0.86	12.83	1.54
DRA-2277A	0.33	11.00	11.00	0.33	0.00	0.00	0.90	6.95	2.06	12.47	3.69
DRA-7008	0.16	4.30	10.00	0.16	0.00	0.00	0.90	7.19	1.04	12.83	1.86
DRA-1568	0.66	14.10	14.10	0.00	0.00	0.66	0.35	6.34	1.47	11.47	2.65
DRA-1610	0.23	7.40	10.00	0.00	0.23	0.00	0.65	7.19	1.10	12.83	1.97
DRA-1624	0.15	3.70	10.00	0.15	0.00	0.00	0.90	7.19	0.97	12.83	1.73
DRA-1624A	2.62	25.90	25.90	0.00	2.62	0.00	0.65	4.80	8.23	8.95	15.35
DRA-1625	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.29	12.83	0.52
DRA-1625A	1.41	19.00	19.00	0.00	0.00	1.41	0.35	5.58	2.77	10.24	5.09
DRA-1628	0.08	5.30	10.00	0.00	0.00	0.08	0.35	7.19	0.21	12.83	0.38
DRA-1633	2.81	25.30	25.30	0.00	0.00	2.81	0.35	4.86	4.82	9.05	8.98
DRA-1635	0.21	4.20	10.00	0.21	0.00	0.00	0.90	7.19	1.36	12.83	2.42
DRA-1639	1.36	20.00	20.00	0.00	0.00	1.36	0.35	5.45	2.61	10.02	4.81
DRA-1640	0.07	6.00	10.00	0.00	0.00	0.07	0.35	7.19	0.17	12.83	0.31
DRA-1644	0.15	7.40	10.00	0.00	0.00	0.15	0.35	7.19	0.38	12.83	0.68
DRA-1646	0.23	3.50	10.00	0.23	0.00	0.00	0.90	7.19	1.50	12.83	2.67
DRA-1648	1.42	16.20	16.20	0.00	0.00	1.42	0.35	5.98	3.00	10.90	5.46
DRA-1649	1.65	18.60	18.60	0.00	0.00	1.65	0.35	5.63	3.28	10.33	6.01
DRA-1651	0.16	6.30	10.00	0.16	0.00	0.00	0.90	7.19	1.02	12.83	1.83
DRA-1655	0.06	2.00	10.00	0.06	0.00	0.00	0.90	7.19	0.38	12.83	0.68
DRA-1655C	0.46	6.40	10.00	0.00	0.46	0.00	0.65	7.19	2.15	12.83	3.84
DRA-1656	0.25	3.50	10.00	0.25	0.00	0.00	0.90	7.19	1.60	12.83	2.86

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)616-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

RUNOFF COMPUTATION

SHEET 1 OF 4

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		95

DATE: 9/11/2023 5:29:50 PM
FILE: ...\FM 519 RUNOFF COMP01.dgn

100% SUBMITTAL

CK DW CK DW

EXISTING RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1657	0.36	11.70	11.70	0.00	0.36	0.00	0.65	6.80	1.62	12.22	2.91
DRA-1658	0.70	0.00	10.00	0.00	0.70	0.00	0.65	7.19	3.30	12.83	5.90
DRA-1660	0.22	4.30	10.00	0.22	0.00	0.00	0.90	7.19	1.41	12.83	2.53
DRA-1661	0.36	15.60	15.60	0.00	0.36	0.00	0.65	6.08	1.41	11.06	2.57
DRA-1662	0.22	13.60	13.60	0.00	0.22	0.00	0.65	6.43	0.94	11.62	1.70
DRA-1663	0.33	11.70	11.70	0.00	0.33	0.00	0.65	6.80	1.49	12.22	2.67
DRA-1664	0.14	4.30	10.00	0.14	0.00	0.00	0.90	7.19	0.89	12.83	1.58
DRA-2297	0.55	11.80	11.80	0.00	0.00	0.55	0.35	6.78	1.32	12.19	2.37
DRA-2312	0.80	17.30	17.30	0.00	0.00	0.80	0.35	5.82	1.63	10.63	2.98
DRA-2332	0.23	3.70	10.00	0.23	0.00	0.00	0.90	7.19	1.53	12.83	2.72
DRA-2337	0.58	11.00	11.00	0.00	0.58	0.00	0.65	6.95	2.63	12.47	4.71
DRA-2339	0.24	3.90	10.00	0.24	0.00	0.00	0.90	7.19	1.56	12.83	2.78
DRA-2347	0.35	11.30	11.30	0.00	0.00	0.35	0.35	6.89	0.85	12.36	1.52
DRA-2353	0.54	10.40	10.40	0.00	0.00	0.54	0.35	7.09	1.34	12.68	2.40
DRA-2365	0.57	9.10	10.00	0.00	0.00	0.57	0.35	7.19	1.45	12.83	2.58
DRA-2372	0.67	11.00	11.00	0.00	0.00	0.67	0.35	6.95	1.65	12.47	2.95
DRA-2380	0.19	4.10	10.00	0.19	0.00	0.00	0.90	7.19	1.26	12.83	2.25
DRA-2386	1.00	11.40	11.40	0.00	0.00	1.00	0.35	6.87	2.41	12.33	4.33
DRA-2402	0.55	10.90	10.90	0.00	0.00	0.55	0.35	6.98	1.34	12.50	2.41
DRA-2403	0.50	11.40	11.40	0.00	0.00	0.50	0.35	6.87	1.20	12.33	2.16
DRA-2408	0.20	4.20	10.00	0.20	0.00	0.00	0.90	7.19	1.32	12.83	2.35
DRA-600	0.04	2.10	10.00	0.04	0.00	0.00	0.90	7.19	0.28	12.83	0.50
DRA-600A	0.24	6.70	10.00	0.00	0.24	0.00	0.65	7.19	1.13	12.83	2.01
DRA-657	0.70	13.50	13.50	0.00	0.70	0.00	0.65	6.45	2.95	11.65	5.33
DRA-CBS02	0.89	17.70	17.70	0.00	0.00	0.89	0.35	5.76	1.81	10.53	3.32
DRA-1562	0.19	5.00	10.00	0.19	0.00	0.00	0.90	7.19	1.23	12.83	2.19
DRA-1563	0.14	7.00	10.00	0.00	0.14	0.00	0.65	7.19	0.66	12.83	1.19
DRA-1563A	0.62	9.00	10.00	0.00	0.62	0.00	0.65	7.19	2.93	12.83	5.23
DRA-1564A	0.14	9.00	10.00	0.00	0.00	0.14	0.35	7.19	0.36	12.83	0.65
DRA-1565	0.46	4.00	10.00	0.00	0.00	0.46	0.35	7.19	1.16	12.83	2.07
DRA-1574	0.15	5.00	10.00	0.15	0.00	0.00	0.90	7.19	0.98	12.83	1.74
DRA-1574A	1.45	26.00	26.00	0.00	0.00	1.45	0.35	4.75	2.42	8.87	4.52
DRA-1580	0.88	19.00	19.00	0.00	0.00	0.88	0.35	5.64	1.74	10.35	3.20
DRA-1584	0.98	20.00	20.00	0.00	0.00	0.98	0.35	5.50	1.90	10.11	3.49
DRA-1616	0.33	8.00	10.00	0.00	0.00	0.33	0.35	7.19	0.83	12.83	1.48
DRA-1618	1.80	31.00	31.00	0.00	0.00	1.80	0.35	4.40	2.79	8.28	5.25
DRA-1619	1.23	26.00	26.00	0.00	0.00	1.23	0.35	4.79	2.07	8.93	3.86
DRA-1620	0.07	5.00	10.00	0.00	0.00	0.07	0.35	7.19	0.17	12.83	0.31
DRA-7002	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.20	12.83	2.14
DRA-1552	0.44	8.00	10.00	0.00	0.00	0.44	0.35	7.19	1.12	12.83	2.01
DRA-1553	0.19	7.00	10.00	0.00	0.00	0.19	0.35	7.19	0.48	12.83	0.85
DRA-1554	0.15	4.00	10.00	0.15	0.00	0.00	0.90	7.19	0.98	12.83	1.74
DRA-1554A	0.17	7.00	10.00	0.00	0.00	0.17	0.35	7.19	0.43	12.83	0.77
DRA-1556	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.53
DRA-1556A	0.28	8.00	10.00	0.00	0.00	0.28	0.35	7.19	0.71	12.83	1.27
DRA-1557	0.22	7.00	10.00	0.00	0.00	0.22	0.35	7.19	0.55	12.83	0.98
DRA-1558	0.24	9.00	10.00	0.00	0.24	0.00	0.65	7.19	1.15	12.83	2.05
DRA-1560	0.22	4.00	10.00	0.22	0.00	0.00	0.90	7.19	1.40	12.83	2.50
DRA-1591	0.12	3.00	10.00	0.12	0.00	0.00	0.90	7.19	0.76	12.83	1.37
DRA-1591B	1.26	21.00	21.00	0.00	0.00	1.26	0.35	5.31	2.36	9.80	4.35
DRA-1593	0.10	4.00	10.00	0.10	0.00	0.00	0.90	7.19	0.66	12.83	1.18
DRA-1593A	1.95	25.00	25.00	0.00	0.00	1.95	0.35	4.90	3.37	9.11	6.26
DRA-1597	1.28	26.00	26.00	0.00	0.00	1.28	0.35	4.84	2.19	9.01	4.07
DRA-1599	0.16	4.00	10.00	0.16	0.00	0.00	0.90	7.19	1.03	12.83	1.83
DRA-1602	2.18	26.00	26.00	0.00	0.00	2.18	0.35	4.80	3.68	8.95	6.87
DRA-1500	0.13	6.00	10.00	0.00	0.00	0.13	0.35	7.19	0.34	12.83	0.61
DRA-1503	0.59	8.00	10.00	0.00	0.00	0.59	0.35	7.19	1.48	12.83	2.65
DRA-1505	0.29	4.00	10.00	0.29	0.00	0.00	0.90	7.19	1.87	12.83	3.34
DRA-1509	0.19	6.00	10.00	0.00	0.00	0.19	0.35	7.19	0.47	12.83	0.84
DRA-1511	0.23	8.00	10.00	0.00	0.00	0.23	0.35	7.19	0.58	12.83	1.04
DRA-1516	0.45	11.00	11.00	0.00	0.00	0.45	0.35	6.91	1.09	12.40	1.96
DRA-1519	0.35	6.00	10.00	0.00	0.00	0.35	0.35	7.19	0.88	12.83	1.58
DRA-1523	0.29	7.00	10.00	0.00	0.00	0.29	0.35	7.19	0.72	12.83	1.29
DRA-1525	0.13	4.00	10.00	0.13	0.00	0.00	0.90	7.19	0.86	12.83	1.54
DRA-1531	0.37	7.00	10.00	0.00	0.00	0.37	0.35	7.19	0.94	12.83	1.69
DRA-1532	0.27	6.00	10.00	0.27	0.00	0.00	0.90	7.19	1.75	12.83	3.12
DRA-1536	0.32	8.00	10.00	0.00	0.00	0.32	0.35	7.19	0.81	12.83	1.45
DRA-1537	0.28	8.00	10.00	0.00	0.00	0.28	0.35	7.19	0.70	12.83	1.25
DRA-1541	0.36	9.00	10.00	0.00	0.00	0.36	0.35	7.19	0.90	12.83	1.61
DRA-1542	0.44	6.00	10.00	0.00	0.00	0.44	0.35	7.19	1.12	12.83	1.99
DRA-1543	0.21	5.00	10.00	0.21	0.00	0.00	0.90	7.19	1.39	12.83	2.48
DRA-1544	0.29	6.00	10.00	0.00	0.00	0.29	0.35	7.19	0.73	12.83	1.31
DRA-1546	0.39	8.00	10.00	0.00	0.00	0.39	0.35	7.19	1.00	12.83	1.78
DRA-1550	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.27	12.83	0.48

PROPOSED RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1657	0.35	11.70	11.70	0.00	0.35	0.00	0.65	6.80	1.58	12.22	2.83
DRA-1658	0.68	13.80	13.80	0.00	0.68	0.00	0.65	6.39	2.86	11.56	5.17
DRA-1660	0.24	4.30	10.00	0.24	0.00	0.00	0.90	7.19	1.55	12.83	2.76
DRA-1661	0.35	15.60	15.60	0.00	0.35	0.00	0.65	6.08	1.38	11.06	2.52
DRA-1662	0.22	13.60	13.60	0.00	0.22	0.00	0.65	6.43	0.93	11.62	1.68
DRA-1663	0.33	11.70	11.70	0.00	0.33	0.00	0.65	6.80	1.46	12.22	2.63
DRA-1664	0.15	2.70	10.00	0.15	0.00	0.00	0.90	7.19	0.98	12.83	1.76
DRA-2297	0.55	11.80	11.80	0.00	0.00	0.55	0.35	6.78	1.30	12.19	2.35
DRA-2312	0.79	17.30	17.30	0.00	0.00	0.79	0.35	5.82	1.61	10.63	2.95
DRA-2332	0.27	3.70	10.00	0.27	0.00	0.00	0.90	7.19	1.77	12.83	3.16
DRA-2337	0.54	11.00	11.00	0.00	0.54	0.00	0.65	6.95	2.45	12.47	4.40
DRA-2339	0.27	3.90	10.00	0.27	0.00	0.00	0.90	7.19	1.78	12.83	3.17
DRA-2347	0.34	11.30	11.30	0.00	0.00	0.34	0.35	6.89	0.84	12.36	1.50
DRA-2353	0.53	10.40	10.40	0.00	0.00	0.53	0.35	7.09	1.33	12.68	2.37
DRA-2365	0.56	9.10	10.00	0.00	0.00	0.56	0.35	7.19	1.43	12.83	2.55
DRA-2372	0.66	11.00	11.00	0.00	0.00	0.66	0.35	6.95	1.63	12.47	2.92
DRA-2380	0.23	4.10	10.00	0.23	0.00	0.00	0.90	7.19	1.50	12.83	2.68
DRA-2386	0.96	11.40	11.40	0.00	0.00	0.96	0.35	6.87	2.32	12.33	4.16
DRA-2402	0.54	10.90	10.90	0.00	0.00	0.54	0.35	6.98	1.33	12.50	2.38
DRA-2403	0.49	11.40	11.40	0.00	0.00	0.49	0.35	6.87	1.18	12.33	2.13
DRA-2408	0.23	4.20	10.00	0.23	0.00	0.00	0.90	7.19	1.52	12.83	2.72
DRA-600	0.05	2.10	10.00	0.05	0.00	0.00	0.90	7.19	0.32	12.83	0.56
DRA-600A	0.24	6.70	10.00	0.00	0.24	0.00	0.65	7.19	1.11	12.83	1.98
DRA-657	0.71	13.50	13.50	0.00	0.71	0.00	0.65	6.45	2.99	11.65	5.40
DRA-CBS02	0.88	17.70	17.70	0.00	0.00	0.88	0.35	5.76	1.79	10.53	3.28
DRA-1562	0.22	5.00	10.00	0.22	0.00	0.00	0.90	7.19	1.40	12.83	2.50
DRA-1563	0.13	7.00	10.00	0.00	0.13	0.00	0.65	7.19	0.61	12.83	1.09
DRA-1563A	0.60	9.00	10.00	0.00	0.60	0.00	0.65	7.19	2.83	12.83	5.05
DRA-1564A	0.14	9.00	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.63
DRA-1565	0.44	4.00	10.00	0.00	0.00	0.44	0.35	7.19	1.12	12.83	2.01
DRA-1574	0.18	5.00	10.00	0.18	0.00	0.00	0.90	7.19	1.16	12.83	2.08
DRA-1574A	1.43	26.00	26.00	0.00	0.00	1.43	0.35	4.75	2.40	8.87	4.48
DRA-1580	0.87	19.00	19.00	0.00	0.00	0.87	0.35	5.64	1.73	10.35	3.17
DRA-1584	0.97	20.00	20.00	0.00	0.00	0.97	0.35	5.50	1.88	10.11	3.46
DRA-1616	0.31	8.00	10.00	0.00	0.00	0.31	0.35	7.19	0.80	12.83	1.42
DRA-1618	1.82	31.00	31.00	0.00	0.00	1.82	0.35	4.40	2.82	8.28	5.30
DRA-1619	1.24	26.00	26.00	0.00	0.00	1.24	0.35	4.79	2.10	8.93	3.91
DRA-1620	0.06	5.00	10.00	0.00	0.00	0.06	0.35	7.19	0.15	12.83	0.27
DRA-7002	0.21	4.00	10.00	0.21	0.00	0.00	0.90	7.19	1.37	12.83	2.44
DRA-1552	0.43	8.00	10.00	0.00	0.00	0.43	0.35	7.19	1.09	12.83	1.95
DRA-1553	0.18	7.00	10.00	0.00	0.00	0.18	0.35	7.19	0.47	12.83	0.83
DRA-1554	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.08	12.83	1.93
DRA-1554A	0.17	7.00	10.00	0.00	0.00	0.17	0.35	7.19	0.43	12.83	0.77
DRA-1556	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-1556A	0.28	8.00	10.00	0.00	0.00	0.28	0.35	7.19	0.71	12.83	1.27
DRA-1557	0.20	7.00	10.00	0.00	0.00	0.20	0.35	7.19	0.52	12.83	0.92
DRA-1558	0.24	9.00	10.00	0.00	0.24	0.00	0.65	7.19	1.15	12.83	2.05
DRA-1560	0.23	4.00	10.00	0.23	0.00	0.00	0.90	7.19	1.50	12.83	2.68
DRA-1591	0.13	3.00	10.00	0.13	0.00	0.00	0.90	7.19	0.87	12.83	1.55
DRA-1591B	1.25	21.00	21.00	0.00	0.00	1.25	0.35	5.31	2.34	9.80	4.32
DRA-1593	0.12	4.00	10.00	0.12	0.00	0.00	0.90	7.19	0.75	12.83	1.34
DRA-1593A	1.93	25.00	25.00	0.00	0.00	1.93	0.35	4.90	3.34	9.11	6.22
DRA-1597	1.27	26.00	26.00	0.00	0.00	1.27	0.35	4.84	2.17	9.01	4.05
DRA-1599	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.20	12.83	2.14
DRA-1602	2.16	26.00	26.00	0.00	0.00	2.16	0.35	4.80	3.65	8.95	6.81
DRA-1500	0.13	6.00	10.00	0.00	0.00	0.13	0.35	7.19	0.32	12.83	0.56
DRA-1503	0.57	8.00	10.00	0.00	0.00	0.57	0.35	7.19	1.44	12.83	2.58
DRA-1505	0.33	4.00	10.00	0.33	0.00	0.00	0.90	7.19	2.13	12.83	3.80
DRA-1509	0.18	6.00	10.00	0.00	0.00	0.18	0.35	7.19	0.46	12.83	0.82
DRA-1511	0.23	8.00	10.00	0.00	0.00	0.23	0.35	7.19	0.57	12.83	1.03
DRA-1516	0.44	11.00	11.00	0.00	0.00	0.44	0.35	6.91	1.07	12.40	1.92
DRA-1519	0.34	6.00	10.00	0.00	0.00	0.34	0.35	7.19	0.86	12.83	1.54
DRA-1523	0.27	7.00	10.00	0.00	0.00	0.27	0.35	7.19	0.69	12.83	1.24
DRA-1525	0.15	4.00	10.00	0.15	0.00	0.00	0.90	7.19	1.01	12.83	1.80
DRA-1531	0.36	7.00	10.00	0.00	0.00	0.36	0.35	7.19	0.92	12.83	1.64
DRA-1532	0.31	6.00	10.00	0.31	0.00	0.00	0.90	7.19	2.01	12.83	3.59
DRA-1536	0.31	8.00	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.41
DRA-1537	0.27	8.00	10.00	0.00	0.00	0.27	0.35	7.19	0.68	12.83	1.22
DRA-1541	0.35	9.00	10.00	0.00	0.00	0.35	0.35	7.19	0.87	12.83	1.56
DRA-1542	0.43	6.00	10.00	0.00	0.00	0.43	0.35	7.19	1.08	12.83	1.93
DRA-1543	0.25	5.00	10.00	0.25	0.00	0.00	0.90	7.19	1.62	12.83	2.89
DRA-1544	0.28	6.00	10.00	0.00	0.00	0.28	0.35	7.19	0.71	12.83	1.27
DRA-1546	0.38	8.00	10.00	0.00	0.00	0.38	0.35	7.19	0.97	12.83	1.73
DRA-1550	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.28	12.83	0.50

DATE: 9/11/2023 5:31:03 PM
FILE: ...\FM 519 RUNOFF COMP02.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)616-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

RUNOFF COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		96

100% SUBMITTAL

CK
DW
CK
DW

EXISTING RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1550A	18.10	53.00	53.00	0.00	0.00	18.10	0.35	3.19	20.38	6.19	39.56
DRA-1551	0.10	3.00	10.00	0.10	0.00	0.00	0.90	7.19	0.64	12.83	1.14
DRA-1551A	34.40	70.00	70.00	0.00	0.00	34.40	0.35	2.69	32.61	5.30	64.35
DRA-1530	0.26	6.00	10.00	0.00	0.00	0.26	0.35	7.19	0.67	12.83	1.19
DRA-1497	12.47	51.00	51.00	0.00	0.00	12.47	0.35	3.28	14.45	6.36	27.97
DRA-1484	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.44	12.83	0.78
DRA-1374	0.23	5.00	10.00	0.00	0.00	0.23	0.35	7.19	0.59	12.83	1.05
DRA-1378	0.17	8.00	10.00	0.00	0.00	0.17	0.35	7.19	0.42	12.83	0.75
DRA-1381	0.14	8.00	10.00	0.00	0.00	0.14	0.35	7.19	0.36	12.83	0.65
DRA-1384	0.14	5.00	10.00	0.00	0.00	0.14	0.35	7.19	0.36	12.83	0.64
DRA-1384A	1.65	10.00	10.00	0.00	0.00	1.65	0.35	7.19	4.19	12.83	7.48
DRA-1384B	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.18	12.83	2.10
DRA-1385	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.29	12.83	0.52
DRA-1385A	1.96	9.00	10.00	0.00	0.00	1.96	0.35	7.19	4.97	12.83	8.88
DRA-1390	0.31	7.00	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.42
DRA-1393	0.36	6.00	10.00	0.00	0.00	0.36	0.35	7.19	0.91	12.83	1.62
DRA-1405	0.14	8.00	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.62
DRA-1410	0.17	5.00	10.00	0.00	0.00	0.17	0.35	7.19	0.42	12.83	0.75
DRA-1412	0.15	5.00	10.00	0.00	0.00	0.15	0.35	7.19	0.37	12.83	0.66
DRA-1417	0.22	4.00	10.00	0.00	0.00	0.22	0.35	7.19	0.55	12.83	0.98
DRA-1420	0.13	3.00	10.00	0.13	0.00	0.00	0.90	7.19	0.81	12.83	1.45
DRA-1423	0.17	7.00	10.00	0.00	0.00	0.17	0.35	7.19	0.43	12.83	0.77
DRA-1429	0.12	7.00	10.00	0.00	0.00	0.12	0.35	7.19	0.31	12.83	0.56
DRA-1433	0.16	7.00	10.00	0.00	0.00	0.16	0.35	7.19	0.40	12.83	0.72
DRA-1436	0.24	4.00	10.00	0.24	0.00	0.00	0.90	7.19	1.54	12.83	2.76
DRA-1436A	1.45	16.00	16.00	0.00	0.00	1.45	0.35	6.06	3.10	11.03	5.64
DRA-1437	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.29	12.83	0.51
DRA-1437A	6.72	37.00	37.00	0.00	0.00	6.72	0.35	3.95	9.37	7.51	17.82
DRA-1439	0.12	4.00	10.00	0.00	0.00	0.12	0.35	7.19	0.29	12.83	0.52
DRA-1444	0.33	5.00	10.00	0.00	0.00	0.33	0.35	7.19	0.84	12.83	1.50
DRA-1446	0.63	8.00	10.00	0.00	0.00	0.63	0.35	7.19	1.60	12.83	2.86
DRA-1450	0.28	4.00	10.00	0.28	0.00	0.00	0.90	7.19	1.80	12.83	3.21
DRA-1454	0.21	4.00	10.00	0.21	0.00	0.00	0.90	7.19	1.39	12.83	2.48
DRA-1455	0.29	7.00	10.00	0.00	0.00	0.29	0.35	7.19	0.73	12.83	1.30
DRA-1455A	0.25	6.00	10.00	0.00	0.00	0.25	0.35	7.19	0.64	12.83	1.15
DRA-1459	0.30	8.00	10.00	0.00	0.00	0.30	0.35	7.19	0.75	12.83	1.34
DRA-1460	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.27	12.83	0.48
DRA-1460A	0.35	6.00	10.00	0.00	0.00	0.35	0.35	7.19	0.89	12.83	1.59
DRA-1461	0.15	4.00	10.00	0.15	0.00	0.00	0.90	7.19	0.99	12.83	1.78
DRA-1461A	0.31	6.00	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.42
DRA-1463	0.31	6.00	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.42
DRA-1469	0.31	7.00	10.00	0.00	0.00	0.31	0.35	7.19	0.79	12.83	1.41
DRA-1471	0.14	4.00	10.00	0.14	0.00	0.00	0.90	7.19	0.88	12.83	1.58
DRA-1473	0.58	9.00	10.00	0.00	0.00	0.58	0.35	7.19	1.46	12.83	2.61
DRA-1476	0.34	4.00	10.00	0.00	0.00	0.34	0.35	7.19	0.86	12.83	1.54
DRA-1477	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.12	12.83	2.00
DRA-1491	0.33	8.00	10.00	0.00	0.00	0.33	0.35	7.19	0.85	12.83	1.51
DRA-1495	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.31	12.83	0.55
DRA-1495A	12.46	56.00	56.00	0.00	0.00	12.46	0.35	3.08	13.54	6.00	26.37
DRA-1496	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.43	12.83	0.78
DRA-1485	0.29	6.00	10.00	0.00	0.00	0.29	0.35	7.19	0.74	12.83	1.33
DRA-1485A	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.23	12.83	0.40
DRA-1325	0.25	4.00	10.00	0.25	0.00	0.00	0.90	7.19	1.66	12.83	2.96
DRA-1326	0.37	8.00	10.00	0.00	0.00	0.37	0.35	7.19	0.92	12.83	1.65
DRA-1331	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.27	12.83	0.48
DRA-1331A	0.35	9.00	10.00	0.00	0.00	0.35	0.35	7.19	0.89	12.83	1.60
DRA-1332	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.11	12.83	1.99
DRA-1332A	0.30	8.00	10.00	0.00	0.30	0.00	0.65	7.19	1.39	12.83	2.48
DRA-1332B	0.48	8.00	10.00	0.00	0.48	0.00	0.65	7.19	2.25	12.83	4.01
DRA-1334	0.54	7.00	10.00	0.00	0.00	0.54	0.35	7.19	1.37	12.83	2.44
DRA-1334A	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.20	12.83	2.14
DRA-1336	0.40	10.00	10.00	0.00	0.40	0.00	0.65	7.19	1.87	12.83	3.35
DRA-1337	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.25	12.83	2.23
DRA-1345	0.12	0.00	10.00	0.12	0.00	0.00	0.90	7.19	0.77	12.83	1.37
DRA-1347	0.10	2.00	10.00	0.10	0.00	0.00	0.90	7.19	0.65	12.83	1.17
DRA-1348	0.50	13.00	13.00	0.00	0.00	0.50	0.35	6.58	1.16	11.87	2.10
DRA-1355	1.20	18.00	18.00	0.00	0.00	1.20	0.35	5.79	2.45	10.58	4.48
DRA-1357	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.44	12.83	0.79
DRA-1357A	0.83	17.00	17.00	0.00	0.83	0.00	0.65	5.83	3.15	10.65	5.76
DRA-1358	1.71	19.00	19.00	0.00	0.00	1.71	0.35	5.55	3.35	10.19	6.15
DRA-1358A	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.27	12.83	0.48
DRA-1359	0.24	6.00	10.00	0.00	0.24	0.00	0.65	7.19	1.14	12.83	2.03
DRA-1362	0.19	6.00	10.00	0.00	0.00	0.19	0.35	7.19	0.47	12.83	0.84
DRA-1366	0.16	5.00	10.00	0.00	0.00	0.16	0.35	7.19	0.40	12.83	0.72

PROPOSED RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1550A	18.11	53.00	53.00	0.00	0.00	18.11	0.35	3.19	20.38	6.19	39.57
DRA-1551	0.11	3.00	10.00	0.11	0.00	0.00	0.90	7.19	0.71	12.83	1.27
DRA-1551A	34.39	70.00	70.00	0.00	0.00	34.39	0.35	2.69	32.60	5.30	64.33
DRA-1530	0.25	6.00	10.00	0.00	0.00	0.25	0.35	7.19	0.63	12.83	1.13
DRA-1497	12.47	51.00	51.00	0.00	0.00	12.47	0.35	3.28	14.45	6.36	27.97
DRA-1484	0.08	3.00	10.00	0.08	0.00	0.00	0.90	7.19	0.49	12.83	0.88
DRA-1374	0.22	5.00	10.00	0.00	0.00	0.22	0.35	7.19	0.57	12.83	1.01
DRA-1378	0.16	8.00	10.00	0.00	0.00	0.16	0.35	7.19	0.41	12.83	0.73
DRA-1381	0.14	8.00	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.63
DRA-1384	0.14	5.00	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.62
DRA-1384A	1.65	10.00	10.00	0.00	0.00	1.65	0.35	7.19	4.19	12.83	7.48
DRA-1384B	0.21	4.00	10.00	0.21	0.00	0.00	0.90	7.19	1.33	12.83	2.38
DRA-1385	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-1385A	1.96	9.00	10.00	0.00	0.00	1.96	0.35	7.19	4.97	12.83	8.88
DRA-1390	0.30	7.00	10.00	0.00	0.00	0.30	0.35	7.19	0.77	12.83	1.37
DRA-1393	0.35	6.00	10.00	0.00	0.00	0.35	0.35	7.19	0.88	12.83	1.57
DRA-1405	0.13	8.00	10.00	0.00	0.00	0.13	0.35	7.19	0.33	12.83	0.59
DRA-1410	0.16	5.00	10.00	0.00	0.00	0.16	0.35	7.19	0.41	12.83	0.73
DRA-1412	0.14	5.00	10.00	0.00	0.00	0.14	0.35	7.19	0.36	12.83	0.64
DRA-1417	0.21	4.00	10.00	0.00	0.00	0.21	0.35	7.19	0.54	12.83	0.96
DRA-1420	0.14	3.00	10.00	0.14	0.00	0.00	0.90	7.19	0.92	12.83	1.65
DRA-1423	0.17	7.00	10.00	0.00	0.00	0.17	0.35	7.19	0.42	12.83	0.75
DRA-1429	0.12	7.00	10.00	0.00	0.00	0.12	0.35	7.19	0.30	12.83	0.54
DRA-1433	0.15	7.00	10.00	0.00	0.00	0.15	0.35	7.19	0.39	12.83	0.70
DRA-1436	0.25	4.00	10.00	0.25	0.00	0.00	0.90	7.19	1.65	12.83	2.95
DRA-1436A	1.45	16.00	16.00	0.00	0.00	1.45	0.35	6.06	3.10	11.03	5.64
DRA-1437	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.29	12.83	0.52
DRA-1437A	6.72	37.00	37.00	0.00	0.00	6.72	0.35	3.95	9.37	7.51	17.82
DRA-1439	0.10	4.00	10.00	0.00	0.00	0.10	0.35	7.19	0.26	12.83	0.47
DRA-1444	0.32	5.00	10.00	0.00	0.00	0.32	0.35	7.19	0.81	12.83	1.46
DRA-1446	0.62	8.00	10.00	0.00	0.00	0.62	0.35	7.19	1.56	12.83	2.79
DRA-1450	0.32	4.00	10.00	0.32	0.00	0.00	0.90	7.19	2.11	12.83	3.76
DRA-1454	0.25	4.00	10.00	0.25	0.00	0.00	0.90	7.19	1.63	12.83	2.92
DRA-1455	0.28	7.00	10.00	0.00	0.00	0.28	0.35	7.19	0.71	12.83	1.27
DRA-1455A	0.25	6.00	10.00	0.00	0.00	0.25	0.35	7.19	0.62	12.83	1.11
DRA-1459	0.29	8.00	10.00	0.00	0.00	0.29	0.35	7.19	0.73	12.83	1.30
DRA-1460	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.29	12.83	0.51
DRA-1460A	0.34	6.00	10.00	0.00	0.00	0.34	0.35	7.19	0.87	12.83	1.56
DRA-1461	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.15	12.83	2.06
DRA-1461A	0.31	6.00	10.00	0.00	0.00	0.31	0.35	7.19	0.77	12.83	1.38
DRA-1463	0.30	6.00	10.00	0.00	0.00	0.30	0.35	7.19	0.77	12.83	1.37
DRA-1469	0.30	7.00	10.00	0.00	0.00	0.30	0.35	7.19	0.77	12.83	1.37
DRA-1471	0.16	4.00	10.00	0.16	0.00	0.00	0.90	7.19	1.06	12.83	1.89
DRA-1473	0.56	9.00	10.00	0.00	0.00	0.56	0.35	7.19	1.41	12.83	2.52
DRA-1476	0.33	4.00	10.00	0.00	0.00	0.33	0.35	7.19	0.83	12.83	1.49
DRA-1477	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.25	12.83	2.24
DRA-1491	0.32	8.00	10.00	0.00	0.00	0.32	0.35	7.19	0.82	12.83	1.46
DRA-1495	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.32	12.83	0.57
DRA-1495A	12.46	56.00	56.00	0.00	0.00	12.46	0.35	3.08	13.53	6.00	26.37
DRA-1496	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.47	12.83	0.83
DRA-1485	0.28	6.00	10.00	0.00	0.00	0.28	0.35	7.19	0.72	12.83	1.28
DRA-1485A	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.23	12.83	0.42
DRA-1325	0.30	4.00	10.00	0.30	0.00	0.00	0.90	7.19	1.95	12.83	3.48
DRA-1326	0.35	8.00	10.00	0.00	0.00	0.35	0.35	7.19	0.89	12.83	1.59
DRA-1331	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.28	12.83	0.50
DRA-1331A	0.34	9.00	10.00	0.00	0.00	0.34	0.35	7.19	0.87	12.83	1.56
DRA-1332	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.22	12.83	2.18
DRA-1332A	0.29	8.00	10.00	0.00	0.29	0.00	0.65	7.19	1.38	12.83	2.46
DRA-1332B	0.46	8.00	10.00	0.00	0.46	0.00	0.65	7.19	2.19	12.83	3.91
DRA-1334	0.52	7.00	10.00	0.00	0.00	0.52	0.35	7.19	1.33	12.83	2.37
DRA-1334A	0.21	4.00	10.00	0.21	0.00	0.00	0.90	7.19	1.36	12.83	2.43
DRA-1336	0.39	10.00	10.00	0.00	0.39	0.00	0.65	7.19	1.82	12.83	3.24
DRA-1337	0.23	4.00	10.00	0.23	0.00	0.00	0.90	7.19	1.48	12.83	2.64
DRA-1345	0.12	3.00	10.00	0.12	0.00	0.00	0.90	7.19	0.80	12.83	1.43
DRA-1347	0.12	4.00	10.00	0.12	0.00	0.00	0.90	7.19	0.76	12.83	1.36
DRA-1348	0.50	13.00	13.00	0.00	0.00	0.50	0.35	6.58	1.15	11.87	2.08
DRA-1355	1.19	18.00	18.00	0.00	0.00	1.19	0.35	5.79	2.42	10.58	4.43
DRA-1357	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.46	12.83	0.83
DRA-1357A	0.82	17.00	17.00	0.00	0.82	0.00	0.65	5.83	3.14	10.65	5.73
DRA-1358	1.71	2.00	10.00	0.00	0.00	1.71	0.35	7.19	4.33	12.83	7.73
DRA-1358A	0.04	19.00	19.00	0.04	0.00	0.00	0.90	5.55	0.22	10.19	0.40
DRA-1359	0.24	6.00	10.00	0.00	0.24	0.00	0.65	7.19	1.11	12.83	1.98
DRA-1362	0.18	6.00	10.00	0.00	0.00	0.18	0.35	7.19	0.46	12.83	0.82
DRA-1366	0.15	5.00	10.00	0.00	0.00	0.15	0.35	7.19	0.39	12.83	0.69

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)816-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

RUNOFF COMPUTATION

SHEET 3 OF 4

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		97

DATE: 9/11/2023 5:32:11 PM
FILE: ...\FM 519 RUNOFF COMP03.dgn

100% SUBMITTAL

CK
DW
CK
DW

EXISTING RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1369	0.11	4.00	10.00	0.11	0.00	0.00	0.90	7.19	0.70	12.83	1.26
DRA-1395	0.23	9.00	10.00	0.00	0.00	0.23	0.35	7.19	0.59	12.83	1.06
DRA-1396	0.10	4.00	10.00	0.10	0.00	0.00	0.90	7.19	0.65	12.83	1.16
DRA-1398	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.26	12.83	0.46
DRA-1398A	0.60	10.00	10.00	0.00	0.00	0.60	0.35	7.19	1.51	12.83	2.70
DRA-1399	0.08	3.00	10.00	0.08	0.00	0.00	0.90	7.19	0.53	12.83	0.95
DRA-1399A	0.29	8.00	10.00	0.00	0.00	0.29	0.35	7.19	0.74	12.83	1.31
DRA-1400	1.30	9.00	10.00	0.00	0.00	1.30	0.35	7.19	3.29	12.83	5.87
DRA-1339	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.25	12.83	0.45
DRA-1339A	0.55	10.00	10.00	0.00	0.55	0.00	0.65	7.19	2.59	12.83	4.62
DRA-1340	0.07	3.00	10.00	0.07	0.00	0.00	0.90	7.19	0.47	12.83	0.85
DRA-1191	0.03	1.00	10.00	0.03	0.00	0.00	0.90	7.19	0.19	12.83	0.33
DRA-1191A	0.08	7.00	10.00	0.00	0.00	0.08	0.35	7.19	0.21	12.83	0.38
DRA-1191B	1.41	10.00	10.00	0.00	0.00	1.41	0.35	7.19	3.58	12.83	6.40
DRA-1192	0.27	4.00	10.00	0.27	0.00	0.00	0.90	7.19	1.73	12.83	3.10
DRA-1192A	0.18	7.00	10.00	0.00	0.00	0.18	0.35	7.19	0.47	12.83	0.83
DRA-1196C	0.26	7.00	10.00	0.00	0.00	0.26	0.35	7.19	0.65	12.83	1.15
DRA-1197	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.08	12.83	1.92
DRA-1197A	1.04	10.00	10.00	0.00	0.00	1.04	0.35	7.19	2.63	12.83	4.69
DRA-1198	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.11	12.83	1.98
DRA-1198A	0.82	19.00	19.00	0.00	0.82	0.00	0.65	5.60	3.00	10.28	5.50
DRA-1202	0.86	19.00	19.00	0.00	0.86	0.00	0.65	5.60	3.17	10.28	5.82
DRA-1205	0.54	8.00	10.00	0.00	0.54	0.00	0.65	7.19	2.53	12.83	4.52
DRA-1210	0.73	19.00	19.00	0.00	0.73	0.00	0.65	5.60	2.67	10.28	4.89
DRA-1214	0.73	19.00	19.00	0.00	0.73	0.00	0.65	5.60	2.69	10.28	4.94
DRA-1218	0.77	8.00	10.00	0.00	0.77	0.00	0.65	7.19	3.62	12.83	6.47
DRA-1222	0.44	8.00	10.00	0.00	0.44	0.00	0.65	7.19	2.09	12.83	3.73
DRA-1225	0.30	4.00	10.00	0.30	0.00	0.00	0.90	7.19	1.94	12.83	3.46
DRA-1230	0.63	8.00	10.00	0.00	0.63	0.00	0.65	7.19	2.98	12.83	5.32
DRA-1231	0.49	19.00	19.00	0.00	0.00	0.49	0.35	5.60	0.97	10.28	1.78
DRA-1237	0.94	19.00	19.00	0.00	0.00	0.94	0.35	5.60	1.86	10.28	3.41
DRA-1237A	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.15	12.83	2.05
DRA-1238	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.11	12.83	1.99
DRA-1238A	0.87	19.00	19.00	0.00	0.00	0.87	0.35	5.60	1.72	10.28	3.16
DRA-1239	1.32	19.00	19.00	0.00	0.00	1.32	0.35	5.60	2.60	10.28	4.78
DRA-1246	0.46	8.00	10.00	0.00	0.00	0.46	0.35	7.19	1.16	12.83	2.08
DRA-1249	0.46	19.00	19.00	0.00	0.00	0.46	0.35	5.60	0.90	10.28	1.65
DRA-1254	0.33	19.00	19.00	0.00	0.00	0.33	0.35	5.60	0.64	10.28	1.18
DRA-1256	0.16	4.00	10.00	0.16	0.00	0.00	0.90	7.19	1.04	12.83	1.85
DRA-1256A	0.66	19.00	19.00	0.00	0.00	0.66	0.35	5.60	1.31	10.28	2.41
DRA-1257	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.10	12.83	1.96
DRA-1257A	0.51	19.00	19.00	0.00	0.00	0.51	0.35	5.60	1.00	10.28	1.83
DRA-1258	0.76	10.00	10.00	0.00	0.00	0.76	0.35	7.19	1.93	12.83	3.45
DRA-1264	0.51	19.00	19.00	0.00	0.00	0.51	0.35	5.60	1.02	10.28	1.86
DRA-1268	0.34	19.00	19.00	0.00	0.00	0.34	0.35	5.58	0.67	10.24	1.23
DRA-1270	0.21	10.00	10.00	0.00	0.00	0.21	0.35	7.19	0.52	12.83	0.94
DRA-1274	0.23	10.00	10.00	0.00	0.00	0.23	0.35	7.19	0.59	12.83	1.06
DRA-1279	0.30	7.00	10.00	0.30	0.00	0.00	0.90	7.19	1.93	12.83	3.44
DRA-1279A	0.32	6.00	10.00	0.00	0.32	0.00	0.65	7.19	1.51	12.83	2.69
DRA-1282	0.40	9.00	10.00	0.00	0.00	0.40	0.35	7.19	1.02	12.83	1.83
DRA-1284	0.30	9.00	10.00	0.00	0.00	0.30	0.35	7.19	0.77	12.83	1.37
DRA-1289	0.49	8.00	10.00	0.00	0.00	0.49	0.35	7.19	1.25	12.83	2.24
DRA-1292	0.42	8.00	10.00	0.00	0.00	0.42	0.35	7.19	1.05	12.83	1.88
DRA-1296	0.14	8.00	10.00	0.00	0.00	0.14	0.35	7.19	0.35	12.83	0.63
DRA-1299	0.07	4.00	10.00	0.00	0.00	0.07	0.35	7.19	0.18	12.83	0.32
DRA-1302	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.15	12.83	2.05
DRA-1302A	0.28	8.00	10.00	0.00	0.00	0.28	0.35	7.19	0.70	12.83	1.25
DRA-1303	0.15	4.00	10.00	0.15	0.00	0.00	0.90	7.19	0.97	12.83	1.74
DRA-1303A	0.34	8.00	10.00	0.00	0.00	0.34	0.35	7.19	0.87	12.83	1.55
DRA-1307	0.16	4.00	10.00	0.16	0.00	0.00	0.90	7.19	1.02	12.83	1.83
DRA-1307A	0.33	8.00	10.00	0.00	0.00	0.33	0.35	7.19	0.83	12.83	1.48
DRA-1308	0.23	10.00	10.00	0.00	0.00	0.23	0.35	7.19	0.59	12.83	1.05
DRA-1308A	0.29	6.00	10.00	0.29	0.00	0.00	0.90	7.19	1.90	12.83	3.40
DRA-1312	0.32	9.00	10.00	0.00	0.32	0.00	0.65	7.19	1.51	12.83	2.69
DRA-1314	0.64	5.00	10.00	0.00	0.00	0.64	0.35	7.19	1.62	12.83	2.89
DRA-1319	0.16	4.00	10.00	0.16	0.00	0.00	0.90	7.19	1.06	12.83	1.90
DRA-1319A	0.31	9.00	10.00	0.00	0.00	0.31	0.35	7.19	0.78	12.83	1.40
DRA-1321	0.52	5.00	10.00	0.00	0.52	0.00	0.65	7.19	2.44	12.83	4.36
DRA-1321A	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.29	12.83	0.52
DRA-1322	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.53

PROPOSED RUNOFF COMPUTATIONS

DRAINAGE ID NAME	AREA (acres)	Tc Calc (min)	Tc Used (min)	Composite Area (ac) Pav. C=0.90	Dev. C=0.65	Res. C=0.35	C-Value Weighted	INTENSITY 5-YR (in/hr)	DISCHARGE 5-YR (cfs)	INTENSITY 100-YR (in/hr)	DISCHARGE 100-YR (cfs)
DRA-1369	0.12	4.00	10.00	0.12	0.00	0.00	0.90	7.19	0.78	12.83	1.40
DRA-1395	0.23	9.00	10.00	0.00	0.00	0.23	0.35	7.19	0.58	12.83	1.03
DRA-1396	0.13	2.00	10.00	0.13	0.00	0.00	0.90	7.19	0.87	12.83	1.56
DRA-1398	0.04	10.00	10.00	0.04	0.00	0.00	0.90	7.19	0.26	12.83	0.47
DRA-1398A	0.58	2.00	10.00	0.00	0.00	0.58	0.35	7.19	1.46	12.83	2.61
DRA-1399	0.08	3.00	10.00	0.08	0.00	0.00	0.90	7.19	0.55	12.83	0.98
DRA-1399A	0.29	8.00	10.00	0.00	0.00	0.29	0.35	7.19	0.73	12.83	1.30
DRA-1400	1.27	9.00	10.00	0.00	0.00	1.27	0.35	7.19	3.22	12.83	5.75
DRA-1339	0.04	2.00	10.00	0.04	0.00	0.00	0.90	7.19	0.26	12.83	0.46
DRA-1339A	0.54	10.00	10.00	0.00	0.54	0.00	0.65	7.19	2.54	12.83	4.53
DRA-1340	0.08	3.00	10.00	0.08	0.00	0.00	0.90	7.19	0.50	12.83	0.89
DRA-1191	0.03	1.00	10.00	0.03	0.00	0.00	0.90	7.19	0.20	12.83	0.36
DRA-1191A	0.08	7.00	10.00	0.00	0.00	0.08	0.35	7.19	0.19	12.83	0.34
DRA-1191B	1.41	10.00	10.00	0.00	0.00	1.41	0.35	7.19	3.58	12.83	6.40
DRA-1192	0.30	4.00	10.00	0.30	0.00	0.00	0.90	7.19	1.98	12.83	3.54
DRA-1192A	0.18	7.00	10.00	0.00	0.00	0.18	0.35	7.19	0.45	12.83	0.81
DRA-1196C	0.25	7.00	10.00	0.00	0.00	0.25	0.35	7.19	0.63	12.83	1.12
DRA-1197	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.25	12.83	2.23
DRA-1197A	1.01	10.00	10.00	0.00	0.00	1.01	0.35	7.19	2.56	12.83	4.57
DRA-1198	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.26	12.83	2.25
DRA-1198A	0.81	19.00	19.00	0.00	0.81	0.00	0.65	5.60	2.98	10.28	5.47
DRA-1202	0.85	19.00	19.00	0.00	0.85	0.00	0.65	5.60	3.12	10.28	5.72
DRA-1205	0.52	8.00	10.00	0.00	0.52	0.00	0.65	7.19	2.45	12.83	4.37
DRA-1210	0.72	19.00	19.00	0.00	0.72	0.00	0.65	5.60	2.65	10.28	4.86
DRA-1214	0.73	19.00	19.00	0.00	0.73	0.00	0.65	5.60	2.68	10.28	4.92
DRA-1218	0.74	8.00	10.00	0.00	0.74	0.00	0.65	7.19	3.50	12.83	6.26
DRA-1222	0.43	8.00	10.00	0.00	0.43	0.00	0.65	7.19	2.02	12.83	3.61
DRA-1225	0.35	4.00	10.00	0.35	0.00	0.00	0.90	7.19	2.31	12.83	4.12
DRA-1230	0.61	8.00	10.00	0.00	0.61	0.00	0.65	7.19	2.89	12.83	5.15
DRA-1231	0.48	19.00	19.00	0.00	0.00	0.48	0.35	5.60	0.96	10.28	1.76
DRA-1237	0.93	19.00	19.00	0.00	0.00	0.93	0.35	5.60	1.84	10.28	3.38
DRA-1237A	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.24	12.83	2.21
DRA-1238	0.20	19.00	19.00	0.20	0.00	0.00	0.90	5.60	1.01	10.28	1.85
DRA-1238A	0.86	4.00	10.00	0.00	0.00	0.86	0.35	7.19	2.19	12.83	3.91
DRA-1239	1.30	19.00	19.00	0.00	0.00	1.30	0.35	5.60	2.57	10.28	4.71
DRA-1246	0.44	8.00	10.00	0.00	0.00	0.44	0.35	7.19	1.13	12.83	2.01
DRA-1249	0.45	19.00	19.00	0.00	0.00	0.45	0.35	5.60	0.89	10.28	1.64
DRA-1254	0.32	19.00	19.00	0.00	0.00	0.32	0.35	5.60	0.62	10.28	1.15
DRA-1256	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.16	12.83	2.06
DRA-1256A	0.66	19.00	19.00	0.00	0.00	0.66	0.35	5.60	1.31	10.28	2.41
DRA-1257	0.19	4.00	10.00	0.19	0.00	0.00	0.90	7.19	1.26	12.83	2.25
DRA-1257A	0.51	19.00	19.00	0.00	0.00	0.51	0.35	5.60	1.00	10.28	1.83
DRA-1258	0.75	10.00	10.00	0.00	0.00	0.75	0.35	7.19	1.90	12.83	3.39
DRA-1264	0.51	19.00	19.00	0.00	0.00	0.51	0.35	5.60	1.00	10.28	1.84
DRA-1268	0.34	19.00	19.00	0.00	0.00	0.34	0.35	5.60	0.67	10.28	1.23
DRA-1270	0.20	10.00	10.00	0.00	0.00	0.20	0.35	7.19	0.51	12.83	0.91
DRA-1274	0.23	10.00	10.00	0.00	0.00	0.23	0.35	7.19	0.57	12.83	1.02
DRA-1279	0.36	7.00	10.00	0.36	0.00	0.00	0.90	7.19	2.33	12.83	4.15
DRA-1279A	0.31	6.00	10.00	0.00	0.31	0.00	0.65	7.19	1.47	12.83	2.62
DRA-1282	0.39	9.00	10.00	0.00	0.00	0.39	0.35	7.19	0.98	12.83	1.75
DRA-1284	0.28	9.00	10.00	0.00	0.00	0.28	0.35	7.19	0.70	12.83	1.25
DRA-1289	0.48	8.00	10.00	0.00	0.00	0.48	0.35	7.19	1.21	12.83	2.17
DRA-1292	0.40	8.00	10.00	0.00	0.00	0.40	0.35	7.19	1.02	12.83	1.82
DRA-1296	0.13	8.00	10.00	0.00	0.00	0.13	0.35	7.19	0.33	12.83	0.60
DRA-1299	0.06	4.00	10.00	0.00	0.00	0.06	0.35	7.19	0.16	12.83	0.29
DRA-1302	0.20	4.00	10.00	0.20	0.00	0.00	0.90	7.19	1.32	12.83	2.35
DRA-1302A	0.28	8.00	10.00	0.00	0.00	0.28	0.35	7.19	0.70	12.83	1.25
DRA-1303	0.17	4.00	10.00	0.17	0.00	0.00	0.90	7.19	1.13	12.83	2.02
DRA-1303A	0.33	8.00	10.00	0.00	0.00	0.33	0.35	7.19	0.84	12.83	1.51
DRA-1307	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.17	12.83	2.09
DRA-1307A	0.32	8.00	10.00	0.00	0.00	0.32	0.35	7.19	0.81	12.83	1.45
DRA-1308	0.23	10.00	10.00	0.00	0.00	0.23	0.35	7.19	0.57	12.83	1.03
DRA-1308A	0.35	6.00	10.00	0.35	0.00	0.00	0.90	7.19	2.25	12.83	4.01
DRA-1312	0.31	9.00	10.00	0.00	0.31	0.00	0.65	7.19	1.45	12.83	2.59
DRA-1314	0.62	5.00	10.00	0.00	0.00	0.62	0.35	7.19	1.56	12.83	2.80
DRA-1319	0.18	4.00	10.00	0.18	0.00	0.00	0.90	7.19	1.20	12.83	2.14
DRA-1319A	0.30	9.00	10.00	0.00	0.00	0.30	0.35	7.19	0.76	12.83	1.36
DRA-1321	0.50	5.00	10.00	0.00	0.50	0.00	0.65	7.19	2.36	12.83	4.22
DRA-1321A	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.30	12.83	0.54
DRA-1322	0.05	2.00	10.00	0.05	0.00	0.00	0.90	7.19	0.31	12.83	0.55

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)816-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

RUNOFF COMPUTATION

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		98

DATE: 9/11/2023 5:33:18 PM
FILE: ...\FM 519 RUNOFF COMP04.dgn

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
A	INL 1059	608+77	-175.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	4.90	0.50	0.12	9.99	0.28	0.28	0.00		
A	INL 2010	609+02	-42.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	3.60	0.50	0.09	11.68	0.11	0.11	0.00		
A	PCO-2009	609+07	-50.30	Curb	On Grade	5.00	2.00	1.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.11	10.60	0.53	0.35	0.18	PCO-2016	
A	PCO 2005	609+36	-123.90	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	6.90	0.50	0.15	8.53	0.62	0.62	0.00		
A	INL 2005A	609+46	-154.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.60	0.50	0.17	8.42	3.34	3.34	0.00		SD 18"
A	PCO- 2002	609+56	-106.80	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	5.30	0.50	0.12	9.09	0.30	0.30	0.00		
A	INL 2002A	609+66	-122.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	71.90	0.50	0.18	7.04	3.84	3.84	0.00		SD 18"
A	INL 2014	610+28	-49.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.00	0.50	0.23	8.07	1.03	1.03	0.00		
A	INL 2015	610+68	36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	2.40	0.50	0.06	8.27	0.05	0.05	0.00		
A	PCO-2016	610+69	26.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.60	0.50	0.18	8.72	1.09	0.72	0.36	PCO-7008	
A	INL 2019	610+84	-37.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.80	0.50	0.27	7.25	1.43	1.43	0.00		
A	PCO- 2018	610+84	-30.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.50	0.50	0.16	8.69	0.77	0.58	0.19	PCO- 2059	
A	INL 2038	611+17	38.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.60	0.50	0.14	8.20	0.38	0.38	0.00		
A	INL 2059A	612+23	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	69.10	0.50	0.17	8.21	3.61	3.61	0.00		SD 18"
A	INL 2049	612+23	37.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.40	0.50	0.18	8.59	0.73	0.73	0.00		
A	PCO- 2059	612+25	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.37	7.82	1.10	1.10	0.00		
A	PCO- 2061	612+57	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	7.78	0.26	0.26	0.00		
A	INL 2061A	612+60	-63.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	73.00	0.50	0.18	8.31	3.92	3.92	0.00		SD 18"
A	PCO-7008	612+61	29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.90	0.50	0.19	8.18	1.18	0.76	0.42	PCO-2085	
A	INL 2055	612+61	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.50	0.50	0.14	7.18	0.37	0.37	0.00		
A	INL 2077	613+71	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.80	0.50	0.20	7.51	0.83	0.83	0.00		
A	INL 2105	614+01	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.20	0.50	0.18	6.83	0.69	0.69	0.00		
A	PCO- 2099	614+01	-29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.60	0.50	0.16	7.76	0.78	0.59	0.19	PCO- 2142	
A	PCO-2085	614+08	29.30	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.90	0.50	0.19	7.70	1.20	1.08	0.12	PCO-2136	
A	INL 2084	614+09	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.90	0.50	0.25	7.05	1.34	1.34	0.00		
A	INL 2117	614+77	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.60	0.50	0.37	7.20	2.41	2.41	0.00		
A	INL 2123	615+15	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.80	0.50	0.14	6.82	0.43	0.43	0.00		
A	INL 2142A	615+82	-148.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	60.70	0.50	0.15	6.43	2.97	2.97	0.00		SD 18"
A	PCO- 2142	615+84	-49.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.80	0.50	0.39	6.76	1.55	1.55	0.00		
A	PCO-2136	616+16	29.20	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.50	0.50	0.18	7.14	1.05	0.97	0.07	PCO-2168	
A	INL 2135	616+16	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.20	0.50	0.18	6.79	0.69	0.69	0.00		
A	PCO- 2145	616+17	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	6.78	0.29	0.29	0.00		
A	INL 2145A	616+25	-78.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.60	0.50	0.17	6.21	3.34	3.34	0.00		SD 18"
A	INL 2157	616+78	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	4.10	0.50	0.10	6.80	0.17	0.17	0.00		
A	INL 2147	617+08	38.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.70	0.50	0.17	6.54	0.60	0.60	0.00		
A	PCO- 2160	617+09	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	6.88	0.81	0.81	0.00		
A	INL 2160A	617+10	-99.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.40	0.50	0.13	6.92	0.35	0.35	0.00		
A	PCO-2168	617+10	28.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.20	0.50	0.35	6.20	0.78	0.78	0.00		
A	INL 2187	618+14	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.50	0.50	0.14	6.34	0.39	0.39	0.00		
A	INL 2189A	618+51	-109.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	13.90	0.50	0.35	6.96	2.52	2.52	0.00		
A	PCO- 2189	618+51	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.20	0.50	0.34	6.37	0.77	0.77	0.00		
A	INL 2203A	618+55	68.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	38.20	0.50	0.10	6.05	1.48	1.48	0.00		SD 18"
A	PCO-2203	618+61	51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.00	0.50	0.33	5.61	0.53	0.53	0.00		
A	PCO- 2193	618+83	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.32	6.40	0.44	0.44	0.00		
A	INL 2193A	618+84	-97.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	57.20	0.50	0.14	6.92	2.72	2.72	0.00		SD 18"
A	PCO-2205	618+93	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	5.63	0.27	0.27	0.00		
A	INL 2205A	618+95	83.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	0.00	0.50	0.00	5.55	0.00	0.00	0.00		
A	INL 2236	619+58	40.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.90	0.50	0.20	5.99	0.86	0.86	0.00		
A	INL 2242	620+02	39.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.40	0.50	0.19	5.58	0.75	0.75	0.00		
A	INL 2223	620+08	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.90	0.50	0.20	5.48	0.79	0.79	0.00		
A	PCO- 2277	621+30	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.60	0.50	0.45	6.03	2.69	2.69	0.00		
A	INL 2256	621+31	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.60	0.50	0.24	12.22	1.26	1.26	0.00		
A	PCO-2258	621+32	29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.50	0.50	0.41	5.33	1.86	1.86	0.00		
B	INL 2297	624+13	-35.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.30	0.50	0.26	4.98	1.32	1.32	0.00		
B	INL 2312	624+66	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	11.00	0.50	0.27	5.93	1.63	1.63	0.00		
B	PCO- 2339	625+20	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.91	1.56	1.56	0.00		
B	PCO-2332	625+21	29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.89	1.53	1.53	0.00		
B	INL 2337	625+22	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.20	0.50	0.36	4.55	2.63	2.63	0.00		
B	INL 2347	625+34	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.10	0.50	0.20	4.94	0.85	0.85	0.00		
B	INL 2353	625+73	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.40	0.50	0.26	5.30	1.34	1.34	0.00		
B	INL 2365	626+34	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.90	0.50	0.27	5.22	1.45	1.45	0.00		
B	INL 2372	627+10	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.70	0.50	0.29	5.56	1.65	1.65	0.00		
B	INL 2402	627+64	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.40	0.50	0.26	5.42	1.34	1.34	0.00		
B	PCO-2380	628+15	29.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.60	0.50	0.38	5.86	1.26	1.26	0.00		
B	INL 2403	628+16	-35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.80	0.50	0.25	5.54	1.20	1.20	0.00		
B	PCO- 2408	628+16	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	5.86	1.32	1.32	0.00		
B	INL 2386	628+17	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	13.50	0.50	0.34	4.54	2.41	2.41	0.00		
B	CBS 02	628+69	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	12.40	0.50	0.31	5.44	1.81	1.81	0.00		
B	INL 1640	629+24	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.10	0.50	0.10	5.79	0.19	0.19	0.00		
B	INL 600A	629+53	72.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.10	0.50	0.23	3.68	1.13	1.13	0.00		
B	PCO- 657	629+54	-51.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	10.20	0.50	0.46	5.91	2.95	2.95	0.00		
B	PCO-600	629+55	52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	5.30	0.28	0.28	0.00		
B	INL 1655C	629+95	170.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	12.80	0.50	0.32	2.95	2.19	2.19	0.00		
B	PCO- 1651	629+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.36	5.96	1.04	1.04	0.00		
B	PCO-1655	629+97	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	5.58	0.36	0.36	0.00		
B	INL 1649	630+74	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	11.34	0.50	0.29	4.95	3.30	3.30	0.00		
B	INL 1648	631+20	-35.10	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	10.69	0.50	0.27	4.66	3.01	3.01	0.00		
B	PCO- 1646	631+51	-29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	5.61	1.30	1.30	0.00		
B	PCO-1656	631+52	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.59	1.44	1.44	0.00		
B	INL 1657	631+53	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.90	0.50	0.27	4.57	1.62	1.62	0.00		
B	INL 1644	631+80	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.60	0.50	0.14	4.87	0.39	0.39	0.00		
B	INL 1639	632+42	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	15.40	0.50	0.38	5.34	2.63	2.63	0.00		
B	INL 1658	632+88	40.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	16.20	0.50	0.40	5.39	3.30	3.30	0.00		
B	PCO- 1635	634+37	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.60	0.50	0.37	5.55	1.16	1.16	0.00		
B	PCO-1660	634+37	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.90	0.50	0.40	5.59	1.66	1.66	0.00		
B	INL 1661	634+37	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.20	0.50	0.25	5.24	1.41	1.41	0.00		
B	INL 1633	634+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	22.30	0.50	0.56	5.35	4.86	4.86	0.00		
B	INL 1662	635+03	41.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.30	0.50	0.21	5.34	0.94	0.94	0.00		
B	INL 1628	635+11	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.40	0.50	0.11	5.33	0.24	0.24	0.00		
B	INL 1625A	635+63	-90.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	57.90	0.50	0.15	5.49	2.77	2.77	0.00		SD 18"
B	PCO- 1625	635+66	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	5.41	0.28	0.28	0.00		
B	PCO-1664	635+69	29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.17	5.59	0.89	0.64	0.25	PCO-1660	
B	INL 1663	635+69	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.40	0.50	0.26	4.92	1.49	1.49	0.00		
B	PCO- 1624	635+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.30	0.50	0.35	4.69	0.88	0.88	0.00		

NOTE:

LARGE VALUE IN COMPUTED PONDED WIDTH ARE LOCATED ALONG THE DITCH ON SIDE STREET. THE "COMMENT" COLUMN SHOWS THE PIPE SIZE RECEIVING THE DISCHARGE.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

SHEET 1 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		99

DATE: 9/11/2023 5:34:24 PM
FILE: ...\FM 519 INLET COMP01.dgn

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
B	INL 1624A	636+00	-74.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	119.80	0.50	0.30	5.68	8.25	8.25	0.00		SD 18"
B	INL 1568	637+37	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.50	0.50	0.26	5.37	1.50	1.50	0.00		
B	INL 1610	637+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.20	0.50	0.23	6.00	1.16	1.16	0.00		
C	INL 1616	638+34	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.00	0.50	0.20	5.51	0.83	0.83	0.00		
C	PCO- 1618	638+89	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.80	0.50	0.46	5.50	2.79	2.79	0.00		
C	PCO-7002	638+93	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.40	5.59	1.74	1.74	0.00		
C	INL 1565	638+93	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.20	0.50	0.23	5.46	1.16	1.16	0.00		
C	PCO- 1619	639+15	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	8.70	0.50	0.43	5.51	2.32	2.32	0.00		
C	INL 1564	639+31	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.40	0.50	0.14	5.46	0.36	0.36	0.00		
C	INL 1620	639+61	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	3.90	0.50	0.10	6.06	0.17	0.17	0.00		
C	PCO- 1562	639+96	29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.00	0.50	0.17	6.38	1.23	0.69	0.54	PCO-7002	
C	INL 1563	639+97	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	17.00	0.50	0.42	5.43	3.59	3.59	0.00		
C	PCO- 1574	640+35	-29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.30	0.50	0.16	6.67	0.98	0.60	0.37	PCO- 1619	
C	INL 1574A	640+37	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.60	0.50	0.37	6.18	2.42	2.42	0.00		
C	INL 1580	641+10	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	12.10	0.50	0.30	6.01	1.74	1.74	0.00		
C	INL 1584	641+62	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	7.95	0.50	0.20	6.32	1.90	1.90	0.00		
C1	INL 1585	642+41	-39.70	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	0.00	0.50	0.00	7.15	0.00	0.00	0.00		
D	INL 1587	642+98	-35.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	0.00	0.50	0.00	7.11	0.00	0.00	0.00		
D	INL 1591B	643+57	-115.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	51.90	0.50	0.13	7.50	2.36	2.36	0.00		SD 18"
D	PCO- 1591	643+75	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.20	0.50	0.34	7.01	0.76	0.76	0.00		
D	PCO-1560	644+04	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.39	5.59	1.41	1.41	0.00		
D	INL 1558	644+04	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.10	0.50	0.23	6.64	1.15	1.15	0.00		
D	PCO- 1593	644+07	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.40	0.50	0.36	7.10	0.99	0.99	0.00		
D	INL 1593A	644+16	-79.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.90	0.50	0.17	6.31	3.37	3.37	0.00		SD 18"
D	INL 1557	644+47	39.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.50	0.50	0.16	6.61	0.55	0.55	0.00		
D	INL 1556A	645+34	61.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	23.40	0.50	0.06	7.50	0.71	0.71	0.00		SD 18"
D	PCO-1556	645+37	52.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	5.20	0.50	0.12	7.36	0.30	0.29	0.01	PCO-1560	
D	INL 1597	645+41	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	13.80	0.50	0.34	7.34	2.19	2.19	0.00		
D	PCO- 1599	645+41	-29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.40	0.50	0.18	7.51	1.03	0.70	0.33	PCO- 1593	
D	PCO-1554	645+69	52.30	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	8.20	0.50	0.18	7.52	0.98	0.98	0.00		
D	INL 1554A	645+72	66.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	16.70	0.50	0.04	5.10	0.43	0.43	0.00		
D	INL 1553	646+21	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.10	0.50	0.15	6.67	0.48	0.48	0.00		
D	INL 1602	646+42	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	18.80	0.50	0.47	7.82	3.68	3.68	0.00		
D	INL 1552	646+65	39.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.10	0.50	0.23	6.75	1.12	1.12	0.00		
E	INL 1551A	648+37	-90.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	10.00	1202.80	0.50	3.04	5.60	32.61	32.61	0.00		SD 30"
E	INL 1546	648+39	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.50	0.50	0.21	6.52	1.00	1.00	0.00		
E	PCO- 1551	648+40	-51.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.10	0.50	0.33	7.69	0.64	0.64	0.00		
E	PCO- 1550	648+72	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	7.60	0.27	0.27	0.00		
E	INL 1550A	648+81	-73.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	10.00	469.60	0.50	1.19	7.00	20.38	20.38	0.00		SD 30"
E	INL 1544	648+88	41.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.40	0.50	0.18	7.41	0.73	0.73	0.00		
E	INL 1523	649+56	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.50	0.50	0.19	7.40	0.72	0.72	0.00		
E	PCO- 1525	649+56	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	7.79	0.86	0.86	0.00		
E	PCO-1543	649+56	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	5.59	1.39	1.39	0.00		
E	INL 1542	649+65	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.00	0.50	0.23	7.82	1.12	1.12	0.00		
E	INL 1519	650+18	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.30	0.50	0.21	7.32	0.88	0.88	0.00		
E	INL 1516	651+01	-34.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.30	0.50	0.23	8.00	1.09	1.09	0.00		
E	INL 1541	651+03	39.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.10	0.50	0.20	6.38	0.90	0.90	0.00		
E	INL 1537	651+47	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.20	0.50	0.18	7.16	0.70	0.70	0.00		
E	INL 1511	652+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.70	0.50	0.17	7.53	0.58	0.58	0.00		
E	INL 1536	652+37	36.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.70	0.50	0.19	6.45	0.81	0.81	0.00		
E	INL 1509	652+46	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.10	0.50	0.15	7.27	0.47	0.47	0.00		
E	INL 1503	653+00	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.00	0.50	0.28	7.68	1.48	1.48	0.00		
E	PCO- 1505	653+00	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.50	0.50	0.41	7.34	1.87	1.87	0.00		
E	INL 1531	653+02	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.30	0.50	0.21	6.34	0.94	0.94	0.00		
E	PCO-1532	653+03	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.40	5.59	1.75	1.75	0.00		
E1	INL 1530	654+37	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.00	0.50	0.18	6.82	0.67	0.67	0.00		
E	INL 1500	654+53	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.20	0.50	0.13	7.37	0.34	0.34	0.00		
E2	INL 1497	654+81	-70.70	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	25.00	0.50	0.63	5.77	14.45	14.45	0.00		
E3	PCO-1484	654+86	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.32	6.89	0.44	0.44	0.00		
F2	PCO- 1496	654+89	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.32	6.99	0.43	0.43	0.00		
F4	PCO-1485	655+18	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.40	0.50	0.36	7.03	0.97	0.97	0.00		
F	PCO- 1495	655+21	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	7.02	0.31	0.31	0.00		
F	INL 1495A	655+28	-210.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	37.80	0.50	0.95	4.31	13.54	13.54	0.00		
F	INL 1491	655+83	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.10	0.50	0.20	6.89	0.85	0.85	0.00		
F	PCO- 1450	657+35	-28.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.30	0.50	0.41	6.88	1.80	1.80	0.00		
F	PCO-1454	657+35	30.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	5.59	1.39	1.39	0.00		
F	INL 1446	657+36	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.50	0.50	0.29	6.21	1.60	1.60	0.00		
F	INL 1455	657+37	40.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.00	0.50	0.25	6.39	1.37	1.37	0.00		
F	INL 1444	657+80	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.10	0.50	0.20	6.39	0.84	0.84	0.00		
F	INL 1459	657+91	40.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.40	0.50	0.19	5.93	0.75	0.75	0.00		
F	INL 1439	658+62	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.90	0.50	0.12	6.69	0.29	0.29	0.00		
F	INL 1460A	658+96	71.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	27.20	0.50	0.07	5.80	0.89	0.89	0.00		SD 15"
F	PCO-1460	658+98	45.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	6.35	0.27	0.27	0.00		
F	INL 1437A	659+09	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	130.40	0.50	0.33	5.10	9.37	9.37	0.00		SD 15"
F	PCO- 1437	659+12	-51.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	6.84	0.29	0.29	0.00		
F	PCO-1461	659+31	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.80	0.50	0.39	6.54	1.56	1.56	0.00		
F	INL 1461A	659+40	66.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	25.10	0.50	0.06	4.60	0.79	0.79	0.00		SD 15"
F	PCO- 1436	659+44	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.30	0.50	0.41	6.84	1.79	1.79	0.00		
F	INL 1436A	659+48	-100.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	62.40	0.50	0.16	4.90	3.10	3.10	0.00		SD 24"
F	INL 1433	659+86	-34.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.60	0.50	0.14	7.11	0.40	0.40	0.00		
F	INL 1463	660+14	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.60	0.50	0.19	6.04	0.79	0.79	0.00		
F	INL 1429	660+40	-34.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.00	0.50	0.13	6.95	0.31	0.31	0.00		
F	INL 1423	660+89	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.80	0.50	0.15	7.63	0.43	0.43	0.00		
F	PCO-1471	661+34	30.00	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.60	0.50	0.18	8.14	1.32	0.75	0.57	PCO-1461	
F	INL 1469	661+34	38.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.60	0.50	0.19	7.45	0.79	0.79	0.00		
F	INL 1417	661+42	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.50	0.50	0.16	8.33	0.55	0.55	0.00		
F	PCO- 1420	661+42	-28.30	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.10	0.50	0.15	8.33	0.81	0.56	0.25	PCO- 1436	
F	INL 1473	661+66	37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.30	0.50	0.26	7.76	1.46	1.46	0.00		
F	INL 1412	661+93	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.40	0.50	0.14	8.52	0.37	0.37	0.00		
F	INL 1410	662+45	-34.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	8.60	0.42	0.42	0.00		
F	INL 1405	662+91	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.30	0.50	0.13	9.14	0.35	0.35	0.00		
F	INL 1385A	663+19	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	85.40	0.50	0.22	7.10	4.97	4.97	0.00		SD 24"
F	PCO-1385	663+25	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	8.67	0.29	0.29	0.00		
F	PCO-1477	663+37	30.10	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.10	0.50	0.17	9.15	1.12	0.68	0.44	PCO-1471	

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		100

DATE: 9/12/2023 10:29:33 AM
FILE: ...\FM 519 INLET COMP02.dgn

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
F	INL 1476	663+37	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.00	0.50	0.20	9.15	0.86	0.86	0.00		
F	PCO-1384	663+57	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.80	0.50	0.39	8.68	1.53	1.53	0.00		
F	INL 1384A	663+63	-174.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	18.50	0.50	0.46	7.60	4.19	4.19	0.00		
F	INL 1390	663+99	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.60	0.50	0.19	9.72	0.79	0.79	0.00		
F	INL 1381	664+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.40	0.50	0.13	9.44	0.36	0.36	0.00		
F	INL 1378	664+63	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	9.58	0.42	0.42	0.00		
F	INL 1374	665+10	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.70	0.50	0.17	8.84	0.59	0.59	0.00		
F	INL 1393	665+27	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.20	0.50	0.20	9.72	0.91	0.91	0.00		
G	INL-1366	665+88	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.70	0.50	0.14	9.60	0.40	0.40	0.00		
G	PCO-1369	665+88	-28.80	Curb	In Sag	9.50	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.50	0.50	0.32	10.19	0.70	0.70	0.00		
G	INL 1395	665+88	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.70	0.50	0.17	9.72	0.59	0.59	0.00		
G	INL 1396	665+89	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	10.00	9.10	0.50	0.14	9.72	0.65	0.65	0.00		
G	INL-1362	666+17	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.10	0.50	0.15	9.39	0.47	0.47	0.00		
G	INL 1359	666+77	-33.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.50	0.50	0.24	9.26	1.14	1.14	0.00		
G	PCO-1358	667+45	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	11.50	0.50	0.50	9.70	3.56	3.56	0.00		
G	PCO-1398	667+45	52.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.20	0.50	0.41	5.59	1.77	1.77	0.00		
G	PCO-1357	667+77	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.00	0.50	0.32	9.64	0.44	0.44	0.00		
G	PCO-1399	667+77	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.10	0.50	0.33	9.18	0.53	0.53	0.00		
G	INL 1399A	667+84	110.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	23.90	0.50	0.06	9.63	0.74	0.74	0.00		
G	INL 1357A	667+85	-72.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	63.00	0.50	0.16	9.23	3.15	3.15	0.00		SD 18"
G	INL 1355	669+04	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.70	0.50	0.37	10.05	2.45	2.45	0.00		
G	PCO-1345	669+67	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	5.80	0.50	0.17	10.95	0.77	0.77	0.00		
G	INL 1348	669+68	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.60	0.50	0.24	10.38	1.16	1.16	0.00		
G	PCO-1347	669+68	-29.00	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.00	0.50	0.16	10.35	0.65	0.65	0.00	PCO-1332	
G	INL 1400	669+68	38.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	16.10	0.50	0.40	9.72	3.29	3.29	0.00		
G	INL 1332B	671+24	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.00	0.50	0.35	8.81	2.25	2.25	0.00		
G	INL 1332A	671+63	-129.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	36.50	0.50	0.09	9.60	1.39	1.39	0.00		SD 18"
G	PCO-1332	671+63	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	8.74	1.11	1.11	0.00		
G	PCO-1331	671+95	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	8.72	0.27	0.27	0.00		
G	INL 1331A	671+97	-72.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	27.20	0.50	0.07	7.70	0.89	0.89	0.00		SD 18"
G	PCO-1334	672+02	28.50	Curb	On Grade	9.50	2.00	0.70	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.10	0.50	0.22	9.18	2.57	1.63	0.94	PCO-1337	
G	INL 1336	673+54	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	11.80	0.50	0.30	9.72	1.87	1.87	0.00		
G	INL 1326	673+55	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.50	0.50	0.21	7.42	0.92	0.92	0.00		
G	PCO-1325	673+55	-29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.41	8.31	1.66	1.66	0.00		
G	PCO-1337	673+55	29.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.30	0.50	0.43	8.34	2.19	2.19	0.00		
G1	INL 1339A	675+02	69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	55.30	0.50	0.14	12.98	2.59	2.59	0.00		SD 15"
G1	PCO-1339	675+06	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	3.80	0.50	0.31	7.77	0.25	0.25	0.00		
G1	PCO-1340	675+38	53.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	7.78	0.47	0.47	0.00		
H	PCO-1322	675+93	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	10.00	3.80	0.50	0.31	8.12	0.30	0.30	0.00		
H	PCO-1321	676+25	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.70	0.50	0.46	8.21	2.73	2.73	0.00		
H	INL 1284	677+93	38.10	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	3.40	0.50	0.09	9.72	0.77	0.77	0.00		
H	INL 1314	678+05	-36.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.60	0.50	0.29	7.84	1.62	1.62	0.00		
H	INL 1282	679+14	38.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.60	0.50	0.22	6.86	1.02	1.02	0.00		
H	INL 1312	679+19	-36.00	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	6.86	0.50	0.17	8.70	1.51	1.51	0.00		
H	INL 1279A	680+04	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	38.60	0.50	0.10	6.80	1.51	1.51	0.00		SD 15"
H	PCO-1308	680+07	-50.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.10	0.50	0.45	7.45	2.49	2.49	0.00		
H	PCO-1279	680+07	53.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.60	0.50	0.42	7.11	1.93	1.93	0.00		
H	PCO-1307	680+39	-50.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.37	7.67	1.02	1.02	0.00		
H	PCO-1319	680+39	53.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.37	7.08	1.06	1.06	0.00		
H	INL 1319A	680+41	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	24.90	0.50	0.06	6.60	0.78	0.78	0.00		SD 15"
H	INL 1307A	680+43	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	25.90	0.50	0.07	7.10	0.83	0.83	0.00		SD 18"
H	INL 1274	681+38	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.70	0.50	0.17	7.10	0.59	0.59	0.00		
H	INL 1289	681+64	-36.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.00	0.50	0.25	8.06	1.25	1.25	0.00		
H	INL 1270	682+00	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.30	0.50	0.16	7.31	0.52	0.52	0.00		
H	INL 1268	682+29	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.10	0.50	0.18	7.28	0.67	0.67	0.00		
H	INL 1292	682+78	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.10	0.50	0.23	7.88	1.05	1.05	0.00		
H	INL 1264	683+01	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.60	0.50	0.22	6.43	1.02	1.02	0.00		
H	INL 1296	683+30	-37.20	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	2.80	0.50	0.07	7.25	0.35	0.35	0.00		
H	INL 1258	683+76	37.80	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	6.70	0.50	0.17	7.15	1.93	1.93	0.00		
H	INL 1299	683+85	-37.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.00	0.50	0.10	7.00	0.18	0.18	0.00		
H	INL 1257A	684+18	67.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	29.30	0.50	0.07	6.80	1.00	1.00	0.00		SD 15"
H	INL 1302A	684+20	-69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	23.10	0.50	0.06	6.60	0.70	0.70	0.00		SD 15"
H	PCO-1302	684+25	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.38	7.04	1.15	1.15	0.00		
H	PCO-1257	684+27	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	6.69	1.10	1.10	0.00		
H	PCO-1303	684+57	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.36	7.12	0.97	0.97	0.00		
H	PCO-1256	684+59	53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.50	0.50	0.37	6.67	1.04	1.04	0.00		
H	INI 1303A	684+62	-70.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	26.60	0.50	0.07	6.92	0.87	0.87	0.00		SD 15"
H	INL 1256A	684+62	75.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	35.10	0.50	0.09	5.30	1.31	1.31	0.00		SD 15"
H	INL 1254	685+02	37.90	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	10.00	9.40	0.50	0.14	7.20	0.64	0.64	0.00		
H	INL 1249	685+64	37.60	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	10.00	10.80	0.50	0.16	6.79	0.90	0.90	0.00		
H	INL 1246	685+67	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.60	0.50	0.24	6.96	1.16	1.16	0.00		
H	INL 1239	686+63	37.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.10	0.50	0.35	6.99	2.60	2.60	0.00		
H	INL 1230	687+52	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	16.50	0.50	0.41	6.86	2.98	2.98	0.00		
H	INL 1231	687+53	36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.40	0.50	0.21	6.20	0.97	0.97	0.00		
H	PCO-1238	688+48	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.30	0.50	0.45	6.51	2.59	2.59	0.00		
H	INL 1222	688+77	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	13.40	0.50	0.34	6.41	2.09	2.09	0.00		
H	PCO-1225	688+77	-28.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.70	0.50	0.42	7.09	1.94	1.94	0.00		
H	PCO-1237	688+80	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.70	0.50	0.46	6.31	2.76	2.76	0.00		
H	INL 1214	689+93	35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.40	0.50	0.36	6.79	2.69	2.69	0.00		
H	INL 1218	689+95	-36.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	18.60	0.50	0.47	6.48	3.62	3.62	0.00		
H	INL 1210	690+89	36.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.30	0.50	0.36	7.00	2.67	2.67	0.00		
H	INL 1202	691+88	35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	15.80	0.50	0.40	6.69	3.17	3.17	0.00		
H	INL 1205	691+89	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	15.00	0.50	0.38	6.49	2.53	2.53	0.00		
H	INL 1196C	692+60	-42.40	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	2.90	0.50	0.07	4.30	0.65	0.65	0.00		
H	INL 1198A	692+60	68.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	61.00	0.50	0.15	4.90	3.00	3.00	0.00		SD 24"
H	PCO-1198	692+69	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	6.38	1.11	1.11	0.00		
H	PCO-1197	693+00	52.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	6.38	1.08	1.08	0.00		
H	INL 1197A	693+03	63.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	55.90	0.50	0.14	6.80	2.63	2.63	0.00		SD 18"
H	INL 1192A	693+05	-44.50	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	2.10	0.50	0.05	5.30	0.47	0.47	0.00		
H	PCO- 1192	693+05	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.10	0.50	0.41	6.78	1.73	1.73	0.00		
H	PCO-1191	694+25	-27.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	4.20	0.50	0.10	7.08	0.19	0.19	0.00	PCO- 1192	
H	INL 1191A	694+38	-31.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	4.50	0.50	0.11	7.54	0.21	0.21	0.00		
H	INL 1191B	695+32	53.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	68.70	0.50	0.17	6.60	3.58	3.58	0.00		SD 24"

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		101

DATE: 9/11/2023 5:36:43 PM
FILE: ...\FM 519 INLET COMP03.dgn

100% SUBMITTAL

CK
DW
CK
DW

EXISTING CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
A	INL 1059	608+77	-175.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	6.20	0.50	0.16	9.99	0.50	0.50	0.00		
A	INL 2010	609+02	-42.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	4.30	0.50	0.11	11.68	0.19	0.19	0.00		
A	PCO-2009	609+07	-50.30	Curb	On Grade	5.00	2.00	1.44	0.013	0.25	3.00	N/A	N/A	N/A	12.00	6.00	0.50	0.13	11.10	0.94	0.49	0.46	PCO-2016	
A	PCO 2005	609+36	-123.90	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	8.60	0.50	0.18	9.03	1.11	1.11	0.00		
A	INL 2005A	609+46	-154.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	98.50	0.50	0.25	8.42	6.15	6.15	0.00		SD 18"
A	PCO- 2002	609+56	-106.80	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	6.60	0.50	0.14	9.59	0.54	0.54	0.00		
A	INL 2002A	609+66	-122.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	108.90	0.50	0.28	7.04	7.15	7.15	0.00		SD 18"
A	INL 2014	610+28	-49.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	12.50	0.50	0.31	8.07	1.85	1.85	0.00		
A	INL 2015	610+68	36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	3.50	0.50	0.09	8.27	0.10	0.10	0.00		
A	PCO-2016	610+69	26.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	11.00	0.50	0.23	9.22	2.08	1.06	1.01	PCO-7008	
A	INL 2019	610+84	-37.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	15.10	0.50	0.38	7.25	2.56	2.56	0.00		
A	PCO- 2018	610+84	-30.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	9.40	0.50	0.20	9.19	1.38	0.84	0.54	PCO- 2059	
A	INL 2038	611+17	38.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	7.10	0.50	0.18	8.20	0.68	0.68	0.00		
A	INL 2059A	612+23	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	103.70	0.50	0.26	8.21	6.65	6.65	0.00		SD 18"
A	INL 2049	612+23	37.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.80	0.50	0.24	8.59	1.31	1.31	0.00		
A	PCO- 2059	612+25	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.30	0.50	0.43	8.32	2.17	2.17	0.00		
A	PCO- 2061	612+57	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	3.90	0.50	0.32	8.28	0.47	0.47	0.00		
A	INL 2061A	612+60	-63.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	110.20	0.50	0.28	8.31	7.28	7.28	0.00		SD 18"
A	PCO-7008	612+61	29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	11.70	0.50	0.25	8.68	2.48	1.18	1.30	PCO-2085	
A	INL 2055	612+61	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	7.10	0.50	0.18	7.18	0.67	0.67	0.00		
A	INL 2077	613+71	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	10.50	0.50	0.26	7.51	1.50	1.50	0.00		
A	INL 2105	614+01	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.50	0.50	0.24	6.83	1.23	1.23	0.00		
A	PCO- 2099	614+01	-29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	9.40	0.50	0.20	8.26	1.39	0.84	0.55	PCO- 2142	
A	PCO-2085	614+08	29.30	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	12.10	0.50	0.25	8.20	2.70	1.90	0.80	PCO-2136	
A	INL 2084	614+09	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	13.70	0.50	0.34	7.05	2.45	2.45	0.00		
A	INL 2117	614+77	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	20.90	0.50	0.52	7.20	4.39	4.39	0.00		
A	INL 2123	615+15	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	7.70	0.50	0.19	6.82	0.76	0.76	0.00		
A	INL 2142A	615+82	-148.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	90.50	0.50	0.23	6.43	5.42	5.42	0.00		SD 18"
A	PCO- 2142	615+84	-49.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.20	0.50	0.47	7.26	2.98	2.98	0.00		
A	PCO-2136	616+16	29.20	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	11.70	0.50	0.24	7.64	2.45	1.78	0.67	PCO-2168	
A	INL 2135	616+16	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.50	0.50	0.24	6.79	1.23	1.23	0.00		
A	PCO- 2145	616+17	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.33	7.28	0.52	0.52	0.00		
A	INL 2145A	616+25	-78.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	98.80	0.50	0.25	6.21	6.18	6.18	0.00		SD 18"
A	INL 2157	616+78	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	5.00	0.50	0.13	6.80	0.30	0.30	0.00		
A	INL 2147	617+08	38.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	8.90	0.50	0.22	6.54	1.08	1.08	0.00		
A	PCO- 2160	617+09	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.80	0.50	0.39	7.38	1.45	1.45	0.00		
A	INL 2160A	617+10	-99.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	6.90	0.50	0.17	6.92	0.63	0.63	0.00		
A	PCO-2168	617+10	28.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	7.70	0.50	0.41	6.70	1.94	1.94	0.00		
A	INL 2187	618+14	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	7.30	0.50	0.18	6.34	0.70	0.70	0.00		
A	INL 2189A	618+51	-109.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	19.60	0.50	0.49	6.96	4.61	4.61	0.00		
A	PCO- 2189	618+51	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.70	0.50	0.38	6.87	1.38	1.38	0.00		
A	INL 2203A	618+55	68.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	56.30	0.50	0.14	6.05	2.66	2.66	0.00		SD 18"
A	PCO-2203	618+61	51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.40	0.50	0.36	6.11	0.94	0.94	0.00		
A	PCO- 2193	618+83	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.20	0.50	0.35	6.90	0.78	0.78	0.00		
A	INL 2193A	618+84	-97.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	85.10	0.50	0.21	6.92	4.94	4.94	0.00		SD 18"
A	PCO-2205	618+93	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.32	6.13	0.48	0.48	0.00		
A	INL 2205A	618+95	83.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	0.00	0.50	0.00	5.55	0.00	0.00	0.00		
A	INL 2236	619+58	40.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	10.60	0.50	0.27	5.99	1.55	1.55	0.00		
A	INL 2242	620+02	39.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.90	0.50	0.25	5.58	1.35	1.35	0.00		
A	INL 2223	620+08	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	10.80	0.50	0.27	5.48	1.42	1.42	0.00		
A	PCO- 2277	621+30	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	14.10	0.50	0.54	6.53	4.82	4.82	0.00		
A	INL 2256	621+31	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	13.10	0.50	0.33	12.22	2.27	2.27	0.00		
A	PCO-2258	621+32	29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	11.00	0.50	0.48	5.83	3.33	3.33	0.00		
B	INL 2297	624+13	-35.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.50	0.50	0.36	4.98	2.37	2.37	0.00		
B	INL 2312	624+66	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	15.20	0.50	0.38	5.93	2.98	2.98	0.00		
B	PCO- 2339	625+20	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.80	0.50	0.46	6.41	2.78	2.78	0.00		
B	PCO-2332	625+21	29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.60	0.50	0.45	6.39	2.72	2.72	0.00		
B	INL 2337	625+22	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	19.80	0.50	0.50	4.55	4.71	4.71	0.00		
B	INL 2347	625+34	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	11.20	0.50	0.28	4.94	1.52	1.52	0.00		
B	INL 2353	625+73	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.60	0.50	0.36	5.30	2.40	2.40	0.00		
B	INL 2365	626+34	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	15.20	0.50	0.38	5.22	2.58	2.58	0.00		
B	INL 2372	627+10	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	16.50	0.50	0.41	5.56	2.95	2.95	0.00		
B	INL 2402	627+64	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.60	0.50	0.37	5.42	2.41	2.41	0.00		
B	PCO-2380	628+15	29.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.50	0.50	0.43	6.36	2.25	2.25	0.00		
B	INL 2403	628+16	-35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	13.70	0.50	0.34	5.54	2.16	2.16	0.00		
B	PCO- 2408	628+16	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.70	0.50	0.44	6.36	2.35	2.35	0.00		
B	INL 2386	628+17	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	18.90	0.50	0.47	4.54	4.33	4.33	0.00		
B	CBS 02	628+69	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	17.60	0.50	0.44	5.44	3.32	3.32	0.00		
B	INL 1640	629+24	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	5.20	0.50	0.13	5.79	0.34	0.34	0.00		
B	INL 600A	629+53	72.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	12.30	0.50	0.31	3.68	2.01	2.01	0.00		
B	PCO- 657	629+54	-51.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	15.10	0.50	0.56	6.41	5.33	5.33	0.00		
B	PCO-600	629+55	52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.32	5.80	0.50	0.50	0.00		
B	INL 1655C	629+95	170.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	17.80	0.50	0.45	2.95	3.91	3.91	0.00		
B	PCO- 1651	629+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	7.50	0.50	0.41	6.46	1.87	1.87	0.00		
B	PCO-1655	629+97	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.10	0.50	0.33	6.08	0.64	0.64	0.00		
B	INL 1649	630+74	-35.30	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	12.00	16.82	0.50	0.42	4.95	6.04	6.04	0.00		
B	INL 1648	631+20	-35.10	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	12.00	15.79	0.50	0.40	4.66	5.48	5.48	0.00		
B	PCO- 1646	631+51	-29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.70	0.50	0.43	6.11	2.32	2.32	0.00		
B	PCO-1656	631+52	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.30	0.50	0.45	6.09	2.57	2.57	0.00		
B	INL 1657	631+53	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	15.00	0.50	0.38	4.57	2.91	2.91	0.00		
B	INL 1644	631+80	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	7.40	0.50	0.19	4.87	0.70	0.70	0.00		
B	INL 1639	632+42	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	22.20	0.50	0.56	5.34	4.84	4.84	0.00		
B	INL 1658	632+88	40.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	22.70	0.50	0.57	5.39	5.90	5.90	0.00		
B	PCO- 1635	634+37	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.00	0.50	0.42	6.05	2.07	2.07	0.00		
B	PCO-1660	634+37	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.70	0.50	0.48	6.09	3.20	3.20	0.00		
B	INL 1661	634+37	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.00	0.50	0.35	5.24	2.57	2.57	0.00		
B	INL 1633	634+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	32.80	0.50	0.82	5.35	9.05	9.05	0.00		
B	INL 1662	635+03	41.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	11.20	0.50	0.28	5.34	1.70	1.70	0.00		
B	INL 1628	635+11	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	5.70	0.50	0.14	5.33	0.42	0.42	0.00		
B	INL 1625A	635+63	-90.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	86.90	0.50	0.22	5.49	5.09	5.09	0.00		SD 18"
B	PCO- 1625	635+66	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.32	5.91	0.51	0.51	0.00		
B	PCO-1664	635+69	29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	9.90	0.50	0.21	6.09	1.58	0.91	0.68	PCO-1660	
B	INL 1663	635+69	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.30	0.50	0.36	4.92	2.67	2.67	0.00		
B	PCO- 1624	635+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.90	0.50	0.40	5.19	1.58	1.58	0.00		

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		102

DATE: 9/11/2023 5:38:02 PM
FILE: ...\FM 519 INLET COMP04.dgn

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
B	INL 1624A	636+00	-74.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	267.70	0.50	0.68	5.68	15.39	15.39	0.00		SD 18"
B	INL 1568	637+37	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.50	0.50	0.36	5.37	2.72	2.72	0.00		
B	INL 1610	637+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	12.50	0.50	0.31	6.00	2.08	2.08	0.00		
C	INL 1616	638+34	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.00	0.50	0.28	5.51	1.48	1.48	0.00		
C	PCO- 1618	638+89	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.90	0.50	0.56	6.00	5.25	5.25	0.00		
C	PCO-7002	638+93	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.10	0.50	0.48	6.09	3.38	3.38	0.00		
C	INL 1565	638+93	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.40	0.50	0.31	5.46	2.07	2.07	0.00		
C	PCO- 1619	639+15	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	13.40	0.50	0.53	6.01	4.49	4.49	0.00		
C	INL 1564	639+31	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	7.00	0.50	0.17	5.46	0.65	0.65	0.00		
C	INL 1620	639+61	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	5.00	0.50	0.12	6.06	0.31	0.31	0.00		
C	PCO- 1562	639+96	29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.00	0.50	0.21	6.88	2.19	0.96	1.23	PCO-7002	
C	INL 1563	639+97	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	23.90	0.50	0.60	5.43	6.42	6.42	0.00		
C	PCO- 1574	640+35	-29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.20	0.50	0.19	7.17	1.74	0.84	0.90	PCO- 1619	
C	INL 1574A	640+37	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	21.30	0.50	0.53	6.18	4.52	4.52	0.00		
C	INL 1580	641+10	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	17.30	0.50	0.43	6.01	3.20	3.20	0.00		
C	INL 1584	641+62	-35.30	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	11.76	0.50	0.30	6.32	3.49	3.49	0.00		
C1	INL 1585	642+41	-39.70	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	0.00	0.50	0.00	7.15	0.00	0.00	0.00		
D	INL 1587	642+98	-35.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	0.00	0.50	0.00	7.11	0.00	0.00	0.00		
D	INL 1591B	643+57	-115.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	78.20	0.50	0.20	7.50	4.35	4.35	0.00		SD 18"
D	PCO- 1591	643+75	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	7.51	1.37	1.37	0.00		
D	PCO-1560	644+04	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.30	0.50	0.45	6.09	2.58	2.58	0.00		
D	INL 1558	644+04	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.40	0.50	0.31	6.64	2.05	2.05	0.00		
D	PCO- 1593	644+07	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.42	7.60	2.02	2.02	0.00		
D	INL 1593A	644+16	-79.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	99.70	0.50	0.25	6.31	6.26	6.26	0.00		SD 18"
D	INL 1557	644+47	39.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.50	0.50	0.21	6.61	0.98	0.98	0.00		
D	INL 1556A	645+34	61.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	34.40	0.50	0.09	7.50	1.27	1.27	0.00		SD 18"
D	PCO-1556	645+37	52.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	6.50	0.50	0.14	7.86	0.53	0.45	0.07	PCO-1560	
D	INL 1597	645+41	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	20.00	0.50	0.50	7.34	4.07	4.07	0.00		
D	PCO- 1599	645+41	-29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.50	0.50	0.22	8.01	1.83	0.99	0.84	PCO- 1593	
D	PCO-1554	645+69	52.30	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.30	0.50	0.22	8.02	1.74	1.74	0.00		
D	INL 1554A	645+72	66.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	24.60	0.50	0.06	5.10	0.77	0.77	0.00		
D	INL 1553	646+21	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	7.90	0.50	0.20	6.67	0.85	0.85	0.00		
D	INL 1602	646+42	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	27.60	0.50	0.69	7.82	6.87	6.87	0.00		
D	INL 1552	646+65	39.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.20	0.50	0.31	6.75	2.01	2.01	0.00		
E	INL 1551A	648+37	-90.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	11.00	4683.80	0.50	11.83	5.60	64.35	64.35	0.00		SD 30"
E	INL 1546	648+39	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.50	0.50	0.29	6.52	1.78	1.78	0.00		
E	PCO- 1551	648+40	-51.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.50	0.50	0.37	8.19	1.14	1.14	0.00		
E	PCO- 1550	648+72	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	8.10	0.48	0.48	0.00		
E	INL 1550A	648+81	-73.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	11.00	1770.10	0.50	4.47	7.00	39.56	39.56	0.00		SD 30"
E	INL 1544	648+88	41.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.80	0.50	0.24	7.41	1.31	1.31	0.00		
E	INL 1523	649+56	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	10.20	0.50	0.26	7.40	1.29	1.29	0.00		
E	PCO- 1525	649+56	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	8.29	1.54	1.54	0.00		
E	PCO-1543	649+56	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.10	0.50	0.44	6.09	2.48	2.48	0.00		
E	INL 1542	649+65	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.20	0.50	0.31	7.82	1.99	1.99	0.00		
E	INL 1519	650+18	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.40	0.50	0.29	7.32	1.58	1.58	0.00		
E	INL 1516	651+01	-34.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.00	0.50	0.32	8.00	1.96	1.96	0.00		
E	INL 1541	651+03	39.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.90	0.50	0.27	6.38	1.61	1.61	0.00		
E	INL 1537	651+47	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.50	0.50	0.24	7.16	1.25	1.25	0.00		
E	INL 1511	652+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	9.10	0.50	0.23	7.53	1.04	1.04	0.00		
E	INL 1536	652+37	36.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.30	0.50	0.26	6.45	1.45	1.45	0.00		
E	INL 1509	652+46	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.10	0.50	0.20	7.27	0.84	0.84	0.00		
E	INL 1503	653+00	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	15.40	0.50	0.39	7.68	2.65	2.65	0.00		
E	PCO- 1505	653+00	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.00	0.50	0.48	7.84	3.34	3.34	0.00		
E	INL 1531	653+02	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.10	0.50	0.28	6.34	1.69	1.69	0.00		
E	PCO-1532	653+03	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.50	0.50	0.47	6.09	3.12	3.12	0.00		
E1	INL 1530	654+37	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.30	0.50	0.23	6.82	1.19	1.19	0.00		
E	INL 1500	654+53	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.90	0.50	0.17	7.37	0.61	0.61	0.00		
E2	INL 1497	654+81	-70.70	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	44.20	0.50	1.11	5.77	27.97	27.97	0.00		
E3	PCO-1484	654+86	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.20	0.50	0.35	7.39	0.78	0.78	0.00		
F2	PCO- 1496	654+89	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.20	0.50	0.34	7.49	0.78	0.78	0.00		
F4	PCO-1485	655+18	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.40	7.53	1.73	1.73	0.00		
F	PCO- 1495	655+21	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	7.52	0.55	0.55	0.00		
F	INL 1495A	655+28	-210.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	104.40	0.50	2.61	4.31	26.37	26.37	0.00		
F	INL 1491	655+83	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.20	0.50	0.28	6.89	1.51	1.51	0.00		
F	PCO- 1450	657+35	-28.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.70	0.50	0.48	7.38	3.21	3.21	0.00		
F	PCO-1454	657+35	30.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.00	0.50	0.44	6.09	2.48	2.48	0.00		
F	INL 1446	657+36	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	16.20	0.50	0.40	6.21	2.86	2.86	0.00		
F	INL 1455	657+37	40.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	13.70	0.50	0.34	6.39	2.45	2.45	0.00		
F	INL 1444	657+80	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.10	0.50	0.28	6.39	1.50	1.50	0.00		
F	INL 1459	657+91	40.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.90	0.50	0.25	5.93	1.34	1.34	0.00		
F	INL 1439	658+62	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.40	0.50	0.16	6.69	0.52	0.52	0.00		
F	INL 1460A	658+96	71.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	40.00	0.50	0.10	5.80	1.59	1.59	0.00		SD 15"
F	PCO-1460	658+98	45.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	6.85	0.48	0.48	0.00		
F	INL 1437A	659+09	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	359.10	0.50	0.91	5.10	17.82	17.82	0.00		SD 15"
F	PCO- 1437	659+12	-51.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	7.34	0.51	0.51	0.00		
F	PCO-1461	659+31	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.90	0.50	0.48	7.04	3.28	3.28	0.00		
F	INL 1461A	659+40	66.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	37.00	0.50	0.09	4.60	1.42	1.42	0.00		SD 15"
F	PCO- 1436	659+44	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.20	0.50	0.49	7.34	3.41	3.41	0.00		
F	INL 1436A	659+48	-100.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	93.00	0.50	0.23	4.90	5.64	5.64	0.00		SD 24"
F	INL 1433	659+86	-34.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.50	0.50	0.19	7.11	0.72	0.72	0.00		
F	INL 1463	660+14	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.20	0.50	0.25	6.04	1.42	1.42	0.00		
F	INL 1429	660+40	-34.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.60	0.50	0.16	6.95	0.56	0.56	0.00		
F	INL 1423	660+89	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.80	0.50	0.19	7.63	0.77	0.77	0.00		
F	PCO-1471	661+34	30.00	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	11.10	0.50	0.23	8.64	2.62	1.12	1.51	PCO-1461	
F	INL 1469	661+34	38.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.10	0.50	0.25	7.45	1.41	1.41	0.00		
F	INL 1417	661+42	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.80	0.50	0.22	8.33	0.98	0.98	0.00		
F	PCO- 1420	661+42	-28.30	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.90	0.50	0.19	8.83	1.45	0.80	0.65	PCO- 1436	
F	INL 1473	661+66	37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	14.10	0.50	0.35	7.76	2.61	2.61	0.00		
F	INL 1412	661+93	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.20	0.50	0.18	8.52	0.66	0.66	0.00		
F	INL 1410	662+45	-34.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.60	0.50	0.19	8.60	0.75	0.75	0.00		
F	INL 1405	662+91	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.90	0.50	0.17	9.14	0.62	0.62	0.00		
F	INL 1385A	663+19	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	125.80	0.50	0.32	7.10	8.88	8.88	0.00		SD 24"
F	PCO-1385	663+25	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	9.17	0.52	0.52	0.00		
F	PCO-1477	663+37	30.10	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.10	0.50	0.21	9.65	2.00	0.96	1.04	PCO-1471	

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

SHEET 5 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		103

DATE: 9/11/2023 5:39:23 PM
FILE: ...\FM 519 INLET COMPOS.dgn

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
F	INL 1476	663+37	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.60	0.50	0.27	9.15	1.54	1.54	0.00		
F	PCO-1384	663+57	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.70	0.50	0.45	9.18	2.74	2.74	0.00		
F	INL 1384A	663+63	-174.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	26.20	0.50	0.66	7.60	7.48	7.48	0.00		
F	INL 1390	663+99	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.20	0.50	0.25	9.72	1.42	1.42	0.00		
F	INL 1381	664+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.10	0.50	0.18	9.44	0.65	0.65	0.00		
F	INL 1378	664+63	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.60	0.50	0.19	9.58	0.75	0.75	0.00		
F	INL 1374	665+10	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	9.10	0.50	0.23	8.84	1.05	1.05	0.00		
F	INL 1393	665+27	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.90	0.50	0.27	9.72	1.62	1.62	0.00		
G	INL-1366	665+88	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	7.30	0.50	0.18	9.60	0.72	0.72	0.00		
G	PCO-1369	665+88	-28.80	Curb	In Sag	9.50	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.90	0.50	0.34	10.69	1.26	1.26	0.00		
G	INL 1395	665+88	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.80	0.50	0.22	9.72	1.06	1.06	0.00		
G	INL 1396	665+89	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	11.40	0.50	0.17	9.72	1.16	1.16	0.00		
G	INL-1362	666+17	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.10	0.50	0.20	9.39	0.84	0.84	0.00		
G	INL 1359	666+77	-33.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.20	0.50	0.33	9.26	2.03	2.03	0.00		
G	PCO-1358	667+45	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	17.30	0.50	0.61	10.20	6.53	6.53	0.00		
G	PCO-1398	667+45	52.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.60	0.50	0.48	6.09	3.15	3.15	0.00		
G	PCO-1357	667+77	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	10.14	0.79	0.79	0.00		
G	PCO-1399	667+77	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.50	0.50	0.36	9.68	0.95	0.95	0.00		
G	INL 1399A	667+84	110.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	35.20	0.50	0.09	9.63	1.31	1.31	0.00		SD 18"
G	INL 1357A	667+85	-72.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	94.20	0.50	0.24	9.23	5.76	5.76	0.00		SD 18"
G	INL 1355	669+04	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	21.20	0.50	0.53	10.05	4.48	4.48	0.00		
G	PCO-1345	669+67	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	7.40	0.50	0.22	10.95	1.37	1.37	0.00		
G	INL 1348	669+68	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.50	0.50	0.34	10.38	2.10	2.10	0.00		
G	PCO-1347	669+68	-29.00	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.80	0.50	0.19	10.85	1.17	1.10	0.07	PCO-1332	
G	INL 1400	669+68	38.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	22.60	0.50	0.57	9.72	5.87	5.87	0.00		
G	INL 1332B	671+24	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	19.80	0.50	0.50	8.81	4.01	4.01	0.00		
G	INL 1332A	671+63	-129.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	53.70	0.50	0.14	9.60	2.48	2.48	0.00		SD 18"
G	PCO-1332	671+63	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.00	0.50	0.43	9.24	2.06	2.06	0.00		
G	PCO-1331	671+95	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	9.22	0.48	0.48	0.00		
G	INL 1331A	671+97	-72.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	40.10	0.50	0.10	7.70	1.60	1.60	0.00		SD 18"
G	PCO-1334	672+02	28.50	Curb	On Grade	9.50	2.00	0.70	0.013	0.25	3.00	N/A	N/A	N/A	11.00	12.60	0.50	0.27	9.68	4.58	2.31	2.27	PCO-1337	
G	INL 1336	673+54	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	16.30	0.50	0.41	9.72	3.35	3.35	0.00		
G	INL 1326	673+55	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.70	0.50	0.29	7.42	1.65	1.65	0.00		
G	PCO-1325	673+55	-29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.20	0.50	0.47	8.81	2.96	2.96	0.00		
G	PCO-1337	673+55	29.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	13.50	0.50	0.54	8.84	4.50	4.50	0.00		
G1	INL 1339A	675+02	69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	81.40	0.50	0.21	12.98	4.62	4.62	0.00		SD 15"
G1	PCO-1339	675+06	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	8.27	0.45	0.45	0.00		
G1	PCO-1340	675+38	53.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.36	8.28	0.85	0.85	0.00		
H	PCO-1322	675+93	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.10	0.50	0.33	8.62	0.53	0.53	0.00		
H	PCO-1321	676+25	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.20	0.50	0.55	8.71	4.88	4.88	0.00		
H	INL 1284	677+93	38.10	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	5.20	0.50	0.13	9.72	1.37	1.37	0.00		
H	INL 1314	678+05	-36.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	16.20	0.50	0.41	7.84	2.89	2.89	0.00		
H	INL 1282	679+14	38.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.60	0.50	0.29	6.86	1.83	1.83	0.00		
H	INL 1312	679+19	-36.00	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	9.94	0.50	0.25	8.70	2.69	2.69	0.00		
H	INL 1279A	680+04	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	56.80	0.50	0.14	6.80	2.69	2.69	0.00		SD 15"
H	PCO-1308	680+07	-50.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	13.40	0.50	0.53	7.95	4.44	4.44	0.00		
H	PCO-1279	680+07	53.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.30	0.50	0.49	7.61	3.44	3.44	0.00		
H	PCO-1307	680+39	-50.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.40	0.50	0.42	8.17	1.83	1.83	0.00		
H	PCO-1319	680+39	53.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.60	0.50	0.42	7.58	1.90	1.90	0.00		
H	INL 1319A	680+41	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	36.70	0.50	0.09	6.60	1.40	1.40	0.00		SD 15"
H	INL 1307A	680+43	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	38.10	0.50	0.10	7.10	1.48	1.48	0.00		SD 18"
H	INL 1274	681+38	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.80	0.50	0.22	7.10	1.06	1.06	0.00		
H	INL 1289	681+64	-36.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	14.00	0.50	0.35	8.06	2.24	2.24	0.00		
H	INL 1270	682+00	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.30	0.50	0.21	7.31	0.94	0.94	0.00		
H	INL 1268	682+29	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.50	0.50	0.24	7.28	1.23	1.23	0.00		
H	INL 1292	682+78	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	12.60	0.50	0.32	7.88	1.88	1.88	0.00		
H	INL 1264	683+01	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.80	0.50	0.29	6.43	1.86	1.86	0.00		
H	INL 1296	683+30	-37.20	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	3.96	0.50	0.10	7.25	0.63	0.63	0.00		
H	INL 1258	683+76	37.80	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	10.10	0.50	0.25	7.15	3.45	3.45	0.00		
H	INL 1299	683+85	-37.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	5.10	0.50	0.13	7.00	0.32	0.32	0.00		
H	INL 1257A	684+18	67.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	43.90	0.50	0.11	6.80	1.83	1.83	0.00		SD 15"
H	INL 1302A	684+20	-69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	34.00	0.50	0.09	6.60	1.25	1.25	0.00		SD 15"
H	PCO-1302	684+25	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.00	0.50	0.43	7.54	2.05	2.05	0.00		
H	PCO-1257	684+27	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.70	0.50	0.42	7.19	1.96	1.96	0.00		
H	PCO-1303	684+57	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.20	0.50	0.41	7.62	1.74	1.74	0.00		
H	PCO-1256	684+59	53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.40	0.50	0.42	7.17	1.85	1.85	0.00		
H	INI 1303A	684+62	-70.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	39.20	0.50	0.10	6.92	1.55	1.55	0.00		SD 15"
H	INL 1256A	684+62	75.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	52.70	0.50	0.13	5.30	2.41	2.41	0.00		SD 15"
H	INL 1254	685+02	37.90	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	11.00	12.20	0.50	0.18	7.20	1.18	1.18	0.00		
H	INL 1249	685+64	37.60	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	11.00	14.30	0.50	0.22	6.79	1.65	1.65	0.00		
H	INL 1246	685+67	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.40	0.50	0.34	6.96	2.08	2.08	0.00		
H	INL 1239	686+63	37.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	20.00	0.50	0.50	6.99	4.78	4.78	0.00		
H	INL 1230	687+52	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	23.50	0.50	0.59	6.86	5.32	5.32	0.00		
H	INL 1231	687+53	36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.50	0.50	0.29	6.20	1.78	1.78	0.00		
H	PCO-1238	688+48	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.00	0.50	0.55	7.01	4.76	4.76	0.00		
H	INL 1222	688+77	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	18.90	0.50	0.47	6.41	3.73	3.73	0.00		
H	PCO-1225	688+77	-28.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.30	0.50	0.49	7.59	3.46	3.46	0.00		
H	PCO-1237	688+80	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.60	0.50	0.56	6.81	5.06	5.06	0.00		
H	INL 1214	689+93	35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	20.40	0.50	0.51	6.79	4.94	4.94	0.00		
H	INL 1218	689+95	-36.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	26.60	0.50	0.67	6.48	6.47	6.47	0.00		
H	INL 1210	690+89	36.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	20.30	0.50	0.51	7.00	4.89	4.89	0.00		
H	INL 1202	691+88	35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	22.50	0.50	0.56	6.69	5.82	5.82	0.00		
H	INL 1205	691+89	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	21.30	0.50	0.53	6.49	4.52	4.52	0.00		
H	INL 1196C	692+60	-42.40	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	4.70	0.50	0.12	4.30	1.15	1.15	0.00		
H	INL 1198A	692+60	68.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	91.40	0.50	0.23	4.90	5.50	5.50	0.00		SD 24"
H	PCO-1198	692+69	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.80	0.50	0.42	6.88	1.98	1.98	0.00		
H	PCO-1197	693+00	52.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.60	0.50	0.42	6.88	1.92	1.92	0.00		
H	INL 1197A	693+03	63.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	82.20	0.50	0.21	6.80	4.69	4.69	0.00		SD 18"
H	INL 1192A	693+05	-44.50	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	3.70	0.50	0.09	5.30	0.83	0.83	0.00		
H	PCO- 1192	693+05	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.50	0.50	0.48	7.28	3.10	3.10	0.00		
H	PCO-1191	694+25	-27.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	5.40	0.50	0.12	7.58	0.33	0.33	0.00	PCO- 1192	
H	INL 1191A	694+38	-31.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	5.60	0.50	0.14	7.54	0.38	0.38	0.00		
H	INL 1191B	695+32	53.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	101.10	0.50	0.26	6.60	6.40	6.40	0.00		SD 24"

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		104

DATE: 9/11/2023 5:40:39 PM
FILE: ...\FM 519 INLET COMP06.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
A	INL 1059	608+77	-175.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	4.80	0.50	0.12	9.99	0.26	0.26	0.00		
A	INL 2010	609+02	-42.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	3.60	0.50	0.09	11.68	0.11	0.11	0.00		
A	PCO-2009	609+07	-50.30	Curb	In Sag	5.00	2.00	1.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.11	10.60	0.53	0.35	0.18	PCO-2016	
A	PCO 2005	609+36	-123.90	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	7.30	0.50	0.16	8.53	0.71	0.71	0.00		
A	INL 2005A	609+46	-154.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.30	0.50	0.16	8.42	3.32	3.32	0.00		SD 18"
A	PCO- 2002	609+56	-106.80	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	5.30	0.50	0.12	9.09	0.30	0.30	0.00		
A	INL 2002A	609+66	-122.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	71.90	0.50	0.18	7.04	3.84	3.84	0.00		SD 18"
A	INL 2014	610+28	-49.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.80	0.50	0.22	8.07	0.97	0.97	0.00		
A	INL 2015	610+68	36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	1.70	0.50	0.04	8.27	0.03	0.03	0.00		
A	PCO-2016	610+69	26.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.80	0.50	0.19	8.72	1.15	0.75	0.40	PCO-7008	
A	INL 2019	610+84	-37.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.60	0.50	0.26	7.25	1.37	1.37	0.00		
A	PCO- 2018	610+84	-30.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.00	0.50	0.17	8.69	0.90	0.64	0.26	PCO- 2059	
A	INL 2038	611+17	38.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.30	0.50	0.13	8.20	0.33	0.33	0.00		
A	INL 2059A	612+23	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	69.10	0.50	0.17	8.21	3.61	3.61	0.00		SD 18"
A	INL 2049	612+23	37.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.20	0.50	0.18	8.59	0.71	0.71	0.00		
A	PCO- 2059	612+25	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.38	7.82	1.28	1.28	0.00		
A	PCO- 2061	612+57	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	7.78	0.26	0.26	0.00		
A	INL 2061A	612+60	-63.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	73.00	0.50	0.18	8.31	3.92	3.92	0.00		SD 18"
A	PCO-7008	612+61	29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.60	0.50	0.20	8.18	1.44	0.86	0.58	PCO-2085	
A	INL 2055	612+61	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.40	0.50	0.14	7.18	0.36	0.36	0.00		
A	INL 2077	613+71	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.70	0.50	0.19	7.51	0.81	0.81	0.00		
A	INL 2105	614+01	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.90	0.50	0.17	6.83	0.63	0.63	0.00		
A	PCO- 2099	614+01	-29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.17	7.76	0.87	0.63	0.24	PCO- 2142	
A	PCO-2085	614+08	29.30	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.60	0.50	0.20	7.70	1.44	1.24	0.21	PCO-2136	
A	INL 2084	614+09	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.70	0.50	0.24	7.05	1.30	1.30	0.00		
A	INL 2117	614+77	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.60	0.50	0.36	7.20	2.40	2.40	0.00		
A	INL 2123	615+15	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	6.82	0.42	0.42	0.00		
A	INL 2142A	615+82	-148.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	60.70	0.50	0.15	6.43	2.97	2.97	0.00		SD 18"
A	PCO- 2142	615+84	-49.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.90	0.50	0.40	6.76	1.69	1.69	0.00		
A	PCO-2136	616+16	29.20	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.20	0.50	0.19	7.14	1.30	1.14	0.15	PCO-2168	
A	INL 2135	616+16	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.00	0.50	0.18	6.79	0.66	0.66	0.00		
A	PCO- 2145	616+17	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	6.78	0.30	0.30	0.00		
A	INL 2145A	616+25	-78.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.60	0.50	0.17	6.21	3.34	3.34	0.00		SD 18"
A	INL 2157	616+78	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	3.90	0.50	0.10	6.80	0.14	0.14	0.00		
A	INL 2160A	617+08	-202.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.30	0.50	0.13	6.92	0.34	0.34	0.00		
A	INL 2147	617+08	38.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.60	0.50	0.17	6.54	0.58	0.58	0.00		
A	PCO- 2160	617+09	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.36	6.88	0.99	0.99	0.00		
A	PCO-2168	617+10	28.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.36	6.20	0.99	0.99	0.00		
A	INL 2187	618+14	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.30	0.50	0.13	6.34	0.35	0.35	0.00		
A	INL 2189A	618+51	-109.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	13.90	0.50	0.35	6.96	2.52	2.52	0.00		
A	PCO- 2189	618+51	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.30	0.50	0.35	6.37	0.80	0.80	0.00		
A	INL 2203A	618+55	68.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	37.40	0.50	0.09	6.05	1.44	1.44	0.00		SD 18"
A	PCO-2203	618+61	51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.10	0.50	0.33	5.61	0.60	0.60	0.00		
A	PCO- 2193	618+83	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.32	6.40	0.45	0.45	0.00		
A	INL 2193A	618+84	-97.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	57.20	0.50	0.14	6.92	2.72	2.72	0.00		SD 18"
A	PCO-2205	618+93	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	5.63	0.28	0.28	0.00		
A	INL 2205A	618+95	83.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	0.00	0.50	0.00	5.55	0.00	0.00	0.00		
A	INL 2236	619+58	40.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.80	0.50	0.20	5.99	0.84	0.84	0.00		
A	INL 2242	620+02	39.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.30	0.50	0.18	5.58	0.72	0.72	0.00		
A	INL 2223	620+08	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.60	0.50	0.19	5.48	0.75	0.75	0.00		
A	PCO- 2277	621+30	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.00	0.50	0.46	6.03	2.89	2.89	0.00		
A	INL 2256	621+31	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.30	0.50	0.23	12.22	1.19	1.19	0.00		
A	PCO-2258	621+32	29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.30	0.50	0.43	5.33	2.17	2.17	0.00		
B	INL 2297	624+13	-35.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.30	0.50	0.26	4.98	1.30	1.30	0.00		
B	INL 2312	624+66	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.90	0.50	0.27	5.93	1.61	1.61	0.00		
B	PCO- 2339	625+20	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.41	5.91	1.78	1.78	0.00		
B	PCO-2332	625+21	29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	5.00	0.50	0.41	5.89	1.77	1.77	0.00		
B	INL 2337	625+22	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	13.70	0.50	0.34	4.55	2.45	2.45	0.00		
B	INL 2347	625+34	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.10	0.50	0.20	4.94	0.84	0.84	0.00		
B	INL 2353	625+73	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.40	0.50	0.26	5.30	1.33	1.33	0.00		
B	INL 2365	626+34	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.80	0.50	0.27	5.22	1.43	1.43	0.00		
B	INL 2372	627+10	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.60	0.50	0.29	5.56	1.63	1.63	0.00		
B	INL 2402	627+64	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.40	0.50	0.26	5.42	1.33	1.33	0.00		
B	PCO-2380	628+15	29.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.86	1.50	1.50	0.00		
B	INL 2403	628+16	-35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.70	0.50	0.24	5.54	1.18	1.18	0.00		
B	PCO- 2408	628+16	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.86	1.52	1.52	0.00		
B	INL 2386	628+17	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	13.20	0.50	0.33	4.54	2.32	2.32	0.00		
B	CBS 02	628+69	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	12.30	0.50	0.31	5.44	1.79	1.79	0.00		
B	INL 1640	629+24	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	3.90	0.50	0.10	5.79	0.17	0.17	0.00		
B	INL 600A	629+53	72.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.00	0.50	0.22	3.68	1.11	1.11	0.00		
B	PCO- 657	629+54	-51.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	10.30	0.50	0.47	5.91	2.99	2.99	0.00		
B	PCO-600	629+55	52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	5.30	0.32	0.32	0.00		
B	INL 1655C	629+95	170.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	12.70	0.50	0.32	2.95	2.15	2.15	0.00		
B	PCO- 1651	629+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.40	0.50	0.36	5.96	1.02	1.02	0.00		
B	PCO-1655	629+97	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.31	5.58	0.38	0.38	0.00		
B	INL 1649	630+74	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	11.30	0.50	0.29	4.95	3.28	3.28	0.00		
B	INL 1648	631+20	-35.10	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	10.66	0.50	0.27	4.66	3.00	3.00	0.00		
B	PCO- 1646	631+51	-29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.61	1.50	1.50	0.00		
B	PCO-1656	631+52	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.90	0.50	0.40	5.59	1.60	1.60	0.00		
B	INL 1657	631+53	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.80	0.50	0.27	4.57	1.58	1.58	0.00		
B	INL 1644	631+80	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.50	0.50	0.14	4.87	0.38	0.38	0.00		
B	INL 1639	632+42	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	15.30	0.50	0.38	5.34	2.61	2.61	0.00		
B	INL 1658	632+88	40.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.90	0.50	0.37	5.39	2.86	2.86	0.00		
B	PCO- 1635	634+37	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.70	0.50	0.38	5.55	1.36	1.36	0.00		
B	PCO-1660	634+37	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.40	0.50	0.41	5.59	1.85	1.85	0.00		
B	INL 1661	634+37	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.10	0.50	0.25	5.24	1.38	1.38	0.00		
B	INL 1633	634+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	22.20	0.50	0.55	5.35	4.82	4.82	0.00		
B	INL 1662	635+03	41.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.20	0.50	0.21	5.34	0.93	0.93	0.00		
B	INL 1628	635+11	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.30	0.50	0.11	5.33	0.21	0.21	0.00		
B	INL 1625A	635+63	-90.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	57.90	0.50	0.15	5.49	2.77	2.77	0.00		SD 18"
B	PCO- 1625	635+66	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	5.41	0.29	0.29	0.00		
B	PCO-1664	635+69	29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.30	0.50	0.18	5.59	0.98	0.68	0.30	PCO-1660	
B	INL 1663	635+69	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.40	0.50	0.26	4.92	1.46	1.46	0.00		
B	PCO- 1624	635+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.40	0.50	0.36	4.69	0.97	0.97	0.00		

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		105

DATE: 9/11/2023 5:41:54 PM
FILE: ...\FM 519 INLET COMP07.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
B	INL 1624A	636+00	-74.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	119.60	0.50	0.30	5.68	8.23	8.23	0.00		SD 18"
B	INL 1568	637+37	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.40	0.50	0.26	5.37	1.47	1.47	0.00		
B	INL 1610	637+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.00	0.50	0.22	6.00	1.10	1.10	0.00		
C	INL 1616	638+34	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.90	0.50	0.20	5.51	0.80	0.80	0.00		
C	PCO- 1618	638+89	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.90	0.50	0.46	5.50	2.82	2.82	0.00		
C	PCO-7002	638+93	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.42	5.59	2.02	2.02	0.00		
C	INL 1565	638+93	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.10	0.50	0.23	5.46	1.12	1.12	0.00		
C	PCO- 1619	639+15	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	8.90	0.50	0.44	5.51	2.43	2.43	0.00		
C	INL 1564	639+31	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.40	0.50	0.13	5.46	0.35	0.35	0.00		
C	INL 1620	639+61	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	3.70	0.50	0.09	6.06	0.15	0.15	0.00		
C	PCO- 1562	639+96	29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.40	0.50	0.18	6.38	1.40	0.74	0.66	PCO-7002	
C	INL 1563	639+97	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	16.50	0.50	0.41	5.43	3.44	3.44	0.00		
C	PCO- 1574	640+35	-29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.17	6.67	1.16	0.67	0.50	PCO- 1619	
C	INL 1574A	640+37	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.60	0.50	0.36	6.18	2.40	2.40	0.00		
C	INL 1580	641+10	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	12.00	0.50	0.30	6.01	1.73	1.73	0.00		
C	INL 1584	641+62	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	7.90	0.50	0.20	6.32	1.88	1.88	0.00		
C1	INL 1585	642+41	-39.70	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	0.00	0.50	0.00	7.15	0.00	0.00	0.00		
D	INL 1587	642+98	-35.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	0.00	0.50	0.00	7.11	0.00	0.00	0.00		
D	INL 1591B	643+57	-115.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	51.70	0.50	0.13	7.50	2.34	2.34	0.00		SD 18"
D	PCO- 1591	643+75	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.30	0.50	0.35	7.01	0.87	0.87	0.00		
D	PCO-1560	644+04	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	5.59	1.51	1.51	0.00		
D	INL 1558	644+04	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.10	0.50	0.23	6.64	1.15	1.15	0.00		
D	PCO- 1593	644+07	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	7.10	1.18	1.18	0.00		
D	INL 1593A	644+16	-79.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	65.60	0.50	0.17	6.31	3.34	3.34	0.00		SD 18"
D	INL 1557	644+47	39.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.30	0.50	0.16	6.61	0.52	0.52	0.00		
D	INL 1556A	645+34	61.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	23.40	0.50	0.06	7.50	0.71	0.71	0.00		SD 18"
D	PCO-1556	645+37	52.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	5.30	0.50	0.12	7.36	0.30	0.30	0.01	PCO-1560	
D	INL 1597	645+41	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	13.70	0.50	0.34	7.34	2.17	2.17	0.00		
D	PCO- 1599	645+41	-29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	8.90	0.50	0.19	7.51	1.20	0.77	0.43	PCO- 1593	
D	PCO-1554	645+69	52.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	8.00	8.60	0.50	0.18	7.52	1.08	1.08	0.00		
D	INL 1554A	645+72	66.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	16.70	0.50	0.04	5.10	0.43	0.43	0.00		
D	INL 1553	646+21	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.00	0.50	0.15	6.67	0.47	0.47	0.00		
D	INL 1602	646+42	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	18.70	0.50	0.47	7.82	3.65	3.65	0.00		
D	INL 1552	646+65	39.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.90	0.50	0.22	6.75	1.09	1.09	0.00		
E	INL 1551A	648+37	-90.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	10.00	1202.00	0.50	3.03	5.60	32.60	32.60	0.00		SD 30"
E	INL 1546	648+39	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.40	0.50	0.21	6.52	0.97	0.97	0.00		
E	PCO- 1551	648+40	-51.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.20	0.50	0.34	7.69	0.71	0.71	0.00		
E	PCO- 1550	648+72	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	7.60	0.28	0.28	0.00		
E	INL 1550A	648+81	-73.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	10.00	469.90	0.50	1.19	7.00	20.38	20.38	0.00		SD 30"
E	INL 1544	648+88	41.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.30	0.50	0.18	7.41	0.71	0.71	0.00		
E	INL 1523	649+56	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.30	0.50	0.18	7.40	0.69	0.69	0.00		
E	PCO- 1525	649+56	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.36	7.79	1.01	1.01	0.00		
E	PCO-1543	649+56	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.90	0.50	0.40	5.59	1.62	1.62	0.00		
E	INL 1542	649+65	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.90	0.50	0.22	7.82	1.08	1.08	0.00		
E	INL 1519	650+18	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.20	0.50	0.21	7.32	0.86	0.86	0.00		
E	INL 1516	651+01	-34.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.20	0.50	0.23	8.00	1.07	1.07	0.00		
E	INL 1541	651+03	39.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.00	0.50	0.20	6.38	0.87	0.87	0.00		
E	INL 1537	651+47	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.10	0.50	0.18	7.16	0.68	0.68	0.00		
E	INL 1511	652+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.70	0.50	0.17	7.53	0.57	0.57	0.00		
E	INL 1536	652+37	36.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.60	0.50	0.19	6.45	0.79	0.79	0.00		
E	INL 1509	652+46	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.00	0.50	0.15	7.27	0.46	0.46	0.00		
E	INL 1503	653+00	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	10.90	0.50	0.27	7.68	1.44	1.44	0.00		
E	PCO- 1505	653+00	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.20	0.50	0.42	7.34	2.13	2.13	0.00		
E	INL 1531	653+02	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.20	0.50	0.21	6.34	0.92	0.92	0.00		
E	PCO-1532	653+03	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.42	5.59	2.01	2.01	0.00		
E1	INL 1530	654+37	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.90	0.50	0.17	6.82	0.63	0.63	0.00		
E	INL 1500	654+53	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.00	0.50	0.13	7.37	0.32	0.32	0.00		
E2	INL 1497	654+81	-70.70	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	25.00	0.50	0.63	5.77	14.45	14.45	0.00		
E3	PCO-1484	654+86	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.00	0.50	0.32	6.89	0.49	0.49	0.00		
F2	PCO- 1496	654+89	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.90	0.50	0.32	6.99	0.47	0.47	0.00		
F4	PCO-1485	655+18	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.40	0.50	0.36	7.03	0.95	0.95	0.00		
F	PCO- 1495	655+21	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	7.02	0.32	0.32	0.00		
F	INL 1495A	655+28	-210.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	37.80	0.50	0.95	4.31	13.53	13.53	0.00		
F	INL 1491	655+83	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.00	0.50	0.20	6.89	0.82	0.82	0.00		
F	PCO- 1450	657+35	-28.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.10	0.50	0.42	6.88	2.11	2.11	0.00		
F	PCO-1454	657+35	30.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.90	0.50	0.40	5.59	1.63	1.63	0.00		
F	INL 1446	657+36	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.40	0.50	0.28	6.21	1.56	1.56	0.00		
F	INL 1455	657+37	40.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	9.90	0.50	0.25	6.39	1.33	1.33	0.00		
F	INL 1444	657+80	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.00	0.50	0.20	6.39	0.81	0.81	0.00		
F	INL 1459	657+91	40.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.40	0.50	0.18	5.93	0.73	0.73	0.00		
F	INL 1439	658+62	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.70	0.50	0.12	6.69	0.26	0.26	0.00		
F	INL 1460A	658+96	71.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	26.80	0.50	0.07	5.80	0.87	0.87	0.00		SD 15"
F	PCO-1460	658+98	45.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	6.35	0.29	0.29	0.00		
F	INL 1437A	659+09	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	130.40	0.50	0.33	5.10	9.37	9.37	0.00		SD 15"
F	PCO- 1437	659+12	-51.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.70	0.50	0.30	6.84	0.29	0.29	0.00		
F	PCO-1461	659+31	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.90	0.50	0.42	6.54	1.96	2.01	0.00		
F	INL 1461A	659+40	66.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	24.70	0.50	0.06	4.60	0.77	0.77	0.00		SD 15"
F	PCO- 1436	659+44	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.80	0.50	0.42	6.84	1.97	1.97	0.00		
F	INL 1436A	659+48	-100.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	62.40	0.50	0.16	4.90	3.10	3.10	0.00		SD 24"
F	INL 1433	659+86	-34.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.50	0.50	0.14	7.11	0.39	0.39	0.00		
F	INL 1463	660+14	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.50	0.50	0.19	6.04	0.77	0.77	0.00		
F	INL 1429	660+40	-34.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	4.90	0.50	0.12	6.95	0.30	0.30	0.00		
F	INL 1423	660+89	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	7.63	0.42	0.42	0.00		
F	PCO-1471	661+34	30.00	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.60	0.50	0.20	8.14	1.63	0.89	0.80	PCO-1461	
F	INL 1469	661+34	38.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.50	0.50	0.19	7.45	0.77	0.77	0.00		
F	INL 1417	661+42	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.40	0.50	0.16	8.33	0.54	0.54	0.00		
F	PCO- 1420	661+42	-28.30	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.50	0.50	0.16	8.33	0.92	0.61	0.31	PCO- 1436	
F	INL 1473	661+66	37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	10.20	0.50	0.25	7.76	1.41	1.41	0.00		
F	INL 1412	661+93	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.30	0.50	0.13	8.52	0.36	0.36	0.00		
F	INL 1410	662+45	-34.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	8.60	0.41	0.41	0.00		
F	INL 1405	662+91	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.20	0.50	0.13	9.14	0.33	0.33	0.00		
F	INL 1385A	663+19	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	85.40	0.50	0.22	7.10	4.97	4.97	0.00		SD 24"
F	PCO-1385	663+25	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	8.67	0.30	0.30	0.00		
F	PCO-1477	663+37	30.10	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.00	0.50	0.19	9.15	1.25	0.81	0.57	PCO-1471	

DATE: 9/11/2023 5:43:06 PM
FILE: ...\FM 519 INLET COMP08.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		106

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
F	INL 1476	663+37	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.80	0.50	0.20	9.15	0.83	0.83	0.00		
F	PCO-1384	663+57	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.90	0.50	0.40	8.68	1.68	1.68	0.00		
F	INL 1384A	663+63	-174.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	18.50	0.50	0.46	7.60	4.19	4.19	0.00		
F	INL 1390	663+99	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.50	0.50	0.19	9.72	0.77	0.77	0.00		
F	INL 1381	664+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.30	0.50	0.13	9.44	0.35	0.35	0.00		
F	INL 1378	664+63	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	5.70	0.50	0.14	9.58	0.41	0.41	0.00		
F	INL 1374	665+10	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.60	0.50	0.17	8.84	0.57	0.57	0.00		
F	INL 1393	665+27	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.00	0.50	0.20	9.72	0.88	0.88	0.00		
G	INL-1366	665+88	-36.30	Grate	In Sag	2.00	1.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	5.60	0.50	0.14	9.60	0.39	0.39	0.00		
G	PCO-1369	665+88	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	10.19	0.78	0.78	0.00		
G	INL 1395	665+88	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.60	0.50	0.17	9.72	0.58	0.58	0.00		
G	INL 1396	665+89	31.60	Grate	In Sag	5.00	2.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	10.00	7.90	0.50	0.16	9.96	0.87	0.87	0.00		
G	INL-1362	666+17	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	6.00	0.50	0.15	9.39	0.46	0.46	0.00		
G	INL 1359	666+77	-33.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.40	0.50	0.24	9.26	1.11	1.11	0.00		
G	PCO-1358	667+45	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	11.50	0.50	0.50	9.70	3.56	3.56	0.00		
G	PCO-1398	667+45	52.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	7.10	0.50	0.41	5.59	1.73	1.73	0.00		
G	PCO-1357	667+77	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.00	0.50	0.33	9.64	0.46	0.46	0.00		
G	PCO-1399	667+77	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.10	0.50	0.33	9.18	0.55	0.55	0.00		
G	INL 1399A	667+84	110.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	23.70	0.50	0.06	9.63	0.73	0.73	0.00		SD 18"
G	INL 1357A	667+85	-72.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	62.90	0.50	0.16	9.23	3.14	3.14	0.00		SD 18"
G	INL 1355	669+04	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.60	0.50	0.37	10.05	2.42	2.42	0.00		
G	PCO-1345	669+67	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	5.90	0.50	0.18	10.95	0.80	0.80	0.00		
G	INL 1348	669+68	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.60	0.50	0.24	10.38	1.15	1.15	0.00		
G	PCO-1347	669+68	-29.00	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	7.40	0.50	0.17	10.35	0.76	0.63	0.13	PCO-1332	
G	INL 1400	669+68	38.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	15.90	0.50	0.40	9.72	3.22	3.22	0.00		
G	INL 1332B	671+24	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	13.80	0.50	0.35	8.81	2.19	2.19	0.00		
G	INL 1332A	671+63	-129.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	36.30	0.50	0.09	9.60	1.38	1.38	0.00		SD 18"
G	PCO-1332	671+63	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.80	0.50	0.39	8.74	1.35	1.35	0.00		
G	PCO-1331	671+95	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	3.80	0.50	0.31	8.72	0.28	0.28	0.00		
G	INL 1331A	671+97	-72.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	26.80	0.50	0.07	7.70	0.87	0.87	0.00		SD 18"
G	PCO-1334	672+02	28.50	Curb	On Grade	5.00	2.00	0.70	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.20	0.50	0.22	9.18	2.68	1.12	1.57	PCO-1337	
G	INL 1336	673+54	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	11.60	0.50	0.29	9.72	1.82	1.82	0.00		
G	INL 1326	673+55	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	8.40	0.50	0.21	7.42	0.89	0.89	0.00		
G	PCO-1325	673+55	-29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.70	0.50	0.42	8.31	1.95	1.95	0.00		
G	PCO-1337	673+55	29.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.40	0.50	0.47	8.34	3.04	3.04	0.00		
G1	INL 1339A	675+02	69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	54.60	0.50	0.14	12.98	2.54	2.54	0.00		SD 15"
G1	PCO-1339	675+06	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	3.80	0.50	0.31	7.77	0.26	0.26	0.00		
G1	PCO-1340	675+38	53.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	7.78	0.50	0.50	0.00		
H	PCO-1322	675+93	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	10.00	3.80	0.50	0.31	8.12	0.31	0.31	0.00		
H	PCO-1321	676+25	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.50	0.50	0.46	8.21	2.66	2.66	0.00		
H	INL 1284	677+87	6.80	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	3.10	0.50	0.08	9.72	0.70	0.70	0.00		
H	INL 1314	678+05	-36.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	11.40	0.50	0.29	7.84	1.56	1.56	0.00		
H	INL 1282	679+14	38.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.50	0.50	0.21	6.86	0.98	0.98	0.00		
H	INL 1312	679+19	-36.00	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	6.69	0.50	0.17	8.70	1.45	1.45	0.00		
H	INL 1279A	680+04	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	37.90	0.50	0.10	6.80	1.47	1.47	0.00		SD 15"
H	PCO-1308	680+07	-50.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	9.90	0.50	0.46	7.45	2.82	2.82	0.00		
H	PCO-1279	680+07	53.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	8.70	0.50	0.44	7.11	2.33	2.33	0.00		
H	PCO-1307	680+39	-50.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.38	7.67	1.17	1.17	0.00		
H	PCO-1319	680+39	53.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.70	0.50	0.38	7.08	1.20	1.20	0.00		
H	INL 1319A	680+41	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	24.50	0.50	0.06	6.60	0.76	0.76	0.00		SD 15"
H	INL 1307A	680+43	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	25.50	0.50	0.06	7.10	0.81	0.81	0.00		SD 18"
H	INL 1274	681+38	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.60	0.50	0.17	7.10	0.57	0.57	0.00		
H	INL 1289	681+64	-36.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.90	0.50	0.25	8.06	1.21	1.21	0.00		
H	INL 1270	682+00	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	6.30	0.50	0.16	7.31	0.51	0.51	0.00		
H	INL 1268	682+29	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	7.10	0.50	0.18	7.28	0.67	0.67	0.00		
H	INL 1292	682+78	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.00	0.50	0.23	7.88	1.02	1.02	0.00		
H	INL 1264	683+01	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.50	0.50	0.21	6.43	1.00	1.00	0.00		
H	INL 1296	683+30	-37.20	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	10.00	2.72	0.50	0.07	7.25	0.33	0.33	0.00		
H	INL 1258	683+76	37.80	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	6.60	0.50	0.17	7.15	1.90	1.90	0.00		
H	INL 1299	683+85	-37.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	3.80	0.50	0.10	7.00	0.16	0.16	0.00		
H	INL 1257A	684+18	67.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	29.30	0.50	0.07	6.80	1.00	1.00	0.00		SD 15"
H	INL 1302A	684+20	-69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	23.10	0.50	0.06	6.60	0.70	0.70	0.00		SD 15"
H	PCO-1302	684+25	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.70	0.50	0.39	7.04	1.32	1.32	0.00		
H	PCO-1257	684+27	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.70	0.50	0.38	6.69	1.26	1.26	0.00		
H	PCO-1303	684+57	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.37	7.12	1.13	1.13	0.00		
H	PCO-1256	684+59	53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.60	0.50	0.38	6.67	1.16	1.16	0.00		
H	INI 1303A	684+62	-70.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	26.20	0.50	0.07	6.92	0.84	0.84	0.00		SD 15"
H	INL 1256A	684+62	75.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	10.00	35.10	0.50	0.09	5.30	1.31	1.31	0.00		SD 15"
H	INL 1254	685+02	37.90	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	10.00	9.30	0.50	0.14	7.20	0.62	0.62	0.00		
H	INL 1249	685+64	37.60	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	10.00	10.80	0.50	0.16	6.79	0.89	0.89	0.00		
H	INL 1246	685+67	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	9.50	0.50	0.24	6.96	1.13	1.13	0.00		
H	INL 1239	686+63	37.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.00	0.50	0.35	6.99	2.57	2.57	0.00		
H	INL 1230	687+52	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	16.20	0.50	0.41	6.86	2.89	2.89	0.00		
H	INL 1231	687+53	36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	8.40	0.50	0.21	6.20	0.96	0.96	0.00		
H	PCO-1238	688+48	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.60	0.50	0.46	6.51	2.72	2.72	0.00		
H	INL 1222	688+77	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	13.20	0.50	0.33	6.41	2.02	2.02	0.00		
H	PCO-1225	688+77	-28.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.60	0.50	0.44	7.09	2.31	2.31	0.00		
H	PCO-1237	688+80	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.80	0.50	0.46	6.31	2.81	2.81	0.00		
H	INL 1214	689+93	35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.40	0.50	0.36	6.79	2.68	2.68	0.00		
H	INL 1218	689+95	-36.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	18.20	0.50	0.46	6.48	3.50	3.50	0.00		
H	INL 1210	690+89	36.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	14.30	0.50	0.36	7.00	2.65	2.65	0.00		
H	INL 1202	691+88	35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	15.60	0.50	0.39	6.69	3.12	3.12	0.00		
H	INL 1205	691+89	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	14.70	0.50	0.37	6.49	2.45	2.45	0.00		
H	INL 1196C	692+60	-42.40	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	2.80	0.50	0.07	4.30	0.63	0.63	0.00		
H	INL 1198A	692+60	68.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	60.70	0.50	0.15	4.90	2.98	2.98	0.00		SD 24"
H	PCO-1198	692+69	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.70	0.50	0.38	6.38	1.26	1.26	0.00		
H	PCO-1197	693+00	52.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	4.70	0.50	0.38	6.38	1.25	1.25	0.00		
H	INL 1197A	693+03	63.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	10.00	54.90	0.50	0.14	6.80	2.56	2.56	0.00		SD 18"
H	PCO- 1192	693+04	-30.60	Grate	In Sag	5.00	2.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	7.60	0.50	0.24	7.28	1.98	1.98	0.00		
H	INL 1192A	693+05	-44.50	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	10.00	2.00	0.50	0.05	5.30	0.45	0.45	0.00		
H	PCO-1191	694+25	-27.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.10	7.08	0.20	0.20	0.00	PCO- 1192	
H	INL 1191A	694+38	-31.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	10.00	4.30	0.50	0.11	7.54	0.19	0.19	0.00		
H	INL 1191B	695+32	53.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	10.00	68.70	1.50	0.17	6.60	3.58	3.58	0.00		SD 24"

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		107

DATE: 9/11/2023 5:44:19 PM
FILE: ...\FM 519 INLET COMP09.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
A	INL 1059	608+77	-175.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	6.10	0.50	0.15	9.99	0.47	0.47	0.00		
A	INL 2010	609+02	-42.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	4.30	0.50	0.11	11.68	0.19	0.19	0.00		
A	PCO-2009	609+07	-50.30	Curb	In Sag	5.00	2.00	1.44	0.013	0.25	3.00	N/A	N/A	N/A	12.00	6.00	0.50	0.13	11.10	0.94	0.49	0.46	PCO-2016	
A	PCO 2005	609+36	-123.90	Curb	In Sag	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	9.10	0.50	0.19	9.03	1.28	1.28	0.00		
A	INL 2005A	609+46	-154.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	98.10	0.50	0.25	8.42	6.11	6.11	0.00		SD 18"
A	PCO- 2002	609+56	-106.80	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	6.60	0.50	0.14	9.59	0.54	0.54	0.00		
A	INL 2002A	609+66	-122.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	108.90	0.50	0.28	7.04	7.15	7.15	0.00		SD 18"
A	INL 2014	610+28	-49.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	12.10	0.50	0.30	8.07	1.74	1.74	0.00		
A	INL 2015	610+68	36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	2.40	0.50	0.06	8.27	0.05	0.05	0.00		
A	PCO-2016	610+69	26.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	11.20	0.50	0.24	9.22	2.19	1.10	1.09	PCO-7008	
A	INL 2019	610+84	-37.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.80	0.50	0.37	7.25	2.46	2.46	0.00		
A	PCO- 2018	610+84	-30.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	10.00	0.50	0.21	9.19	1.61	0.92	0.69	PCO- 2059	
A	INL 2038	611+17	38.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	6.70	0.50	0.17	8.20	0.59	0.59	0.00		
A	INL 2059A	612+23	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	103.70	0.50	0.26	8.21	6.65	6.65	0.00		SD 18"
A	INL 2049	612+23	37.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.60	0.50	0.24	8.59	1.26	1.26	0.00		
A	PCO- 2059	612+25	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.10	0.50	0.44	8.32	2.52	2.52	0.00		
A	PCO- 2061	612+57	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	3.90	0.50	0.32	8.28	0.47	0.47	0.00		
A	INL 2061A	612+60	-63.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	110.20	0.50	0.28	8.31	7.28	7.28	0.00		SD 18"
A	PCO-7008	612+61	29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	12.50	0.50	0.26	8.68	2.95	1.30	1.65	PCO-2085	
A	INL 2055	612+61	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	7.00	0.50	0.17	7.18	0.65	0.65	0.00		
A	INL 2077	613+71	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	10.40	0.50	0.26	7.51	1.47	1.47	0.00		
A	INL 2105	614+01	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.10	0.50	0.23	6.83	1.13	1.13	0.00		
A	PCO- 2099	614+01	-29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	9.80	0.50	0.21	8.26	1.55	0.90	0.66	PCO- 2142	
A	PCO-2085	614+08	29.30	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	12.90	0.50	0.27	8.20	3.19	2.12	1.07	PCO-2136	
A	INL 2084	614+09	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	13.40	0.50	0.34	7.05	2.37	2.37	0.00		
A	INL 2117	614+77	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	20.90	0.50	0.52	7.20	4.38	4.38	0.00		
A	INL 2123	615+15	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	7.60	0.50	0.19	6.82	0.75	0.75	0.00		
A	INL 2142A	615+82	-148.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	90.50	0.50	0.23	6.43	5.42	5.42	0.00		SD 18"
A	PCO- 2142	615+84	-49.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.80	0.50	0.48	7.26	3.24	3.24	0.00		
A	PCO-2136	616+16	29.20	Curb	On Grade	9.50	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	12.60	0.50	0.26	7.64	3.02	2.04	0.98	PCO-2168	
A	INL 2135	616+16	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.30	0.50	0.23	6.79	1.19	1.19	0.00		
A	PCO- 2145	616+17	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.33	7.28	0.54	0.54	0.00		
A	INL 2145A	616+25	-78.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	98.80	0.50	0.25	6.21	6.18	6.18	0.00		SD 18"
A	INL 2157	616+78	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	4.70	0.50	0.12	6.80	0.24	0.24	0.00		
A	INL 2160A	617+08	-205.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	6.70	0.50	0.17	6.92	0.60	0.60	0.00		
A	INL 2147	617+08	38.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	8.80	0.50	0.22	6.54	1.05	1.05	0.00		
A	PCO- 2160	617+09	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	5.00	0.50	0.41	7.38	1.76	1.76	0.00		
A	PCO-2168	617+10	28.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.00	0.50	0.44	6.70	2.47	2.47	0.00		
A	INL 2187	618+14	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	7.00	0.50	0.17	6.34	0.63	0.63	0.00		
A	INL 2189A	618+51	-109.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	19.60	0.50	0.49	6.96	4.61	4.61	0.00		
A	PCO- 2189	618+51	-52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.80	0.50	0.39	6.87	1.42	1.42	0.00		
A	INL 2203A	618+55	68.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	55.10	0.50	0.14	6.05	2.57	2.57	0.00		SD 18"
A	PCO-2203	618+61	51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.50	0.50	0.36	6.11	1.06	1.06	0.00		
A	PCO- 2193	618+83	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.30	0.50	0.35	6.90	0.80	0.80	0.00		
A	INL 2193A	618+84	-97.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	85.10	0.50	0.21	6.92	4.94	4.94	0.00		SD 18"
A	PCO-2205	618+93	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.32	6.13	0.50	0.50	0.00		
A	INL 2205A	618+95	83.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	0.00	0.50	0.00	5.55	0.00	0.00	0.00		
A	INL 2236	619+58	40.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	10.50	0.50	0.26	5.99	1.50	1.50	0.00		
A	INL 2242	620+02	39.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	9.80	0.50	0.24	5.58	1.31	1.31	0.00		
A	INL 2223	620+08	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	10.40	0.50	0.26	5.48	1.33	1.33	0.00		
A	PCO- 2277	621+30	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	14.80	0.50	0.56	6.53	5.19	5.19	0.00		
A	INL 2256	621+31	38.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	12.70	0.50	0.32	12.22	2.15	2.15	0.00		
A	PCO-2258	621+32	29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	12.20	0.50	0.51	5.83	3.88	3.88	0.00		
B	INL 2297	624+13	-35.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.40	0.50	0.36	4.98	2.35	2.35	0.00		
B	INL 2312	624+66	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	15.10	0.50	0.38	5.93	2.95	2.95	0.00		
B	PCO- 2339	625+20	-29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.70	0.50	0.47	6.41	3.17	3.17	0.00		
B	PCO-2332	625+21	29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.60	0.50	0.47	6.39	3.16	3.16	0.00		
B	INL 2337	625+22	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	19.10	0.50	0.48	4.55	4.40	4.40	0.00		
B	INL 2347	625+34	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	11.10	0.50	0.28	4.94	1.50	1.50	0.00		
B	INL 2353	625+73	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.50	0.50	0.36	5.30	2.37	2.37	0.00		
B	INL 2365	626+34	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	15.10	0.50	0.38	5.22	2.55	2.55	0.00		
B	INL 2372	627+10	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	16.30	0.50	0.41	5.56	2.92	2.92	0.00		
B	INL 2402	627+64	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	14.50	0.50	0.36	5.42	2.38	2.38	0.00		
B	PCO-2380	628+15	29.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.50	0.50	0.45	6.36	2.68	2.68	0.00		
B	INL 2403	628+16	-35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	13.60	0.50	0.34	5.54	2.13	2.13	0.00		
B	PCO- 2408	628+16	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.60	0.50	0.45	6.36	2.72	2.72	0.00		
B	INL 2386	628+17	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	18.50	0.50	0.46	4.54	4.16	4.16	0.00		
B	CBS 02	628+69	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	17.50	0.50	0.44	5.44	3.28	3.28	0.00		
B	INL 1640	629+24	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	5.00	0.50	0.12	5.79	0.31	0.31	0.00		
B	INL 600A	629+53	72.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	12.10	0.50	0.30	3.68	1.98	1.98	0.00		
B	PCO- 657	629+54	-51.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	15.20	0.50	0.57	6.41	5.40	5.40	0.00		
B	PCO-600	629+55	52.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.33	5.80	0.56	0.56	0.00		
B	INL 1655C	629+95	170.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	17.60	0.50	0.44	2.95	3.84	3.84	0.00		
B	PCO- 1651	629+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	7.40	0.50	0.41	6.46	1.83	1.83	0.00		
B	PCO-1655	629+97	52.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.20	0.50	0.34	6.08	0.68	0.68	0.00		
B	INL 1649	630+74	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	12.00	16.76	0.50	0.42	4.95	6.01	6.01	0.00		
B	INL 1648	631+20	-35.10	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	12.00	15.74	0.50	0.40	4.66	5.46	5.46	0.00		
B	PCO- 1646	631+51	-29.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	9.50	0.50	0.45	6.11	2.67	2.67	0.00		
B	PCO-1656	631+52	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	10.00	0.50	0.46	6.09	2.86	2.86	0.00		
B	INL 1657	631+53	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.80	0.50	0.37	4.57	2.83	2.83	0.00		
B	INL 1644	631+80	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	10.00	7.20	0.50	0.18	4.87	0.68	0.68	0.00		
B	INL 1639	632+42	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	22.10	0.50	0.55	5.34	4.81	4.81	0.00		
B	INL 1658	632+88	40.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	21.00	0.50	0.53	5.39	5.17	5.17	0.00		
B	PCO- 1635	634+37	-29.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	8.90	0.50	0.44	6.05	2.42	2.42	0.00		
B	PCO-1660	634+37	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	11.50	0.50	0.49	6.09	3.56	3.56	0.00		
B	INL 1661	634+37	39.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	13.90	0.50	0.35	5.24	2.52	2.52	0.00		
B	INL 1633	634+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	32.70	0.50	0.82	5.35	8.98	8.98	0.00		
B	INL 1662	635+03	41.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	11.10	0.50	0.28	5.34	1.68	1.68	0.00		
B	INL 1628	635+11	-35.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	12.00	5.50	0.50	0.14	5.33	0.38	0.38	0.00		
B	INL 1625A	635+63	-90.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	86.90	0.50	0.22	5.49	5.09	5.09	0.00		SD 18"
B	PCO- 1625	635+66	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	4.00	0.50	0.33	5.91	0.52	0.52	0.00		
B	PCO-1664	635+69	29.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	12.00	10.30	0.50	0.22	6.09	1.76	0.97	0.79	PCO-1660	
B	INL 1663	635+69	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.20	0.50	0.36	4.92	2.63	2.63	0.00		
B	PCO- 1624	635+97	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	12.00	5.00	0.50	0.40	5.19	1.73	1.73	0.00		

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

SHEET 10 OF 12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		108

DATE: 9/11/2023 5:45:38 PM
FILE: ...\FM 519 INLET COMP10.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
B	INL 1624A	636+00	-74.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	12.00	266.50	0.50	0.67	5.68	15.35	15.35	0.00		SD 18"
B	INL 1568	637+37	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	14.30	0.50	0.36	5.37	2.65	2.65	0.00		
B	INL 1610	637+38	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	12.00	12.10	0.50	0.30	6.00	1.97	1.97	0.00		
C	INL 1616	638+34	-35.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	10.80	0.50	0.27	5.51	1.42	1.42	0.00		
C	PCO- 1618	638+89	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	15.00	0.50	0.56	6.00	5.30	5.30	0.00		
C	PCO-7002	638+93	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.30	0.50	0.51	6.09	3.91	3.91	0.00		
C	INL 1565	638+93	39.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.20	0.50	0.31	5.46	2.01	2.01	0.00		
C	PCO- 1619	639+15	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	13.90	0.50	0.54	6.01	4.71	4.71	0.00		
C	INL 1564	639+31	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	6.90	0.50	0.17	5.46	0.63	0.63	0.00		
C	INL 1620	639+61	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	4.70	0.50	0.12	6.06	0.27	0.27	0.00		
C	PCO- 1562	639+96	29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.50	0.50	0.22	6.88	2.50	1.03	1.47	PCO-7002	
C	INL 1563	639+97	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	23.30	0.50	0.58	5.43	6.15	6.15	0.00		
C	PCO- 1574	640+35	-29.30	Curb	On Grade	5.00	2.00	0.55	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.80	0.50	0.21	7.17	2.08	0.93	1.15	PCO- 1619	
C	INL 1574A	640+37	-35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	21.20	0.50	0.53	6.18	4.48	4.48	0.00		
C	INL 1580	641+10	-35.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	17.20	0.50	0.43	6.01	3.17	3.17	0.00		
C	INL 1584	641+62	-35.30	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	11.69	0.50	0.30	6.32	3.46	3.46	0.00		
C1	INL 1585	642+41	-39.70	Grate	In Sag	2.50	0.50	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	0.00	0.50	0.00	7.15	0.00	0.00	0.00		
D	INL 1587	642+98	-35.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	0.00	0.50	0.00	7.11	0.00	0.00	0.00		
D	INL 1591B	643+57	-115.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	77.80	0.50	0.20	7.50	4.32	4.32	0.00		SD 18"
D	PCO- 1591	643+75	-51.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	7.51	1.55	1.55	0.00		
D	PCO-1560	644+04	29.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.70	0.50	0.46	6.09	2.76	2.76	0.00		
D	INL 1558	644+04	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.40	0.50	0.31	6.64	2.05	2.05	0.00		
D	PCO- 1593	644+07	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.80	0.50	0.44	7.60	2.40	2.40	0.00		
D	INL 1593A	644+16	-79.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	99.20	0.50	0.25	6.31	6.22	6.22	0.00		SD 18"
D	INL 1557	644+47	39.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.20	0.50	0.21	6.61	0.92	0.92	0.00		
D	INL 1556A	645+34	61.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	34.40	0.50	0.09	7.50	1.27	1.27	0.00		SD 18"
D	PCO-1556	645+37	52.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	6.60	0.50	0.14	7.86	0.54	0.46	0.08	PCO-1560	
D	INL 1597	645+41	-35.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	19.90	0.50	0.50	7.34	4.05	4.05	0.00		
D	PCO- 1599	645+41	-29.20	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	11.10	0.50	0.23	8.01	2.14	1.08	1.06	PCO- 1593	
D	PCO-1554	645+69	52.30	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.70	0.50	0.22	8.02	1.93	1.93	0.00		
D	INL 1554A	645+72	66.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	24.60	0.50	0.06	5.10	0.77	0.77	0.00		
D	INL 1553	646+21	40.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	7.80	0.50	0.20	6.67	0.83	0.83	0.00		
D	INL 1602	646+42	-34.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	27.40	0.50	0.69	7.82	6.81	6.81	0.00		
D	INL 1552	646+65	39.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.00	0.50	0.30	6.75	1.95	1.95	0.00		
E	INL 1551A	648+37	-90.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	11.00	4680.60	0.50	11.82	5.60	64.33	64.33	0.00		SD 30"
E	INL 1546	648+39	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.30	0.50	0.28	6.52	1.73	1.73	0.00		
E	PCO- 1551	648+40	-51.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.60	0.50	0.38	8.19	1.27	1.27	0.00		
E	PCO- 1550	648+72	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	8.10	0.50	0.50	0.00		
E	INL 1550A	648+81	-73.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.50	5.00	0.00	Parallel	11.00	1771.00	0.50	4.47	7.00	39.57	39.57	0.00		SD 30"
E	INL 1544	648+88	41.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.60	0.50	0.24	7.41	1.27	1.27	0.00		
E	INL 1523	649+56	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	10.00	0.50	0.25	7.40	1.24	1.24	0.00		
E	PCO- 1525	649+56	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.30	0.50	0.41	8.29	1.80	1.80	0.00		
E	PCO-1543	649+56	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.00	0.50	0.46	6.09	2.89	2.89	0.00		
E	INL 1542	649+65	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	12.00	0.50	0.30	7.82	1.93	1.93	0.00		
E	INL 1519	650+18	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.30	0.50	0.28	7.32	1.54	1.54	0.00		
E	INL 1516	651+01	-34.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	12.80	0.50	0.32	8.00	1.92	1.92	0.00		
E	INL 1541	651+03	39.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.70	0.50	0.27	6.38	1.56	1.56	0.00		
E	INL 1537	651+47	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.40	0.50	0.24	7.16	1.22	1.22	0.00		
E	INL 1511	652+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	9.00	0.50	0.23	7.53	1.03	1.03	0.00		
E	INL 1536	652+37	36.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.20	0.50	0.25	6.45	1.41	1.41	0.00		
E	INL 1509	652+46	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.00	0.50	0.20	7.27	0.82	0.82	0.00		
E	INL 1503	653+00	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	15.20	0.50	0.38	7.68	2.58	2.58	0.00		
E	PCO- 1505	653+00	-28.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.00	0.50	0.50	7.84	3.80	3.80	0.00		
E	INL 1531	653+02	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.00	0.50	0.28	6.34	1.64	1.64	0.00		
E	PCO-1532	653+03	29.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.60	0.50	0.49	6.09	3.59	3.59	0.00		
E1	INL 1530	654+37	40.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.10	0.50	0.23	6.82	1.13	1.13	0.00		
E	INL 1500	654+53	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.60	0.50	0.17	7.37	0.56	0.56	0.00		
E2	INL 1497	654+81	-70.70	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	44.20	0.50	1.11	5.77	27.97	27.97	0.00		
E3	PCO-1484	654+86	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	7.39	0.88	0.88	0.00		
F2	PCO- 1496	654+89	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.30	0.50	0.35	7.49	0.83	0.83	0.00		
F4	PCO-1485	655+18	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.90	0.50	0.40	7.53	1.70	1.70	0.00		
F	PCO- 1495	655+21	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	7.52	0.57	0.57	0.00		
F	INL 1495A	655+28	-210.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	104.40	0.50	2.61	4.31	26.37	26.37	0.00		
F	INL 1491	655+83	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	10.90	0.50	0.27	6.89	1.46	1.46	0.00		
F	PCO- 1450	657+35	-28.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.00	0.50	0.50	7.38	3.76	3.76	0.00		
F	PCO-1454	657+35	30.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.10	0.50	0.46	6.09	2.92	2.92	0.00		
F	INL 1446	657+36	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	15.90	0.50	0.40	6.21	2.79	2.79	0.00		
F	INL 1455	657+37	40.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	13.40	0.50	0.34	6.39	2.38	2.38	0.00		
F	INL 1444	657+80	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	10.90	0.50	0.27	6.39	1.46	1.46	0.00		
F	INL 1459	657+91	40.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.70	0.50	0.24	5.93	1.30	1.30	0.00		
F	INL 1439	658+62	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.10	0.50	0.15	6.69	0.47	0.47	0.00		
F	INL 1460A	658+96	71.10	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	39.40	0.50	0.10	5.80	1.56	1.56	0.00		SD 15"
F	PCO-1460	658+98	45.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	6.85	0.51	0.51	0.00		
F	INL 1437A	659+09	-66.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	359.10	0.50	0.91	5.10	17.82	17.82	0.00		SD 15"
F	PCO- 1437	659+12	-51.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.32	7.34	0.52	0.52	0.00		
F	PCO-1461	659+31	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.60	0.50	0.51	7.04	4.00	4.09	0.00		
F	INL 1461A	659+40	66.70	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	36.40	0.50	0.09	4.60	1.38	1.38	0.00		SD 15"
F	PCO- 1436	659+44	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.90	0.50	0.50	7.34	3.74	3.74	0.00		
F	INL 1436A	659+48	-100.40	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	93.00	0.50	0.23	4.90	5.64	5.64	0.00		SD 24"
F	INL 1433	659+86	-34.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.40	0.50	0.18	7.11	0.70	0.70	0.00		
F	INL 1463	660+14	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.00	0.50	0.25	6.04	1.37	1.37	0.00		
F	INL 1429	660+40	-34.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.40	0.50	0.16	6.95	0.54	0.54	0.00		
F	INL 1423	660+89	-34.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.60	0.50	0.19	7.63	0.75	0.75	0.00		
F	PCO-1471	661+34	30.00	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	12.10	0.50	0.25	8.64	3.16	1.27	1.94	PCO-1461	
F	INL 1469	661+34	38.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.00	0.50	0.25	7.45	1.37	1.37	0.00		
F	INL 1417	661+42	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.70	0.50	0.22	8.33	0.96	0.96	0.00		
F	PCO- 1420	661+42	-28.30	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.40	0.50	0.20	8.83	1.65	0.86	0.79	PCO- 1436	
F	INL 1473	661+66	37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	13.90	0.50	0.35	7.76	2.52	2.52	0.00		
F	INL 1412	661+93	-34.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.10	0.50	0.18	8.52	0.64	0.64	0.00		
F	INL 1410	662+45	-34.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.50	0.50	0.19	8.60	0.73	0.73	0.00		
F	INL 1405	662+91	-34.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	6.80	0.50	0.17	9.14	0.59	0.59	0.00		
F	INL 1385A	663+19	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	125.80	0.50	0.32	7.10	8.88	8.88	0.00		SD 24"
F	PCO-1385	663+25	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	9.17	0.54	0.54	0.00		
F	PCO-1477	663+37	30.10	Curb	On Grade	5.00	2.00	0.44	0.013	0.25	3.00	N/A	N/A	N/A	11.00	10.90	0.50	0.23	9.65	2.24	1.08	1.26	PCO-1471	

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		109

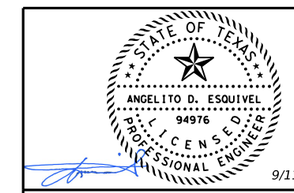
DATE: 9/11/2023 5:46:55 PM
FILE: ...\FM 519 INLET COMP11.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (100 YEAR)

System	INLET ID	STATION	OFFSET (- / +)	INLET TYPE	INLET PROFILE	INLET LENGTH (ft)	TRANSVERSE SLOPE (%)	LONGITUDINAL SLOPE (%)	n-VALUE GUTTER (ft)	DEPRESSION (ft)	GRATE WIDTH (ft)	GRATE PERIMETER (ft)	GRATE AREA (sf)	GRATE TYPE	ALLOWABLE PONDED WIDTH (ft)	COMPUTED PONDED WIDTH (ft)	ALLOWABLE PONDED DEPTH (ft)	COMPUTED PONDED DEPTH (ft)	CRITICAL ELEVATION (ft)	TOTAL DISCHARGE (Q) (cfs)	INTERCEPT CAPACITY (cfs)	BYPASSED FLOW (cfs)	BYPASS TO INLET	COMMENT
F	INL 1476	663+37	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.40	0.50	0.26	9.15	1.49	1.49	0.00		
F	PCO-1384	663+57	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.30	0.50	0.47	9.18	3.01	3.01	0.00		
F	INL 1384A	663+63	-174.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	26.20	0.50	0.66	7.60	7.48	7.48	0.00		
F	INL 1390	663+99	37.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.00	0.50	0.25	9.72	1.37	1.37	0.00		
F	INL 1381	664+01	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.00	0.50	0.17	9.44	0.63	0.63	0.00		
F	INL 1378	664+63	-34.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	7.50	0.50	0.19	9.58	0.73	0.73	0.00		
F	INL 1374	665+10	-34.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	9.00	0.50	0.22	8.84	1.01	1.01	0.00		
F	INL 1393	665+27	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	10.70	0.50	0.27	9.72	1.57	1.57	0.00		
G	INL-1366	665+88	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	7.20	0.50	0.18	9.60	0.69	0.69	0.00		
G	PCO-1369	665+88	-28.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.80	0.50	0.39	10.69	1.40	1.40	0.00		
G	INL 1395	665+88	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.70	0.50	0.22	9.72	1.03	1.03	0.00		
G	INL 1396	665+89	31.60	Grate	In Sag	5.00	2.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	10.50	0.50	0.21	9.96	1.56	1.56	0.00		
G	INL-1362	666+17	-35.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	8.00	0.50	0.20	9.39	0.82	0.82	0.00		
G	INL 1359	666+77	-33.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.00	0.50	0.33	9.26	1.98	1.98	0.00		
G	PCO-1358	667+45	-51.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	17.30	0.50	0.61	10.20	6.54	6.54	0.00		
G	PCO-1398	667+45	52.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	10.50	0.50	0.48	6.09	3.08	3.08	0.00		
G	PCO-1357	667+77	-51.20	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.35	10.14	0.83	0.83	0.00		
G	PCO-1399	667+77	52.50	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.50	0.50	0.37	9.68	0.98	0.98	0.00		
G	INL 1399A	667+84	110.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	34.90	0.50	0.09	9.63	1.30	1.30	0.00		SD 18"
G	INL 1357A	667+85	-72.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	94.00	0.50	0.24	9.23	5.73	5.73	0.00		SD 18"
G	INL 1355	669+04	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	21.00	0.50	0.53	10.05	4.43	4.43	0.00		
G	PCO-1345	669+67	31.60	Grate	In Sag	5.00	3.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	7.50	0.50	0.23	10.95	1.43	1.43	0.00		
G	INL 1348	669+68	-35.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.40	0.50	0.34	10.38	2.08	2.08	0.00		
G	PCO-1347	669+68	-29.00	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	9.30	0.50	0.20	10.85	1.36	0.90	0.46	PCO-1332	
G	INL 1400	669+68	38.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	22.30	0.50	0.56	9.72	5.75	5.75	0.00		
G	INL 1332B	671+24	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	19.50	0.50	0.49	8.81	3.91	3.91	0.00		
G	INL 1332A	671+63	-129.90	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	53.50	0.50	0.14	9.60	2.46	2.46	0.00		SD 18"
G	PCO-1332	671+63	-51.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	9.40	0.50	0.46	9.24	2.63	2.63	0.00		
G	PCO-1331	671+95	-51.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.10	0.50	0.33	9.22	0.50	0.50	0.00		
G	INL 1331A	671+97	-72.60	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	39.40	0.50	0.10	7.70	1.56	1.56	0.00		SD 18"
G	PCO-1334	672+02	28.50	Curb	On Grade	5.00	2.00	0.70	0.013	0.25	3.00	N/A	N/A	N/A	11.00	12.80	0.50	0.27	9.68	4.79	1.52	3.27	PCO-1337	
G	INL 1336	673+54	39.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	16.00	0.50	0.40	9.72	3.24	3.24	0.00		
G	INL 1326	673+55	-36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	11.50	0.50	0.29	7.42	1.59	1.59	0.00		
G	PCO-1325	673+55	-29.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	11.30	0.50	0.49	8.81	3.48	3.48	0.00		
G	PCO-1337	673+55	29.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	16.10	0.50	0.59	8.84	5.91	5.91	0.00		
G1	INL 1339A	675+02	69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	80.30	0.50	0.20	12.98	4.53	4.53	0.00		SD 15"
G1	PCO-1339	675+06	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.00	0.50	0.33	8.27	0.46	0.46	0.00		
G1	PCO-1340	675+38	53.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.40	0.50	0.36	8.28	0.89	0.89	0.00		
H	PCO-1322	675+93	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	4.10	0.50	0.33	8.62	0.55	0.55	0.00		
H	PCO-1321	676+25	-53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.00	0.50	0.55	8.71	4.76	4.76	0.00		
H	INL 1284	677+87	6.00	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	4.90	0.50	0.12	9.72	1.25	1.25	0.00		
H	INL 1314	678+05	-36.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	15.90	0.50	0.40	7.84	2.80	2.80	0.00		
H	INL 1282	679+14	38.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.40	0.50	0.29	6.86	1.75	1.75	0.00		
H	INL 1312	679+19	-36.00	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	9.69	0.50	0.25	8.70	2.59	2.59	0.00		
H	INL 1279A	680+04	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	55.80	0.50	0.14	6.80	2.62	2.62	0.00		SD 15"
H	PCO-1308	680+07	-50.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.50	0.50	0.56	7.95	5.04	5.04	0.00		
H	PCO-1279	680+07	53.70	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.80	0.50	0.52	7.61	4.15	4.15	0.00		
H	PCO-1307	680+39	-50.30	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.10	0.50	0.43	8.17	2.09	2.09	0.00		
H	PCO-1319	680+39	53.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.20	0.50	0.43	7.58	2.14	2.14	0.00		
H	INL 1319A	680+41	73.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	36.00	0.50	0.09	6.60	1.36	1.36	0.00		SD 15"
H	INL 1307A	680+43	-72.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	37.60	0.50	0.10	7.10	1.45	1.45	0.00		SD 18"
H	INL 1274	681+38	38.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.60	0.50	0.22	7.10	1.02	1.02	0.00		
H	INL 1289	681+64	-36.70	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.70	0.50	0.34	8.06	2.17	2.17	0.00		
H	INL 1270	682+00	39.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	8.20	0.50	0.20	7.31	0.91	0.91	0.00		
H	INL 1268	682+29	39.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	9.50	0.50	0.24	7.28	1.23	1.23	0.00		
H	INL 1292	682+78	-36.20	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	12.40	0.50	0.31	7.88	1.82	1.82	0.00		
H	INL 1264	683+01	38.00	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.70	0.50	0.29	6.43	1.84	1.84	0.00		
H	INL 1296	683+30	-37.20	Grate	In Sag	2.50	5.00	0.00	N/A	N/A	2.50	10.00	6.25	Parallel	11.00	3.85	0.50	0.10	7.25	0.60	0.60	0.00		
H	INL 1258	683+76	37.80	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	10.00	0.50	0.25	7.15	3.39	3.39	0.00		
H	INL 1299	683+85	-37.40	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	4.80	0.50	0.12	7.00	0.29	0.29	0.00		
H	INL 1257A	684+18	67.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	43.90	0.50	0.11	6.80	1.83	1.83	0.00		SD 15"
H	INL 1302A	684+20	-69.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	34.00	0.50	0.09	6.60	1.25	1.25	0.00		SD 15"
H	PCO-1302	684+25	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.70	0.50	0.44	7.54	2.35	2.35	0.00		
H	PCO-1257	684+27	53.10	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.50	0.50	0.44	7.19	2.25	2.25	0.00		
H	PCO-1303	684+57	-50.80	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	7.90	0.50	0.43	7.62	2.02	2.02	0.00		
H	PCO-1256	684+59	53.00	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.00	0.50	0.43	7.17	2.06	2.06	0.00		
H	INI 1303A	684+62	-70.80	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	38.60	0.50	0.10	6.92	1.51	1.51	0.00		SD 15"
H	INL 1256A	684+62	75.50	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.25	2.50	0.00	Parallel	11.00	52.70	0.50	0.13	5.30	2.41	2.41	0.00		SD 15"
H	INL 1254	685+02	37.90	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	11.00	12.00	0.50	0.18	7.20	1.15	1.15	0.00		
H	INL 1249	685+64	37.60	Grate	In Sag	3.00	3.00	0.00	N/A	N/A	3.00	12.00	9.00	Parallel	11.00	14.20	0.50	0.21	6.79	1.64	1.64	0.00		
H	INL 1246	685+67	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	13.10	0.50	0.33	6.96	2.01	2.01	0.00		
H	INL 1239	686+63	37.50	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	19.90	0.50	0.50	6.99	4.71	4.71	0.00		
H	INL 1230	687+52	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	23.10	0.50	0.58	6.86	5.15	5.15	0.00		
H	INL 1231	687+53	36.30	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	11.40	0.50	0.29	6.20	1.76	1.76	0.00		
H	PCO-1238	688+48	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	14.40	0.50	0.56	7.01	4.98	4.98	0.00		
H	INL 1222	688+77	-36.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	18.60	0.50	0.47	6.41	3.61	3.61	0.00		
H	PCO-1225	688+77	-28.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	12.70	0.50	0.52	7.59	4.12	4.12	0.00		
H	PCO-1237	688+80	52.90	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	8.00	14.70	0.50	0.56	6.81	5.15	5.15	0.00		
H	INL 1214	689+93	35.80	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	20.40	0.50	0.51	6.79	4.92	4.92	0.00		
H	INL 1218	689+95	-36.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	26.00	0.50	0.65	6.48	6.26	6.26	0.00		
H	INL 1210	690+89	36.10	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	20.20	0.50	0.51	7.00	4.86	4.86	0.00		
H	INL 1202	691+88	35.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	22.30	0.50	0.56	6.69	5.72	5.72	0.00		
H	INL 1205	691+89	-37.60	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.20	6.40	2.40	Parallel	11.00	20.90	0.50	0.52	6.49	4.37	4.37	0.00		
H	INL 1196C	692+60	-42.40	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	4.60	0.50	0.12	4.30	1.12	1.12	0.00		
H	INL 1198A	692+60	68.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	91.00	0.50	0.23	4.90	5.47	5.47	0.00		SD 24"
H	PCO-1198	692+69	52.60	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.50	0.50	0.44	6.88	2.25	2.25	0.00		
H	PCO-1197	693+00	52.40	Curb	In Sag	5.00	2.00	0.00	N/A	0.25	3.00	N/A	N/A	N/A	11.00	8.40	0.50	0.44	6.88	2.23	2.23	0.00		
H	INL 1197A	693+03	63.00	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	1.50	3.00	0.00	Parallel	11.00	80.90	0.50	0.20	6.80	4.57	4.57	0.00		SD 18"
H	PCO- 1192	693+04	-30.60	Grate	In Sag	5.00	2.00	0.00	N/A	N/A	3.00	16.00	15.00	Parallel	11.00	10.48	0.50	0.33	7.28	3.54	3.54	0.00		
H	INL 1192A	693+05	-44.50	Grate	In Sag	0.00	5.00	0.00	N/A	N/A	3.00	6.00	0.00	Parallel	11.00	3.60	0.50	0.09	5.30	0.81	0.81	0.00		
H	PCO-1191	694+25	-27.70	Curb	On Grade	5.00	2.00	0.30	0.013	0.25	3.00	N/A	N/A	N/A	11.00	5.50	0.50	0.13	7.58	0.36	0.35	0.01	PCO- 1192	
H	INL 1191A	694+38	-31.90	Grate	In Sag	2.00	5.00	0.00	N/A	N/A	1.70	7.40	3.40	Parallel	11.00	5.30	0.50	0.13	7.54	0.34	0.34	0.00		
H	INL 1191B	695+32	53.20	Grate	In Sag	0.00	0.50	0.00	N/A	N/A	2.00	4.00	0.00	Parallel	11.00	101.10	1.50	0.26	6.60	6.40	6.40	0.00		SD 24"



9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

INLET COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		110

DATE: 9/11/2023 5:48:10 PM
FILE: ...\FM 519 INLET COMP12.dgn

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
A	P-7008	PCO-7008	PRM- 2064	4.22	4.07	Circle		1.50	55.40	0.27	0.013	6.49	6.48	0.03	1.50	0.58	3.03	0.98	1.72	5.46	0.01
A	P-2279	PRM- 2279	A	0.40	0.08	Circle		3.00	184.10	0.18	0.013	3.83	3.08	0.41	3.00	2.13	3.94	6.05	42.76	27.98	0.76
A	P-2277	PCO- 2277	PRM- 2279	1.59	1.40	Circle		1.50	10.60	1.79	0.013	4.16	4.16	0.07	1.50	0.44	7.81	1.52	2.69	14.06	0.01
A	P-2258	PCO-2258	PRM- 2279	2.50	1.26	Circle		1.50	55.80	2.22	0.013	4.32	4.28	0.08	1.50	0.44	8.70	1.67	2.96	15.66	0.04
A	P-2256	INL 2256	PCO-2258	3.23	3.15	Circle		1.25	7.70	1.04	0.013	4.34	4.34	0.03	1.19	0.37	5.48	4.13	1.26	6.58	0.00
A	P-2242	INL 2242	PRM- 2230	3.04	1.65	Circle		1.50	64.60	2.15	0.013	4.63	4.62	0.02	1.50	0.32	8.56	0.88	1.56	15.41	0.01
A	P-2236	INL 2236	INL 2242	3.95	3.04	Circle		1.25	43.60	2.09	0.013	4.64	4.65	0.02	1.25	0.26	7.78	4.75	0.86	9.33	0.01
A	P-2230	PRM- 2230	PRM- 2279	0.63	0.43	Circle		3.00	103.40	0.19	0.013	4.24	3.88	0.35	3.00	2.04	4.13	5.57	39.35	29.33	0.36
A	P-2223	INL 2223	PRM- 2230	3.38	2.90	Circle		1.25	17.30	2.78	0.013	4.54	4.54	0.01	1.25	0.23	8.98	5.13	0.79	10.77	0.00
A	P-2205A	INL 2205A	PCO-2205	3.63	3.53	Circle		1.50	31.30	0.32	0.013	5.08	5.08	0.00	1.50	0.00	3.30	0.00	0.00	5.94	0.00
A	P-2205	PCO-2205	PCO-2203	3.33	3.29	Circle		1.50	35.90	0.11	0.013	5.08	5.07	0.00	1.50	0.28	1.94	0.15	0.27	3.50	0.00
A	P-2203A	INL 2203A	PCO-2203	3.39	3.29	Circle		1.50	17.00	0.59	0.013	5.08	5.08	0.02	1.50	0.44	4.47	0.84	1.48	8.04	0.00
A	P-2203	PCO-2203	PRM- 2196	3.29	2.52	Circle		1.50	80.20	0.96	0.013	5.07	5.04	0.04	1.50	0.45	5.72	1.16	2.05	10.29	0.03
A	P-2196	PRM- 2196	PRM- 2230	1.42	1.26	Circle		3.00	132.20	0.12	0.013	4.71	4.28	0.33	3.00	2.01	3.27	5.39	38.08	23.20	0.43
A	P-2193A	INL 2193A	PCO- 2193	3.05	2.89	Circle		1.50	45.10	0.35	0.013	5.24	5.21	0.07	1.50	0.69	3.47	1.54	2.72	6.25	0.03
A	P-2193	PCO- 2193	PRM- 2196	2.79	2.32	Circle		1.50	28.60	1.64	0.013	5.15	5.06	0.32	1.50	0.70	7.48	3.35	5.92	13.46	0.09
A	P-2189A	INL 2189A	PCO- 2189	3.25	3.05	Circle		1.50	57.80	0.35	0.013	5.34	5.31	0.06	1.50	0.67	3.43	1.43	2.52	6.18	0.03
A	P-2189	PCO- 2189	PCO- 2193	3.05	2.79	Circle		1.50	36.50	0.71	0.013	5.26	5.23	0.09	1.50	0.61	4.93	1.75	3.10	8.87	0.03
A	P-2187	INL 2187	PRM-2162A	4.64	3.00	Circle		1.25	12.60	12.98	0.013	5.15	5.16	0.01	1.25	0.11	19.39	7.12	0.39	23.27	-0.01
A	P-2168	PCO-2168	PRM- 2162	3.20	3.10	Circle		1.50	54.70	0.18	0.013	5.46	5.45	0.02	1.50	0.55	2.49	0.74	1.31	4.49	0.01
A	P-2162A	PRM-2162A	PRM- 2196	1.68	1.42	Circle		3.00	72.30	0.36	0.013	4.91	4.74	0.23	3.00	2.04	5.63	4.56	32.25	40.00	0.17
A	P-2162	PRM- 2162	PRM-2162A	1.78	1.68	Circle		3.00	111.20	0.09	0.013	5.20	4.94	0.23	3.00	1.84	2.82	4.56	32.25	20.00	0.26
A	P-2160A	INL 2160A	PCO- 2160	4.30	3.40	Circle		1.50	68.00	1.32	0.013	5.41	5.41	0.00	1.50	0.18	6.71	3.03	0.35	12.08	0.00
A	P-2160	PCO- 2160	PRM- 2162	3.10	3.06	Circle		1.50	9.70	0.41	0.013	5.41	5.41	0.01	1.50	0.42	3.75	0.65	1.15	6.75	0.00
A	P-2157	INL 2157	PRM-2148A	5.07	4.60	Circle		1.25	12.00	3.91	0.013	5.51	5.51	0.00	0.91	0.10	10.64	3.61	0.17	12.77	0.00
A	P-2148A	PRM-2148A	PRM- 2162	1.81	1.78	Circle		3.00	24.60	0.12	0.013	5.28	5.22	0.21	3.00	1.80	3.28	4.34	30.69	23.29	0.05
A	P-2148	PRM- 2148	PRM-2148A	1.89	1.81	Circle		3.00	68.20	0.12	0.013	5.44	5.30	0.21	3.00	1.80	3.22	4.35	30.73	22.85	0.14
A	P-2147	INL 2147	PCO-2168	3.56	3.40	Circle		1.25	8.00	2.01	0.013	5.46	5.46	0.01	1.25	0.22	7.63	0.49	0.60	9.15	0.00
A	P-2145A	INL 2145A	PCO- 2145	3.85	3.74	Circle		1.50	27.10	0.41	0.013	5.74	5.72	0.10	1.50	0.75	3.72	1.89	3.34	6.69	0.03
A	P-2145	PCO- 2145	PRM- 2148	3.74	3.60	Circle		1.50	28.60	0.49	0.013	5.70	5.67	0.11	1.50	0.73	4.08	2.00	3.53	7.35	0.03
A	P-2142A	INL 2142A	PCO- 2142	3.79	3.49	Circle		1.50	98.60	0.30	0.013	5.81	5.73	0.08	1.50	0.76	3.22	1.68	2.97	5.79	0.08
A	P-2142	PCO- 2142	PRM- 2148	3.49	3.34	Circle		1.50	38.00	0.40	0.013	5.66	5.60	0.16	1.50	0.86	3.70	2.35	4.16	6.66	0.06
A	P-2136	PCO-2136	PRM- 2148	3.64	3.40	Circle		1.50	56.10	0.43	0.013	5.69	5.68	0.02	1.50	0.50	3.82	0.94	1.66	6.87	0.01
A	P-2135	INL 2135	PCO-2136	4.61	4.34	Circle		1.25	7.60	3.57	0.013	5.70	5.70	0.01	1.25	0.20	10.18	5.37	0.69	12.21	0.00
A	P-2123	INL 2123	PRM-2098B	5.55	5.10	Circle		1.25	11.40	3.95	0.013	6.07	6.08	0.01	0.98	0.16	10.70	4.84	0.43	12.84	0.01
A	P-2117	INL 2117	PRM-2098A	5.42	5.10	Circle		1.25	11.50	2.78	0.013	6.16	6.23	0.18	1.13	0.40	8.98	7.08	2.41	10.78	0.07
A	P-2105	INL 2105	PCO- 2099	5.32	4.89	Circle		1.50	4.10	10.53	0.013	6.41	6.41	0.00	1.50	0.15	18.93	7.66	0.69	34.08	0.00
A	P-2099	PCO- 2099	PRM- 2098	4.24	3.30	Circle		1.50	10.70	8.78	0.013	6.40	6.40	0.01	1.50	0.21	17.29	0.72	1.28	31.13	0.00
A	P-2098B	PRM-2098B	PRM- 2148	2.93	2.82	Circle		2.50	97.40	0.11	0.013	5.79	5.47	0.33	2.50	1.65	2.81	4.81	23.61	13.79	0.32
A	P-2098A	PRM-2098A	PRM-2098B	2.98	2.93	Circle		2.50	35.60	0.14	0.013	5.94	5.82	0.33	2.50	1.65	3.13	4.77	23.40	15.36	0.12
A	P-2098	PRM- 2098	PRM-2098A	3.10	2.99	Circle		2.50	84.50	0.13	0.013	6.21	5.97	0.28	2.50	1.58	3.02	4.42	21.72	14.80	0.24
A	P-2085	PCO-2085	PRM- 2098	4.24	4.02	Circle		1.50	56.80	0.40	0.013	6.51	6.46	0.08	1.50	0.71	3.67	1.69	2.98	6.61	0.05
A	P-2084	INL 2084	PCO-2085	5.09	4.89	Circle		1.50	7.70	2.60	0.013	6.52	6.52	0.04	1.50	0.36	9.40	6.51	2.09	16.92	0.00
A	P-2077	INL 2077	INL 2084	5.23	5.09	Circle		1.50	38.10	0.37	0.013	6.54	6.54	0.01	1.45	0.37	3.54	2.49	0.83	6.37	0.00
A	P-2064	PRM- 2064	PRM- 2098	4.05	3.83	Circle		2.50	121.70	0.18	0.013	6.46	6.24	0.18	2.41	1.47	3.56	3.83	18.81	17.44	0.22
A	P-2061A	INL 2061A	PCO- 2061	4.45	4.37	Circle		1.50	11.50	0.70	0.013	6.95	6.94	0.14	1.50	0.70	4.87	2.22	3.92	8.77	0.02
A	P-2061	PCO- 2061	PRM- 2064	4.37	4.25	Circle		1.50	31.50	0.40	0.013	6.72	6.53	0.61	1.50	1.11	3.68	4.64	8.20	6.62	0.19
A	P-2059A	INL 2059A	PCO- 2059	4.55	4.47	Circle		1.50	14.50	0.55	0.013	7.10	7.08	0.12	1.50	0.72	4.34	2.05	3.61	7.81	0.02
A	P-2059	PCO- 2059	PCO- 2061	4.47	4.37	Circle		1.50	36.10	0.28	0.013	6.97	6.91	0.18	1.50	1.02	3.07	2.52	4.45	5.53	0.06
A	P-2055	INL 2055	PCO-7008	4.78	4.62	Circle		1.50	7.80	2.04	0.013	6.50	6.50	0.01	1.50	0.27	8.34	0.59	1.04	15.01	0.00
A	P-2049	INL 2049	INL 2055	4.93	4.78	Circle		1.25	38.00	0.39	0.013	6.51	6.50	0.01	1.25	0.36	3.38	0.60	0.73	4.06	0.00
A	P-2038	INL 2038	INL 2015	5.69	5.27	Circle		1.25	43.90	0.96	0.013	6.61	6.61	0.00	1.25	0.21	5.27	2.84	0.38	6.32	0.00
A	P-2019	INL 2019	PCO- 2018	5.44	4.76	Circle		1.25	4.30	15.96	0.013	6.61	6.61	0.05	1.25	0.20	21.50	11.30	1.43	25.80	0.00
A	P-2018	PCO- 2018	PRM- 2017	4.31	3.97	Circle		1.50	8.40	4.07	0.013	6.60	6.60	0.04	1.50	0.31	11.77	1.13	2.00	21.19	0.00
A	P-2017	PRM- 2017	PRM- 2064	4.42	4.21	Circle		2.50	191.60	0.11	0.013	6.59	6.49	0.06	2.28	1.64	2.77	3.05	10.38	13.58	0.10
A	P-2016	PCO-2016	PRM- 2017	4.58	4.42	Circle		1.50	54.50	0.29	0.013	6.60	6.60	0.01	1.50	0.46	3.16	0.65	1.15	5.69	0.01
A	P-2015	INL 2015	PCO-2016	5.27	5.20	Circle		1.50	7.90	0.88	0.013	6.61	6.61	0.00	1.41	0.21	5.48	2.80	0.43	9.86	0.00
A	P-2014	INL 2014	PRM-2007A	5.92	5.50	Circle		1.25	12.30	3.42	0.013	6.75	6.76	0.03	1.25	0.25	9.95	5.96	1.03	11.94	0.01
A	P-2010	INL 2010	PCO-2009	7.84	6.84	Circle		1.25	7.30	13.61	0.013	7.97	6.90	9.99	0.06	0.06	19.86	4.92	0.11	23.83	1.07
A	P-2009	PCO-2009	PRM- 2007	6.35	5.69	Circle		1.50	55.60	1.19	0.013	6.88	6.89	0.01	1.20	0.20	6.36	3.15	0.46	11.44	0.00
A	P-2007A	PRM-2007A	PRM- 2017	4.77	4.62	Circle		2.00	65.60	0.23	0.013	6.68	6.60	0.12	1.98	1.32	3.49	3.80	8.34	10.82	0.08
A	P-2007	PRM- 2007	PRM-2007A	5.09	4.78	Circle		2.00	133.20	0.23	0.013	6.81	6.69	0.10	1.91	1.24	3.52	3.77	7.74	10.91	0.12
A	P-2005A	INL 2005A	PCO 2005	5.40	5.20	Circle		2.00	34.00	0.59	0.013	6.94	6.94	0.02	1.74	0.59	5.59	4.26	3.34	17.34	0.00
A	P-2005	PCO 2005	PRM- 2007	5.10	5.06	Circle		2.00	29.20	0.15	0.013	6.91	6.89	0.09	1.83	1.38	2.86	3.15	7.27	8.88	0.02
A	P-2002A	INL 2002A	PCO- 2002	5.80	5.69	Circle		1.50	21.20	0.52	0.013	7.08	7.06	0.12	1.37	0.76	4.20	4.30	3.84	7.56	0.02
A	P-1059	INL 1059	PRM- 2007	7.68	7.40	Circle		1.00	105.70	0.26	0.013	7.94	7.62	0.28	0.22	0.26	2.29	1.69	0.28	1.83	0.33
A	P- 2002	PCO- 2002	PCO 2005	5.44	5.10	Circle		1.50	36.30	0.94	0.013	7.00	6.94	0.15	1.50	0.66	5.65	2.28	4.03	10.17	0.05
B	P-CBS 02	CBS 02	PRM-684B	3.50	2.50	Circle		1.25	11.80	8.48	0.013	5.01	5.00	0.08	1.25	0.26	15.68	1.48	1.81	18.81	0.01
B	P-684B	PRM-684B	PRM-2410	-0.14	-0.22	Circle		3.00	45.60	0.18	0.013	5.30	5.13	0.38	3.00	2.09	3.94	5.81	41.10	27.94	0.17
B	P-684A	PRM-684A	PRM-684B	-0.06	-0.14	Circle		3.00	54.60	0.15	0.013	5.19	5.00	0.36	3.00	2.05	3.59	5.63	39.80	25.52	0.19
B	P-657	PCO- 657	PRM-684	1.80	0.50	Circle		2.00	29.30	4.43	0.013	5.21	5.20	0.02	2.00	0.34	15.36	0.94	2.95	47.63	0.00
B	P-648	PRM-684	PRM-684A	0.00	-0.06	Circle		3.00	37.80	0.16	0.013	5.13	5.00	0.36	3.00	2.05	3.75	5.62	39.76	26.59	0.13
B	P-640	INL 1640	PRM-684A	3.50	2.40	Circle		1.25	11.70	9.40	0.013	5.00	5.00	0.00	1.25	0.09	16.50	0.16	0.19	19.80	0.00
B	P-600A	INL 600A	PCO-600	2.38	2.28	Circle		1.50	20.70	0.48	0.013	3.07	3.07	0.05	0.79	0.40	4.06	3.00	1.13	7.31	0.00
B	P-600	PCO-600	PCO-1655	2.23	2.11	Circle		1.50	46.20	0.26	0.013	3.05	3.04	0.04	0.93	0.52	2.97	2.55	1.40	5.35	0.01
B	P-2410D	PRM-2410D	PRM- 2342	-0.70	-0.79	Circle		3.00	45.30	0.20	0.013	3.58	3.34	0.52	3.00	2.26	4.19	6.81	48.13	29.74	0.24
B	P-2410C	PRM-2410C	PRM-2410D	-0.59	-0.70	Circle		3.00	60.80	0.18	0.013	3.95	3.64	0.51	3.00	2.24	3.99	6.71	47.42	28.36	0.31
B	P-2410B	PRM-2410B	PRM-2410C	-0.46	-0.59	Circle		3.00	76.40	0.17	0.013	4.39	4.02	0.49	3.00	2.23	3.88	6.60	46.68	27.52	0.37
B	P-2410A	PRM-2410A	PRM-2410B	-0.36	-0.46	Circle		3.00	53.90	0.19	0.013	4.71	4.46	0.47	3.00	2.20	4.05	6.47	45.73	28.72	0.25
B	P-2410	PRM-2410	PRM-2410A	-0.25	-0.36	Circle		3.00	59.70	0.18	0.013	5.04	4.77	0.46	3.00	2.19	4.03	6.37	44.99	28.63	0.27
B	P-2408	PCO- 2408	PRM-2410	1.44	0.00	Circle		1.50	11.30	12.72	0.013	5.31	5.30	0.05	1.50	0.26	20.81	1.39	2.45	37.46	0.01
B	P-2403	INL 2403	PCO- 2408	3.89	3.04	Circle		1.25	4.60	18.58	0.013	5.34	5.34	0.03	1.25	0.18	23.20	0.98	1.20	27.84	0.00
B	P-2402	INL 2402	PRM-2410A	3.61	2.50	Circle		1.25	12.60	8.84	0.013	5.01	5.00	0.04	1.25	0.22	16.00	1.09	1.34	19.20	0.01
B	P-2386	INL 2386	PCO-2380	2.39	2.09	Circle		1.25	7.90	3.79	0.013	5.84	5.83	0.14	1.25	0.37	10.48	1.97	2.41	12.58	0.01
B	P-2380	PCO-2380	PRM-2410	1.99	1.75	Circle		1.50	54.70	0.44	0.013	5.75	5.68	0.12	1.50	0.77	3.87	2.04	3.61	6.96	0.06
B	P-2372	INL 2372	PRM-2410B	3.79	2.50	Circle		1.25	12.30	10.49	0.013	5.02	5.01	0.06	1.25	0.24	17.43	10.15	1.65	20.92	0.01
B	P-2365	INL 2365	PRM-2410C	3.20	2.35	Circle		1.25	12.60	6.74	0.013	4.61	4.61	0.05	1.25	0.25	13.98	1.18	1.45	16.77	0.01
B	P-2353	INL 2353	PRM-2410D	3.36	2.35	Circle		1.25	12.80	7.86	0.013	4.22	4.23	0.04	1.25	0.23	15.09	8.64	1.34	18.11	0.01
B	P-2347	INL 2347	PRM- 2342	2.07	1.30	Circle		1.25	14.10	5.48	0.013	3.93	3.93	0.02	1.25	0.20	12.60	0.69	0.85	15.12	0.00
B	P-2342C	PRM-2342C	B	-1.00	-1.10	Circle		3.00	77.30	0.13	0.013	2.41	1.90	0.66	3.00	2.39	3.38	7.64	54.04	24.00	0.51
B	P-2342A	PRM-2342A	PRM-2342C	-0.91	-1.00	Circle		3.00	53.20	0.17	0.013	2.81	2.48	0.64	3.00	2.37	3.86	7.54	53.29	27.43	0.34

DATE: 9/11/2023 5:49:24 PM
FILE: ...\FM 519 HYDRAULIC COMP01.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 1 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		111

100% SUBMITTAL

CK DW CK DW

EXISTING CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
B	P-2342	PRM- 2342	PRM-2342A	-0.79	-0.91	Circle		3.00	61.60	0.19	0.013	3.26	2.88	0.61	3.00	2.35	4.15	7.38	52.17	29.43	0.38
B	P-2339	PCO- 2339	PRM- 2342	1.31	0.80	Circle		2.00	11.50	4.42	0.013	3.84	3.84	0.00	2.00	0.25	15.34	0.50	1.56	47.55	0.00
B	P-2337	INL 2337	PCO-2332	2.41	2.11	Circle		1.25	8.10	3.69	0.013	4.13	4.12	0.17	1.25	0.39	10.34	2.14	2.63	12.41	0.01
B	P-2332	PCO-2332	PRM- 2342	2.11	1.00	Circle		1.50	54.30	2.04	0.013	4.08	4.00	0.15	1.50	0.54	8.34	2.32	4.09	15.01	0.08
B	P-2312	INL 2312	PRM-2342A	2.77	2.20	Circle		1.25	12.40	4.59	0.013	3.52	3.55	0.08	1.25	0.29	11.54	7.56	1.63	13.85	0.03
B	P-2297	INL 2297	PRM-2342C	2.45	1.80	Circle		1.25	11.80	5.50	0.013	3.08	3.12	0.06	1.25	0.25	12.63	7.58	1.32	15.15	0.05
B	P-1664	PCO-1664	PRM- 1626	2.28	2.03	Circle		1.50	55.10	0.45	0.013	5.14	5.10	0.08	1.50	0.67	3.93	1.63	2.88	7.08	0.04
B	P-1663	INL 1663	PCO-1664	4.18	2.63	Circle		1.50	8.40	18.41	0.013	5.12	5.15	0.05	1.50	0.23	25.03	13.40	2.32	45.06	0.03
B	P-1662	INL 1662	INL 1663	4.65	4.38	Circle		1.25	66.80	0.40	0.013	5.06	4.92	0.29	0.54	0.41	3.43	2.72	0.94	4.11	0.14
B	P-1661	INL 1661	PCO-1660	2.88	2.84	Circle		1.50	8.00	0.50	0.013	4.58	4.58	0.02	1.50	0.44	4.12	0.80	1.41	7.41	0.00
B	P-1660	PCO-1660	PRM- 1636	2.54	1.30	Circle		1.50	54.70	2.27	0.013	4.57	4.53	0.07	1.50	0.43	8.79	1.59	2.81	15.82	0.04
B	P-1658	INL 1658	PRM-1636A	3.25	1.00	Circle		1.50	74.60	3.02	0.013	4.36	4.32	0.10	1.50	0.43	10.14	7.84	3.30	18.25	0.04
B	P-1657	INL 1657	PCO-1656	2.67	2.53	Circle		1.50	8.20	1.70	0.013	4.35	4.35	0.02	1.50	0.35	7.61	0.92	1.62	13.69	0.00
B	P-1656	PCO-1656	PRM- 1647	2.53	2.41	Circle		1.50	55.00	0.22	0.013	4.33	4.29	0.08	1.50	0.84	2.73	1.68	2.96	4.91	0.04
B	P-1655B	INL 1655C	PCO-1655	2.36	2.06	Circle		2.00	119.00	0.25	0.013	3.09	3.04	0.07	0.98	0.59	3.66	2.79	2.19	11.36	0.05
B	P-1655A	PRM-1655A	PRM- 1654	1.83	1.75	Circle		2.00	38.50	0.21	0.013	5.81	5.80	0.03	2.00	0.84	3.33	1.22	3.83	10.31	0.01
B	P-1655	PCO-1655	PRM-1655A	1.91	1.83	Circle		2.00	37.60	0.21	0.013	3.03	3.01	0.07	1.18	0.84	3.36	3.07	3.86	10.43	0.02
B	P-1654	PRM- 1654	PRM-684	0.05	0.00	Circle		3.00	44.90	0.11	0.013	5.34	5.20	0.32	3.00	2.00	3.14	5.34	37.78	22.27	0.14
B	P-1651	PCO- 1651	PRM- 1654	2.24	0.85	Circle		1.25	29.30	4.74	0.013	5.79	5.78	0.03	1.25	0.23	11.72	0.85	1.04	14.06	0.01
B	P-1650	PRM- 1650	PRM- 1654	0.49	0.05	Circle		3.00	75.70	0.58	0.013	5.59	5.39	0.27	3.00	1.82	7.16	4.92	34.77	50.85	0.21
B	P-1649	INL 1649	PRM- 1650	2.25	1.50	Circle		2.00	14.60	5.13	0.013	5.92	5.92	0.02	2.00	0.34	16.53	1.05	3.30	51.25	0.00
B	P-1648	INL 1648	PRM-1647A	2.30	1.70	Circle		2.00	12.10	4.95	0.013	4.00	4.00	0.02	2.00	0.33	16.24	8.81	3.01	50.34	0.00
B	P-1647A	PRM-1647A	PRM- 1650	0.66	0.49	Circle		3.00	39.30	0.43	0.013	5.72	5.63	0.23	3.00	1.91	6.18	4.55	32.18	43.86	0.09
B	P-1647	PRM- 1647	PRM-1647A	0.83	0.66	Circle		3.00	36.60	0.46	0.013	4.08	4.00	0.20	3.00	1.78	6.40	4.24	29.95	45.46	0.07
B	P-1646	PCO- 1646	PRM- 1647	1.78	1.74	Circle		2.00	10.60	0.38	0.013	4.24	4.24	0.00	2.00	0.41	4.49	0.41	1.30	13.93	0.00
B	P-1644	INL 1644	PRM-1636B	3.10	2.50	Circle		1.50	11.70	5.14	0.013	4.30	4.30	0.00	1.50	0.13	13.23	5.04	0.39	23.81	0.00
B	P-1639	INL 1639	PRM-1636A	3.73	3.00	Circle		1.50	13.70	5.34	0.013	4.34	4.42	0.87	1.42	0.33	13.48	8.99	2.63	24.27	0.08
B	P-1636B	PRM-1636B	PRM- 1647	0.91	0.88	Circle		3.00	22.40	0.13	0.013	4.13	4.10	0.17	3.00	1.68	3.44	3.84	27.15	24.41	0.04
B	P-1636A	PRM-1636A	PRM-1636B	1.00	0.91	Circle		3.00	68.00	0.13	0.013	4.26	4.15	0.16	3.00	1.68	3.42	3.83	27.05	24.26	0.11
B	P-1636	PRM- 1636	PRM-1636A	1.25	1.00	Circle		3.00	196.00	0.13	0.013	4.52	4.29	0.12	3.00	2.38	3.35	3.27	23.12	23.82	0.24
B	P-1635	PCO- 1635	PRM- 1636	1.77	1.72	Circle		2.00	10.80	0.46	0.013	4.58	4.58	0.06	2.00	0.84	4.96	1.80	5.64	15.39	0.01
B	P-1633	INL 1633	PCO- 1635	3.54	3.27	Circle		1.25	4.10	6.66	0.013	4.57	4.62	0.54	1.25	0.46	13.89	11.77	4.86	16.67	0.05
B	P-1628	INL 1628	PRM-1626A	3.44	3.00	Circle		1.25	12.40	3.54	0.013	4.80	4.80	0.00	1.25	0.12	10.13	0.19	0.24	12.16	0.00
B	P-1626A	PRM-1626A	PRM- 1636	1.61	1.25	Circle		2.00	65.90	0.55	0.013	4.85	4.54	0.47	2.00	1.52	5.39	4.93	15.50	16.72	0.31
B	P-1626	PRM- 1626	PRM-1626A	1.93	1.61	Circle		2.00	52.20	0.61	0.013	5.04	4.80	0.46	2.00	1.44	5.72	4.90	15.39	17.72	0.24
B	P-1625A	INL 1625A	PCO- 1625	2.85	2.25	Circle		2.00	38.10	1.58	0.013	5.43	5.42	0.02	2.00	0.42	9.16	0.88	2.77	28.40	0.01
B	P-1625	PCO- 1625	PRM- 1626	2.20	2.11	Circle		2.00	28.50	0.32	0.013	5.36	5.28	0.25	2.00	1.48	4.10	3.62	11.36	12.70	0.07
B	P-1624A	INL 1624A	PCO- 1624	3.50	2.46	Circle		2.00	23.10	4.51	0.013	5.19	5.19	0.13	2.00	0.56	15.50	11.44	8.25	48.05	0.01
B	P-1624	PCO- 1624	PCO- 1625	2.36	2.30	Circle		2.00	35.30	0.17	0.013	5.55	5.50	0.15	2.00	1.55	3.01	2.81	8.84	9.32	0.05
B	P-1610	INL 1610	PRM- 1571	4.13	4.10	Circle		1.25	12.10	0.25	0.013	5.27	5.27	0.03	1.17	0.52	2.68	2.41	1.16	3.22	0.00
B	P-1571	PRM- 1571	PRM- 1626	2.87	2.33	Circle		1.50	175.10	0.31	0.013	5.24	5.14	0.06	1.50	0.68	3.24	1.40	2.47	5.83	0.10
B	P-1568	INL 1568	PRM- 1571	3.25	3.10	Circle		1.25	63.30	0.24	0.013	5.30	5.27	0.05	1.25	0.61	2.62	1.22	1.50	3.14	0.03
C	P-7002	PCO-7002	PRM-1572A	3.31	3.09	Circle		1.50	54.30	0.40	0.013	4.14	4.08	0.21	0.99	0.74	3.71	3.75	3.23	6.68	0.06
C	P-1620	INL 1620	PRM-1573A	3.96	3.50	Circle		1.25	11.90	3.86	0.013	4.12	3.97	1.72	0.47	0.10	10.58	3.63	0.17	12.70	0.15
C	P-1619	PCO- 1619	PRM- 1573	1.98	1.87	Circle		1.50	28.90	0.38	0.013	4.05	3.99	0.22	1.50	0.97	3.60	2.77	4.90	6.48	0.06
C	P-1618	PCO- 1618	PCO- 1619	2.10	1.98	Circle		1.50	29.80	0.40	0.013	4.19	4.17	0.07	1.50	0.68	3.71	1.58	2.79	6.67	0.02
C	P-1616	INL 1616	PRM- 1572	3.78	3.22	Circle		1.25	12.90	4.35	0.013	4.14	4.03	1.73	0.81	0.21	11.23	6.08	0.83	13.47	0.11
C	P-1584	INL 1584	PRM-1573D	4.32	4.14	Circle		1.25	12.70	1.41	0.013	4.87	4.58	0.98	0.44	0.42	6.40	5.18	1.90	7.68	0.28
C	P-1580	INL 1580	PRM-1573C	4.19	3.50	Circle		1.25	13.00	5.32	0.013	4.71	3.82	2.41	0.32	0.29	12.42	8.13	1.74	14.90	0.90
C	P-1574A	INL 1574A	PCO- 1574	3.79	3.77	Circle		1.25	5.20	0.38	0.013	4.46	4.39	0.49	0.62	0.70	3.33	3.41	2.42	4.00	0.06
C	P-1574	PCO- 1574	PRM-1573B	1.47	1.43	Circle		1.50	8.40	0.48	0.013	3.82	3.81	0.07	1.50	0.65	4.03	1.60	2.82	7.25	0.01
C	P-1573D	PRM-1573D	C	1.22	0.90	Circle		2.00	84.20	0.38	0.013	3.28	2.90	0.45	2.00	1.40	4.50	4.83	15.16	13.94	0.38
C	P-1573C	PRM-1573C	PRM-1573D	1.36	1.22	Circle		2.00	52.90	0.26	0.013	3.51	3.32	0.37	2.00	1.33	3.75	4.37	13.74	11.64	0.20
C	P-1573B	PRM-1573B	PRM-1573C	1.54	1.36	Circle		2.00	75.70	0.24	0.013	3.78	3.55	0.30	2.00	1.27	3.56	3.97	12.48	11.03	0.23
C	P-1573A	PRM-1573A	PRM-1573B	1.72	1.54	Circle		2.00	73.20	0.25	0.013	3.90	3.82	0.11	2.00	1.19	3.62	2.36	7.43	11.22	0.08
C	P-1573	PRM- 1573	PRM-1573A	1.82	1.72	Circle		2.00	44.80	0.22	0.013	3.95	3.91	0.11	2.00	1.22	3.45	2.34	7.37	10.69	0.05
C	P-1572A	PRM-1572A	PRM- 1573	2.32	2.22	Circle		1.50	28.30	0.35	0.013	4.01	3.97	0.15	1.50	0.88	3.47	2.17	3.84	6.24	0.04
C	P-1572	PRM- 1572	PRM-1572A	2.52	2.32	Circle		1.50	53.50	0.37	0.013	4.02	4.02	0.01	1.50	0.36	3.57	0.47	0.83	6.42	0.00
C	P-1565	INL 1565	PCO-7002	3.34	3.31	Circle		1.50	8.40	0.36	0.013	4.16	4.16	0.06	0.85	0.50	3.49	2.93	1.51	6.29	0.00
C	P-1564	INL 1564	INL 1565	3.92	3.34	Circle		1.25	37.70	1.54	0.013	4.15	4.18	0.14	0.84	0.18	6.68	3.30	0.36	8.01	0.03
C	P-1563	INL 1563	PCO- 1562	2.97	2.93	Circle		1.50	8.00	0.50	0.013	4.04	4.04	0.15	1.11	0.74	4.13	4.17	3.59	7.44	0.00
C	P-1562	PCO- 1562	PRM-1573B	2.13	1.87	Circle		1.50	66.00	0.39	0.013	3.98	3.87	0.17	1.50	0.88	3.66	2.42	4.28	6.59	0.11
D	P-1603	PRM- 1603	PRM- 1600	3.84	3.77	Circle		2.00	101.20	0.07	0.013	5.82	5.78	0.04	2.00	1.35	1.92	2.10	4.75	5.95	0.04
D	P-1602	INL 1602	PRM- 1603	4.73	4.19	Circle		1.25	12.10	4.45	0.013	5.86	5.84	0.32	1.25	0.44	11.36	9.43	3.68	13.63	0.02
D	P-1600	PRM- 1600	PRM- 1594	3.67	3.13	Circle		2.00	132.10	0.41	0.013	5.76	5.56	0.15	2.00	1.11	4.66	2.76	8.66	14.46	0.19
D	P-1599	PCO- 1599	PRM- 1600	3.78	3.77	Circle		1.50	8.40	0.12	0.013	5.79	5.78	0.06	1.50	0.95	2.01	1.50	2.66	3.62	0.01
D	P-1597	INL 1597	PCO- 1599	5.37	5.23	Circle		1.25	4.20	3.37	0.013	5.96	5.68	1.10	0.45	0.36	9.88	7.37	2.19	11.86	0.28
D	P-1594B	PRM-1594B	D	2.69	2.60	Circle		2.00	44.80	0.20	0.013	4.85	4.60	0.55	2.00	1.48	3.27	5.35	16.81	10.14	0.25
D	P-1594A	PRM-1594A	PRM-1594B	2.99	2.69	Circle		2.00	74.60	0.40	0.013	5.31	4.90	0.56	2.00	1.48	4.63	5.37	16.89	14.35	0.42
D	P-1594	PRM- 1594	PRM-1594A	3.13	2.99	Circle		2.00	36.30	0.39	0.013	5.51	5.36	0.40	2.00	1.68	4.53	4.57	14.37	14.05	0.15
D	P-1593	PCO- 1593	PRM- 1594	3.77	3.65	Circle		1.50	28.90	0.42	0.013	5.83	5.79	0.15	1.50	0.83	3.76	2.27	4.02	6.77	0.04
D	P-1592A	INL 1593A	PCO- 1593	3.98	3.87	Circle		1.50	28.50	0.39	0.013	5.89	5.86	0.10	1.50	0.76	3.62	1.90	3.37	6.52	0.03
D	P-1591A	INL 1591B	PCO- 1591	3.90	3.65	Circle		1.50	65.10	0.38	0.013	5.65	5.62	0.05	1.50	0.62	3.62	1.33	2.36	6.51	0.03
D	P-1591	PCO- 1591	PRM-1594A	3.65	3.53	Circle		1.50	29.20	0.41	0.013	5.60	5.58	0.07	1.50	0.68	3.74	1.62	2.87	6.73	0.02
D	P-1587	INL 1587	PRM-1594B	5.38	5.34	Circle		1.25	12.70	0.31	0.013	5.38	5.34	0.31	0.00	0.00	3.02	0.00	0.00	3.62	0.04
D	P-1560	PCO-1560	PRM- 1594	3.72	3.50	Circle		1.50	54.30	0.41	0.013	5.60	5.55	0.08	1.50	0.71	3.72	1.72	3.05	6.69	0.05
D	P-1558	INL 1558	PCO-1560	4.26	3.82	Circle		1.50	8.00	5.47	0.013	5.61	5.61	0.02	1.50	0.26	13.66	7.94	1.67	24.58	0.00
D	P-1557	INL 1557	INL 1558	4.65	4.61	Circle		1.25	42.60	0.09	0.013	5.62	5.62	0.01	1.01	0.45	1.65	1.38	0.55	1.98	0.00
D	P-1556A	INL 1556A	PCO-1556	4.40	4.37	Circle		1.25	9.50	0.31	0.013	5.87	5.87	0.01	1.25	0.38	3.02	0.58	0.71	3.62	0.00
D	P-1556	PCO-1556	PRM- 1600	4.02	3.67	Circle		1.25	75.20	0.47	0.013	5.85	5.77	0.10	1.25	0.59	3.68	1.65	2.02	4.41	0.07
D	P-1554A	INL 1554A	PCO-1554	4.43	4.37	Circle		1.25	14.10	0.43	0.013	5.89	5.89	0.00	1.25	0.27	3.51	0.35	0.43	4.21	0.00
D	P-1554	PCO-1554	PCO-1556	4.37	4.32	Circle		1.25	35.80	0.14	0.013	5.88	5.87	0.03	1.25	0.59	2.01	0.88	1.08	2.41	0.01
D	P-1553	INL 1553	PRM- 1603	4.84	4.15	Circle		1.50	66.20	1.04	0.013	5.83	5.83	0.02	1.50	0.39	5.96	4.35	1.59	10.72	0.00
D	P-1552	INL 1552	INL 1553	5.24	4.99	Circle		1.25	44.30	0.56	0.013	5.85	5.85	0.08	0.86	0.41	4.04	3.22	1.12	4.85	0.00
E	P-1604	PRM- 1604	PRM- 1547	4.41	4.20	Circle		1.25	93.20	0.23	0.013	5.83	5.83	0.00	1.25	0.00	2.56	0.00	0.00	3.07	0.00
E	P-1551A	INL 1551A	PCO- 1551	2.28	2.12	Circle		2.50	38.60	0.41	0.013	6.44	6.20	0.63	2.50	1.94	5.39	6.64	32.61	26.40	0.24
E	P-1551	PCO- 1551	PRM- 1547	2.02	1.97	Circle		2.50	28.50	0.18	0.013	6.09	5.91	0.64	2.50	1.95	3.50	6.69	32.82	17.16	0.18
E	P-1550A	INL 1550A	PCO- 1550	2.25	2.13	Circle		3.00	23.60	0.51	0.013	5.93	5.91	0.09	3.00	1.37	6.70	2.88	20.38	47.54	0.02
E	P-1550	PCO- 1550	PRM-1547A	2.28	2.21	Circle		3.00	28.20	0.25	0.013	5.87	5.84	0.09	3.00	1.70	4.68	2.89	20.46	33.25	0.03
E	P-1547A	PRM-1547A	PRM-1526	2.16	2.05	Circle		4.00	74.00	0.15	0.013	5.78	5.70	0.11	3.65	3.01	4.39	5.00	50.61	55.37	0.08
E	P-1547	PRM- 1547	PRM-1547A	2.22	2.16	Circle		4.00	38.50	0.16	0.013	5.83	5.81	0.05	3.65	2.18	4.50	4.68	32.80	56.74	0.02

DATE: 9/11/2023 5:50:41 PM
FILE: ...\FM 519 HYDRAULIC COMP02.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 2 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		112

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
E	P-1546	INL 1546	INL 1544	5.02	3.94	Circle		1.25	49.10	2.20	0.013	5.87	5.87	0.02	1.25	0.27	7.98	5.05	1.00	9.58	0.00
E	P-1544	INL 1544	PRM-1547A	3.89	2.30	Circle		1.25	65.40	2.43	0.013	5.84	5.79	0.07	1.25	0.35	8.39	1.40	1.72	10.07	0.05
E	P-1543	PCO-1543	PRM-1526	4.00	2.50	Circle		1.50	55.40	2.71	0.013	5.72	5.69	0.06	1.50	0.39	9.60	1.42	2.50	17.28	0.03
E	P-1542	INL 1542	PCO-1543	4.72	4.20	Circle		1.25	12.40	4.20	0.013	5.74	5.74	0.03	1.25	0.25	11.03	6.56	1.12	13.24	0.00
E	P-1541	INL 1541	INL 1537	4.51	4.32	Circle		1.25	44.30	0.43	0.013	5.79	5.78	0.02	1.25	0.39	3.53	0.73	0.90	4.23	0.01
E	P-1537	INL 1537	PRM-1526C	4.32	2.50	Circle		1.00	59.80	3.04	0.013	5.72	5.61	0.19	1.00	0.34	7.76	1.97	1.55	6.21	0.11
E	P-1536	INL 1536	PRM-1526E	4.26	2.50	Circle		1.25	59.20	2.97	0.013	5.47	5.46	0.02	1.25	0.23	9.28	5.29	0.81	11.14	0.01
E	P-1532	PCO-1532	PRM- 1506	3.57	3.35	Circle		1.50	54.70	0.40	0.013	5.43	5.39	0.07	1.50	0.66	3.70	1.52	2.68	6.66	0.04
E	P-1531	INL 1531	PCO-1532	3.79	3.62	Circle		1.25	5.90	2.90	0.013	5.44	5.44	0.02	1.25	0.25	9.16	0.77	0.94	10.99	0.00
E	P-1526E	PRM-1526E	PRM- 1506	1.52	1.46	Circle		4.00	45.50	0.13	0.013	5.25	5.19	0.12	3.73	3.39	4.14	4.72	53.61	52.18	0.05
E	P-1526D	PRM-1526D	PRM-1526E	1.61	1.52	Circle		4.00	45.80	0.20	0.013	5.32	5.27	0.12	3.75	2.80	5.05	5.67	53.20	63.65	0.05
E	P-1526C	PRM-1526C	PRM-1526D	1.71	1.61	Circle		4.00	54.00	0.19	0.013	5.40	5.34	0.12	3.73	2.86	4.90	5.53	53.06	61.78	0.06
E	P-1526B	PRM-1526B	PRM-1526C	1.79	1.71	Circle		4.00	45.70	0.18	0.013	5.47	5.42	0.12	3.71	2.90	4.77	5.39	52.54	60.09	0.05
E	P-1526A	PRM-1526A	PRM-1526B	1.93	1.79	Circle		4.00	83.20	0.17	0.013	5.59	5.50	0.11	3.71	2.93	4.68	5.30	52.24	58.93	0.09
E	P-1526	PRM-1526	PRM-1526A	2.05	1.93	Circle		4.00	68.90	0.17	0.013	5.68	5.61	0.11	3.68	2.88	4.76	5.37	52.02	59.93	0.07
E	P-1525	PCO- 1525	PRM-1526	3.20	2.95	Circle		1.50	10.70	2.33	0.013	5.84	5.84	0.02	1.50	0.32	8.91	0.90	1.59	16.04	0.00
E	P-1523	INL 1523	PCO- 1525	5.55	5.35	Circle		1.25	4.20	4.72	0.013	5.88	5.85	2.67	0.50	0.19	11.70	6.01	0.72	14.04	0.03
E	P-1519	INL 1519	PRM-1526A	5.22	3.50	Circle		1.25	12.10	14.19	0.013	5.76	5.79	0.03	1.25	0.16	20.28	9.40	0.88	24.33	0.04
E	P-1516	INL 1516	PRM-1526B	4.69	3.00	Circle		1.25	11.40	14.84	0.013	5.68	5.68	0.03	1.25	0.18	20.73	10.16	1.09	24.88	0.00
E	P-1511	INL 1511	PRM-1526D	5.23	3.50	Circle		1.25	13.00	13.33	0.013	5.53	5.53	0.77	1.25	0.14	19.65	8.11	0.58	23.58	0.00
E	P-1509	INL 1509	PRM-1526E	5.12	3.00	Circle		1.25	12.50	17.00	0.013	5.39	5.46	0.15	1.25	0.12	22.19	8.29	0.47	26.63	0.07
E	P-1506A	PRM-1506A	E	0.95	0.90	Circle		4.00	22.90	0.22	0.013	4.93	4.90	0.15	4.00	2.78	5.32	5.97	55.68	67.05	0.03
E	P-1506	PRM- 1506	PRM-1506A	1.46	0.95	Circle		4.00	161.20	0.32	0.013	5.16	4.96	0.14	4.00	2.44	6.41	6.94	55.75	80.80	0.21
E	P-1505	PCO- 1505	PRM- 1506	2.85	1.46	Circle		1.50	11.70	11.91	0.013	5.27	5.26	0.10	1.50	0.31	20.14	1.90	3.35	36.26	0.01
E	P-1503	INL 1503	PCO- 1505	4.32	3.05	Circle		1.25	4.10	31.25	0.013	5.31	5.31	0.05	1.25	0.17	30.09	14.46	1.48	36.11	0.01
E	P-1500	INL 1500	PRM-1506A	5.17	4.00	Circle		1.25	12.50	9.38	0.013	5.40	5.16	2.52	1.16	0.11	16.49	6.10	0.34	19.79	0.24
E1	P-1530	INL 1530	E1	4.57	2.80	Circle		1.50	66.60	2.66	0.013	4.87	4.30	1.02	1.50	0.20	9.51	4.69	0.67	17.12	0.57
E2	P-1497	INL 1497	E2	1.37	1.35	Circle		3.00	2.90	0.68	0.013	4.35	4.35	0.05	3.00	1.05	7.75	6.56	14.45	55.01	0.00
E3	P-1484	PCO-1484	E3	3.56	3.43	Circle		1.25	32.80	0.40	0.013	4.68	4.68	0.00	1.25	0.28	3.38	2.16	0.44	4.06	0.00
F	P-1495B	PRM-1495B	F	0.50	-1.00	Circle		4.00	94.00	1.60	0.013	2.84	3.00	0.09	4.00	1.25	14.40	11.44	38.24	181.49	0.16
F	P-1495A	INL 1495A	PCO- 1495	1.40	1.04	Circle		2.00	159.50	0.23	0.013	3.35	2.82	0.31	1.78	1.32	3.47	4.31	13.54	10.75	0.53
F	P-1495	PCO- 1495	PRM-1495B	1.04	0.50	Circle		4.00	27.80	1.94	0.013	2.82	2.86	0.03	2.36	0.71	15.89	9.09	13.57	200.17	0.04
F	P-1491	INL 1491	PRM-1451A	4.96	4.00	Circle		1.25	11.50	8.34	0.013	5.32	4.19	4.15	0.19	0.18	15.54	7.69	0.85	18.65	1.13
F	P-1477	PCO-1477	PRM-1383A	5.75	4.85	Circle		1.50	56.30	1.60	0.013	7.10	7.07	0.05	1.50	0.42	7.38	5.65	2.32	13.28	0.02
F	P-1476	INL 1476	PCO-1477	6.24	5.95	Circle		1.25	6.30	4.59	0.013	7.09	7.11	0.07	1.16	0.29	11.53	7.57	1.64	13.84	0.02
F	P-1473	INL 1473	INL 1469	5.40	5.30	Circle		1.25	31.80	0.31	0.013	6.19	6.18	0.08	0.88	0.55	3.02	2.79	1.46	3.62	0.02
F	P-1471	PCO-1471	PRM- 1421	4.74	4.35	Circle		1.50	54.80	0.71	0.013	6.14	6.10	0.08	1.50	0.60	4.92	4.52	2.98	8.86	0.04
F	P-1469	INL 1469	PCO-1471	5.25	4.99	Circle		1.25	6.90	3.77	0.013	6.12	6.15	0.13	1.16	0.36	10.45	7.72	2.24	12.54	0.03
F	P-1463	INL 1463	PCO-1461	4.27	4.07	Circle		1.25	82.50	0.24	0.013	6.12	6.10	0.02	1.25	0.43	2.65	0.65	0.79	3.18	0.01
F	P-1461A	INL 1461A	PCO-1461	3.55	3.47	Circle		1.25	15.40	0.52	0.013	6.15	6.14	0.02	1.25	0.35	3.88	0.65	0.79	4.66	0.00
F	P-1461	PCO-1461	PCO-1460	3.32	3.10	Circle		1.25	36.90	0.60	0.013	6.04	5.97	0.21	1.25	0.69	4.15	2.40	2.94	4.98	0.08
F	P-1460A	INL 1460A	PCO-1460	3.50	3.20	Circle		1.25	25.50	1.17	0.013	5.95	5.94	0.02	1.25	0.30	5.83	0.73	0.89	7.00	0.00
F	P-1460	PCO-1460	PRM-1435A	3.00	2.89	Circle		1.25	69.60	0.16	0.013	5.83	5.56	0.38	1.25	0.81	2.14	3.25	3.99	2.57	0.27
F	P-1459	INL 1459	INL 1455	4.10	3.87	Circle		1.25	54.90	0.42	0.013	4.90	4.90	0.02	1.03	0.36	3.48	2.58	0.75	4.18	0.00
F	P-1455	INL 1455	PCO-1454	3.87	3.76	Circle		1.25	8.70	1.27	0.013	4.86	4.86	0.10	1.10	0.46	6.07	5.13	2.10	7.28	0.00
F	P-1454	PCO-1454	PRM- 1451	3.76	2.20	Circle		1.25	55.20	2.83	0.013	4.80	4.67	0.29	1.25	0.49	9.05	7.87	3.47	10.86	0.12
F	P-1451A	PRM-1451A	PRM-1495B	1.44	1.21	Circle		2.50	59.30	0.39	0.013	3.69	3.12	0.55	1.91	1.91	5.21	6.40	31.40	25.53	0.57
F	P-1451	PRM- 1451	PRM-1451A	2.07	1.44	Circle		2.50	159.60	0.39	0.013	4.63	3.74	0.52	2.30	1.90	5.26	6.34	31.14	25.77	0.89
F	P-1450	PCO- 1450	PRM- 1451	3.02	2.07	Circle		1.25	10.70	8.90	0.013	4.86	4.83	0.28	1.25	0.36	16.06	2.77	3.40	19.27	0.03
F	P-1446	INL 1446	PCO- 1450	4.12	3.37	Circle		1.25	4.30	17.33	0.013	4.94	4.97	0.07	1.25	0.21	22.41	12.03	1.60	26.89	0.03
F	P-1444	INL 1444	PRM-1435C	4.30	3.20	Circle		1.25	12.50	8.83	0.013	5.24	5.24	0.02	1.25	0.18	15.99	7.82	0.84	19.19	0.00
F	P-1439	INL 1439	PRM-1435B	4.67	4.00	Circle		1.25	11.70	5.71	0.013	5.64	5.64	0.00	1.25	0.12	12.87	4.89	0.29	15.44	0.00
F	P-1437A	INL 1437A	PCO- 1437	4.30	3.19	Circle		1.25	15.50	7.18	0.013	6.88	6.55	2.10	1.25	0.66	14.43	7.64	9.37	17.31	0.33
F	P-1437	PCO- 1437	PRM-1435A	3.14	2.85	Circle		1.25	28.20	1.03	0.013	6.22	5.61	2.17	1.25	1.17	5.46	7.76	9.52	6.55	0.61
F	P-1436A	INL 1436A	PCO- 1436	3.50	3.13	Circle		2.00	49.60	0.75	0.013	5.73	5.72	0.02	2.00	0.54	6.30	0.99	3.10	19.54	0.01
F	P-1436	PCO- 1436	PRM- 1435	3.08	2.71	Circle		2.00	28.40	1.30	0.013	5.71	5.70	0.04	2.00	0.57	8.33	1.44	4.51	25.83	0.01
F	P-1435C	PRM-1435C	PRM- 1451	2.27	2.17	Circle		2.50	39.30	0.25	0.013	4.87	4.69	0.45	2.50	1.79	4.22	5.59	27.42	20.69	0.18
F	P-1435B	PRM-1435B	PRM-1435C	2.50	2.27	Circle		2.50	80.70	0.28	0.013	5.26	4.91	0.44	2.50	1.77	4.47	5.51	27.06	21.89	0.35
F	P-1435A	PRM-1435A	PRM-1435B	2.63	2.50	Circle		2.50	47.00	0.28	0.013	5.51	5.30	0.43	2.50	1.77	4.40	5.49	26.96	21.58	0.20
F	P-1435	PRM- 1435	PRM-1435A	2.71	2.63	Circle		2.50	32.30	0.25	0.013	5.66	5.56	0.30	2.50	1.61	4.17	4.58	22.49	20.41	0.10
F	P-1433	INL 1433	PRM-1421C	5.12	4.00	Circle		1.25	11.60	9.63	0.013	5.99	5.99	0.00	1.25	0.12	16.70	6.48	0.40	20.04	0.00
F	P-1429	INL 1429	PRM-1421B	4.83	3.50	Circle		1.25	11.70	11.34	0.013	5.92	5.92	0.00	1.25	0.10	18.13	6.36	0.31	21.75	0.00
F	P-1423	INL 1423	PRM-1421A	5.72	4.50	Circle		1.25	12.00	10.15	0.013	6.19	6.20	0.01	1.25	0.13	17.15	6.74	0.43	20.58	0.01
F	P-1421C	PRM-1421C	PRM- 1435	3.31	3.05	Circle		2.50	44.30	0.59	0.013	5.80	5.69	0.24	2.50	1.45	6.41	6.79	20.04	31.43	0.11
F	P-1421B	PRM-1421B	PRM-1421C	3.62	3.31	Circle		2.50	54.00	0.57	0.013	5.92	5.82	0.22	2.50	1.45	6.34	6.70	19.75	31.06	0.10
F	P-1421A	PRM-1421A	PRM-1421B	3.90	3.62	Circle		2.50	49.50	0.57	0.013	6.00	5.94	0.21	2.32	1.44	6.29	6.65	19.53	30.84	0.06
F	P-1421	PRM- 1421	PRM-1421A	4.19	3.90	Circle		2.50	52.70	0.54	0.013	6.07	6.02	0.23	2.12	1.45	6.18	6.53	19.22	30.26	0.05
F	P-1420	PCO- 1420	PRM- 1421	4.34	4.30	Circle		1.25	8.10	0.49	0.013	6.08	6.08	0.03	1.25	0.42	3.78	0.91	1.11	4.53	0.00
F	P-1417	INL 1417	PCO- 1420	6.42	4.94	Circle		1.25	4.10	35.99	0.013	6.71	6.08	17.63	1.14	0.10	32.29	11.31	0.55	38.75	0.63
F	P-1412	INL 1412	PRM-1383D	6.96	5.50	Circle		1.25	12.50	11.67	0.013	7.20	6.62	5.22	1.12	0.11	18.38	6.76	0.37	22.06	0.57
F	P-1410	INL 1410	PRM-1383C	6.83	6.00	Circle		1.25	12.00	6.89	0.013	7.08	6.90	2.20	0.90	0.14	14.13	5.83	0.42	16.95	0.18
F	P-1405	INL 1405	PRM-1383B	6.95	5.00	Circle		1.25	12.20	16.00	0.013	7.18	6.85	3.34	1.25	0.10	21.53	7.38	0.35	25.84	0.33
F	P-1393	INL 1393	PRM- 1371	6.30	6.23	Circle		1.25	62.80	0.11	0.013	7.21	7.19	0.02	0.96	0.57	1.80	1.68	0.91	2.16	0.01
F	P-1390	INL 1390	INL 1476	6.77	6.24	Circle		1.25	61.90	0.86	0.013	7.12	7.12	0.18	0.88	0.31	4.98	3.38	0.79	5.98	0.00
F	P-1385A	INL 1385A	PCO-1385	5.00	4.91	Circle		2.00	21.60	0.42	0.013	7.14	7.13	0.05	2.00	0.80	4.71	1.58	4.97	14.59	0.01
F	P-1385	PCO-1385	PRM-1383A	4.71	4.62	Circle		2.00	29.00	0.31	0.013	7.12	7.10	0.05	2.00	0.90	4.06	1.66	5.22	12.59	0.02
F	P-1384A	INL 1384A	PCO-1384	5.27	4.83	Circle		2.00	123.70	0.36	0.013	7.24	7.20	0.03	2.00	0.77	4.35	3.79	4.19	13.49	0.04
F	P-1384	PCO-1384	PRM- 1383	4.83	4.71	Circle		2.00	28.90	0.42	0.013	7.19	7.17	0.06	2.00	0.86	4.70	1.79	5.62	14.58	0.02
F	P-1383D	PRM-1383D	PRM- 1421	4.32	4.19	Circle		2.00	50.80	0.26	0.013	6.33	6.10	0.43	1.91	1.42	3.69	4.93	15.50	11.45	0.23
F	P-1383C	PRM-1383C	PRM-1383D	4.45	4.32	Circle		2.00	52.00	0.25	0.013	6.61	6.37	0.45	2.00	1.41	3.65	4.85	15.24	11.32	0.24
F	P-1383B	PRM-1383B	PRM-1383C	4.55	4.45	Circle		2.00	45.60	0.22	0.013	6.84	6.65	0.44	2.00	1.39	3.42	4.75	14.92	10.60	0.20
F	P-1383A	PRM-1383A	PRM-1383B	4.63	4.55	Circle		2.00	32.60	0.25	0.013	7.02	6.89	0.42	2.00	1.38	3.62	4.66	14.65	11.21	0.14
F	P-1383	PRM- 1383	PRM-1383A	4.71	4.63	Circle		2.00	32.70	0.24	0.013	7.12	7.08	0.11	2.00	1.21	3.61	2.41	7.57	11.18	0.04
F	P-1381	INL 1381	PRM-1371B	7.48	6.20	Circle		1.25	12.60	10.19	0.013	7.71	7.18	4.90	0.98	0.12	17.18	6.41	0.36	20.62	0.54
F	P-1378	INL 1378	PRM-1371A	7.65	6.20	Circle		1.25	12.40	11.68	0.013	7.90	7.18	6.49	0.98	0.12	18.39	7.02	0.42	22.07	0.72
F	P-1374	INL 1374	PRM- 1371	6.43	6.28	Circle		1.25	12.50	1.20	0.013	7.19	7.19	0.01	0.91	0.24	5.90	3.49	0.59	7.08	0.00
F	P-1371B	PRM-1371B	PRM- 1383	5.52	5.21	Circle		1.50	44.60	0.70	0.013	7.16	7.14	0.04	1.50	0.51	4.87	1.24	2.20	8.76	0.02
F	P-1371A	PRM-1371A	PRM-1371B	5.82	5.52	Circle		1.50	62.20	0.48	0.013	7.18	7.16	0.03	1.50	0.52	4.05	3.45	1.87	7.29	0.02
F	P-1371	PRM- 1371	PRM-1371A	6.08	5.82	Circle		1.50	47.10	0.55	0.013	7.19	7.18	0.02	1.36	0.44	4.34	3.39	1.47	7.81	0.00
F2	P-1496	PCO- 1496	F2	0.93	0.70	Circle		4.00	4.00	5.75	0.013	4.70	4.70	0.00	4.00	0.11	27.34	4.67	0.43	344.49	0.00
F4	P-1485	PCO-1485	F4	4.65	4.62	Circle		1.25	4.50	0.66	0.013	5.87	5.87	0.02	1.25	0.36	4.39	3.27	0.97	5.27	0.00

DATE: 9/11/2023 5:51:57 PM
FILE: ...\FM 519 HYDRAULIC COMP03.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 3 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		113

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US	DS							US ELEV	DS ELEV	SLOPE	UNIFORM	ACTUAL	UNIFORM	ACTUAL	Q		LOSS
				(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft/s)	(ft/s)	(cfs)	(cfs)	(ft)
G	P-1400	INL 1400	PCO-1345	7.20	6.98	Circle		1.25	7.00	3.13	0.013	9.87	9.86	0.26	1.25	0.46	9.53	2.68	3.29	11.43	0.02
G	P-1399A	INL 1399A	PCO-1399	7.50	5.92	Circle		1.50	58.10	2.72	0.013	9.46	9.46	0.00	1.50	0.21	9.63	0.42	0.74	17.33	0.00
G	P-1399	PCO-1399	PRM- 1356	5.92	5.58	Circle		1.50	75.30	0.45	0.013	9.44	9.39	0.07	1.50	0.66	3.92	1.59	2.82	7.06	0.05
G	P-1398	PCO-1398	PCO-1399	6.30	5.92	Circle		1.50	36.40	1.04	0.013	9.48	9.47	0.03	1.50	0.41	5.96	1.00	1.77	10.73	0.01
G	P-1396	INL 1396	PRM- 1370	6.71	6.58	Circle		1.50	54.20	0.24	0.013	8.55	8.54	0.01	1.50	0.50	2.86	0.70	1.23	5.15	0.01
G	P-1395	INL 1395	INL 1396	6.90	6.86	Circle		1.25	7.70	0.52	0.013	8.55	8.55	0.01	1.25	0.30	3.88	0.48	0.59	4.65	0.00
G	P-1370C	PRM-1370C	PRM- 1356	5.75	5.53	Circle		2.00	35.90	0.61	0.013	9.43	9.40	0.08	2.00	0.84	5.71	2.09	6.58	17.71	0.03
G	P-1370B	PRM-1370B	PRM-1370C	6.15	5.75	Circle		2.00	65.30	0.61	0.013	8.87	8.86	0.03	2.00	0.61	5.71	1.14	3.59	17.71	0.02
G	P-1370A	PRM-1370A	PRM-1370B	6.55	6.15	Circle		2.00	60.40	0.66	0.013	8.70	8.70	0.01	2.00	0.51	5.94	0.84	2.65	18.41	0.01
G	P-1370	PRM- 1370	PRM-1370A	6.72	6.55	Circle		1.50	28.70	0.59	0.013	8.53	8.52	0.05	1.50	0.54	4.49	1.27	2.24	8.08	0.01
G	P-1369	PCO-1369	PRM- 1370	6.78	6.73	Circle		1.25	8.30	0.61	0.013	8.55	8.54	0.03	1.25	0.40	4.19	0.90	1.10	5.03	0.00
G	P-1366	INL-1366	PCO-1369	7.51	6.78	Circle		1.25	5.50	13.36	0.013	8.55	8.55	0.00	1.25	0.11	19.68	7.25	0.40	23.61	0.00
G	P-1362	INL-1362	PRM-1370A	7.61	5.77	Circle		1.25	13.10	14.01	0.013	8.52	8.52	0.01	1.25	0.12	20.15	7.74	0.47	24.18	0.00
G	P-1359	INL 1359	PRM-1370B	8.00	6.00	Circle		1.25	11.30	17.74	0.013	8.67	8.70	0.03	1.25	0.17	22.67	10.93	1.14	27.20	0.03
G	P-1358	PCO-1358	PRM-1370C	6.10	5.00	Circle		1.50	28.30	3.89	0.013	8.89	8.86	0.11	1.50	0.42	11.52	2.01	3.56	20.73	0.03
G	P-1357A	INL 1357A	PCO-1357	7.50	6.34	Circle		1.50	21.60	5.37	0.013	9.48	9.46	0.09	1.50	0.36	13.52	1.78	3.15	24.34	0.02
G	P-1357	PCO-1357	PRM- 1356	6.04	5.58	Circle		1.50	28.60	1.61	0.013	9.43	9.40	0.11	1.50	0.52	7.39	1.98	3.49	13.31	0.03
G	P-1356A	PRM-1356A	PRM- 1346	4.98	4.77	Circle		2.00	63.50	0.33	0.013	9.44	9.19	0.40	2.00	1.36	4.20	4.55	14.28	13.01	0.25
G	P-1356	PRM- 1356	PRM-1356A	5.43	4.98	Circle		2.00	126.30	0.36	0.013	9.34	8.97	0.29	2.00	1.48	4.35	3.87	12.14	13.50	0.36
G	P-1355	INL 1355	PRM-1356A	7.49	6.00	Circle		1.25	12.70	11.73	0.013	8.99	8.97	0.14	1.25	0.28	18.43	2.00	2.45	22.12	0.02
G	P-1349	PRM-1346B	PRM- 1330	4.16	4.05	Circle		2.00	35.10	0.31	0.013	9.87	9.54	0.94	2.00	1.67	4.08	6.99	21.97	12.66	0.33
G	P-1348	INL 1348	PCO-1347	7.94	7.08	Circle		1.25	4.10	21.23	0.013	9.12	9.12	0.03	1.25	0.17	24.80	11.75	1.16	29.76	0.00
G	P-1347	PCO-1347	PRM- 1346	6.78	4.77	Circle		1.50	9.10	22.11	0.013	9.11	9.11	0.03	1.50	0.19	27.44	1.00	1.76	49.40	0.00
G	P-1346A	PRM-1346A	PRM-1346B	4.24	4.16	Circle		2.00	36.30	0.22	0.013	8.52	8.24	0.79	2.00	1.61	3.43	6.42	20.17	10.63	0.29
G	P-1346	PRM- 1346	PRM-1346A	4.62	4.24	Circle		2.00	156.50	0.24	0.013	9.06	8.00	0.68	2.00	1.56	3.60	5.95	18.68	11.15	1.07
G	P-1345	PCO-1345	PRM- 1346	6.98	6.62	Circle		1.50	53.50	0.67	0.013	9.83	9.75	0.15	1.50	0.72	4.79	2.29	4.05	8.62	0.08
G	P-1337	PCO-1337	PRM- 1324	5.17	5.00	Circle		1.25	54.30	0.31	0.013	8.85	8.63	0.39	1.25	0.81	3.01	3.30	4.05	3.61	0.21
G	P-1336	INL 1336	PCO-1337	5.25	5.22	Circle		1.25	8.00	0.37	0.013	8.85	8.84	0.08	1.25	0.61	3.28	1.53	1.87	3.94	0.01
G	P-1334	PCO-1334	PRM- 1330	5.54	4.35	Circle		1.50	53.60	2.22	0.013	9.56	9.54	0.02	1.50	0.33	8.69	0.92	1.63	15.65	0.01
G	P-1332B	INL 1332B	PRM-1346A	5.50	4.40	Circle		1.25	13.60	8.09	0.013	8.01	8.00	0.12	1.25	0.30	15.31	1.83	2.25	18.37	0.02
G	P-1332A	INL 1332A	PCO-1332	5.60	5.25	Circle		1.50	78.50	0.45	0.013	8.27	8.26	0.02	1.50	0.45	3.89	0.78	1.39	7.01	0.01
G	P-1332	PCO-1332	PRM-1346B	5.15	4.38	Circle		1.50	28.80	2.68	0.013	8.25	8.24	0.05	1.50	0.38	9.55	1.34	2.37	17.19	0.01
G	P-1331A1	PCO-1331	PRM- 1330	4.81	4.40	Circle		1.50	29.10	1.41	0.013	9.55	9.54	0.01	1.50	0.31	6.92	0.65	1.14	12.46	0.00
G	P-1331A	INL 1331A	PCO-1331	6.00	5.11	Circle		1.50	20.70	4.30	0.013	9.22	9.22	0.01	1.50	0.21	12.10	0.51	0.89	21.78	0.00
G	P-1330	PRM- 1330	PRM- 1324	4.05	3.65	Circle		2.00	158.70	0.25	0.013	9.56	7.77	1.13	2.00	1.74	3.66	7.64	24.00	11.36	1.79
G	P-1326	INL 1326	PCO-1325	4.71	4.53	Circle		1.25	4.80	3.73	0.013	7.64	7.64	0.02	1.25	0.23	10.40	0.75	0.92	12.48	0.00
G	P-1325	PCO-1325	PRM- 1324	3.88	3.65	Circle		1.50	8.10	2.83	0.013	7.63	7.63	0.06	1.50	0.39	9.81	1.46	2.57	17.66	0.00
G	P-1324	PRM- 1324	G	3.50	2.72	Circle		2.00	174.40	0.45	0.013	7.52	4.72	1.61	2.00	1.84	4.88	9.13	28.68	15.13	2.80
G1	P-1340	PCO-1340	G1	4.27	3.50	Circle		1.25	37.90	2.03	0.013	5.00	4.75	1.16	1.25	0.52	7.68	6.87	3.28	9.21	0.25
G1	P-1339A	INL 1339A	PCO-1339	5.50	4.63	Circle		1.25	16.30	5.35	0.013	6.14	5.38	5.18	0.75	0.35	12.45	9.13	2.59	14.94	0.76
G1	P-1339	PCO-1339	PCO-1340	4.33	4.32	Circle		1.25	35.90	0.03	0.013	5.30	5.17	0.25	0.85	0.68	0.90	2.31	2.83	1.08	0.13
H	P-1322	PCO-1322	PRM-1317B	4.43	-1.25	Circle		1.50	29.40	19.31	0.013	4.63	1.56	10.68	1.50	0.09	25.64	7.31	0.30	46.16	3.07
H	P-1321	PCO-1321	PRM-1317A	4.40	-1.20	Circle		1.50	29.20	19.15	0.013	5.03	2.00	11.02	1.50	0.25	25.53	14.27	2.73	45.96	3.02
H	P-1319A	INL 1319A	PCO-1319	4.00	3.38	Circle		1.25	20.00	3.09	0.013	5.40	5.39	0.01	1.25	0.22	9.47	0.64	0.78	11.36	0.00
H	P-1319	PCO-1319	PCO-1279	3.78	3.71	Circle		1.50	36.10	0.19	0.013	5.38	5.37	0.03	1.50	0.65	2.57	1.03	1.81	4.63	0.01
H	P-1318B	PRM-1318B	PRM-1317	-0.89	-1.16	Circle		3.00	129.60	0.21	0.013	4.47	3.47	0.77	3.00	2.47	4.29	8.27	58.46	30.44	1.00
H	P-1318A	PRM-1318A	PRM-1318B	-0.76	-0.89	Circle		3.00	85.70	0.15	0.013	5.21	4.58	0.73	3.00	2.44	3.66	8.05	56.89	25.98	0.62
H	P-1318	PRM- 1318	PRM-1318A	-0.71	-0.75	Circle		3.00	31.70	0.13	0.013	5.34	5.16	0.57	3.00	2.31	3.34	7.10	50.18	23.68	0.18
H	P-1317B	PRM-1317B	H	-1.55	-1.59	Circle		3.00	17.10	0.22	0.013	1.56	1.41	0.85	3.00	2.53	4.44	8.69	61.42	31.50	0.14
H	P-1317A	PRM-1317A	PRM-1317B	-1.47	-1.55	Circle		3.00	37.70	0.21	0.013	1.97	1.65	0.84	3.00	2.52	4.33	8.67	61.30	30.71	0.32
H	P-1317	PRM-1317	PRM-1317A	-1.16	-1.47	Circle		3.00	161.20	0.19	0.013	3.37	2.07	0.80	3.00	2.50	4.12	8.46	59.80	29.25	1.30
H	P-1314	INL 1314	PRM-1317	5.66	4.00	Circle		1.25	21.10	7.86	0.013	6.16	4.26	4.35	0.26	0.25	15.09	9.13	1.62	18.11	1.90
H	P-1312	INL 1312	PRM-1318B	6.31	4.00	Circle		1.25	13.30	17.38	0.013	6.80	5.57	10.42	1.25	0.20	22.44	11.82	1.51	26.93	1.23
H	P-1308	PCO-1308	PRM-1318A	3.99	0.00	Circle		1.50	28.00	14.24	0.013	5.16	5.16	0.17	1.50	0.33	22.02	14.70	4.31	39.63	0.01
H	P-1307A	INL 1307A	PCO-1307	5.00	4.27	Circle		1.50	22.40	3.25	0.013	5.34	5.28	0.76	1.01	0.21	10.53	5.37	0.83	18.95	0.06
H	P-1307	PCO-1307	PCO-1308	4.37	4.09	Circle		1.50	36.10	0.78	0.013	5.25	5.26	0.05	1.17	0.45	5.14	4.09	1.85	9.26	0.00
H	P-1304C	PRM-1304C	PRM- 1293	-0.11	-0.15	Circle		3.00	45.70	0.09	0.013	5.39	5.16	0.51	3.00	2.25	2.78	6.77	47.83	19.74	0.23
H	P-1304B1	PRM-1304B	PRM-1304C	-0.03	-0.11	Circle		3.00	68.80	0.12	0.013	5.79	5.47	0.46	3.00	2.20	3.20	6.43	45.44	22.74	0.32
H	P-1304B	PRM-1304A	PRM-1304B	0.02	-0.03	Circle		3.00	38.60	0.13	0.013	5.74	5.56	0.46	3.00	2.20	3.38	6.42	45.41	24.01	0.18
H	P-1304	PRM- 1304	PRM-1304A	0.07	0.02	Circle		3.00	38.40	0.13	0.013	5.98	5.82	0.41	3.00	2.13	3.39	6.06	42.85	24.07	0.16
H	P-1303A	INI 1303A	PCO-1303	4.50	3.97	Circle		1.25	20.30	2.61	0.013	5.87	5.87	0.02	1.25	0.24	8.69	0.71	0.87	10.43	0.00
H	P-1303	PCO-1303	PCO-1302	3.82	3.65	Circle		1.50	36.10	0.47	0.013	5.85	5.84	0.03	1.50	0.51	4.01	1.03	1.81	7.21	0.01
H	P-1302A	INL 1302A	PCO-1302	4.00	3.65	Circle		1.25	18.50	1.89	0.013	5.85	5.85	0.01	1.25	0.24	7.40	0.57	0.70	8.88	0.00
H	P-1302	PCO-1302	PRM-1304A	3.55	0.50	Circle		1.50	28.60	10.67	0.013	5.82	5.78	0.12	1.50	0.33	19.06	2.02	3.56	34.31	0.03
H	P-1299	INL 1299	PRM-1304B	5.39	3.00	Circle		1.25	15.70	15.18	0.013	5.55	5.56	0.29	1.25	0.07	20.97	5.96	0.18	25.16	0.01
H	P-1296	INL 1296	PRM-1304C	5.49	4.00	Circle		1.25	21.00	7.10	0.013	5.96	5.97	0.01	1.25	0.12	14.34	5.58	0.35	17.21	0.01
H	P-1293A	PRM-1293A	PRM- 1318	-0.38	-0.61	Circle		3.00	116.90	0.20	0.013	6.09	5.42	0.57	3.00	2.31	4.17	7.14	50.47	29.58	0.67
H	P-1293	PRM- 1293	PRM-1293A	-0.15	-0.38	Circle		3.00	117.10	0.20	0.013	5.09	4.47	0.53	3.00	2.27	4.16	6.86	48.47	29.56	0.62
H	P-1292	INL 1292	PRM- 1293	5.72	3.00	Circle		2.00	16.50	16.48	0.013	6.07	5.76	2.62	2.00	0.15	29.63	9.78	1.05	91.84	0.31
H	P-1289	INL 1289	PRM-1293A	5.57	1.00	Circle		1.25	18.50	24.66	0.013	6.01	4.47	9.11	1.25	0.17	26.73	12.66	1.25	32.08	1.54
H	P-1284	INL 1284	PRM-1317	4.51	-1.00	Circle		1.25	61.10	9.02	0.013	4.85	3.38	2.60	1.25	0.17	16.17	7.68	0.77	19.40	1.47
H	P-1282	INL 1282	PRM-1318B	4.25	-0.70	Circle		1.25	61.40	8.06	0.013	4.65	4.49	0.47	1.25	0.20	15.28	8.05	1.02	18.34	0.16
H	P-1279A	INL 1279A	PCO-1279	4.00	3.56	Circle		1.25	20.00	2.20	0.013	5.39	5.38	0.05	1.25	0.34	7.98	1.23	1.51	9.57	0.01
H	P-1279	PCO-1279	PRM-1318A	3.41	-1.06	Circle		1.50	76.00	5.89	0.013	5.33	5.16	0.24	1.50	0.45	14.16	2.88	5.09	25.48	0.18
H	P-1274	INL 1274	PRM-1293A	4.28	-0.38	Circle		1.50	62.00	7.51	0.013	4.74	4.47	0.69	1.50	0.23	15.99	8.63	1.52	28.79	0.27
H	P-1270	INL 1270	INL 1274	5.21	4.68	Circle		1.25	62.00	0.85	0.013	5.62	5.04	0.83	0.36	0.36	4.98	3.68	1.07	5.97	0.58
H	P-1268	INL 1268	INL 1270	5.63	5.31	Circle		1.25	29.10	1.10	0.013	5.95	5.58	1.02	0.27	0.27	5.65	3.52	0.67	6.78	0.37
H	P-1264	INL 1264	PRM-1304C	4.06	-0.11	Circle		1.50	61.50	6.78	0.013	5.50	5.47	0.06	1.50	0.31	15.19	9.66	2.52	27.35	0.03
H	P-1258	INL 1258	INL 1264	4.84	4.26	Circle		1.25	75.00	0.77	0.013	5.54	5.52	0.12	1.25	0.50	4.73	4.19	1.93	5.68	0.01
H	P-1257A	INL 1257A	PCO-1257	4.00	3.34	Circle		1.25	16.40	4.03	0.013	6.20	6.19	0.02	1.25	0.23	10.80	0.81	1.00	12.96	0.00
H	P-1257	PCO-1257	PCO-1256	3.54	3.21	Circle		1.50	36.10	0.92	0.013	6.17	6.16	0.03	1.50	0.43	5.58	1.04	1.84	10.05	0.01
H	P-1256A	INL 1256A	PCO-1256	3.50	3.11	Circle		1.25	22.50	1.73	0.013	6.17	6.16	0.04	1.25	0.33	7.09	1.07	1.31	8.51	0.01
H	P-1256	PCO-1256	PRM- 1304	3.11	0.27	Circle		1.50	75.10	3.78	0.013	6.13	6.02	0.14	1.50	0.44	11.34	2.20	3.89	20.42	0.10
H	P-1254	INL 1254	PRM-1243A	4.23	0.47	Circle		1.50	60.10	6.25	0.013	5.93	5.91	0.02	1.50	0.24	14.59	0.84	1.49	26.27	0.01
H	P-1249	INL 1249	INL 1254	4.29	4.13	Circle		1.25	62.10	0.26	0.013	5.95	5.94	0.02	1.25	0.45	2.73	0.73	0.90	3.28	0.01
H	P-1246	INL 1246	PRM- 1243	5.55	3.00	Circle		1.25	21.30	11.96	0.013	6.52	6.52	0.03	1.25	0.19	18.62	9.60	1.16	22.34	0.00
H	P-1243A	PRM-1243A	PRM- 1304	0.47	0.27	Circle		3.00	40.90	0.49	0.013	6.19	6.05	0.35	3.00	2.11	6.57	5.56	39.27	46.65	0.14
H	P-1243	PRM- 1243	PRM-1243A	0.82	0.47	Circle		3.00	79.20	0.44	0.013	6.17	5.91	0.33	3.00	2.14	6.24	5.38	38.04	44.33	0.26
H	P-1239	INL 1239	PRM-1226B	4.09	0.97	Circle		1.25	59.50	5.24	0.013	5.81	5.71	0.16	1.25	0.35	12.33	2.12	2.60	14.79	0.10
H	P-1238	PCO-1238	PRM- 1226	2.73	1.89	Circle		1.50	76.90	1.09	0.013	6.37	6.17	0.25	1.50	0.73	6.10	3.00	5.30	10.98	0.20
H	P-1237	PCO-1237	PCO-1238	3.01	2.93	Circle		1.50	35.90	0.22	0.013	6.58	6.56	0.07	1.50	0.80	2.76	1.56	2.76	4.96	0.02

DATE: 9/11/2023 5:53:13 PM
FILE: ...\FM 519 HYDRAULIC COMP04.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 4 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		114

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US	DS							US ELEV	DS ELEV	SLOPE	UNIFORM	ACTUAL	UNIFORM	ACTUAL	Q		LOSS
				(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft/s)	(ft/s)	(cfs)	(cfs)	(ft)
H	P-1231	INL 1231	PRM-1226A	3.29	0.87	Circle		1.25	58.70	4.12	0.013	5.39	5.38	0.02	1.25	0.23	10.93	0.79	0.97	13.11	0.01
H	P-1230	INL 1230	PRM-1226A	5.31	3.00	Circle		1.25	14.50	15.93	0.013	6.00	5.38	5.63	1.25	0.29	21.48	14.01	2.98	25.78	0.63
H	P-1226B	PRM-1226B	PRM- 1243	1.18	0.87	Circle		3.00	81.20	0.38	0.013	6.47	6.21	0.31	3.00	2.24	5.80	5.29	37.40	41.21	0.26
H	P-1226A	PRM-1226A	PRM-1226B	1.50	1.18	Circle		3.00	89.20	0.36	0.013	5.96	5.71	0.28	3.00	2.19	5.63	4.98	35.19	39.96	0.25
H	P-1226	PRM- 1226	PRM-1226A	1.89	1.50	Circle		2.50	110.20	0.35	0.013	6.06	5.38	0.62	2.50	1.93	4.98	6.58	32.28	24.40	0.68
H	P-1225	PCO-1225	PRM-1215A	3.30	1.92	Circle		1.50	7.60	18.14	0.013	6.57	6.56	0.15	1.50	0.30	24.85	2.27	4.02	44.73	0.01
H	P-1222	INL 1222	PCO-1225	4.47	3.65	Circle		1.25	6.60	12.46	0.013	6.61	6.60	0.10	1.25	0.26	19.00	1.70	2.09	22.80	0.01
H	P-1218	INL 1218	PRM- 1215	4.09	2.36	Circle		1.25	14.10	12.25	0.013	7.69	7.64	0.31	1.25	0.34	18.84	2.95	3.62	22.61	0.04
H	P-1215A	PRM-1215A	PRM- 1226	1.92	1.89	Circle		2.00	15.50	0.19	0.013	6.38	6.16	1.45	2.00	1.81	3.21	8.66	27.20	9.94	0.22
H	P-1215	PRM- 1215	PRM-1215A	2.10	1.92	Circle		2.00	116.60	0.15	0.013	7.98	6.63	1.16	2.00	1.74	2.87	7.75	24.35	8.89	1.35
H	P-1214	INL 1214	PRM- 1215	3.57	2.16	Circle		1.50	58.30	2.42	0.013	7.68	7.64	0.07	1.50	0.41	9.08	1.52	2.69	16.34	0.04
H	P-1210	INL 1210	PRM-1196B	3.71	2.40	Circle		1.50	58.40	2.24	0.013	5.83	5.80	0.06	1.50	0.42	8.74	1.51	2.67	15.73	0.04
H	P-1205	INL 1205	PRM-1196A	4.51	2.60	Circle		1.25	15.00	12.74	0.013	5.38	5.41	0.15	1.25	0.28	19.21	12.35	2.53	23.05	0.03
H	P-1202	INL 1202	PRM-1196A	3.62	2.54	Circle		1.50	58.50	1.85	0.013	5.46	5.41	0.09	1.50	0.48	7.93	1.79	3.17	14.27	0.05
H	P-1198A	INL 1198A	PCO-1198	3.00	2.80	Circle		2.00	17.00	1.18	0.013	5.82	5.82	0.02	2.00	0.47	7.93	0.95	3.00	24.57	0.00
H	P-1198	PCO-1198	PRM- 1196	2.90	2.86	Circle		2.00	75.50	0.05	0.013	5.78	5.72	0.09	2.00	0.92	1.68	2.13	6.70	5.21	0.07
H	P-1197A	INL 1197A	PCO-1197	3.50	3.18	Circle		1.50	10.60	3.01	0.013	5.94	5.94	0.06	1.50	0.38	10.13	1.49	2.63	18.23	0.01
H	P-1197	PCO-1197	PCO-1198	3.18	2.86	Circle		1.50	35.80	0.89	0.013	5.86	5.81	0.12	1.50	0.63	5.52	2.09	3.69	9.93	0.04
H	P-1196C	INL 1196C	PRM- 1196	3.00	2.80	Circle		1.25	20.30	0.98	0.013	5.64	5.64	0.01	1.25	0.27	5.34	0.53	0.65	6.41	0.00
H	P-1196B	PRM-1196B	PRM- 1215	2.32	2.11	Circle		2.00	94.10	0.22	0.013	8.32	7.64	0.72	2.00	1.58	3.45	6.10	19.17	10.69	0.68
H	P-1196A	PRM-1196A	PRM-1196B	2.54	2.32	Circle		2.00	100.10	0.22	0.013	6.34	5.80	0.55	2.00	1.47	3.42	5.32	16.72	10.61	0.55
H	P-1196	PRM- 1196	PRM-1196A	2.70	2.54	Circle		2.00	77.20	0.21	0.013	5.62	5.41	0.27	2.00	1.24	3.32	3.76	11.82	10.30	0.21
H	P-1192A	INL 1192A	PCO- 1192	3.50	3.15	Circle		1.50	13.90	2.52	0.013	5.74	5.74	0.00	1.50	0.17	9.26	0.26	0.47	16.67	0.00
H	P-1192	PCO- 1192	PRM- 1196	2.90	2.85	Circle		2.00	39.90	0.13	0.013	5.73	5.71	0.06	2.00	1.24	2.58	1.80	5.66	8.01	0.02
H	P-1191B	INL 1191B	INL 1191A	4.20	3.90	Circle		1.50	127.10	0.24	0.013	6.00	5.86	0.12	1.50	0.93	2.83	2.03	3.58	5.10	0.15
H	P-1191A	INL 1191A	PCO-1191	3.78	3.72	Circle		1.50	13.60	0.44	0.013	5.81	5.79	0.12	1.50	0.77	3.88	2.08	3.67	6.98	0.02
H	P-1191	PCO-1191	PCO- 1192	3.72	3.15	Circle		2.00	119.40	0.48	0.013	5.79	5.75	0.03	2.00	0.67	5.04	1.22	3.84	15.63	0.03

DATE: 9/11/2023 5:54:32 PM
FILE: ...\FM 519 HYDRAULIC COMP05.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		115

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
A	P-7008	PCO-7008	PRM- 2064	4.22	4.07	Circle		1.50	55.40	0.27	0.013	8.37	8.33	0.08	1.50	0.79	3.03	1.67	2.95	5.46	0.04
A	P-2279	PRM- 2279	A	0.40	0.08	Circle		3.00	184.10	0.18	0.013	5.93	3.08	1.55	3.00	2.80	3.94	11.74	83.01	27.98	2.85
A	P-2277	PCO- 2277	PRM- 2279	1.59	1.40	Circle		1.50	10.60	1.79	0.013	7.58	7.55	0.21	1.50	0.61	7.81	2.73	4.82	14.06	0.02
A	P-2258	PCO-2258	PRM- 2279	2.50	1.26	Circle		1.50	55.80	2.22	0.013	8.30	8.16	0.26	1.50	0.60	8.70	3.01	5.33	15.66	0.14
A	P-2256	INL 2256	PCO-2258	3.23	3.15	Circle		1.25	7.70	1.04	0.013	5.84	5.83	0.12	1.25	0.51	5.48	1.85	2.27	6.58	0.01
A	P-2242	INL 2242	PRM- 2230	3.04	1.65	Circle		1.50	64.60	2.15	0.013	6.66	6.61	0.07	1.50	0.43	8.56	1.59	2.81	15.41	0.05
A	P-2236	INL 2236	INL 2242	3.95	3.04	Circle		1.25	43.60	2.09	0.013	5.61	5.58	0.06	1.25	0.34	7.78	1.26	1.55	9.33	0.02
A	P-2230	PRM- 2230	PRM- 2279	0.63	0.43	Circle		3.00	103.40	0.19	0.013	7.52	6.17	1.30	3.00	2.73	4.13	10.77	76.15	29.33	1.35
A	P-2223	INL 2223	PRM- 2230	3.38	2.90	Circle		1.25	17.30	2.78	0.013	6.62	6.61	0.05	1.25	0.31	8.98	1.16	1.42	10.77	0.01
A	P-2205A	INL 2205A	PCO-2205	3.63	3.53	Circle		1.50	31.30	0.32	0.013	6.11	6.11	0.00	1.50	0.00	3.30	0.00	0.00	5.94	0.00
A	P-2205	PCO-2205	PCO-2203	3.33	3.29	Circle		1.50	35.90	0.11	0.013	6.11	6.11	0.00	1.50	0.38	1.94	0.27	0.48	3.50	0.00
A	P-2203A	INL 2203A	PCO-2203	3.39	3.29	Circle		1.50	17.00	0.59	0.013	6.12	6.11	0.06	1.50	0.59	4.47	1.50	2.66	8.04	0.01
A	P-2203	PCO-2203	PRM- 2196	3.29	2.52	Circle		1.50	80.20	0.96	0.013	7.13	7.02	0.14	1.50	0.64	5.72	2.20	3.88	10.29	0.11
A	P-2196	PRM- 2196	PRM- 2230	1.42	1.26	Circle		3.00	132.20	0.12	0.013	8.21	6.61	1.21	3.00	2.70	3.27	10.39	73.42	23.20	1.60
A	P-2193A	INL 2193A	PCO- 2193	3.05	2.89	Circle		1.50	45.10	0.35	0.013	7.00	6.90	0.22	1.50	1.01	3.47	2.80	4.94	6.25	0.10
A	P-2193	PCO- 2193	PRM- 2196	2.79	2.32	Circle		1.50	28.60	1.64	0.013	7.33	7.02	1.09	1.50	1.03	7.48	6.20	10.95	13.46	0.31
A	P-2189A	INL 2189A	PCO- 2189	3.25	3.05	Circle		1.50	57.80	0.35	0.013	6.98	6.87	0.19	1.50	0.97	3.43	2.61	4.61	6.18	0.11
A	P-2189	PCO- 2189	PCO- 2193	3.05	2.79	Circle		1.50	36.50	0.71	0.013	7.01	6.90	0.29	1.50	0.88	4.93	3.23	5.70	8.87	0.11
A	P-2187	INL 2187	PRM-2162A	4.64	3.00	Circle		1.25	12.60	12.98	0.013	6.00	6.00	0.01	1.25	0.15	19.39	0.57	0.70	23.27	0.00
A	P-2168	PCO-2168	PRM- 2162	3.20	3.10	Circle		1.50	54.70	0.18	0.013	7.09	7.05	0.07	1.50	0.87	2.49	1.62	2.87	4.49	0.04
A	P-2162A	PRM-2162A	PRM- 2196	1.68	1.42	Circle		3.00	72.30	0.36	0.013	7.65	7.02	0.86	3.00	2.54	5.63	8.77	62.02	40.00	0.63
A	P-2162	PRM- 2162	PRM-2162A	1.78	1.68	Circle		3.00	111.20	0.09	0.013	6.95	6.00	0.86	3.00	2.53	2.82	8.74	61.77	20.00	0.95
A	P-2160A	INL 2160A	PCO- 2160	4.30	3.40	Circle		1.50	68.00	1.32	0.013	7.07	7.07	0.00	1.50	0.23	6.71	0.36	0.63	12.08	0.00
A	P-2160	PCO- 2160	PRM- 2162	3.10	3.06	Circle		1.50	9.70	0.41	0.013	7.05	7.05	0.03	1.50	0.55	3.75	1.08	1.91	6.75	0.00
A	P-2157	INL 2157	PRM-2148A	5.07	4.60	Circle		1.25	12.00	3.91	0.013	6.99	6.99	0.00	1.25	0.13	10.64	0.24	0.30	12.77	0.00
A	P-2148A	PRM-2148A	PRM- 2162	1.81	1.78	Circle		3.00	24.60	0.12	0.013	7.23	7.05	0.77	3.00	2.47	3.28	8.26	58.38	23.29	0.19
A	P-2148	PRM- 2148	PRM-2148A	1.89	1.81	Circle		3.00	68.20	0.12	0.013	7.51	6.99	0.76	3.00	2.47	3.22	8.25	58.31	22.85	0.52
A	P-2147	INL 2147	PCO-2168	3.56	3.40	Circle		1.25	8.00	2.01	0.013	6.70	6.70	0.03	1.25	0.29	7.63	0.88	1.08	9.15	0.00
A	P-2145A	INL 2145A	PCO- 2145	3.85	3.74	Circle		1.50	27.10	0.41	0.013	7.38	7.28	0.35	1.50	1.14	3.72	3.50	6.18	6.69	0.09
A	P-2145	PCO- 2145	PRM- 2148	3.74	3.60	Circle		1.50	28.60	0.49	0.013	7.43	7.32	0.39	1.50	1.10	4.08	3.71	6.55	7.35	0.11
A	P-2142A	INL 2142A	PCO- 2142	3.79	3.49	Circle		1.50	98.60	0.30	0.013	7.52	7.26	0.27	1.50	1.15	3.22	3.07	5.42	5.79	0.26
A	P-2142	PCO- 2142	PRM- 2148	3.49	3.34	Circle		1.50	38.00	0.40	0.013	7.53	7.32	0.56	1.50	1.09	3.70	4.44	7.85	6.66	0.21
A	P-2136	PCO-2136	PRM- 2148	3.64	3.40	Circle		1.50	56.10	0.43	0.013	7.37	7.32	0.08	1.50	0.69	3.82	1.70	3.00	6.87	0.05
A	P-2135	INL 2135	PCO-2136	4.61	4.34	Circle		1.25	7.60	3.57	0.013	7.38	7.38	0.04	1.25	0.27	10.18	1.00	1.23	12.21	0.00
A	P-2123	INL 2123	PRM-2098B	5.55	5.10	Circle		1.25	11.40	3.95	0.013	7.00	7.00	0.01	1.25	0.21	10.70	0.62	0.76	12.84	0.00
A	P-2117	INL 2117	PRM-2098A	5.42	5.10	Circle		1.25	11.50	2.78	0.013	7.06	7.01	0.46	1.25	0.56	8.98	3.58	4.39	10.78	0.05
A	P-2105	INL 2105	PCO- 2099	5.32	4.89	Circle		1.50	4.10	10.53	0.013	7.92	7.92	0.01	1.50	0.19	18.93	0.70	1.23	34.08	0.00
A	P-2099	PCO- 2099	PRM- 2098	4.24	3.30	Circle		1.50	10.70	8.78	0.013	7.90	7.90	0.04	1.50	0.26	17.29	1.17	2.07	31.13	0.00
A	P-2098B	PRM-2098B	PRM- 2148	2.93	2.82	Circle		2.50	97.40	0.11	0.013	8.46	7.32	1.17	2.50	2.21	2.81	9.04	44.37	13.79	1.14
A	P-2098A	PRM-2098A	PRM-2098B	2.98	2.93	Circle		2.50	35.60	0.14	0.013	7.41	7.00	1.15	2.50	2.21	3.13	8.95	43.91	15.36	0.41
A	P-2098	PRM- 2098	PRM-2098A	3.10	2.99	Circle		2.50	84.50	0.13	0.013	7.84	7.01	0.98	2.50	2.14	3.02	8.27	40.58	14.80	0.83
A	P-2085	PCO-2085	PRM- 2098	4.24	4.02	Circle		1.50	56.80	0.40	0.013	8.05	7.90	0.26	1.50	1.03	3.67	3.06	5.40	6.61	0.15
A	P-2084	INL 2084	PCO-2085	5.09	4.89	Circle		1.50	7.70	2.60	0.013	8.12	8.11	0.13	1.50	0.48	9.40	2.16	3.82	16.92	0.01
A	P-2077	INL 2077	INL 2084	5.23	5.09	Circle		1.50	38.10	0.37	0.013	7.06	7.05	0.02	1.50	0.50	3.54	0.85	1.50	6.37	0.01
A	P-2064	PRM- 2064	PRM- 2098	4.05	3.83	Circle		2.50	121.70	0.18	0.013	8.79	7.90	0.73	2.50	2.01	3.56	7.14	35.04	17.44	0.89
A	P-2061A	INL 2061A	PCO- 2061	4.45	4.37	Circle		1.50	11.50	0.70	0.013	8.33	8.28	0.48	1.50	1.04	4.87	4.12	7.28	8.77	0.06
A	P-2061	PCO- 2061	PRM- 2064	4.37	4.25	Circle		1.50	31.50	0.40	0.013	9.00	8.33	2.14	1.50	1.41	3.68	8.70	15.37	6.62	0.67
A	P-2059A	INL 2059A	PCO- 2059	4.55	4.47	Circle		1.50	14.50	0.55	0.013	8.38	8.32	0.40	1.50	1.06	4.34	3.76	6.65	7.81	0.06
A	P-2059	PCO- 2059	PCO- 2061	4.47	4.37	Circle		1.50	36.10	0.28	0.013	8.51	8.28	0.63	1.50	1.12	3.07	4.72	8.35	5.53	0.23
A	P-2055	INL 2055	PCO-7008	4.78	4.62	Circle		1.50	7.80	2.04	0.013	8.39	8.39	0.03	1.50	0.36	8.34	1.06	1.88	15.01	0.00
A	P-2049	INL 2049	INL 2055	4.93	4.78	Circle		1.25	38.00	0.39	0.013	7.20	7.18	0.04	1.25	0.49	3.38	1.07	1.31	4.06	0.02
A	P-2038	INL 2038	INL 2015	5.69	5.27	Circle		1.25	43.90	0.96	0.013	8.28	8.27	0.01	1.25	0.28	5.27	0.56	0.68	6.32	0.00
A	P-2019	INL 2019	PCO- 2018	5.44	4.76	Circle		1.25	4.30	15.96	0.013	8.82	8.81	0.16	1.25	0.27	21.50	2.09	2.56	25.80	0.01
A	P-2018	PCO- 2018	PRM- 2017	4.31	3.97	Circle		1.50	8.40	4.07	0.013	8.78	8.77	0.10	1.50	0.40	11.77	1.91	3.38	21.19	0.01
A	P-2017	PRM- 2017	PRM- 2064	4.42	4.21	Circle		2.50	191.60	0.11	0.013	8.74	8.33	0.21	2.50	1.48	2.77	3.86	18.97	13.58	0.41
A	P-2016	PCO-2016	PRM- 2017	4.58	4.42	Circle		1.50	54.50	0.29	0.013	8.77	8.76	0.03	1.50	0.57	3.16	1.00	1.76	5.69	0.02
A	P-2015	INL 2015	PCO-2016	5.27	5.20	Circle		1.50	7.90	0.88	0.013	8.78	8.78	0.01	1.50	0.28	5.48	0.43	0.75	9.86	0.00
A	P-2014	INL 2014	PRM-2007A	5.92	5.50	Circle		1.25	12.30	3.42	0.013	7.52	7.51	0.08	1.25	0.33	9.95	1.51	1.85	11.94	0.01
A	P-2010	INL 2010	PCO-2009	7.84	6.84	Circle		1.25	7.30	13.61	0.013	8.34	8.34	0.00	1.25	0.08	19.86	5.88	0.19	23.83	0.00
A	P-2009	PCO-2009	PRM- 2007	6.35	5.69	Circle		1.50	55.60	1.19	0.013	8.34	8.34	0.00	1.50	0.25	6.36	0.39	0.68	11.44	0.00
A	P-2007A	PRM-2007A	PRM- 2017	4.77	4.62	Circle		2.00	65.60	0.23	0.013	9.07	8.77	0.46	2.00	1.42	3.49	4.90	15.40	10.82	0.30
A	P-2007	PRM- 2007	PRM-2007A	5.09	4.78	Circle		2.00	133.20	0.23	0.013	8.03	7.51	0.40	2.00	1.36	3.52	4.53	14.22	10.91	0.53
A	P-2005A	INL 2005A	PCO 2005	5.40	5.20	Circle		2.00	34.00	0.59	0.013	8.59	8.56	0.07	2.00	0.82	5.59	1.96	6.15	17.34	0.03
A	P-2005	PCO 2005	PRM- 2007	5.10	5.06	Circle		2.00	29.20	0.15	0.013	8.44	8.34	0.35	2.00	1.32	2.86	4.28	13.43	8.88	0.10
A	P-2002A	INL 2002A	PCO- 2002	5.80	5.69	Circle		1.50	21.20	0.52	0.013	9.23	9.13	0.46	1.50	1.16	4.20	4.05	7.15	7.56	0.10
A	P-1059	INL 1059	PRM- 2007	7.68	7.40	Circle		1.00	105.70	0.26	0.013	8.14	8.10	0.06	0.70	0.36	2.29	1.99	0.50	1.83	0.04
A	P- 2002	PCO- 2002	PCO 2005	5.44	5.10	Circle		1.50	36.30	0.94	0.013	8.77	8.58	0.50	1.50	0.95	5.65	4.22	7.46	10.17	0.18
B	P-CBS 02	CBS 02	PRM-684B	3.50	2.50	Circle		1.25	11.80	8.48	0.013	5.03	5.00	0.26	1.25	0.36	15.68	2.70	3.32	18.81	0.03
B	P-684B	PRM-684B	PRM-2410	-0.14	-0.22	Circle		3.00	45.60	0.18	0.013	6.75	6.11	1.40	3.00	2.76	3.94	11.18	79.02	27.94	0.64
B	P-684A	PRM-684A	PRM-684B	-0.06	-0.14	Circle		3.00	54.60	0.15	0.013	5.72	5.00	1.31	3.00	2.73	3.59	10.81	76.39	25.52	0.72
B	P-657	PCO- 657	PRM-684	1.80	0.50	Circle		2.00	29.30	4.43	0.013	5.77	5.76	0.06	2.00	0.45	15.36	1.70	5.33	47.63	0.02
B	P-648	PRM-684	PRM-684A	0.00	-0.06	Circle		3.00	37.80	0.16	0.013	5.49	5.00	1.31	3.00	2.73	3.75	10.78	76.23	26.59	0.49
B	P-640	INL 1640	PRM-684A	3.50	2.40	Circle		1.25	11.70	9.40	0.013	5.00	5.00	0.00	1.25	0.11	16.50	0.28	0.34	19.80	0.00
B	P-600A	INL 600A	PCO-600	2.38	2.28	Circle		1.50	20.70	0.48	0.013	3.21	3.21	0.09	0.93	0.54	4.06	3.53	2.01	7.31	0.00
B	P-600	PCO-600	PCO-1655	2.23	2.11	Circle		1.50	46.20	0.26	0.013	3.16	3.13	0.10	1.02	0.72	2.97	2.98	2.50	5.35	0.03
B	P-2410D	PRM-2410D	PRM- 2342	-0.70	-0.79	Circle		3.00	45.30	0.20	0.013	6.70	5.82	1.95	3.00	2.86	4.19	13.18	93.20	29.74	0.88
B	P-2410C	PRM-2410C	PRM-2410D	-0.59	-0.70	Circle		3.00	60.80	0.18	0.013	6.16	5.01	1.89	3.00	2.86	3.99	12.97	91.69	28.36	1.15
B	P-2410B	PRM-2410B	PRM-2410C	-0.46	-0.59	Circle		3.00	76.40	0.17	0.013	6.39	5.00	1.82	3.00	2.85	3.88	12.75	90.10	27.52	1.39
B	P-2410A	PRM-2410A	PRM-2410B	-0.36	-0.46	Circle		3.00	53.90	0.19	0.013	5.95	5.01	1.75	3.00	2.83	4.05	12.47	88.15	28.72	0.94
B	P-2410	PRM-2410	PRM-2410A	-0.25	-0.36	Circle		3.00	59.70	0.18	0.013	6.01	5.00	1.69	3.00	2.82	4.03	12.25	86.60	28.63	1.01
B	P-2408	PCO- 2408	PRM-2410	1.44	0.00	Circle		1.50	11.30	12.72	0.013	6.13	6.11	0.18	1.50	0.35	20.81	2.50	4.41	37.46	0.02
B	P-2403	INL 2403	PCO- 2408	3.89	3.04	Circle		1.25	4.60	18.58	0.013	6.33	6.32	0.11	1.25	0.24	23.20	1.76	2.16	27.84	0.01
B	P-2402	INL 2402	PRM-2410A	3.61	2.50	Circle		1.25	12.60	8.84	0.013	5.02	5.00	0.14	1.25	0.30	16.00	1.96	2.41	19.20	0.02
B	P-2386	INL 2386	PCO-2380	2.39	2.09	Circle		1.25	7.90	3.79	0.013	6.40	6.36	0.45	1.25	0.51	10.48	3.53	4.33	12.58	0.04
B	P-2380	PCO-2380	PRM-2410	1.99	1.75	Circle		1.50	54.70	0.44	0.013	6.31	6.11	0.38	1.50	1.15	3.87	3.67	6.48	6.96	0.21
B	P-2372	INL 2372	PRM-2410B	3.79	2.50	Circle		1.25	12.30	10.49	0.013	5.03	5.01	0.21	1.25	0.32	17.43	12.05	2.95	20.92	0.03
B	P-2365	INL 2365	PRM-2410C	3.20	2.35	Circle		1.25	12.60	6.74	0.013	5.02	5.00	0.16	1.25	0.33	13.98	2.11	2.58	16.77	0.02
B	P-2353	INL 2353	PRM-2410D	3.36	2.35	Circle		1.25	12.80	7.86	0.013	5.02	5.01	0.14	1.25	0.31	15.09	1.95	2.40	18.11	0.02
B	P-2347	INL 2347	PRM- 2342	2.07	1.30	Circle		1.25	14.10	5.48	0.013	6.19	6.19	0.06	1.25	0.27	12.60	1.24	1.52	15.12	0.01
B	P-2342C	PRM-2342C	B	-1.00	-1.10	Circle		3.00	77.30	0.13	0.013	3.81	1.90	2.48	3.00	2.91	3.38	14.85	104.99	24.00	1.91
B	P-2342A	PRM-2342A	PRM-2342C	-0.91	-1.00	Circle		3.00	53.20	0.17	0.013	5.28	4.01	2.40	3.00	2.91	3.86	14.63	103.42	27.43	1.28

DATE: 9/11/2023 5:56:00 PM
FILE: ...\FM 519 HYDRAULIC COMP06.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		116

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
B	P-2342	PRM- 2342	PRM-2342A	-0.79	-0.91	Circle		3.00	61.60	0.19	0.013	5.42	4.00	2.30	3.00	2.90	4.15	14.31	101.13	29.43	1.42
B	P-2339	PCO- 2339	PRM- 2342	1.31	0.80	Circle		2.00	11.50	4.42	0.013	6.19	6.19	0.02	2.00	0.33	15.34	0.89	2.78	47.55	0.00
B	P-2337	INL 2337	PCO-2332	2.41	2.11	Circle		1.25	8.10	3.69	0.013	6.44	6.39	0.53	1.25	0.53	10.34	3.83	4.71	12.41	0.04
B	P-2332	PCO-2332	PRM- 2342	2.11	1.00	Circle		1.50	54.30	2.04	0.013	6.45	6.19	0.49	1.50	0.74	8.34	4.16	7.35	15.01	0.27
B	P-2312	INL 2312	PRM-2342A	2.77	2.20	Circle		1.25	12.40	4.59	0.013	4.03	4.00	0.21	1.25	0.39	11.54	2.43	2.98	13.85	0.03
B	P-2297	INL 2297	PRM-2342C	2.45	1.80	Circle		1.25	11.80	5.50	0.013	4.02	4.01	0.13	1.25	0.33	12.63	1.93	2.37	15.15	0.02
B	P-1664	PCO-1664	PRM- 1626	2.28	2.03	Circle		1.50	55.10	0.45	0.013	5.97	5.85	0.23	1.50	0.93	3.93	2.83	5.01	7.08	0.13
B	P-1663	INL 1663	PCO-1664	4.18	2.63	Circle		1.50	8.40	18.41	0.013	6.02	6.01	0.16	1.50	0.31	25.03	2.38	4.20	45.06	0.01
B	P-1662	INL 1662	INL 1663	4.65	4.38	Circle		1.25	66.80	0.40	0.013	5.21	4.92	0.41	0.54	0.56	3.43	3.19	1.70	4.11	0.29
B	P-1661	INL 1661	PCO-1660	2.88	2.84	Circle		1.50	8.00	0.50	0.013	5.87	5.86	0.06	1.50	0.61	4.12	1.45	2.57	7.41	0.00
B	P-1660	PCO-1660	PRM- 1636	2.54	1.30	Circle		1.50	54.70	2.27	0.013	5.82	5.68	0.26	1.50	0.60	8.79	3.01	5.32	15.82	0.14
B	P-1658	INL 1658	PRM-1636A	3.25	1.00	Circle		1.50	74.60	3.02	0.013	5.05	4.81	0.32	1.50	0.59	10.14	3.34	5.90	18.25	0.24
B	P-1657	INL 1657	PCO-1656	2.67	2.53	Circle		1.50	8.20	1.70	0.013	5.28	5.27	0.08	1.50	0.47	7.61	1.65	2.91	13.69	0.01
B	P-1656	PCO-1656	PRM- 1647	2.53	2.41	Circle		1.50	55.00	0.22	0.013	5.21	5.07	0.26	1.50	0.89	2.73	3.02	5.34	4.91	0.14
B	P-1655B	INL 1655C	PCO-1655	2.36	2.06	Circle		2.00	119.00	0.25	0.013	3.25	3.14	0.13	1.08	0.81	3.66	3.28	3.91	11.36	0.11
B	P-1655A	PRM-1655A	PRM- 1654	1.83	1.75	Circle		2.00	38.50	0.21	0.013	6.64	6.61	0.09	2.00	1.20	3.33	2.19	6.90	10.31	0.04
B	P-1655	PCO-1655	PRM-1655A	1.91	1.83	Circle		2.00	37.60	0.21	0.013	3.09	3.01	0.22	1.18	1.19	3.36	3.55	6.93	10.43	0.08
B	P-1654	PRM- 1654	PRM-684	0.05	0.00	Circle		3.00	44.90	0.11	0.013	6.27	5.74	1.18	3.00	2.69	3.14	10.23	72.34	22.27	0.53
B	P-1651	PCO- 1651	PRM- 1654	2.24	0.85	Circle		1.25	29.30	4.74	0.013	6.63	6.61	0.08	1.25	0.31	11.72	1.52	1.87	14.06	0.02
B	P-1650	PRM- 1650	PRM- 1654	0.49	0.05	Circle		3.00	75.70	0.58	0.013	7.20	6.45	0.99	3.00	2.61	7.16	9.40	66.42	50.85	0.75
B	P-1649	INL 1649	PRM- 1650	2.25	1.50	Circle		2.00	14.60	5.13	0.013	6.08	6.07	0.07	2.00	0.46	16.53	1.92	6.04	51.25	0.01
B	P-1648	INL 1648	PRM-1647A	2.30	1.70	Circle		2.00	12.10	4.95	0.013	4.00	4.00	0.06	2.00	0.45	16.24	10.51	5.48	50.34	0.00
B	P-1647A	PRM-1647A	PRM- 1650	0.66	0.49	Circle		3.00	39.30	0.43	0.013	6.40	6.07	0.85	3.00	2.53	6.18	8.68	61.38	43.86	0.33
B	P-1647	PRM- 1647	PRM-1647A	0.83	0.66	Circle		3.00	36.60	0.46	0.013	4.27	4.00	0.73	3.00	2.45	6.40	8.07	57.05	45.46	0.27
B	P-1646	PCO- 1646	PRM- 1647	1.78	1.74	Circle		2.00	10.60	0.38	0.013	4.89	4.88	0.01	2.00	0.55	4.49	0.74	2.32	13.93	0.00
B	P-1644	INL 1644	PRM-1636B	3.10	2.50	Circle		1.50	11.70	5.14	0.013	4.30	4.30	0.00	1.50	0.18	13.23	6.00	0.70	23.81	0.00
B	P-1639	INL 1639	PRM-1636A	3.73	3.00	Circle		1.50	13.70	5.34	0.013	4.72	4.81	0.22	1.50	0.45	13.48	10.71	4.84	24.27	0.09
B	P-1636B	PRM-1636B	PRM- 1647	0.91	0.88	Circle		3.00	22.40	0.13	0.013	4.48	4.34	0.60	3.00	2.34	3.44	7.31	51.67	24.41	0.13
B	P-1636A	PRM-1636A	PRM-1636B	1.00	0.91	Circle		3.00	68.00	0.13	0.013	4.70	4.30	0.59	3.00	2.33	3.42	7.26	51.33	24.26	0.40
B	P-1636	PRM- 1636	PRM-1636A	1.25	1.00	Circle		3.00	196.00	0.13	0.013	5.62	4.79	0.42	3.00	2.15	3.35	6.14	43.44	23.82	0.83
B	P-1635	PCO- 1635	PRM- 1636	1.77	1.72	Circle		2.00	10.80	0.46	0.013	5.80	5.78	0.22	2.00	1.21	4.96	3.35	10.51	15.39	0.02
B	P-1633	INL 1633	PCO- 1635	3.54	3.27	Circle		1.25	4.10	6.66	0.013	6.03	5.95	1.96	1.25	0.66	13.89	7.38	9.05	16.67	0.08
B	P-1628	INL 1628	PRM-1626A	3.44	3.00	Circle		1.25	12.40	3.54	0.013	4.80	4.80	0.00	1.25	0.16	10.13	0.34	0.42	12.16	0.00
B	P-1626A	PRM-1626A	PRM- 1636	1.61	1.25	Circle		2.00	65.90	0.55	0.013	6.77	5.69	1.63	2.00	1.84	5.39	9.20	28.89	16.72	1.08
B	P-1626	PRM- 1626	PRM-1626A	1.93	1.61	Circle		2.00	52.20	0.61	0.013	5.64	4.80	1.60	2.00	1.84	5.72	9.12	28.65	17.72	0.84
B	P-1625A	INL 1625A	PCO- 1625	2.85	2.25	Circle		2.00	38.10	1.58	0.013	5.93	5.91	0.05	2.00	0.57	9.16	1.62	5.09	28.40	0.02
B	P-1625	PCO- 1625	PRM- 1626	2.20	2.11	Circle		2.00	28.50	0.32	0.013	6.36	6.11	0.88	2.00	1.65	4.10	6.76	21.24	12.70	0.25
B	P-1624A	INL 1624A	PCO- 1624	3.50	2.46	Circle		2.00	23.10	4.51	0.013	5.22	5.19	0.45	2.00	0.78	15.50	13.61	15.39	48.05	0.03
B	P-1624	PCO- 1624	PCO- 1625	2.36	2.30	Circle		2.00	35.30	0.17	0.013	6.10	5.91	0.53	2.00	1.46	3.01	5.25	16.48	9.32	0.19
B	P-1610	INL 1610	PRM- 1571	4.13	4.10	Circle		1.25	12.10	0.25	0.013	6.48	6.47	0.10	1.25	0.73	2.68	1.69	2.08	3.22	0.01
B	P-1571	PRM- 1571	PRM- 1626	2.87	2.33	Circle		1.50	175.10	0.31	0.013	6.33	6.01	0.19	1.50	0.99	3.24	2.56	4.52	5.83	0.32
B	P-1568	INL 1568	PRM- 1571	3.25	3.10	Circle		1.25	63.30	0.24	0.013	6.58	6.47	0.18	1.25	0.90	2.62	2.22	2.72	3.14	0.11
C	P-7002	PCO-7002	PRM-1572A	3.31	3.09	Circle		1.50	54.30	0.40	0.013	5.61	5.44	0.31	1.50	1.09	3.71	3.32	5.87	6.68	0.17
C	P-1620	INL 1620	PRM-1573A	3.96	3.50	Circle		1.25	11.90	3.86	0.013	5.37	5.37	0.00	1.25	0.13	10.58	0.25	0.31	12.70	0.00
C	P-1619	PCO- 1619	PRM- 1573	1.98	1.87	Circle		1.50	28.90	0.38	0.013	5.67	5.44	0.80	1.50	1.18	3.60	5.32	9.39	6.48	0.23
C	P-1618	PCO- 1618	PCO- 1619	2.10	1.98	Circle		1.50	29.80	0.40	0.013	6.08	6.01	0.25	1.50	1.00	3.71	2.97	5.25	6.67	0.07
C	P-1616	INL 1616	PRM- 1572	3.78	3.22	Circle		1.25	12.90	4.35	0.013	5.47	5.46	0.05	1.25	0.28	11.23	1.20	1.48	13.47	0.01
C	P-1584	INL 1584	PRM-1573D	4.32	4.14	Circle		1.25	12.70	1.41	0.013	5.65	5.61	0.29	1.25	0.59	6.40	2.84	3.49	7.68	0.04
C	P-1580	INL 1580	PRM-1573C	4.19	3.50	Circle		1.25	13.00	5.32	0.013	5.53	5.50	0.25	1.25	0.39	12.42	2.61	3.20	14.90	0.03
C	P-1574A	INL 1574A	PCO- 1574	3.79	3.77	Circle		1.25	5.20	0.38	0.013	4.86	4.84	0.46	1.07	0.86	3.33	3.68	4.52	4.00	0.03
C	P-1574	PCO- 1574	PRM-1573B	1.47	1.43	Circle		1.50	8.40	0.48	0.013	4.75	4.73	0.24	1.50	0.93	4.03	2.89	5.10	7.25	0.02
C	P-1573D	PRM-1573D	C	1.22	0.90	Circle		2.00	84.20	0.38	0.013	4.28	2.90	1.64	2.00	1.85	4.50	9.23	29.01	13.94	1.38
C	P-1573C	PRM-1573C	PRM-1573D	1.36	1.22	Circle		2.00	52.90	0.26	0.013	5.18	4.47	1.34	2.00	1.79	3.75	8.35	26.23	11.64	0.71
C	P-1573B	PRM-1573B	PRM-1573C	1.54	1.36	Circle		2.00	75.70	0.24	0.013	6.18	5.35	1.10	2.00	1.73	3.56	7.57	23.77	11.03	0.84
C	P-1573A	PRM-1573A	PRM-1573B	1.72	1.54	Circle		2.00	73.20	0.25	0.013	5.03	4.73	0.41	2.00	1.37	3.62	4.58	14.40	11.22	0.30
C	P-1573	PRM- 1573	PRM-1573A	1.82	1.72	Circle		2.00	44.80	0.22	0.013	5.25	5.07	0.40	2.00	1.36	3.45	4.53	14.24	10.69	0.18
C	P-1572A	PRM-1572A	PRM- 1573	2.32	2.22	Circle		1.50	28.30	0.35	0.013	5.46	5.32	0.47	1.50	1.04	3.47	4.10	7.24	6.24	0.13
C	P-1572	PRM- 1572	PRM-1572A	2.52	2.32	Circle		1.50	53.50	0.37	0.013	5.45	5.44	0.02	1.50	0.49	3.57	0.83	1.47	6.42	0.01
C	P-1565	INL 1565	PCO-7002	3.34	3.31	Circle		1.50	8.40	0.36	0.013	5.66	5.65	0.06	1.50	0.68	3.49	1.49	2.62	6.29	0.01
C	P-1564	INL 1564	INL 1565	3.92	3.34	Circle		1.25	37.70	1.54	0.013	5.47	5.46	0.01	1.25	0.24	6.68	0.53	0.65	8.01	0.00
C	P-1563	INL 1563	PCO- 1562	2.97	2.93	Circle		1.50	8.00	0.50	0.013	5.32	5.29	0.37	1.50	1.08	4.13	3.63	6.42	7.44	0.03
C	P-1562	PCO- 1562	PRM-1573B	2.13	1.87	Circle		1.50	66.00	0.39	0.013	5.06	4.73	0.49	1.50	1.05	3.66	4.17	7.37	6.59	0.33
D	P-1603	PRM- 1603	PRM- 1600	3.84	3.77	Circle		2.00	101.20	0.07	0.013	7.21	7.06	0.15	2.00	1.06	1.92	2.82	8.86	5.95	0.16
D	P-1602	INL 1602	PRM- 1603	4.73	4.19	Circle		1.25	12.10	4.45	0.013	7.44	7.30	1.13	1.25	0.63	11.36	5.60	6.87	13.63	0.14
D	P-1600	PRM- 1600	PRM- 1594	3.67	3.13	Circle		2.00	132.10	0.41	0.013	6.97	6.33	0.49	2.00	1.43	4.66	5.04	15.83	14.46	0.65
D	P-1599	PCO- 1599	PRM- 1600	3.78	3.77	Circle		1.50	8.40	0.12	0.013	7.09	7.07	0.21	1.50	0.84	2.01	2.70	4.76	3.62	0.02
D	P-1597	INL 1597	PCO- 1599	5.37	5.23	Circle		1.25	4.20	3.37	0.013	7.13	7.12	0.40	1.25	0.51	9.88	3.32	4.07	11.86	0.02
D	P-1594B	PRM-1594B	D	2.69	2.60	Circle		2.00	44.80	0.20	0.013	5.48	4.60	1.96	2.00	1.89	3.27	10.09	31.69	10.14	0.88
D	P-1594A	PRM-1594A	PRM-1594B	2.99	2.69	Circle		2.00	74.60	0.40	0.013	7.15	5.68	1.97	2.00	1.89	4.63	10.11	31.76	14.35	1.47
D	P-1594	PRM- 1594	PRM-1594A	3.13	2.99	Circle		2.00	36.30	0.39	0.013	6.10	5.58	1.42	2.00	1.81	4.53	8.58	26.97	14.05	0.52
D	P-1593	PCO- 1593	PRM- 1594	3.77	3.65	Circle		1.50	28.90	0.42	0.013	7.38	7.22	0.53	1.50	1.07	3.76	4.34	7.68	6.77	0.15
D	P-1592A	INL 1593A	PCO- 1593	3.98	3.87	Circle		1.50	28.50	0.39	0.013	7.62	7.52	0.36	1.50	1.18	3.62	3.54	6.26	6.52	0.10
D	P-1591A	INL 1591B	PCO- 1591	3.90	3.65	Circle		1.50	65.10	0.38	0.013	5.82	5.71	0.17	1.50	0.90	3.62	2.46	4.35	6.51	0.11
D	P-1591	PCO- 1591	PRM-1594A	3.65	3.53	Circle		1.50	29.20	0.41	0.013	5.66	5.58	0.26	1.50	1.01	3.74	3.02	5.34	6.73	0.08
D	P-1587	INL 1587	PRM-1594B	5.38	5.34	Circle		1.25	12.70	0.31	0.013	6.98	6.98	0.00	1.25	0.00	3.02	0.00	0.00	3.62	0.00
D	P-1560	PCO-1560	PRM- 1594	3.72	3.50	Circle		1.50	54.30	0.41	0.013	6.42	6.28	0.27	1.50	1.03	3.72	3.08	5.45	6.69	0.15
D	P-1558	INL 1558	PCO-1560	4.26	3.82	Circle		1.50	8.00	5.47	0.013	6.09	6.09	0.08	1.50	0.35	13.66	1.67	2.95	24.58	0.01
D	P-1557	INL 1557	INL 1558	4.65	4.61	Circle		1.25	42.60	0.09	0.013	6.14	6.13	0.02	1.25	0.62	1.65	0.80	0.98	1.98	0.01
D	P-1556A	INL 1556A	PCO-1556	4.40	4.37	Circle		1.25	9.50	0.31	0.013	7.32	7.32	0.04	1.25	0.51	3.02	1.04	1.27	3.62	0.00
D	P-1556	PCO-1556	PRM- 1600	4.02	3.67	Circle		1.25	75.20	0.47	0.013	7.25	7.04	0.27	1.25	0.82	3.68	2.75	3.37	4.41	0.21
D	P-1554A	INL 1554A	PCO-1554	4.43	4.37	Circle		1.25	14.10	0.43	0.013	7.39	7.39	0.01	1.25	0.36	3.51	0.63	0.77	4.21	0.00
D	P-1554	PCO-1554	PCO-1556	4.37	4.32	Circle		1.25	35.80	0.14	0.013	7.34	7.32	0.07	1.25	0.78	2.01	1.39	1.71	2.41	0.03
D	P-1553	INL 1553	PRM- 1603	4.84	4.15	Circle		1.50	66.20	1.04	0.013	7.30	7.25	0.07	1.50	0.53	5.96	1.60	2.82	10.72	0.05
D	P-1552	INL 1552	INL 1553	5.24	4.99	Circle		1.25	44.30	0.56	0.013	6.72	6.67	0.10	1.25	0.56	4.04	1.64	2.01	4.85	0.04
E	P-1604	PRM- 1604	PRM- 1547	4.41	4.20	Circle		1.25	93.20	0.23	0.013	8.08	8.08	0.00	1.25	0.00	2.56	0.00	0.00	3.07	0.00
E	P-1551A	INL 1551A	PCO- 1551	2.28	2.12	Circle		2.50	38.60	0.41	0.013	9.14	8.19	2.46	2.50	2.42	5.39	13.11	64.35	26.40	0.95
E	P-1551	PCO- 1551	PRM- 1547	2.02	1.97	Circle		2.50	28.50	0.18	0.013	9.06	8.35	2.50	2.50	2.42	3.50	13.20	64.79	17.16	0.71
E	P-1550A	INL 1550A	PCO- 1550	2.25	2.13	Circle		3.00	23.60	0.51	0.013	8.19	8.10	0.35	3.00	2.09	6.70	5.60	39.56	47.54	0.08
E	P-1550	PCO- 1550	PRM-1547A	2.28	2.21	Circle		3.00	28.20	0.25	0.013	8.10	8.00	0.36	3.00	2.05	4.68	5.63	39.76	33.25	0.10
E	P-1547A	PRM-1547A	PRM-1526	2.16	2.05	Circle		4.00	74.00	0.15	0.013	7.82	7.47	0.48	4.00	3.03	4.39	7.96	99.98	55.37	0.36
E	P-1547	PRM- 1547	PRM-1547A	2.22	2.16	Circle		4.00	38.50	0.16	0.013	8.04	7.96	0.20	4.00	2.43	4.50	5.15	64.77	56.74	0.08

DATE: 9/11/2023 5:57:24 PM
FILE: ...\FM 519 HYDRAULIC COMP07.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 7 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		117

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
E	P-1546	INL 1546	INL 1544	5.02	3.94	Circle		1.25	49.10	2.20	0.013	7.45	7.41	0.08	1.25	0.37	7.98	1.45	1.78	9.58	0.04
E	P-1544	INL 1544	PRM-1547A	3.89	2.30	Circle		1.25	65.40	2.43	0.013	8.02	7.88	0.22	1.25	0.47	8.39	2.48	3.04	10.07	0.14
E	P-1543	PCO-1543	PRM-1526	4.00	2.50	Circle		1.50	55.40	2.71	0.013	7.51	7.41	0.18	1.50	0.52	9.60	2.52	4.46	17.28	0.10
E	P-1542	INL 1542	PCO-1543	4.72	4.20	Circle		1.25	12.40	4.20	0.013	6.10	6.09	0.10	1.25	0.33	11.03	1.62	1.99	13.24	0.01
E	P-1541	INL 1541	INL 1537	4.51	4.32	Circle		1.25	44.30	0.43	0.013	7.19	7.16	0.06	1.25	0.53	3.53	1.31	1.61	4.23	0.03
E	P-1537	INL 1537	PRM-1526C	4.32	2.50	Circle		1.00	59.80	3.04	0.013	7.38	7.00	0.62	1.00	0.47	7.76	3.58	2.81	6.21	0.37
E	P-1536	INL 1536	PRM-1526E	4.26	2.50	Circle		1.25	59.20	2.97	0.013	7.03	7.00	0.05	1.25	0.30	9.28	1.18	1.45	11.14	0.03
E	P-1532	PCO-1532	PRM- 1506	3.57	3.35	Circle		1.50	54.70	0.40	0.013	7.17	7.06	0.21	1.50	0.94	3.70	2.71	4.80	6.66	0.11
E	P-1531	INL 1531	PCO-1532	3.79	3.62	Circle		1.25	5.90	2.90	0.013	6.09	6.09	0.07	1.25	0.33	9.16	1.37	1.69	10.99	0.00
E	P-1526E	PRM-1526E	PRM- 1506	1.52	1.46	Circle		4.00	45.50	0.13	0.013	6.46	6.21	0.55	4.00	3.12	4.14	8.46	106.36	52.18	0.25
E	P-1526D	PRM-1526D	PRM-1526E	1.61	1.52	Circle		4.00	45.80	0.20	0.013	6.81	6.56	0.54	4.00	3.11	5.05	8.40	105.50	63.65	0.25
E	P-1526C	PRM-1526C	PRM-1526D	1.71	1.61	Circle		4.00	54.00	0.19	0.013	7.19	6.90	0.54	4.00	3.10	4.90	8.37	105.17	61.78	0.29
E	P-1526B	PRM-1526B	PRM-1526C	1.79	1.71	Circle		4.00	45.70	0.18	0.013	7.24	7.00	0.53	4.00	3.09	4.77	8.28	104.08	60.09	0.24
E	P-1526A	PRM-1526A	PRM-1526B	1.93	1.79	Circle		4.00	83.20	0.17	0.013	7.43	7.00	0.52	4.00	3.08	4.68	8.23	103.39	58.93	0.43
E	P-1526	PRM-1526	PRM-1526A	2.05	1.93	Circle		4.00	68.90	0.17	0.013	7.36	7.01	0.51	4.00	3.07	4.76	8.19	102.86	59.93	0.35
E	P-1525	PCO- 1525	PRM-1526	3.20	2.95	Circle		1.50	10.70	2.33	0.013	8.00	7.99	0.07	1.50	0.43	8.91	1.60	2.83	16.04	0.01
E	P-1523	INL 1523	PCO- 1525	5.55	5.35	Circle		1.25	4.20	4.72	0.013	8.09	8.09	0.04	1.25	0.26	11.70	1.05	1.29	14.04	0.00
E	P-1519	INL 1519	PRM-1526A	5.22	3.50	Circle		1.25	12.10	14.19	0.013	7.02	7.01	0.06	1.25	0.22	20.28	1.29	1.58	24.33	0.01
E	P-1516	INL 1516	PRM-1526B	4.69	3.00	Circle		1.25	11.40	14.84	0.013	7.01	7.00	0.09	1.25	0.24	20.73	1.60	1.96	24.88	0.01
E	P-1511	INL 1511	PRM-1526D	5.23	3.50	Circle		1.25	13.00	13.33	0.013	7.01	7.00	0.03	1.25	0.18	19.65	0.85	1.04	23.58	0.00
E	P-1509	INL 1509	PRM-1526E	5.12	3.00	Circle		1.25	12.50	17.00	0.013	7.00	7.00	0.02	1.25	0.15	22.19	0.69	0.84	26.63	0.00
E	P-1506A	PRM-1506A	E	0.95	0.90	Circle		4.00	22.90	0.22	0.013	5.04	4.90	0.59	4.00	3.18	5.32	8.81	110.67	67.05	0.14
E	P-1506	PRM- 1506	PRM-1506A	1.46	0.95	Circle		4.00	161.20	0.32	0.013	6.09	5.14	0.59	4.00	3.18	6.41	8.81	110.70	80.80	0.96
E	P-1505	PCO- 1505	PRM- 1506	2.85	1.46	Circle		1.50	11.70	11.91	0.013	6.52	6.48	0.32	1.50	0.41	20.14	3.38	5.98	36.26	0.04
E	P-1503	INL 1503	PCO- 1505	4.32	3.05	Circle		1.25	4.10	31.25	0.013	6.71	6.70	0.17	1.25	0.23	30.09	2.16	2.65	36.11	0.01
E	P-1500	INL 1500	PRM-1506A	5.17	4.00	Circle		1.25	12.50	9.38	0.013	5.94	5.94	0.01	1.25	0.15	16.49	7.28	0.61	19.79	0.00
E1	P-1530	INL 1530	E1	4.57	2.80	Circle		1.50	66.60	2.66	0.013	4.98	4.30	1.23	1.50	0.27	9.51	5.57	1.19	17.12	0.68
E2	P-1497	INL 1497	E2	1.37	1.35	Circle		3.00	2.90	0.68	0.013	4.35	4.35	0.17	3.00	1.52	7.75	7.81	27.97	55.01	0.00
E3	P-1484	PCO-1484	E3	3.56	3.43	Circle		1.25	32.80	0.40	0.013	4.68	4.68	0.01	1.25	0.37	3.38	2.56	0.78	4.06	0.00
F	P-1495B	PRM-1495B	F	0.50	-1.00	Circle		4.00	94.00	1.60	0.013	3.12	3.00	0.76	4.00	1.79	14.40	13.74	74.78	181.49	0.12
F	P-1495A	INL 1495A	PCO- 1495	1.40	1.04	Circle		2.00	159.50	0.23	0.013	5.26	3.09	1.36	2.00	1.79	3.47	8.39	26.37	10.75	2.17
F	P-1495	PCO- 1495	PRM-1495B	1.04	0.50	Circle		4.00	27.80	1.94	0.013	3.08	3.18	0.08	2.68	0.98	15.89	11.06	26.54	200.17	0.10
F	P-1491	INL 1491	PRM-1451A	4.96	4.00	Circle		1.25	11.50	8.34	0.013	6.49	6.48	0.05	1.25	0.24	15.54	1.23	1.51	18.65	0.01
F	P-1477	PCO-1477	PRM-1383A	5.75	4.85	Circle		1.50	56.30	1.60	0.013	8.36	8.28	0.13	1.50	0.55	7.38	2.16	3.81	13.28	0.07
F	P-1476	INL 1476	PCO-1477	6.24	5.95	Circle		1.25	6.30	4.59	0.013	8.40	8.39	0.20	1.25	0.39	11.53	2.35	2.88	13.84	0.01
F	P-1473	INL 1473	INL 1469	5.40	5.30	Circle		1.25	31.80	0.31	0.013	7.51	7.45	0.16	1.25	0.79	3.02	2.13	2.61	3.62	0.05
F	P-1471	PCO-1471	PRM- 1421	4.74	4.35	Circle		1.50	54.80	0.71	0.013	7.58	7.45	0.23	1.50	0.81	4.92	2.88	5.09	8.86	0.13
F	P-1469	INL 1469	PCO-1471	5.25	4.99	Circle		1.25	6.90	3.77	0.013	7.64	7.62	0.38	1.25	0.48	10.45	3.25	3.99	12.54	0.03
F	P-1463	INL 1463	PCO-1461	4.27	4.07	Circle		1.25	82.50	0.24	0.013	7.08	7.04	0.05	1.25	0.58	2.65	1.15	1.42	3.18	0.04
F	P-1461A	INL 1461A	PCO-1461	3.55	3.47	Circle		1.25	15.40	0.52	0.013	7.05	7.04	0.05	1.25	0.47	3.88	1.15	1.42	4.66	0.01
F	P-1461	PCO-1461	PCO-1460	3.32	3.10	Circle		1.25	36.90	0.60	0.013	7.16	6.85	0.84	1.25	0.98	4.15	4.81	5.91	4.98	0.31
F	P-1460A	INL 1460A	PCO-1460	3.50	3.20	Circle		1.25	25.50	1.17	0.013	6.86	6.85	0.06	1.25	0.41	5.83	1.30	1.59	7.00	0.02
F	P-1460	PCO-1460	PRM-1435A	3.00	2.89	Circle		1.25	69.60	0.16	0.013	7.64	6.60	1.49	1.25	1.11	2.14	6.42	7.88	2.57	1.04
F	P-1459	INL 1459	INL 1455	4.10	3.87	Circle		1.25	54.90	0.42	0.013	6.29	6.26	0.04	1.25	0.49	3.48	1.09	1.34	4.18	0.02
F	P-1455	INL 1455	PCO-1454	3.87	3.76	Circle		1.25	8.70	1.27	0.013	6.12	6.09	0.33	1.25	0.63	6.07	3.01	3.70	7.28	0.03
F	P-1454	PCO-1454	PRM- 1451	3.76	2.20	Circle		1.25	55.20	2.83	0.013	7.55	7.06	0.89	1.25	0.67	9.05	4.98	6.11	10.86	0.49
F	P-1451A	PRM-1451A	PRM-1495B	1.44	1.21	Circle		2.50	59.30	0.39	0.013	5.06	3.78	2.15	2.50	2.39	5.21	12.26	60.19	25.53	1.28
F	P-1451	PRM- 1451	PRM-1451A	2.07	1.44	Circle		2.50	159.60	0.39	0.013	8.65	5.30	2.10	2.50	2.39	5.26	12.12	59.49	25.77	3.36
F	P-1450	PCO- 1450	PRM- 1451	3.02	2.07	Circle		1.25	10.70	8.90	0.013	7.15	7.06	0.88	1.25	0.48	16.06	4.94	6.07	19.27	0.09
F	P-1446	INL 1446	PCO- 1450	4.12	3.37	Circle		1.25	4.30	17.33	0.013	7.39	7.38	0.20	1.25	0.28	22.41	2.33	2.86	26.89	0.01
F	P-1444	INL 1444	PRM-1435C	4.30	3.20	Circle		1.25	12.50	8.83	0.013	6.18	6.17	0.05	1.25	0.24	15.99	1.22	1.50	19.19	0.01
F	P-1439	INL 1439	PRM-1435B	4.67	4.00	Circle		1.25	11.70	5.71	0.013	6.38	6.38	0.01	1.25	0.16	12.87	0.42	0.52	15.44	0.00
F	P-1437A	INL 1437A	PCO- 1437	4.30	3.19	Circle		1.25	15.50	7.18	0.013	8.52	7.34	7.61	1.25	1.06	14.43	14.52	17.82	17.31	1.18
F	P-1437	PCO- 1437	PRM-1435A	3.14	2.85	Circle		1.25	28.20	1.03	0.013	8.82	6.60	7.86	1.25	1.24	5.46	14.76	18.11	6.55	2.21
F	P-1436A	INL 1436A	PCO- 1436	3.50	3.13	Circle		2.00	49.60	0.75	0.013	7.23	7.19	0.06	2.00	0.74	6.30	1.80	5.64	19.54	0.03
F	P-1436	PCO- 1436	PRM- 1435	3.08	2.71	Circle		2.00	28.40	1.30	0.013	7.16	7.12	0.14	2.00	0.79	8.33	2.70	8.48	25.83	0.04
F	P-1435C	PRM-1435C	PRM- 1451	2.27	2.17	Circle		2.50	39.30	0.25	0.013	7.70	7.06	1.63	2.50	2.33	4.22	10.66	52.34	20.69	0.64
F	P-1435B	PRM-1435B	PRM-1435C	2.50	2.27	Circle		2.50	80.70	0.28	0.013	7.45	6.17	1.58	2.50	2.32	4.47	10.50	51.56	21.89	1.28
F	P-1435A	PRM-1435A	PRM-1435B	2.63	2.50	Circle		2.50	47.00	0.28	0.013	7.11	6.38	1.56	2.50	2.32	4.40	10.45	51.31	21.58	0.73
F	P-1435	PRM- 1435	PRM-1435A	2.71	2.63	Circle		2.50	32.30	0.25	0.013	6.93	6.60	1.01	2.50	2.15	4.17	8.38	41.14	20.41	0.33
F	P-1433	INL 1433	PRM-1421C	5.12	4.00	Circle		1.25	11.60	9.63	0.013	7.01	7.01	0.01	1.25	0.16	16.70	0.59	0.72	20.04	0.00
F	P-1429	INL 1429	PRM-1421B	4.83	3.50	Circle		1.25	11.70	11.34	0.013	7.01	7.01	0.01	1.25	0.14	18.13	0.45	0.56	21.75	0.00
F	P-1423	INL 1423	PRM-1421A	5.72	4.50	Circle		1.25	12.00	10.15	0.013	7.01	7.01	0.01	1.25	0.17	17.15	0.63	0.77	20.58	0.00
F	P-1421C	PRM-1421C	PRM- 1435	3.31	3.05	Circle		2.50	44.30	0.59	0.013	7.41	7.08	0.75	2.50	2.02	6.41	7.22	35.44	31.43	0.33
F	P-1421B	PRM-1421B	PRM-1421C	3.62	3.31	Circle		2.50	54.00	0.57	0.013	7.40	7.01	0.72	2.50	2.01	6.34	7.11	34.90	31.06	0.39
F	P-1421A	PRM-1421A	PRM-1421B	3.90	3.62	Circle		2.50	49.50	0.57	0.013	7.36	7.01	0.71	2.50	2.00	6.29	7.03	34.49	30.84	0.35
F	P-1421	PRM- 1421	PRM-1421A	4.19	3.90	Circle		2.50	52.70	0.54	0.013	7.37	7.01	0.68	2.50	1.98	6.18	6.90	33.89	30.26	0.36
F	P-1420	PCO- 1420	PRM- 1421	4.34	4.30	Circle		1.25	8.10	0.49	0.013	7.40	7.39	0.08	1.25	0.54	3.78	1.45	1.78	4.53	0.01
F	P-1417	INL 1417	PCO- 1420	6.42	4.94	Circle		1.25	4.10	35.99	0.013	7.40	7.41	0.02	1.25	0.14	32.29	13.42	0.98	38.75	0.00
F	P-1412	INL 1412	PRM-1383D	6.96	5.50	Circle		1.25	12.50	11.67	0.013	7.74	7.74	0.01	1.25	0.15	18.38	8.05	0.66	22.06	0.00
F	P-1410	INL 1410	PRM-1383C	6.83	6.00	Circle		1.25	12.00	6.89	0.013	7.94	7.94	0.01	1.25	0.18	14.13	6.94	0.75	16.95	0.00
F	P-1405	INL 1405	PRM-1383B	6.95	5.00	Circle		1.25	12.20	16.00	0.013	7.67	7.67	0.01	1.25	0.13	21.53	8.81	0.62	25.84	0.01
F	P-1393	INL 1393	PRM- 1371	6.30	6.23	Circle		1.25	62.80	0.11	0.013	8.32	8.28	0.06	1.25	0.81	1.80	1.32	1.62	2.16	0.04
F	P-1390	INL 1390	INL 1476	6.77	6.24	Circle		1.25	61.90	0.86	0.013	8.52	8.49	0.05	1.25	0.41	4.98	1.15	1.42	5.98	0.03
F	P-1385A	INL 1385A	PCO-1385	5.00	4.91	Circle		2.00	21.60	0.42	0.013	8.55	8.51	0.15	2.00	1.13	4.71	2.83	8.88	14.59	0.03
F	P-1385	PCO-1385	PRM-1383A	4.71	4.62	Circle		2.00	29.00	0.31	0.013	8.47	8.42	0.17	2.00	1.28	4.06	2.98	9.36	12.59	0.05
F	P-1384A	INL 1384A	PCO-1384	5.27	4.83	Circle		2.00	123.70	0.36	0.013	8.88	8.74	0.11	2.00	1.06	4.35	2.38	7.48	13.49	0.14
F	P-1384	PCO-1384	PRM- 1383	4.83	4.71	Circle		2.00	28.90	0.42	0.013	8.70	8.65	0.19	2.00	1.21	4.70	3.17	9.97	14.58	0.06
F	P-1383D	PRM-1383D	PRM- 1421	4.32	4.19	Circle		2.00	50.80	0.26	0.013	8.21	7.46	1.48	2.00	1.82	3.69	8.77	27.56	11.45	0.75
F	P-1383C	PRM-1383C	PRM-1383D	4.45	4.32	Circle		2.00	52.00	0.25	0.013	8.48	7.74	1.43	2.00	1.81	3.65	8.60	27.01	11.32	0.74
F	P-1383B	PRM-1383B	PRM-1383C	4.55	4.45	Circle		2.00	45.60	0.22	0.013	8.56	7.94	1.36	2.00	1.79	3.42	8.40	26.37	10.60	0.62
F	P-1383A	PRM-1383A	PRM-1383B	4.63	4.55	Circle		2.00	32.60	0.25	0.013	8.10	7.67	1.30	2.00	1.78	3.62	8.23	25.84	11.21	0.42
F	P-1383	PRM- 1383	PRM-1383A	4.71	4.63	Circle		2.00	32.70	0.24	0.013	8.44	8.33	0.35	2.00	1.32	3.61	4.27	13.43	11.18	0.12
F	P-1381	INL 1381	PRM-1371B	7.48	6.20	Circle		1.25	12.60	10.19	0.013	8.15	8.16	0.01	1.25	0.15	17.18	7.65	0.65	20.62	0.01
F	P-1378	INL 1378	PRM-1371A	7.65	6.20	Circle		1.25	12.40	11.68	0.013	8.21	8.23	0.02	1.25	0.16	18.39	8.37	0.75	22.07	0.02
F	P-1374	INL 1374	PRM- 1371	6.43	6.28	Circle		1.25	12.50	1.20	0.013	8.28	8.27	0.03	1.25	0.33	5.90	0.85	1.05	7.08	0.00
F	P-1371B	PRM-1371B	PRM- 1383	5.52	5.21	Circle		1.50	44.60	0.70	0.013	8.58	8.52	0.14	1.50	0.70	4.87	2.19	3.86	8.76	0.06
F	P-1371A	PRM-1371A	PRM-1371B	5.82	5.52	Circle		1.50	62.20	0.48	0.013	8.22	8.16	0.10	1.50	0.71	4.05	1.87	3.30	7.29	0.06
F	P-1371	PRM- 1371	PRM-1371A	6.08	5.82	Circle		1.50	47.10	0.55	0.013	8.26	8.23	0.06	1.50	0.60	4.34	1.48	2.61	7.81	0.03
F2	P-1496	PCO- 1496	F2	0.93	0.70	Circle		4.00	4.00	5.75	0.013	4.70	4.70	0.00	4.00	0.14	27.34	5.59	0.78	344.49	0.00
F4	P-1485	PCO-1485	F4	4.65	4.62	Circle		1.25	4.50	0.66	0.013	5.87	5.87	0.07	1.25	0.49	4.39	3.84	1.73	5.27	0.00

DATE: 9/11/2023 5:58:47 PM
FILE: ...\FM 519 HYDRAULIC COMP08.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 8 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		118

100% SUBMITTAL

CK: DW: CK: DW:

EXISTING CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
G	P-1400	INL 1400	PCO-1345	7.20	6.98	Circle		1.25	7.00	3.13	0.013	11.00	10.95	0.83	1.25	0.63	9.53	4.78	5.87	11.43	0.06
G	P-1399A	INL 1399A	PCO-1399	7.50	5.92	Circle		1.50	58.10	2.72	0.013	9.69	9.68	0.02	1.50	0.28	9.63	0.74	1.31	17.33	0.01
G	P-1399	PCO-1399	PRM- 1356	5.92	5.58	Circle		1.50	75.30	0.45	0.013	10.59	10.40	0.25	1.50	0.96	3.92	2.95	5.21	7.06	0.19
G	P-1398	PCO-1398	PCO-1399	6.30	5.92	Circle		1.50	36.40	1.04	0.013	9.71	9.68	0.09	1.50	0.56	5.96	1.79	3.15	10.73	0.03
G	P-1396	INL 1396	PRM- 1370	6.71	6.58	Circle		1.50	54.20	0.24	0.013	8.62	8.60	0.04	1.50	0.69	2.86	1.25	2.21	5.15	0.02
G	P-1395	INL 1395	INL 1396	6.90	6.86	Circle		1.25	7.70	0.52	0.013	8.63	8.63	0.03	1.25	0.41	3.88	0.86	1.06	4.65	0.00
G	P-1370C	PRM-1370C	PRM- 1356	5.75	5.53	Circle		2.00	35.90	0.61	0.013	10.54	10.44	0.29	2.00	1.21	5.71	3.86	12.11	17.71	0.10
G	P-1370B	PRM-1370B	PRM-1370C	6.15	5.75	Circle		2.00	65.30	0.61	0.013	8.92	8.86	0.09	2.00	0.85	5.71	2.14	6.73	17.71	0.06
G	P-1370A	PRM-1370A	PRM-1370B	6.55	6.15	Circle		2.00	60.40	0.66	0.013	8.72	8.70	0.05	2.00	0.70	5.94	1.55	4.89	18.41	0.03
G	P-1370	PRM- 1370	PRM-1370A	6.72	6.55	Circle		1.50	28.70	0.59	0.013	8.57	8.52	0.15	1.50	0.76	4.49	2.32	4.09	8.08	0.04
G	P-1369	PCO-1369	PRM- 1370	6.78	6.73	Circle		1.25	8.30	0.61	0.013	8.60	8.59	0.09	1.25	0.54	4.19	1.61	1.97	5.03	0.01
G	P-1366	INL-1366	PCO-1369	7.51	6.78	Circle		1.25	5.50	13.36	0.013	8.61	8.61	0.01	1.25	0.15	19.68	8.63	0.72	23.61	0.00
G	P-1362	INL-1362	PRM-1370A	7.61	5.77	Circle		1.25	13.10	14.01	0.013	8.52	8.52	0.02	1.25	0.16	20.15	9.22	0.84	24.18	0.00
G	P-1359	INL 1359	PRM-1370B	8.00	6.00	Circle		1.25	11.30	17.74	0.013	8.57	8.70	0.42	1.25	0.23	22.67	13.00	2.03	27.20	0.13
G	P-1358	PCO-1358	PRM-1370C	6.10	5.00	Circle		1.50	28.30	3.89	0.013	8.97	8.86	0.39	1.50	0.58	11.52	3.70	6.53	20.73	0.11
G	P-1357A	INL 1357A	PCO-1357	7.50	6.34	Circle		1.50	21.60	5.37	0.013	10.21	10.14	0.30	1.50	0.50	13.52	3.26	5.76	24.34	0.06
G	P-1357	PCO-1357	PRM- 1356	6.04	5.58	Circle		1.50	28.60	1.61	0.013	10.56	10.45	0.37	1.50	0.73	7.39	3.62	6.40	13.31	0.11
G	P-1356A	PRM-1356A	PRM- 1346	4.98	4.77	Circle		2.00	63.50	0.33	0.013	11.53	10.65	1.38	2.00	1.80	4.20	8.46	26.57	13.01	0.88
G	P-1356	PRM- 1356	PRM-1356A	5.43	4.98	Circle		2.00	126.30	0.36	0.013	10.22	8.97	0.98	2.00	1.69	4.35	7.15	22.45	13.50	1.24
G	P-1355	INL 1355	PRM-1356A	7.49	6.00	Circle		1.25	12.70	11.73	0.013	9.04	8.97	0.48	1.25	0.38	18.43	3.65	4.48	22.12	0.06
G	P-1349	PRM-1346B	PRM- 1330	4.16	4.05	Circle		2.00	35.10	0.31	0.013	10.71	9.54	3.32	2.00	1.96	4.08	13.13	41.25	12.66	1.17
G	P-1348	INL 1348	PCO-1347	7.94	7.08	Circle		1.25	4.10	21.23	0.013	10.68	10.67	0.11	1.25	0.22	24.80	1.71	2.10	29.76	0.00
G	P-1347	PCO-1347	PRM- 1346	6.78	4.77	Circle		1.50	9.10	22.11	0.013	10.66	10.65	0.09	1.50	0.26	27.44	1.76	3.11	49.40	0.01
G	P-1346A	PRM-1346A	PRM-1346B	4.24	4.16	Circle		2.00	36.30	0.22	0.013	9.25	8.24	2.79	2.00	1.94	3.43	12.02	37.76	10.63	1.01
G	P-1346	PRM- 1346	PRM-1346A	4.62	4.24	Circle		2.00	156.50	0.24	0.013	11.70	8.00	2.37	2.00	1.92	3.60	11.08	34.80	11.15	3.70
G	P-1345	PCO-1345	PRM- 1346	6.98	6.62	Circle		1.50	53.50	0.67	0.013	10.91	10.65	0.47	1.50	1.05	4.79	4.09	7.23	8.62	0.25
G	P-1337	PCO-1337	PRM- 1324	5.17	5.00	Circle		1.25	54.30	0.31	0.013	9.43	8.63	1.47	1.25	1.11	3.01	6.39	7.84	3.61	0.80
G	P-1336	INL 1336	PCO-1337	5.25	5.22	Circle		1.25	8.00	0.37	0.013	8.87	8.84	0.27	1.25	0.88	3.28	2.73	3.35	3.94	0.02
G	P-1334	PCO-1334	PRM- 1330	5.54	4.35	Circle		1.50	53.60	2.22	0.013	9.57	9.54	0.05	1.50	0.39	8.69	1.31	2.31	15.65	0.03
G	P-1332B	INL 1332B	PRM-1346A	5.50	4.40	Circle		1.25	13.60	8.09	0.013	8.05	8.00	0.39	1.25	0.40	15.31	3.27	4.01	18.37	0.05
G	P-1332A	INL 1332A	PCO-1332	5.60	5.25	Circle		1.50	78.50	0.45	0.013	8.35	8.31	0.06	1.50	0.62	3.89	1.40	2.48	7.01	0.04
G	P-1332	PCO-1332	PRM-1346B	5.15	4.38	Circle		1.50	28.80	2.68	0.013	8.29	8.24	0.18	1.50	0.52	9.55	2.50	4.42	17.19	0.05
G	P-1331A1	PCO-1331	PRM- 1330	4.81	4.40	Circle		1.50	29.10	1.41	0.013	9.55	9.54	0.04	1.50	0.41	6.92	1.16	2.06	12.46	0.01
G	P-1331A	INL 1331A	PCO-1331	6.00	5.11	Circle		1.50	20.70	4.30	0.013	9.23	9.22	0.02	1.50	0.27	12.10	0.90	1.60	21.78	0.00
G	P-1330	PRM- 1330	PRM- 1324	4.05	3.65	Circle		2.00	158.70	0.25	0.013	14.81	8.63	3.89	2.00	1.97	3.66	14.20	44.62	11.36	6.18
G	P-1326	INL 1326	PCO-1325	4.71	4.53	Circle		1.25	4.80	3.73	0.013	8.71	8.70	0.07	1.25	0.31	10.40	1.34	1.65	12.48	0.00
G	P-1325	PCO-1325	PRM- 1324	3.88	3.65	Circle		1.50	8.10	2.83	0.013	8.65	8.63	0.19	1.50	0.52	9.81	2.60	4.60	17.66	0.02
G	P-1324	PRM- 1324	G	3.50	2.72	Circle		2.00	174.40	0.45	0.013	14.70	4.72	5.72	2.00	1.99	4.88	17.22	54.10	15.13	9.98
G1	P-1340	PCO-1340	G1	4.27	3.50	Circle		1.25	37.90	2.03	0.013	5.25	4.75	1.71	1.25	0.73	7.68	7.96	5.88	9.21	0.50
G1	P-1339A	INL 1339A	PCO-1339	5.50	4.63	Circle		1.25	16.30	5.35	0.013	6.37	6.05	3.06	1.25	0.48	12.45	10.74	4.62	14.94	0.32
G1	P-1339	PCO-1339	PCO-1340	4.33	4.32	Circle		1.25	35.90	0.03	0.013	5.81	5.59	0.61	1.25	0.91	0.90	4.12	5.06	1.08	0.22
H	P-1322	PCO-1322	PRM-1317B	4.43	-1.25	Circle		1.50	29.40	19.31	0.013	4.70	1.97	9.59	1.50	0.11	25.64	8.76	0.53	46.16	2.73
H	P-1321	PCO-1321	PRM-1317A	4.40	-1.20	Circle		1.50	29.20	19.15	0.013	5.25	3.71	6.06	1.50	0.33	25.53	16.93	4.88	45.96	1.54
H	P-1319A	INL 1319A	PCO-1319	4.00	3.38	Circle		1.25	20.00	3.09	0.013	5.97	5.96	0.05	1.25	0.30	9.47	1.14	1.40	11.36	0.01
H	P-1319	PCO-1319	PCO-1279	3.78	3.71	Circle		1.50	36.10	0.19	0.013	5.91	5.87	0.10	1.50	0.93	2.57	1.85	3.27	4.63	0.03
H	P-1318B	PRM-1318B	PRM-1317	-0.89	-1.16	Circle		3.00	129.60	0.21	0.013	10.73	7.00	2.87	3.00	2.93	4.29	16.00	113.08	30.44	3.73
H	P-1318A	PRM-1318A	PRM-1318B	-0.76	-0.89	Circle		3.00	85.70	0.15	0.013	8.75	6.43	2.71	3.00	2.93	3.66	15.54	109.84	25.98	2.32
H	P-1318	PRM- 1318	PRM-1318A	-0.71	-0.75	Circle		3.00	31.70	0.13	0.013	5.82	5.16	2.11	3.00	2.88	3.34	13.69	96.80	23.68	0.67
H	P-1317B	PRM-1317B	H	-1.55	-1.59	Circle		3.00	17.10	0.22	0.013	1.96	1.41	3.22	3.00	2.95	4.44	16.92	119.63	31.50	0.55
H	P-1317A	PRM-1317A	PRM-1317B	-1.47	-1.55	Circle		3.00	37.70	0.21	0.013	3.57	2.36	3.20	3.00	2.95	4.33	16.88	119.32	30.71	1.21
H	P-1317	PRM-1317	PRM-1317A	-1.16	-1.47	Circle		3.00	161.20	0.19	0.013	8.91	4.03	3.03	3.00	2.94	4.12	16.41	116.00	29.25	4.88
H	P-1314	INL 1314	PRM-1317	5.66	4.00	Circle		1.25	21.10	7.86	0.013	7.04	7.00	0.20	1.25	0.34	15.09	2.35	2.89	18.11	0.04
H	P-1312	INL 1312	PRM-1318B	6.31	4.00	Circle		1.25	13.30	17.38	0.013	6.97	6.43	5.47	1.25	0.27	22.44	14.03	2.69	26.93	0.54
H	P-1308	PCO-1308	PRM-1318A	3.99	0.00	Circle		1.50	28.00	14.24	0.013	5.21	5.16	0.54	1.50	0.45	22.02	17.38	7.72	39.63	0.06
H	P-1307A	INL 1307A	PCO-1307	5.00	4.27	Circle		1.50	22.40	3.25	0.013	5.46	5.56	0.20	1.29	0.28	10.53	6.39	1.48	18.95	0.11
H	P-1307	PCO-1307	PCO-1308	4.37	4.09	Circle		1.50	36.10	0.78	0.013	5.51	5.50	0.10	1.41	0.62	5.14	4.80	3.31	9.26	0.01
H	P-1304C	PRM-1304C	PRM- 1293	-0.11	-0.15	Circle		3.00	45.70	0.09	0.013	7.91	7.05	1.89	3.00	2.86	2.78	12.96	91.61	19.74	0.86
H	P-1304B1	PRM-1304B	PRM-1304C	-0.03	-0.11	Circle		3.00	68.80	0.12	0.013	7.52	6.35	1.70	3.00	2.83	3.20	12.29	86.85	22.74	1.17
H	P-1304B	PRM-1304A	PRM-1304B	0.02	-0.03	Circle		3.00	38.60	0.13	0.013	6.21	5.56	1.69	3.00	2.82	3.38	12.27	86.70	24.01	0.65
H	P-1304	PRM- 1304	PRM-1304A	0.07	0.02	Circle		3.00	38.40	0.13	0.013	6.58	6.00	1.50	3.00	2.79	3.39	11.56	81.71	24.07	0.58
H	P-1303A	INI 1303A	PCO-1303	4.50	3.97	Circle		1.25	20.30	2.61	0.013	6.31	6.30	0.06	1.25	0.33	8.69	1.26	1.55	10.43	0.01
H	P-1303	PCO-1303	PCO-1302	3.82	3.65	Circle		1.50	36.10	0.47	0.013	6.24	6.21	0.10	1.50	0.71	4.01	1.85	3.26	7.21	0.03
H	P-1302A	INL 1302A	PCO-1302	4.00	3.65	Circle		1.25	18.50	1.89	0.013	6.23	6.22	0.04	1.25	0.32	7.40	1.02	1.25	8.88	0.01
H	P-1302	PCO-1302	PRM-1304A	3.55	0.50	Circle		1.50	28.60	10.67	0.013	6.11	6.00	0.38	1.50	0.44	19.06	3.67	6.48	34.31	0.11
H	P-1299	INL 1299	PRM-1304B	5.39	3.00	Circle		1.25	15.70	15.18	0.013	5.61	5.56	0.76	1.25	0.10	20.97	7.07	0.32	25.16	0.05
H	P-1296	INL 1296	PRM-1304C	5.49	4.00	Circle		1.25	21.00	7.10	0.013	6.35	6.35	0.01	1.25	0.16	14.34	6.65	0.63	17.21	0.00
H	P-1293A	PRM-1293A	PRM- 1318	-0.38	-0.61	Circle		3.00	116.90	0.20	0.013	8.62	6.15	2.12	3.00	2.88	4.17	13.73	97.08	29.58	2.48
H	P-1293	PRM- 1293	PRM-1293A	-0.15	-0.38	Circle		3.00	117.10	0.20	0.013	6.74	4.47	1.94	3.00	2.86	4.16	13.15	92.94	29.56	2.27
H	P-1292	INL 1292	PRM- 1293	5.72	3.00	Circle		2.00	16.50	16.48	0.013	8.52	8.52	0.01	2.00	0.20	29.63	0.60	1.88	91.84	0.00
H	P-1289	INL 1289	PRM-1293A	5.57	1.00	Circle		1.25	18.50	24.66	0.013	6.17	4.47	10.14	1.25	0.22	26.73	15.04	2.24	32.08	1.70
H	P-1284	INL 1284	PRM-1317	4.51	-1.00	Circle		1.25	61.10	9.02	0.013	7.03	7.00	0.04	1.25	0.22	16.17	1.12	1.37	19.40	0.03
H	P-1282	INL 1282	PRM-1318B	4.25	-0.70	Circle		1.25	61.40	8.06	0.013	6.48	6.43	0.08	1.25	0.27	15.28	1.49	1.83	18.34	0.05
H	P-1279A	INL 1279A	PCO-1279	4.00	3.56	Circle		1.25	20.00	2.20	0.013	5.96	5.92	0.17	1.25	0.45	7.98	2.20	2.69	9.57	0.03
H	P-1279	PCO-1279	PRM-1318A	3.41	-1.06	Circle		1.50	76.00	5.89	0.013	5.75	5.16	0.78	1.50	0.63	14.16	5.24	9.26	25.48	0.59
H	P-1274	INL 1274	PRM-1293A	4.28	-0.38	Circle		1.50	62.00	7.51	0.013	4.91	4.47	1.04	1.50	0.32	15.99	10.33	2.80	28.79	0.45
H	P-1270	INL 1270	INL 1274	5.21	4.68	Circle		1.25	62.00	0.85	0.013	5.77	5.17	0.83	0.49	0.49	4.98	4.36	1.97	5.97	0.59
H	P-1268	INL 1268	INL 1270	5.63	5.31	Circle		1.25	29.10	1.10	0.013	6.07	5.78	1.09	0.47	0.36	5.65	4.19	1.23	6.78	0.29
H	P-1264	INL 1264	PRM-1304C	4.06	-0.11	Circle		1.50	61.50	6.78	0.013	6.47	6.35	0.19	1.50	0.42	15.19	2.62	4.63	27.35	0.12
H	P-1258	INL 1258	INL 1264	4.84	4.26	Circle		1.25	75.00	0.77	0.013	6.65	6.43	0.29	1.25	0.70	4.73	2.81	3.45	5.68	0.21
H	P-1257A	INL 1257A	PCO-1257	4.00	3.34	Circle		1.25	16.40	4.03	0.013	7.21	7.19	0.08	1.25	0.32	10.80	1.49	1.83	12.96	0.01
H	P-1257	PCO-1257	PCO-1256	3.54	3.21	Circle		1.50	36.10	0.92	0.013	7.21	7.17	0.10	1.50	0.60	5.58	1.92	3.39	10.05	0.04
H	P-1256A	INL 1256A	PCO-1256	3.50	3.11	Circle		1.25	22.50	1.73	0.013	7.20	7.17	0.14	1.25	0.45	7.09	1.96	2.41	8.51	0.03
H	P-1256	PCO-1256	PRM- 1304	3.11	0.27	Circle		1.50	75.10	3.78	0.013	7.10	6.74	0.47	1.50	0.62	11.34	4.08	7.21	20.42	0.35
H	P-1254	INL 1254	PRM-1243A	4.23	0.47	Circle		1.50	60.10	6.25	0.013	5.96	5.91	0.07	1.50	0.33	14.59	1.58	2.78	26.27	0.04
H	P-1249	INL 1249	INL 1254	4.29	4.13	Circle		1.25	62.10	0.26	0.013	6.03	5.99	0.07	1.25	0.63	2.73	1.35	1.65	3.28	0.04
H	P-1246	INL 1246	PRM- 1243	5.55	3.00	Circle		1.25	21.30	11.96	0.013	8.18	8.16	0.10	1.25	0.26	18.62	1.69	2.08	22.34	0.02
H	P-1243A	PRM-1243A	PRM- 1304	0.47	0.27	Circle		3.00	40.90	0.49	0.013	7.37	6.85	1.26	3.00	2.72	6.57	10.58	74.78	46.65	0.51
H	P-1243	PRM- 1243	PRM-1243A	0.82	0.47	Circle		3.00	79.20	0.44	0.013	6.84	5.91	1.17	3.00	2.69	6.24	10.22	72.24	44.33	0.93
H	P-1239	INL 1239	PRM-1226B	4.09	0.97	Circle		1.25	59.50	5.24	0.013	6.04	5.71	0.55	1.25	0.49	12.33	3.89	4.78	14.79	0.33
H	P-1238	PCO-1238	PRM- 1226	2.73	1.89	Circle		1.50	76.90	1.09	0.013	8.03	7.36	0.87	1.50	1.10	6.10	5.53	9.77	10.98	0.67
H	P-1237	PCO-1237	PCO-1238	3.01	2.93	Circle		1.50	35.90	0.22	0.013	7.09	7.01	0.23	1.50	1.26	2.76	2.86	5.06	4.96	0.08

DATE: 9/11/2023 6:00:12 PM
FILE: ...\FM 519 HYDRAULIC COMP09.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 9 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		119

100% SUBMITTAL

CK | DW | CK | DW

EXISTING CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US	DS							US ELEV	DS ELEV	SLOPE	UNIFORM	ACTUAL	UNIFORM	ACTUAL	Q		LOSS
				(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft/s)	(ft/s)	(cfs)	(cfs)	(ft)
H	P-1231	INL 1231	PRM-1226A	3.29	0.87	Circle		1.25	58.70	4.12	0.013	5.42	5.38	0.08	1.25	0.31	10.93	1.45	1.78	13.11	0.04
H	P-1230	INL 1230	PRM-1226A	5.31	3.00	Circle		1.25	14.50	15.93	0.013	6.24	5.38	7.09	1.25	0.39	21.48	16.54	5.32	25.78	0.87
H	P-1226B	PRM-1226B	PRM- 1243	1.18	0.87	Circle		3.00	81.20	0.38	0.013	7.92	7.01	1.13	3.00	2.67	5.80	10.02	70.82	41.21	0.92
H	P-1226A	PRM-1226A	PRM-1226B	1.50	1.18	Circle		3.00	89.20	0.36	0.013	6.59	5.71	0.99	3.00	2.61	5.63	9.39	66.41	39.96	0.88
H	P-1226	PRM- 1226	PRM-1226A	1.89	1.50	Circle		2.50	110.20	0.35	0.013	7.79	5.38	2.19	2.50	2.40	4.98	12.37	60.72	24.40	2.42
H	P-1225	PCO-1225	PRM-1215A	3.30	1.92	Circle		1.50	7.60	18.14	0.013	7.26	7.23	0.47	1.50	0.41	24.85	4.06	7.18	44.73	0.04
H	P-1222	INL 1222	PCO-1225	4.47	3.65	Circle		1.25	6.60	12.46	0.013	7.39	7.37	0.33	1.25	0.34	19.00	3.04	3.73	22.80	0.02
H	P-1218	INL 1218	PRM- 1215	4.09	2.36	Circle		1.25	14.10	12.25	0.013	7.78	7.64	1.00	1.25	0.46	18.84	5.27	6.47	22.61	0.14
H	P-1215A	PRM-1215A	PRM- 1226	1.92	1.89	Circle		2.00	15.50	0.19	0.013	8.16	7.36	5.11	2.00	1.98	3.21	16.28	51.15	9.94	0.79
H	P-1215	PRM- 1215	PRM-1215A	2.10	1.92	Circle		2.00	116.60	0.15	0.013	11.98	7.23	4.07	2.00	1.97	2.87	14.53	45.65	8.89	4.75
H	P-1214	INL 1214	PRM- 1215	3.57	2.16	Circle		1.50	58.30	2.42	0.013	7.77	7.64	0.22	1.50	0.57	9.08	2.80	4.94	16.34	0.13
H	P-1210	INL 1210	PRM-1196B	3.71	2.40	Circle		1.50	58.40	2.24	0.013	5.92	5.80	0.22	1.50	0.57	8.74	2.77	4.89	15.73	0.13
H	P-1205	INL 1205	PRM-1196A	4.51	2.60	Circle		1.25	15.00	12.74	0.013	5.37	5.41	0.95	1.25	0.38	19.21	14.59	4.52	23.05	0.04
H	P-1202	INL 1202	PRM-1196A	3.62	2.54	Circle		1.50	58.50	1.85	0.013	5.59	5.41	0.31	1.50	0.67	7.93	3.29	5.82	14.27	0.18
H	P-1198A	INL 1198A	PCO-1198	3.00	2.80	Circle		2.00	17.00	1.18	0.013	6.89	6.88	0.06	2.00	0.64	7.93	1.75	5.50	24.57	0.01
H	P-1198	PCO-1198	PRM- 1196	2.90	2.86	Circle		2.00	75.50	0.05	0.013	6.73	6.51	0.30	2.00	1.26	1.68	3.93	12.34	5.21	0.22
H	P-1197A	INL 1197A	PCO-1197	3.50	3.18	Circle		1.50	10.60	3.01	0.013	6.90	6.88	0.20	1.50	0.52	10.13	2.66	4.69	18.23	0.02
H	P-1197	PCO-1197	PCO-1198	3.18	2.86	Circle		1.50	35.80	0.89	0.013	6.99	6.85	0.39	1.50	0.89	5.52	3.74	6.60	9.93	0.14
H	P-1196C	INL 1196C	PRM- 1196	3.00	2.80	Circle		1.25	20.30	0.98	0.013	6.23	6.22	0.03	1.25	0.36	5.34	0.94	1.15	6.41	0.01
H	P-1196B	PRM-1196B	PRM- 1215	2.32	2.11	Circle		2.00	94.10	0.22	0.013	10.01	7.64	2.51	2.00	1.93	3.45	11.41	35.84	10.69	2.36
H	P-1196A	PRM-1196A	PRM-1196B	2.54	2.32	Circle		2.00	100.10	0.22	0.013	7.69	5.80	1.90	2.00	1.88	3.42	9.91	31.14	10.61	1.90
H	P-1196	PRM- 1196	PRM-1196A	2.70	2.54	Circle		2.00	77.20	0.21	0.013	6.13	5.41	0.94	2.00	1.67	3.32	6.98	21.93	10.30	0.73
H	P-1192A	INL 1192A	PCO- 1192	3.50	3.15	Circle		1.50	13.90	2.52	0.013	6.57	6.57	0.01	1.50	0.23	9.26	0.47	0.83	16.67	0.00
H	P-1192	PCO- 1192	PRM- 1196	2.90	2.85	Circle		2.00	39.90	0.13	0.013	6.55	6.47	0.22	2.00	1.16	2.58	3.36	10.57	8.01	0.09
H	P-1191B	INL 1191B	INL 1191A	4.20	3.90	Circle		1.50	127.10	0.24	0.013	7.49	7.02	0.37	1.50	0.98	2.83	3.62	6.40	5.10	0.47
H	P-1191A	INL 1191A	PCO-1191	3.78	3.72	Circle		1.50	13.60	0.44	0.013	6.82	6.77	0.40	1.50	1.17	3.88	3.77	6.67	6.98	0.05
H	P-1191	PCO-1191	PCO- 1192	3.72	3.15	Circle		2.00	119.40	0.48	0.013	6.75	6.63	0.10	2.00	0.94	5.04	2.22	6.98	15.63	0.11

DATE: 9/11/2023 6:01:40 PM
FILE: ...\FM 519 HYDRAULIC COMP10.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		120

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
A	P-7008	PCO-7008	PRM- 2064	4.22	4.07	Circle		1.50	55.40	0.27	0.013	6.60	6.59	0.03	1.50	0.59	3.03	1.00	1.78	5.46	0.02
A	P-2279	PRM- 2279	A	0.40	0.08	Circle		3.00	184.10	0.17	0.013	3.86	3.08	0.42	3.00	2.15	3.92	6.14	43.37	27.80	0.78
A	P-2277	PCO- 2277	PRM- 2279	1.59	1.40	Circle		1.50	10.60	1.79	0.013	4.21	4.20	0.08	1.50	0.46	7.81	1.64	2.89	14.06	0.01
A	P-2258	PCO-2258	PRM- 2279	2.50	1.26	Circle		1.50	55.80	2.22	0.013	4.38	4.32	0.09	1.50	0.46	8.70	1.79	3.17	15.66	0.05
A	P-2256	INL 2256	PCO-2258	3.23	3.15	Circle		1.25	7.70	1.04	0.013	4.39	4.39	0.03	1.24	0.36	5.48	4.07	1.19	6.58	0.00
A	P-2242	INL 2242	PRM- 2230	3.04	1.65	Circle		1.50	64.60	2.15	0.013	4.68	4.67	0.02	1.50	0.32	8.56	0.86	1.51	15.41	0.01
A	P-2236	INL 2236	INL 2242	3.95	3.04	Circle		1.25	43.60	2.09	0.013	4.70	4.70	0.02	1.25	0.25	7.78	4.71	0.84	9.33	0.00
A	P-2230	PRM- 2230	PRM- 2279	0.63	0.43	Circle		3.00	103.40	0.19	0.013	4.28	3.91	0.36	3.00	2.05	4.13	5.62	39.70	29.33	0.37
A	P-2223	INL 2223	PRM- 2230	3.38	2.90	Circle		1.25	17.30	2.78	0.013	4.59	4.59	0.01	1.25	0.22	8.98	5.04	0.75	10.77	0.00
A	P-2205A	INL 2205A	PCO-2205	3.63	3.53	Circle		1.50	31.30	0.32	0.013	5.14	5.14	0.00	1.50	0.00	3.30	0.00	0.00	5.94	0.00
A	P-2205	PCO-2205	PCO-2203	3.33	3.29	Circle		1.50	35.90	0.11	0.013	5.14	5.14	0.00	1.50	0.29	1.94	0.16	0.28	3.50	0.00
A	P-2203A	INL 2203A	PCO-2203	3.39	3.29	Circle		1.50	17.00	0.59	0.013	5.15	5.14	0.02	1.50	0.43	4.47	0.81	1.44	8.04	0.00
A	P-2203	PCO-2203	PRM- 2196	3.29	2.52	Circle		1.50	80.20	0.96	0.013	5.14	5.10	0.04	1.50	0.46	5.72	1.18	2.08	10.29	0.03
A	P-2196	PRM- 2196	PRM- 2230	1.42	1.26	Circle		3.00	132.20	0.12	0.013	4.76	4.32	0.33	3.00	2.02	3.27	5.45	38.49	23.20	0.44
A	P-2193A	INL 2193A	PCO- 2193	3.05	2.89	Circle		1.50	45.10	0.35	0.013	5.31	5.28	0.07	1.50	0.69	3.47	1.54	2.72	6.25	0.03
A	P-2193	PCO- 2193	PRM- 2196	2.79	2.32	Circle		1.50	28.60	1.64	0.013	5.22	5.12	0.32	1.50	0.70	7.48	3.36	5.94	13.46	0.09
A	P-2189A	INL 2189A	PCO- 2189	3.25	3.05	Circle		1.50	57.80	0.35	0.013	5.41	5.38	0.06	1.50	0.67	3.43	1.43	2.52	6.18	0.03
A	P-2189	PCO- 2189	PCO- 2193	3.05	2.79	Circle		1.50	36.50	0.71	0.013	5.33	5.30	0.09	1.50	0.61	4.93	1.76	3.12	8.87	0.03
A	P-2187	INL 2187	PRM-2162A	4.64	3.00	Circle		1.25	12.60	12.98	0.013	5.22	5.23	0.00	1.25	0.11	19.39	6.92	0.35	23.27	0.00
A	P-2168	PCO-2168	PRM- 2162	3.20	3.10	Circle		1.50	54.70	0.18	0.013	5.54	5.53	0.02	1.50	0.59	2.49	0.84	1.48	4.49	0.01
A	P-2162A	PRM-2162A	PRM- 2196	1.68	1.42	Circle		3.00	72.30	0.36	0.013	4.97	4.80	0.24	3.00	2.06	5.63	4.62	32.64	40.00	0.17
A	P-2162	PRM- 2162	PRM-2162A	1.78	1.68	Circle		3.00	111.20	0.09	0.013	5.26	5.00	0.24	3.00	1.86	2.82	4.62	32.66	20.00	0.27
A	P-2160A	INL 2160A	PCO- 2160	4.30	3.40	Circle		1.50	170.90	0.53	0.013	5.49	5.49	0.00	1.50	0.22	4.23	2.17	0.34	7.62	0.00
A	P-2160	PCO- 2160	PRM- 2162	3.10	3.06	Circle		1.50	9.70	0.41	0.013	5.49	5.48	0.01	1.50	0.44	3.75	0.72	1.27	6.75	0.00
A	P-2157	INL 2157	PRM-2148A	5.07	4.60	Circle		1.25	12.00	3.91	0.013	5.58	5.58	0.00	0.98	0.09	10.64	3.41	0.14	12.77	0.00
A	P-2148A	PRM-2148A	PRM- 2162	1.81	1.78	Circle		3.00	24.60	0.12	0.013	5.34	5.29	0.22	3.00	1.80	3.28	4.37	30.89	23.29	0.05
A	P-2148	PRM- 2148	PRM-2148A	1.89	1.81	Circle		3.00	68.20	0.12	0.013	5.51	5.37	0.22	3.00	1.81	3.22	4.38	30.95	22.85	0.15
A	P-2147	INL 2147	PCO-2168	3.56	3.40	Circle		1.25	8.00	2.01	0.013	5.54	5.54	0.01	1.25	0.21	7.63	0.48	0.58	9.15	0.00
A	P-2145A	INL 2145A	PCO- 2145	3.85	3.74	Circle		1.50	27.10	0.41	0.013	5.82	5.80	0.10	1.50	0.75	3.72	1.89	3.34	6.69	0.03
A	P-2145	PCO- 2145	PRM- 2148	3.74	3.60	Circle		1.50	28.60	0.49	0.013	5.78	5.75	0.11	1.50	0.73	4.08	2.00	3.54	7.35	0.03
A	P-2142A	INL 2142A	PCO- 2142	3.79	3.49	Circle		1.50	98.60	0.30	0.013	5.90	5.82	0.08	1.50	0.76	3.22	1.68	2.97	5.79	0.08
A	P-2142	PCO- 2142	PRM- 2148	3.49	3.34	Circle		1.50	38.00	0.39	0.013	5.74	5.68	0.17	1.50	0.88	3.67	2.42	4.27	6.60	0.06
A	P-2136	PCO-2136	PRM- 2148	3.64	3.40	Circle		1.50	56.10	0.43	0.013	5.77	5.76	0.03	1.50	0.52	3.82	1.02	1.81	6.87	0.02
A	P-2135	INL 2135	PCO-2136	4.61	4.34	Circle		1.25	7.60	3.57	0.013	5.78	5.78	0.01	1.25	0.20	10.18	5.32	0.66	12.21	0.00
A	P-2123	INL 2123	PRM-2098B	5.55	5.10	Circle		1.25	11.40	3.95	0.013	6.16	6.16	0.01	1.06	0.15	10.70	4.81	0.42	12.84	0.00
A	P-2117	INL 2117	PRM-2098A	5.42	5.10	Circle		1.25	11.50	2.78	0.013	6.28	6.32	0.14	1.22	0.40	8.98	7.07	2.40	10.78	-0.03
A	P-2105	INL 2105	PCO- 2099	5.32	4.89	Circle		1.50	4.10	10.53	0.013	6.49	6.49	0.00	1.50	0.14	18.93	7.48	0.63	34.08	0.00
A	P-2099	PCO- 2099	PRM- 2098	4.24	3.30	Circle		1.50	10.70	8.78	0.013	6.49	6.49	0.01	1.50	0.21	17.29	0.71	1.26	31.13	0.00
A	P-2098B	PRM-2098B	PRM- 2148	2.93	2.82	Circle		2.50	97.40	0.11	0.013	5.87	5.54	0.33	2.50	1.66	2.81	4.82	23.66	13.79	0.33
A	P-2098A	PRM-2098A	PRM-2098B	2.98	2.93	Circle		2.50	35.60	0.14	0.013	6.02	5.90	0.33	2.50	1.65	3.13	4.78	23.46	15.36	0.12
A	P-2098	PRM- 2098	PRM-2098A	3.10	2.99	Circle		2.50	84.50	0.13	0.013	6.29	6.05	0.28	2.50	1.59	3.02	4.44	21.79	14.80	0.24
A	P-2085	PCO-2085	PRM- 2098	4.24	4.02	Circle		1.50	56.80	0.39	0.013	6.60	6.55	0.08	1.50	0.72	3.63	1.72	3.04	6.54	0.05
A	P-2084	INL 2084	PCO-2085	5.09	4.89	Circle		1.50	7.70	2.60	0.013	6.61	6.61	0.04	1.50	0.35	9.40	1.15	2.03	16.92	0.00
A	P-2077	INL 2077	INL 2084	5.23	5.09	Circle		1.50	38.10	0.37	0.013	6.63	6.63	0.01	1.50	0.36	3.54	2.47	0.81	6.37	0.00
A	P-2064	PRM- 2064	PRM- 2098	4.05	3.83	Circle		2.50	121.70	0.18	0.013	6.57	6.32	0.21	2.49	1.47	3.56	3.84	18.84	17.44	0.25
A	P-2061A	INL 2061A	PCO- 2061	4.45	4.37	Circle		1.50	11.50	0.70	0.013	7.09	7.07	0.14	1.50	0.70	4.87	2.22	3.92	8.77	0.02
A	P-2061	PCO- 2061	PRM- 2064	4.37	4.25	Circle		1.50	31.50	0.38	0.013	6.84	6.65	0.63	1.50	1.12	3.60	4.71	8.32	6.48	0.20
A	P-2059A	INL 2059A	PCO- 2059	4.55	4.47	Circle		1.50	14.50	0.55	0.013	7.24	7.23	0.12	1.50	0.72	4.34	2.05	3.61	7.81	0.02
A	P-2059	PCO- 2059	PCO- 2061	4.47	4.37	Circle		1.50	36.10	0.28	0.013	7.11	7.04	0.19	1.50	1.04	3.07	2.59	4.58	5.53	0.07
A	P-2055	INL 2055	PCO-7008	4.78	4.62	Circle		1.50	7.80	2.04	0.013	6.61	6.61	0.01	1.50	0.26	8.34	0.57	1.00	15.01	0.00
A	P-2049	INL 2049	INL 2055	4.93	4.78	Circle		1.25	38.00	0.39	0.013	6.62	6.61	0.01	1.25	0.35	3.38	0.57	0.71	4.06	0.00
A	P-2038	INL 2038	INL 2015	5.69	5.27	Circle		1.25	43.90	0.96	0.013	6.72	6.72	0.00	1.25	0.19	5.27	2.72	0.33	6.32	0.00
A	P-2019	INL 2019	PCO- 2018	5.44	4.76	Circle		1.25	4.30	15.96	0.013	6.72	6.72	0.05	1.25	0.20	21.50	1.12	1.37	25.80	0.00
A	P-2018	PCO- 2018	PRM- 2017	4.31	3.97	Circle		1.50	8.40	4.07	0.013	6.71	6.71	0.04	1.50	0.31	11.77	1.13	2.00	21.19	0.00
A	P-2017	PRM- 2017	PRM- 2064	4.42	4.21	Circle		2.50	191.60	0.11	0.013	6.70	6.60	0.06	2.39	1.63	2.77	3.04	10.29	13.58	0.10
A	P-2016	PCO-2016	PRM- 2017	4.58	4.42	Circle		1.50	54.50	0.29	0.013	6.71	6.71	0.01	1.50	0.45	3.16	0.62	1.10	5.69	0.01
A	P-2015	INL 2015	PCO-2016	5.27	5.20	Circle		1.50	7.90	0.88	0.013	6.71	6.71	0.00	1.50	0.20	5.48	2.64	0.36	9.86	0.00
A	P-2014	INL 2014	PRM-2007A	5.92	5.50	Circle		1.25	12.30	3.42	0.013	6.88	6.88	0.02	1.25	0.24	9.95	5.86	0.97	11.94	0.00
A	P-2010	INL 2010	PCO-2009	7.84	6.84	Circle		1.25	7.30	13.61	0.013	7.97	7.02	13.25	0.18	0.06	19.86	4.92	0.11	23.83	0.95
A	P-2009	PCO-2009	PRM- 2007	6.35	5.69	Circle		1.50	55.60	1.19	0.013	7.02	7.02	0.00	1.33	0.20	6.36	3.15	0.46	11.44	0.00
A	P-2007A	PRM-2007A	PRM- 2017	4.77	4.62	Circle		2.00	65.60	0.23	0.013	6.80	6.71	0.13	2.00	1.31	3.49	2.64	8.31	10.82	0.09
A	P-2007	PRM- 2007	PRM-2007A	5.09	4.78	Circle		2.00	133.20	0.23	0.013	6.95	6.81	0.11	2.00	1.24	3.52	3.77	7.74	10.91	0.14
A	P-2005A	INL 2005A	PCO 2005	5.40	5.20	Circle		2.00	34.00	0.59	0.013	7.08	7.07	0.02	1.87	0.59	5.59	4.26	3.32	17.34	0.00
A	P-2005	PCO 2005	PRM- 2007	5.10	5.06	Circle		2.00	29.20	0.14	0.013	7.05	7.02	0.09	1.96	1.44	2.70	3.00	7.29	8.37	0.03
A	P-2002A	INL 2002A	PCO- 2002	5.80	5.69	Circle		1.50	21.20	0.52	0.013	7.23	7.20	0.13	1.50	0.76	4.20	4.30	3.84	7.56	0.02
A	P-1059	INL 1059	PRM- 2007	7.68	7.40	Circle		1.00	105.70	0.26	0.013	7.94	7.61	0.28	0.21	0.26	2.29	1.66	0.26	1.83	0.33
A	P- 2002	PCO- 2002	PCO 2005	5.44	5.10	Circle		1.50	36.30	0.94	0.013	7.13	7.08	0.15	1.50	0.66	5.65	2.28	4.03	10.17	0.05
B	P-CBS 02	CBS 02	PRM-684B	3.50	2.50	Circle		1.25	11.80	8.48	0.013	5.01	5.00	0.08	1.25	0.26	15.68	1.46	1.79	18.81	0.01
B	P-684B	PRM-684B	PRM-2410	-0.14	-0.22	Circle		3.00	45.60	0.18	0.013	5.37	5.20	0.38	3.00	2.09	3.94	5.85	41.35	27.94	0.18
B	P-684A	PRM-684A	PRM-684B	-0.06	-0.14	Circle		3.00	54.60	0.15	0.013	5.20	5.00	0.36	3.00	2.06	3.59	5.67	40.06	25.52	0.20
B	P-657	PCO- 657	PRM-684	1.80	0.50	Circle		2.00	29.30	4.43	0.013	5.21	5.21	0.02	2.00	0.34	15.36	0.95	2.99	47.63	0.01
B	P-648	PRM-684	PRM-684A	0.00	-0.06	Circle		3.00	37.80	0.16	0.013	5.14	5.00	0.36	3.00	2.06	3.75	5.66	40.04	26.59	0.14
B	P-640	INL 1640	PRM-684A	3.50	2.40	Circle		1.25	11.70	9.40	0.013	5.00	5.00	0.00	1.25	0.08	16.50	0.14	0.17	19.80	0.00
B	P-600A	INL 600A	PCO-600	2.38	2.28	Circle		1.50	20.70	0.48	0.013	3.07	3.07	0.05	0.79	0.39	4.06	2.98	1.11	7.31	0.00
B	P-600	PCO-600	PCO-1655	2.23	2.11	Circle		1.50	46.20	0.26	0.013	3.05	3.04	0.04	0.93	0.53	2.97	2.56	1.42	5.35	0.01
B	P-2410D	PRM-2410D	PRM- 2342	-0.70	-0.79	Circle		3.00	45.30	0.20	0.013	3.62	3.38	0.53	3.00	2.27	4.19	6.87	48.55	29.74	0.24
B	P-2410C	PRM-2410C	PRM-2410D	-0.59	-0.70	Circle		3.00	60.80	0.18	0.013	4.00	3.68	0.51	3.00	2.25	3.99	6.77	47.85	28.36	0.31
B	P-2410B	PRM-2410B	PRM-2410C	-0.46	-0.59	Circle		3.00	76.40	0.17	0.013	4.44	4.06	0.50	3.00	2.24	3.88	6.67	47.12	27.52	0.38
B	P-2410A	PRM-2410A	PRM-2410B	-0.36	-0.46	Circle		3.00	53.90	0.19	0.013	4.77	4.51	0.48	3.00	2.21	4.05	6.53	46.19	28.72	0.26
B	P-2410	PRM-2410	PRM-2410A	-0.25	-0.36	Circle		3.00	59.70	0.18	0.013	5.11	4.83	0.46	3.00	2.20	4.03	6.43	45.46	28.63	0.28
B	P-2408	PCO- 2408	PRM-2410	1.44	0.00	Circle		1.50	11.30	12.72	0.013	5.38	5.38	0.06	1.50	0.27	20.81	1.49	2.63	37.46	0.01
B	P-2403	INL 2403	PCO- 2408	3.89	3.04	Circle		1.25	4.60	18.58	0.013	5.45	5.45	0.03	1.25	0.18	23.20	0.97	1.18	27.84	0.00
B	P-2402	INL 2402	PRM-2410A	3.61	2.50	Circle		1.25	12.60	8.84	0.013	5.01	5.00	0.04	1.25	0.22	16.00	1.08	1.33	19.20	0.01
B	P-2386	INL 2386	PCO-2380	2.39	2.09	Circle		1.25	7.90	3.79	0.013	5.93	5.92	0.13	1.25	0.36	10.48	1.89	2.32	12.58	0.01
B	P-2380	PCO-2380	PRM-2410	1.99	1.75	Circle		1.50	54.70	0.44	0.013	5.84	5.77	0.13	1.50	0.78	3.87	2.12	3.74	6.96	0.07
B	P-2372	INL 2372	PRM-2410B	3.79	2.50	Circle		1.25	12.30	10.49	0.013	5.02	5.01	0.06	1.25	0.24	17.43	10.14	1.63	20.92	0.01
B	P-2365	INL 2365	PRM-2410C	3.20	2.35	Circle		1.25	12.60	6.74	0.013	4.67	4.67	0.05	1.25	0.25	13.98	1.17	1.43	16.77	0.01
B	P-2353	INL 2353	PRM-2410D	3.36	2.35	Circle		1.25	12.80	7.86	0.013	4.28	4.28	0.04	1.25	0.23	15.09	8.61	1.33	18.11	-0.01
B	P-2347	INL 2347	PRM- 2342	2.07	1.30	Circle		1.25	14.10	5.48	0.013	3.98	3.98	0.02	1.25	0.20	12.60	0.68	0.84	15.12	0.00
B	P-2342C	PRM-2342C	B	-1.00	-1.10	Circle		3.00	77.30	0.13	0.013	2.42	1.90	0.67	3.00	2.40	3.38	7.73	54.61	24.00	0.52
B	P-2342A	PRM-2342A	PRM-2342C	-0.91	-1.00	Circle		3.00	53.20	0.17	0.013	2.83	2.49	0.65	3.00	2.38	3.86	7.62	53.87	27.43	0.35

DATE: 9/11/2023 6:03:02 PM
FILE: ...\FM 519 HYDRAULIC COMP11.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

©2023
Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 11 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		121

100% SUBMITTAL

CK DW CK DW

PROPOSED CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D. US	NODE I.D. DS	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE #	SPAN (ft)	RISE (ft)	LENGTH (ft)	SLOPE (%)	n_VALUE (ft)	HYDRAULIC GRADELINE US ELEV (ft)	HYDRAULIC GRADELINE DS ELEV (ft)	FRICTION SLOPE (%)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft/s)	VELOCITY ACTUAL (ft/s)	DISCHARGE Q (cfs)	CAPACITY (cfs)	JUNCTION LOSS (ft)
B	P-2342	PRM- 2342	PRM-2342A	-0.79	-0.91	Circle		3.00	61.60	0.19	0.013	3.29	2.91	0.63	3.00	2.36	4.15	7.47	52.77	29.43	0.39
B	P-2339	PCO- 2339	PRM- 2342	1.31	0.80	Circle		2.00	11.50	4.42	0.013	3.88	3.88	0.01	2.00	0.26	15.34	0.57	1.78	47.55	0.00
B	P-2337	INL 2337	PCO-2332	2.41	2.11	Circle		1.25	8.10	3.69	0.013	4.19	4.17	0.14	1.25	0.38	10.34	2.00	2.45	12.41	0.01
B	P-2332	PCO-2332	PRM- 2342	2.11	1.00	Circle		1.50	54.30	2.04	0.013	4.13	4.05	0.16	1.50	0.54	8.34	2.35	4.16	15.01	0.09
B	P-2312	INL 2312	PRM-2342A	2.77	2.20	Circle		1.25	12.40	4.59	0.013	3.56	3.59	0.07	1.25	0.29	11.54	7.54	1.61	13.85	-0.02
B	P-2297	INL 2297	PRM-2342C	2.45	1.80	Circle		1.25	11.80	5.50	0.013	3.12	3.15	0.06	1.25	0.25	12.63	7.56	1.30	15.15	-0.04
B	P-1664	PCO-1664	PRM- 1626	2.28	2.03	Circle		1.50	55.10	0.45	0.013	5.14	5.10	0.08	1.50	0.67	3.93	1.63	2.89	7.08	0.04
B	P-1663	INL 1663	PCO-1664	4.18	2.63	Circle		1.50	8.40	18.41	0.013	5.13	5.15	0.05	1.50	0.23	25.03	13.35	2.29	45.06	-0.03
B	P-1662	INL 1662	INL 1663	4.65	4.38	Circle		1.25	66.80	0.40	0.013	5.05	4.92	0.29	0.54	0.40	3.43	2.70	0.93	4.11	0.13
B	P-1661	INL 1661	PCO-1660	2.88	2.84	Circle		1.50	8.00	0.50	0.013	4.60	4.59	0.02	1.50	0.44	4.12	0.78	1.38	7.41	0.00
B	P-1660	PCO-1660	PRM- 1636	2.54	1.30	Circle		1.50	54.70	2.27	0.013	4.58	4.54	0.08	1.50	0.44	8.79	1.66	2.93	15.82	0.04
B	P-1658	INL 1658	PRM-1636A	3.25	1.00	Circle		1.50	74.60	3.02	0.013	4.35	4.32	0.07	1.50	0.40	10.14	7.52	2.86	18.25	0.03
B	P-1657	INL 1657	PCO-1656	2.67	2.53	Circle		1.50	8.20	1.70	0.013	4.36	4.36	0.02	1.50	0.34	7.61	0.89	1.58	13.69	0.00
B	P-1656	PCO-1656	PRM- 1647	2.53	2.41	Circle		1.50	55.00	0.22	0.013	4.34	4.29	0.09	1.50	0.86	2.73	1.74	3.08	4.91	0.05
B	P-1655B	INL 1655C	PCO-1655	2.36	2.06	Circle		2.00	119.00	0.25	0.013	3.09	3.04	0.07	0.98	0.59	3.66	2.78	2.15	11.36	0.04
B	P-1655A	PRM-1655A	PRM- 1654	1.83	1.75	Circle		2.00	38.50	0.21	0.013	5.82	5.81	0.03	2.00	0.84	3.33	1.22	3.84	10.31	0.01
B	P-1655	PCO-1655	PRM-1655A	1.91	1.83	Circle		2.00	37.60	0.21	0.013	3.03	3.01	0.07	1.18	0.84	3.36	3.07	3.86	10.43	0.02
B	P-1654	PRM- 1654	PRM-684	0.05	0.00	Circle		3.00	44.90	0.11	0.013	5.35	5.20	0.33	3.00	2.01	3.14	5.38	38.02	22.27	0.15
B	P-1651	PCO- 1651	PRM- 1654	2.24	0.85	Circle		1.25	29.30	4.74	0.013	5.80	5.79	0.03	1.25	0.23	11.72	0.83	1.02	14.06	0.01
B	P-1650	PRM- 1650	PRM- 1654	0.49	0.05	Circle		3.00	75.70	0.58	0.013	5.60	5.39	0.28	3.00	1.83	7.16	4.96	35.03	50.85	0.21
B	P-1649	INL 1649	PRM- 1650	2.25	1.50	Circle		2.00	14.60	5.13	0.013	5.93	5.93	0.02	2.00	0.34	16.53	1.04	3.28	51.25	0.00
B	P-1648	INL 1648	PRM-1647A	2.30	1.70	Circle		2.00	12.10	4.95	0.013	4.00	4.00	0.02	2.00	0.33	16.24	8.79	3.00	50.34	0.00
B	P-1647A	PRM-1647A	PRM- 1650	0.66	0.49	Circle		3.00	39.30	0.43	0.013	5.73	5.64	0.24	3.00	1.92	6.18	4.59	32.45	43.86	0.09
B	P-1647	PRM- 1647	PRM-1647A	0.83	0.66	Circle		3.00	36.60	0.46	0.013	4.08	4.00	0.21	3.00	1.79	6.40	4.28	30.23	45.46	0.08
B	P-1646	PCO- 1646	PRM- 1647	1.78	1.74	Circle		2.00	10.60	0.38	0.013	4.24	4.24	0.00	2.00	0.44	4.49	0.48	1.50	13.93	0.00
B	P-1644	INL 1644	PRM-1636B	3.10	2.50	Circle		1.50	11.70	5.14	0.013	4.30	4.30	0.00	1.50	0.13	13.23	4.98	0.38	23.81	0.00
B	P-1639	INL 1639	PRM-1636A	3.73	3.00	Circle		1.50	13.70	5.34	0.013	4.34	4.43	0.82	1.43	0.33	13.48	8.97	2.61	24.27	-0.08
B	P-1636B	PRM-1636B	PRM- 1647	0.91	0.88	Circle		3.00	22.40	0.13	0.013	4.13	4.10	0.17	3.00	1.69	3.44	3.85	27.23	24.41	0.04
B	P-1636A	PRM-1636A	PRM-1636B	1.00	0.91	Circle		3.00	68.00	0.13	0.013	4.27	4.15	0.17	3.00	1.68	3.42	3.84	27.14	24.26	0.11
B	P-1636	PRM- 1636	PRM-1636A	1.25	1.00	Circle		3.00	196.00	0.13	0.013	4.53	4.29	0.12	3.00	2.40	3.35	3.29	23.28	23.82	0.24
B	P-1635	PCO- 1635	PRM- 1636	1.77	1.72	Circle		2.00	10.80	0.46	0.013	4.59	4.59	0.06	2.00	0.85	4.96	1.83	5.74	15.39	0.01
B	P-1633	INL 1633	PCO- 1635	3.54	3.27	Circle		1.25	4.10	6.66	0.013	4.59	4.63	0.53	1.25	0.46	13.89	11.75	4.82	16.67	-0.04
B	P-1628	INL 1628	PRM-1626A	3.44	3.00	Circle		1.25	12.40	3.54	0.013	4.80	4.80	0.00	1.25	0.12	10.13	0.17	0.21	12.16	0.00
B	P-1626A	PRM-1626A	PRM- 1636	1.61	1.25	Circle		2.00	65.90	0.55	0.013	4.85	4.55	0.47	2.00	1.52	5.39	4.92	15.47	16.72	0.31
B	P-1626	PRM- 1626	PRM-1626A	1.93	1.61	Circle		2.00	52.20	0.61	0.013	5.04	4.80	0.46	2.00	1.44	5.72	4.89	15.38	17.72	0.24
B	P-1625A	INL 1625A	PCO- 1625	2.85	2.25	Circle		2.00	38.10	1.58	0.013	5.43	5.43	0.02	2.00	0.42	9.16	0.88	2.77	28.40	0.01
B	P-1625	PCO- 1625	PRM- 1626	2.20	2.11	Circle		2.00	28.50	0.32	0.013	5.36	5.28	0.25	2.00	1.48	4.10	3.63	11.41	12.70	0.07
B	P-1624A	INL 1624A	PCO- 1624	3.50	2.46	Circle		2.00	23.10	4.51	0.013	5.19	5.19	0.13	2.00	0.56	15.50	11.43	8.23	48.05	0.01
B	P-1624	PCO- 1624	PCO- 1625	2.36	2.30	Circle		2.00	35.30	0.17	0.013	5.55	5.50	0.15	2.00	1.56	3.01	2.82	8.87	9.32	0.05
B	P-1610	INL 1610	PRM- 1571	4.13	4.10	Circle		1.25	12.10	0.25	0.013	5.26	5.26	0.03	1.16	0.51	2.68	2.38	1.10	3.22	0.00
B	P-1571	PRM- 1571	PRM- 1626	2.87	2.33	Circle		1.50	175.10	0.31	0.013	5.23	5.14	0.05	1.50	0.67	3.24	1.35	2.38	5.83	0.09
B	P-1568	INL 1568	PRM- 1571	3.25	3.10	Circle		1.25	63.30	0.24	0.013	5.29	5.26	0.05	1.25	0.60	2.62	1.19	1.47	3.14	0.03
C	P-7002	PCO-7002	PRM-1572A	3.31	3.09	Circle		1.50	54.30	0.40	0.013	4.18	4.12	0.21	1.03	0.77	3.71	3.82	3.48	6.68	0.06
C	P-1620	INL 1620	PRM-1573A	3.96	3.50	Circle		1.25	11.90	3.86	0.013	4.11	4.00	1.31	0.50	0.10	10.58	3.51	0.15	12.70	0.11
C	P-1619	PCO- 1619	PRM- 1573	1.98	1.87	Circle		1.50	28.90	0.38	0.013	4.10	4.03	0.23	1.50	0.99	3.60	2.84	5.02	6.48	0.07
C	P-1618	PCO- 1618	PCO- 1619	2.10	1.98	Circle		1.50	29.80	0.40	0.013	4.24	4.22	0.07	1.50	0.68	3.71	1.60	2.82	6.67	0.02
C	P-1616	INL 1616	PRM- 1572	3.78	3.22	Circle		1.25	12.90	4.35	0.013	4.13	4.06	1.39	0.84	0.21	11.23	6.01	0.80	13.47	0.07
C	P-1584	INL 1584	PRM-1573D	4.32	4.14	Circle		1.25	12.70	1.41	0.013	4.87	4.58	0.98	0.44	0.42	6.40	5.17	1.88	7.68	0.28
C	P-1580	INL 1580	PRM-1573C	4.19	3.50	Circle		1.25	13.00	5.32	0.013	4.71	3.82	2.42	0.32	0.29	12.42	8.11	1.73	14.90	0.90
C	P-1574A	INL 1574A	PCO- 1574	3.79	3.77	Circle		1.25	5.20	0.38	0.013	4.45	4.39	0.49	0.62	0.70	3.33	3.41	2.40	4.00	0.06
C	P-1574	PCO- 1574	PRM-1573B	1.47	1.43	Circle		1.50	8.40	0.48	0.013	3.84	3.84	0.07	1.50	0.65	4.03	1.61	2.84	7.25	0.01
C	P-1573D	PRM-1573D	C	1.22	0.90	Circle		2.00	84.20	0.38	0.013	3.29	2.90	0.46	2.00	1.41	4.50	4.89	15.35	13.94	0.39
C	P-1573C	PRM-1573C	PRM-1573D	1.36	1.22	Circle		2.00	52.90	0.26	0.013	3.53	3.33	0.38	2.00	1.34	3.75	4.44	13.93	11.64	0.20
C	P-1573B	PRM-1573B	PRM-1573C	1.54	1.36	Circle		2.00	75.70	0.24	0.013	3.80	3.56	0.31	2.00	1.28	3.56	4.04	12.69	11.03	0.24
C	P-1573A	PRM-1573A	PRM-1573B	1.72	1.54	Circle		2.00	73.20	0.25	0.013	3.93	3.84	0.12	2.00	1.21	3.62	2.44	7.67	11.22	0.08
C	P-1573	PRM- 1573	PRM-1573A	1.82	1.72	Circle		2.00	44.80	0.22	0.013	3.99	3.94	0.11	2.00	1.25	3.45	2.43	7.62	10.69	0.05
C	P-1572A	PRM-1572A	PRM- 1573	2.32	2.22	Circle		1.50	28.30	0.35	0.013	4.05	4.00	0.15	1.50	0.88	3.47	2.28	4.03	6.24	0.04
C	P-1572	PRM- 1572	PRM-1572A	2.52	2.32	Circle		1.50	53.50	0.37	0.013	4.06	4.06	0.01	1.50	0.36	3.57	0.45	0.80	6.42	0.00
C	P-1565	INL 1565	PCO-7002	3.34	3.31	Circle		1.50	8.40	0.36	0.013	4.20	4.20	0.05	0.89	0.49	3.49	2.90	1.47	6.29	0.00
C	P-1564	INL 1564	INL 1565	3.92	3.34	Circle		1.25	37.70	1.54	0.013	4.19	4.22	0.05	0.88	0.18	6.68	3.28	0.35	8.01	-0.03
C	P-1563	INL 1563	PCO- 1562	2.97	2.93	Circle		1.50	8.00	0.50	0.013	4.06	4.06	0.13	1.13	0.72	4.13	4.13	3.44	7.44	0.00
C	P-1562	PCO- 1562	PRM-1573B	2.13	1.87	Circle		1.50	66.00	0.39	0.013	4.00	3.89	0.16	1.50	0.87	3.66	2.37	4.18	6.59	0.10
D	P-1603	PRM- 1603	PRM- 1600	3.84	3.77	Circle		2.00	101.20	0.07	0.013	5.84	5.80	0.04	2.00	1.34	1.92	1.49	4.69	5.95	0.04
D	P-1602	INL 1602	PRM- 1603	4.73	4.19	Circle		1.25	12.10	4.45	0.013	5.89	5.86	0.32	1.25	0.44	11.36	9.41	3.65	13.63	0.03
D	P-1600	PRM- 1600	PRM- 1594	3.67	3.13	Circle		2.00	132.10	0.41	0.013	5.78	5.59	0.15	2.00	1.12	4.66	2.74	8.61	14.46	0.19
D	P-1599	PCO- 1599	PRM- 1600	3.78	3.77	Circle		1.50	8.40	0.12	0.013	5.81	5.81	0.07	1.50	0.96	2.01	1.52	2.69	3.62	0.01
D	P-1597	INL 1597	PCO- 1599	5.37	5.23	Circle		1.25	4.20	3.37	0.013	5.96	5.68	1.10	0.45	0.36	9.88	7.36	2.17	11.86	0.28
D	P-1594B	PRM-1594B	D	2.69	2.60	Circle		2.00	44.80	0.20	0.013	4.85	4.60	0.57	2.00	1.49	3.27	5.38	16.91	10.14	0.25
D	P-1594A	PRM-1594A	PRM-1594B	2.99	2.69	Circle		2.00	74.60	0.40	0.013	5.33	4.90	0.57	2.00	1.49	4.63	5.41	16.99	14.35	0.43
D	P-1594	PRM- 1594	PRM-1594A	3.13	2.99	Circle		2.00	36.30	0.39	0.013	5.53	5.38	0.41	2.00	1.71	4.53	4.59	14.43	14.05	0.15
D	P-1593	PCO- 1593	PRM- 1594	3.77	3.65	Circle		1.50	28.90	0.42	0.013	5.86	5.82	0.15	1.50	0.85	3.76	2.33	4.12	6.77	0.04
D	P-1592A	INL 1593A	PCO- 1593	3.98	3.87	Circle		1.50	28.50	0.39	0.013	5.92	5.89	0.10	1.50	0.76	3.62	1.89	3.34	6.52	0.03
D	P-1591A	INL 1591B	PCO- 1591	3.90	3.65	Circle		1.50	65.10	0.38	0.013	5.65	5.62	0.05	1.50	0.62	3.62	1.33	2.34	6.51	0.03
D	P-1591	PCO- 1591	PRM-1594A	3.65	3.53	Circle		1.50	29.20	0.41	0.013	5.61	5.58	0.08	1.50	0.69	3.74	1.66	2.93	6.73	0.02
D	P-1587	INL 1587	PRM-1594B	5.38	5.34	Circle		1.25	12.70	0.31	0.013	5.38	5.34	0.31	0.00	0.00	3.02	0.00	0.00	3.62	0.04
D	P-1560	PCO-1560	PRM- 1594	3.72	3.50	Circle		1.50	54.30	0.41	0.013	5.63	5.58	0.09	1.50	0.72	3.72	1.76	3.11	6.69	0.05
D	P-1558	INL 1558	PCO-1560	4.26	3.82	Circle		1.50	8.00	5.47	0.013	5.64	5.64	0.02	1.50	0.26	13.66	7.89	1.64	24.58	0.00
D	P-1557	INL 1557	INL 1558	4.65	4.61	Circle		1.25	42.60	0.09	0.013	5.65	5.65	0.01	1.04	0.44	1.65	1.36	0.52	1.98	0.00
D	P-1556A	INL 1556A	PCO-1556	4.40	4.37	Circle		1.25	9.50	0.31	0.013	5.90	5.90	0.01	1.25	0.38	3.02	0.58	0.71	3.62	0.00
D	P-1556	PCO-1556	PRM- 1600	4.02	3.67	Circle		1.25	75.20	0.47	0.013	5.88	5.80	0.10	1.25	0.60	3.68	1.69	2.07	4.41	0.08
D	P-1554A	INL 1554A	PCO-1554	4.43	4.37	Circle		1.25	14.10	0.43	0.013	5.92	5.92	0.00	1.25	0.27	3.51	0.35	0.43	4.21	0.00
D	P-1554	PCO-1554	PCO-1556	4.37	4.32	Circle		1.25	35.80	0.14	0.013	5.91	5.90	0.03	1.25	0.60	2.01	0.92	1.13	2.41	0.01
D	P-1553	INL 1553	PRM- 1603	4.84	4.15	Circle		1.50	66.20	1.04	0.013	5.86	5.85	0.02	1.50	0.38	5.96	4.31	1.54	10.72	0.00
D	P-1552	INL 1552	INL 1553	5.24	4.99	Circle		1.25	44.30	0.56	0.013	5.87	5.87	0.07	0.88	0.40	4.04	3.19	1.09	4.85	0.00
E	P-1604	PRM- 1604	PRM- 1547	4.41	4.20	Circle		1.25	93.20	0.23	0.013	5.84	5.84	0.00	1.25	0.00	2.56	0.00	0.00	3.07	0.00
E	P-1551A	INL 1551A	PCO- 1551	2.28	2.12	Circle		2.50	38.60	0.41	0.013	6.45	6.20	0.63	2.50	1.94	5.39	6.64	32.60	26.40	0.24
E	P-1551	PCO- 1551	PRM- 1547	2.02	1.97	Circle		2.50	28.50	0.18	0.013	6.10	5.91	0.64	2.50	1.95	3.50	6.69	32.84	17.16	0.18
E	P-1550A	INL 1550A	PCO- 1550	2.25	2.13	Circle		3.00	23.60	0.51	0.013	5.94	5.92	0.09	3.00	1.37	6.70	2.88	20.38	47.54	0.02
E	P-1550	PCO- 1550	PRM-1547A	2.28	2.21	Circle		3.00	28.20	0.25	0.013	5.88	5.85	0.09	3.00	1.70	4.68	2.90	20.47	33.25	0.03
E	P-1547A	PRM-1547A	PRM-1526	2.16	2.05	Circle		4.00	74.00	0.15	0.013	5.79	5.71	0.11	3.66	3.01	4.39	5.00	50.62	55.37	0.08
E	P-1547	PRM- 1547	PRM-1547A	2.22	2.16	Circle		4.00	38.50	0.16	0.013	5.83	5.81	0.05	3.65	2.18	4.50	4.68	32.81	56.74	0.02

DATE: 9/11/2023 6:04:24 PM
FILE: ...\FM 519 HYDRAULIC COMP12.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		122

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US	DS							US ELEV	DS ELEV	SLOPE	UNIFORM	ACTUAL	UNIFORM	ACTUAL	Q		LOSS
				(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft/s)	(ft/s)	(cfs)	(cfs)	(ft)
E	P-1546	INL 1546	INL 1544	5.02	3.94	Circle		1.25	49.10	2.20	0.013	5.87	5.87	0.02	1.25	0.27	7.98	5.01	0.97	9.58	0.00
E	P-1544	INL 1544	PRM-1547A	3.89	2.30	Circle		1.25	65.40	2.43	0.013	5.84	5.80	0.07	1.25	0.34	8.39	1.36	1.67	10.07	0.04
E	P-1543	PCO-1543	PRM-1526	4.00	2.50	Circle		1.50	55.40	2.71	0.013	5.73	5.70	0.07	1.50	0.40	9.60	1.53	2.70	17.28	0.04
E	P-1542	INL 1542	PCO-1543	4.72	4.20	Circle		1.25	12.40	4.20	0.013	5.76	5.76	0.03	1.25	0.24	11.03	6.50	1.08	13.24	0.00
E	P-1541	INL 1541	INL 1537	4.51	4.32	Circle		1.25	44.30	0.43	0.013	5.78	5.78	0.02	1.25	0.39	3.53	0.71	0.87	4.23	0.01
E	P-1537	INL 1537	PRM-1526C	4.32	2.50	Circle		1.00	59.80	3.04	0.013	5.72	5.62	0.18	1.00	0.34	7.76	1.91	1.50	6.21	0.11
E	P-1536	INL 1536	PRM-1526E	4.26	2.50	Circle		1.25	59.20	2.97	0.013	5.47	5.46	0.01	1.25	0.23	9.28	5.25	0.79	11.14	0.01
E	P-1532	PCO-1532	PRM- 1506	3.57	3.35	Circle		1.50	54.70	0.40	0.013	5.44	5.40	0.08	1.50	0.69	3.70	1.65	2.92	6.66	0.04
E	P-1531	INL 1531	PCO-1532	3.79	3.62	Circle		1.25	5.90	2.90	0.013	5.46	5.46	0.02	1.25	0.24	9.16	0.75	0.92	10.99	0.00
E	P-1526E	PRM-1526E	PRM- 1506	1.52	1.46	Circle		4.00	45.50	0.13	0.013	5.25	5.19	0.12	3.73	3.39	4.14	4.72	53.67	52.18	0.05
E	P-1526D	PRM-1526D	PRM-1526E	1.61	1.52	Circle		4.00	45.80	0.20	0.013	5.32	5.27	0.12	3.75	2.80	5.05	5.67	53.28	63.65	0.05
E	P-1526C	PRM-1526C	PRM-1526D	1.71	1.61	Circle		4.00	54.00	0.19	0.013	5.40	5.34	0.12	3.73	2.86	4.90	5.53	53.15	61.78	0.06
E	P-1526B	PRM-1526B	PRM-1526C	1.79	1.71	Circle		4.00	45.70	0.18	0.013	5.48	5.43	0.12	3.72	2.90	4.77	5.39	52.64	60.09	0.05
E	P-1526A	PRM-1526A	PRM-1526B	1.93	1.79	Circle		4.00	83.20	0.17	0.013	5.59	5.50	0.12	3.71	2.93	4.68	5.30	52.35	58.93	0.09
E	P-1526	PRM-1526	PRM-1526A	2.05	1.93	Circle		4.00	68.90	0.17	0.013	5.69	5.61	0.11	3.68	2.89	4.76	5.37	52.14	59.93	0.07
E	P-1525	PCO- 1525	PRM-1526	3.20	2.95	Circle		1.50	10.70	2.33	0.013	5.84	5.84	0.03	1.50	0.33	8.91	0.96	1.70	16.04	0.00
E	P-1523	INL 1523	PCO- 1525	5.55	5.35	Circle		1.25	4.20	4.72	0.013	5.88	5.86	2.38	0.51	0.19	11.70	5.94	0.69	14.04	0.02
E	P-1519	INL 1519	PRM-1526A	5.22	3.50	Circle		1.25	12.10	14.19	0.013	5.76	5.80	0.03	1.25	0.16	20.28	9.33	0.86	24.33	-0.03
E	P-1516	INL 1516	PRM-1526B	4.69	3.00	Circle		1.25	11.40	14.84	0.013	5.68	5.68	0.03	1.25	0.18	20.73	10.10	1.07	24.88	0.00
E	P-1511	INL 1511	PRM-1526D	5.23	3.50	Circle		1.25	13.00	13.33	0.013	5.53	5.53	0.71	1.25	0.13	19.65	8.07	0.57	23.58	-0.01
E	P-1509	INL 1509	PRM-1526E	5.12	3.00	Circle		1.25	12.50	17.00	0.013	5.38	5.46	0.08	1.25	0.11	22.19	8.21	0.46	26.63	-0.08
E	P-1506A	PRM-1506A	E	0.95	0.90	Circle		4.00	22.90	0.22	0.013	4.93	4.90	0.15	4.00	2.79	5.32	5.97	55.91	67.05	0.03
E	P-1506	PRM- 1506	PRM-1506A	1.46	0.95	Circle		4.00	161.20	0.32	0.013	5.17	4.96	0.14	4.00	2.45	6.41	6.94	55.99	80.80	0.21
E	P-1505	PCO- 1505	PRM- 1506	2.85	1.46	Circle		1.50	11.70	11.91	0.013	5.27	5.26	0.12	1.50	0.32	20.14	2.02	3.57	36.26	0.01
E	P-1503	INL 1503	PCO- 1505	4.32	3.05	Circle		1.25	4.10	31.25	0.013	5.32	5.32	0.05	1.25	0.17	30.09	14.34	1.44	36.11	-0.01
E	P-1500	INL 1500	PRM-1506A	5.17	4.00	Circle		1.25	12.50	9.38	0.013	5.39	5.16	2.41	1.16	0.11	16.49	5.97	0.32	19.79	0.23
E1	P-1530	INL 1530	E1	4.57	2.80	Circle		1.50	66.60	2.66	0.013	4.87	4.30	1.00	1.50	0.20	9.51	4.62	0.63	17.12	0.57
E2	P-1497	INL 1497	E2	1.37	1.35	Circle		3.00	2.90	0.68	0.013	4.35	4.35	0.05	3.00	1.05	7.75	6.56	14.45	55.01	0.00
E3	P-1484	PCO-1484	E3	3.56	3.43	Circle		1.25	32.80	0.40	0.013	4.68	4.68	0.01	1.25	0.29	3.38	2.24	0.49	4.06	0.00
F	P-1495B	PRM-1495B	F	0.50	-1.00	Circle		4.00	94.00	1.60	0.013	2.83	3.00	0.09	4.00	1.26	14.40	11.50	38.86	181.49	-0.17
F	P-1495A	INL 1495A	PCO- 1495	1.40	1.04	Circle		2.00	159.50	0.23	0.013	3.35	2.81	0.31	1.77	1.32	3.47	4.31	13.53	10.75	0.53
F	P-1495	PCO- 1495	PRM-1495B	1.04	0.50	Circle		4.00	27.80	1.94	0.013	2.81	2.85	0.03	2.35	0.71	15.89	9.09	13.58	200.17	-0.04
F	P-1491	INL 1491	PRM-1451A	4.96	4.00	Circle		1.25	11.50	8.34	0.013	5.31	4.19	4.20	0.19	0.18	15.54	7.60	0.82	18.65	1.13
F	P-1477	PCO-1477	PRM-1383A	5.75	4.85	Circle		1.50	56.30	1.60	0.013	7.28	7.25	0.05	1.50	0.43	7.38	1.35	2.39	13.28	0.03
F	P-1476	INL 1476	PCO-1477	6.24	5.95	Circle		1.25	6.30	4.59	0.013	7.29	7.29	0.06	1.25	0.29	11.53	7.50	1.58	13.84	0.00
F	P-1473	INL 1473	INL 1469	5.40	5.30	Circle		1.25	31.80	0.31	0.013	6.39	6.38	0.05	1.08	0.54	3.02	2.77	1.41	3.62	0.01
F	P-1471	PCO-1471	PRM- 1421	4.74	4.35	Circle		1.50	54.80	0.71	0.013	6.33	6.29	0.08	1.50	0.61	4.92	1.72	3.04	8.86	0.05
F	P-1469	INL 1469	PCO-1471	5.25	4.99	Circle		1.25	6.90	3.77	0.013	6.34	6.34	0.11	1.25	0.35	10.45	7.65	2.16	12.54	0.00
F	P-1463	INL 1463	PCO-1461	4.27	4.07	Circle		1.25	82.50	0.24	0.013	6.39	6.38	0.01	1.25	0.42	2.65	0.63	0.77	3.18	0.01
F	P-1461A	INL 1461A	PCO-1461	3.55	3.47	Circle		1.25	15.40	0.52	0.013	6.44	6.43	0.01	1.25	0.34	3.88	0.63	0.77	4.66	0.00
F	P-1461	PCO-1461	PCO-1460	3.32	3.10	Circle		1.25	36.90	0.60	0.013	6.30	6.20	0.26	1.25	0.75	4.15	2.70	3.32	4.98	0.10
F	P-1460A	INL 1460A	PCO-1460	3.50	3.20	Circle		1.25	25.50	1.17	0.013	6.17	6.17	0.02	1.25	0.30	5.83	0.71	0.87	7.00	0.00
F	P-1460	PCO-1460	PRM-1435A	3.00	2.89	Circle		1.25	69.60	0.16	0.013	6.02	5.70	0.46	1.25	0.85	2.14	3.56	4.37	2.57	0.32
F	P-1459	INL 1459	INL 1455	4.10	3.87	Circle		1.25	54.90	0.42	0.013	5.05	5.04	0.01	1.17	0.35	3.48	2.56	0.73	4.18	0.00
F	P-1455	INL 1455	PCO-1454	3.87	3.76	Circle		1.25	8.70	1.27	0.013	5.01	5.01	0.09	1.25	0.45	6.07	5.09	2.04	7.28	0.00
F	P-1454	PCO-1454	PRM- 1451	3.76	2.20	Circle		1.25	55.20	2.83	0.013	4.95	4.78	0.32	1.25	0.50	9.05	7.98	3.65	10.86	0.17
F	P-1451A	PRM-1451A	PRM-1495B	1.44	1.21	Circle		2.50	59.30	0.39	0.013	3.72	3.14	0.57	1.93	1.93	5.21	6.54	32.12	25.53	0.58
F	P-1451	PRM- 1451	PRM-1451A	2.07	1.44	Circle		2.50	159.60	0.39	0.013	4.72	3.78	0.57	2.34	1.92	5.26	6.49	31.88	25.77	0.95
F	P-1450	PCO- 1450	PRM- 1451	3.02	2.07	Circle		1.25	10.70	8.90	0.013	4.98	4.94	0.32	1.25	0.37	16.06	2.99	3.67	19.27	0.03
F	P-1446	INL 1446	PCO- 1450	4.12	3.37	Circle		1.25	4.30	17.33	0.013	5.10	5.10	0.06	1.25	0.20	22.41	11.93	1.56	26.89	-0.01
F	P-1444	INL 1444	PRM-1435C	4.30	3.20	Circle		1.25	12.50	8.83	0.013	5.37	5.37	0.02	1.25	0.18	15.99	7.78	0.81	19.19	0.00
F	P-1439	INL 1439	PRM-1435B	4.67	4.00	Circle		1.25	11.70	5.71	0.013	5.79	5.79	0.00	1.25	0.11	12.87	4.76	0.26	15.44	0.00
F	P-1437A	INL 1437A	PCO- 1437	4.30	3.19	Circle		1.25	15.50	7.18	0.013	7.03	6.70	2.10	1.25	0.66	14.43	7.64	9.37	17.31	0.33
F	P-1437	PCO- 1437	PRM-1435A	3.14	2.85	Circle		1.25	28.20	1.03	0.013	6.37	5.75	2.17	1.25	1.17	5.46	7.76	9.52	6.55	0.61
F	P-1436A	INL 1436A	PCO- 1436	3.50	3.13	Circle		2.00	49.60	0.75	0.013	5.88	5.87	0.02	2.00	0.54	6.30	0.99	3.10	19.54	0.01
F	P-1436	PCO- 1436	PRM- 1435	3.08	2.71	Circle		2.00	28.40	1.30	0.013	5.86	5.85	0.04	2.00	0.58	8.33	1.48	4.66	25.83	0.01
F	P-1435C	PRM-1435C	PRM- 1451	2.27	2.17	Circle		2.50	39.30	0.25	0.013	4.98	4.80	0.46	2.50	1.80	4.22	5.69	27.91	20.69	0.18
F	P-1435B	PRM-1435B	PRM-1435C	2.50	2.27	Circle		2.50	80.70	0.28	0.013	5.39	5.02	0.45	2.50	1.79	4.47	5.62	27.57	21.89	0.36
F	P-1435A	PRM-1435A	PRM-1435B	2.63	2.50	Circle		2.50	47.00	0.28	0.013	5.64	5.43	0.45	2.50	1.79	4.40	5.60	27.48	21.58	0.21
F	P-1435	PRM- 1435	PRM-1435A	2.71	2.63	Circle		2.50	32.30	0.25	0.013	5.80	5.70	0.31	2.50	1.63	4.17	4.65	22.81	20.41	0.10
F	P-1433	INL 1433	PRM-1421C	5.12	4.00	Circle		1.25	11.60	9.63	0.013	6.14	6.14	0.00	1.25	0.12	16.70	6.42	0.39	20.04	0.00
F	P-1429	INL 1429	PRM-1421B	4.83	3.50	Circle		1.25	11.70	11.34	0.013	6.09	6.09	0.00	1.25	0.10	18.13	0.24	0.30	21.75	0.00
F	P-1423	INL 1423	PRM-1421A	5.72	4.50	Circle		1.25	12.00	10.15	0.013	6.36	6.37	0.01	1.25	0.12	17.15	6.69	0.42	20.58	0.00
F	P-1421C	PRM-1421C	PRM- 1435	3.31	3.05	Circle		2.50	44.30	0.59	0.013	5.94	5.84	0.23	2.50	1.44	6.41	4.03	19.76	31.43	0.10
F	P-1421B	PRM-1421B	PRM-1421C	3.62	3.31	Circle		2.50	54.00	0.57	0.013	6.08	5.96	0.22	2.50	1.44	6.34	6.68	19.49	31.06	0.12
F	P-1421A	PRM-1421A	PRM-1421B	3.90	3.62	Circle		2.50	49.50	0.57	0.013	6.18	6.11	0.20	2.49	1.43	6.29	6.63	19.29	30.84	0.08
F	P-1421	PRM- 1421	PRM-1421A	4.19	3.90	Circle		2.50	52.70	0.55	0.013	6.26	6.20	0.20	2.30	1.43	6.21	6.54	18.99	30.41	0.06
F	P-1420	PCO- 1420	PRM- 1421	4.34	4.30	Circle		1.25	8.10	0.49	0.013	6.27	6.27	0.03	1.25	0.43	3.78	0.93	1.15	4.53	0.00
F	P-1417	INL 1417	PCO- 1420	6.42	4.94	Circle		1.25	4.10	35.99	0.013	6.71	6.28	12.83	1.25	0.10	32.29	11.15	0.54	38.75	0.43
F	P-1412	INL 1412	PRM-1383D	6.96	5.50	Circle		1.25	12.50	11.67	0.013	7.19	6.82	3.60	1.25	0.11	18.38	6.70	0.36	22.06	0.37
F	P-1410	INL 1410	PRM-1383C	6.83	6.00	Circle		1.25	12.00	6.89	0.013	7.08	7.09	0.58	1.09	0.13	14.13	5.78	0.41	16.95	-0.02
F	P-1405	INL 1405	PRM-1383B	6.95	5.00	Circle		1.25	12.20	16.00	0.013	7.17	7.03	1.81	1.25	0.10	21.53	7.29	0.33	25.84	0.14
F	P-1393	INL 1393	PRM- 1371	6.30	6.23	Circle		1.25	62.80	0.11	0.013	7.38	7.37	0.02	1.14	0.56	1.80	1.67	0.88	2.16	0.01
F	P-1390	INL 1390	INL 1476	6.77	6.24	Circle		1.25	61.90	0.86	0.013	7.30	7.31	0.04	1.07	0.30	4.98	3.35	0.77	5.98	-0.01
F	P-1385A	INL 1385A	PCO-1385	5.00	4.91	Circle		2.00	21.60	0.42	0.013	7.32	7.31	0.05	2.00	0.80	4.71	1.58	4.97	14.59	0.01
F	P-1385	PCO-1385	PRM-1383A	4.71	4.62	Circle		2.00	29.00	0.31	0.013	7.30	7.29	0.05	2.00	0.90	4.06	1.66	5.23	12.59	0.02
F	P-1384A	INL 1384A	PCO-1384	5.27	4.83	Circle		2.00	123.70	0.36	0.013	7.42	7.38	0.03	2.00	0.77	4.35	1.33	4.19	13.49	0.04
F	P-1384	PCO-1384	PRM- 1383	4.83	4.71	Circle		2.00	28.90	0.42	0.013	7.37	7.35	0.06	2.00	0.86	4.70	1.78	5.59	14.58	0.02
F	P-1383D	PRM-1383D	PRM- 1421	4.32	4.19	Circle		2.00	50.80	0.26	0.013	6.52	6.29	0.46	2.00	1.41	3.69	4.86	15.27	11.45	0.23
F	P-1383C	PRM-1383C	PRM-1383D	4.45	4.32	Circle		2.00	52.00	0.25	0.013	6.79	6.56	0.44	2.00	1.40	3.65	4.78	15.02	11.32	0.23
F	P-1383B	PRM-1383B	PRM-1383C	4.55	4.45	Circle		2.00	45.60	0.22	0.013	7.02	6.83	0.42	2.00	1.38	3.42	4.69	14.72	10.60	0.19
F	P-1383A	PRM-1383A	PRM-1383B	4.63	4.55	Circle		2.00	32.60	0.25	0.013	7.20	7.07	0.41	2.00	1.37	3.62	4.60	14.47	11.21	0.13
F	P-1383	PRM- 1383	PRM-1383A	4.71	4.63	Circle		2.00	32.70	0.24	0.013	7.30	7.26	0.11	2.00	1.19	3.61	2.37	7.46	11.18	0.04
F	P-1381	INL 1381	PRM-1371B	7.48	6.20	Circle		1.25	12.60	10.19	0.013	7.71	7.35	3.45	1.15	0.11	17.18	6.34	0.35	20.62	0.36
F	P-1378	INL 1378	PRM-1371A	7.65	6.20	Circle		1.25	12.40	11.68	0.013	7.90	7.36	5.03	1.16	0.12	18.39	6.97	0.41	22.07	0.54
F	P-1374	INL 1374	PRM- 1371	6.43	6.28	Circle		1.25	12.50	1.20	0.013	7.37	7.37	0.01	1.09	0.24	5.90	3.46	0.57	7.08	0.00
F	P-1371B	PRM-1371B	PRM- 1383	5.52	5.21	Circle		1.50	44.60	0.70	0.013	7.33	7.32	0.04	1.50	0.50	4.87	1.17	2.08	8.76	0.02
F	P-1371A	PRM-1371A	PRM-1371B	5.82	5.52	Circle		1.50	62.20	0.48	0.013	7.36	7.34	0.03	1.50	0.51	4.05	1.02	1.80	7.29	0.02
F	P-1371	PRM- 1371	PRM-1371A	6.08	5.82	Circle		1.50	47.10	0.55	0.013	7.37	7.36	0.02	1.50	0.43	4.34	3.35	1.42	7.81	0.01
F2	P-1496	PCO- 1496	F2	0.93	0.70	Circle		4.00	4.00	5.75	0.013	4.70	4.70	0.00	4.00	0.11	27.34	4.77	0.47	344.49	0.00
F4	P-1485	PCO-1485	F4	4.65	4.62	Circle		1.25	4.50	0.66	0.013	5.87	5.87	0.02	1.25	0.36	4.39	3.25	0.95	5.27	0.00

DATE: 9/11/2023 6:05:51 PM
FILE: ...\FM 519 HYDRAULIC COMP13.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG'NO, F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		123

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
G	P-1400	INL 1400	PCO-1345	7.20	6.98	Circle		1.25	7.00	3.13	0.013	9.87	9.89	0.25	1.25	0.45	9.53	2.62	3.22	11.43	0.02
G	P-1399A	INL 1399A	PCO-1399	7.50	5.92	Circle		1.50	58.10	2.72	0.013	9.47	9.47	0.00	1.50	0.21	9.63	0.41	0.73	17.33	0.00
G	P-1399	PCO-1399	PRM- 1356	5.92	5.58	Circle		1.50	75.30	0.45	0.013	9.40	9.45	0.07	1.50	0.66	3.92	1.58	2.79	7.06	0.05
G	P-1398	PCO-1398	PCO-1399	6.30	5.92	Circle		1.50	36.40	1.04	0.013	9.48	9.49	0.03	1.50	0.41	5.96	0.98	1.73	10.73	0.01
G	P-1396	INL 1396	PRM- 1370	6.71	6.58	Circle		1.50	54.20	0.24	0.013	8.55	8.56	0.02	1.50	0.54	2.86	0.81	1.43	5.14	0.01
G	P-1395	INL 1395	INL 1396	6.90	6.86	Circle		1.25	7.70	0.52	0.013	8.56	8.56	0.01	1.25	0.30	3.88	0.47	0.58	4.66	0.00
G	P-1370C	PRM-1370C	PRM- 1356	5.75	5.53	Circle		2.00	35.90	0.61	0.013	9.41	9.44	0.09	2.00	0.86	5.71	2.15	6.76	17.71	0.03
G	P-1370B	PRM-1370B	PRM-1370C	6.15	5.75	Circle		2.00	65.30	0.61	0.013	8.86	8.88	0.03	2.00	0.63	5.71	1.22	3.83	17.71	0.02
G	P-1370A	PRM-1370A	PRM-1370B	6.55	6.15	Circle		2.00	60.40	0.66	0.013	8.70	8.71	0.02	2.00	0.54	5.94	0.93	2.91	18.41	0.01
G	P-1370	PRM- 1370	PRM-1370A	6.72	6.55	Circle		1.50	28.70	0.59	0.013	8.52	8.54	0.06	1.50	0.57	4.49	1.42	2.50	8.08	0.02
G	P-1369	PCO-1369	PRM- 1370	6.78	6.73	Circle		1.25	8.30	0.61	0.013	8.55	8.55	0.03	1.25	0.41	4.19	0.95	1.17	5.03	0.00
G	P-1366	INL-1366	PCO-1369	7.51	6.78	Circle		1.25	5.50	13.36	0.013	8.55	8.55	0.00	1.25	0.11	19.68	7.18	0.39	23.61	0.00
G	P-1362	INL-1362	PRM-1370A	7.61	5.77	Circle		1.25	13.10	14.03	0.013	8.52	8.52	0.01	1.25	0.12	20.16	7.68	0.46	24.19	0.00
G	P-1359	INL 1359	PRM-1370B	8.00	6.00	Circle		1.25	11.30	17.74	0.013	8.70	8.67	0.03	1.25	0.17	22.67	10.87	1.11	27.20	-0.03
G	P-1358	PCO-1358	PRM-1370C	6.10	5.00	Circle		1.50	28.30	3.89	0.013	8.86	8.89	0.11	1.50	0.42	11.52	2.01	3.56	20.73	0.03
G	P-1357A	INL 1357A	PCO-1357	7.50	6.34	Circle		1.50	21.60	5.37	0.013	9.47	9.49	0.09	1.50	0.36	13.52	1.78	3.14	24.34	0.02
G	P-1357	PCO-1357	PRM- 1356	6.04	5.58	Circle		1.50	28.60	1.61	0.013	9.41	9.44	0.11	1.50	0.52	7.39	1.98	3.50	13.31	0.03
G	P-1356A	PRM-1356A	PRM- 1346	4.98	4.77	Circle		2.00	63.50	0.33	0.013	9.20	9.46	0.41	2.00	1.37	4.20	4.59	14.42	13.01	0.26
G	P-1356	PRM- 1356	PRM-1356A	5.43	4.98	Circle		2.00	126.30	0.36	0.013	8.97	9.35	0.30	2.00	1.50	4.35	3.92	12.31	13.50	0.37
G	P-1355	INL 1355	PRM-1356A	7.49	6.00	Circle		1.25	12.70	11.73	0.013	8.97	8.99	0.14	1.25	0.28	18.43	1.97	2.42	22.12	0.02
G	P-1349	PRM-1346B	PRM- 1330	4.16	4.05	Circle		2.00	35.10	0.31	0.013	9.54	9.88	0.96	2.00	1.68	4.08	7.06	22.19	12.66	0.34
G	P-1348	INL 1348	PCO-1347	7.94	7.08	Circle		1.25	4.10	21.23	0.013	9.13	9.13	0.03	1.25	0.17	24.80	11.72	1.15	29.76	0.00
G	P-1347	PCO-1347	PRM- 1346	6.78	4.77	Circle		1.50	9.10	22.11	0.013	9.12	9.12	0.03	1.50	0.19	27.44	0.98	1.73	49.40	0.00
G	P-1346A	PRM-1346A	PRM-1346B	4.24	4.16	Circle		2.00	36.30	0.22	0.013	8.24	8.53	0.80	2.00	1.61	3.43	6.43	20.21	10.63	0.29
G	P-1346	PRM- 1346	PRM-1346A	4.62	4.24	Circle		2.00	156.50	0.24	0.013	8.00	9.07	0.69	2.00	1.56	3.60	5.97	18.77	11.15	1.08
G	P-1345	PCO-1345	PRM- 1346	6.98	6.62	Circle		1.50	53.50	0.67	0.013	9.77	9.85	0.15	1.50	0.72	4.79	2.27	4.01	8.62	0.08
G	P-1337	PCO-1337	PRM- 1324	5.17	5.00	Circle		1.25	54.30	0.31	0.013	8.63	8.94	0.56	1.25	0.89	3.01	3.95	4.85	3.61	0.31
G	P-1336	INL 1336	PCO-1337	5.25	5.22	Circle		1.25	8.00	0.37	0.013	8.84	8.85	0.08	1.25	0.60	3.28	1.48	1.82	3.94	0.01
G	P-1334	PCO-1334	PRM- 1330	5.54	4.35	Circle		1.50	53.60	2.22	0.013	9.54	9.55	0.01	1.50	0.27	8.69	0.63	1.12	15.65	0.01
G	P-1332B	INL 1332B	PRM-1346A	5.50	4.40	Circle		1.25	13.60	8.09	0.013	8.00	8.01	0.11	1.25	0.29	15.31	1.78	2.19	18.37	0.02
G	P-1332A	INL 1332A	PCO-1332	5.60	5.25	Circle		1.50	78.50	0.45	0.013	8.26	8.28	0.02	1.50	0.45	3.89	0.78	1.38	7.01	0.01
G	P-1332	PCO-1332	PRM-1346B	5.15	4.38	Circle		1.50	28.80	2.68	0.013	8.24	8.25	0.06	1.50	0.39	9.55	1.46	2.59	17.19	0.02
G	P-1331A1	PCO-1331	PRM- 1330	4.81	4.40	Circle		1.50	29.10	1.41	0.013	9.54	9.55	0.01	1.50	0.30	6.92	0.64	1.13	12.46	0.00
G	P-1331A	INL 1331A	PCO-1331	6.00	5.11	Circle		1.50	20.70	4.30	0.013	9.22	9.22	0.01	1.50	0.20	12.10	0.49	0.87	21.78	0.00
G	P-1330	PRM- 1330	PRM- 1324	4.05	3.65	Circle		2.00	158.70	0.25	0.013	7.91	9.67	1.11	2.00	1.73	3.66	7.58	23.82	11.36	1.76
G	P-1326	INL 1326	PCO-1325	4.71	4.53	Circle		1.25	4.80	3.73	0.013	7.78	7.78	0.02	1.25	0.23	10.40	0.73	0.89	12.48	0.00
G	P-1325	PCO-1325	PRM- 1324	3.88	3.65	Circle		1.50	8.10	2.83	0.013	7.76	7.77	0.07	1.50	0.41	9.81	1.60	2.83	17.66	0.01
G	P-1324	PRM- 1324	G	3.50	2.72	Circle		2.00	174.40	0.45	0.013	4.72	7.64	1.68	2.00	1.85	4.88	9.32	29.28	15.13	2.92
G1	P-1340	PCO-1340	G1	4.27	3.50	Circle		1.25	37.90	2.03	0.013	4.75	5.00	1.16	1.25	0.51	7.68	6.86	3.26	9.21	0.25
G1	P-1339A	INL 1339A	PCO-1339	5.50	4.63	Circle		1.25	16.30	5.35	0.013	5.38	6.14	5.18	0.75	0.35	12.45	9.08	2.54	14.94	0.76
G1	P-1339	PCO-1339	PCO-1340	4.33	4.32	Circle		1.25	35.90	0.03	0.013	5.16	5.29	0.25	0.84	0.67	0.90	2.27	2.79	1.08	0.13
H	P-1322	PCO-1322	PRM-1317B	4.43	-1.25	Circle		1.50	29.40	19.31	0.013	1.56	4.63	10.68	1.50	0.09	25.64	7.44	0.31	46.16	3.07
H	P-1321	PCO-1321	PRM-1317A	4.40	-1.20	Circle		1.50	29.20	19.15	0.013	2.02	5.02	10.92	1.50	0.25	25.53	14.16	2.66	45.96	3.00
H	P-1319A	INL 1319A	PCO-1319	4.00	3.38	Circle		1.25	20.00	3.09	0.013	5.44	5.44	0.01	1.25	0.22	9.47	0.62	0.76	11.36	0.00
H	P-1319	PCO-1319	PCO-1279	3.78	3.71	Circle		1.50	36.10	0.19	0.013	5.41	5.42	0.03	1.50	0.68	2.57	1.09	1.93	4.63	0.01
H	P-1318B	PRM-1318B	PRM-1317	-0.89	-1.16	Circle		3.00	129.60	0.21	0.013	3.55	4.59	0.80	3.00	2.50	4.29	8.45	59.70	30.44	1.04
H	P-1318A	PRM-1318A	PRM-1318B	-0.76	-0.89	Circle		3.00	85.70	0.15	0.013	4.71	5.36	0.76	3.00	2.47	3.66	8.23	58.21	25.98	0.65
H	P-1318	PRM- 1318	PRM-1318A	-0.71	-0.75	Circle		3.00	31.70	0.13	0.013	5.16	5.34	0.58	3.00	2.32	3.34	7.19	50.82	23.68	0.18
H	P-1317B	PRM-1317B	H	-1.55	-1.59	Circle		3.00	17.10	0.23	0.013	1.41	1.56	0.88	3.00	2.55	4.55	8.85	62.55	32.30	0.15
H	P-1317A	PRM-1317A	PRM-1317B	-1.47	-1.55	Circle		3.00	37.70	0.21	0.013	1.66	1.99	0.88	3.00	2.54	4.33	8.83	62.42	30.71	0.33
H	P-1317	PRM-1317	PRM-1317A	-1.16	-1.47	Circle		3.00	161.20	0.19	0.013	2.09	3.44	0.84	3.00	2.52	4.12	8.63	60.97	29.25	1.35
H	P-1314	INL 1314	PRM-1317	5.66	4.00	Circle		1.25	21.10	7.86	0.013	4.26	6.16	4.39	0.26	0.25	15.09	9.04	1.56	18.11	1.90
H	P-1312	INL 1312	PRM-1318B	6.31	4.00	Circle		1.25	13.30	17.38	0.013	5.75	6.79	8.94	1.25	0.20	22.44	11.68	1.45	26.93	1.03
H	P-1308	PCO-1308	PRM-1318A	3.99	0.00	Circle		1.50	28.00	14.24	0.013	5.16	5.17	0.21	1.50	0.35	22.02	15.15	4.77	39.63	0.01
H	P-1307A	INL 1307A	PCO-1307	5.00	4.27	Circle		1.50	22.40	3.25	0.013	5.31	5.34	0.62	1.04	0.21	10.53	5.34	0.81	18.95	0.03
H	P-1307	PCO-1307	PCO-1308	4.37	4.09	Circle		1.50	36.10	0.78	0.013	5.28	5.28	0.05	1.19	0.47	5.14	4.17	1.98	9.26	0.00
H	P-1304C	PRM-1304C	PRM- 1293	-0.11	-0.15	Circle		3.00	45.70	0.09	0.013	5.18	5.42	0.53	3.00	2.27	2.78	6.87	48.55	19.74	0.24
H	P-1304B1	PRM-1304B	PRM-1304C	-0.03	-0.11	Circle		3.00	68.80	0.12	0.013	5.50	5.83	0.48	3.00	2.21	3.20	6.54	46.21	22.74	0.33
H	P-1304B	PRM-1304A	PRM-1304B	0.02	-0.03	Circle		3.00	38.60	0.13	0.013	5.56	5.75	0.48	3.00	2.21	3.38	6.53	46.19	24.01	0.18
H	P-1304	PRM- 1304	PRM-1304A	0.07	0.02	Circle		3.00	38.40	0.13	0.013	5.83	6.00	0.42	3.00	2.15	3.39	6.14	43.41	24.07	0.16
H	P-1303A	INI 1303A	PCO-1303	4.50	3.97	Circle		1.25	20.30	2.61	0.013	5.89	5.90	0.02	1.25	0.24	8.69	0.69	0.84	10.43	0.00
H	P-1303	PCO-1303	PCO-1302	3.82	3.65	Circle		1.50	36.10	0.47	0.013	5.86	5.88	0.03	1.50	0.53	4.01	1.10	1.94	7.21	0.01
H	P-1302A	INL 1302A	PCO-1302	4.00	3.65	Circle		1.25	18.50	1.89	0.013	5.87	5.87	0.01	1.25	0.24	7.40	0.57	0.70	8.88	0.00
H	P-1302	PCO-1302	PRM-1304A	3.55	0.50	Circle		1.50	28.60	10.67	0.013	5.79	5.83	0.13	1.50	0.34	19.06	2.18	3.86	34.31	0.04
H	P-1299	INL 1299	PRM-1304B	5.39	3.00	Circle		1.25	15.70	15.18	0.013	5.56	5.54	0.22	1.25	0.07	20.97	5.72	0.16	25.16	-0.02
H	P-1296	INL 1296	PRM-1304C	5.49	4.00	Circle		1.25	21.00	7.10	0.013	6.01	6.01	0.00	1.25	0.12	14.34	5.50	0.33	17.21	-0.01
H	P-1293A	PRM-1293A	PRM- 1318	-0.38	-0.61	Circle		3.00	116.90	0.20	0.013	5.42	6.11	0.59	3.00	2.33	4.17	7.23	51.12	29.58	0.69
H	P-1293	PRM- 1293	PRM-1293A	-0.15	-0.38	Circle		3.00	117.10	0.20	0.013	4.47	5.11	0.54	3.00	2.28	4.16	6.96	49.17	29.56	0.64
H	P-1292	INL 1292	PRM- 1293	5.72	3.00	Circle		2.00	16.50	16.48	0.013	5.80	6.07	2.34	2.00	0.15	29.63	9.69	1.02	91.84	0.27
H	P-1289	INL 1289	PRM-1293A	5.57	1.00	Circle		1.25	18.50	24.66	0.013	4.47	6.00	9.07	1.25	0.17	26.73	12.54	1.21	32.08	1.54
H	P-1284	INL 1284	PRM-1317	4.51	-1.00	Circle		1.25	29.70	18.58	0.013	3.45	4.84	5.04	1.25	0.14	23.20	9.61	0.70	27.84	1.38
H	P-1282	INL 1282	PRM-1318B	4.25	-0.70	Circle		1.25	61.40	8.06	0.013	4.61	4.64	0.26	1.25	0.20	15.28	7.95	0.98	18.34	0.03
H	P-1279A	INL 1279A	PCO-1279	4.00	3.56	Circle		1.25	20.00	2.20	0.013	5.43	5.44	0.05	1.25	0.33	7.98	1.20	1.47	9.57	0.01
H	P-1279	PCO-1279	PRM-1318A	3.41	-1.06	Circle		1.50	76.00	5.89	0.013	5.16	5.37	0.28	1.50	0.48	14.16	3.14	5.56	25.48	0.21
H	P-1274	INL 1274	PRM-1293A	4.28	-0.38	Circle		1.50	62.00	7.51	0.013	4.47	4.74	0.69	1.50	0.23	15.99	8.59	1.50	28.79	0.27
H	P-1270	INL 1270	INL 1274	5.21	4.68	Circle		1.25	62.00	0.85	0.013	5.04	5.62	0.83	0.36	0.36	4.98	3.67	1.06	5.97	0.58
H	P-1268	INL 1268	INL 1270	5.63	5.31	Circle		1.25	29.10	1.10	0.013	5.58	5.95	1.02	0.27	0.27	5.65	3.52	0.67	6.78	0.37
H	P-1264	INL 1264	PRM-1304C	4.06	-0.11	Circle		1.50	61.50	6.78	0.013	5.50	5.53	0.06	1.50	0.31	15.19	9.62	2.48	27.35	0.03
H	P-1258	INL 1258	INL 1264	4.84	4.26	Circle		1.25	75.00	0.77	0.013	5.55	5.57	0.11	1.25	0.50	4.73	4.16	1.90	5.68	0.02
H	P-1257A	INL 1257A	PCO-1257	4.00	3.34	Circle		1.25	16.40	4.03	0.013	6.23	6.23	0.02	1.25	0.23	10.80	0.81	1.00	12.96	0.00
H	P-1257	PCO-1257	PCO-1256	3.54	3.21	Circle		1.50	36.10	0.92	0.013	6.20	6.21	0.03	1.50	0.45	5.58	1.11	1.96	10.05	0.01
H	P-1256A	INL 1256A	PCO-1256	3.50	3.11	Circle		1.25	22.50	1.73	0.013	6.20	6.21	0.04	1.25	0.33	7.09	1.07	1.31	8.51	0.01
H	P-1256	PCO-1256	PRM- 1304	3.11	0.27	Circle		1.50	75.10	3.78	0.013	6.04	6.16	0.15	1.50	0.46	11.34	2.32	4.11	20.42	0.11
H	P-1254	INL 1254	PRM-1243A	4.23	0.47	Circle		1.50	60.10	6.25	0.013	5.91	5.93	0.02	1.50	0.24	14.59	0.83	1.47	26.27	0.01
H	P-1249	INL 1249	INL 1254	4.29	4.13	Circle		1.25	62.10	0.26	0.013	5.94	5.95	0.02	1.25	0.45	2.73	0.73	0.89	3.28	0.01
H	P-1246	INL 1246	PRM- 1243	5.55	3.00	Circle		1.25	21.30	11.96	0.013	6.53	6.54	0.03	1.25	0.19	18.62	9.51	1.13	22.34	0.00
H	P-1243A	PRM-1243A	PRM- 1304	0.47	0.27	Circle		3.00	40.90	0.49	0.013	6.07	6.21	0.35	3.00	2.12	6.57	5.61	39.63	46.65	0.14
H	P-1243	PRM- 1243	PRM-1243A	0.82	0.47	Circle		3.00	79.20	0.44	0.013	5.91	6.18	0.33	3.00	2.16	6.24	5.44	38.42	44.33	0.26
H	P-1239	INL 1239	PRM-1226B	4.09	0.97	Circle		1.25	59.50	5.24	0.013	5.71	5.80	0.16	1.25	0.35	12.33	2.09	2.57	14.79	0.09
H	P-1238	PCO-1238	PRM- 1226	2.73	1.89	Circle		1.50	76.90	1.09	0.013	6.20	6.41	0.27	1.50	0.75	6.10	3.10	5.47	10.98	0.21
H	P-1237	PCO-1237	PCO-1238	3.01	2.93	Circle		1.50	35.90	0.22	0.013	6.61	6.64	0.07	1.50	0.81	2.76	1.59	2.81	4.96	0.03

DATE: 9/11/2023 6:07:19 PM
FILE: ...\FM 519 HYDRAULIC COMP14.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		124

100% SUBMITTAL

CK | DW | CK | DW

PROPOSED CONDITION (5 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US	DS							US ELEV	DS ELEV	SLOPE	UNIFORM	ACTUAL	UNIFORM	ACTUAL	Q		LOSS
				(ft)	(ft)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft/s)	(ft/s)	(cfs)	(cfs)	(ft)
H	P-1231	INL 1231	PRM-1226A	3.29	0.87	Circle		1.25	58.70	4.12	0.013	5.38	5.39	0.02	1.25	0.23	10.93	0.78	0.96	13.11	0.01
H	P-1230	INL 1230	PRM-1226A	5.31	3.00	Circle		1.25	14.50	15.93	0.013	5.38	5.99	5.55	1.25	0.28	21.48	13.88	2.89	25.78	0.62
H	P-1226B	PRM-1226B	PRM- 1243	1.18	0.87	Circle		3.00	81.20	0.38	0.013	6.22	6.48	0.32	3.00	2.26	5.80	5.35	37.81	41.21	0.26
H	P-1226A	PRM-1226A	PRM-1226B	1.50	1.18	Circle		3.00	89.20	0.36	0.013	5.71	5.96	0.29	3.00	2.21	5.63	5.04	35.63	39.96	0.25
H	P-1226	PRM- 1226	PRM-1226A	1.89	1.50	Circle		2.50	110.20	0.35	0.013	5.38	6.08	0.64	2.50	1.95	4.98	6.68	32.79	24.40	0.70
H	P-1225	PCO-1225	PRM-1215A	3.30	1.92	Circle		1.50	7.60	18.14	0.013	6.60	6.62	0.17	1.50	0.31	24.85	2.44	4.32	44.73	0.01
H	P-1222	INL 1222	PCO-1225	4.47	3.65	Circle		1.25	6.60	12.46	0.013	6.65	6.66	0.10	1.25	0.25	19.00	1.65	2.02	22.80	0.01
H	P-1218	INL 1218	PRM- 1215	4.09	2.36	Circle		1.25	14.10	12.25	0.013	7.64	7.69	0.29	1.25	0.33	18.84	2.86	3.50	22.61	0.04
H	P-1215A	PRM-1215A	PRM- 1226	1.92	1.89	Circle		2.00	15.50	0.19	0.013	6.18	6.41	1.48	2.00	1.82	3.21	8.77	27.55	9.94	0.23
H	P-1215	PRM- 1215	PRM-1215A	2.10	1.92	Circle		2.00	116.60	0.15	0.013	6.67	8.03	1.17	2.00	1.75	2.87	7.79	24.47	8.89	1.36
H	P-1214	INL 1214	PRM- 1215	3.57	2.16	Circle		1.50	58.30	2.42	0.013	7.64	7.68	0.07	1.50	0.41	9.08	1.52	2.68	16.34	0.04
H	P-1210	INL 1210	PRM-1196B	3.71	2.40	Circle		1.50	58.40	2.24	0.013	5.80	5.83	0.06	1.50	0.42	8.74	1.50	2.65	15.73	0.04
H	P-1205	INL 1205	PRM-1196A	4.51	2.60	Circle		1.25	15.00	12.74	0.013	5.41	5.38	0.14	1.25	0.28	19.21	12.23	2.45	23.05	-0.03
H	P-1202	INL 1202	PRM-1196A	3.62	2.54	Circle		1.50	58.50	1.85	0.013	5.41	5.46	0.09	1.50	0.48	7.93	1.76	3.12	14.27	0.05
H	P-1198A	INL 1198A	PCO-1198	3.00	2.80	Circle		2.00	17.00	1.18	0.013	5.85	5.85	0.02	2.00	0.47	7.93	0.95	2.98	24.57	0.00
H	P-1198	PCO-1198	PRM- 1196	2.90	2.86	Circle		2.00	75.50	0.05	0.013	5.74	5.81	0.09	2.00	0.93	1.68	2.19	6.88	5.21	0.07
H	P-1197A	INL 1197A	PCO-1197	3.50	3.18	Circle		1.50	10.60	3.01	0.013	5.97	5.98	0.06	1.50	0.38	10.13	1.45	2.56	18.23	0.01
H	P-1197	PCO-1197	PCO-1198	3.18	2.86	Circle		1.50	35.80	0.89	0.013	5.84	5.89	0.13	1.50	0.64	5.52	2.15	3.79	9.93	0.05
H	P-1196C	INL 1196C	PRM- 1196	3.00	2.80	Circle		1.25	20.30	0.98	0.013	5.66	5.66	0.01	1.25	0.26	5.34	0.51	0.63	6.41	0.00
H	P-1196B	PRM-1196B	PRM- 1215	2.32	2.11	Circle		2.00	94.10	0.22	0.013	7.64	8.33	0.73	2.00	1.58	3.45	6.17	19.38	10.69	0.69
H	P-1196A	PRM-1196A	PRM-1196B	2.54	2.32	Circle		2.00	100.10	0.22	0.013	5.80	6.36	0.56	2.00	1.48	3.42	5.40	16.95	10.61	0.56
H	P-1196	PRM- 1196	PRM-1196A	2.70	2.54	Circle		2.00	77.20	0.21	0.013	5.41	5.63	0.29	2.00	1.25	3.32	3.87	12.16	10.30	0.22
H	P-1192A	INL 1192A	PCO- 1192	3.50	3.15	Circle		1.50	14.00	2.51	0.013	5.76	5.76	0.00	1.50	0.17	9.24	0.26	0.45	16.63	0.00
H	P-1192	PCO- 1192	PRM- 1196	2.90	2.85	Circle		2.00	38.40	0.13	0.013	5.73	5.75	0.07	2.00	1.26	2.63	1.87	5.86	8.16	0.03
H	P-1191B	INL 1191B	INL 1191A	4.20	3.90	Circle		1.50	127.10	0.24	0.013	5.88	6.03	0.12	1.50	0.93	2.83	2.03	3.58	5.10	0.15
H	P-1191A	INL 1191A	PCO-1191	3.78	3.72	Circle		1.50	13.60	0.44	0.013	5.81	5.83	0.12	1.50	0.77	3.88	2.06	3.65	6.98	0.02
H	P-1191	PCO-1191	PCO- 1192	3.72	3.15	Circle		2.00	120.90	0.47	0.013	5.77	5.81	0.03	2.00	0.68	5.01	1.22	3.83	15.53	0.03

DATE: 9/11/2023 6:08:53 PM
FILE: ...\FM 519 HYDRAULIC COMP15.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		125

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
A	P-7008	PCO-7008	PRM- 2064	4.22	4.07	Circle		1.50	55.40	0.27	0.013	8.37	8.33	0.08	1.50	0.79	3.03	1.70	3.00	5.46	0.05
A	P-2279	PRM- 2279	A	0.40	0.08	Circle		3.00	184.10	0.17	0.013	6.03	3.08	1.60	3.00	2.81	3.92	11.93	84.35	27.80	2.95
A	P-2277	PCO- 2277	PRM- 2279	1.59	1.40	Circle		1.50	10.60	1.79	0.013	7.75	7.72	0.24	1.50	0.63	7.81	2.94	5.19	14.06	0.03
A	P-2258	PCO-2258	PRM- 2279	2.50	1.26	Circle		1.50	55.80	2.22	0.013	8.52	8.36	0.30	1.50	0.63	8.70	3.23	5.71	15.66	0.16
A	P-2256	INL 2256	PCO-2258	3.23	3.15	Circle		1.25	7.70	1.04	0.013	5.84	5.83	0.11	1.25	0.49	5.48	1.75	2.15	6.58	0.01
A	P-2242	INL 2242	PRM- 2230	3.04	1.65	Circle		1.50	64.60	2.15	0.013	6.66	6.61	0.07	1.50	0.43	8.56	1.55	2.74	15.41	0.04
A	P-2236	INL 2236	INL 2242	3.95	3.04	Circle		1.25	43.60	2.09	0.013	5.61	5.58	0.05	1.25	0.34	7.78	1.23	1.50	9.33	0.02
A	P-2230	PRM- 2230	PRM- 2279	0.63	0.43	Circle		3.00	103.40	0.19	0.013	7.65	6.28	1.33	3.00	2.74	4.13	10.89	76.98	29.33	1.38
A	P-2223	INL 2223	PRM- 2230	3.38	2.90	Circle		1.25	17.30	2.78	0.013	6.62	6.61	0.04	1.25	0.30	8.98	1.09	1.33	10.77	0.01
A	P-2205A	INL 2205A	PCO-2205	3.63	3.53	Circle		1.50	31.30	0.32	0.013	6.11	6.11	0.00	1.50	0.00	3.30	0.00	0.00	5.94	0.00
A	P-2205	PCO-2205	PCO-2203	3.33	3.29	Circle		1.50	35.90	0.11	0.013	6.11	6.11	0.00	1.50	0.38	1.94	0.28	0.50	3.50	0.00
A	P-2203A	INL 2203A	PCO-2203	3.39	3.29	Circle		1.50	17.00	0.59	0.013	6.12	6.11	0.06	1.50	0.58	4.47	1.46	2.57	8.04	0.01
A	P-2203	PCO-2203	PRM- 2196	3.29	2.52	Circle		1.50	80.20	0.96	0.013	7.14	7.02	0.14	1.50	0.64	5.72	2.23	3.94	10.29	0.11
A	P-2196	PRM- 2196	PRM- 2230	1.42	1.26	Circle		3.00	132.20	0.12	0.013	8.26	6.61	1.24	3.00	2.71	3.27	10.52	74.36	23.20	1.64
A	P-2193A	INL 2193A	PCO- 2193	3.05	2.89	Circle		1.50	45.10	0.35	0.013	7.00	6.90	0.22	1.50	1.01	3.47	2.80	4.94	6.25	0.10
A	P-2193	PCO- 2193	PRM- 2196	2.79	2.32	Circle		1.50	28.60	1.64	0.013	7.34	7.02	1.10	1.50	1.03	7.48	6.23	11.00	13.46	0.31
A	P-2189A	INL 2189A	PCO- 2189	3.25	3.05	Circle		1.50	57.80	0.35	0.013	6.98	6.87	0.19	1.50	0.97	3.43	2.61	4.61	6.18	0.11
A	P-2189	PCO- 2189	PCO- 2193	3.05	2.79	Circle		1.50	36.50	0.71	0.013	7.01	6.90	0.30	1.50	0.88	4.93	3.25	5.74	8.87	0.11
A	P-2187	INL 2187	PRM-2162A	4.64	3.00	Circle		1.25	12.60	12.98	0.013	6.00	6.00	0.01	1.25	0.14	19.39	0.51	0.63	23.27	0.00
A	P-2168	PCO-2168	PRM- 2162	3.20	3.10	Circle		1.50	54.70	0.18	0.013	7.10	7.05	0.10	1.50	0.96	2.49	1.88	3.32	4.49	0.05
A	P-2162A	PRM-2162A	PRM- 2196	1.68	1.42	Circle		3.00	72.30	0.36	0.013	7.67	7.02	0.89	3.00	2.55	5.63	8.90	62.88	40.00	0.64
A	P-2162	PRM- 2162	PRM-2162A	1.78	1.68	Circle		3.00	111.20	0.09	0.013	6.98	6.00	0.88	3.00	2.55	2.82	8.87	62.68	20.00	0.98
A	P-2160A	INL 2160A	PCO- 2160	4.30	3.40	Circle		1.50	173.80	0.52	0.013	7.07	7.07	0.00	1.50	0.29	4.20	0.34	0.60	7.56	0.01
A	P-2160	PCO- 2160	PRM- 2162	3.10	3.06	Circle		1.50	9.70	0.41	0.013	7.05	7.05	0.03	1.50	0.55	3.75	1.08	1.91	6.75	0.00
A	P-2157	INL 2157	PRM-2148A	5.07	4.60	Circle		1.25	12.00	3.91	0.013	6.99	6.99	0.00	1.25	0.12	10.64	0.20	0.24	12.77	0.00
A	P-2148A	PRM-2148A	PRM- 2162	1.81	1.78	Circle		3.00	24.60	0.12	0.013	7.24	7.05	0.78	3.00	2.48	3.28	8.31	58.77	23.29	0.19
A	P-2148	PRM- 2148	PRM-2148A	1.89	1.81	Circle		3.00	68.20	0.12	0.013	7.52	6.99	0.78	3.00	2.48	3.22	8.31	58.74	22.85	0.53
A	P-2147	INL 2147	PCO-2168	3.56	3.40	Circle		1.25	8.00	2.01	0.013	6.70	6.70	0.03	1.25	0.29	7.63	0.86	1.05	9.15	0.00
A	P-2145A	INL 2145A	PCO- 2145	3.85	3.74	Circle		1.50	27.10	0.41	0.013	7.38	7.28	0.35	1.50	1.14	3.72	3.50	6.18	6.69	0.09
A	P-2145	PCO- 2145	PRM- 2148	3.74	3.60	Circle		1.50	28.60	0.49	0.013	7.43	7.32	0.39	1.50	1.11	4.08	3.72	6.57	7.35	0.11
A	P-2142A	INL 2142A	PCO- 2142	3.79	3.49	Circle		1.50	98.60	0.30	0.013	7.52	7.26	0.27	1.50	1.15	3.22	3.07	5.42	5.79	0.26
A	P-2142	PCO- 2142	PRM- 2148	3.49	3.34	Circle		1.50	38.00	0.39	0.013	7.54	7.32	0.59	1.50	1.10	3.67	4.57	8.07	6.60	0.22
A	P-2136	PCO-2136	PRM- 2148	3.64	3.40	Circle		1.50	56.10	0.43	0.013	7.37	7.32	0.09	1.50	0.72	3.82	1.82	3.22	6.87	0.05
A	P-2135	INL 2135	PCO-2136	4.61	4.34	Circle		1.25	7.60	3.57	0.013	7.39	7.39	0.03	1.25	0.26	10.18	0.97	1.19	12.21	0.00
A	P-2123	INL 2123	PRM-2098B	5.55	5.10	Circle		1.25	11.40	3.95	0.013	7.00	7.00	0.01	1.25	0.20	10.70	0.61	0.75	12.84	0.00
A	P-2117	INL 2117	PRM-2098A	5.42	5.10	Circle		1.25	11.50	2.78	0.013	7.06	7.01	0.46	1.25	0.55	8.98	3.57	4.38	10.78	0.05
A	P-2105	INL 2105	PCO- 2099	5.32	4.89	Circle		1.50	4.10	10.53	0.013	7.92	7.92	0.01	1.50	0.19	18.93	0.64	1.13	34.08	0.00
A	P-2099	PCO- 2099	PRM- 2098	4.24	3.30	Circle		1.50	10.70	8.78	0.013	7.90	7.90	0.04	1.50	0.26	17.29	1.14	2.02	31.13	0.00
A	P-2098B	PRM-2098B	PRM- 2148	2.93	2.82	Circle		2.50	97.40	0.11	0.013	8.46	7.32	1.18	2.50	2.22	2.81	9.06	44.47	13.79	1.14
A	P-2098A	PRM-2098A	PRM-2098B	2.98	2.93	Circle		2.50	35.60	0.14	0.013	7.41	7.00	1.15	2.50	2.21	3.13	8.97	44.02	15.36	0.41
A	P-2098	PRM- 2098	PRM-2098A	3.10	2.99	Circle		2.50	84.50	0.13	0.013	7.84	7.01	0.98	2.50	2.14	3.02	8.29	40.70	14.80	0.83
A	P-2085	PCO-2085	PRM- 2098	4.24	4.02	Circle		1.50	56.80	0.39	0.013	8.05	7.90	0.27	1.50	1.05	3.63	3.10	5.48	6.54	0.15
A	P-2084	INL 2084	PCO-2085	5.09	4.89	Circle		1.50	7.70	2.60	0.013	8.13	8.12	0.12	1.50	0.48	9.40	2.10	3.71	16.92	0.01
A	P-2077	INL 2077	INL 2084	5.23	5.09	Circle		1.50	38.10	0.37	0.013	7.06	7.05	0.02	1.50	0.49	3.54	0.83	1.47	6.37	0.01
A	P-2064	PRM- 2064	PRM- 2098	4.05	3.83	Circle		2.50	121.70	0.18	0.013	8.79	7.90	0.73	2.50	2.01	3.56	7.16	35.13	17.44	0.89
A	P-2061A	INL 2061A	PCO- 2061	4.45	4.37	Circle		1.50	11.50	0.70	0.013	8.33	8.28	0.48	1.50	1.04	4.87	4.12	7.28	8.77	0.06
A	P-2061	PCO- 2061	PRM- 2064	4.37	4.25	Circle		1.50	31.50	0.38	0.013	9.02	8.33	2.21	1.50	1.42	3.60	8.84	15.62	6.48	0.70
A	P-2059A	INL 2059A	PCO- 2059	4.55	4.47	Circle		1.50	14.50	0.55	0.013	8.38	8.32	0.40	1.50	1.06	4.34	3.76	6.65	7.81	0.06
A	P-2059	PCO- 2059	PCO- 2061	4.47	4.37	Circle		1.50	36.10	0.28	0.013	8.52	8.28	0.67	1.50	1.14	3.07	4.88	8.62	5.53	0.24
A	P-2055	INL 2055	PCO-7008	4.78	4.62	Circle		1.50	7.80	2.04	0.013	8.39	8.39	0.03	1.50	0.35	8.34	1.02	1.81	15.01	0.00
A	P-2049	INL 2049	INL 2055	4.93	4.78	Circle		1.25	38.00	0.39	0.013	7.19	7.18	0.04	1.25	0.48	3.38	1.03	1.26	4.06	0.01
A	P-2038	INL 2038	INL 2015	5.69	5.27	Circle		1.25	43.90	0.96	0.013	8.28	8.27	0.01	1.25	0.26	5.27	0.48	0.59	6.32	0.00
A	P-2019	INL 2019	PCO- 2018	5.44	4.76	Circle		1.25	4.30	15.96	0.013	8.81	8.80	0.15	1.25	0.26	21.50	2.01	2.46	25.80	0.01
A	P-2018	PCO- 2018	PRM- 2017	4.31	3.97	Circle		1.50	8.40	4.07	0.013	8.77	8.76	0.10	1.50	0.40	11.77	1.90	3.35	21.19	0.01
A	P-2017	PRM- 2017	PRM- 2064	4.42	4.21	Circle		2.50	191.60	0.11	0.013	8.73	8.33	0.21	2.50	1.47	2.77	3.83	18.80	13.58	0.40
A	P-2016	PCO-2016	PRM- 2017	4.58	4.42	Circle		1.50	54.50	0.29	0.013	8.76	8.75	0.02	1.50	0.55	3.16	0.93	1.65	5.69	0.01
A	P-2015	INL 2015	PCO-2016	5.27	5.20	Circle		1.50	7.90	0.88	0.013	8.77	8.77	0.00	1.50	0.25	5.48	0.35	0.62	9.86	0.00
A	P-2014	INL 2014	PRM-2007A	5.92	5.50	Circle		1.25	12.30	3.42	0.013	7.51	7.51	0.07	1.25	0.32	9.95	1.42	1.74	11.94	0.01
A	P-2010	INL 2010	PCO-2009	7.84	6.84	Circle		1.25	7.30	13.61	0.013	8.34	8.34	0.00	1.25	0.08	19.86	5.88	0.19	23.83	0.00
A	P-2009	PCO-2009	PRM- 2007	6.35	5.69	Circle		1.50	55.60	1.19	0.013	8.34	8.34	0.00	1.50	0.25	6.36	0.39	0.68	11.44	0.00
A	P-2007A	PRM-2007A	PRM- 2017	4.77	4.62	Circle		2.00	65.60	0.23	0.013	9.06	8.76	0.46	2.00	1.41	3.49	4.88	15.32	10.82	0.30
A	P-2007	PRM- 2007	PRM-2007A	5.09	4.78	Circle		2.00	133.20	0.23	0.013	8.03	7.51	0.39	2.00	1.36	3.52	4.53	14.22	10.91	0.53
A	P-2005A	INL 2005A	PCO 2005	5.40	5.20	Circle		2.00	34.00	0.59	0.013	8.59	8.56	0.07	2.00	0.82	5.59	1.95	6.11	17.34	0.02
A	P-2005	PCO 2005	PRM- 2007	5.10	5.06	Circle		2.00	29.20	0.14	0.013	8.44	8.34	0.35	2.00	1.32	2.70	4.28	13.45	8.37	0.10
A	P-2002A	INL 2002A	PCO- 2002	5.80	5.69	Circle		1.50	21.20	0.52	0.013	9.23	9.13	0.46	1.50	1.16	4.20	4.05	7.15	7.56	0.10
A	P-1059	INL 1059	PRM- 2007	7.68	7.40	Circle		1.00	105.70	0.26	0.013	8.13	8.10	0.05	0.70	0.35	2.29	1.96	0.47	1.83	0.04
A	P- 2002	PCO- 2002	PCO 2005	5.44	5.10	Circle		1.50	36.30	0.94	0.013	8.77	8.58	0.50	1.50	0.95	5.65	4.22	7.46	10.17	0.18
B	P-CBS 02	CBS 02	PRM-684B	3.50	2.50	Circle		1.25	11.80	8.48	0.013	5.03	5.00	0.26	1.25	0.35	15.68	2.68	3.28	18.81	0.03
B	P-684B	PRM-684B	PRM-2410	-0.14	-0.22	Circle		3.00	45.60	0.18	0.013	6.75	6.11	1.42	3.00	2.77	3.94	11.25	79.49	27.94	0.65
B	P-684A	PRM-684A	PRM-684B	-0.06	-0.14	Circle		3.00	54.60	0.15	0.013	5.73	5.00	1.33	3.00	2.74	3.59	10.88	76.89	25.52	0.73
B	P-657	PCO- 657	PRM-684	1.80	0.50	Circle		2.00	29.30	4.43	0.013	5.78	5.77	0.06	2.00	0.45	15.36	1.72	5.40	47.63	0.02
B	P-648	PRM-684	PRM-684A	0.00	-0.06	Circle		3.00	37.80	0.16	0.013	5.50	5.00	1.32	3.00	2.74	3.75	10.86	76.76	26.59	0.50
B	P-640	INL 1640	PRM-684A	3.50	2.40	Circle		1.25	11.70	9.40	0.013	5.00	5.00	0.00	1.25	0.11	16.50	0.25	0.31	19.80	0.00
B	P-600A	INL 600A	PCO-600	2.38	2.28	Circle		1.50	20.70	0.48	0.013	3.21	3.21	0.09	0.93	0.53	4.06	3.51	1.98	7.31	0.00
B	P-600	PCO-600	PCO-1655	2.23	2.11	Circle		1.50	46.20	0.26	0.013	3.16	3.13	0.10	1.02	0.73	2.97	2.99	2.53	5.35	0.03
B	P-2410D	PRM-2410D	PRM- 2342	-0.70	-0.79	Circle		3.00	45.30	0.20	0.013	6.76	5.86	1.99	3.00	2.87	4.19	13.30	93.99	29.74	0.90
B	P-2410C	PRM-2410C	PRM-2410D	-0.59	-0.70	Circle		3.00	60.80	0.18	0.013	6.18	5.01	1.92	3.00	2.86	3.99	13.09	92.50	28.36	1.17
B	P-2410B	PRM-2410B	PRM-2410C	-0.46	-0.59	Circle		3.00	76.40	0.17	0.013	6.42	5.00	1.86	3.00	2.85	3.88	12.86	90.93	27.52	1.42
B	P-2410A	PRM-2410A	PRM-2410B	-0.36	-0.46	Circle		3.00	53.90	0.19	0.013	5.97	5.01	1.78	3.00	2.84	4.05	12.59	89.01	28.72	0.96
B	P-2410	PRM-2410	PRM-2410A	-0.25	-0.36	Circle		3.00	59.70	0.18	0.013	6.03	5.00	1.72	3.00	2.83	4.03	12.38	87.48	28.63	1.03
B	P-2408	PCO- 2408	PRM-2410	1.44	0.00	Circle		1.50	11.30	12.72	0.013	6.13	6.11	0.20	1.50	0.36	20.81	2.68	4.73	37.46	0.02
B	P-2403	INL 2403	PCO- 2408	3.89	3.04	Circle		1.25	4.60	18.58	0.013	6.36	6.36	0.11	1.25	0.23	23.20	1.73	2.13	27.84	0.00
B	P-2402	INL 2402	PRM-2410A	3.61	2.50	Circle		1.25	12.60	8.84	0.013	5.02	5.00	0.14	1.25	0.30	16.00	1.94	2.38	19.20	0.02
B	P-2386	INL 2386	PCO-2380	2.39	2.09	Circle		1.25	7.90	3.79	0.013	6.40	6.36	0.41	1.25	0.49	10.48	3.39	4.16	12.58	0.03
B	P-2380	PCO-2380	PRM-2410	1.99	1.75	Circle		1.50	54.70	0.44	0.013	6.33	6.11	0.41	1.50	1.19	3.87	3.81	6.73	6.96	0.22
B	P-2372	INL 2372	PRM-2410B	3.79	2.50	Circle		1.25	12.30	10.49	0.013	5.03	5.01	0.20	1.25	0.32	17.43	12.01	2.92	20.92	0.02
B	P-2365	INL 2365	PRM-2410C	3.20	2.35	Circle		1.25	12.60	6.74	0.013	5.02	5.00	0.16	1.25	0.33	13.98	2.08	2.55	16.77	0.02
B	P-2353	INL 2353	PRM-2410D	3.36	2.35	Circle		1.25	12.80	7.86	0.013	5.02	5.01	0.13	1.25	0.31	15.09	1.93	2.37	18.11	0.02
B	P-2347	INL 2347	PRM- 2342	2.07	1.30	Circle		1.25	14.10	5.48	0.013	6.19	6.19	0.05	1.25	0.27	12.60	1.22	1.50	15.12	0.01
B	P-2342C	PRM-2342C	B	-1.00	-1.10	Circle		3.00	77.30	0.13	0.013	3.85	1.90	2.53	3.00	2.92	3.38	15.01	106.08	24.00	1.95
B	P-2342A	PRM-2342A	PRM-2342C	-0.91	-1.00	Circle		3.00	53.20	0.17	0.013	5.31	4.01	2.46	3.00	2.91	3.86	14.79	104.53	27.43	1.31

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

SHEET 16 OF 20

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		126

DATE: 9/11/2023 6:10:34 PM
FILE: ...\FM 519 HYDRAULIC COMP16.dgn

100% SUBMITTAL

CK: DW: CK: DW:

PROPOSED CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
B	P-2342	PRM- 2342	PRM-2342A	-0.79	-0.91	Circle		3.00	61.60	0.19	0.013	5.45	4.00	2.35	3.00	2.90	4.15	14.47	102.26	29.43	1.45
B	P-2339	PCO- 2339	PRM- 2342	1.31	0.80	Circle		2.00	11.50	4.42	0.013	6.19	6.19	0.02	2.00	0.35	15.34	1.01	3.17	47.55	0.00
B	P-2337	INL 2337	PCO-2332	2.41	2.11	Circle		1.25	8.10	3.69	0.013	6.43	6.39	0.46	1.25	0.51	10.34	3.58	4.40	12.41	0.04
B	P-2332	PCO-2332	PRM- 2342	2.11	1.00	Circle		1.50	54.30	2.04	0.013	6.46	6.19	0.50	1.50	0.75	8.34	4.22	7.46	15.01	0.27
B	P-2312	INL 2312	PRM-2342A	2.77	2.20	Circle		1.25	12.40	4.59	0.013	4.03	4.00	0.21	1.25	0.39	11.54	2.40	2.95	13.85	0.03
B	P-2297	INL 2297	PRM-2342C	2.45	1.80	Circle		1.25	11.80	5.50	0.013	4.02	4.01	0.13	1.25	0.33	12.63	1.91	2.35	15.15	0.02
B	P-1664	PCO-1664	PRM- 1626	2.28	2.03	Circle		1.50	55.10	0.45	0.013	5.97	5.84	0.23	1.50	0.93	3.93	2.83	5.00	7.08	0.13
B	P-1663	INL 1663	PCO-1664	4.18	2.63	Circle		1.50	8.40	18.41	0.013	6.02	6.01	0.16	1.50	0.31	25.03	2.35	4.15	45.06	0.01
B	P-1662	INL 1662	INL 1663	4.65	4.38	Circle		1.25	66.80	0.40	0.013	5.21	4.92	0.41	0.54	0.56	3.43	3.18	1.68	4.11	0.29
B	P-1661	INL 1661	PCO-1660	2.88	2.84	Circle		1.50	8.00	0.50	0.013	5.90	5.90	0.06	1.50	0.60	4.12	1.42	2.52	7.41	0.00
B	P-1660	PCO-1660	PRM- 1636	2.54	1.30	Circle		1.50	54.70	2.27	0.013	5.85	5.69	0.28	1.50	0.61	8.79	3.15	5.57	15.82	0.15
B	P-1658	INL 1658	PRM-1636A	3.25	1.00	Circle		1.50	74.60	3.02	0.013	4.99	4.81	0.24	1.50	0.55	10.14	2.93	5.17	18.25	0.18
B	P-1657	INL 1657	PCO-1656	2.67	2.53	Circle		1.50	8.20	1.70	0.013	5.31	5.31	0.07	1.50	0.46	7.61	1.60	2.83	13.69	0.01
B	P-1656	PCO-1656	PRM- 1647	2.53	2.41	Circle		1.50	55.00	0.22	0.013	5.24	5.09	0.28	1.50	0.91	2.73	3.14	5.54	4.91	0.15
B	P-1655B	INL 1655C	PCO-1655	2.36	2.06	Circle		2.00	119.00	0.25	0.013	3.24	3.14	0.13	1.08	0.80	3.66	3.26	3.84	11.36	0.10
B	P-1655A	PRM-1655A	PRM- 1654	1.83	1.75	Circle		2.00	38.50	0.21	0.013	6.64	6.61	0.09	2.00	1.20	3.33	2.20	6.90	10.31	0.04
B	P-1655	PCO-1655	PRM-1655A	1.91	1.83	Circle		2.00	37.60	0.21	0.013	3.09	3.01	0.22	1.18	1.19	3.36	3.55	6.94	10.43	0.08
B	P-1654	PRM- 1654	PRM-684	0.05	0.00	Circle		3.00	44.90	0.11	0.013	6.28	5.75	1.19	3.00	2.69	3.14	10.30	72.80	22.27	0.53
B	P-1651	PCO- 1651	PRM- 1654	2.24	0.85	Circle		1.25	29.30	4.74	0.013	6.63	6.61	0.08	1.25	0.30	11.72	1.49	1.83	14.06	0.02
B	P-1650	PRM- 1650	PRM- 1654	0.49	0.05	Circle		3.00	75.70	0.58	0.013	7.23	6.47	1.01	3.00	2.61	7.16	9.47	66.91	50.85	0.76
B	P-1649	INL 1649	PRM- 1650	2.25	1.50	Circle		2.00	14.60	5.13	0.013	6.08	6.07	0.07	2.00	0.46	16.53	1.91	6.01	51.25	0.01
B	P-1648	INL 1648	PRM-1647A	2.30	1.70	Circle		2.00	12.10	4.95	0.013	4.00	4.00	0.06	2.00	0.44	16.24	10.50	5.46	50.34	0.00
B	P-1647A	PRM-1647A	PRM- 1650	0.66	0.49	Circle		3.00	39.30	0.43	0.013	6.41	6.07	0.86	3.00	2.53	6.18	8.76	61.90	43.86	0.34
B	P-1647	PRM- 1647	PRM-1647A	0.83	0.66	Circle		3.00	36.60	0.46	0.013	4.27	4.00	0.75	3.00	2.46	6.40	8.15	57.58	45.46	0.27
B	P-1646	PCO- 1646	PRM- 1647	1.78	1.74	Circle		2.00	10.60	0.38	0.013	4.90	4.90	0.01	2.00	0.59	4.49	0.85	2.67	13.93	0.00
B	P-1644	INL 1644	PRM-1636B	3.10	2.50	Circle		1.50	11.70	5.14	0.013	4.30	4.30	0.00	1.50	0.17	13.23	5.92	0.68	23.81	0.00
B	P-1639	INL 1639	PRM-1636A	3.73	3.00	Circle		1.50	13.70	5.34	0.013	4.72	4.81	0.22	1.50	0.45	13.48	10.69	4.81	24.27	-0.09
B	P-1636B	PRM-1636B	PRM- 1647	0.91	0.88	Circle		3.00	22.40	0.13	0.013	4.49	4.35	0.60	3.00	2.34	3.44	7.33	51.82	24.41	0.14
B	P-1636A	PRM-1636A	PRM-1636B	1.00	0.91	Circle		3.00	68.00	0.13	0.013	4.71	4.30	0.60	3.00	2.33	3.42	7.29	51.50	24.26	0.41
B	P-1636	PRM- 1636	PRM-1636A	1.25	1.00	Circle		3.00	196.00	0.13	0.013	5.63	4.79	0.43	3.00	2.15	3.35	6.19	43.74	23.82	0.84
B	P-1635	PCO- 1635	PRM- 1636	1.77	1.72	Circle		2.00	10.80	0.46	0.013	5.81	5.78	0.22	2.00	1.23	4.96	3.40	10.69	15.39	0.02
B	P-1633	INL 1633	PCO- 1635	3.54	3.27	Circle		1.25	4.10	6.66	0.013	6.04	5.96	1.93	1.25	0.65	13.89	7.32	8.98	16.67	0.08
B	P-1628	INL 1628	PRM-1626A	3.44	3.00	Circle		1.25	12.40	3.54	0.013	4.80	4.80	0.00	1.25	0.15	10.13	0.31	0.38	12.16	0.00
B	P-1626A	PRM-1626A	PRM- 1636	1.61	1.25	Circle		2.00	65.90	0.55	0.013	6.78	5.71	1.62	2.00	1.84	5.39	9.17	28.82	16.72	1.07
B	P-1626	PRM- 1626	PRM-1626A	1.93	1.61	Circle		2.00	52.20	0.61	0.013	5.64	4.80	1.60	2.00	1.84	5.72	9.10	28.60	17.72	0.83
B	P-1625A	INL 1625A	PCO- 1625	2.85	2.25	Circle		2.00	38.10	1.58	0.013	5.93	5.91	0.05	2.00	0.57	9.16	1.62	5.09	28.40	0.02
B	P-1625	PCO- 1625	PRM- 1626	2.20	2.11	Circle		2.00	28.50	0.32	0.013	6.37	6.11	0.89	2.00	1.65	4.10	6.79	21.32	12.70	0.25
B	P-1624A	INL 1624A	PCO- 1624	3.50	2.46	Circle		2.00	23.10	4.51	0.013	5.22	5.19	0.45	2.00	0.78	15.50	13.60	15.35	48.05	0.03
B	P-1624	PCO- 1624	PCO- 1625	2.36	2.30	Circle		2.00	35.30	0.17	0.013	6.10	5.91	0.54	2.00	1.47	3.01	5.27	16.55	9.32	0.19
B	P-1610	INL 1610	PRM- 1571	4.13	4.10	Circle		1.25	12.10	0.25	0.013	6.44	6.43	0.09	1.25	0.71	2.68	1.61	1.97	3.22	0.01
B	P-1571	PRM- 1571	PRM- 1626	2.87	2.33	Circle		1.50	175.10	0.31	0.013	6.31	6.01	0.17	1.50	0.97	3.24	2.47	4.36	5.83	0.30
B	P-1568	INL 1568	PRM- 1571	3.25	3.10	Circle		1.25	63.30	0.24	0.013	6.54	6.43	0.17	1.25	0.88	2.62	2.16	2.65	3.14	0.11
C	P-7002	PCO-7002	PRM-1572A	3.31	3.09	Circle		1.50	54.30	0.40	0.013	5.63	5.44	0.36	1.50	1.16	3.71	3.57	6.31	6.68	0.20
C	P-1620	INL 1620	PRM-1573A	3.96	3.50	Circle		1.25	11.90	3.86	0.013	5.42	5.42	0.00	1.25	0.13	10.58	0.22	0.27	12.70	0.00
C	P-1619	PCO- 1619	PRM- 1573	1.98	1.87	Circle		1.50	28.90	0.38	0.013	5.74	5.49	0.84	1.50	1.20	3.60	5.46	9.64	6.48	0.24
C	P-1618	PCO- 1618	PCO- 1619	2.10	1.98	Circle		1.50	29.80	0.40	0.013	6.08	6.01	0.26	1.50	1.01	3.71	3.00	5.30	6.67	0.08
C	P-1616	INL 1616	PRM- 1572	3.78	3.22	Circle		1.25	12.90	4.35	0.013	5.47	5.46	0.05	1.25	0.27	11.23	1.16	1.42	13.47	0.01
C	P-1584	INL 1584	PRM-1573D	4.32	4.14	Circle		1.25	12.70	1.41	0.013	5.72	5.69	0.29	1.25	0.59	6.40	2.82	3.46	7.68	0.04
C	P-1580	INL 1580	PRM-1573C	4.19	3.50	Circle		1.25	13.00	5.32	0.013	5.53	5.50	0.24	1.25	0.39	12.42	2.58	3.17	14.90	0.03
C	P-1574A	INL 1574A	PCO- 1574	3.79	3.77	Circle		1.25	5.20	0.38	0.013	4.86	4.84	0.45	1.07	0.86	3.33	3.65	4.48	4.00	0.03
C	P-1574	PCO- 1574	PRM-1573B	1.47	1.43	Circle		1.50	8.40	0.48	0.013	4.75	4.73	0.24	1.50	0.93	4.03	2.90	5.12	7.25	0.02
C	P-1573D	PRM-1573D	C	1.22	0.90	Circle		2.00	84.20	0.38	0.013	4.32	2.90	1.68	2.00	1.85	4.50	9.34	29.35	13.94	1.42
C	P-1573C	PRM-1573C	PRM-1573D	1.36	1.22	Circle		2.00	52.90	0.26	0.013	5.23	4.50	1.38	2.00	1.80	3.75	8.47	26.60	11.64	0.73
C	P-1573B	PRM-1573B	PRM-1573C	1.54	1.36	Circle		2.00	75.70	0.24	0.013	6.27	5.41	1.14	2.00	1.74	3.56	7.69	24.16	11.03	0.86
C	P-1573A	PRM-1573A	PRM-1573B	1.72	1.54	Circle		2.00	73.20	0.25	0.013	5.05	4.73	0.43	2.00	1.39	3.62	4.74	14.90	11.22	0.32
C	P-1573	PRM- 1573	PRM-1573A	1.82	1.72	Circle		2.00	44.80	0.22	0.013	5.29	5.10	0.43	2.00	1.38	3.45	4.70	14.76	10.69	0.19
C	P-1572A	PRM-1572A	PRM- 1573	2.32	2.22	Circle		1.50	28.30	0.35	0.013	5.52	5.37	0.53	1.50	1.07	3.47	4.32	7.63	6.24	0.15
C	P-1572	PRM- 1572	PRM-1572A	2.52	2.32	Circle		1.50	53.50	0.37	0.013	5.45	5.44	0.02	1.50	0.48	3.57	0.80	1.42	6.42	0.01
C	P-1565	INL 1565	PCO-7002	3.34	3.31	Circle		1.50	8.40	0.36	0.013	5.69	5.68	0.06	1.50	0.66	3.49	1.44	2.55	6.29	0.00
C	P-1564	INL 1564	INL 1565	3.92	3.34	Circle		1.25	37.70	1.54	0.013	5.47	5.46	0.01	1.25	0.24	6.68	0.51	0.63	8.01	0.00
C	P-1563	INL 1563	PCO- 1562	2.97	2.93	Circle		1.50	8.00	0.50	0.013	5.29	5.26	0.34	1.50	1.04	4.13	3.48	6.15	7.44	0.03
C	P-1562	PCO- 1562	PRM-1573B	2.13	1.87	Circle		1.50	66.00	0.39	0.013	5.04	4.73	0.47	1.50	1.04	3.66	4.06	7.17	6.59	0.31
D	P-1603	PRM- 1603	PRM- 1600	3.84	3.77	Circle		2.00	101.20	0.07	0.013	7.22	7.07	0.15	2.00	1.05	1.92	2.78	8.74	5.95	0.15
D	P-1602	INL 1602	PRM- 1603	4.73	4.19	Circle		1.25	12.10	4.45	0.013	7.44	7.31	1.11	1.25	0.62	11.36	5.55	6.81	13.63	0.13
D	P-1600	PRM- 1600	PRM- 1594	3.67	3.13	Circle		2.00	132.10	0.41	0.013	6.99	6.34	0.49	2.00	1.43	4.66	5.03	15.80	14.46	0.64
D	P-1599	PCO- 1599	PRM- 1600	3.78	3.77	Circle		1.50	8.40	0.12	0.013	7.11	7.09	0.21	1.50	0.84	2.01	2.72	4.81	3.62	0.02
D	P-1597	INL 1597	PCO- 1599	5.37	5.23	Circle		1.25	4.20	3.37	0.013	7.15	7.13	0.39	1.25	0.50	9.88	3.30	4.05	11.86	0.02
D	P-1594B	PRM-1594B	D	2.69	2.60	Circle		2.00	44.80	0.20	0.013	5.50	4.60	2.01	2.00	1.89	3.27	10.21	32.06	10.14	0.90
D	P-1594A	PRM-1594A	PRM-1594B	2.99	2.69	Circle		2.00	74.60	0.40	0.013	7.21	5.71	2.02	2.00	1.89	4.63	10.23	32.13	14.35	1.50
D	P-1594	PRM- 1594	PRM-1594A	3.13	2.99	Circle		2.00	36.30	0.39	0.013	6.11	5.58	1.45	2.00	1.81	4.53	8.67	27.24	14.05	0.53
D	P-1593	PCO- 1593	PRM- 1594	3.77	3.65	Circle		1.50	28.90	0.42	0.013	7.42	7.26	0.57	1.50	1.09	3.76	4.47	7.90	6.77	0.16
D	P-1592A	INL 1593A	PCO- 1593	3.98	3.87	Circle		1.50	28.50	0.39	0.013	7.67	7.57	0.35	1.50	1.17	3.62	3.52	6.22	6.52	0.10
D	P-1591A	INL 1591B	PCO- 1591	3.90	3.65	Circle		1.50	65.10	0.38	0.013	5.83	5.72	0.17	1.50	0.89	3.62	2.45	4.32	6.51	0.11
D	P-1591	PCO- 1591	PRM-1594A	3.65	3.53	Circle		1.50	29.20	0.41	0.013	5.66	5.58	0.27	1.50	1.02	3.74	3.09	5.46	6.73	0.08
D	P-1587	INL 1587	PRM-1594B	5.38	5.34	Circle		1.25	12.70	0.31	0.013	7.01	7.01	0.00	1.25	0.00	3.02	0.00	0.00	3.62	0.00
D	P-1560	PCO-1560	PRM- 1594	3.72	3.50	Circle		1.50	54.30	0.41	0.013	6.45	6.29	0.28	1.50	1.05	3.72	3.15	5.57	6.69	0.15
D	P-1558	INL 1558	PCO-1560	4.26	3.82	Circle		1.50	8.00	5.47	0.013	6.09	6.09	0.08	1.50	0.35	13.66	1.64	2.89	24.58	0.01
D	P-1557	INL 1557	INL 1558	4.65	4.61	Circle		1.25	42.60	0.09	0.013	6.14	6.13	0.02	1.25	0.60	1.65	0.75	0.92	1.98	0.01
D	P-1556A	INL 1556A	PCO-1556	4.40	4.37	Circle		1.25	9.50	0.31	0.013	7.35	7.34	0.04	1.25	0.51	3.02	1.04	1.27	3.62	0.00
D	P-1556	PCO-1556	PRM- 1600	4.02	3.67	Circle		1.25	75.20	0.47	0.013	7.27	7.06	0.28	1.25	0.83	3.68	2.81	3.44	4.41	0.21
D	P-1554A	INL 1554A	PCO-1554	4.43	4.37	Circle		1.25	14.10	0.43	0.013	7.42	7.42	0.01	1.25	0.36	3.51	0.63	0.77	4.21	0.00
D	P-1554	PCO-1554	PCO-1556	4.37	4.32	Circle		1.25	35.80	0.14	0.013	7.37	7.35	0.08	1.25	0.80	2.01	1.44	1.77	2.41	0.03
D	P-1553	INL 1553	PRM- 1603	4.84	4.15	Circle		1.50	66.20	1.04	0.013	7.31	7.26	0.07	1.50	0.52	5.96	1.55	2.74	10.72	0.05
D	P-1552	INL 1552	INL 1553	5.24	4.99	Circle		1.25	44.30	0.56	0.013	6.71	6.67	0.09	1.25	0.55	4.04	1.59	1.95	4.85	0.04
E	P-1604	PRM- 1604	PRM- 1547	4.41	4.20	Circle		1.25	93.20	0.23	0.013	8.08	8.08	0.00	1.25	0.00	2.56	0.00	0.00	3.07	0.00
E	P-1551A	INL 1551A	PCO- 1551	2.28	2.12	Circle		2.50	38.60	0.41	0.013	9.14	8.19	2.46	2.50	2.42	5.39	13.10	64.33	26.40	0.95
E	P-1551	PCO- 1551	PRM- 1547	2.02	1.97	Circle		2.50	28.50	0.18	0.013	9.06	8.35	2.50	2.50	2.42	3.50	13.21	64.83	17.16	0.71
E	P-1550A	INL 1550A	PCO- 1550	2.25	2.13	Circle		3.00	23.60	0.51	0.013	8.19	8.10	0.35	3.00	2.09	6.70	5.60	39.57	47.54	0.08
E	P-1550	PCO- 1550	PRM-1547A	2.28	2.21	Circle		3.00	28.20	0.25	0.013	8.10	8.00	0.36	3.00	2.05	4.68	5.63	39.78	33.25	0.10
E	P-1547A	PRM-1547A	PRM-1526	2.16	2.05	Circle		4.00	74.00	0.15	0.013	7.83	7.47	0.48	4.00	3.03	4.39	7.96	99.99	55.37	0.36
E	P-1547	PRM- 1547	PRM-1547A	2.22	2.16	Circle		4.00	38.50	0.16	0.013	8.04	7.96	0.20	4.00	2.43	4.50	5.16	64.81	56.74	0.08

DATE: 9/11/2023 6:12:17 PM
FILE: ...\FM 519 HYDRAULIC COMP17.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		127

100% SUBMITTAL

CK | DW | CK | DW

PROPOSED CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
E	P-1546	INL 1546	INL 1544	5.02	3.94	Circle		1.25	49.10	2.20	0.013	7.45	7.41	0.07	1.25	0.36	7.98	1.41	1.73	9.58	0.04
E	P-1544	INL 1544	PRM-1547A	3.89	2.30	Circle		1.25	65.40	2.43	0.013	8.02	7.88	0.21	1.25	0.46	8.39	2.40	2.95	10.07	0.14
E	P-1543	PCO-1543	PRM-1526	4.00	2.50	Circle		1.50	55.40	2.71	0.013	7.53	7.41	0.21	1.50	0.54	9.60	2.72	4.80	17.28	0.12
E	P-1542	INL 1542	PCO-1543	4.72	4.20	Circle		1.25	12.40	4.20	0.013	6.10	6.09	0.09	1.25	0.32	11.03	1.58	1.93	13.24	0.01
E	P-1541	INL 1541	INL 1537	4.51	4.32	Circle		1.25	44.30	0.43	0.013	7.19	7.16	0.06	1.25	0.53	3.53	1.27	1.56	4.23	0.03
E	P-1537	INL 1537	PRM-1526C	4.32	2.50	Circle		1.00	59.80	3.04	0.013	7.35	7.00	0.59	1.00	0.46	7.76	3.48	2.73	6.21	0.35
E	P-1536	INL 1536	PRM-1526E	4.26	2.50	Circle		1.25	59.20	2.97	0.013	7.03	7.00	0.05	1.25	0.30	9.28	1.15	1.41	11.14	0.03
E	P-1532	PCO-1532	PRM- 1506	3.57	3.35	Circle		1.50	54.70	0.40	0.013	7.21	7.08	0.25	1.50	1.00	3.70	2.95	5.22	6.66	0.14
E	P-1531	INL 1531	PCO-1532	3.79	3.62	Circle		1.25	5.90	2.90	0.013	6.09	6.09	0.06	1.25	0.33	9.16	1.34	1.64	10.99	0.00
E	P-1526E	PRM-1526E	PRM- 1506	1.52	1.46	Circle		4.00	45.50	0.13	0.013	6.47	6.22	0.55	4.00	3.12	4.14	8.47	106.50	52.18	0.25
E	P-1526D	PRM-1526D	PRM-1526E	1.61	1.52	Circle		4.00	45.80	0.20	0.013	6.82	6.57	0.54	4.00	3.11	5.05	8.41	105.66	63.65	0.25
E	P-1526C	PRM-1526C	PRM-1526D	1.71	1.61	Circle		4.00	54.00	0.19	0.013	7.21	6.92	0.54	4.00	3.11	4.90	8.38	105.34	61.78	0.29
E	P-1526B	PRM-1526B	PRM-1526C	1.79	1.71	Circle		4.00	45.70	0.18	0.013	7.24	7.00	0.53	4.00	3.09	4.77	8.30	104.28	60.09	0.24
E	P-1526A	PRM-1526A	PRM-1526B	1.93	1.79	Circle		4.00	83.20	0.17	0.013	7.43	7.00	0.52	4.00	3.08	4.68	8.24	103.61	58.93	0.43
E	P-1526	PRM-1526	PRM-1526A	2.05	1.93	Circle		4.00	68.90	0.17	0.013	7.36	7.01	0.52	4.00	3.08	4.76	8.20	103.10	59.93	0.36
E	P-1525	PCO- 1525	PRM-1526	3.20	2.95	Circle		1.50	10.70	2.33	0.013	8.00	7.99	0.08	1.50	0.44	8.91	1.71	3.03	16.04	0.01
E	P-1523	INL 1523	PCO- 1525	5.55	5.35	Circle		1.25	4.20	4.72	0.013	8.11	8.10	0.04	1.25	0.25	11.70	1.01	1.24	14.04	0.00
E	P-1519	INL 1519	PRM-1526A	5.22	3.50	Circle		1.25	12.10	14.19	0.013	7.02	7.01	0.06	1.25	0.21	20.28	1.25	1.54	24.33	0.01
E	P-1516	INL 1516	PRM-1526B	4.69	3.00	Circle		1.25	11.40	14.84	0.013	7.01	7.00	0.09	1.25	0.23	20.73	1.56	1.92	24.88	0.01
E	P-1511	INL 1511	PRM-1526D	5.23	3.50	Circle		1.25	13.00	13.33	0.013	7.01	7.00	0.03	1.25	0.18	19.65	0.84	1.03	23.58	0.00
E	P-1509	INL 1509	PRM-1526E	5.12	3.00	Circle		1.25	12.50	17.00	0.013	7.00	7.00	0.02	1.25	0.15	22.19	0.67	0.82	26.63	0.00
E	P-1506A	PRM-1506A	E	0.95	0.90	Circle		4.00	22.90	0.22	0.013	5.04	4.90	0.60	4.00	3.19	5.32	8.84	111.12	67.05	0.14
E	P-1506	PRM- 1506	PRM-1506A	1.46	0.95	Circle		4.00	161.20	0.32	0.013	6.10	5.14	0.60	4.00	3.19	6.41	8.85	111.17	80.80	0.97
E	P-1505	PCO- 1505	PRM- 1506	2.85	1.46	Circle		1.50	11.70	11.91	0.013	6.54	6.49	0.37	1.50	0.43	20.14	3.60	6.37	36.26	0.04
E	P-1503	INL 1503	PCO- 1505	4.32	3.05	Circle		1.25	4.10	31.25	0.013	6.75	6.74	0.16	1.25	0.23	30.09	2.10	2.58	36.11	0.01
E	P-1500	INL 1500	PRM-1506A	5.17	4.00	Circle		1.25	12.50	9.38	0.013	5.95	5.95	0.01	1.25	0.15	16.49	7.10	0.56	19.79	0.00
E1	P-1530	INL 1530	E1	4.57	2.80	Circle		1.50	66.60	2.66	0.013	4.97	4.30	1.21	1.50	0.26	9.51	5.49	1.13	17.12	0.67
E2	P-1497	INL 1497	E2	1.37	1.35	Circle		3.00	2.90	0.68	0.013	4.35	4.35	0.17	3.00	1.52	7.75	7.81	27.97	55.01	0.00
E3	P-1484	PCO-1484	E3	3.56	3.43	Circle		1.25	32.80	0.40	0.013	4.68	4.68	0.02	1.25	0.40	3.38	2.65	0.88	4.06	0.00
F	P-1495B	PRM-1495B	F	0.50	-1.00	Circle		4.00	94.00	1.60	0.013	3.14	3.00	0.77	4.00	1.80	14.40	13.79	75.77	181.49	0.14
F	P-1495A	INL 1495A	PCO- 1495	1.40	1.04	Circle		2.00	159.50	0.23	0.013	5.28	3.12	1.36	2.00	1.79	3.47	8.39	26.37	10.75	2.17
F	P-1495	PCO- 1495	PRM-1495B	1.04	0.50	Circle		4.00	27.80	1.94	0.013	3.10	3.20	0.08	2.70	0.98	15.89	11.06	26.55	200.17	-0.10
F	P-1491	INL 1491	PRM-1451A	4.96	4.00	Circle		1.25	11.50	8.34	0.013	6.49	6.48	0.05	1.25	0.24	15.54	1.19	1.46	18.65	0.01
F	P-1477	PCO-1477	PRM-1383A	5.75	4.85	Circle		1.50	56.30	1.60	0.013	8.36	8.28	0.13	1.50	0.55	7.38	2.17	3.84	13.28	0.07
F	P-1476	INL 1476	PCO-1477	6.24	5.95	Circle		1.25	6.30	4.59	0.013	8.41	8.40	0.19	1.25	0.38	11.53	2.27	2.78	13.84	0.01
F	P-1473	INL 1473	INL 1469	5.40	5.30	Circle		1.25	31.80	0.31	0.013	7.50	7.45	0.15	1.25	0.77	3.02	2.05	2.52	3.62	0.05
F	P-1471	PCO-1471	PRM- 1421	4.74	4.35	Circle		1.50	54.80	0.71	0.013	7.58	7.45	0.24	1.50	0.82	4.92	2.89	5.11	8.86	0.13
F	P-1469	INL 1469	PCO-1471	5.25	4.99	Circle		1.25	6.90	3.77	0.013	7.65	7.62	0.36	1.25	0.48	10.45	3.14	3.86	12.54	0.02
F	P-1463	INL 1463	PCO-1461	4.27	4.07	Circle		1.25	82.50	0.24	0.013	7.08	7.04	0.05	1.25	0.57	2.65	1.12	1.37	3.18	0.04
F	P-1461A	INL 1461A	PCO-1461	3.55	3.47	Circle		1.25	15.40	0.52	0.013	7.05	7.04	0.05	1.25	0.47	3.88	1.12	1.38	4.66	0.01
F	P-1461	PCO-1461	PCO-1460	3.32	3.10	Circle		1.25	36.90	0.60	0.013	7.24	6.85	1.05	1.25	1.03	4.15	5.38	6.60	4.98	0.39
F	P-1460A	INL 1460A	PCO-1460	3.50	3.20	Circle		1.25	25.50	1.17	0.013	6.86	6.85	0.06	1.25	0.40	5.83	1.27	1.56	7.00	0.01
F	P-1460	PCO-1460	PRM-1435A	3.00	2.89	Circle		1.25	69.60	0.16	0.013	7.83	6.60	1.76	1.25	1.14	2.14	6.99	8.57	2.57	1.23
F	P-1459	INL 1459	INL 1455	4.10	3.87	Circle		1.25	54.90	0.42	0.013	6.28	6.25	0.04	1.25	0.48	3.48	1.06	1.30	4.18	0.02
F	P-1455	INL 1455	PCO-1454	3.87	3.76	Circle		1.25	8.70	1.27	0.013	6.11	6.09	0.31	1.25	0.62	6.07	2.93	3.59	7.28	0.03
F	P-1454	PCO-1454	PRM- 1451	3.76	2.20	Circle		1.25	55.20	2.83	0.013	7.61	7.06	0.99	1.25	0.69	9.05	5.24	6.43	10.86	0.55
F	P-1451A	PRM-1451A	PRM-1495B	1.44	1.21	Circle		2.50	59.30	0.39	0.013	5.13	3.81	2.24	2.50	2.40	5.21	12.50	61.35	25.53	1.33
F	P-1451	PRM- 1451	PRM-1451A	2.07	1.44	Circle		2.50	159.60	0.39	0.013	8.88	5.39	2.19	2.50	2.40	5.26	12.36	60.69	25.77	3.49
F	P-1450	PCO- 1450	PRM- 1451	3.02	2.07	Circle		1.25	10.70	8.90	0.013	7.17	7.06	1.03	1.25	0.50	16.06	5.33	6.54	19.27	0.11
F	P-1446	INL 1446	PCO- 1450	4.12	3.37	Circle		1.25	4.30	17.33	0.013	7.39	7.38	0.19	1.25	0.27	22.41	2.27	2.79	26.89	0.01
F	P-1444	INL 1444	PRM-1435C	4.30	3.20	Circle		1.25	12.50	8.83	0.013	6.18	6.17	0.05	1.25	0.23	15.99	1.19	1.46	19.19	0.01
F	P-1439	INL 1439	PRM-1435B	4.67	4.00	Circle		1.25	11.70	5.71	0.013	6.38	6.38	0.01	1.25	0.15	12.87	0.38	0.47	15.44	0.00
F	P-1437A	INL 1437A	PCO- 1437	4.30	3.19	Circle		1.25	15.50	7.18	0.013	8.52	7.34	7.61	1.25	1.06	14.43	14.52	17.82	17.31	1.18
F	P-1437	PCO- 1437	PRM-1435A	3.14	2.85	Circle		1.25	28.20	1.03	0.013	8.82	6.60	7.86	1.25	1.24	5.46	14.76	18.12	6.55	2.22
F	P-1436A	INL 1436A	PCO- 1436	3.50	3.13	Circle		2.00	49.60	0.75	0.013	7.24	7.21	0.06	2.00	0.74	6.30	1.80	5.64	19.54	0.03
F	P-1436	PCO- 1436	PRM- 1435	3.08	2.71	Circle		2.00	28.40	1.30	0.013	7.18	7.14	0.15	2.00	0.80	8.33	2.79	8.77	25.83	0.04
F	P-1435C	PRM-1435C	PRM- 1451	2.27	2.17	Circle		2.50	39.30	0.25	0.013	7.72	7.06	1.67	2.50	2.34	4.22	10.81	53.06	20.69	0.66
F	P-1435B	PRM-1435B	PRM-1435C	2.50	2.27	Circle		2.50	80.70	0.28	0.013	7.49	6.17	1.63	2.50	2.33	4.47	10.66	52.31	21.89	1.31
F	P-1435A	PRM-1435A	PRM-1435B	2.63	2.50	Circle		2.50	47.00	0.28	0.013	7.13	6.38	1.61	2.50	2.32	4.40	10.61	52.08	21.58	0.76
F	P-1435	PRM- 1435	PRM-1435A	2.71	2.63	Circle		2.50	32.30	0.25	0.013	6.94	6.60	1.03	2.50	2.16	4.17	8.46	41.54	20.41	0.33
F	P-1433	INL 1433	PRM-1421C	5.12	4.00	Circle		1.25	11.60	9.63	0.013	7.01	7.01	0.01	1.25	0.16	16.70	0.57	0.70	20.04	0.00
F	P-1429	INL 1429	PRM-1421B	4.83	3.50	Circle		1.25	11.70	11.34	0.013	7.01	7.01	0.01	1.25	0.14	18.13	0.44	0.54	21.75	0.00
F	P-1423	INL 1423	PRM-1421A	5.72	4.50	Circle		1.25	12.00	10.15	0.013	7.01	7.01	0.01	1.25	0.16	17.15	0.61	0.75	20.58	0.00
F	P-1421C	PRM-1421C	PRM- 1435	3.31	3.05	Circle		2.50	44.30	0.59	0.013	7.43	7.09	0.75	2.50	2.02	6.41	7.23	35.47	31.43	0.33
F	P-1421B	PRM-1421B	PRM-1421C	3.62	3.31	Circle		2.50	54.00	0.57	0.013	7.40	7.01	0.73	2.50	2.01	6.34	7.12	34.95	31.06	0.39
F	P-1421A	PRM-1421A	PRM-1421B	3.90	3.62	Circle		2.50	49.50	0.57	0.013	7.36	7.01	0.71	2.50	2.00	6.29	7.04	34.56	30.84	0.35
F	P-1421	PRM- 1421	PRM-1421A	4.19	3.90	Circle		2.50	52.70	0.55	0.013	7.37	7.01	0.69	2.50	1.98	6.21	6.92	33.98	30.41	0.36
F	P-1420	PCO- 1420	PRM- 1421	4.34	4.30	Circle		1.25	8.10	0.49	0.013	7.40	7.39	0.08	1.25	0.55	3.78	1.48	1.81	4.53	0.01
F	P-1417	INL 1417	PCO- 1420	6.42	4.94	Circle		1.25	4.10	35.99	0.013	7.41	7.41	0.02	1.25	0.14	32.29	13.32	0.96	38.75	0.00
F	P-1412	INL 1412	PRM-1383D	6.96	5.50	Circle		1.25	12.50	11.67	0.013	7.74	7.74	0.01	1.25	0.15	18.38	7.97	0.64	22.06	0.00
F	P-1410	INL 1410	PRM-1383C	6.83	6.00	Circle		1.25	12.00	6.89	0.013	7.94	7.94	0.01	1.25	0.18	14.13	6.89	0.73	16.95	0.00
F	P-1405	INL 1405	PRM-1383B	6.95	5.00	Circle		1.25	12.20	16.00	0.013	7.67	7.67	0.01	1.25	0.13	21.53	8.69	0.59	25.84	-0.01
F	P-1393	INL 1393	PRM- 1371	6.30	6.23	Circle		1.25	62.80	0.11	0.013	8.31	8.27	0.06	1.25	0.79	1.80	1.28	1.57	2.16	0.04
F	P-1390	INL 1390	INL 1476	6.77	6.24	Circle		1.25	61.90	0.86	0.013	8.52	8.49	0.05	1.25	0.41	4.98	1.12	1.37	5.98	0.03
F	P-1385A	INL 1385A	PCO-1385	5.00	4.91	Circle		2.00	21.60	0.42	0.013	8.55	8.52	0.15	2.00	1.13	4.71	2.83	8.88	14.59	0.03
F	P-1385	PCO-1385	PRM-1383A	4.71	4.62	Circle		2.00	29.00	0.31	0.013	8.48	8.43	0.17	2.00	1.29	4.06	2.98	9.38	12.59	0.05
F	P-1384A	INL 1384A	PCO-1384	5.27	4.83	Circle		2.00	123.70	0.36	0.013	8.90	8.76	0.11	2.00	1.06	4.35	2.38	7.48	13.49	0.14
F	P-1384	PCO-1384	PRM- 1383	4.83	4.71	Circle		2.00	28.90	0.42	0.013	8.72	8.66	0.20	2.00	1.24	4.70	3.26	10.23	14.58	0.06
F	P-1383D	PRM-1383D	PRM- 1421	4.32	4.19	Circle		2.00	50.80	0.26	0.013	8.21	7.46	1.49	2.00	1.82	3.69	8.79	27.60	11.45	0.76
F	P-1383C	PRM-1383C	PRM-1383D	4.45	4.32	Circle		2.00	52.00	0.25	0.013	8.49	7.74	1.43	2.00	1.81	3.65	8.62	27.08	11.32	0.74
F	P-1383B	PRM-1383B	PRM-1383C	4.55	4.45	Circle		2.00	45.60	0.22	0.013	8.57	7.94	1.37	2.00	1.80	3.42	8.42	26.46	10.60	0.62
F	P-1383A	PRM-1383A	PRM-1383B	4.63	4.55	Circle		2.00	32.60	0.25	0.013	8.10	7.67	1.32	2.00	1.79	3.62	8.26	25.95	11.21	0.43
F	P-1383	PRM- 1383	PRM-1383A	4.71	4.63	Circle		2.00	32.70	0.24	0.013	8.45	8.33	0.36	2.00	1.32	3.61	4.30	13.52	11.18	0.12
F	P-1381	INL 1381	PRM-1371B	7.48	6.20	Circle		1.25	12.60	10.19	0.013	8.15	8.16	0.01	1.25	0.15	17.18	7.54	0.63	20.62	-0.01
F	P-1378	INL 1378	PRM-1371A	7.65	6.20	Circle		1.25	12.40	11.68	0.013	8.20	8.23	0.02	1.25	0.16	18.39	8.29	0.73	22.07	-0.02
F	P-1374	INL 1374	PRM- 1371	6.43	6.28	Circle		1.25	12.50	1.20	0.013	8.27	8.27	0.02	1.25	0.32	5.90	0.83	1.01	7.08	0.00
F	P-1371B	PRM-1371B	PRM- 1383	5.52	5.21	Circle		1.50	44.60	0.70	0.013	8.59	8.53	0.13	1.50	0.68	4.87	2.11	3.72	8.76	0.06
F	P-1371A	PRM-1371A	PRM-1371B	5.82	5.52	Circle		1.50	62.20	0.48	0.013	8.22	8.16	0.09	1.50	0.69	4.05	1.80	3.18	7.29	0.06
F	P-1371	PRM- 1371	PRM-1371A	6.08	5.82	Circle		1.50	47.10	0.55	0.013	8.26	8.23	0.06	1.50	0.59	4.34	1.43	2.52	7.81	0.03
F2	P-1496	PCO- 1496	F2	0.93	0.70	Circle		4.00	4.00	5.75	0.013	4.70	4.70	0.00	4.00	0.14	27.34	5.72	0.83	344.49	0.00
F4	P-1485	PCO-1485	F4	4.65	4.62	Circle		1.25	4.50	0.66	0.013	5.87	5.87	0.07	1.25	0.49	4.39	3.82	1.70	5.27	0.00

DATE: 9/11/2023 6:13:51 PM
FILE: ...\FM 519 HYDRAULIC COMP18.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		128

100% SUBMITTAL

CK | DW | CK | DW

PROPOSED CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
G	P-1400	INL 1400	PCO-1345	7.20	6.98	Circle		1.25	7.00	3.13	0.013	10.95	11.00	0.79	1.25	0.63	9.53	4.68	5.75	11.43	0.06
G	P-1399A	INL 1399A	PCO-1399	7.50	5.92	Circle		1.50	58.10	2.72	0.013	9.68	9.69	0.02	1.50	0.28	9.63	0.74	1.30	17.33	0.01
G	P-1399	PCO-1399	PRM- 1356	5.92	5.58	Circle		1.50	75.30	0.45	0.013	10.44	10.62	0.24	1.50	0.95	3.92	2.92	5.16	7.06	0.18
G	P-1398	PCO-1398	PCO-1399	6.30	5.92	Circle		1.50	36.40	1.04	0.013	9.68	9.71	0.09	1.50	0.55	5.96	1.74	3.08	10.73	0.03
G	P-1396	INL 1396	PRM- 1370	6.71	6.58	Circle		1.50	54.20	0.24	0.013	8.62	8.65	0.06	1.50	0.75	2.86	1.46	2.57	5.14	0.03
G	P-1395	INL 1395	INL 1396	6.90	6.86	Circle		1.25	7.70	0.52	0.013	8.66	8.66	0.03	1.25	0.40	3.88	0.84	1.03	4.66	0.00
G	P-1370C	PRM-1370C	PRM- 1356	5.75	5.53	Circle		2.00	35.90	0.61	0.013	10.48	10.59	0.30	2.00	1.24	5.71	3.96	12.45	17.71	0.11
G	P-1370B	PRM-1370B	PRM-1370C	6.15	5.75	Circle		2.00	65.30	0.61	0.013	8.86	8.92	0.10	2.00	0.88	5.71	2.28	7.15	17.71	0.07
G	P-1370A	PRM-1370A	PRM-1370B	6.55	6.15	Circle		2.00	60.40	0.66	0.013	8.70	8.73	0.06	2.00	0.74	5.94	1.70	5.35	18.41	0.03
G	P-1370	PRM- 1370	PRM-1370A	6.72	6.55	Circle		1.50	28.70	0.59	0.013	8.52	8.58	0.19	1.50	0.81	4.49	2.59	4.57	8.08	0.05
G	P-1369	PCO-1369	PRM- 1370	6.78	6.73	Circle		1.25	8.30	0.61	0.013	8.61	8.62	0.10	1.25	0.56	4.19	1.70	2.09	5.03	0.01
G	P-1366	INL-1366	PCO-1369	7.51	6.78	Circle		1.25	5.50	13.36	0.013	8.63	8.63	0.01	1.25	0.15	19.68	8.54	0.69	23.61	0.00
G	P-1362	INL-1362	PRM-1370A	7.61	5.77	Circle		1.25	13.10	14.03	0.013	8.52	8.52	0.02	1.25	0.16	20.16	9.16	0.82	24.19	0.00
G	P-1359	INL 1359	PRM-1370B	8.00	6.00	Circle		1.25	11.30	17.74	0.013	8.70	8.56	0.34	1.25	0.23	22.67	12.91	1.98	27.20	-0.14
G	P-1358	PCO-1358	PRM-1370C	6.10	5.00	Circle		1.50	28.30	3.89	0.013	8.86	8.97	0.39	1.50	0.58	11.52	3.70	6.54	20.73	0.11
G	P-1357A	INL 1357A	PCO-1357	7.50	6.34	Circle		1.50	21.60	5.37	0.013	10.14	10.21	0.30	1.50	0.50	13.52	3.24	5.73	24.34	0.06
G	P-1357	PCO-1357	PRM- 1356	6.04	5.58	Circle		1.50	28.60	1.61	0.013	10.49	10.59	0.37	1.50	0.73	7.39	3.62	6.41	13.31	0.11
G	P-1356A	PRM-1356A	PRM- 1346	4.98	4.77	Circle		2.00	63.50	0.33	0.013	10.65	11.55	1.41	2.00	1.80	4.20	8.54	26.83	13.01	0.89
G	P-1356	PRM- 1356	PRM-1356A	5.43	4.98	Circle		2.00	126.30	0.36	0.013	8.97	10.25	1.01	2.00	1.70	4.35	7.24	22.75	13.50	1.28
G	P-1355	INL 1355	PRM-1356A	7.49	6.00	Circle		1.25	12.70	11.73	0.013	8.97	9.03	0.47	1.25	0.38	18.43	3.61	4.43	22.12	0.06
G	P-1349	PRM-1346B	PRM- 1330	4.16	4.05	Circle		2.00	35.10	0.31	0.013	9.54	10.73	3.39	2.00	1.96	4.08	13.25	41.64	12.66	1.19
G	P-1348	INL 1348	PCO-1347	7.94	7.08	Circle		1.25	4.10	21.23	0.013	10.67	10.68	0.10	1.25	0.22	24.80	1.69	2.08	29.76	0.00
G	P-1347	PCO-1347	PRM- 1346	6.78	4.77	Circle		1.50	9.10	22.11	0.013	10.65	10.66	0.08	1.50	0.25	27.44	1.65	2.91	49.40	0.01
G	P-1346A	PRM-1346A	PRM-1346B	4.24	4.16	Circle		2.00	36.30	0.22	0.013	8.24	9.24	2.78	2.00	1.94	3.43	12.00	37.71	10.63	1.01
G	P-1346	PRM- 1346	PRM-1346A	4.62	4.24	Circle		2.00	156.50	0.24	0.013	8.00	11.71	2.37	2.00	1.92	3.60	11.09	34.84	11.15	3.71
G	P-1345	PCO-1345	PRM- 1346	6.98	6.62	Circle		1.50	53.50	0.67	0.013	10.65	10.90	0.47	1.50	1.04	4.79	4.06	7.17	8.62	0.25
G	P-1337	PCO-1337	PRM- 1324	5.17	5.00	Circle		1.25	54.30	0.31	0.013	8.63	9.72	2.00	1.25	1.16	3.01	7.45	9.14	3.61	1.09
G	P-1336	INL 1336	PCO-1337	5.25	5.22	Circle		1.25	8.00	0.37	0.013	8.84	8.86	0.25	1.25	0.86	3.28	2.64	3.24	3.94	0.02
G	P-1334	PCO-1334	PRM- 1330	5.54	4.35	Circle		1.50	53.60	2.22	0.013	9.54	9.55	0.02	1.50	0.32	8.69	0.86	1.52	15.65	0.01
G	P-1332B	INL 1332B	PRM-1346A	5.50	4.40	Circle		1.25	13.60	8.09	0.013	8.00	8.05	0.37	1.25	0.39	15.31	3.18	3.91	18.37	0.05
G	P-1332A	INL 1332A	PCO-1332	5.60	5.25	Circle		1.50	78.50	0.45	0.013	8.33	8.37	0.05	1.50	0.61	3.89	1.39	2.46	7.01	0.04
G	P-1332	PCO-1332	PRM-1346B	5.15	4.38	Circle		1.50	28.80	2.68	0.013	8.24	8.30	0.22	1.50	0.55	9.55	2.80	4.96	17.19	0.06
G	P-1331A1	PCO-1331	PRM- 1330	4.81	4.40	Circle		1.50	29.10	1.41	0.013	9.54	9.55	0.04	1.50	0.41	6.92	1.15	2.04	12.46	0.01
G	P-1331A	INL 1331A	PCO-1331	6.00	5.11	Circle		1.50	20.70	4.30	0.013	9.22	9.23	0.02	1.50	0.27	12.10	0.88	1.56	21.78	0.00
G	P-1330	PRM- 1330	PRM- 1324	4.05	3.65	Circle		2.00	158.70	0.25	0.013	8.63	14.74	3.85	2.00	1.97	3.66	14.13	44.39	11.36	6.11
G	P-1326	INL 1326	PCO-1325	4.71	4.53	Circle		1.25	4.80	3.73	0.013	8.72	8.72	0.06	1.25	0.30	10.40	1.30	1.59	12.48	0.00
G	P-1325	PCO-1325	PRM- 1324	3.88	3.65	Circle		1.50	8.10	2.83	0.013	8.63	8.65	0.23	1.50	0.55	9.81	2.86	5.06	17.66	0.02
G	P-1324	PRM- 1324	G	3.50	2.72	Circle		2.00	174.40	0.45	0.013	4.72	15.12	5.96	2.00	1.99	4.88	17.58	55.23	15.13	10.40
G1	P-1340	PCO-1340	G1	4.27	3.50	Circle		1.25	37.90	2.03	0.013	4.75	5.25	1.71	1.25	0.72	7.68	7.95	5.85	9.21	0.50
G1	P-1339A	INL 1339A	PCO-1339	5.50	4.63	Circle		1.25	16.30	5.35	0.013	6.03	6.36	3.14	1.25	0.47	12.45	10.68	4.53	14.94	0.33
G1	P-1339	PCO-1339	PCO-1340	4.33	4.32	Circle		1.25	35.90	0.03	0.013	5.58	5.80	0.60	1.25	0.91	0.90	4.06	4.99	1.08	0.21
H	P-1322	PCO-1322	PRM-1317B	4.43	-1.25	Circle		1.50	29.40	19.31	0.013	1.99	4.70	9.55	1.50	0.11	25.64	8.84	0.55	46.16	2.71
H	P-1321	PCO-1321	PRM-1317A	4.40	-1.20	Circle		1.50	29.20	19.15	0.013	3.78	5.24	5.76	1.50	0.33	25.53	16.80	4.76	45.96	1.46
H	P-1319A	INL 1319A	PCO-1319	4.00	3.38	Circle		1.25	20.00	3.09	0.013	6.11	6.12	0.04	1.25	0.29	9.47	1.11	1.36	11.36	0.01
H	P-1319	PCO-1319	PCO-1279	3.78	3.71	Circle		1.50	36.10	0.19	0.013	6.01	6.05	0.11	1.50	0.97	2.57	1.97	3.47	4.63	0.04
H	P-1318B	PRM-1318B	PRM-1317	-0.89	-1.16	Circle		3.00	129.60	0.21	0.013	7.00	10.88	2.99	3.00	2.94	4.29	16.33	115.41	30.44	3.88
H	P-1318A	PRM-1318A	PRM-1318B	-0.76	-0.89	Circle		3.00	85.70	0.15	0.013	6.43	8.86	2.84	3.00	2.93	3.66	15.89	112.31	25.98	2.43
H	P-1318	PRM- 1318	PRM-1318A	-0.71	-0.75	Circle		3.00	31.70	0.13	0.013	5.16	5.84	2.16	3.00	2.89	3.34	13.86	97.98	23.68	0.69
H	P-1317B	PRM-1317B	H	-1.55	-1.59	Circle		3.00	17.10	0.23	0.013	1.41	1.98	3.33	3.00	2.95	4.55	17.22	121.73	32.30	0.57
H	P-1317A	PRM-1317A	PRM-1317B	-1.47	-1.55	Circle		3.00	37.70	0.21	0.013	2.39	3.64	3.31	3.00	2.95	4.33	17.17	121.40	30.71	1.25
H	P-1317	PRM-1317	PRM-1317A	-1.16	-1.47	Circle		3.00	161.20	0.19	0.013	4.13	9.19	3.14	3.00	2.95	4.12	16.72	118.18	29.25	5.06
H	P-1314	INL 1314	PRM-1317	5.66	4.00	Circle		1.25	21.10	7.86	0.013	7.00	7.04	0.19	1.25	0.33	15.09	2.28	2.80	18.11	0.04
H	P-1312	INL 1312	PRM-1318B	6.31	4.00	Circle		1.25	13.30	17.38	0.013	6.43	6.95	5.36	1.25	0.26	22.44	13.87	2.59	26.93	0.53
H	P-1308	PCO-1308	PRM-1318A	3.99	0.00	Circle		1.50	28.00	14.24	0.013	5.16	5.25	0.66	1.50	0.47	22.02	17.88	8.53	39.63	0.10
H	P-1307A	INL 1307A	PCO-1307	5.00	4.27	Circle		1.50	22.40	3.25	0.013	5.66	5.62	0.05	1.39	0.28	10.53	6.34	1.45	18.95	-0.05
H	P-1307	PCO-1307	PCO-1308	4.37	4.09	Circle		1.50	36.10	0.78	0.013	5.59	5.61	0.11	1.50	0.64	5.14	4.89	3.53	9.26	0.02
H	P-1304C	PRM-1304C	PRM- 1293	-0.11	-0.15	Circle		3.00	45.70	0.09	0.013	7.13	8.01	1.94	3.00	2.86	2.78	13.15	92.93	19.74	0.89
H	P-1304B1	PRM-1304B	PRM-1304C	-0.03	-0.11	Circle		3.00	68.80	0.12	0.013	6.35	7.56	1.75	3.00	2.84	3.20	12.49	88.27	22.74	1.21
H	P-1304B	PRM-1304A	PRM-1304B	0.02	-0.03	Circle		3.00	38.60	0.13	0.013	5.56	6.24	1.75	3.00	2.83	3.38	12.47	88.14	24.01	0.67
H	P-1304	PRM- 1304	PRM-1304A	0.07	0.02	Circle		3.00	38.40	0.13	0.013	6.00	6.60	1.54	3.00	2.79	3.39	11.71	82.74	24.07	0.59
H	P-1303A	INI 1303A	PCO-1303	4.50	3.97	Circle		1.25	20.30	2.61	0.013	6.35	6.36	0.05	1.25	0.32	8.69	1.23	1.51	10.43	0.01
H	P-1303	PCO-1303	PCO-1302	3.82	3.65	Circle		1.50	36.10	0.47	0.013	6.24	6.28	0.11	1.50	0.74	4.01	1.98	3.50	7.21	0.04
H	P-1302A	INL 1302A	PCO-1302	4.00	3.65	Circle		1.25	18.50	1.89	0.013	6.26	6.26	0.04	1.25	0.32	7.40	1.02	1.25	8.88	0.01
H	P-1302	PCO-1302	PRM-1304A	3.55	0.50	Circle		1.50	28.60	10.67	0.013	6.00	6.13	0.44	1.50	0.46	19.06	3.96	7.00	34.31	0.13
H	P-1299	INL 1299	PRM-1304B	5.39	3.00	Circle		1.25	15.70	15.18	0.013	5.56	5.60	0.67	1.25	0.09	20.97	6.85	0.29	25.16	0.03
H	P-1296	INL 1296	PRM-1304C	5.49	4.00	Circle		1.25	21.00	7.10	0.013	6.35	6.35	0.01	1.25	0.16	14.34	6.56	0.60	17.21	0.00
H	P-1293A	PRM-1293A	PRM- 1318	-0.38	-0.61	Circle		3.00	116.90	0.20	0.013	6.17	8.71	2.17	3.00	2.89	4.17	13.90	98.26	29.58	2.54
H	P-1293	PRM- 1293	PRM-1293A	-0.15	-0.38	Circle		3.00	117.10	0.20	0.013	4.47	6.81	2.00	3.00	2.87	4.16	13.33	94.23	29.56	2.34
H	P-1292	INL 1292	PRM- 1293	5.72	3.00	Circle		2.00	16.50	16.48	0.013	8.52	8.52	0.01	2.00	0.20	29.63	0.58	1.82	91.84	0.00
H	P-1289	INL 1289	PRM-1293A	5.57	1.00	Circle		1.25	18.50	24.66	0.013	4.47	6.16	10.08	1.25	0.22	26.73	14.90	2.17	32.08	1.69
H	P-1284	INL 1284	PRM-1317	4.51	-1.00	Circle		1.25	28.90	19.05	0.013	7.00	7.01	0.04	1.25	0.18	23.49	1.02	1.25	28.19	0.01
H	P-1282	INL 1282	PRM-1318B	4.25	-0.70	Circle		1.25	61.40	8.06	0.013	6.43	6.47	0.07	1.25	0.26	15.28	1.43	1.75	18.34	0.05
H	P-1279A	INL 1279A	PCO-1279	4.00	3.56	Circle		1.25	20.00	2.20	0.013	6.07	6.11	0.16	1.25	0.45	7.98	2.14	2.62	9.57	0.03
H	P-1279	PCO-1279	PRM-1318A	3.41	-1.06	Circle		1.50	76.00	5.89	0.013	5.16	5.86	0.92	1.50	0.66	14.16	5.72	10.10	25.48	0.70
H	P-1274	INL 1274	PRM-1293A	4.28	-0.38	Circle		1.50	62.00	7.51	0.013	4.47	4.91	1.03	1.50	0.31	15.99	10.28	2.75	28.79	0.44
H	P-1270	INL 1270	INL 1274	5.21	4.68	Circle		1.25	62.00	0.85	0.013	5.17	5.77	0.83	0.49	0.49	4.98	4.35	1.95	5.97	0.59
H	P-1268	INL 1268	INL 1270	5.63	5.31	Circle		1.25	29.10	1.10	0.013	5.78	6.07	1.09	0.47	0.36	5.65	4.19	1.23	6.78	0.29
H	P-1264	INL 1264	PRM-1304C	4.06	-0.11	Circle		1.50	61.50	6.78	0.013	6.35	6.47	0.19	1.50	0.41	15.19	2.57	4.55	27.35	0.12
H	P-1258	INL 1258	INL 1264	4.84	4.26	Circle		1.25	75.00	0.77	0.013	6.43	6.64	0.27	1.25	0.69	4.73	2.76	3.39	5.68	0.21
H	P-1257A	INL 1257A	PCO-1257	4.00	3.34	Circle		1.25	16.40	4.03	0.013	7.19	7.21	0.08	1.25	0.32	10.80	1.49	1.83	12.96	0.01
H	P-1257	PCO-1257	PCO-1256	3.54	3.21	Circle		1.50	36.10	0.92	0.013	7.17	7.21	0.12	1.50	0.62	5.58	2.05	3.62	10.05	0.04
H	P-1256A	INL 1256A	PCO-1256	3.50	3.11	Circle		1.25	22.50	1.73	0.013	7.17	7.20	0.14	1.25	0.45	7.09	1.96	2.41	8.51	0.03
H	P-1256	PCO-1256	PRM- 1304	3.11	0.27	Circle		1.50	75.10	3.78	0.013	6.77	7.16	0.53	1.50	0.63	11.34	4.31	7.61	20.42	0.39
H	P-1254	INL 1254	PRM-1243A	4.23	0.47	Circle		1.50	60.10	6.25	0.013	5.91	5.96	0.07	1.50	0.33	14.59	1.55	2.74	26.27	0.04
H	P-1249	INL 1249	INL 1254	4.29	4.13	Circle		1.25	62.10	0.26	0.013	5.99	6.03	0.06	1.25	0.62	2.73	1.34	1.64	3.28	0.04
H	P-1246	INL 1246	PRM- 1243	5.55	3.00	Circle		1.25	21.30	11.96	0.013	8.16	8.18	0.10	1.25	0.25	18.62	1.64	2.01	22.34	0.02
H	P-1243A	PRM-1243A	PRM- 1304	0.47	0.27	Circle		3.00	40.90	0.49	0.013	6.88	7.40	1.28	3.00	2.72	6.57	10.67	75.42	46.65	0.52
H	P-1243	PRM- 1243	PRM-1243A	0.82	0.47	Circle		3.00	79.20	0.44	0.013	5.91	6.86	1.20	3.00	2.70	6.24	10.32	72.93	44.33	0.95
H	P-1239	INL 1239	PRM-1226B	4.09	0.97	Circle		1.25	59.50	5.24	0.013	5.71	6.03	0.53	1.25	0.49	12.33	3.84	4.71	14.79	0.32
H	P-1238	PCO-1238	PRM- 1226	2.73	1.89	Circle		1.50	76.90	1.09	0.013	7.36	8.07	0.92	1.50	1.13	6.10	5.71	10.09	10.98	0.71
H	P-1237	PCO-1237	PCO-1238	3.01	2.93	Circle		1.50	35.90	0.22	0.013	7.01	7.09	0.24	1.50	1.29	2.76	2.92	5.15	4.96	0.09

DATE: 9/11/2023 6:15:18 PM
FILE: ...\FM 519 HYDRAULIC COMP19.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		129

100% SUBMITTAL

CK | DW | CK | DW

PROPOSED CONDITION (100 YEAR)

SYSTEM	RUN #	NODE I.D.		FLOWLINE		SHAPE #	SPAN	RISE	LENGTH	SLOPE	n_VALUE	HYDRAULIC GRADELINE		FRICTION	DEPTH		VELOCITY		DISCHARGE	CAPACITY	JUNCTION
		US	DS	US (ft)	DS (ft)		(ft)	(ft)	(ft)	(%)	(ft)	US ELEV (ft)	DS ELEV (ft)	SLOPE (%)	UNIFORM (ft)	ACTUAL (ft)	UNIFORM (ft/s)	ACTUAL (ft/s)	Q (cfs)	(cfs)	LOSS (ft)
H	P-1231	INL 1231	PRM-1226A	3.29	0.87	Circle		1.25	58.70	4.12	0.013	5.38	5.42	0.07	1.25	0.31	10.93	1.43	1.76	13.11	0.04
H	P-1230	INL 1230	PRM-1226A	5.31	3.00	Circle		1.25	14.50	15.93	0.013	5.38	6.23	7.02	1.25	0.38	21.48	16.40	5.15	25.78	0.85
H	P-1226B	PRM-1226B	PRM- 1243	1.18	0.87	Circle		3.00	81.20	0.38	0.013	7.03	7.96	1.15	3.00	2.68	5.80	10.12	71.56	41.21	0.93
H	P-1226A	PRM-1226A	PRM-1226B	1.50	1.18	Circle		3.00	89.20	0.36	0.013	5.71	6.62	1.02	3.00	2.62	5.63	9.51	67.21	39.96	0.91
H	P-1226	PRM- 1226	PRM-1226A	1.89	1.50	Circle		2.50	110.20	0.35	0.013	5.38	7.87	2.26	2.50	2.40	4.98	12.56	61.67	24.40	2.49
H	P-1225	PCO-1225	PRM-1215A	3.30	1.92	Circle		1.50	7.60	18.14	0.013	7.23	7.27	0.54	1.50	0.42	24.85	4.37	7.72	44.73	0.04
H	P-1222	INL 1222	PCO-1225	4.47	3.65	Circle		1.25	6.60	12.46	0.013	7.39	7.41	0.31	1.25	0.34	19.00	2.94	3.61	22.80	0.02
H	P-1218	INL 1218	PRM- 1215	4.09	2.36	Circle		1.25	14.10	12.25	0.013	7.64	7.78	0.94	1.25	0.45	18.84	5.10	6.26	22.61	0.13
H	P-1215A	PRM-1215A	PRM- 1226	1.92	1.89	Circle		2.00	15.50	0.19	0.013	7.36	8.18	5.24	2.00	1.98	3.21	16.48	51.78	9.94	0.81
H	P-1215	PRM- 1215	PRM-1215A	2.10	1.92	Circle		2.00	116.60	0.15	0.013	7.23	12.02	4.11	2.00	1.97	2.87	14.60	45.86	8.89	4.79
H	P-1214	INL 1214	PRM- 1215	3.57	2.16	Circle		1.50	58.30	2.42	0.013	7.64	7.77	0.22	1.50	0.56	9.08	2.78	4.92	16.34	0.13
H	P-1210	INL 1210	PRM-1196B	3.71	2.40	Circle		1.50	58.40	2.24	0.013	5.80	5.92	0.21	1.50	0.57	8.74	2.75	4.86	15.73	0.12
H	P-1205	INL 1205	PRM-1196A	4.51	2.60	Circle		1.25	15.00	12.74	0.013	5.41	5.36	0.87	1.25	0.37	19.21	14.45	4.37	23.05	-0.05
H	P-1202	INL 1202	PRM-1196A	3.62	2.54	Circle		1.50	58.50	1.85	0.013	5.41	5.58	0.30	1.50	0.66	7.93	3.24	5.72	14.27	0.17
H	P-1198A	INL 1198A	PCO-1198	3.00	2.80	Circle		2.00	17.00	1.18	0.013	6.88	6.89	0.06	2.00	0.64	7.93	1.74	5.47	24.57	0.01
H	P-1198	PCO-1198	PRM- 1196	2.90	2.86	Circle		2.00	75.50	0.05	0.013	6.57	6.81	0.31	2.00	1.28	1.68	4.04	12.68	5.21	0.24
H	P-1197A	INL 1197A	PCO-1197	3.50	3.18	Circle		1.50	10.60	3.01	0.013	6.88	6.90	0.19	1.50	0.51	10.13	2.59	4.57	18.23	0.02
H	P-1197	PCO-1197	PCO-1198	3.18	2.86	Circle		1.50	35.80	0.89	0.013	6.88	7.03	0.42	1.50	0.91	5.52	3.84	6.79	9.93	0.15
H	P-1196C	INL 1196C	PRM- 1196	3.00	2.80	Circle		1.25	20.30	0.98	0.013	6.27	6.27	0.03	1.25	0.35	5.34	0.91	1.12	6.41	0.01
H	P-1196B	PRM-1196B	PRM- 1215	2.32	2.11	Circle		2.00	94.10	0.22	0.013	7.64	10.06	2.56	2.00	1.93	3.45	11.53	36.23	10.69	2.41
H	P-1196A	PRM-1196A	PRM-1196B	2.54	2.32	Circle		2.00	100.10	0.22	0.013	5.80	7.74	1.95	2.00	1.88	3.42	10.05	31.56	10.61	1.95
H	P-1196	PRM- 1196	PRM-1196A	2.70	2.54	Circle		2.00	77.20	0.21	0.013	5.41	6.18	0.99	2.00	1.69	3.32	7.18	22.56	10.30	0.77
H	P-1192A	INL 1192A	PCO- 1192	3.50	3.15	Circle		1.50	14.00	2.51	0.013	6.66	6.66	0.01	1.50	0.23	9.24	0.46	0.81	16.63	0.00
H	P-1192	PCO- 1192	PRM- 1196	2.90	2.85	Circle		2.00	38.40	0.13	0.013	6.54	6.63	0.23	2.00	1.19	2.63	3.48	10.94	8.16	0.09
H	P-1191B	INL 1191B	INL 1191A	4.20	3.90	Circle		1.50	127.10	0.24	0.013	7.11	7.58	0.37	1.50	0.98	2.83	3.62	6.40	5.10	0.47
H	P-1191A	INL 1191A	PCO-1191	3.78	3.72	Circle		1.50	13.60	0.44	0.013	6.85	6.91	0.40	1.50	1.17	3.88	3.75	6.62	6.98	0.05
H	P-1191	PCO-1191	PCO- 1192	3.72	3.15	Circle		2.00	120.90	0.47	0.013	6.71	6.83	0.09	2.00	0.94	5.01	2.22	6.96	15.53	0.11

DATE: 9/11/2023 6:16:48 PM
FILE: ...\FM 519 HYDRAULIC COMP20.dgn

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

HYDRAULIC COMPUTATION

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		130

100% SUBMITTAL

CK | DW | CK | DW

FLOODPLAIN FILL

UNNAMED TRIBUTARY 1 TO LOWER HIGHLAND BAYOU
ZONE A, ASSUMED BASE FLOOD ELEVATION = 7.00'

STATION	MATERIAL	TYPE	END AREAS (sq ft)	COMPUTED VOLUMES (cy)
656+90.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
657+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.49
657+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	1.34	0.49
657+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
657+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.22
657+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.59	0.52
658+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.82	0.30
658+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
658+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
658+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
658+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
659+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
659+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
659+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
659+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
659+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
660+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
660+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.01	0.03
660+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.06	0.02
660+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
660+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
661+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
661+05.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00

TOTAL	EXCAVATION	FILL
(CY)	0.00	2.07

NET FILL (2.07-0.00) = 2.07 CY

PROVIDING STORAGE VOLUME:	
5 LF~ 4'X3' RCB	2.16 CY

FLOODPLAIN FILL

UNNAMED TRIBUTARY 1 TO LOWER HIGHLAND BAYOU
ZONE A/AE, ASSUMED BASE FLOOD ELEVATION = 7.60'

STATION	MATERIAL	TYPE	END AREAS (sq ft)	COMPUTED VOLUMES (cy)
687+10.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
687+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.43
687+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	1.16	0.84
687+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	1.10	0.92
687+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	1.39	1.30
688+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	2.12	1.98
688+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	3.23	1.19
688+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
688+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.05
688+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.13	0.05
689+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.13
689+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.34	0.13
689+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
689+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
689+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
690+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.01	0.00
690+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
690+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
690+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.02
690+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.07	0.02
691+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
691+20.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.01
691+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.04	0.11
691+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.26	0.37
691+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.74	0.58
692+00.00	DIRT	EXCAVATION	0.00	0.06
	DIRT	FILL	0.83	0.81
692+20.00	DIRT	EXCAVATION	0.16	0.30
	DIRT	FILL	1.36	0.90
692+40.00	DIRT	EXCAVATION	0.66	0.24
	DIRT	FILL	1.07	0.40
692+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
692+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
693+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00
693+20.00	DIRT	EXCAVATION	0.00	0.56
	DIRT	FILL	0.00	0.20
693+40.00	DIRT	EXCAVATION	1.52	0.56
	DIRT	FILL	0.54	0.39
693+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.51	0.59
693+80.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	1.08	0.57
694+00.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.46	0.46
694+20.00	DIRT	EXCAVATION	0.01	0.00
	DIRT	FILL	0.77	0.36
694+40.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.22	0.09
694+60.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.02	0.01
694+75.00	DIRT	EXCAVATION	0.00	0.00
	DIRT	FILL	0.00	0.00

TOTAL	EXCAVATION	FILL
(CY)	1.72	12.91

NET FILL (12.91-1.72) = 11.19 CY

PROVIDING STORAGE VOLUME:	
26 LF~ 4'X3' RCB	11.22 CY

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

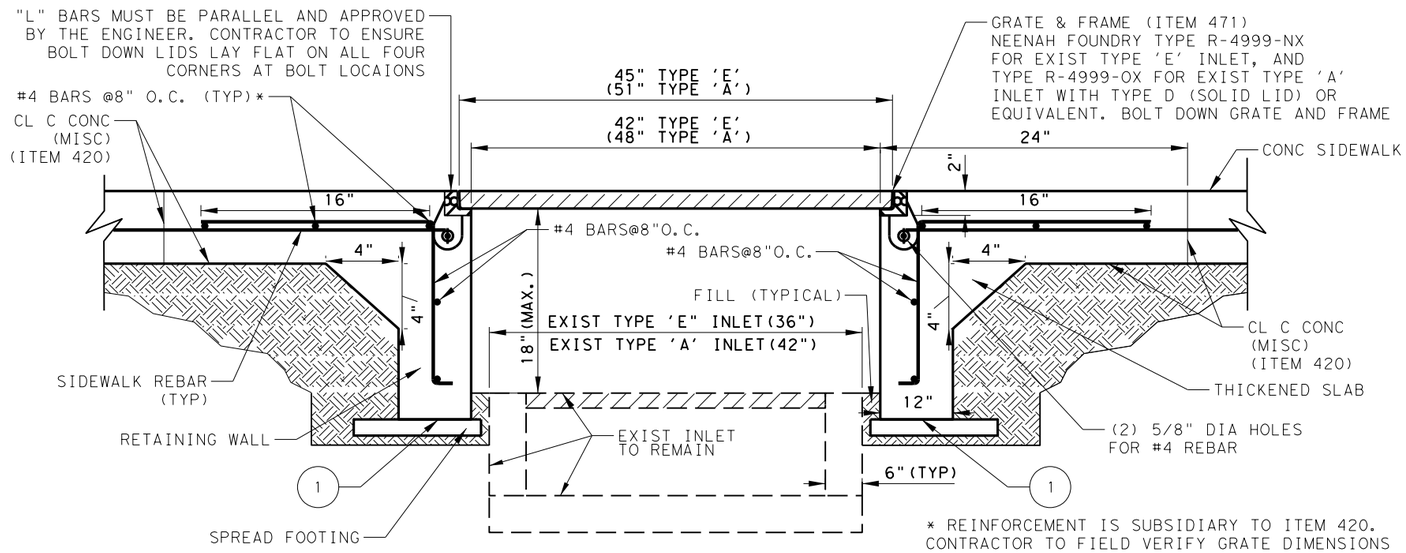
FLOODPLAIN FILL

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		131

DATE: 9/11/2023 6:18:18 PM
FILE: ...\FM 519 FLOODPLAIN FILL.dgn

100% SUBMITTAL



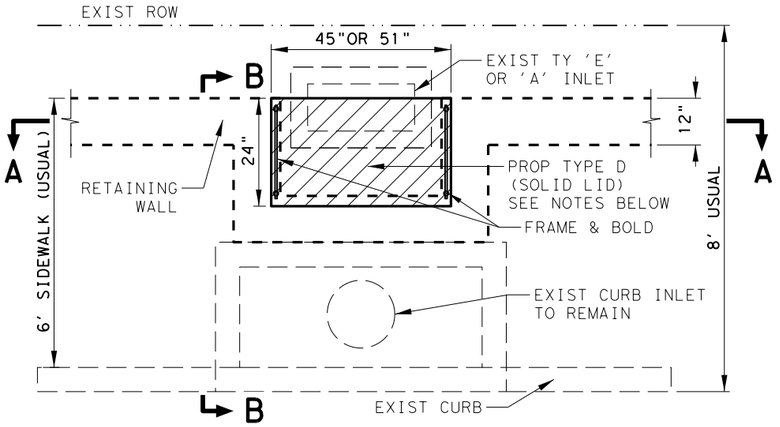
SECTION A-A

GRATE AND FRAME DETAIL

NTS

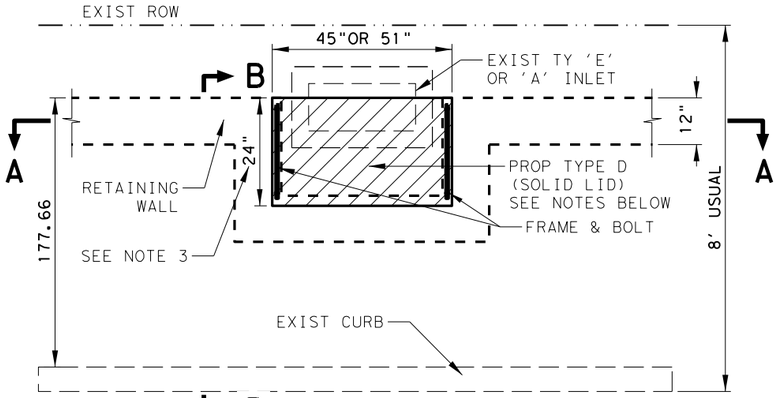
* REINFORCEMENT IS SUBSIDIARY TO ITEM 420. CONTRACTOR TO FIELD VERIFY GRATE DIMENSIONS PRIOR TO ORDERING GRATE & FRAME.

(1) THE BOTTOM OF RETAINING WALL/TOP OF SPREAD FOOTING SHALL EXTEND 6 IN. BELOW THE EXISTING INLET TOP ELEVATION. THE THICKENED SLAB SHALL BE ONLY BETWEEN INTERIOR FACE OF RETAINING WALL AND PAVEMENT EDGE.



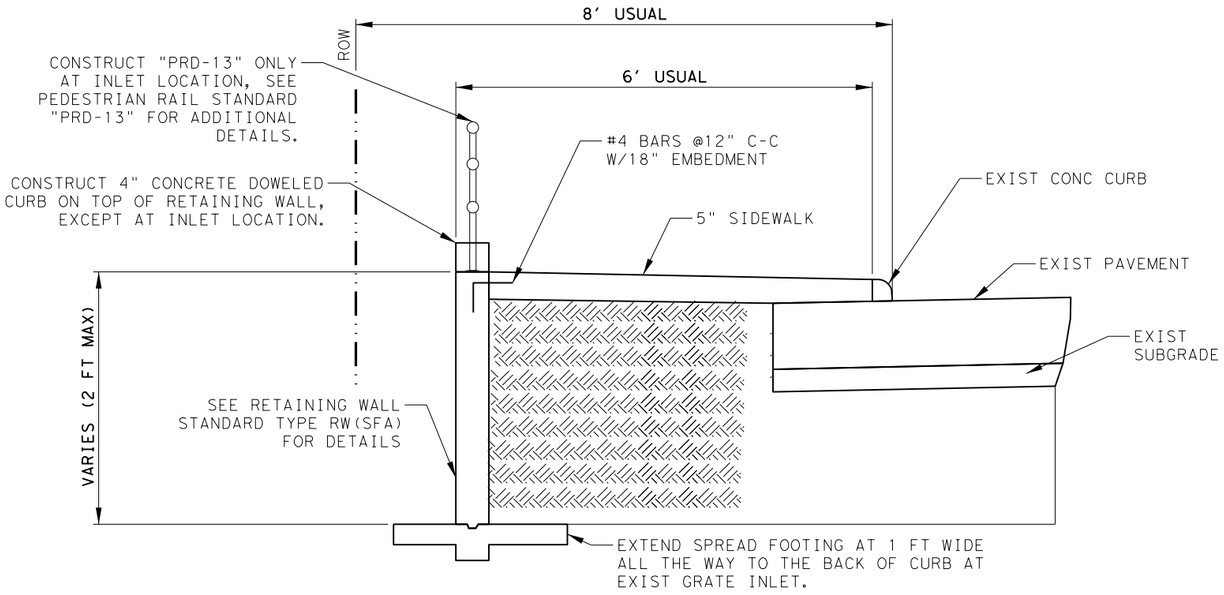
PLAN VIEW SHOWING WITH EXISTING CURB INLET

NTS



PLAN VIEW SHOWING WITHOUT EXISTING CURB INLET

NTS



SECTION B-B

RETAINING WALL DETAIL

NTS

NOTES:

1. FOR EXIST TYPE 'E' INLET, USE R-4999-NX SOLID LID (45"x24").
2. FOR EXIST TYPE 'A' INLET, USE R-4999-OX SOLID LID (51"x24").
3. IF THE WIDTH REQUIRES MORE THAN 24", USE TWO PLATES OF (51"x24") OR (45"x24"). THE ADDITIONAL PLATE SHALL BE INCIDENTAL TO ITEM 471.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

MISCELLANEOUS DETAILS

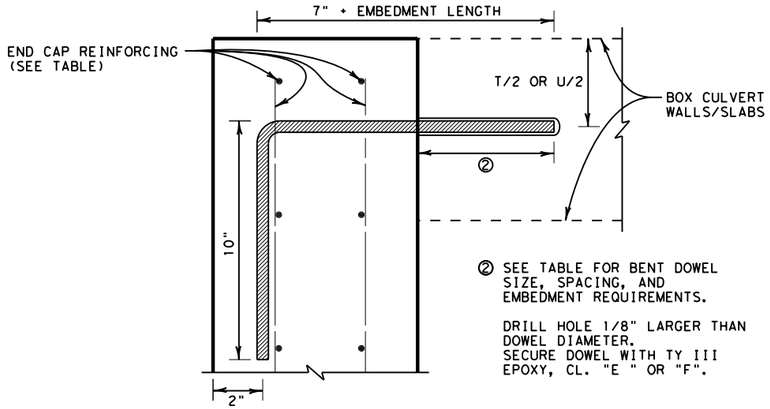
SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		132

DATE: 8/22/2023 10:03:50 AM
FILE: ...\FM 519 - DRNG-DETAIL-01.dgn

100% SUBMITTAL

CK | DW | CK | DW



BENT DOWEL DETAIL

N.T.S.

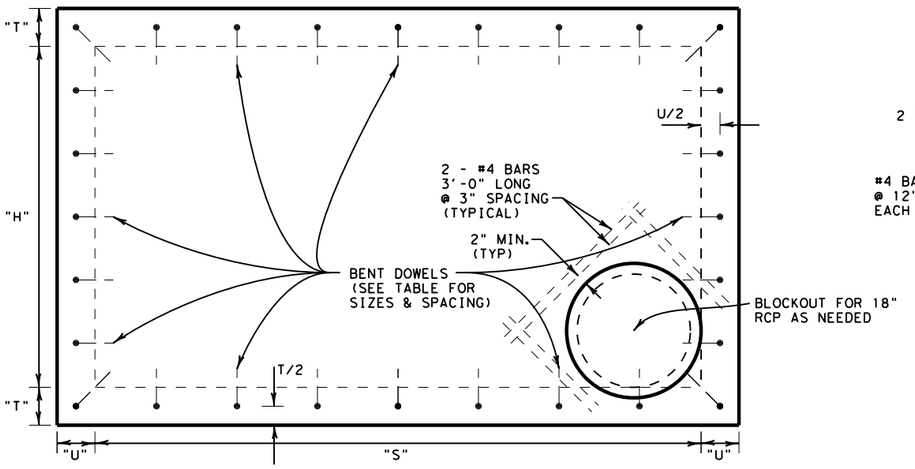
(SEE TABLE FOR SIZES AND SPACING)

BENT DOWEL SIZE/SPACING/EMBEDMENT			
"T" OR "U" (IN)	SIZE	SPACING	EMBEDMENT
4"	#3	6"	4"
5"	#4	8"	5"
6"	#4	8"	6"

BOX CULVERT - END CAP REINFORCEMENT		
"S" OR "H" (MAX)	INSIDE MAT OF REINFORCING	
	MAX FILL ≤ 15'	
	SIZE	SPACING
< 4'	4	12"
OUTSIDE MAT OF REINFORCING: # 4 BARS @ 12" C-C EA WAY		

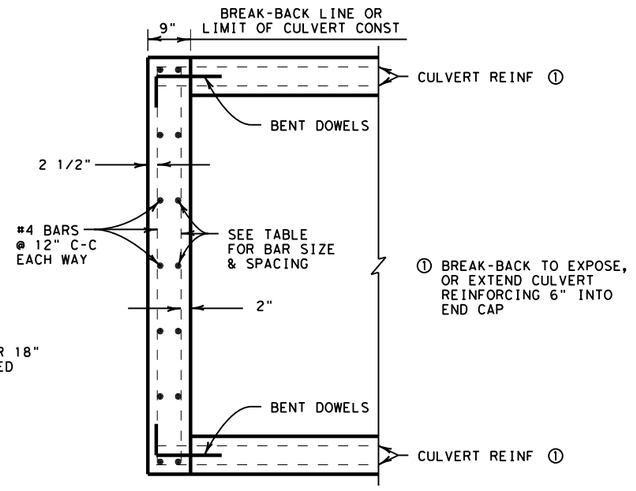
GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS "C" EXCEPT AS NOTED.
2. ALL REINFORCING STEEL SHALL BE GRADE 60.
3. DIMENSTIONS RELATING TO REINFORCING ARE TO CENTERS OF BARS.
4. PERMANENT FORMS MAY BE USED FOR INTERIOR FACE OF CAP.
5. WHEN CONSTRUCTED IN CONJUNCTION WITH NEW CULVERT INSTALLATION, END CAP MAY BE FORMED MONOLITHICALLY WITH CULVERT. FOR PRECAST CULVERT END CAPS, USE CLASS "H"CONCRETE, (MINIMUM DESIGN STRENGTH = 5000 PSI) AND SUBMIT SEALED ENGINEERING CALCULATIONS AND DRAWINGS FOR APPROVAL PRIOR TO FABRICATION
6. BOX CULVERT END CAP SHALL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO ITEM 462, "CONCRETE BOX CULVERTS AND DRAINS".



FRONT ELEVATION VIEW

N.T.S.



SIDE ELEVATION VIEW

N.T.S.

STATE OF TEXAS
ANGELITO D. ESQUIVEL
94976
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

BOX CULVERT END CAP DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		133

DATE: 8/22/2023 10:04:25 AM
FILE: ...\FM 519 - DRNG-DETAIL-02.dgn

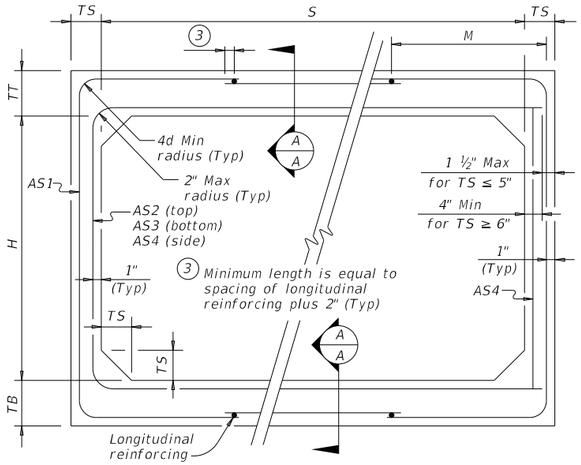
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
3	2	7	6	4	< 2	–	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	–	–	–	2.4
3	2	4	4	4	3 – 5	31	0.10	0.11	0.12	0.10	–	–	–	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	–	–	–	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	–	–	–	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	–	–	–	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	–	–	–	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	–	–	–	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	–	–	–	2.4
3	3	7	6	4	< 2	–	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	–	–	–	2.8
3	3	4	4	4	3 – 5	31	0.10	0.14	0.14	0.10	–	–	–	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	–	–	–	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	–	–	–	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	–	–	–	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	–	–	–	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	–	–	–	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	–	–	–	2.8

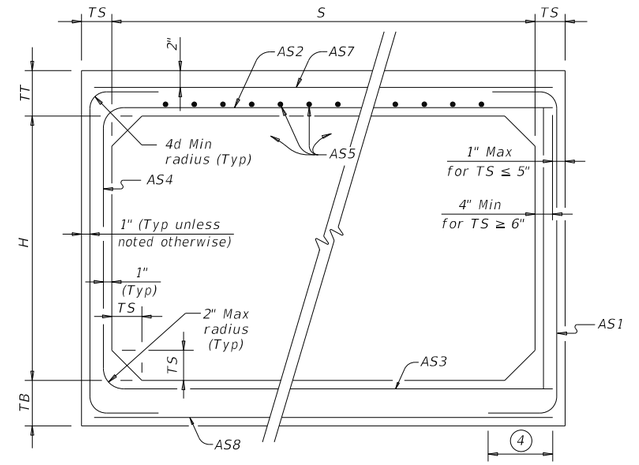
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

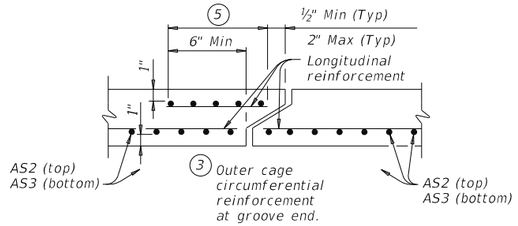
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

3'-0" SPAN

SCP-3

FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		134

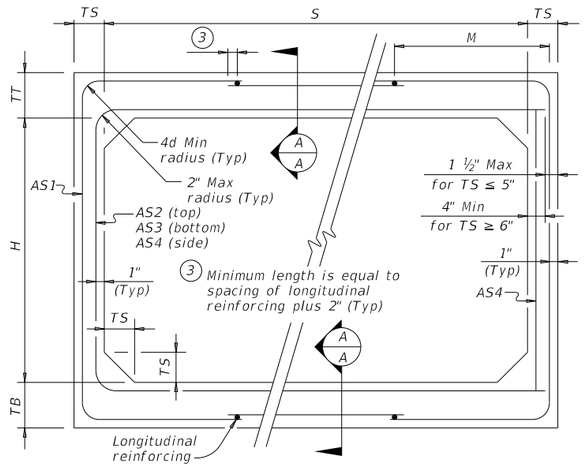
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
4	2	7.5	6	5	< 2	–	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	–	–	–	3.6
4	2	5	5	5	3 – 5	38	0.13	0.13	0.13	0.12	–	–	–	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	–	–	–	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	–	–	–	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	–	–	–	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	–	–	–	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	–	–	–	3.6
4	3	7.5	6	5	< 2	–	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	–	–	–	4.1
4	3	5	5	5	3 – 5	38	0.12	0.16	0.16	0.12	–	–	–	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	–	–	–	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	–	–	–	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	–	–	–	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	–	–	–	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	–	–	–	4.1
4	4	7.5	6	5	< 2	–	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	–	–	–	4.6
4	4	5	5	5	3 – 5	38	0.12	0.18	0.18	0.12	–	–	–	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	–	–	–	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	–	–	–	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	–	–	–	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	–	–	–	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	–	–	–	4.6

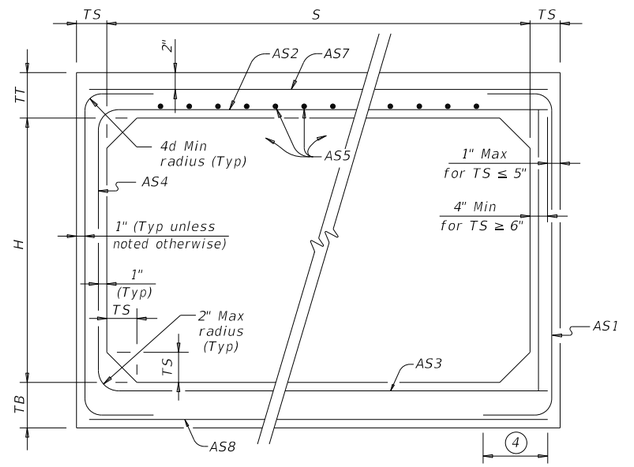
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

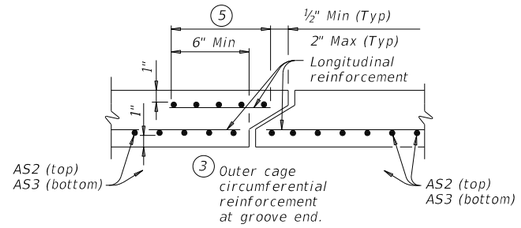
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

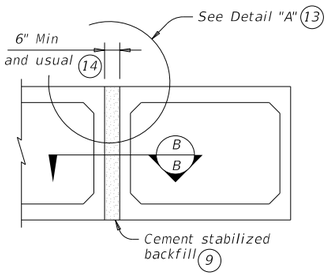
Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

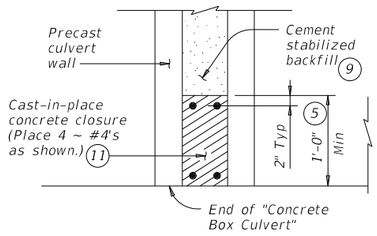
4'-0" SPAN

SCP-4

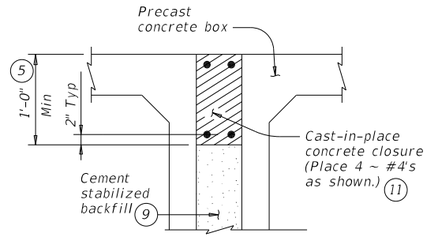
FILE: scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		135



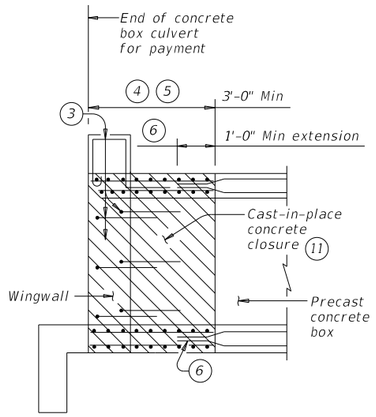
MULTIPLE UNIT PLACEMENT



SECTION B-B

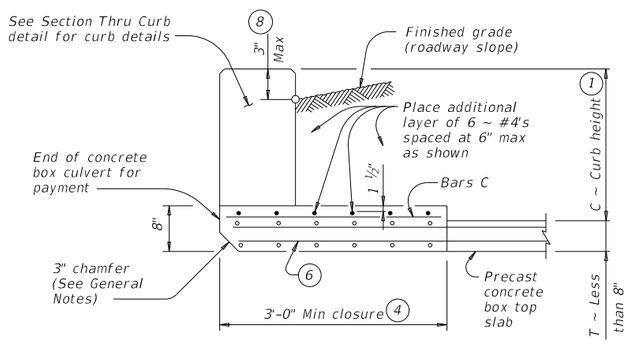


DETAIL "A" (13)

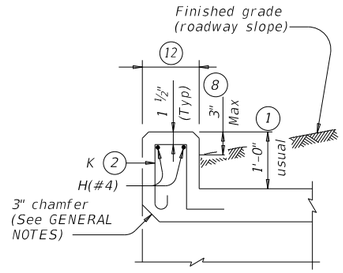


WINGWALL CONNECTION

(Also applies to safety end treatment.)

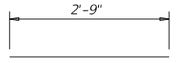


SECTION THRU TOP SLABS LESS THAN 8"



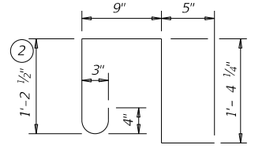
SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



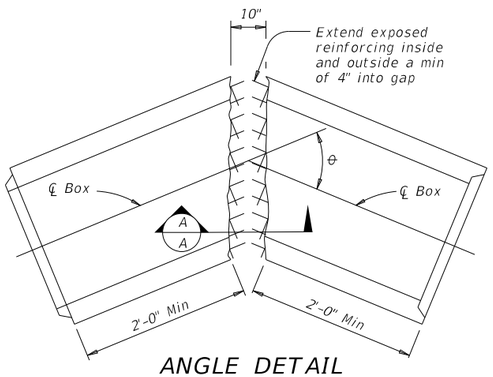
BARS C (#4)

(Spa = 1'-0" Max)

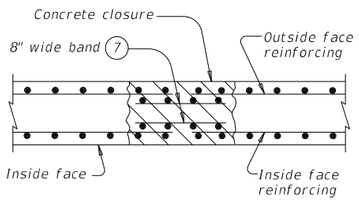


BARS K (#4)

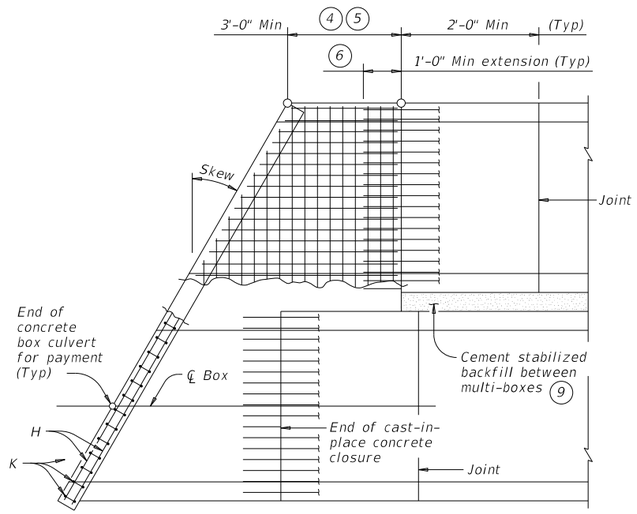
(Spa = 1'-0" Max)
(Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

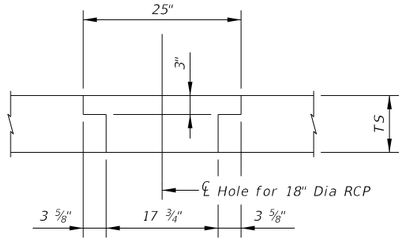
BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

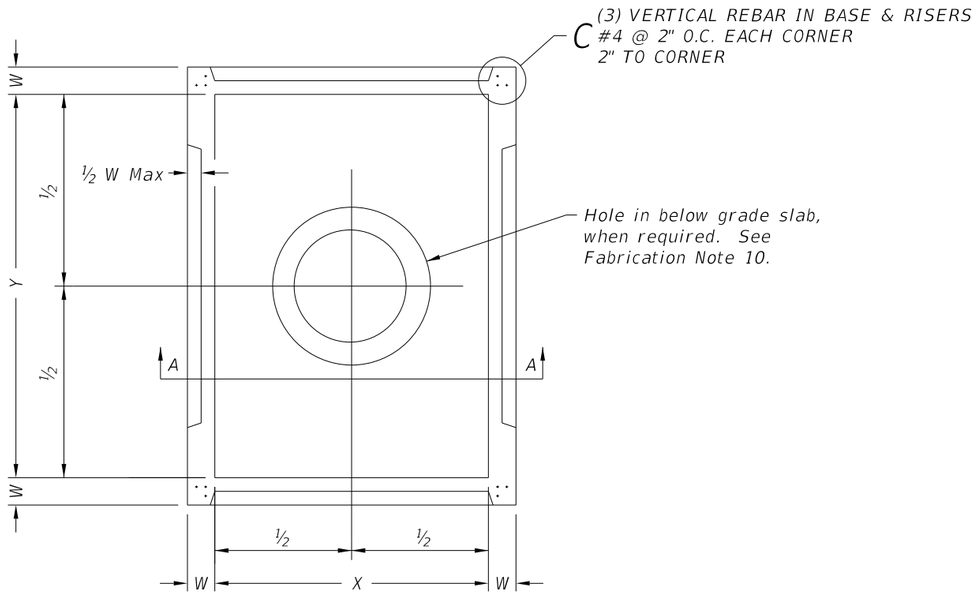
FILE:	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		135A

DATE:
FILE:

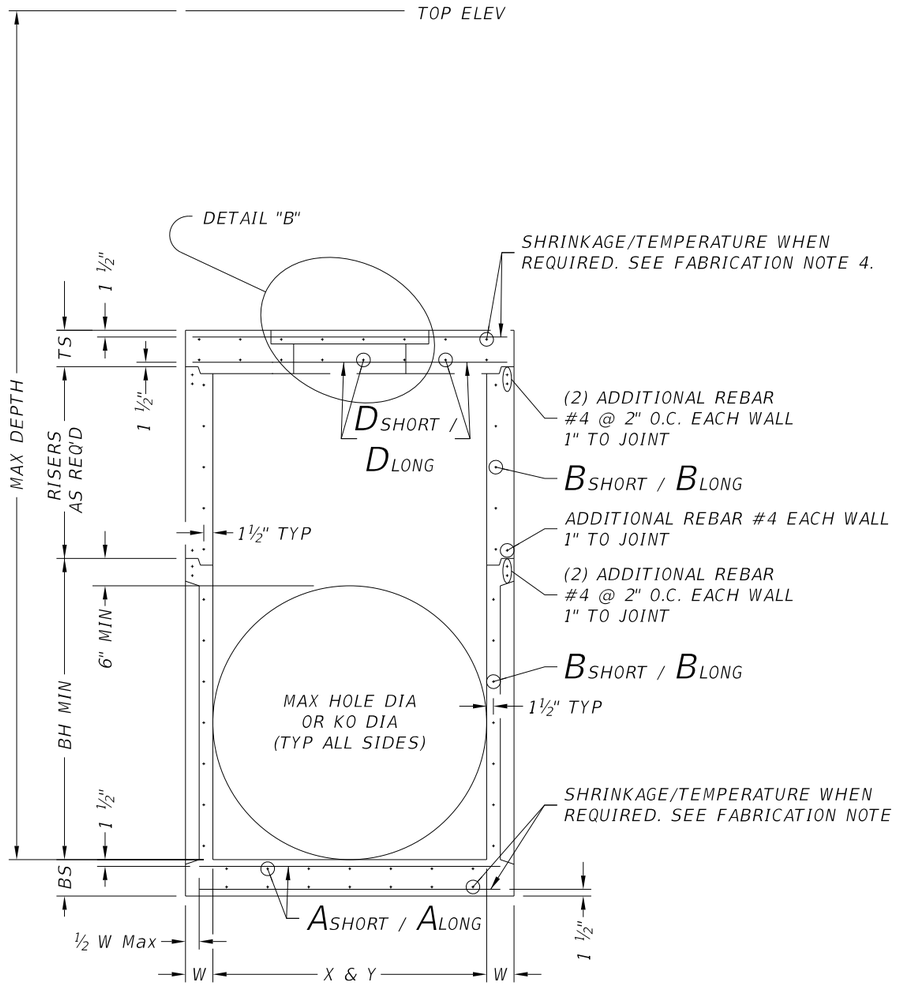
DATE:
FILE:



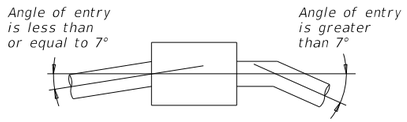
DETAIL "B"



PLAN VIEW



SECTION A-A



PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PJB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.
10. Provide hole in below grade slab only when PJB is installed with inlet type POD.

INSTALLATION NOTES:

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to junction box.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for junction box is per Item 465 "Junction Boxes, Manholes, and Inlets" by type and size.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST JUNCTION BOX

PJB

FILE: prestd09-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		136

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

HL93 LOADING

Texas Department of Transportation

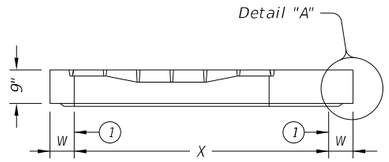
Bridge Division Standard

DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

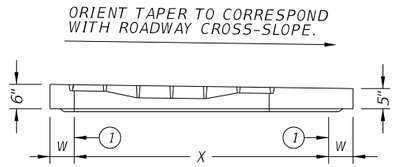
PDD

FILE: prestd10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		137

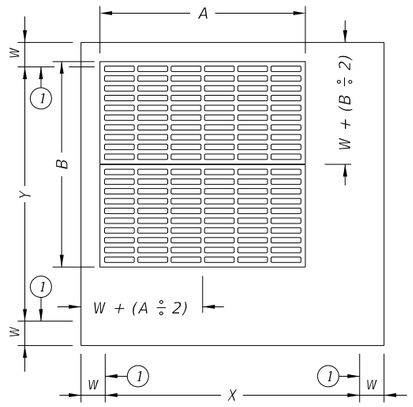
DATE:
FILE:



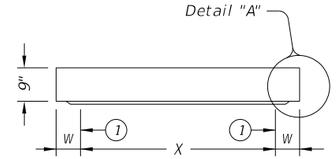
STYLE 'FG'



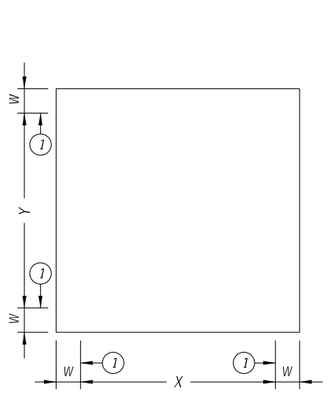
STYLE 'SFG'
ELEVATION VIEW



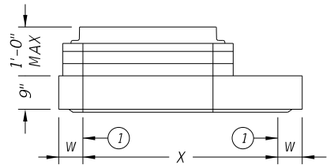
PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



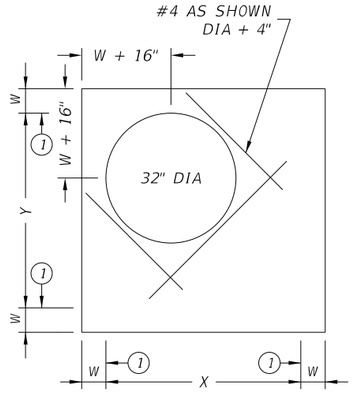
ELEVATION VIEW
STYLE 'SL'



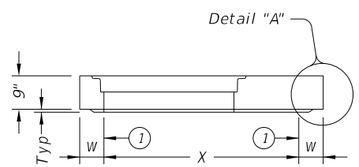
PLAN VIEW
NO OPENINGS
STYLE 'SL'



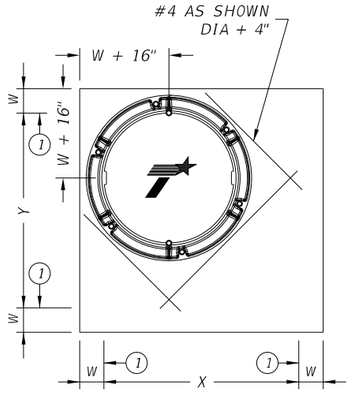
ELEVATION VIEW
STYLE 'RH'



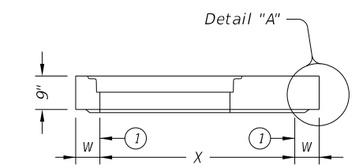
PLAN VIEW
SHIP LOOSE RING & COVER
STYLE 'RH'



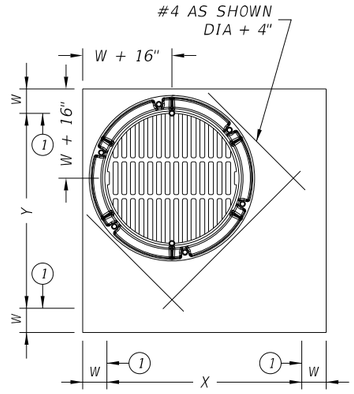
ELEVATION VIEW
STYLE 'RC'



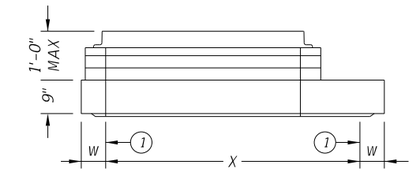
PLAN VIEW
32" DIA CAST-IN RING & COVER
STYLE 'RC'



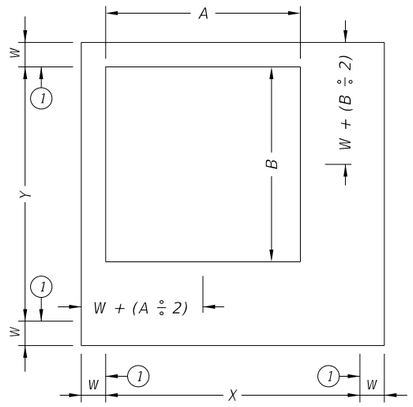
ELEVATION VIEW
STYLE 'RG'



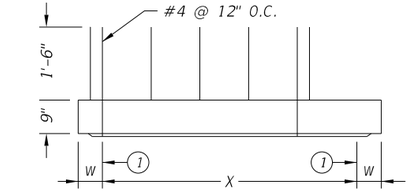
PLAN VIEW
32" DIA CAST-IN RING & GRATE
STYLE 'RG'



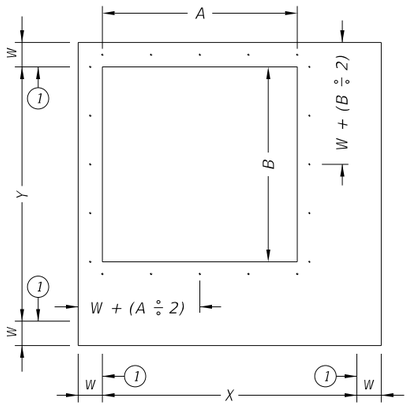
ELEVATION VIEW
STYLE 'SH'



PLAN VIEW
SHIP LOOSE FRAME & GRATE
STYLE 'SH'



ELEVATION VIEW



PLAN VIEW
EXPOSED REBAR
STYLE 'S1'

(1) Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRECAST SLAB LID

PSL

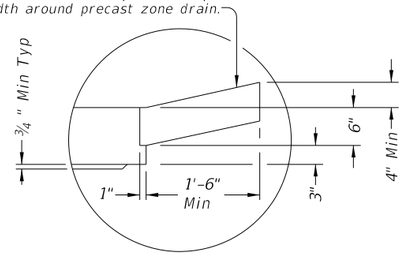
FILE: prestd05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		138

DATE:
FILE:

Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in²/ft	0.37 in²/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in²/ft	0.37 in²/ft
SFG	3'x3'	6"	3'x3'	0.32 in²/ft	0.32 in²/ft
SL	4'x4'	6"	n/a	0.34 in²/ft	0.34 in²/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in²/ft	0.41 in²/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in²/ft	0.41 in²/ft
SFG	4'x4'	6"	4'x4'	0.32 in²/ft	0.32 in²/ft
SL	3'x5'	6"	n/a	0.39 in²/ft	0.39 in²/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in²/ft	0.48 in²/ft
SFG	3'x5'	6"	3'x5'	0.32 in²/ft	0.32 in²/ft
SL	4'x5'	6"	n/a	0.42 in²/ft	0.42 in²/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in²/ft	0.42 in²/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in²/ft	0.66 in²/ft
SL	5'x5'	6"	n/a	0.36 in²/ft	0.36 in²/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in²/ft	0.43 in²/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in²/ft	0.63 in²/ft
SL	5'x6'	6"/8"	n/a	0.48 in²/ft	0.48 in²/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in²/ft	0.60 in²/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in²/ft	0.60 in²/ft
SL	6'x6'	6"/8"	n/a	0.43 in²/ft	0.43 in²/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in²/ft	0.59 in²/ft
SL	8'x8'	8"/10"	n/a	0.45 in²/ft	0.45 in²/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in²/ft	0.45 in²/ft

(2) See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of ¾" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in²/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

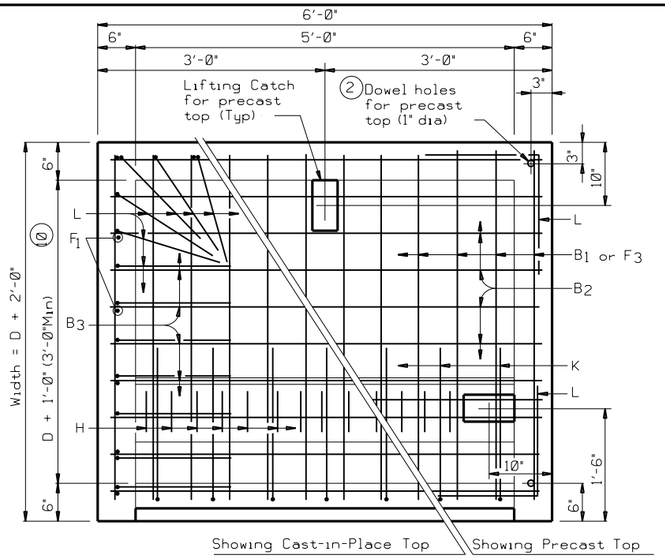
Texas Department of Transportation

Bridge Division Standard

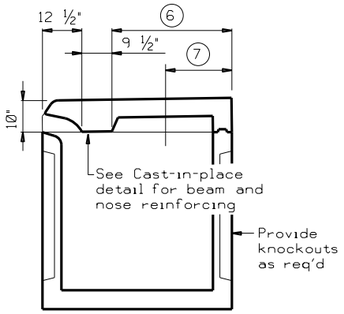
PRECAST SLAB LID

PSL

FILE: prestd05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		139

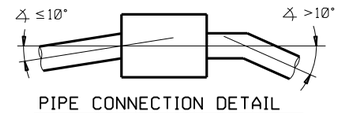


PLAN



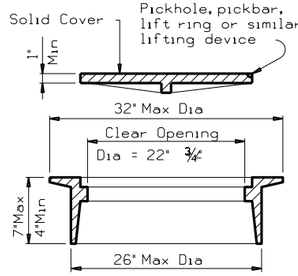
PREFABRICATED INLET

(6) For reinforcing steel and dimensions not shown, see fabricators shop drawings. Structure shall be of the size required to accommodate size of pipe shown elsewhere in the plans. Length of inlet = 6'-0"



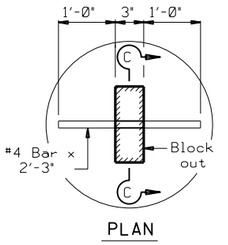
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

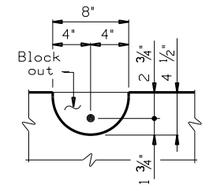


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900-FTX

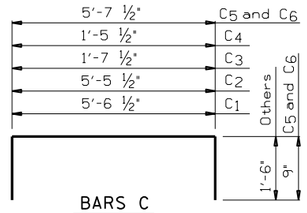


PLAN

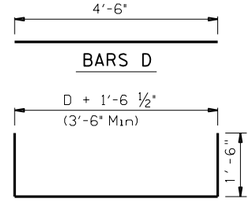


SECTION C-C

LIFTING CATCH



BARS C

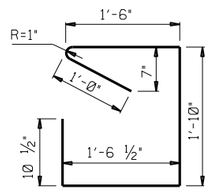


BARS D

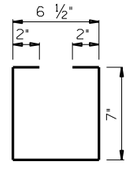
BARS E

REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	(9)
C5	#6	(9)
C6	#4	(9)
D	#4	(9)
E	#4	12"
F1-3	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

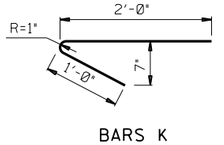
(9) As shown



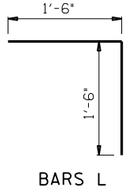
BARS G



BARS H



BARS K



BARS L

GENERAL NOTES:

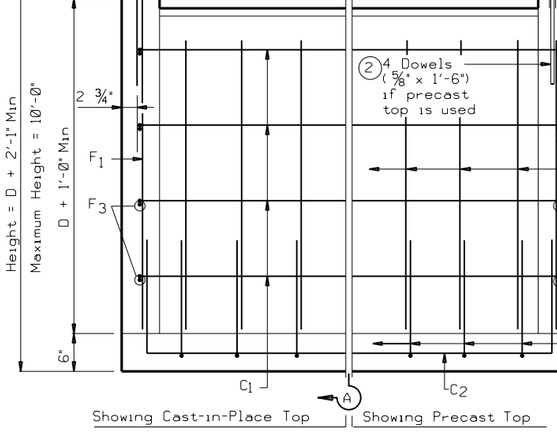
No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.

Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.

Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans. Shop drawings are required for Precast Inlets.

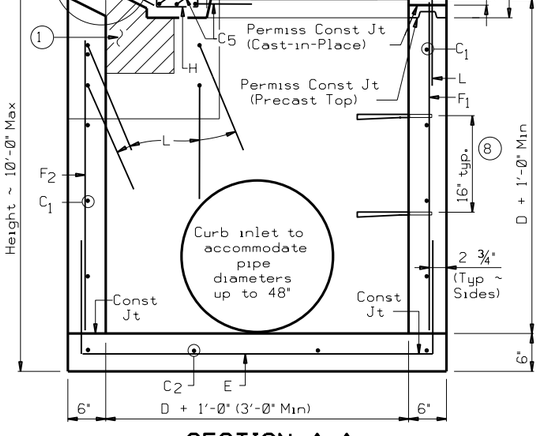
In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



ELEVATION

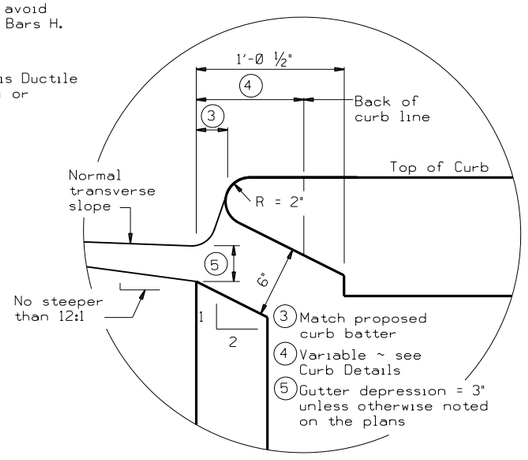
(2) If precast top is used, provide 4 ~ ⅝" dia x 1'-6" smooth bars in inlet walls for 1" dia holes



SECTION A-A

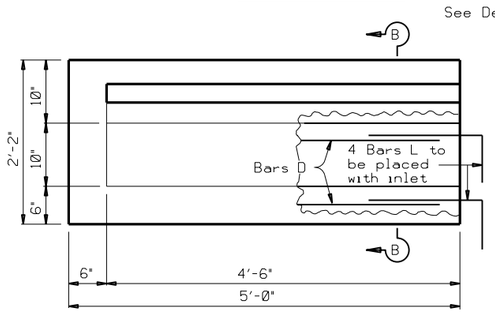
(7) 1'-6" Min, 1'-9" Max Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

(8) Ladder rung is Ductile Iron, Aluminum or Cast Iron.

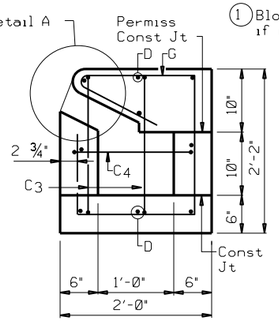


DETAIL A

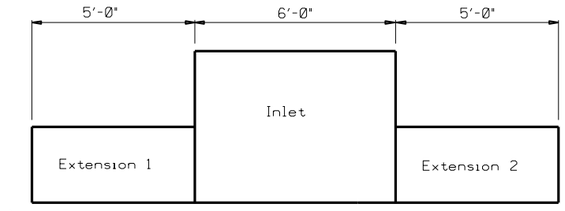
(1) Block out to accommodate extension if used and to place 4 Bars L



EXTENSION ELEVATION



SECTION B-B



Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

EXTENSION PLACEMENT

INSTALL A 3 FT.(HORIZ.) x 6 IN.(VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.

DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.

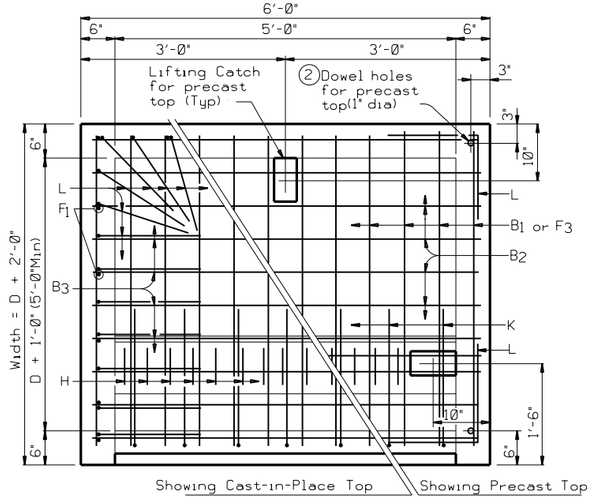
D = Diameter
R = Radius

Texas Department of Transportation
Houston District

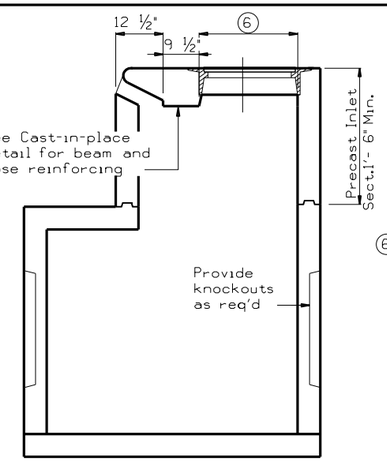
CURB INLET TYPE C
(WITH OR WITHOUT EXTENSION)

HIL-C

FILE: STDD1.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 2/2010 Added note concerning opening on the back of inlet. 10/2014 Removed Note 10	HOU	6	STP 2B23(207)TAPS			140
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

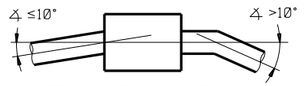


PLAN



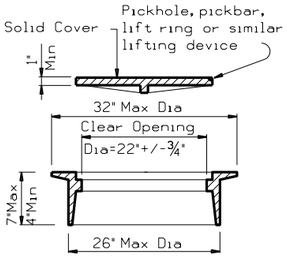
PREFABRICATED INLET

⑥ For reinforcing steel and dimensions not shown, see fabricator's shop drawings. Structure shall be of the size required to accommodate size of pipe shown elsewhere in the plans. Length of inlet = 5'-0"



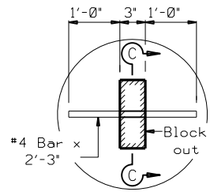
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

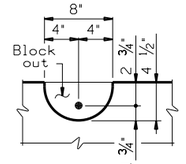


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900 FTX



PLAN

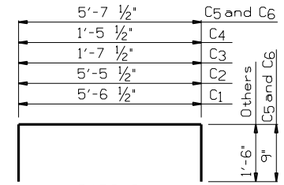


SECTION C-C

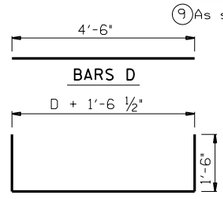
LIFTING CATCH

REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	⑨
C5	#6	⑨
C6	#4	⑨
D	#4	⑨
E	#4	12"
F1-5	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

⑨ As shown



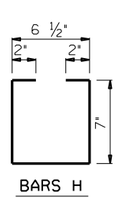
BARS C



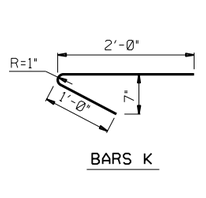
BARS D

BARS E

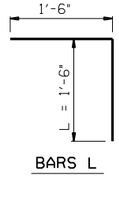
BARS G



BARS H



BARS K



BARS L

GENERAL NOTES:

No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.

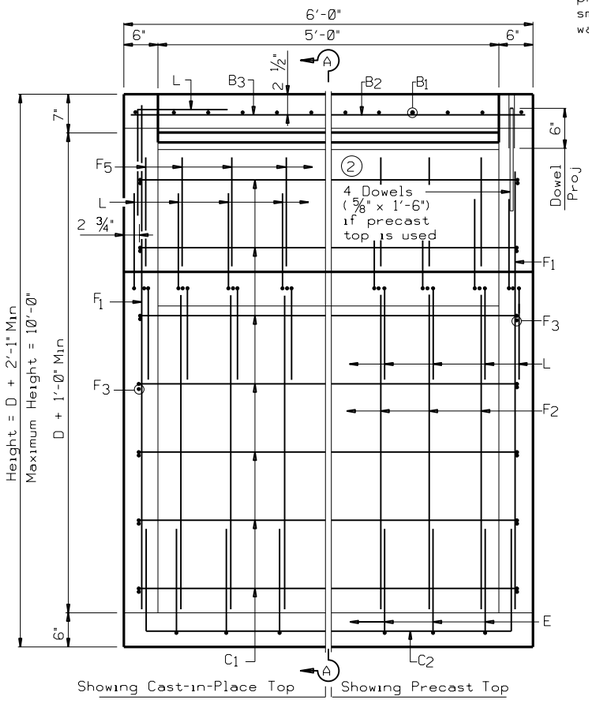
Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.

Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans.

Shop drawings will be required for precast construction of inlets.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

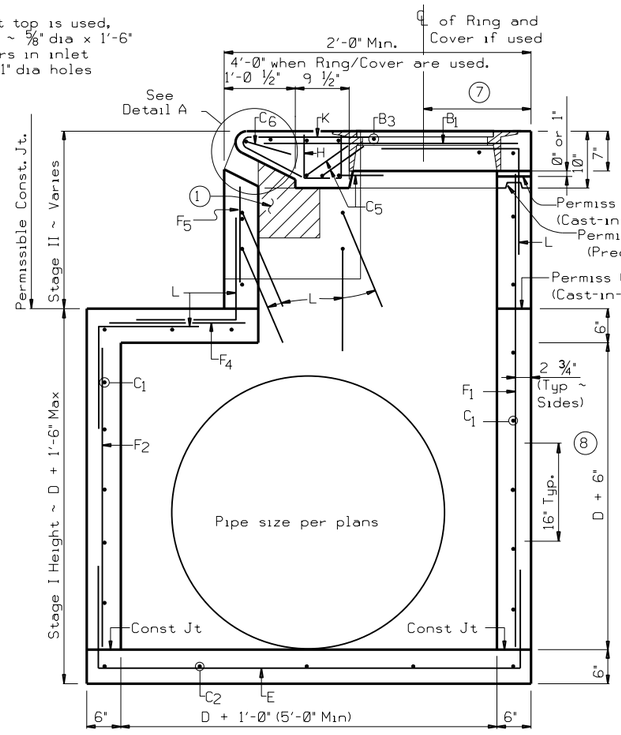
Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



② 4 Dowels (⅝" x 1'-6") if precast top is used

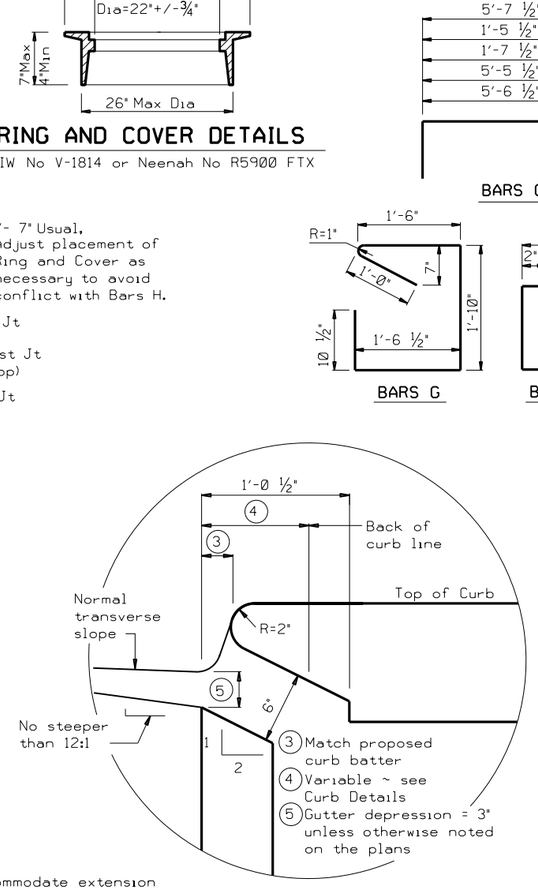
② If precast top is used, provide 4 ~ ⅝" dia x 1'-6" smooth bars in inlet walls for 1" dia holes

ELEVATION

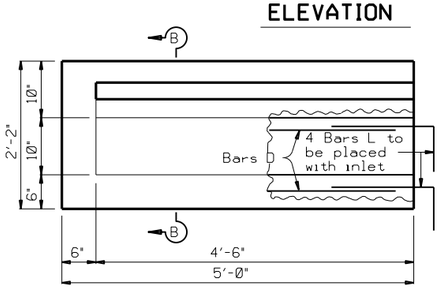


⑦ 1'- 7" Usual, Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

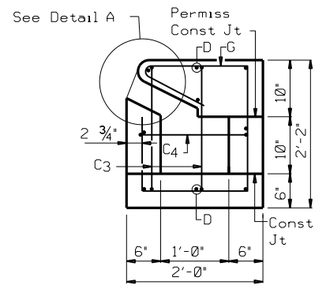
SECTION A-A



DETAIL A

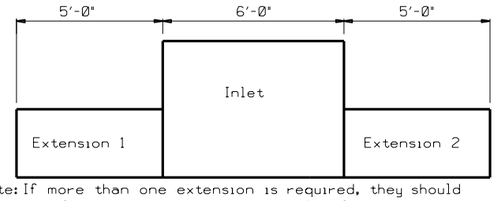


EXTENSION ELEVATION



SECTION B-B

① Block out to accommodate extension if used and to place 4 Bars L



Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

EXTENSION PLACEMENT

INSTALL A 3 FT.(HORIZ.) x 6 IN.(VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.

DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.

D = Diameter
R = Radius

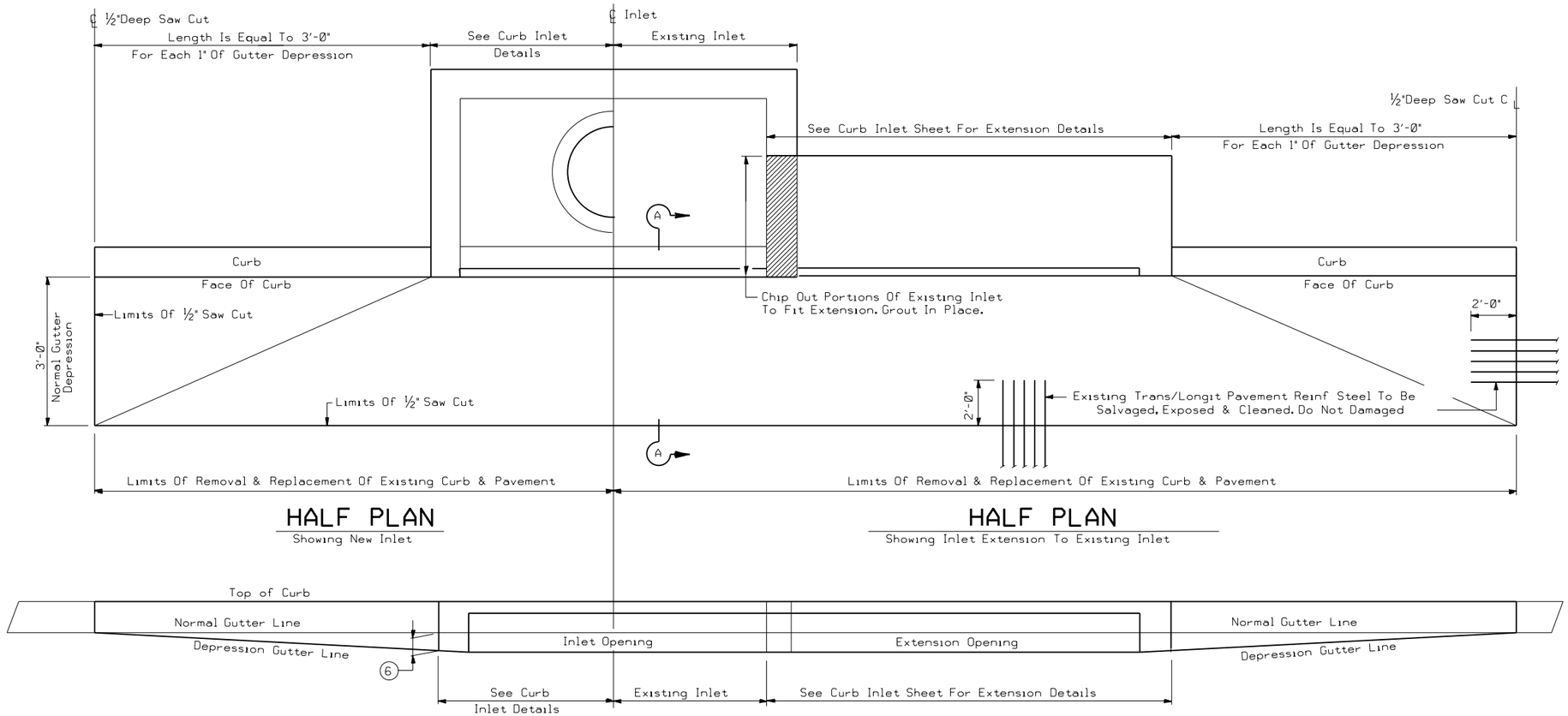
Texas Department of Transportation
Houston District

CURB INLET TYPE C1
(WITH OR WITHOUT EXTENSION)

HIL-C1

FILE: STDD2.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 2/2010 Note for alternate design and opening on the back of inlet. 10/2016 Removed ladder rung and wordings.	HOU	6	STP 2B23(207)TAPS			141
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

STDD2.DGN



HALF PLAN
Showing New Inlet

HALF PLAN
Showing Inlet Extension To Existing Inlet

HALF ELEVATION
Showing New Inlet

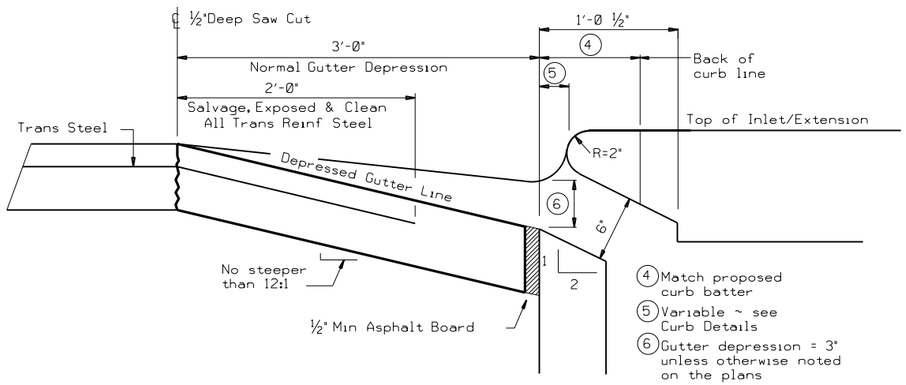
HALF ELEVATION
Showing Inlet Extension To Existing Inlet

GENERAL NOTES:

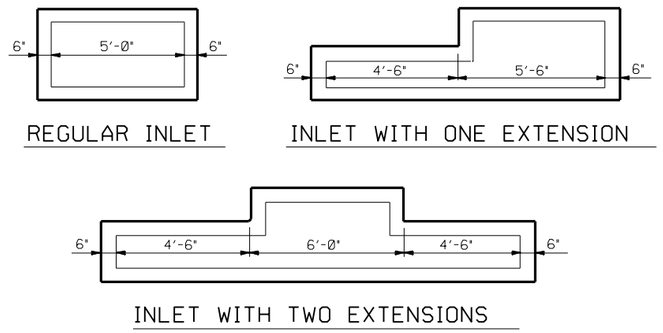
All Concrete Shall Be Class"C".All Exposed Corners Shall Be Chamfered ¾".

Payment For Adding Proposed Inlets And Extensions At Existing Pavement Locations Will Be Made At The Unit Price Bid Which Will Also Include Compensation of Removing Pavement,Curb, Base And Replacing Same As Directed By The Engineer.

For Inlet Details See Details Curb Inlet Type"C".



SECTION A-A



PLAN OF INLET AND EXTENSIONS

R = Radius

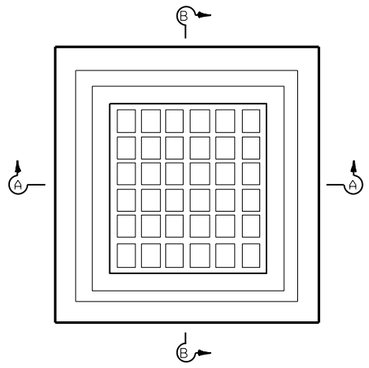
Texas Department of Transportation
Houston District

DETAIL FOR ADDING EXTENSIONS AND CURB INLETS AT EXISTING PAVEMENT LOCATIONS

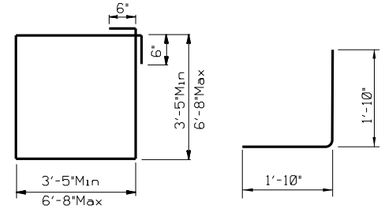
EXC-EPL

FILE: STDD3.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:		
©TxDOT Mar 2004	DIST	FED REG	PROJECT NO.			SHEET	
REVISIONS	HOU	6	STP 2B23(207)TAPS			142	
	COUNTY		CONTROL	SECT	JOB	HIGHWAY	
	GALVESTON		0979	01	027	FM 519	

STDD3.DGN

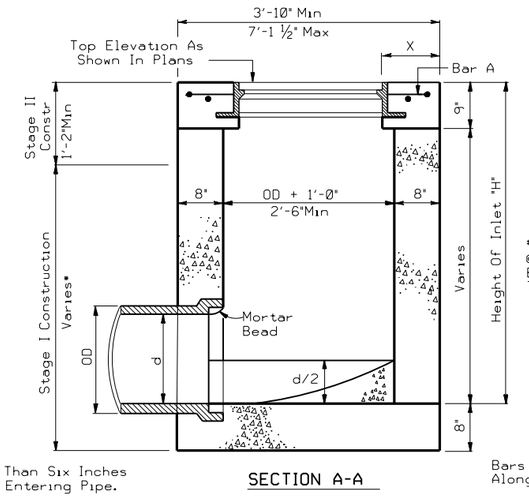


PLAN



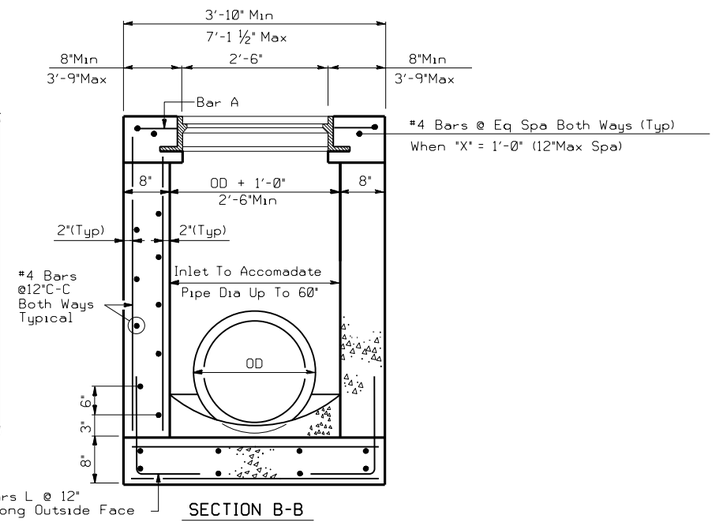
BAR A (#4)

BAR L (#4)



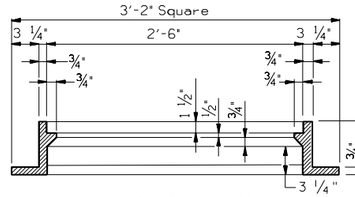
• But Not Less Than Six Inches
Over Highest Entering Pipe.

SECTION A-A

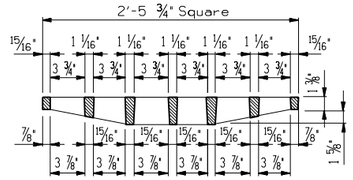


SECTION B-B

TYPE A INLET



SECTION THRU FRAME



SECTION THRU GRATE

FRAME AND GRATE

Neenah No.R3418-A
EJIW No.V-4880-1

GENERAL NOTES:

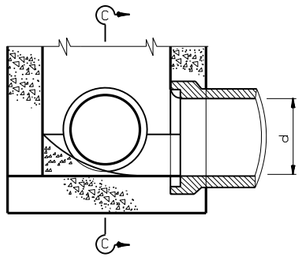
Where Size Of Pipes Passing Thru Inlet Exceeds 30" Increase Inside Width To Outside Diameter Of Pipe Plus 1'-0" (OD + 1'-0").

See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

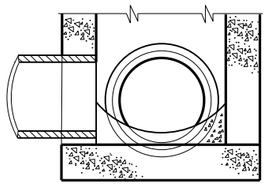
Frames And Grates May Be Gray Cast Iron.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

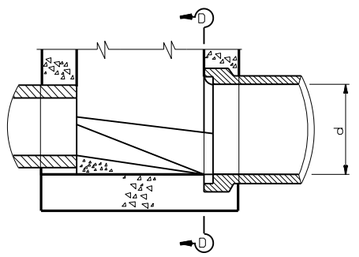


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

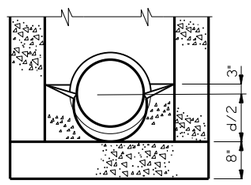


SECTION C-C



PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides



SECTION D-D

d = Diameter

NOT FOR TRAFFIC LOADS

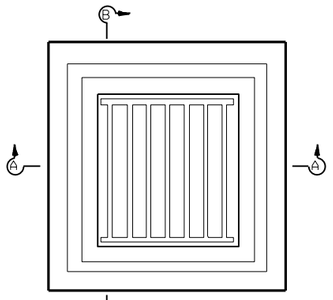
Texas Department of Transportation
Houston District

INLET TYPE A

HIL-A

FILE: STDD4.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 9/30/2016: Removed Manhole Steps	HOU	6	STP 2B23(207)TAPS			143
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

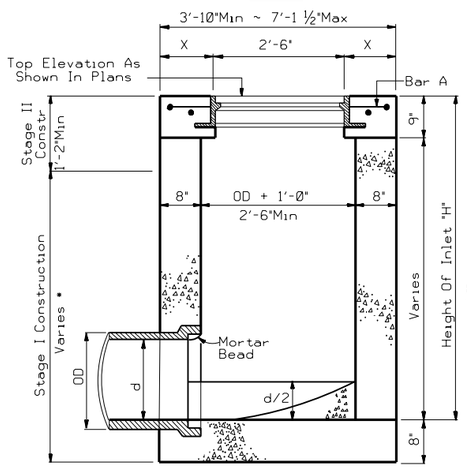
STDD4.DGN



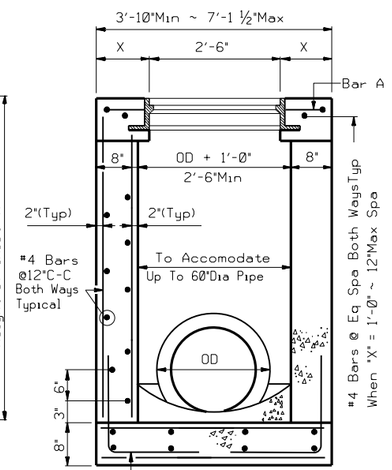
PLAN

• But Not Less Than Six Inches Over Highest Entering Pipe.

X = 8" Min to 3'-9" Max

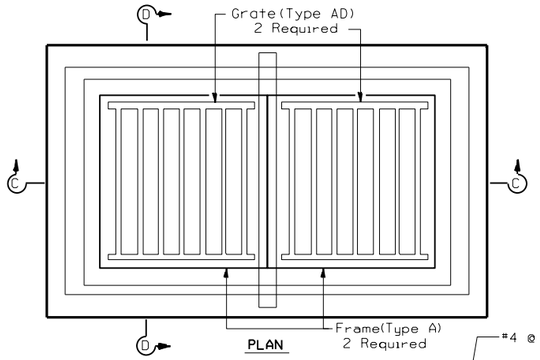


SECTION A-A



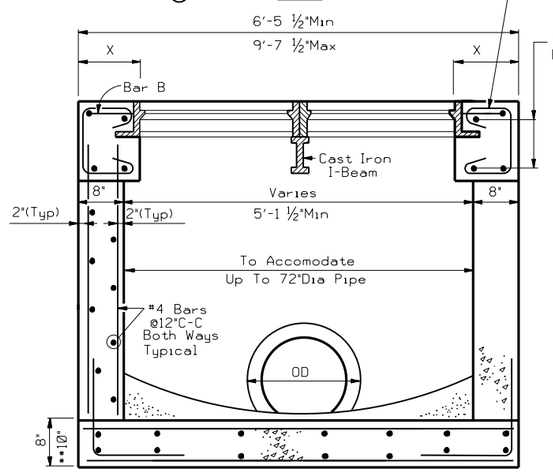
SECTION B-B

INLET TYPE AD

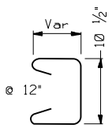


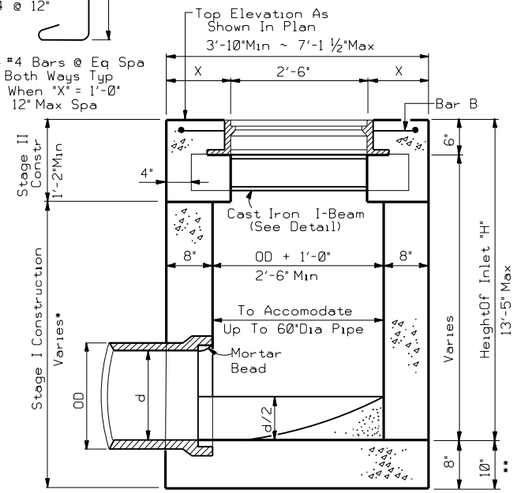
• But Not Less Than Six Inches Over Highest Entering Pipe.

•• For Pipe Diameters 66" And Greater



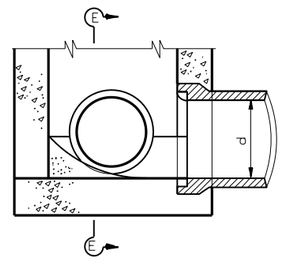
SECTION C-C





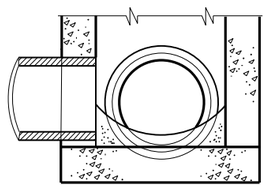
SECTION D-D

INLET TYPE AAD

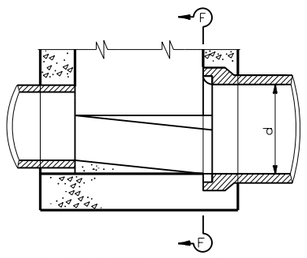


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

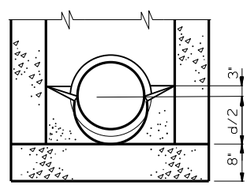


SECTION E-E

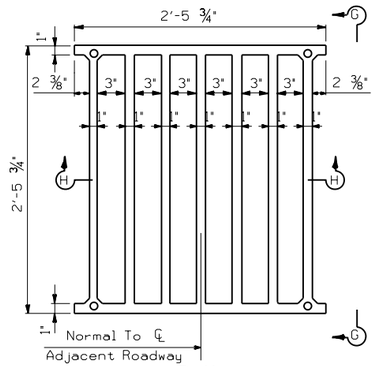


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides

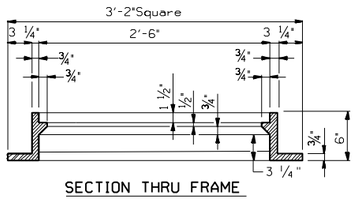


SECTION F-F

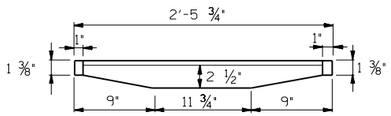


PLAN

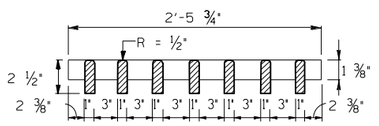
Provide 4 ~ Stainless Steel Hex Head Bolts per Grate



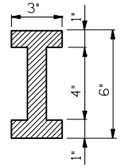
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

FRAME AND GRATE

Type AD ~ Neenah No.3418 or EJIW No.V-4880-2
Type AAD ~ Neenah No.3418-2 or EJIW No.V-4881-2

d = Diameter
R = Radius

GENERAL NOTES:

Type AD Inlet contains a single frame with grate. Type AAD Inlet contains a double frame and double grate with an I-beam.

Frame and Grates may be gray cast iron.

The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Compl) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where "D" Exceeds 5'-0".

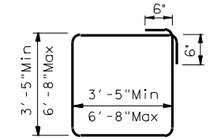
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

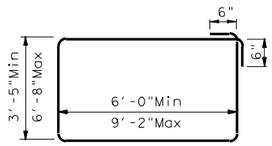
Shop Drawings Will Be Required For Precast Construction Of Inlets.

Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed.

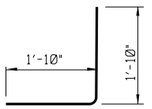
Bolted grates and frames are a matched set, do not unbolt without "Match Marking" so that grates and frames are re-installed as originally built.



BAR A (#4)



BAR B (#4)



BAR L (#4)

NOT FOR TRAFFIC LOADS

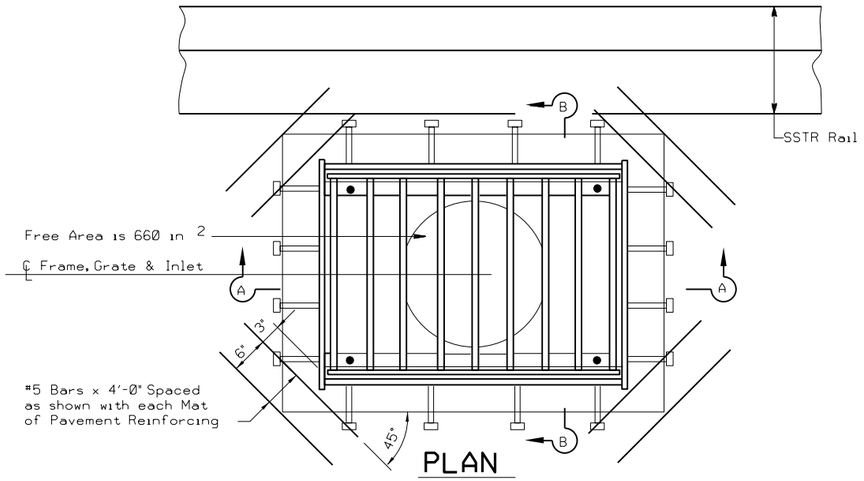
Texas Department of Transportation
Houston District

INLETS TYPE AD & AAD

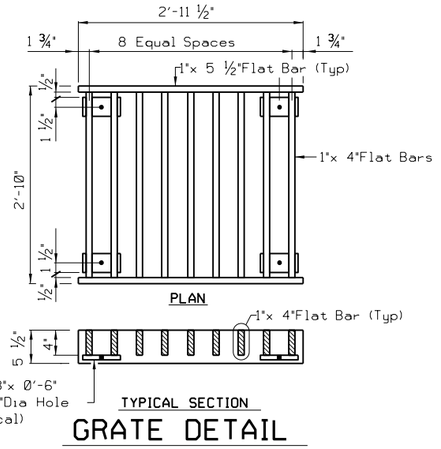
HIL-AD/AAD

FILE: STDD5.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOU	6	STP 2B23(207)TAPS			144
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

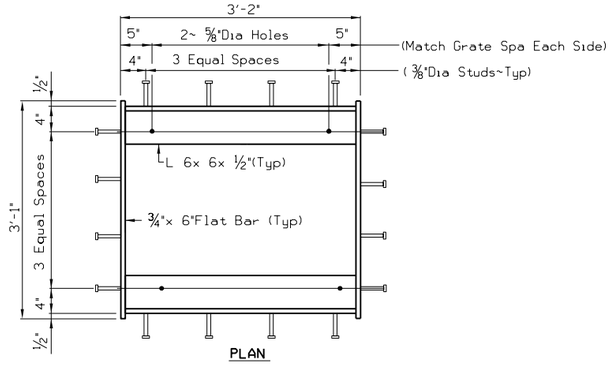
STDD5.DGN



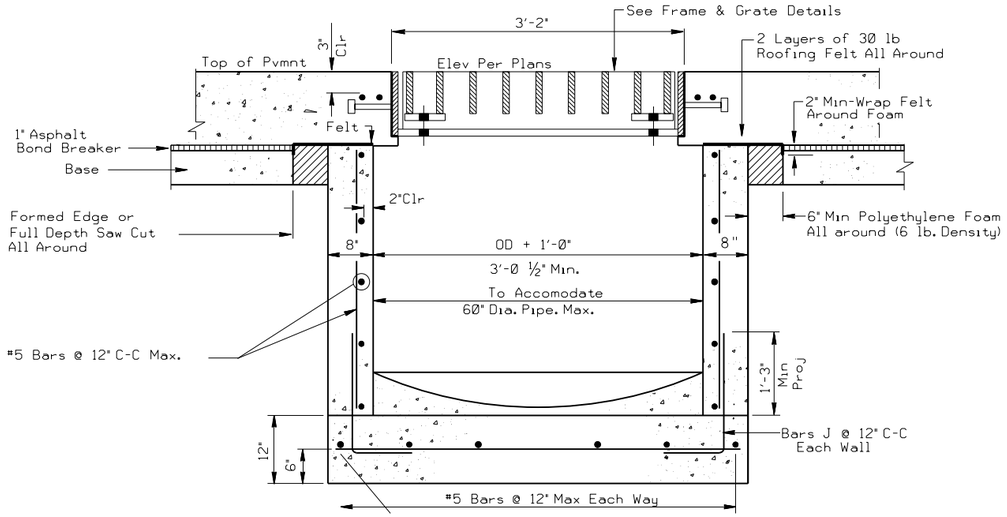
PLAN



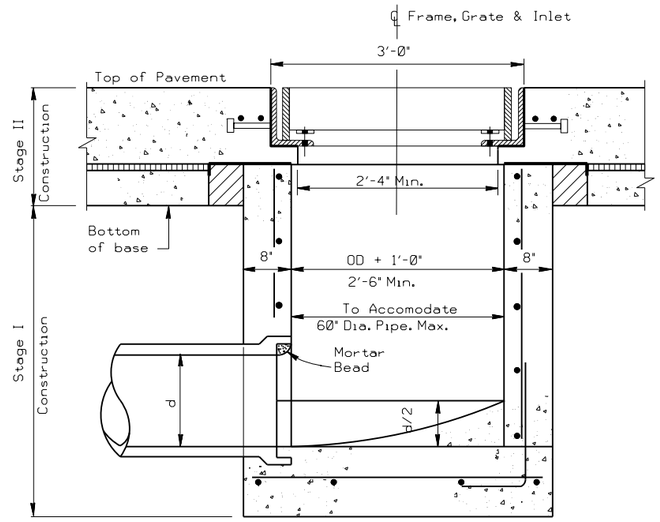
GRATE DETAIL



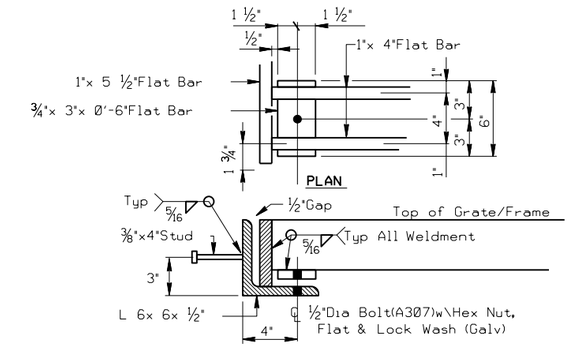
FRAME DETAIL



SECTION A-A



SECTION B-B



WELDMENT DETAIL

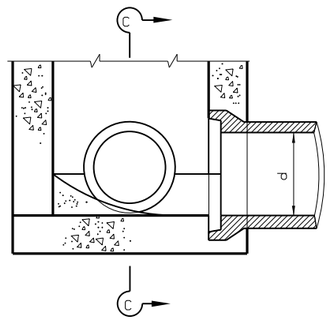
GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication.

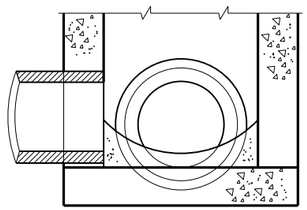
Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

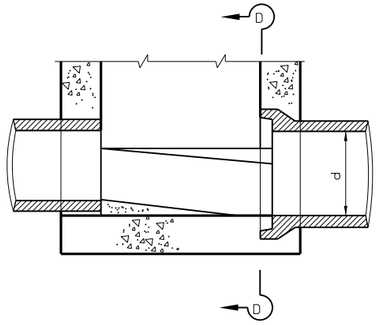


PART SECTION AT INVERT

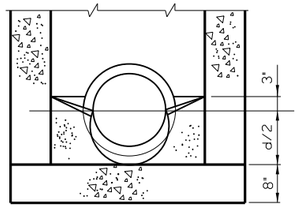


SECTION C-C

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

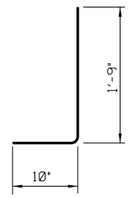


PART SECTION AT INVERT



SECTION D-D

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides



BARS J (#5)

d = Diameter
R = Radius

FOR TRAFFIC LOADS

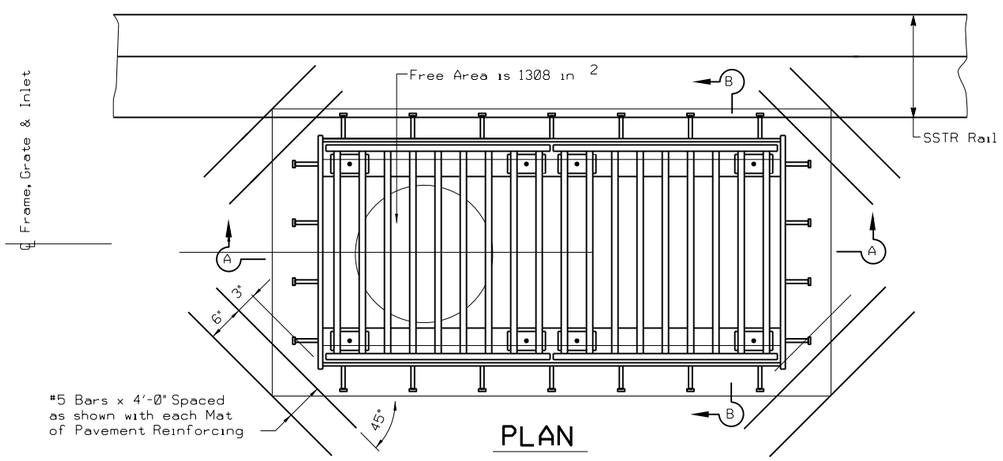
Texas Department of Transportation
Houston District

INLET TYPE AZ

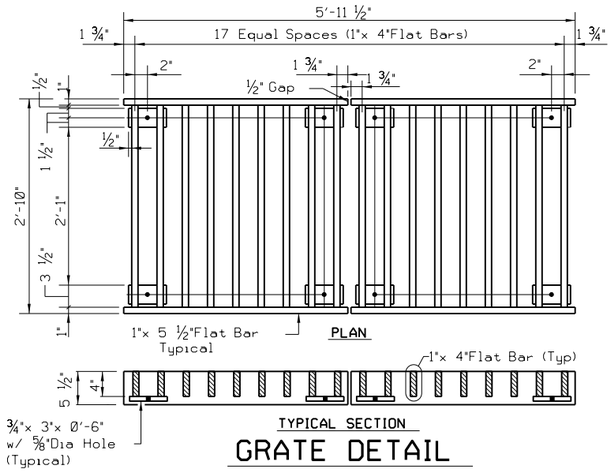
HIL-AZ

FILE: STDD6.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOU	6	STP 2B23(207)TAPS			145
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

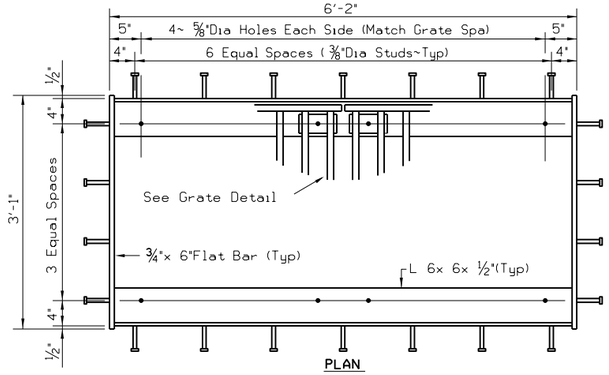
STDD6.DGN



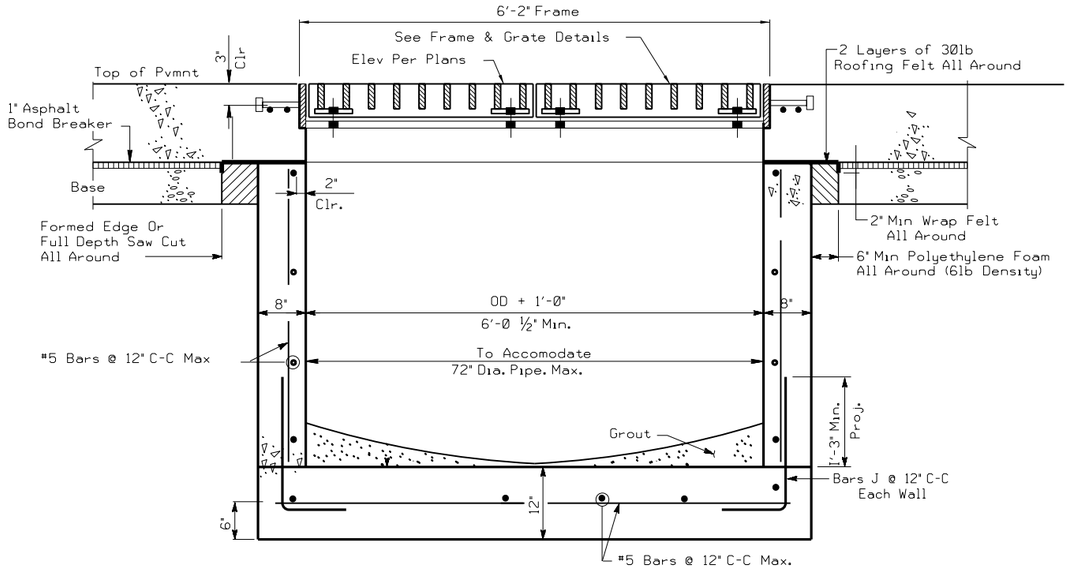
PLAN



GRATE DETAIL



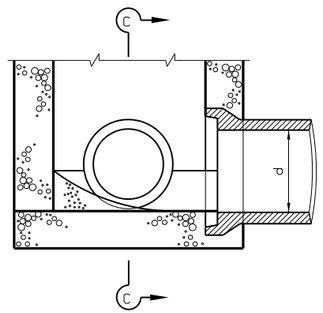
FRAME DETAIL

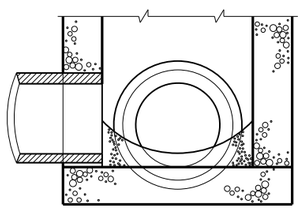


PART SECTION AT INVERT

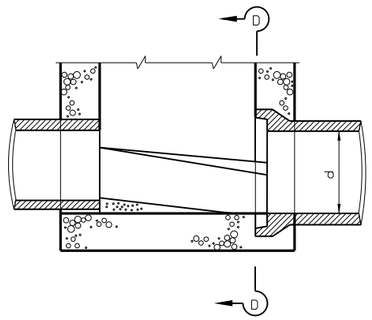
Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

SECTION A-A



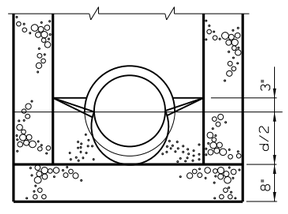


SECTION C-C

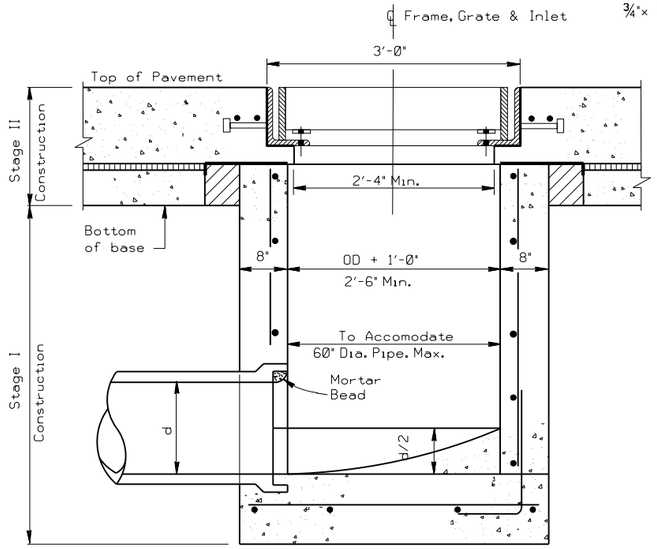


PART SECTION AT INVERT

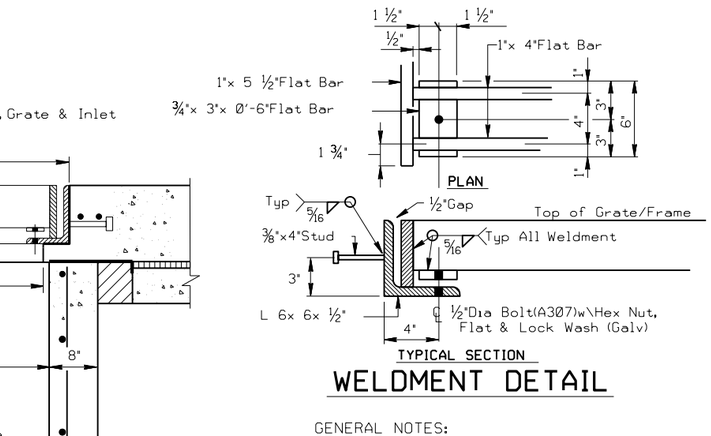
Showing Shaping Of Invert, Pipe Entering From Opposite Sides



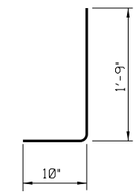
SECTION D-D



SECTION B-B



WELDMENT DETAIL



BARS J (#5)

GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication.

Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

d = Diameter

FOR TRAFFIC LOADS

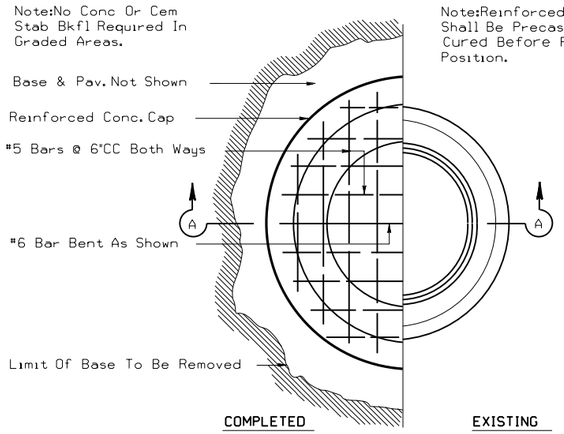
Texas Department of Transportation
Houston District

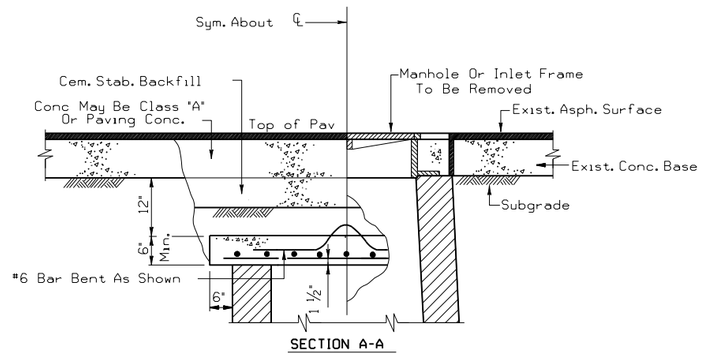
INLET TYPE AZ2G

HIL-AZ2G

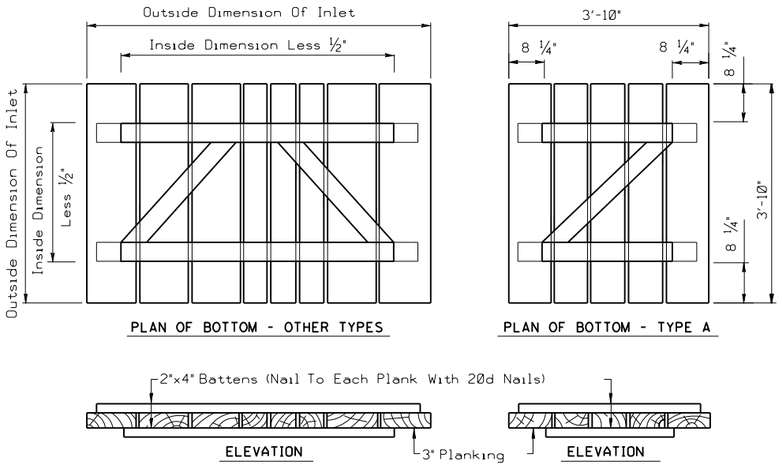
FILE: STDD7.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOU	6	STP 2B23(207)TAPS			146
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

STDD7.DGN

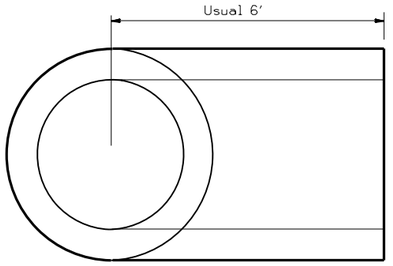




DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)

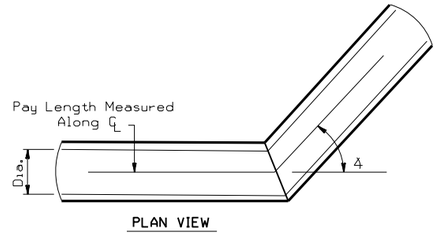


TEMPORARY COVERS FOR ALL TYPES OF INLETS



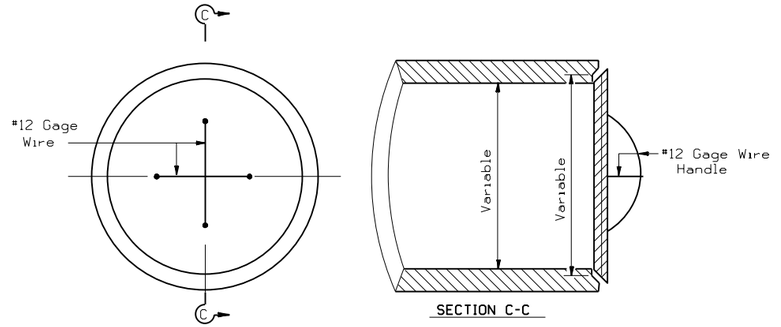
Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

PRECAST STORM SEWER TEE



BENDING DETAIL

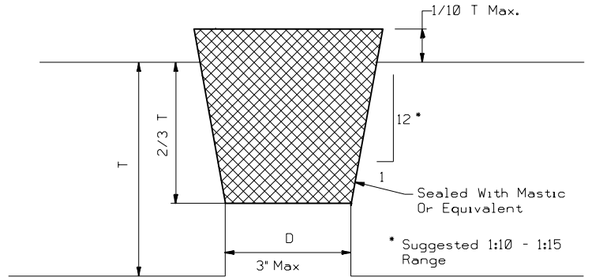
Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer. Price Of "Pipe Collar" Or "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe. Pay Length Measurement To Be Along Horizontal C [& Horizontal Plane Of Pipes.



Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

Concrete Plug For End Of Pipe Culvert Or Sewer

CONCRETE PLUG FOR PIPE

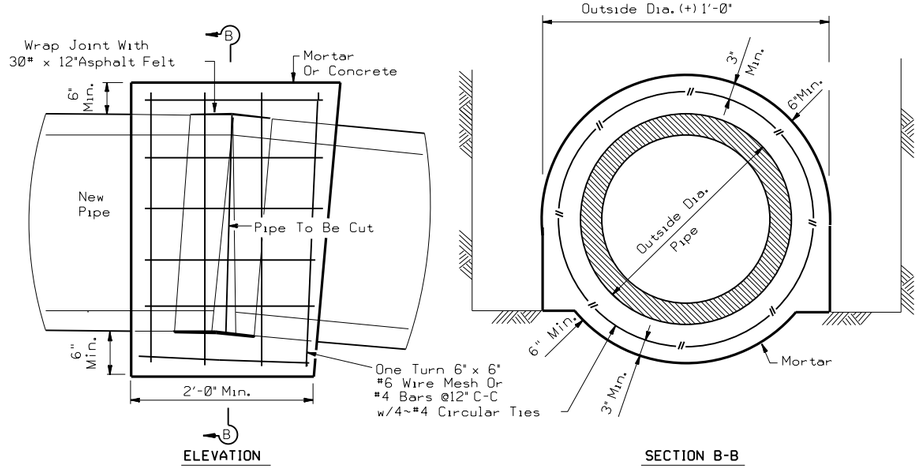


T = Wall Thickness On Top Of Box Or Pipe
D = Diameter Of Lifting Hole

Minimum Length Of Plug Is 2/3 T +/-
Minimum Diameter At Bottom Of Plug = D - ⅛"
Maximum 1/10 T Of Plug Not Seated In Lifting Hole

Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



PIPE COLLAR DETAIL

For Horizontal Or Vertical Placement

d = Diameter
R = Radius

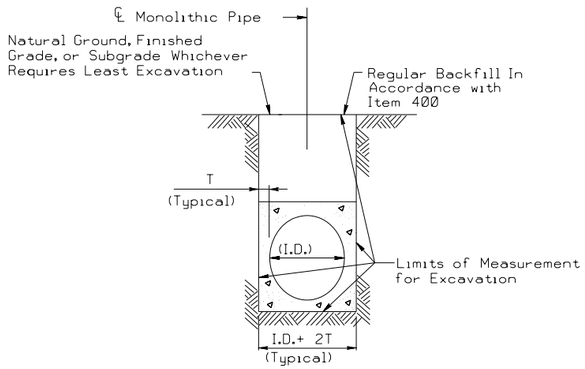
Texas Department of Transportation
Houston District (Bridge)

MISCELLANEOUS SEWER DETAILS

MSD

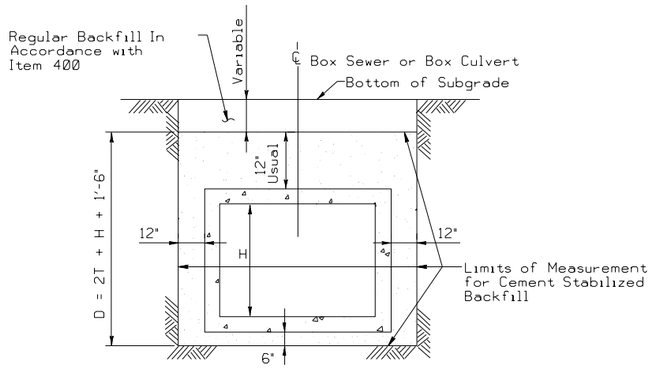
FILE: STDD11.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:	
© TxDOT Mar 2004	DISTRICT	FED REG	PROJECT NO.		SHEET
REVISIONS 3/2015 2014 Specs	~~HOU~~	6	STP 2B23(207)TAPS		147
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

STDD11.DGN



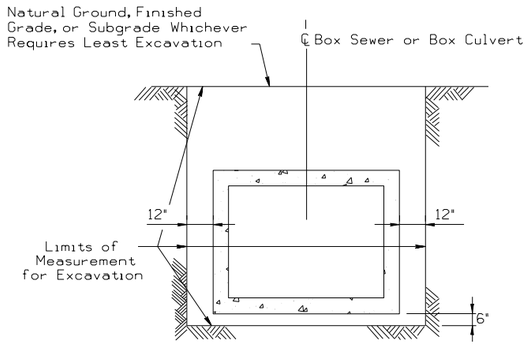
EXCAVATION DETAIL

MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *

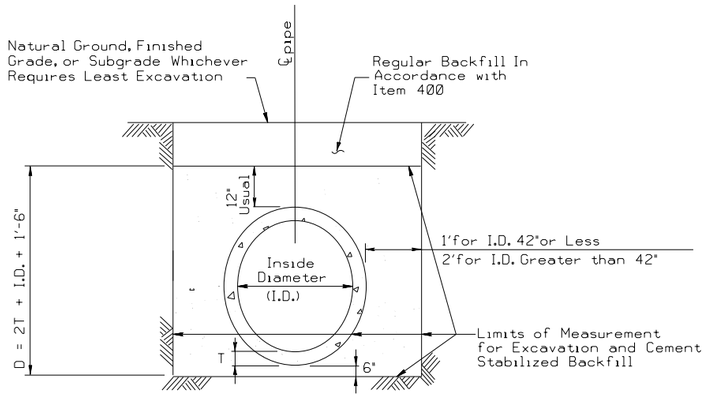


EXCAVATION DETAIL

BOX CULVERTS
IN A GRADED AREA

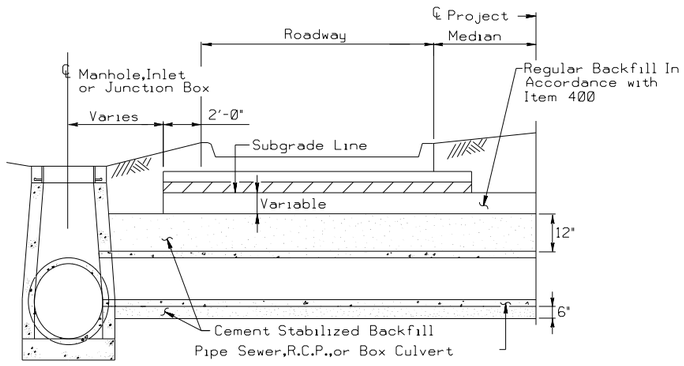
REINFORCED CONCRETE PIPE			
EXCAVATION AND BACKFILL QUANTITIES			
PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA C.Y.PER L.F.PER FT.OF DEPTH	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA C.Y.PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474

MONOLITHIC PIPE		
EXCAVATION QUANTITIES		
PIPE DIA. IN.	T FT.	EXCAVATION C.Y.PER L.F.PER FT.OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



EXCAVATION & BACKFILL DETAIL

REINFORCED CONCRETE PIPE
IN A GRADED OR PAVED AREA
INCLUDING DETOURS



BACKFILL DETAIL

AT MANHOLE, INLET OR JUNCTION BOX

NOTE:

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

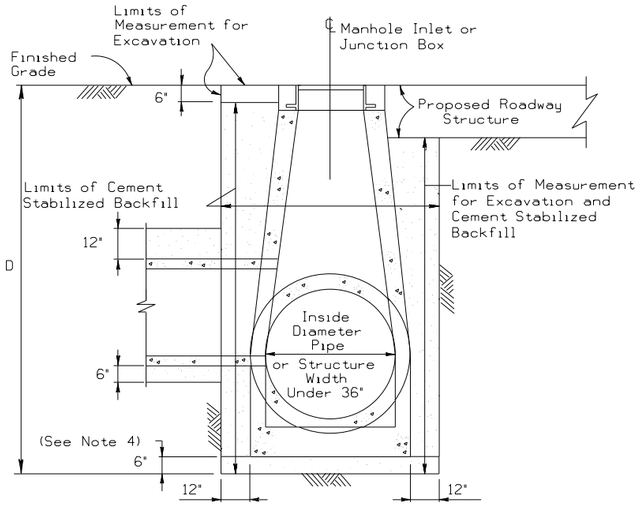
D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

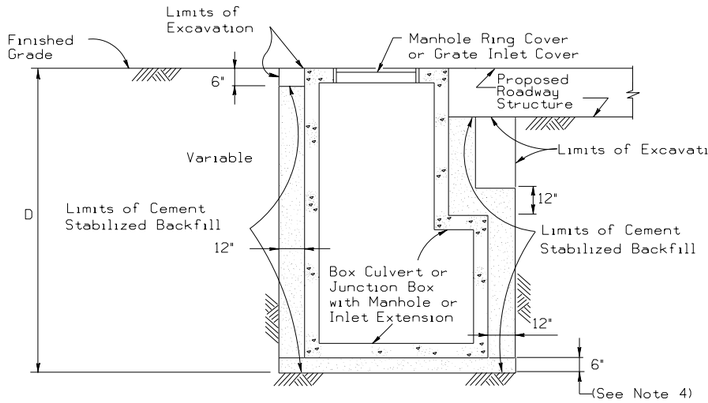
FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 2B23(207)TAPS	148
REVISED 11/05 REVISED 2/2010 Added note to Table 1,Sht 2 of 2. REVISED 6/12 REVISED 9/14	COUNTY		CONTROL SECT JOB	HIGHWAY
	GALVESTON		0979 01 027	FM 519



EXCAVATION AND BACKFILL DETAIL

MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS

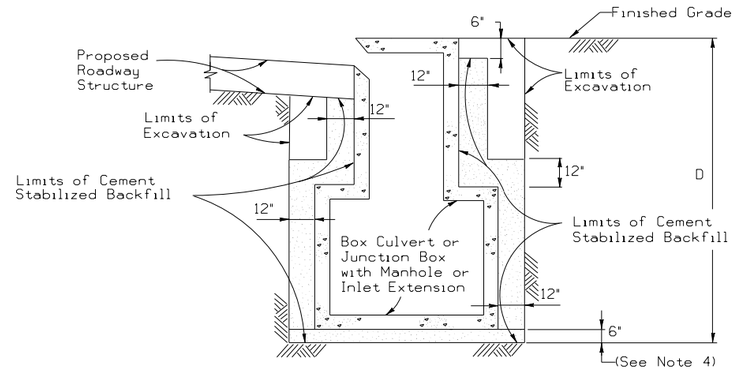
N.T.S.



EXCAVATION AND BACKFILL DETAIL

JUNCTION BOXES IN A
PAVED OR GRADED AREA

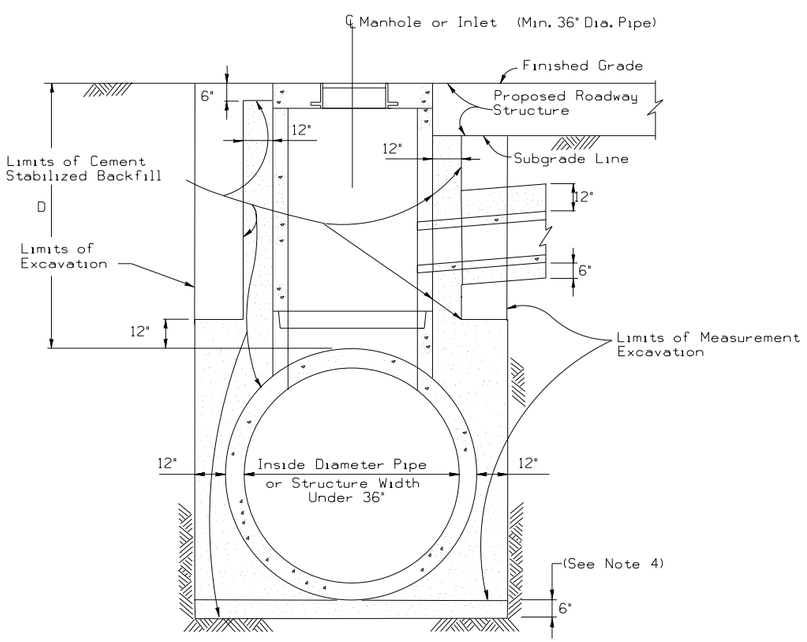
N.T.S.



EXCAVATION AND BACKFILL DETAIL

INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA

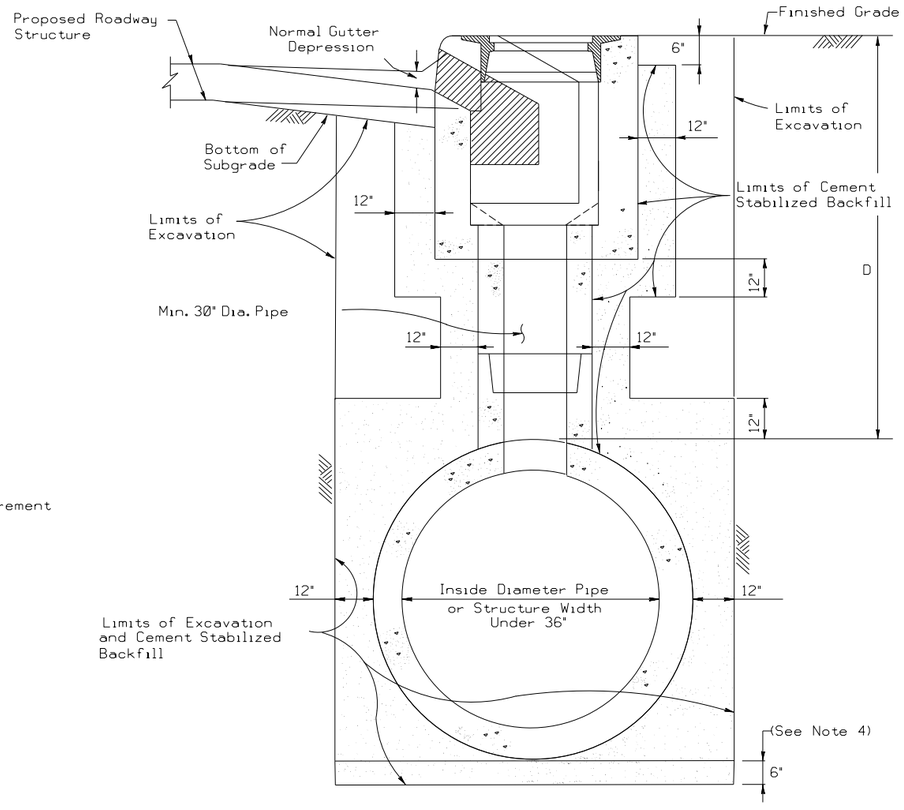
N.T.S.



EXCAVATION AND BACKFILL DETAIL

MANHOLES 36 IN. AND GREATER
IN A PAVED OR GRADED AREA

N.T.S.



EXCAVATION AND BACKFILL DETAIL

CURB INLETS IN A PAVED OR GRADED AREA

N.T.S.

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

TABLE I

SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)

MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

TO BE PAID UNDER ITEM 400-6009 CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)

NOTES:

1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table. 1.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 2/2010 Added note to Table 1. REVISED 6/12 REVISED 9/14 REVISED 3/15	HOU	6	STP 2B23(207)TAPS	149
	COUNTY		CONTROL SECT JOB	HIGHWAY
	GALVESTON		0979 01 027	FM 519

100% SUBMITTAL

LEGEND

EXIST UTILITIES

OH ELECTRIC	OE1	TEXAS NEW MEXICO POWER
OH ELECTRIC	OE2	CENTERPOINT ENERGY (TRANS)
OH ELECTRIC	OE3	TXDOT
UG ELECTRIC	E3	TXDOT
UG ELECTRIC	E4	UNKNOWN
OH FIBER OPTIC	OHFOC1	AT&T TEXAS
OH FIBER OPTIC	OHFOC2	COMCAST
UG FIBER OPTIC	FOC1	AT&T TEXAS
UG FIBER OPTIC	FOC2	COMCAST
OH TELEPHONE	OHT1	AT&T TEXAS
OH TELEPHONE	OHT99	UNKNOWN
UG TELEPHONE	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT ENERGY
GAS	PL2	SHELL
GAS	PL3	AIR LIQUIDE
WATER	W1	CITY OF LA MARQUE
FORCE MAIN	FM1	CITY OF LA MARQUE
WASTEWATER	WW1	CITY OF LA MARQUE

PROP UTILITIES

OH ELECTRIC	OE1	TEXAS NEW MEXICO POWER
OH TELEPHONE	OHT1	AT&T TEXAS
TELEPHONE	T1	AT&T TEXAS
FIBER OPTIC	FOC1	AT&T TEXAS
FIBER OPTIC	FOC2	COMCAST
OH CATV	OHCTV2	COMCAST
CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT ENERGY
WATER	W1	CITY OF LA MARQUE
WASTEWATER	WW1	CITY OF LA MARQUE

PROP UTILITIES (ABAN/REMO)

OH ELECTRIC	OE1	REMO
OH TELEPHONE	OHT1	REMO
TELEPHONE	T1	ABAN
TELEPHONE	T1	REMO
FIBER OPTIC	FOC1	ABAN
FIBER OPTIC	FOC1	REMO
UG CATV	CTV2	ABAN
UG CATV	CTV2	REMO
OH CATV	OHCTV2	REMO
WATER	W1	ABAN
WATER	W1	REMO
WASTEWATER	WW1	ABAN
WASTEWATER	WW1	REMO
GAS	G1	ABAN
GAS	G1	REMO

QUALITY LEVELS

WW1	QUALITY LEVEL "B"
WW1(C)	QUALITY LEVEL "C"
WW1(D)	QUALITY LEVEL "D"

TYPICAL FOR ALL UTILITIES

Quality Level "D": Information derived from existing records and/or oral recollections,

Quality Level "C": Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to quality level D information.

Quality Level "B": Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities (aka Designating).

Quality Level "A": Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities, usually at a specific point (aka Locating).

OHFOC1 OHFOC2	OVERHEAD COMMUNICATION CALLOUT
	EXISTING ROW
	PROPOSED ROW
	ROADWAY CENTERLINE OR BASELINE
	UTILITY EASEMENT
	EXISTING DRAINAGE
ABC#-#	CONFLICT ID

EXIST UTILITIES

- POWER POLE
- GENERAL POLE
- TRAFFIC CONTROL BOX
- PULL BOX
- ELECTRIC POWER BOX
- LIGHT POLE
- SIGNAL POLE TRAFFIC LIGHT
- TRAFFIC SIGNAL LIGHT POLE
- PEDESTRIAN SIGNAL BOX
- GUY ANCHOR
- TRANSMISSION TOWER
- ELECTRIC PEDESTAL
- TELEPHONE PEDESTAL
- PAINT MARKS
- PIN FLAG
- PHONE MARKER
- FOC MARKER
- GAS METER
- GAS PAINT MARKS
- GAS MARKER
- GAS PIN FLAG
- GAS VENT
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- SPRINKLER VALVE
- WATER MARKER
- WATER PIN FLAG

EXIST UTILITIES

- CLEAN OUT
- SANITARY MANHOLE
- DRAINAGE MANHOLE
- GENERIC JUNCTION BOX
- GENERIC MANHOLE
- GENERIC PEDESTAL
- GENERIC VALVE

PROP UTILITIES

- POWER POLE
- POWER POLE W/ RISER
- ELECTRIC SERVICE POLE
- GUY ANCHOR
- ELECTRIC POWER BOX
- TELEPHONE MH
- TELEPHONE PEDESTAL
- TELEPHONE POLE
- CABLE PEDESTAL
- GAS VENT
- GAS VALVE
- GAS METER
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- SANITARY MH
- CLEANOUT

ABBREVIATIONS

ABAN	ABAN
AC	ASBESTOS CEMENT
BL	BASE LINE
BOT	BOTTOM
CI	CAST IRON
CL	CENTER LINE
CT	COUNT
CSC	CONCRETE STEEL CYLINDER
CSNG	CASING
DI	DUCTILE IRON
DBC	DIRECT BURIED CABLE
ESMT	EASEMENT
EXIST	EXISTING
FH	FIBER HANDHOLE
FM	FORCE MAIN
FOC	FIBER OPTIC CABLE
GL	GAS LINE
HP	HIGH PRESSURE
INV	INVERT
IP	INTERMEDIATE PRESSURE
LP	LOW PRESSURE
MH	MANHOLE
PL	PIPELINE
PLA	PLASTIC
PROP	PROPOSED
PVC	POLYVINYL CHLORIDE
OH	OVERHEAD
QLA	QUALITY LEVEL A
QLB	QUALITY LEVEL B
QLC	QUALITY LEVEL C
QLD	QUALITY LEVEL D
RCP	REINFORCED CONCRETE PIPE
REMO	REMOVAL
ROW	RIGHT OF WAY
SAN	SANITARY
SSI	STORM SEWER INLET
STL	STEEL
SWR	SEWER
SZ	SIZE
UG	UNDERGROUND
UNKN	UNKNOWN
VC	VITRIFIED CLAY
WL	WATER LINE
WT	WALL THICKNESS
WW	WASTEWATER
W/	WITH

COMPANY	NAME	ADDRESS	PHONE	EMAIL
AT&T TEXAS	BRIAN HILL	9051 PARK WEST DR, HOUSTON, TX 77063	832-491-7378	BH898J@ATT.COM
COMCAST	DANA MORENO	7033 AIRPORT BLVD, HOUSTON, TX 77061	713-637-5638	DANA_MORENO@COMCAST.COM
CENTERPOINT ENERGY (GAS)	CINDY MARTINEZ	1111 LOUISIANA ST, 7TH FLOOR, HOUSTON, TX 77002	713-207-6555	CINDY.MARTINEZ@CENTERPOINTENERGY.COM
SHELL PIPELINE CO. LP	ROBERT WAGNER	150 N DAIRY ASFORD, WCK A0226, HOUSTON, TX 77079	832-696-4296	ROBERT.WAGNER2@SHELL.COM
TEXAS NEW MEXICO POWER	VINCENT HERRERA	1207 W PARKWOOD AVE, FRIENDSWOOD, TX 77546	281-996-0453 x7103	VINCENT.HERRERA@TNMP.COM
CITY OF LA MARQUE	RICK SAILLER	4916 TEXAS AVE, SUITE C, LA MARQUE, TX 77568	409-938-9213	R.SAILLER@CITYOFLAMARQUE.ORG

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED UTILITY LAYOUT LEGEND

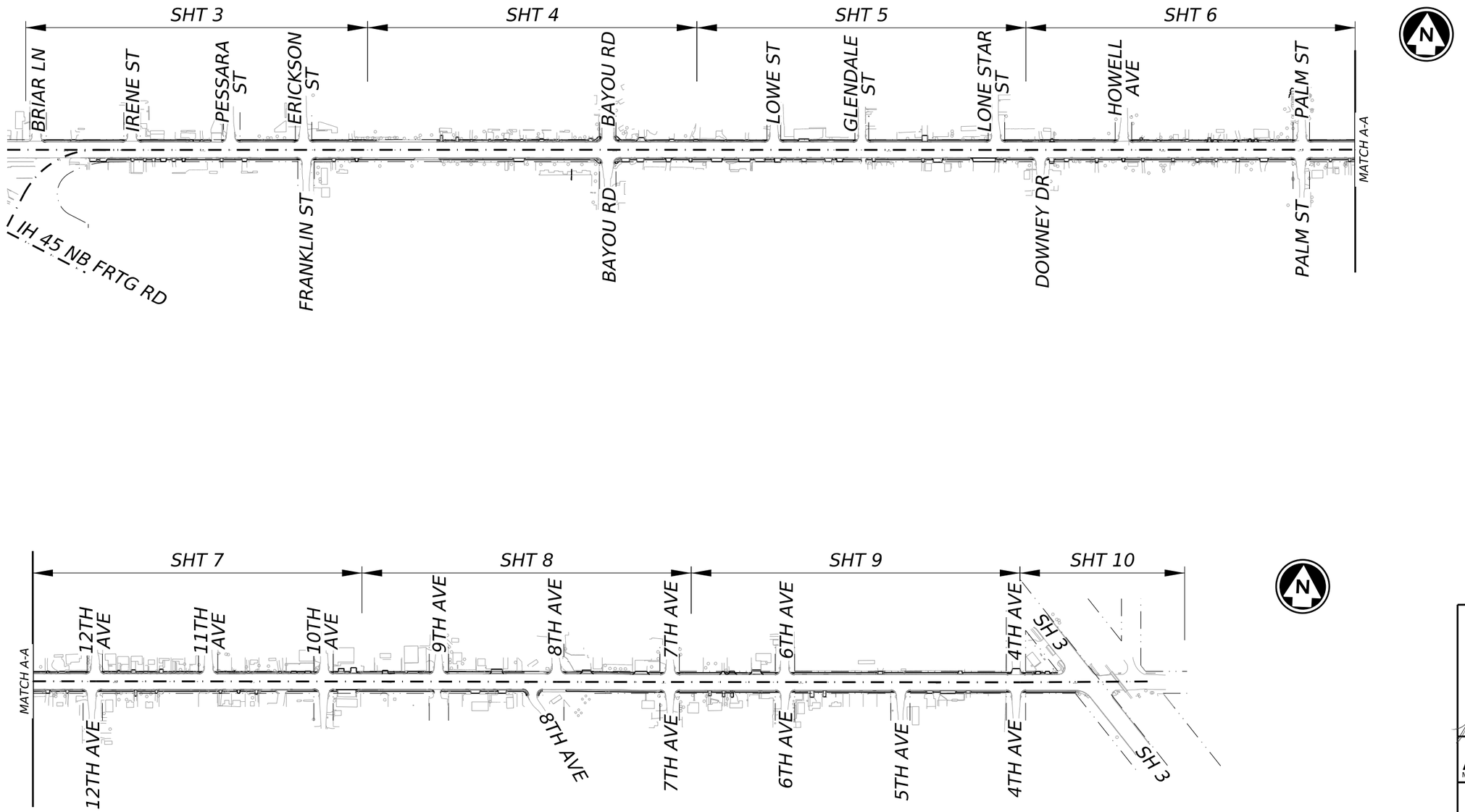
SCALE: NTS SHEET 1 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		150

DATE: 9/11/2023 6:58:33 PM
FILE: 01 FM 519 UTIL LEG.dgn

100% SUBMITTAL

DW	MR	CK	JY	DW	EC	CK	WA



STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

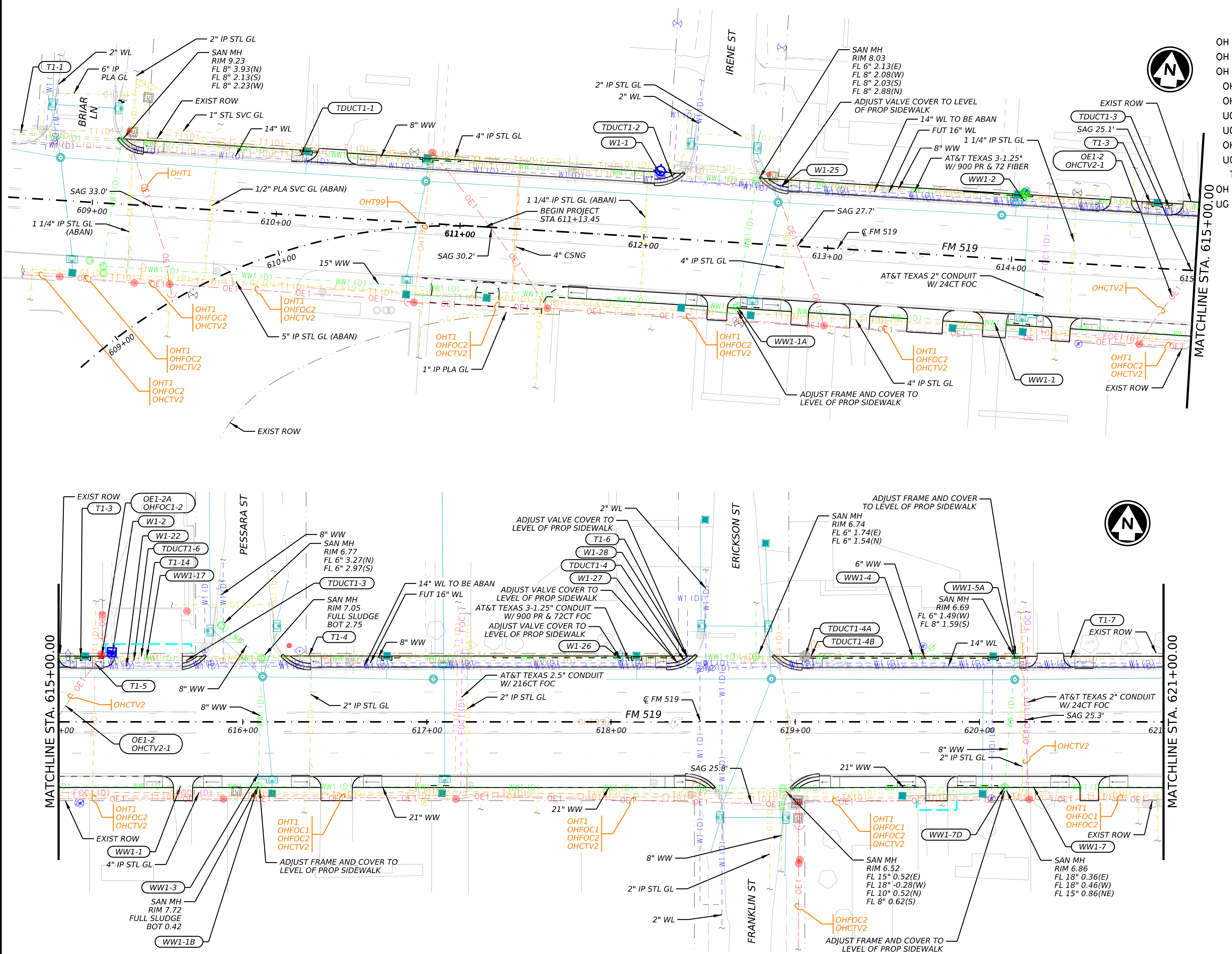
PROPOSED UTILITY LAYOUT
SHEET LAYOUT

SCALE: 1"=400' SHEET 2 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		151

DATE: 9/11/2023 7:00:19 PM
FILE: 02_FM 519_UTIL_LAY.dgn

100% SUBMITTAL



LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50
SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

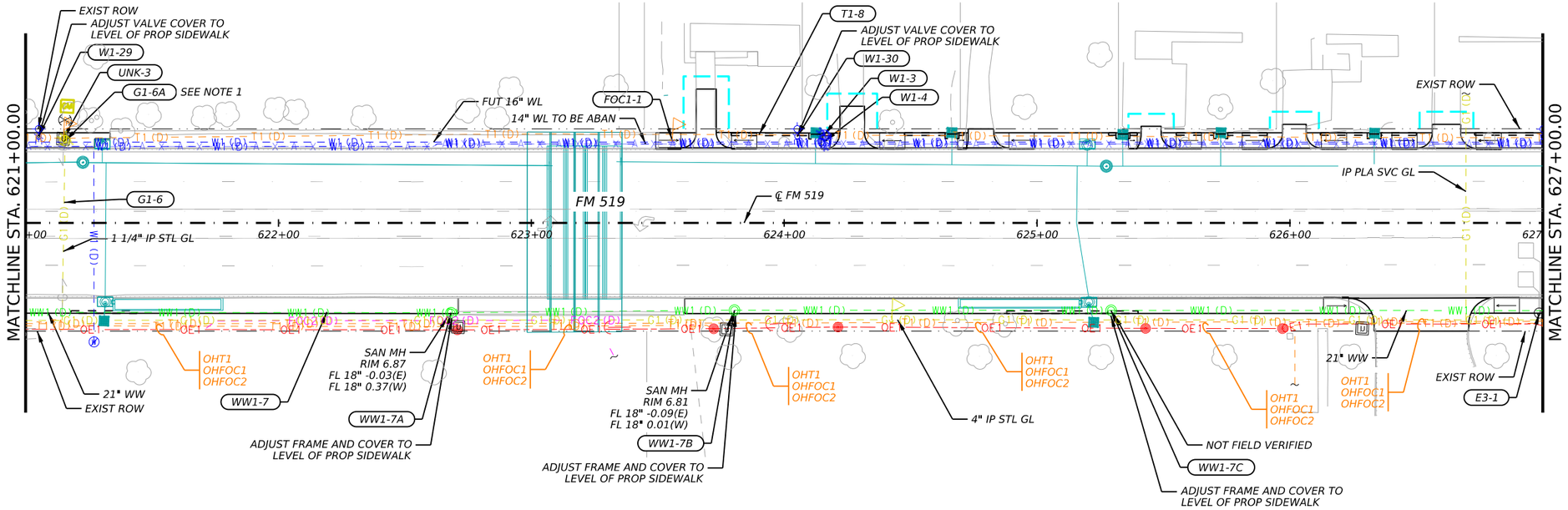
PROPOSED UTILITY LAYOUT
BEGIN TO STA 621+00

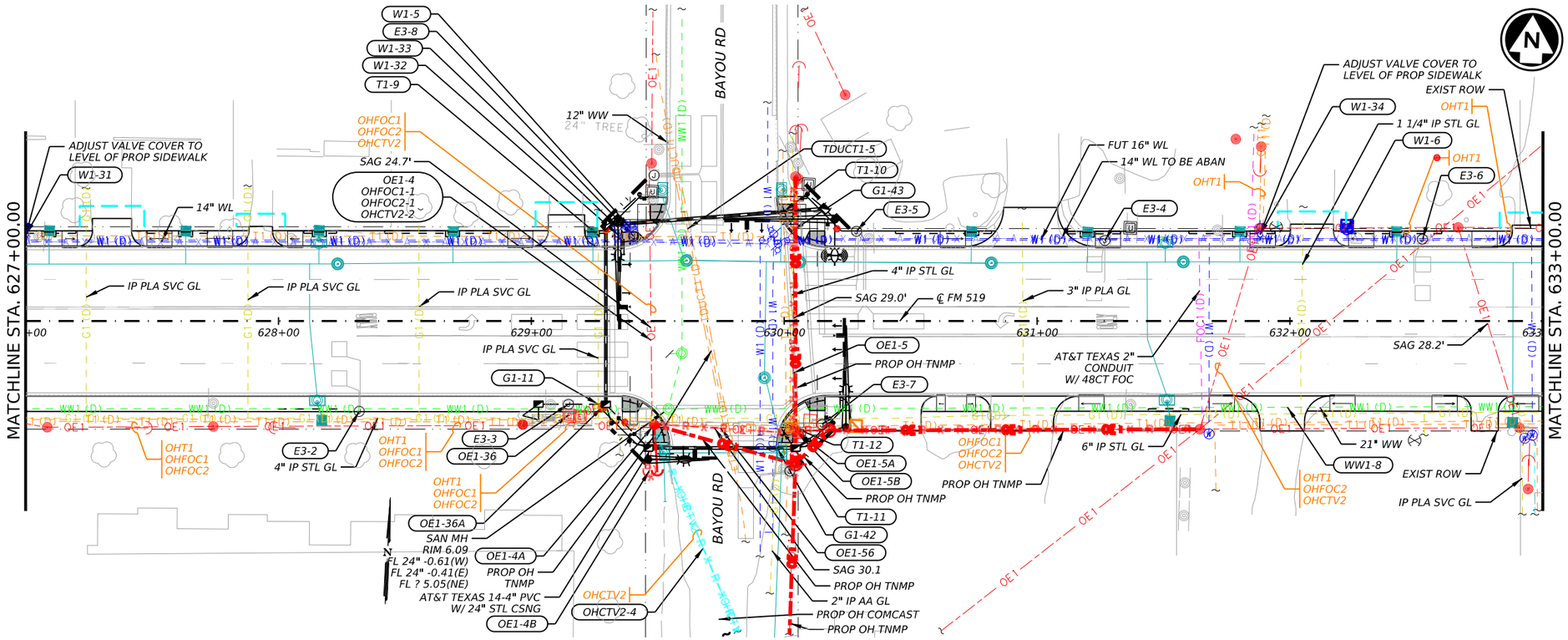
SCALE: 1"=50'
SHEET 3 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		152

DATE: 9/11/2023 7:02:07 PM
FILE: 03 FM 519 UTIL PL01.dgn

100% SUBMITTAL





LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

NOTES:

1. GAS METER RELOCATION TO BE PAID UNDER FORCE ACCT 18-0275. CONTRACTOR TO COORDINATE WITH CENTERPOINT GAS ON ACTUAL LOCATION OF RELOCATED GAS METER.

0 25 50
SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

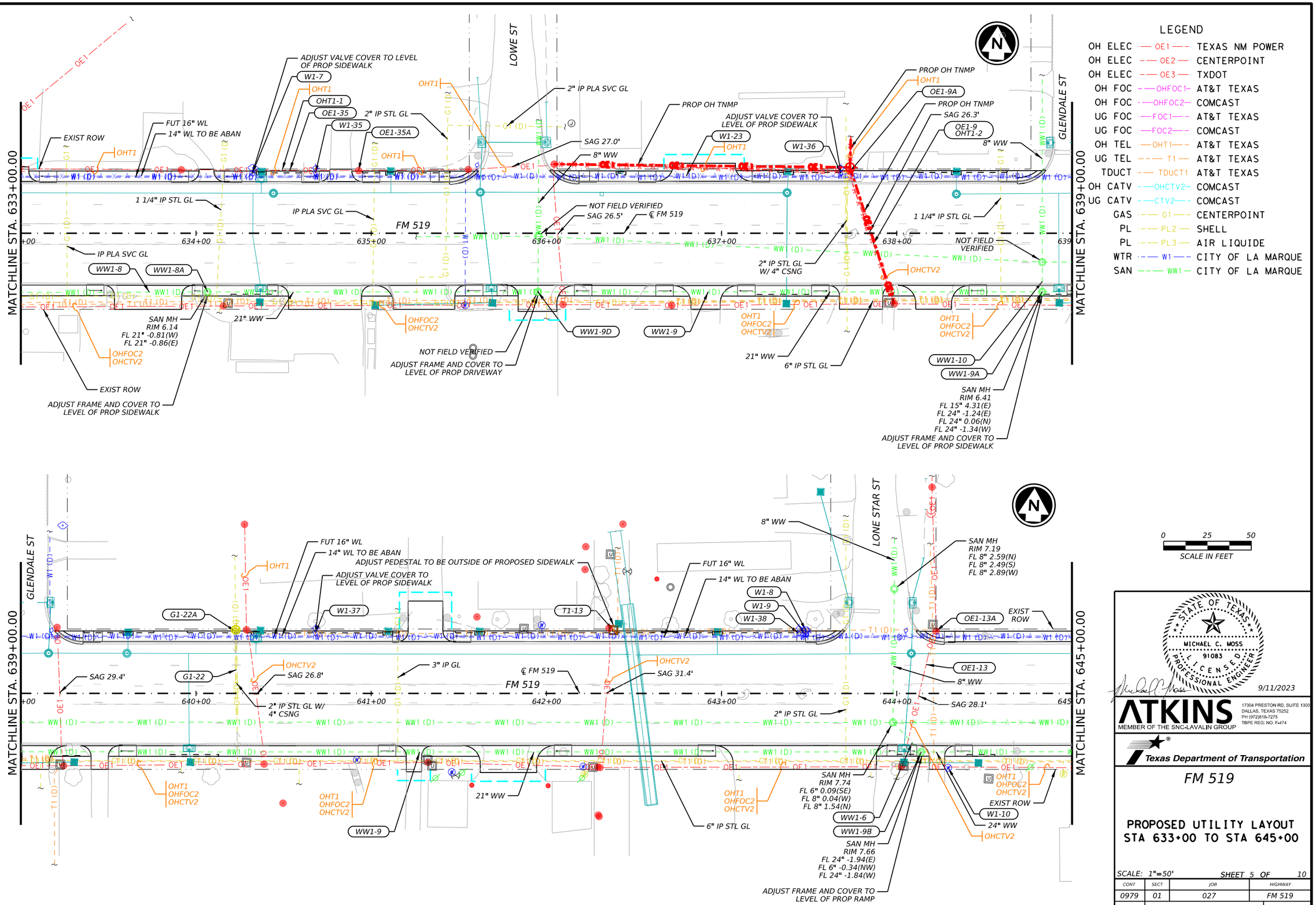
PROPOSED UTILITY LAYOUT
STA 621+00 TO STA 633+00

SCALE: 1"=50' SHEET 4 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		153

DATE: 9/11/2023 7:03:54 PM
FILE: 04 FM 519 UTIL PL02.dgn

100% SUBMITTAL



LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50
SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

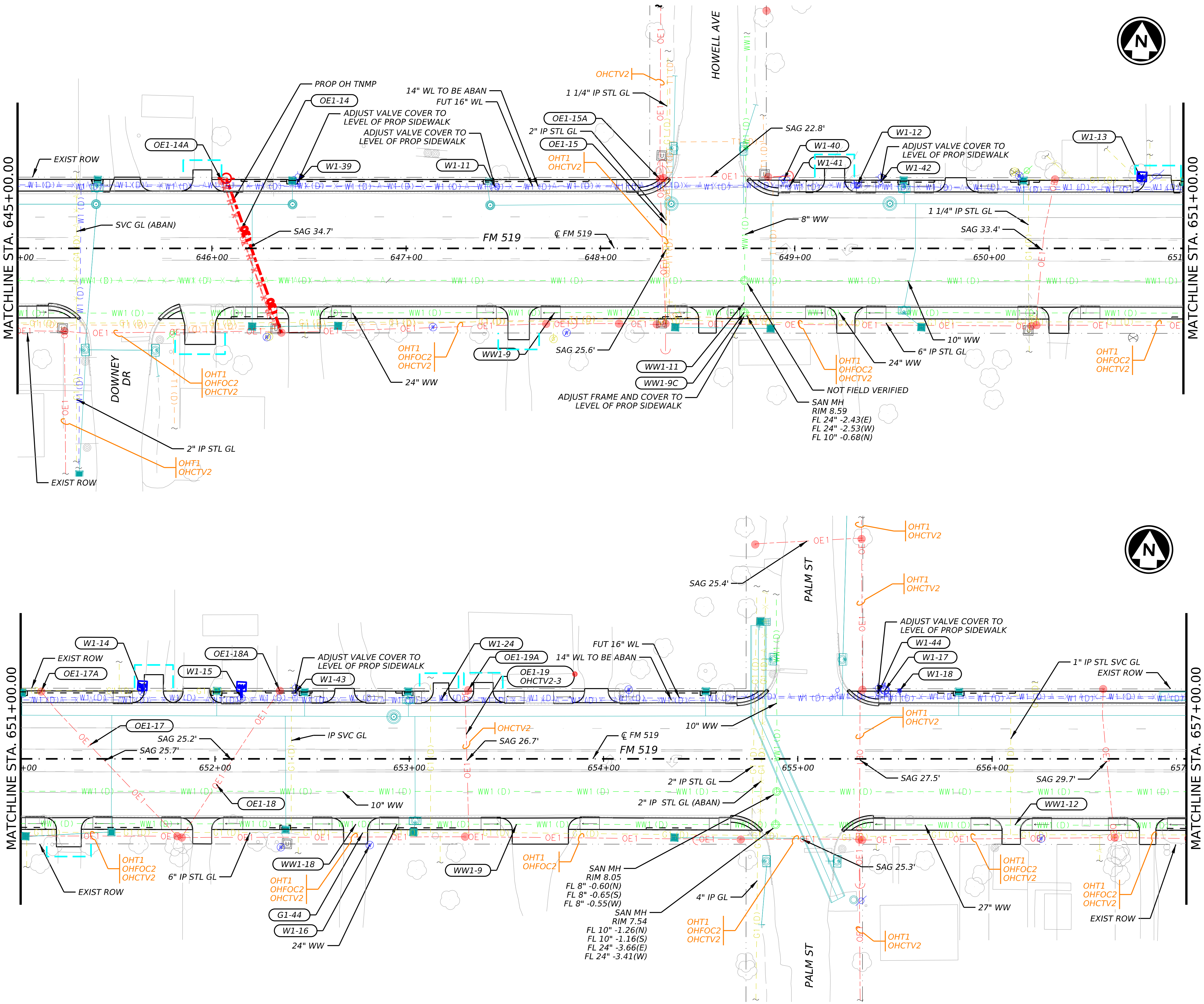
PROPOSED UTILITY LAYOUT
STA 633+00 TO STA 645+00

SCALE: 1"=50' SHEET 5 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		154

DATE: 9/11/2023 7:06:43 PM
FILE: 05 FM 519 UTIL PL03.dgn

100% SUBMITTAL



LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50
SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED UTILITY LAYOUT
STA 645+00 TO STA 657+00

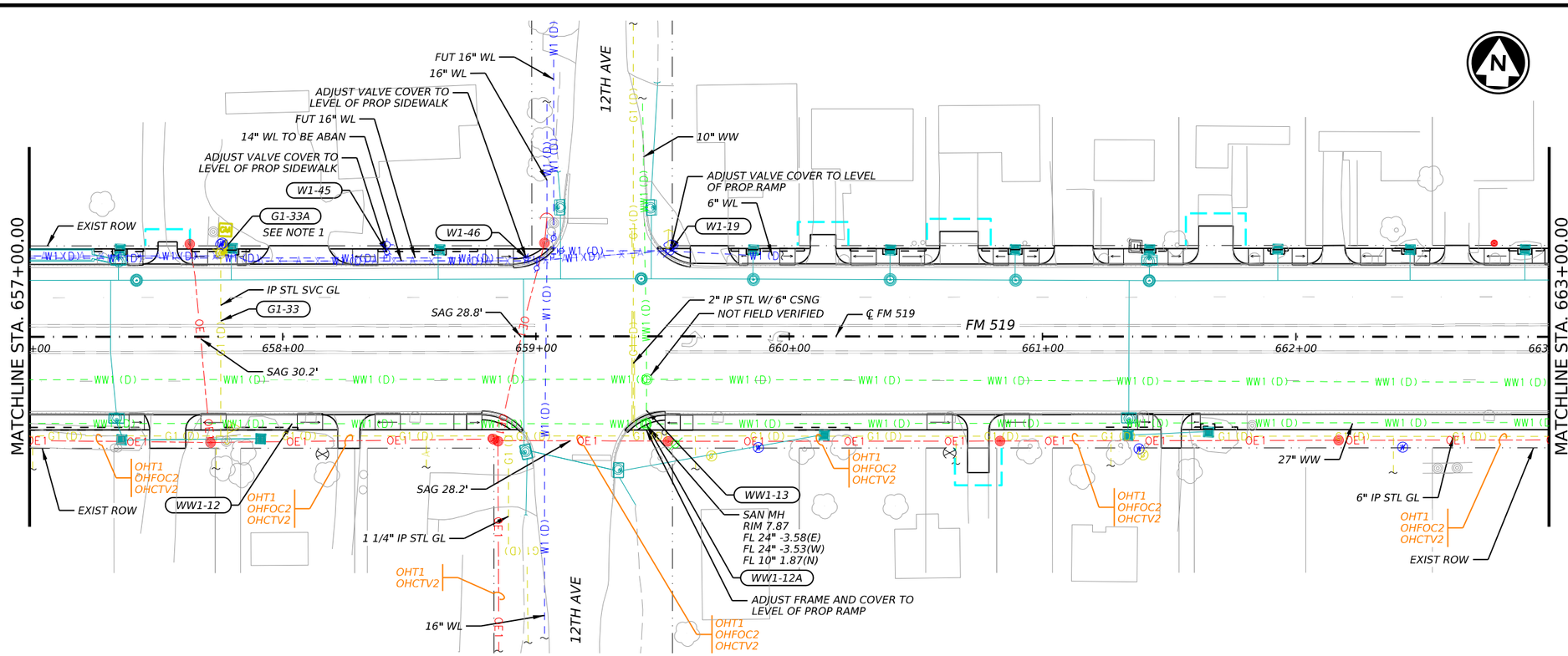
SCALE: 1"=50' SHEET 6 OF 10

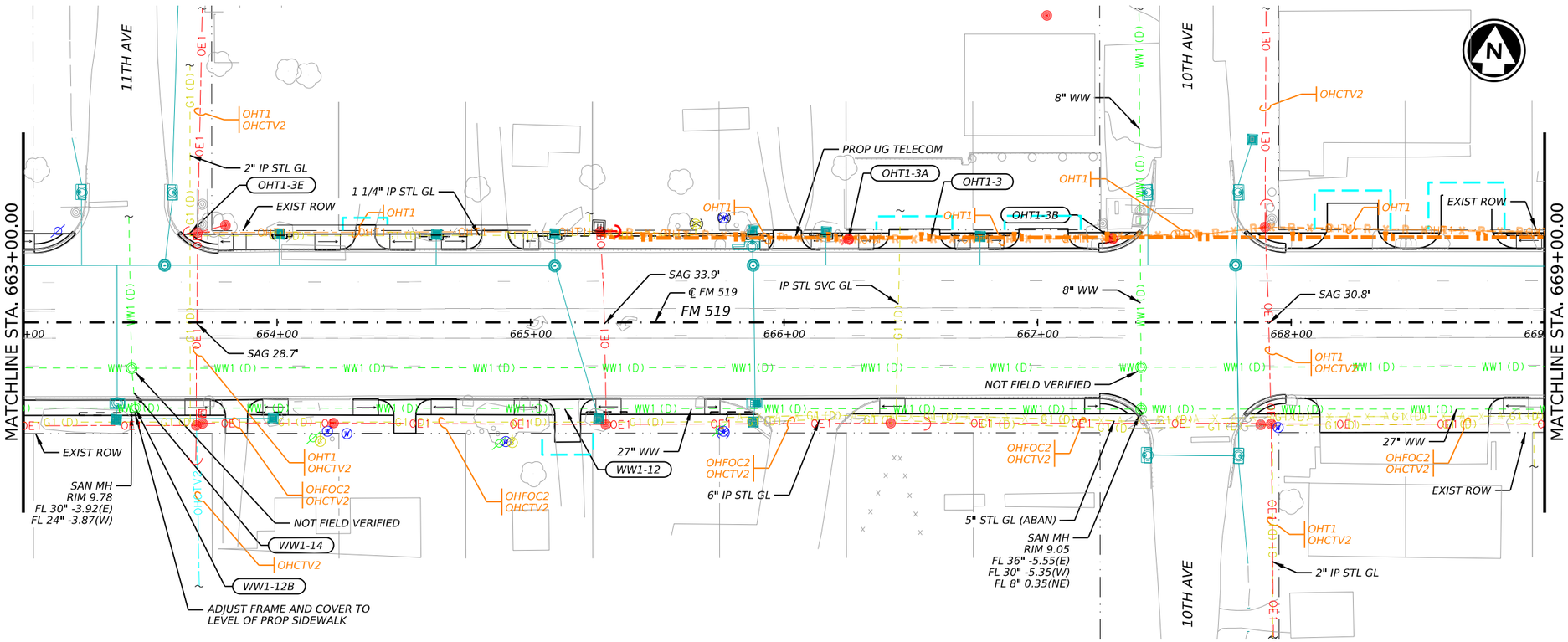
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		155

DATE: 9/11/2023 7:10:12 PM
FILE: 06 FM 519 UTIL PL04.dgn

100% SUBMITTAL

DW | JK | CK | EC | CK | WA





LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

NOTES:

1. GAS METER RELOCATION TO BE PAID UNDER FORCE ACCT 18-0275. CONTRACTOR TO COORDINATE WITH CENTERPOINT GAS ON ACTUAL LOCATION OF RELOCATED GAS METER.

0 25 50

SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED UTILITY LAYOUT STA 657+00 TO STA 669+00

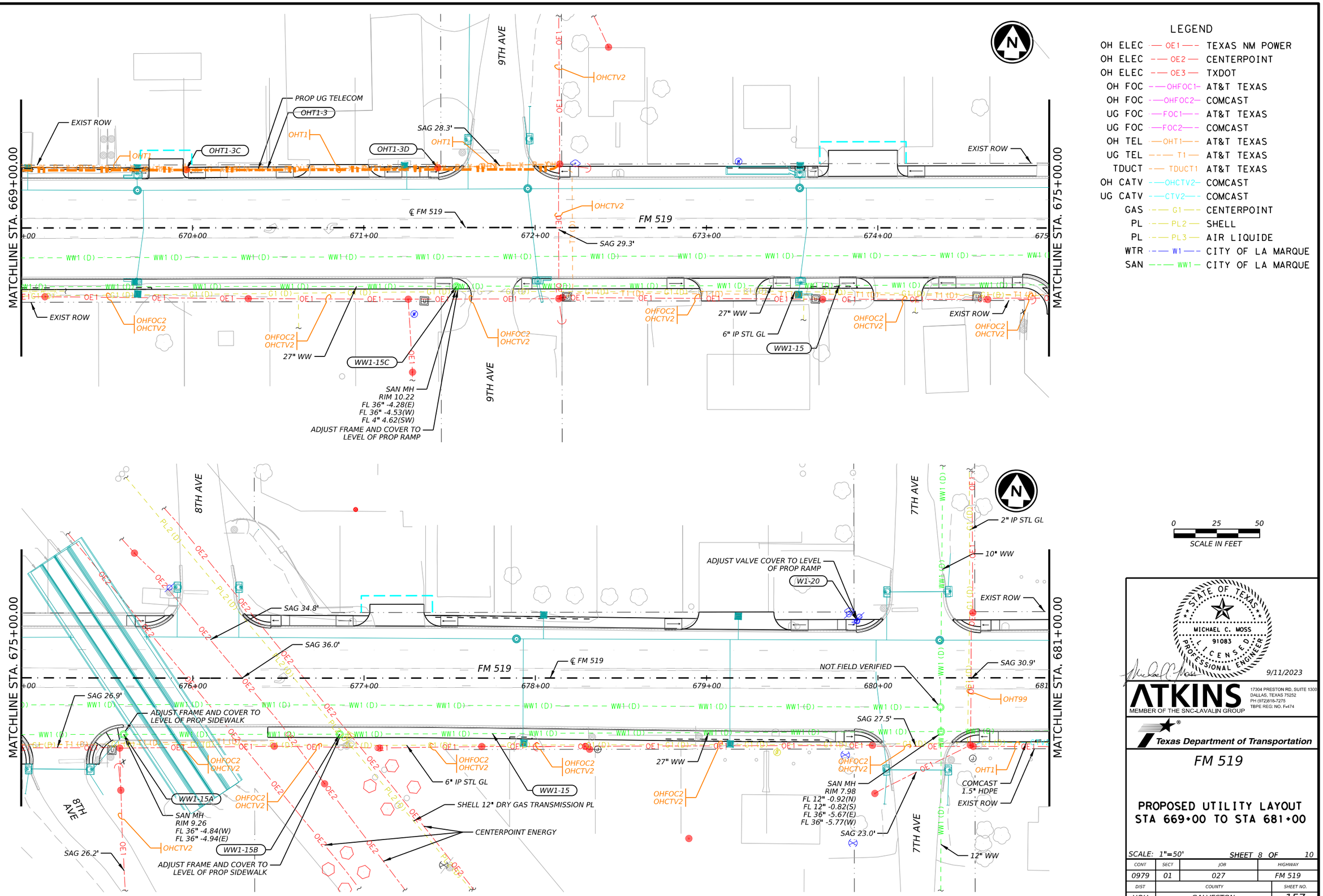
SCALE: 1"=50' SHEET 7 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		156

DATE: 9/11/2023 7:14:01 PM
FILE: 07_FM 519_UTIL_PL05.dgn

100% SUBMITTAL

DW | JV | CK | EC | WA



LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50

SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

PROPOSED UTILITY LAYOUT
STA 669+00 TO STA 681+00

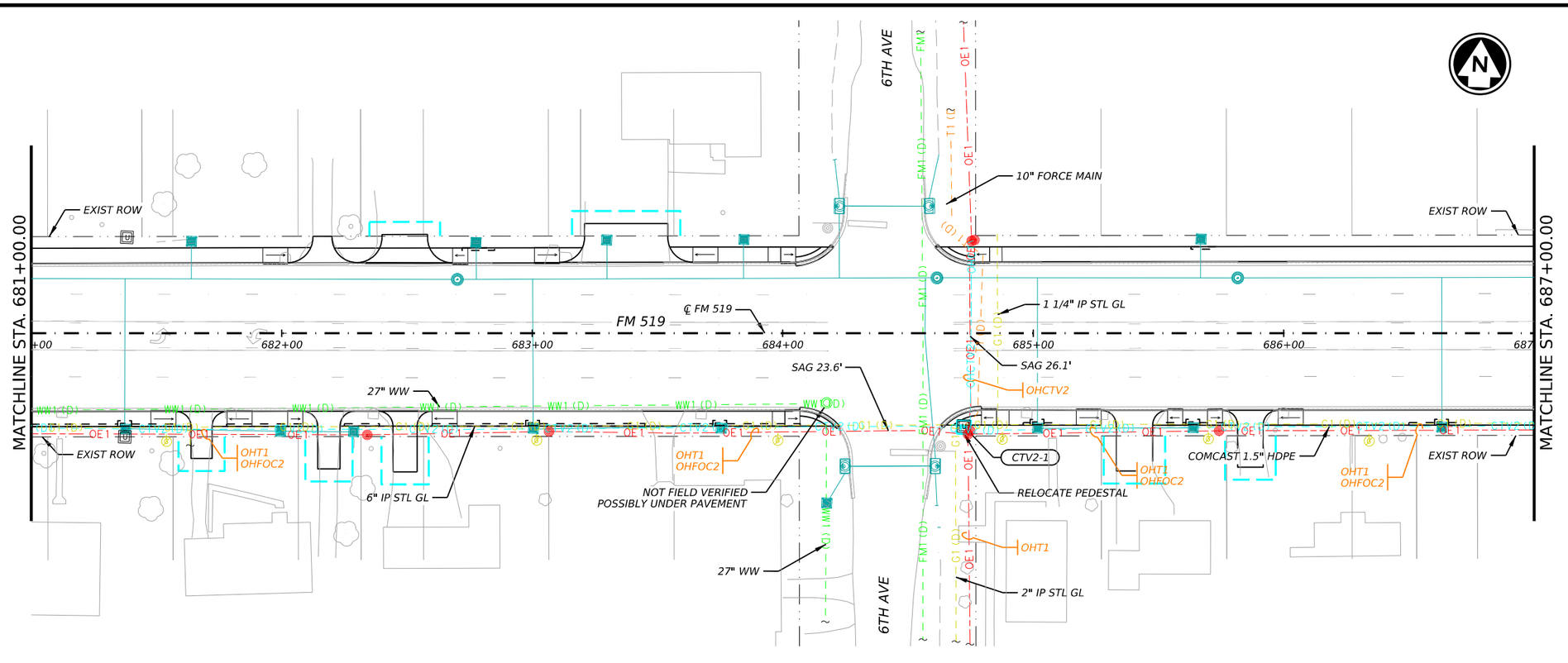
SCALE: 1"=50' SHEET 8 OF 10

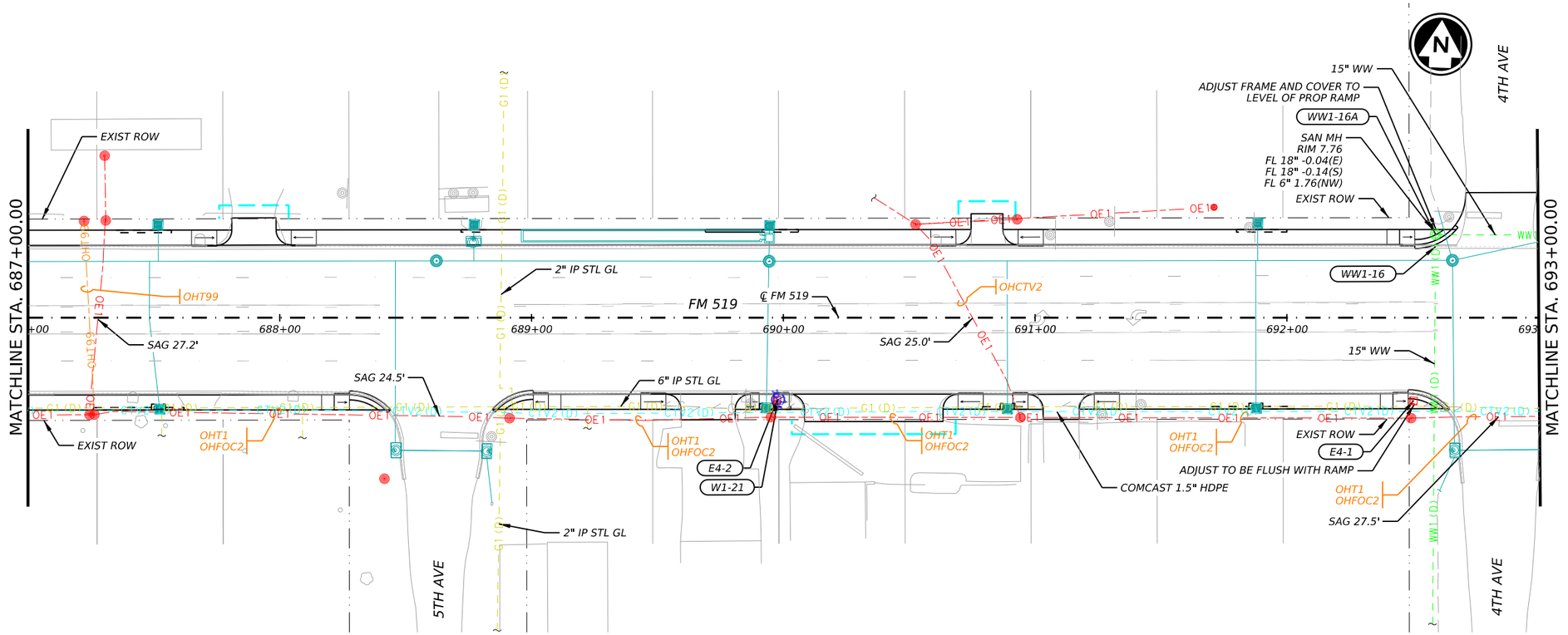
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		157

DATE: 9/11/2023 7:15:52 PM
FILE: 08 FM 519 UTIL PL06.dgn

100% SUBMITTAL

DW | JW | CK | EC | CK | WA





LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50

SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER

9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

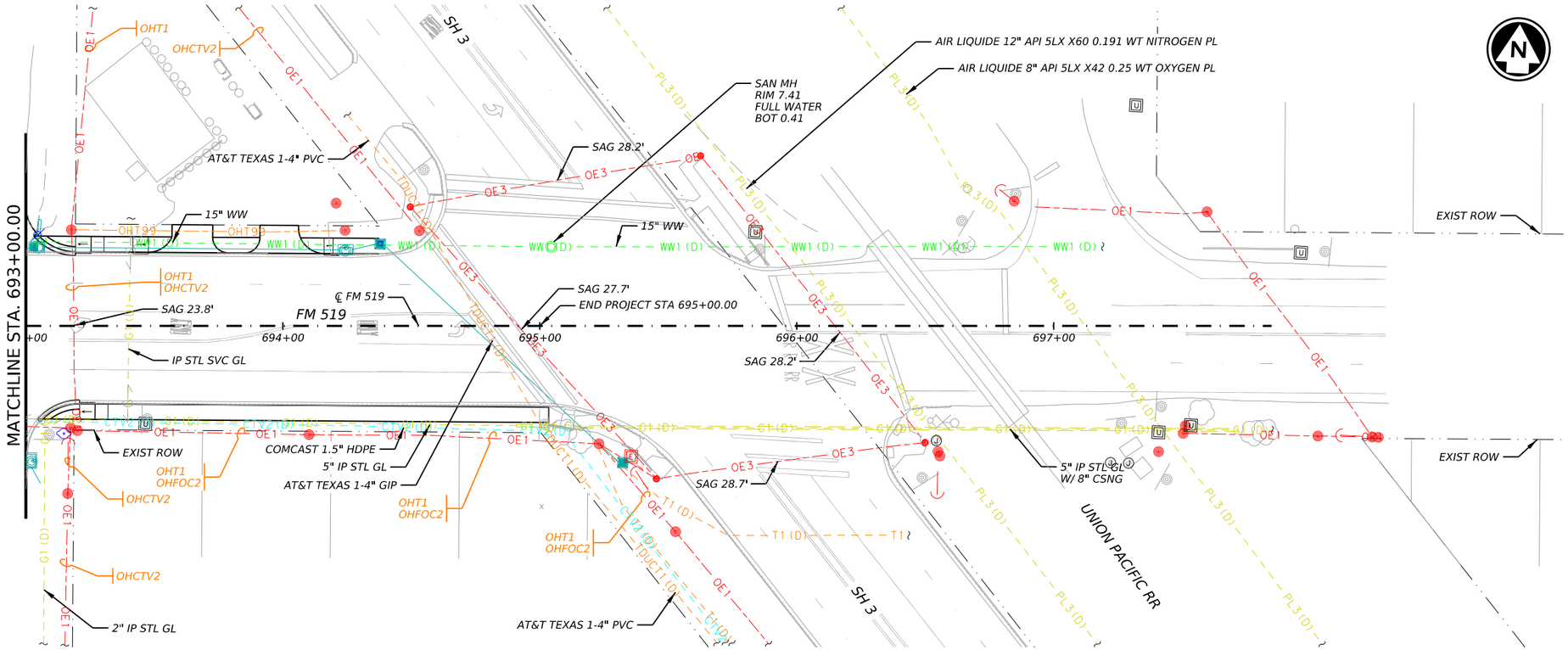
PROPOSED UTILITY LAYOUT STA 681+00 TO STA 693+00

SCALE: 1"=50' SHEET 9 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		158

DATE: 9/11/2023 7:17:42 PM
FILE: 09 FM 519 UTIL PL07.dgn

100% SUBMITTAL



LEGEND

OH ELEC	OE1	TEXAS NM POWER
OH ELEC	OE2	CENTERPOINT
OH ELEC	OE3	TXDOT
OH FOC	OHFOC1	AT&T TEXAS
OH FOC	OHFOC2	COMCAST
UG FOC	FOC1	AT&T TEXAS
UG FOC	FOC2	COMCAST
OH TEL	OHT1	AT&T TEXAS
UG TEL	T1	AT&T TEXAS
TDUCT	TDUCT1	AT&T TEXAS
OH CATV	OHCTV2	COMCAST
UG CATV	CTV2	COMCAST
GAS	G1	CENTERPOINT
PL	PL2	SHELL
PL	PL3	AIR LIQUIDE
WTR	W1	CITY OF LA MARQUE
SAN	WW1	CITY OF LA MARQUE

0 25 50
SCALE IN FEET

STATE OF TEXAS
MICHAEL C. MOSS
91083
LICENSED
PROFESSIONAL ENGINEER
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

PROPOSED UTILITY LAYOUT STA 693+00 TO END

SCALE: 1"=50' SHEET 10 OF 10

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		159

DATE: 9/11/2023 7:19:32 PM
FILE: 10 FM 519 UTIL PL08.dgn

100% SUBMITTAL

CK: DW: CK: DW:

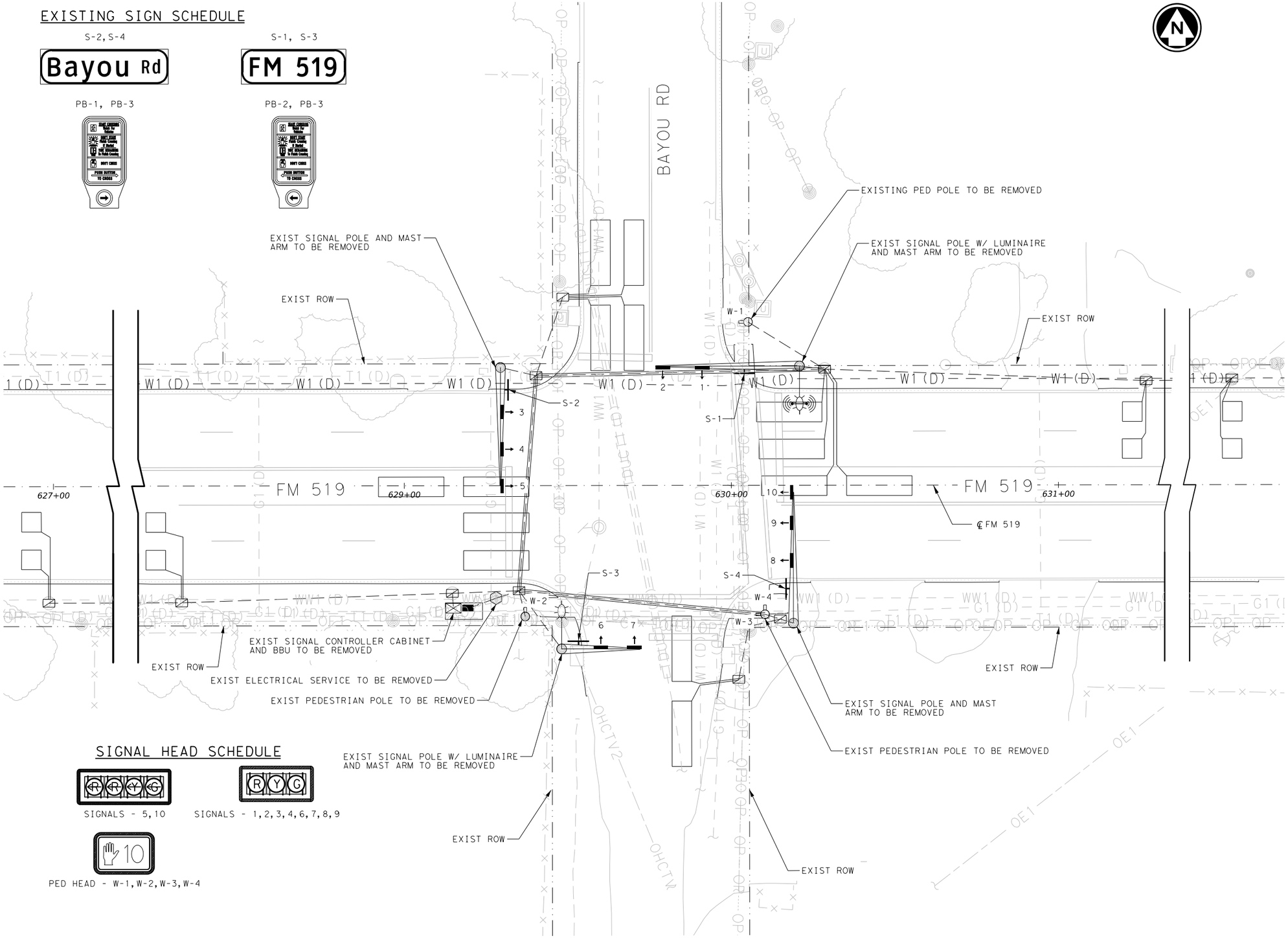
EXISTING SIGN SCHEDULE

S-2, S-4

PB-1, PB-3

S-1, S-3

PB-2, PB-3



SIGNAL HEAD SCHEDULE

SIGNALS - 5,10

SIGNALS - 1,2,3,4,6,7,8,9

PED HEAD - W-1,W-2,W-3,W-4

LEGEND

- EXIST SIGNAL POLE & MAST ARM
- EXIST SIGNAL HEAD
- EXIST SIGN MAST ARM MOUNT)
- EXIST PED BUTTON
- EXIST GROUND BOX
- EXIST SIGNAL CONTROLER CABINET W/ BBU
- EXIST SERVICE ASSEMBLY
- EXIST WIRELESS RADIO
- EXIST LUMINAIRE
- EXIST CONDUIT (TRENCH)
- EXIST CONDUIT (BORE)
- EXIST LOOP DETECTOR

NOTES:

1. REMOVE ALL EXISTING GROUND BOXES, ABANDON CONDUITS AND CABLES THAT WILL NOT BE REUSED AS PART OF PROPOSED SIGNAL INSTALLATIONS.

0 15 30

SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519 AT BAYOU RD

EXISTING TRAFFIC SIGNAL LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		160

DATE: 9/12/2023 10:36:07 AM
FILE: ...\FM 519 SGNL LAYOUT SHEET 01.dgn

100% SUBMITTAL

SIGN SCHEDULE

S-2, S-4

D3-1G(7) 10in;
1.5" Radius, 0.5" Border, White on Green;
"Bayou", ClearviewHwy-3-W; "Rd", ClearviewHwy-3-W;

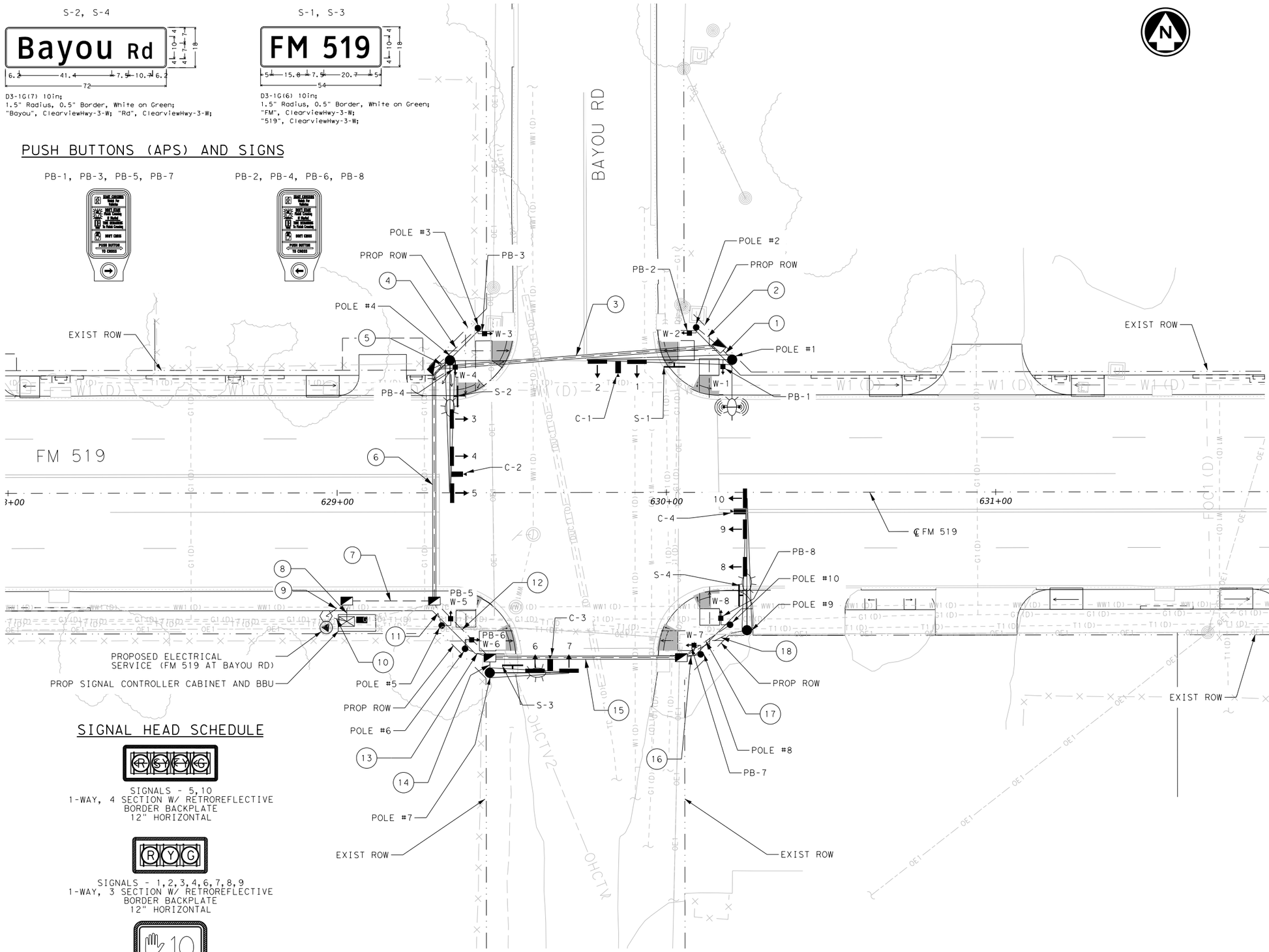
S-1, S-3

D3-1G(6) 10in;
1.5" Radius, 0.5" Border, White on Green;
"FM", ClearviewHwy-3-W;
"519", ClearviewHwy-3-W;

PUSH BUTTONS (APS) AND SIGNS

PB-1, PB-3, PB-5, PB-7

PB-2, PB-4, PB-6, PB-8



SIGNAL HEAD SCHEDULE

SIGNALS - 5,10
1-WAY, 4 SECTION W/ RETROREFLECTIVE
BORDER BACKPLATE
12" HORIZONTAL

SIGNALS - 1,2,3,4,6,7,8,9
1-WAY, 3 SECTION W/ RETROREFLECTIVE
BORDER BACKPLATE
12" HORIZONTAL

PED HEAD - W-1,W-2,W-3,W-4,W-5,W-6,W-7,W-8

LEGEND

- PROP SIGNAL POLE & MAST ARM
- PROP PEDESTRIAN POLE ASSEMBLY
- PROP SIGNAL HEAD
- PROP SIGN (MAST ARM MOUNT)
- PROP PED BUTTON
- PROP GROUND BOX
- PROP SIGNAL CONTROLER CABINET W/ BBU
- EXIST POWER SOURCE
- PROP ELECTRICAL SERVICE
- PROP WIRELESS RADIO
- PROP VIVDS CAMERA
- PROP LUMINAIRE
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)

0 15 30
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER
Lacey L Hebert
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519 AT BAYOU RD

PROPOSED TRAFFIC SIGNAL LAYOUT

SHEET 1 OF 1

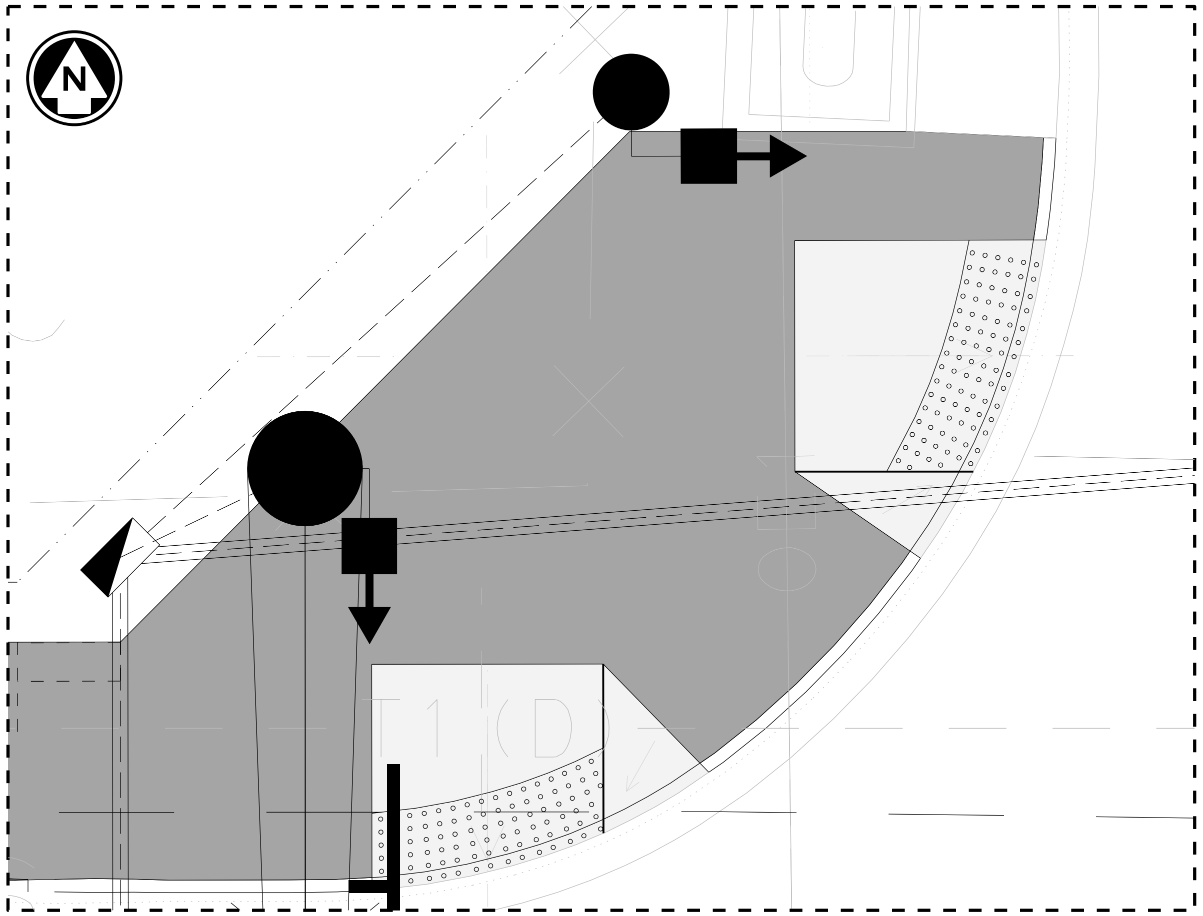
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		161

DATE: 9/12/2023 10:36:48 AM
FILE: ...\FM 519 SGNL LAYOUT SHEET 02.dgn

100% SUBMITTAL

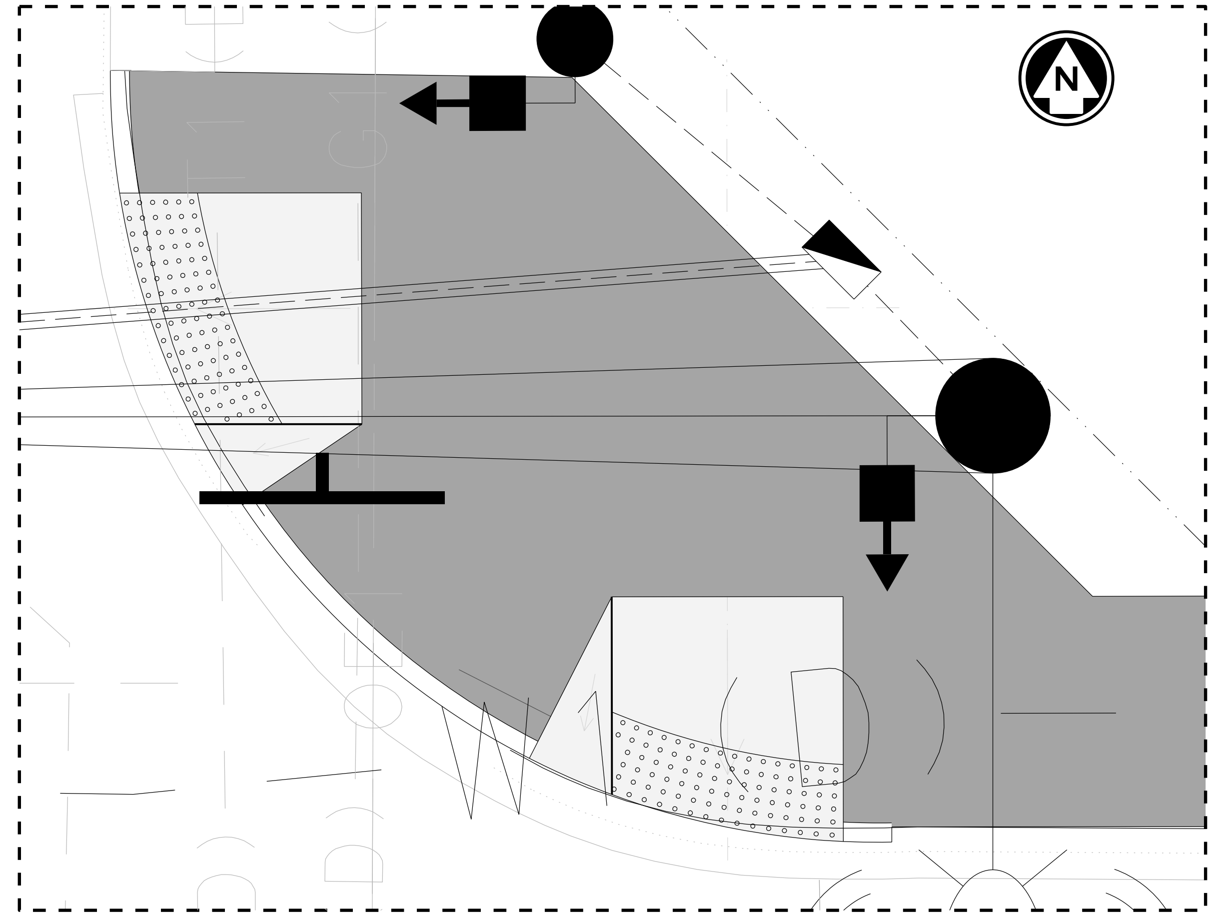
NORTHWEST CORNER DETAIL

N.T.S.



NORTHEAST CORNER DETAIL

N.T.S.

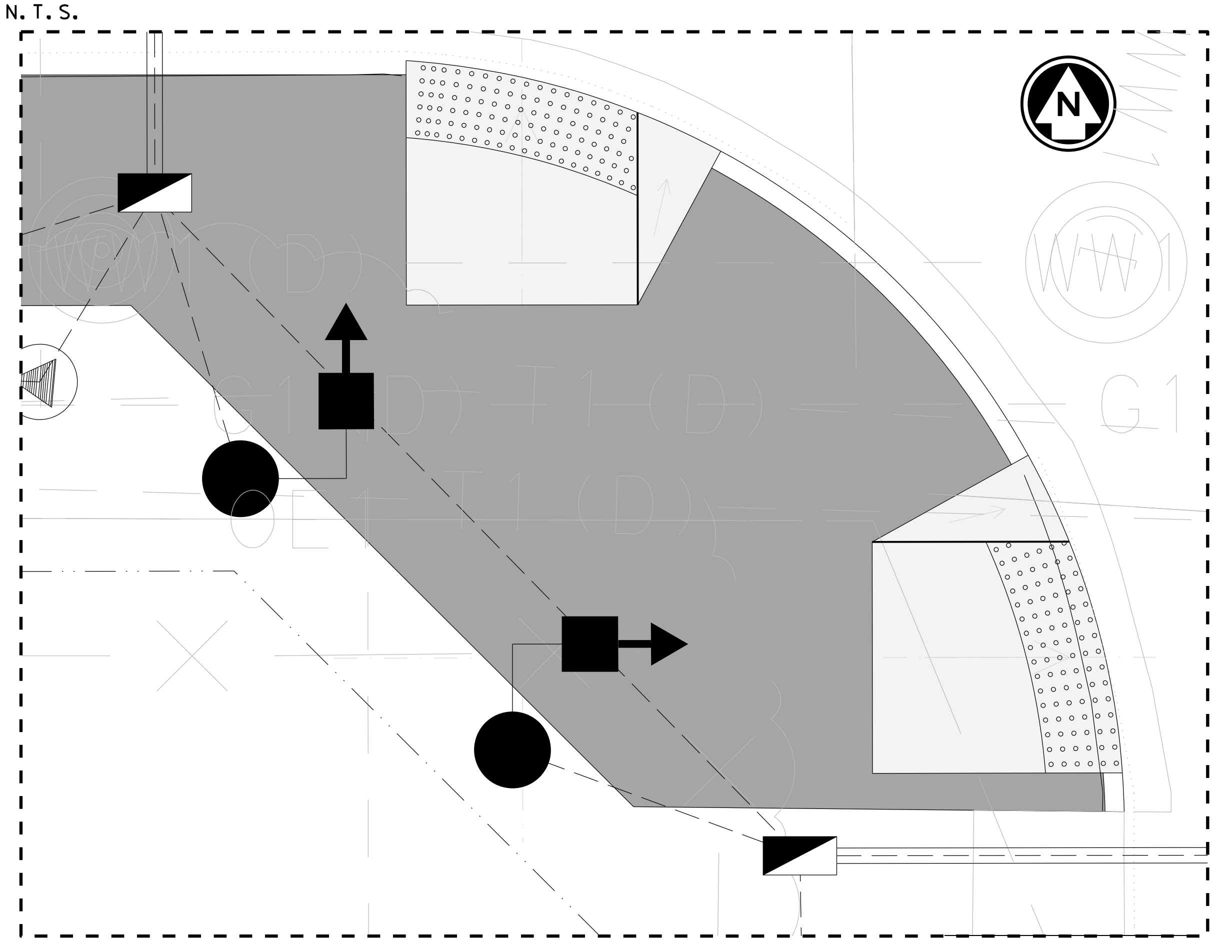


LEGEND

- PROP SIGNAL POLE & MAST ARM
- PROP PEDESTRIAN POLE ASSEMBLY
- PROP SIGN (MAST ARM MOUNT)
- PROP PED BUTTON
- PROP GROUND BOX
- PROP ELECTRICAL SERVICE ASSEMBLY
- PROP WIRELESS RADIO
- PROP LUMINAIRE
- PROP CONDUIT (TRENCH)
- PROP CONDUIT (BORE)
- PROP CONC. RAMP (SLOPED)
- PROP CONC. SIDEWALK (FLAT)

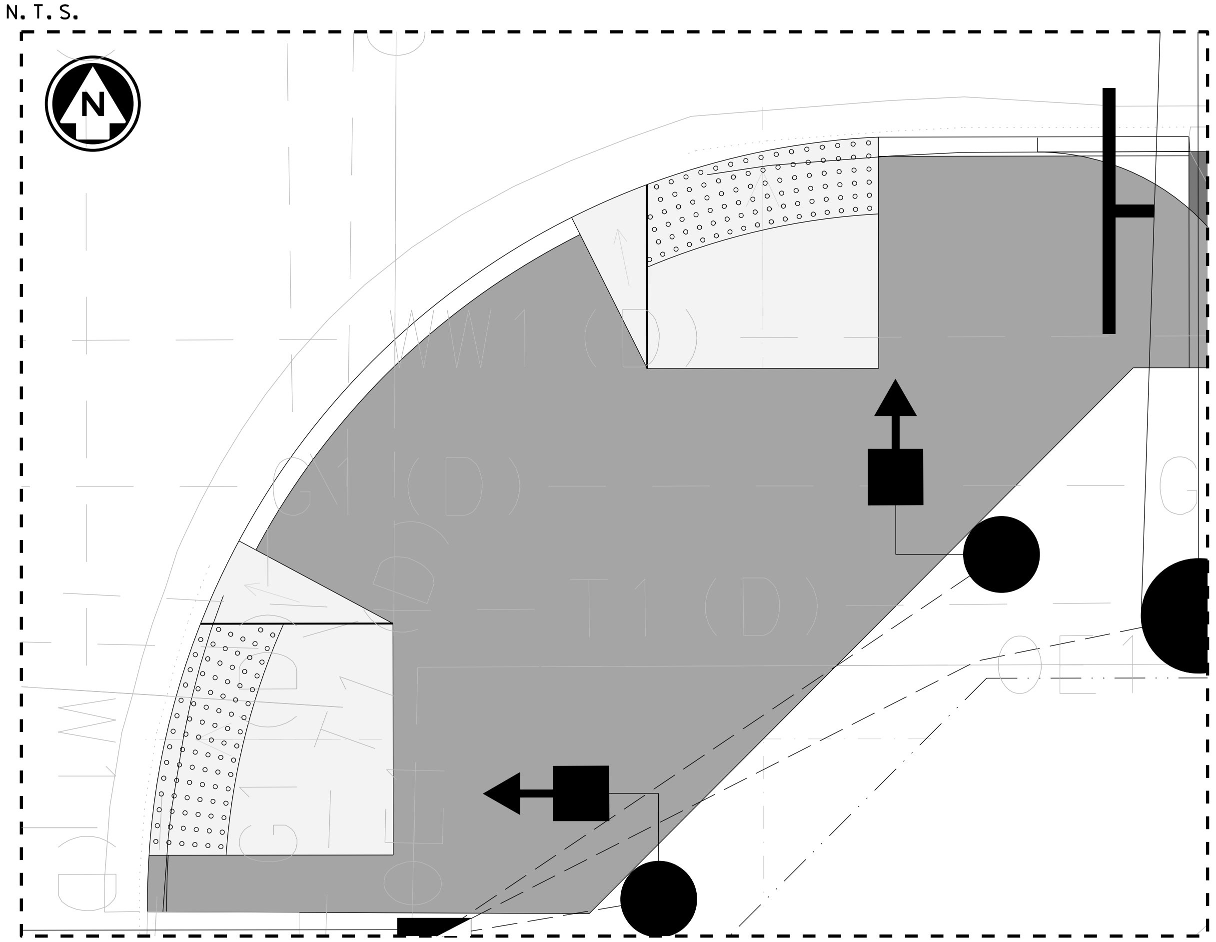
SOUTHWEST CORNER DETAIL

N.T.S.



SOUTHEAST CORNER DETAIL

N.T.S.



STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED PROFESSIONAL ENGINEER
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

©2023 Texas Department of Transportation

FM 519 AT BAYOU RD

PROPOSED TRAFFIC SIGNAL CORNER DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		162

DATE: 9/12/2023 10:37:27 AM
FILE: ...\FM 519 SGNL LAYOUT SHEET 02 Details.dgn

100% SUBMITTAL

CK DW CK DW

CONDUIT AND CONDUCTOR RUNS

RUN NO.	CONDUIT (618)						CONDUCTORS (620)						CABLES (684)								VIVDS (6306)	
	PVC						POWER		GROUND				LUMINAIRE		PEDESTRIAN				SIGNAL		DETECTION	
	3" (SCHD 80)				4" (SCHD 80)		#4 INSULATED		#4 BARE		#8 BARE		#12/4C TRAY CABLE		PUSH BUTTON #12 / 2C		SIGNAL #12 / 4C		#12/7C		#14/3C	
	(6054)		(6055)		(6058)		(6012)		(6011)		(6007)		(6005)		(6007)		(6009)		(6012)		(6007)	
	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	1	10									1	10	1	10	1	10	1	10	2	20	1	10
2	1	10									1	10			1	10	1	10				
3			1	90							1	90	1	90	2	180	2	180	2	180	1	90
4	1	20									1	20			1	20	1	20				
5	1	10									1	10	1	10	1	10	1	10	3	30	1	10
6			1	75							1	75	2	150	4	300	4	300	5	375	2	150
7	1	30									1	30	4	120	8	240	8	240	10	300	4	120
8	1	10									1	10			8	80	8	80	10	100	4	40
9					1	10					1	10	4	40								
10					1	10	2	20	1	10												
11	1	10									1	10			1	10	1	10				
12	1	25									1	25	2	50	3	75	3	75	5	125	2	50
13	1	10									1	10			1	10	1	10				
14	1	5									1	5	1	5					2	10	1	5
15			1	60							1	60	1	60	2	120	2	120	3	180	1	60
16	1	10									1	10			1	10	1	10				
17	1	20									1	20			1	20	1	20				
18	1	25									1	25	1	25					3	75	1	25
POLE 1													1	45								
MA																			2	110	1	55
POLE 2															1	10	1	10				
POLE 3															1	10	1	10				
POLE 4													1	45								
MA																			3	150	1	55
POLE 5															1	10	1	10				
POLE 6															1	10	1	10				
POLE 7													1	45								
MA																			2	80	1	40
POLE 8															1	10	1	10				
POLE 9													1	45								
MA																			3	150	1	55
POLE 10															1	10	1	10				
TOTAL		195		225		20		20		10		430		740		1155		1155		1885		765
EST. TOTAL		215		250		25		25		15		475		815		1275		1275		2075		845

ELECTRICAL SERVICE DATA

PROPOSED ELECTRICAL SERVICE (FM 519 AT BAYOU RD)	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	BRANCH CKT. AMPS	KVA LOAD
	ELEC SERV TY D(120/240)070(NS)SS(E)SP(O)	1 1/4"	3/#4	N/A	2P/70	70	70	T.S.	1P/50	40	10.3
								Lighting	2P/20	3	

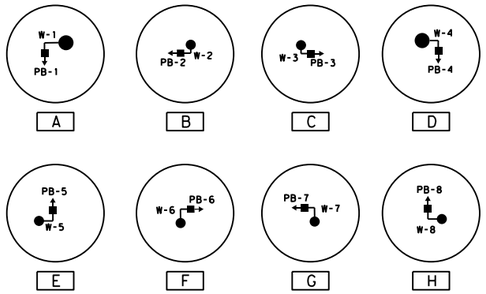
TRAFFIC SIGNAL POLES

POLE NO.	SIGNAL POLE DESIGNATION	FOUNDATION TYPE DRILL SHAFT/LENGTH	STATION	OFFSET
1	PROP 44' MAST ARM W/ LUMINAIRE WITH W-1/PB-1	36-B/16'	630+19.92	40.28' LT
2	PROP PEDESTRIAN POLE WITH W-2/PB-2	SCREW ANCHOR	630+09.04	50.11' LT
3	PROP PEDESTRIAN POLE WITH W-3/PB-3	SCREW ANCHOR	629+42.74	50.03' LT
4	PROP 40' MAST ARM W/ LUMINAIRE WITH W-4/PB-4	36-B/16'	629+34.24	40.21' LT
5	PROP PEDESTRIAN POLE WITH W-5/PB-5	SCREW ANCHOR	629+31.75	40.33' RT
6	PROP PEDESTRIAN POLE WITH W-6/PB-6	SCREW ANCHOR	629+38.83	47.43' RT
7	PROP 24' MAST ARM W/ LUMINAIRE	36-A/14'	629+46.38	54.70' RT
8	PROP PEDESTRIAN POLE WITH W-7/PB-7	SCREW ANCHOR	630+10.40	49.22' RT
9	PROP 40' MAST ARM W/ LUMINAIRE	36-B/16'	630+19.34	40.25' RT
10	PROP PEDESTRIAN POLE WITH W-8/PB-8	SCREW ANCHOR	630+24.41	41.85' RT

PROPOSED VIVDS DETECTION CHART:

CAMERA NO.	DESCRIPTION
C-1	DESIGNATED FOR PRESENCE NORTHBOUND VEHICLES (BAYOU RD)
C-2	DESIGNATED FOR PRESENCE WESTBOUND VEHICLES (FM 519)
C-3	DESIGNATED FOR PRESENCE SOUTHBOUND VEHICLES (BAYOU RD)
C-4	DESIGNATED FOR PRESENCE EASTBOUND VEHICLES (FM 519)

PROPOSED PEDESTRIAN PUSH BUTTON ORIENATION SCHEDULE



CALLOUTS:

A — PROP. 44 FT MAS ARM POLE WITH LUMINAIRE, STREET NAME SIGN, PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT) AND VIVDS CAMERA

B — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

C — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

D — PROP. 40 FT MAS ARM POLE WITH LUMINAIRE, STREET NAME SIGN, PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT) AND VIVDS CAMERA

E — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

F — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

G — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

H — PROP. PEDESTAL POLE WITH PEDESTRIAN SIGNAL HEAD, SIGN AND PUSH BUTTON (APS UNIT).

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER
Lacey L Hebert PE 2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519 AT BAYOU RD

PROPOSED TRAFFIC SIGNAL SCHEDULE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		163

DATE: 2/12/2024 9:38:29 PM
FILE: ...\FM 519 SGNL LAYOUT SHEET 03.dgn

100% SUBMITTAL

CK | DW | CK | DW

NOTES FOR PERMANENT TRAFFIC SIGNAL(S):

1. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH 2 IN. RETROFLECTIVE YELLOW BORDER.
2. FURNISH VEHICLE AND PEDESTRIAN SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.
3. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.
4. FURNISH SYMBOL TYPE PEDESTRIAN COUNTDOWN SIGNALS. INSTALL USING MOUNTING HEIGHT IN ACCORDANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
5. ROUTE CABLE FOR LUMINAIRES (#12/4C - TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.
6. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A CABINET, MOUNTED ON AN 18-INCH BASE EXTENSION.
7. THE DEPARTMENT'S TRAFFIC SIGNAL MAINTENANCE OFFICE WILL PROVIDE PHASING FOR TEMPORARY AND PERMANENT TRAFFIC SIGNALS.
8. LOCATE CONTROLLER(S), MAST ARM POLES, DETECTORS, VIVDS DETECTION, ETC., AS APPROVED.
9. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.
10. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM,

    OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT

    IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS PERMANENT CONDUIT SEALANT. DO NOT USE SILICON CAULK AS A CONDUIT SEALANT.
11. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.
12. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.
13. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.
14. PROVIDE CONTINUED OPERATION OF THE EXISTING SIGNAL(S) DURING CONSTRUCTION AND UNTIL THE PROPOSED OPERATION IS COMPLETED.
15. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.
16. PROVIDE 250 WATT HPS (HIGH PRESSURE SODIUM) EQUIVALENT LIGHT EMITTING DIODE (LED) LUMINAIRES OPERATING AT 240 VOLTS.
17. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
18. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.
19. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.
20. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.
21. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING VIVDS DETECTION, VIVDS CAMERAS, WIRELESS MAGNETOMETERS, VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, SYMBOLIC PEDESTRIAN SIGNAL HEAD, SYMBOLIC PEDESTRIAN SIGNAL LAMP, ACCESSIBLE PEDESTRIAN SIGNALS, SIGNAL CONTROLLERS, SIGNAL CABINETS, BUS INTERFACE UNITS, BATTERY BACKUP UNITS. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.
22. THE CONTRACTOR TO FURNISH AND INSTALL ALL EQUIPMENT CALLED FOR AND REQUIRED AS NEEDED FOR A FULLY OPERATIONAL TRAFFIC SIGNAL.
23. FURNISH VIDEO IMAGING VEHICLE DETECTION SYSTEM (VIVDS) CABLE RECOMMENDED BY MANUFACTURER OR PURCHASE CABLE FROM THE SAME MANUFACTURER THAT SUPPLIED/PROVIDED THE VIVDS EQUIPMENT.
24. FOR VIVDS CAMERA(S) MOUNTED TO LUMINAIRE ARMS, STRAP THE VIVDS CABLE TO THE LUMINAIRE ARMS WITH A METAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3/4-IN MINIMUM WIDTH AND TWO WRAPS AT 8 IN. MAXIMUM SPACING.
25. THE LOCATION OF THE VIVDS DETECTION ZONE IS APPROXIMATE. THE EXACT LOCATION WILL BE DETERMINED BY THE ENGINEER AND/OR DEPARTMENT'S TRAFFIC OPERATIONS SECTION.

Notes for Install Notes for Install 6306-6009 and 6306-6010 only.

1. ONCE THE CONTRACT HAS BEEN EXECUTED OR DURING THE KICK-OFF MEETING, THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE OR ARRANGE FOR THE VIVDS EQUIPMENT TO BE PROVIDED BY THE DEPARTMENT.
2. THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE THE ORDERING OF THE VIVDS EQUIPMENT BY USING THE FORCE ACCOUNT. ENGINEER OR HIS/HER REPRESENTATIVE WILL CONTACT ARNOLD TREVINO AT (713) 866-7101 TO ORDER THE EQUIPMENT.

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER
Lacey L Hebert PE
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519 AT BAYOU RD

TRAFFIC SIGNAL NOTES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519

DIST	COUNTY	SHEET NO.
HOU	GALVESTON	164

DATE: 9/12/2023 10:38:32 AM
FILE: ...\FM 519 SGNL LAYOUT SHEET 04.dgn

DATE:
FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
	REVISIONS	0979	01	027	FM 519
		DIST	COUNTY		SHEET NO.
		HOU	GALVESTON		165

71A

DATE:
FILE:

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.
12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

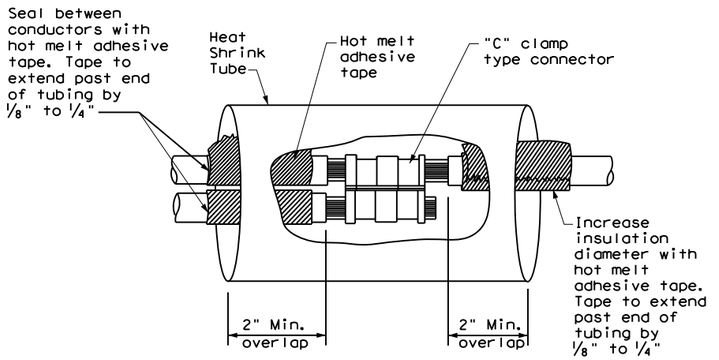
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

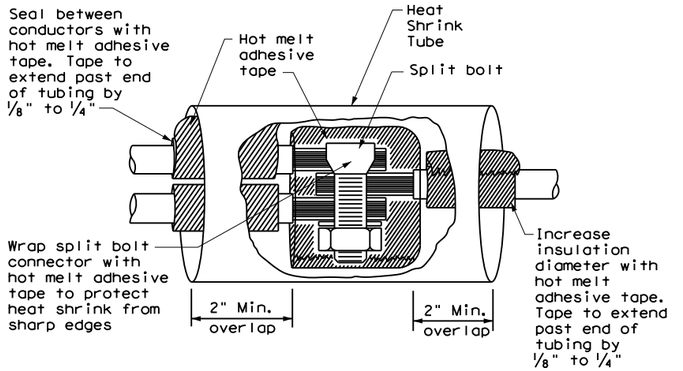
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

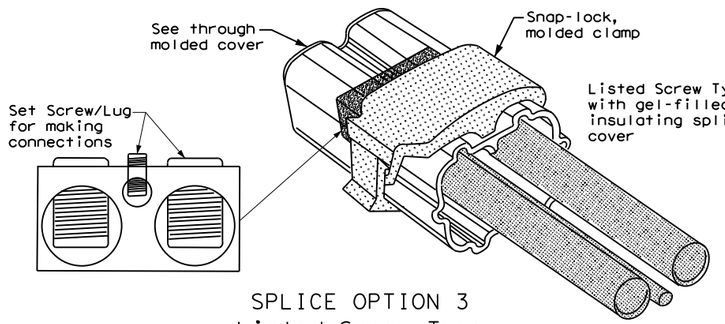
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

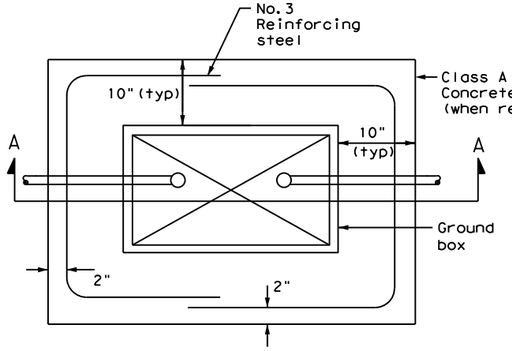
ELECTRICAL DETAILS
CONDUCTORS

ED(3)-14

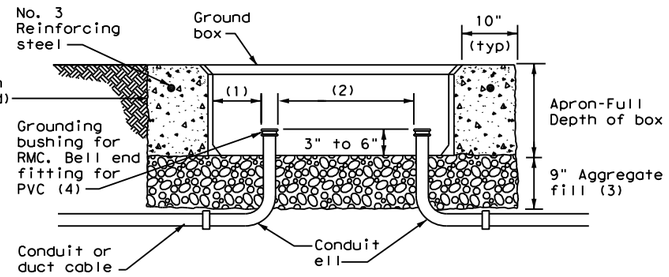
FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		166

71C

DATE:
FILE:



PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

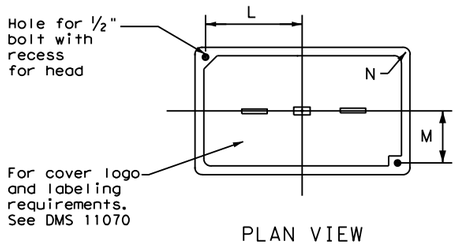
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

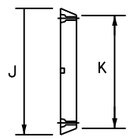
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

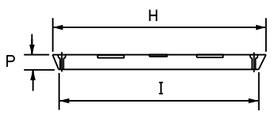
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		167

71D

DATE:
FILE:

ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

*ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

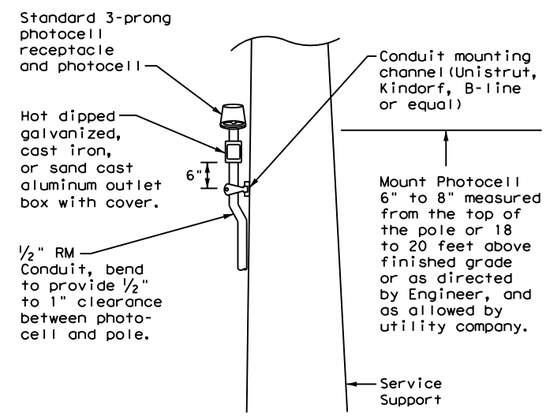
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

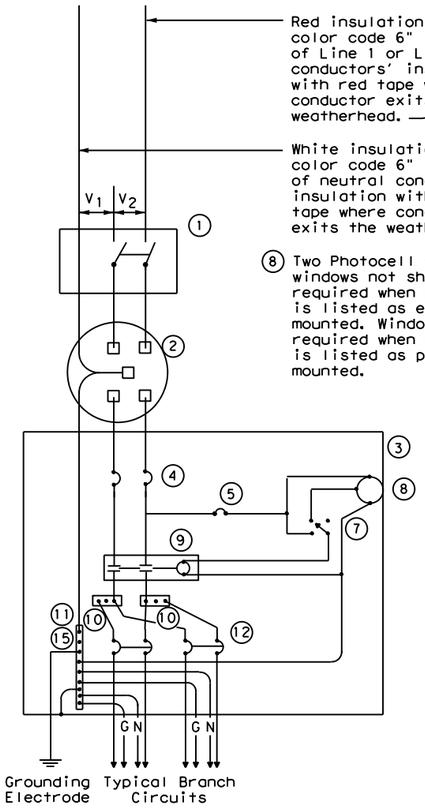
ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		168

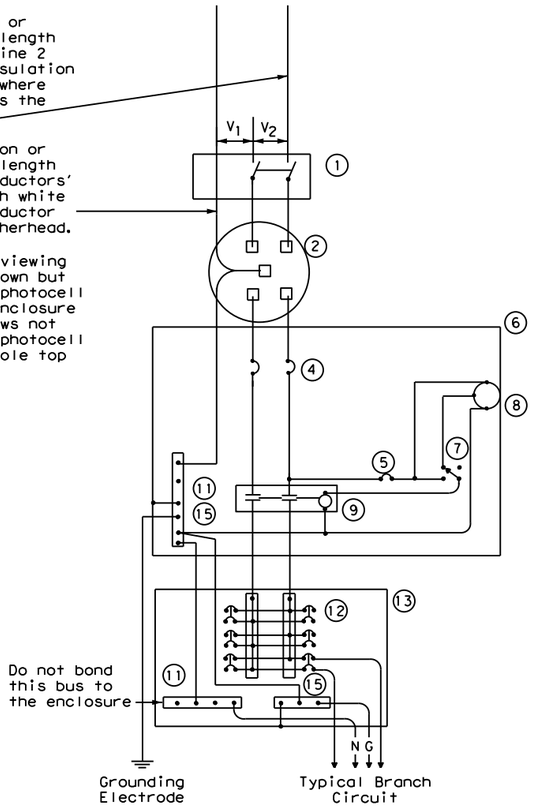
71E

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

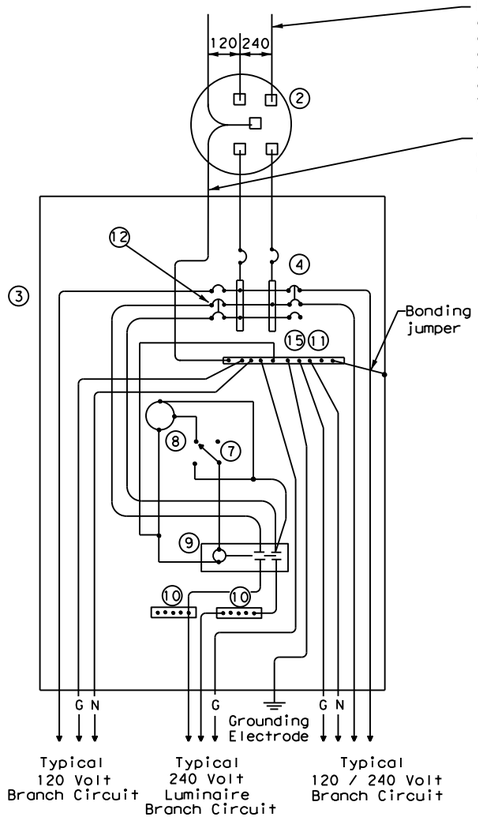
DATE:
FILE:



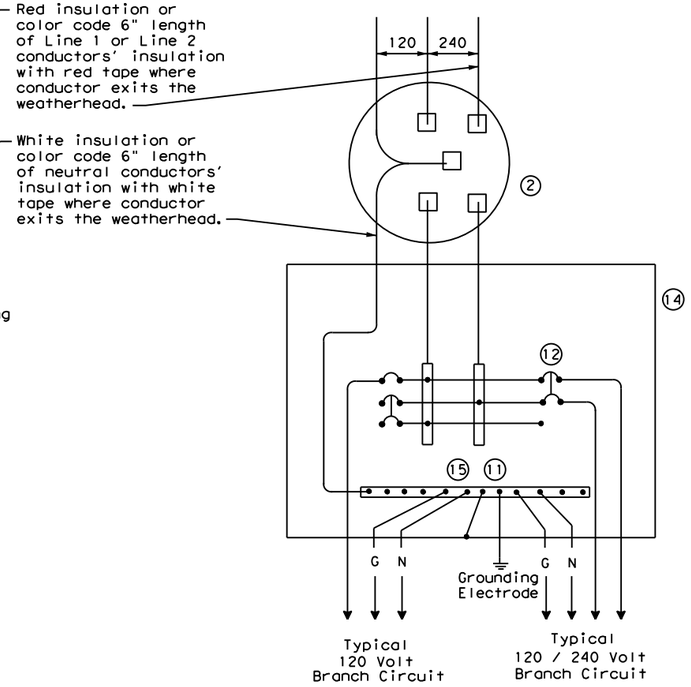
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
———	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		169

71F

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

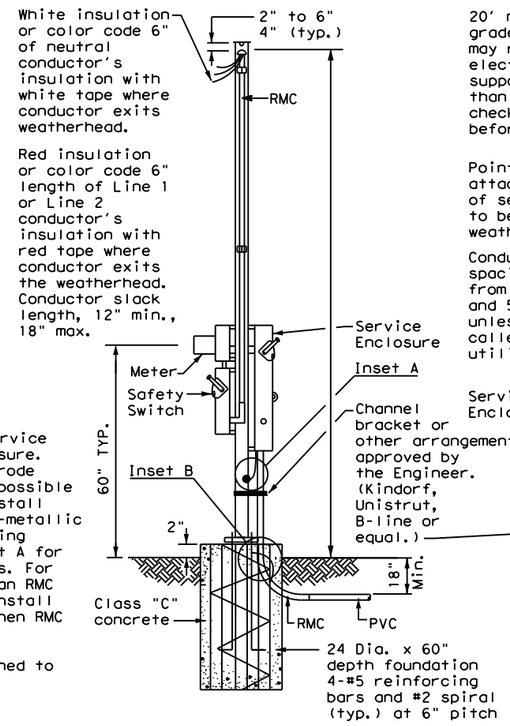
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

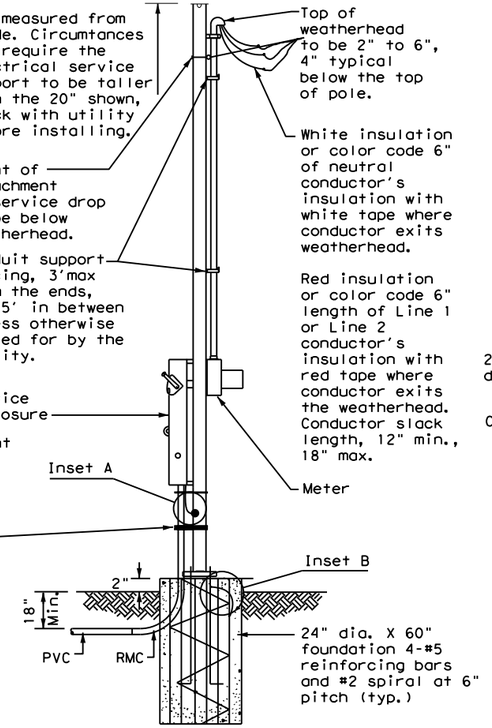
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

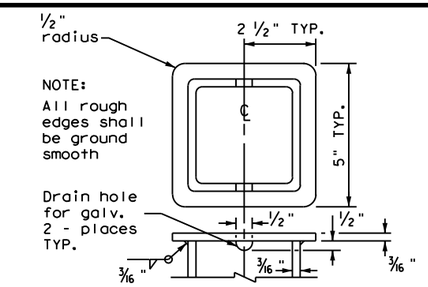


WITH SAFETY SWITCH

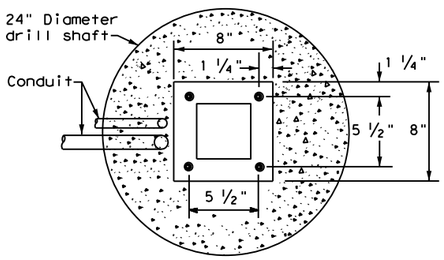


WITHOUT SAFETY SWITCH

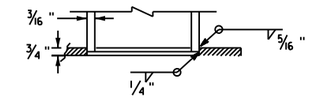
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

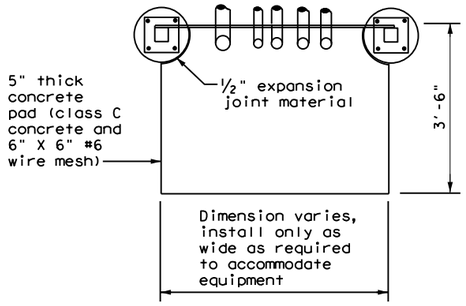


BASE PLATE DETAIL



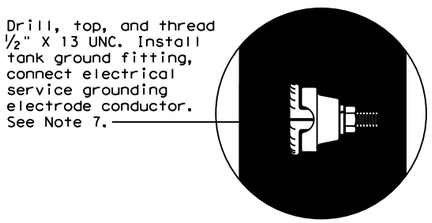
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP

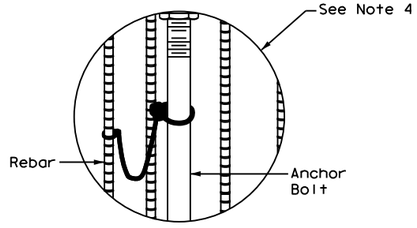


TOP VIEW

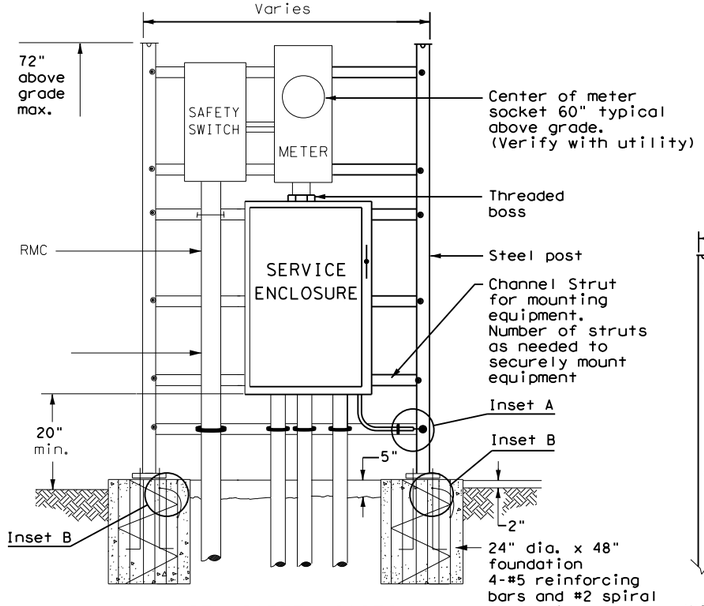
SERVICE SUPPORT TY SF (O) & SF (U)



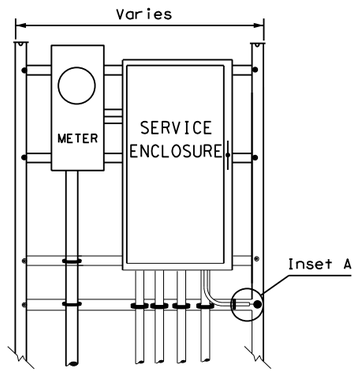
FRONT VIEW
INSET A



INSET B

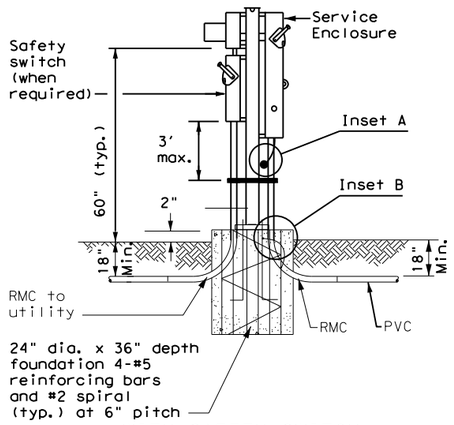


WITH SAFETY SWITCH
FRONT VIEW

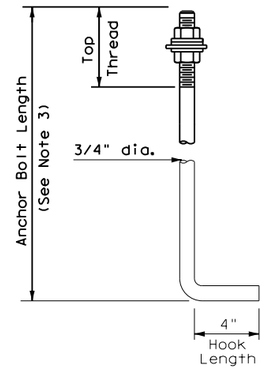


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

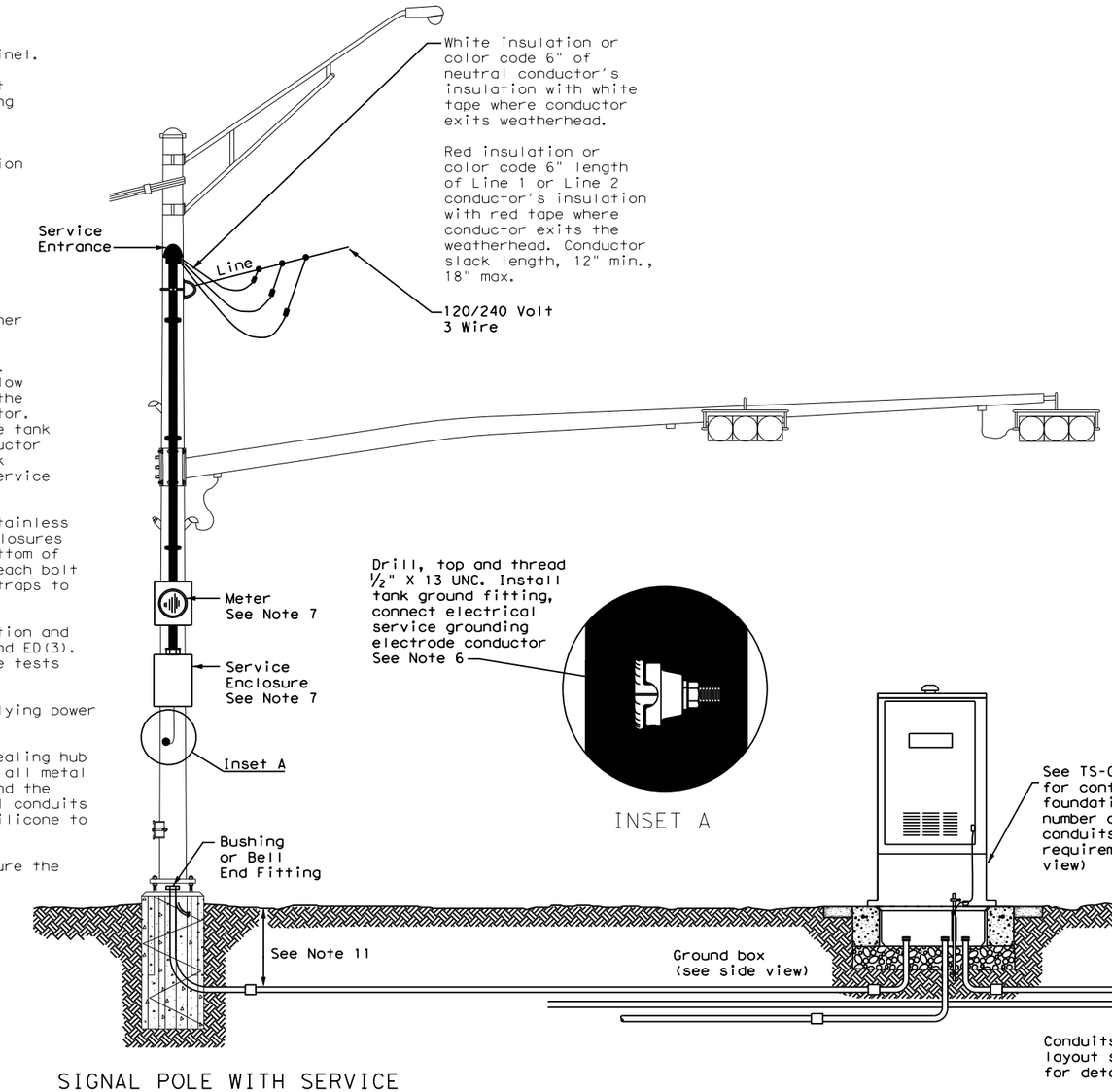
FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		170

71G

DATE:
FILE:

TRAFFIC SIGNAL NOTES

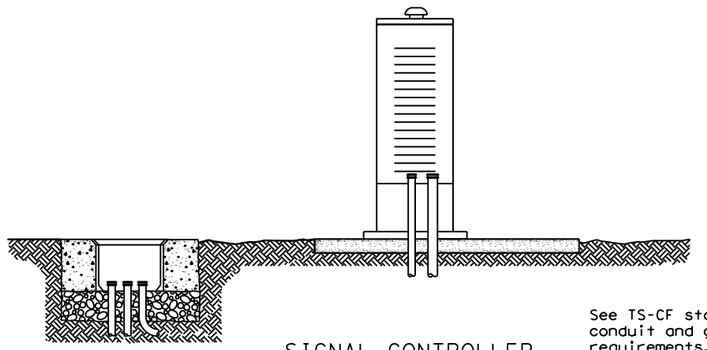
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

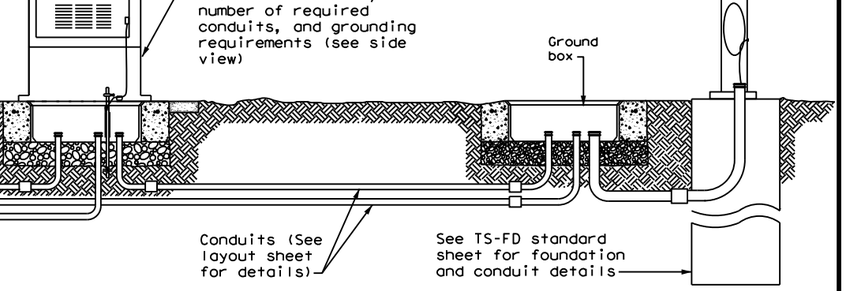
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		171

71H

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

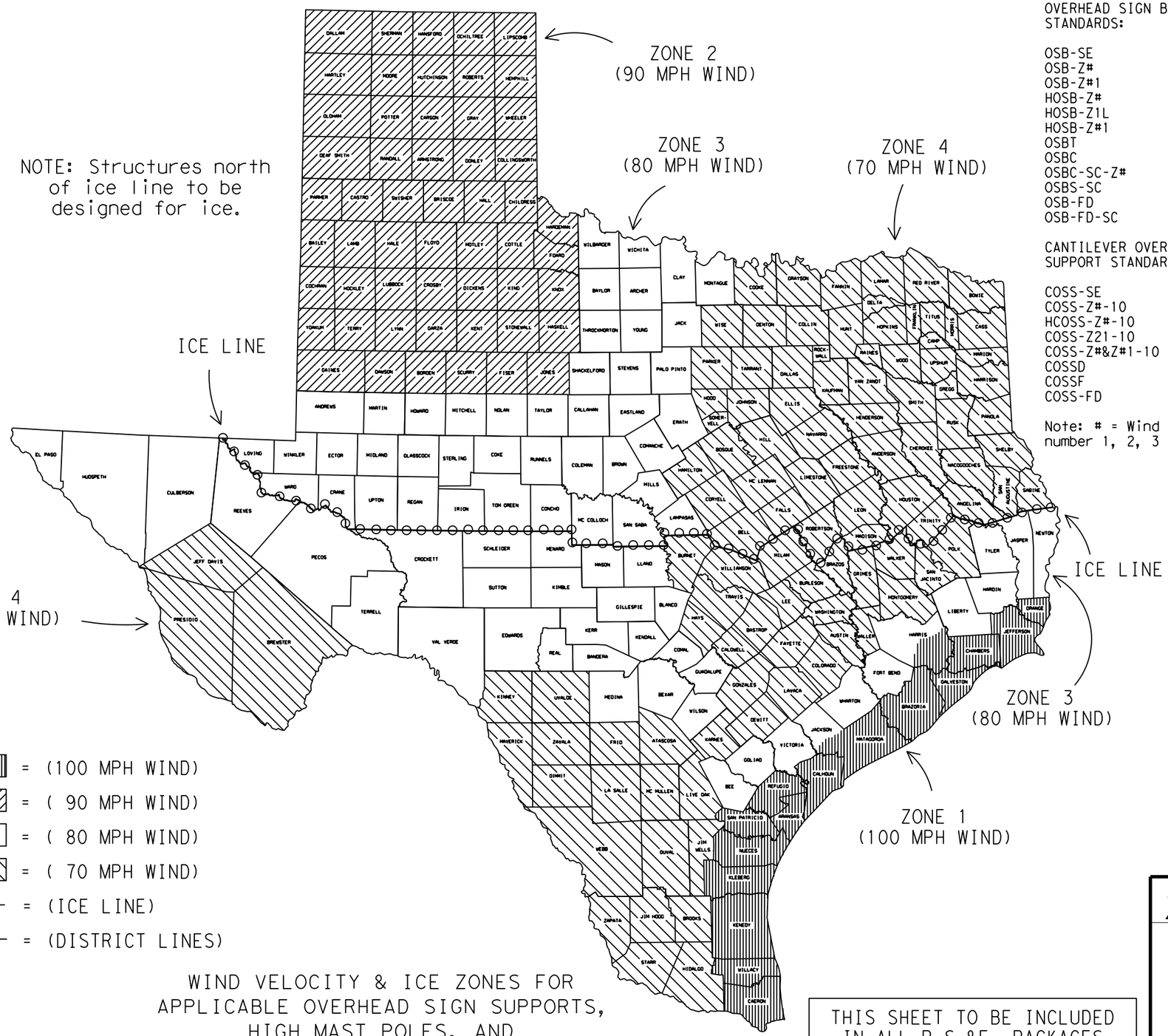
NOTE: Structures north of ice line to be designed for ice.

ZONE 2
(90 MPH WIND)

ZONE 3
(80 MPH WIND)

ZONE 4
(70 MPH WIND)

ICE LINE



ZONE 4
(70 MPH WIND)

ICE LINE

ZONE 3
(80 MPH WIND)

ZONE 1
(100 MPH WIND)

LEGEND

ZONE 1 - = (100 MPH WIND)
ZONE 2 - = (90 MPH WIND)
ZONE 3 - = (80 MPH WIND)
ZONE 4 - = (70 MPH WIND)
= (ICE LINE)
= (DISTRICT LINES)

WIND VELOCITY & ICE ZONES FOR
APPLICABLE OVERHEAD SIGN SUPPORTS,
HIGH MAST POLES, AND
TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of
Fastest Mile Wind Velocity at 33 feet height.

APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

OSB-SE
OSB-Z#
OSB-Z#1
HOSB-Z#
HOSB-Z1L
HOSB-Z#1
OSBT
OSBC
OSBC-SC-Z#
OSBS-SC
OSB-FD
OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

COSS-SE
COSS-Z#-10
HCOSS-Z#-10
COSS-Z21-10
COSS-Z#&Z#1-10
COSSD
COSSF
COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

HMIP-98
HMIF-98

WALKWAYS AND BRACKETS STANDARDS:

SWW
SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

SP-80
SP-100
SMA-80
SMA-100
DMA-80
DMA-100
MA-C
MAC(ILSN)
MAD-D
TS-FD
LUM-A
CFA
LMA
TS-C
MA-DPD

FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
Zone line is just North of SH 616.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

Texas Department of Transportation

Traffic Operations Division Standard

WIND VELOCITY AND ICE ZONES

WV & IZ-14

FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		172

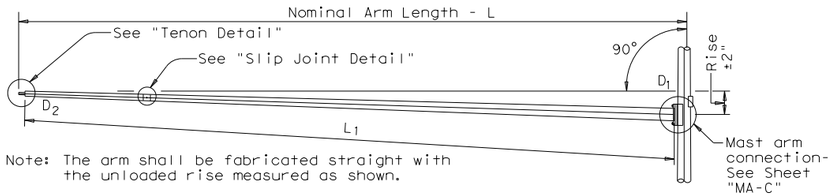
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1′-8"	19.1	8.0	3.5	.179	1′-7"
24	23.1	9.0	5.8	.179	1′-9"	23.1	9.0	3.5	.179	1′-8"
28	27.1	9.5	5.7	.179	1′-10"	27.1	10.0	3.5	.179	1′-9"
32	31.0	9.5	5.2	.239	1′-11"	31.0	9.5	3.5	.239	1′-10"
36	35.0	10.0	5.1	.239	2′-0"	35.0	10.0	3.5	.239	1′-11"
40	39.0	10.5	5.1	.239	2′-3"	39.0	11.0	3.5	.239	2′-1"
44	43.0	11.0	5.1	.239	2′-8"	43.0	11.5	4.0	.239	2′-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

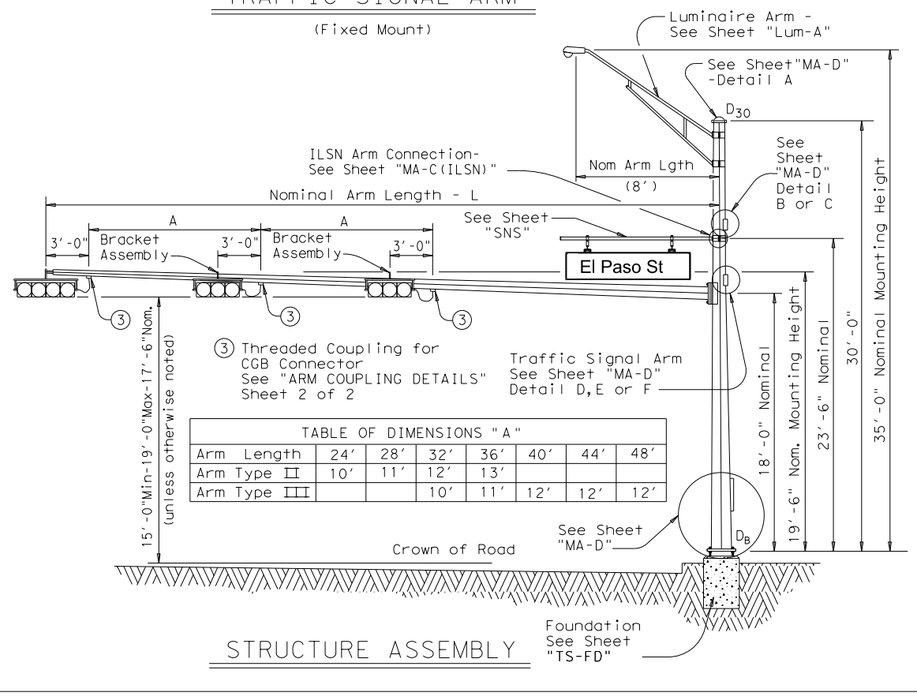


TABLE OF DIMENSIONS "A"							
Arm Length	24′	28′	32′	36′	40′	44′	48′
Arm Type II	10′	11′	12′	13′			
Arm Type III			10′	11′	12′	12′	12′

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30′ Poles With Luminaire		24′ Poles With ILSN		19′ Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100	1	24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100		32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100	2	40S-100		40-100	
44	44L-100	1	44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100	1		
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	2
44					44III-100	1

Luminaire Arms (1 per 30′ pole)

Nominal Arm Length	Quantity
8′ Arm	4

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7′ Arm	
9′ Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3′-4"	
1 ¾"	3′-10"	1
2"	4′-3"	3

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DN: MMF	CK: JSY

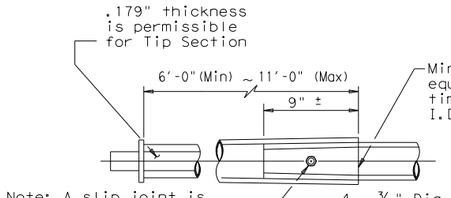
REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		173

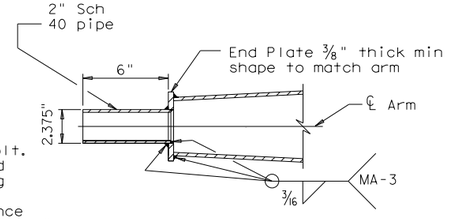
123A

DATE:
FILE:

DATE:
FILE:



SLIP JOINT DETAIL



TENON DETAIL

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

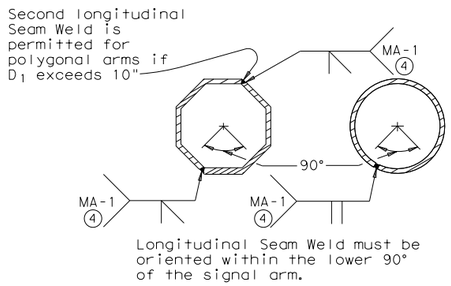
If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

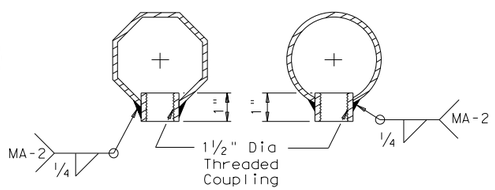
This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL



ARM COUPLING DETAILS

④ 60% Min. penetration
100% pemetration within 6" of circumferential base welds.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

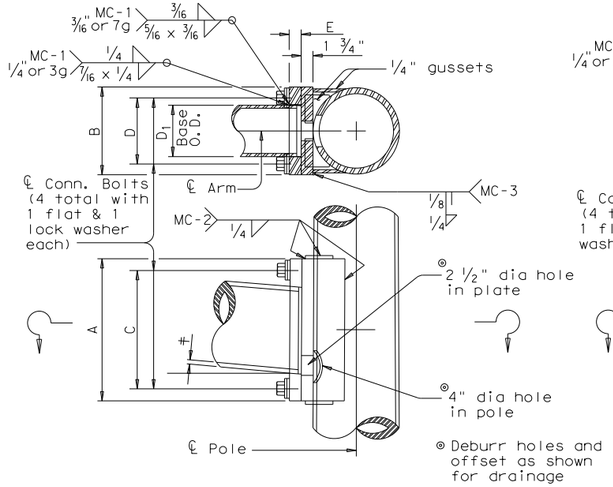
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		174

123B

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatever. TxDOT shall not be responsible for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

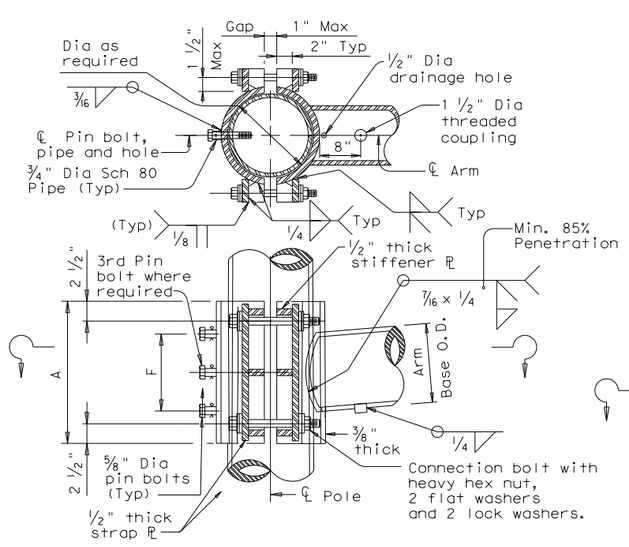
DATE:
FILE:

ARM SIZE D_1	ARM SIZE ǂ	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 ¾	1
7.5	.179	13	9	10	6	1 ¾	1
8.0	.179	14	10	11	7	2	1 ¼
9.0	.179	16	11	13	8	2	1 ¼
9.5	.179	17	12	14	9	2	1 ¼
9.5	.239	18	12	15	9	2	1 ¼
10.0	.239	18	12	15	9	2	1 ¼
10.5	.239	18	13	15	10	3	1 ½
11.0	.239	18	13	15	10	3	1 ½



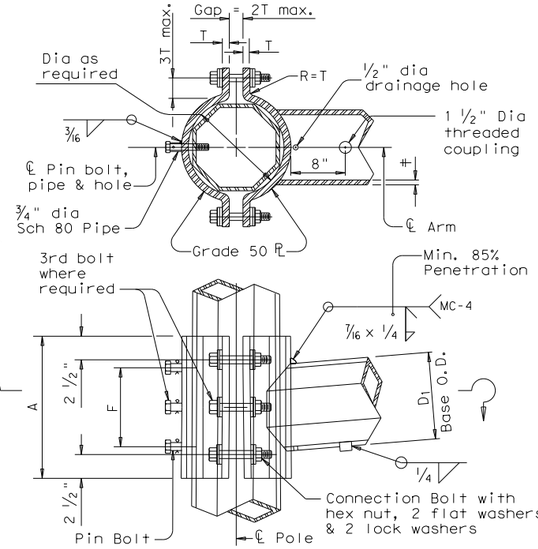
FIXED MOUNT DETAIL 1

ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	⅝
7.5	.179	14	8	4	1	2	⅝
8.0	.179	14	8	4	1	2	⅝
9.0	.179	16	10	4	1	2	⅝
9.5	.179	18	12	4	1 ¼	3	⅝
9.5	.239	18	12	4	1 ¼	3	⅝
10.0	.239	18	12	4	1 ¼	3	⅝



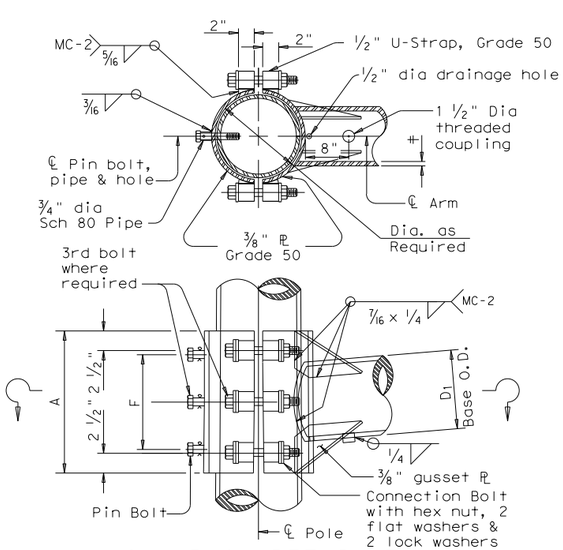
CLAMP-ON DETAIL 1

ARM SIZE D_1	ARM SIZE ǂ	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	6	¾	4	¾	2	⅝
7.5	.179	14	8	¾	4	¾	2	⅝
8.0	.179	14	8	¾	4	¾	2	⅝
9.0	.179	16	10	⅞	4	1	2	⅝
10.0	.179	18	10	⅞	4	1	2	⅝
9.5	.239	18	10	1	6	1	3	⅝
10.0	.239	18	10	1	6	1	3	⅝

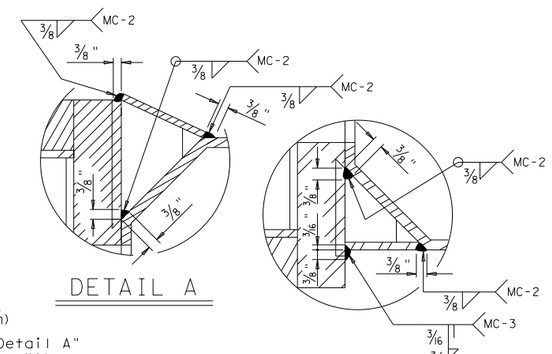


CLAMP-ON DETAIL 2

ARM SIZE D_1	ARM SIZE ǂ	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	6	4	1	2	⅝
7.5	.179	14	8	4	1	2	⅝
8.0	.179	14	8	4	1	2	⅝
9.0	.179	16	10	4	1	2	⅝
9.5	.179	18	12	6	1	3	⅝
9.5	.239	18	12	6	1	3	⅝
10.0	.239	18	12	6	1	3	⅝

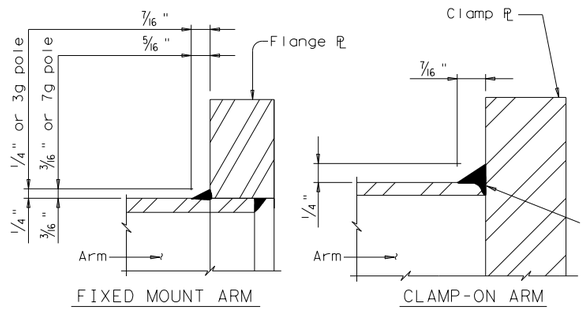


CLAMP-ON DETAIL 3



DETAIL A

DETAIL B



FIXED MOUNT ARM

CLAMP-ON ARM

ARM BASE WELD DETAILS

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 ½" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 5/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

REVISIONS
5-96
5-09
1-12

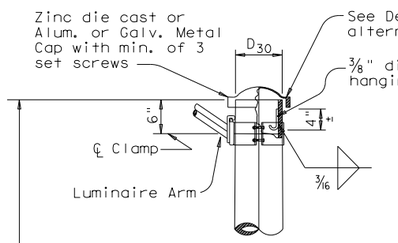
DN: MS	CK: JSY	DW: MMF	CK: JSY

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		175

126A

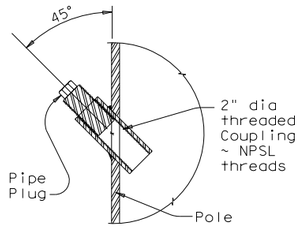
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

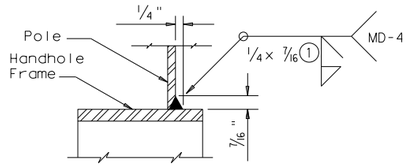


DETAIL A

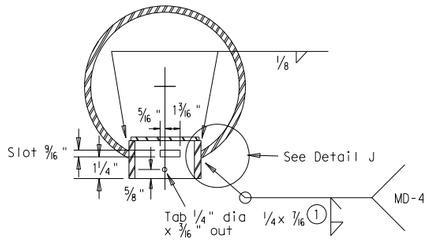
(for pole with luminaire)



POLE COUPLING DETAIL

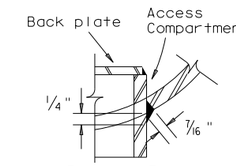


DETAIL G

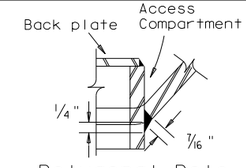


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

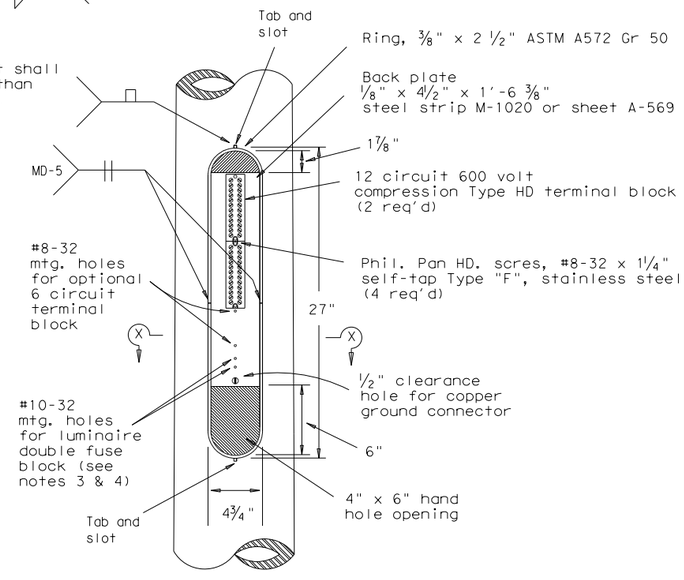


Round Pole

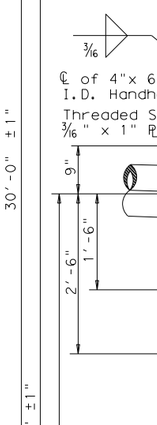


Polygonal Pole

DETAIL J

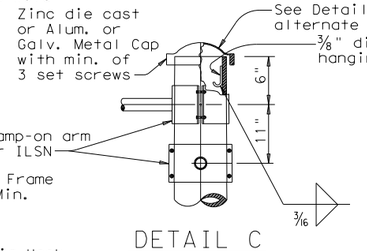


ACCESS COMPARTMENT

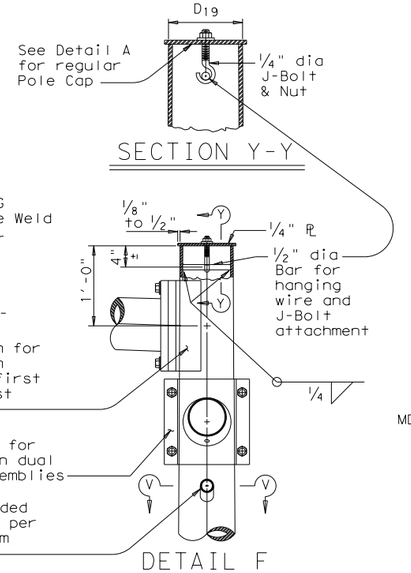


DETAIL B

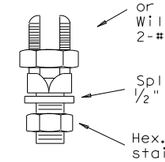
(If ILSN applied)



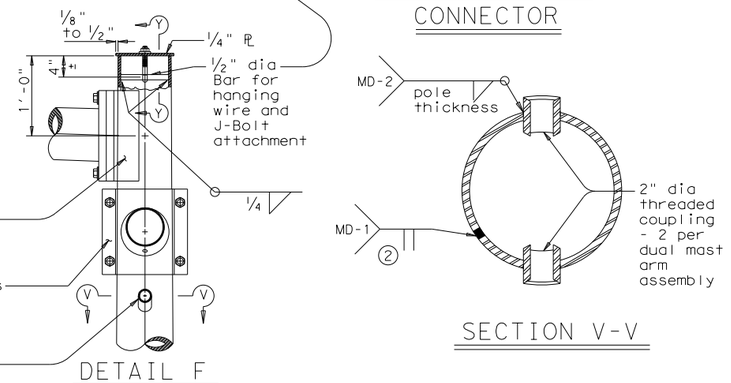
DETAIL C



SECTION Y-Y

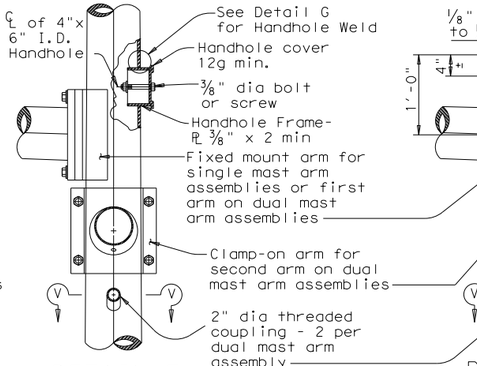


COPPER GROUND CONNECTOR



DETAIL D

(for 30' pole with luminaire and ILSN sign)



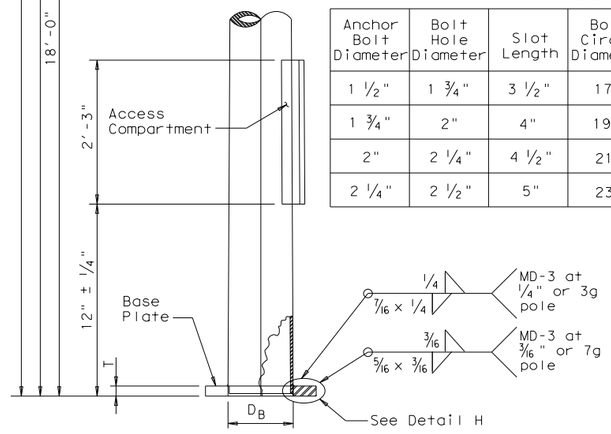
DETAIL E

(for 24' pole with ILSN sign and no luminaire)

DETAIL F

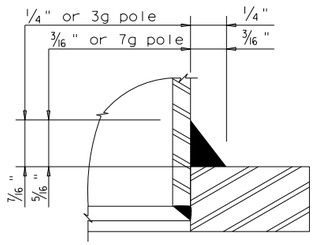
(for 19' pole with no ILSN sign and no luminaire)

SECTION V-V

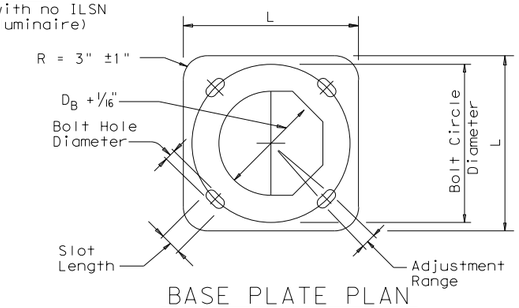


POLE ELEVATION

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		176

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	16"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

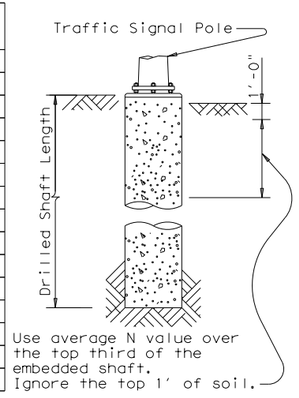
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
POLE #1	10	D.S.	1				16	
POLE #4	10	D.S.	1				16	
POLE #7	10	D.S.	1			14		
POLE #9	10	D.S.	1				16	
TOTAL DRILLED SHAFT LENGTHS						14	48	

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

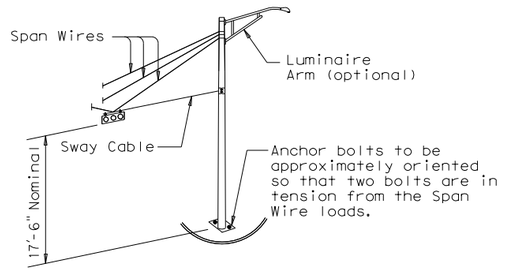


ANCHOR BOLT & TEMPLATE SIZES

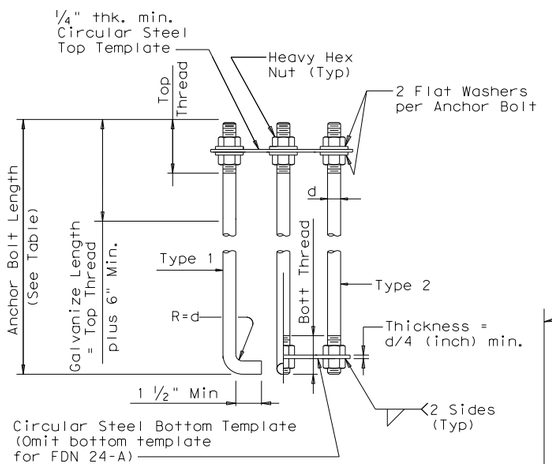
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.

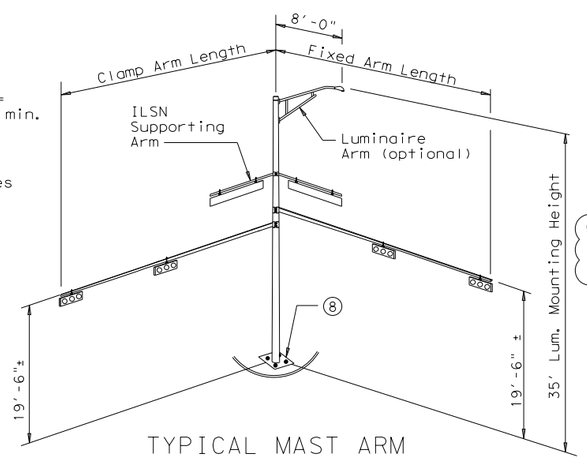


TYPICAL STRAIN POLE ASSEMBLY

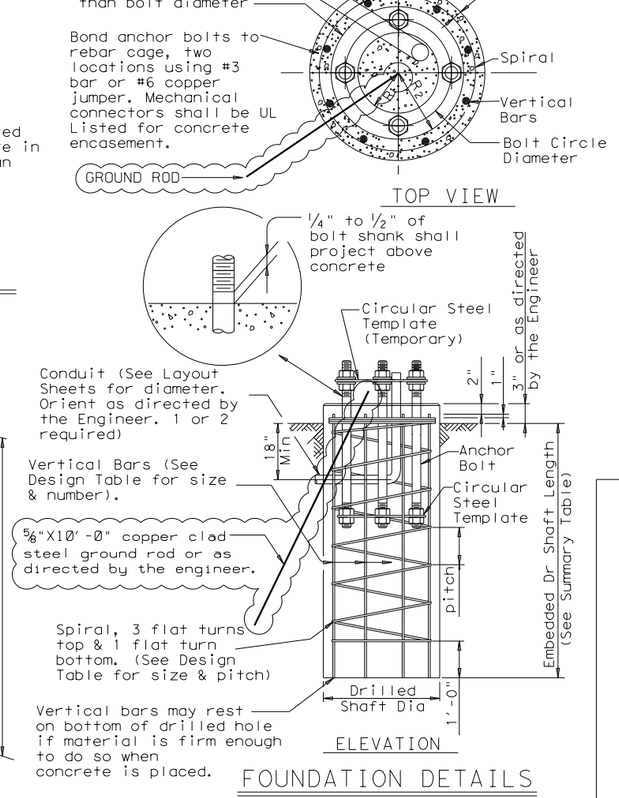


ANCHOR BOLT ASSEMBLY

⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



TYPICAL MAST ARM ASSEMBLY



FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED PROFESSIONAL ENGINEER
Lacey L Hebert, PE

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

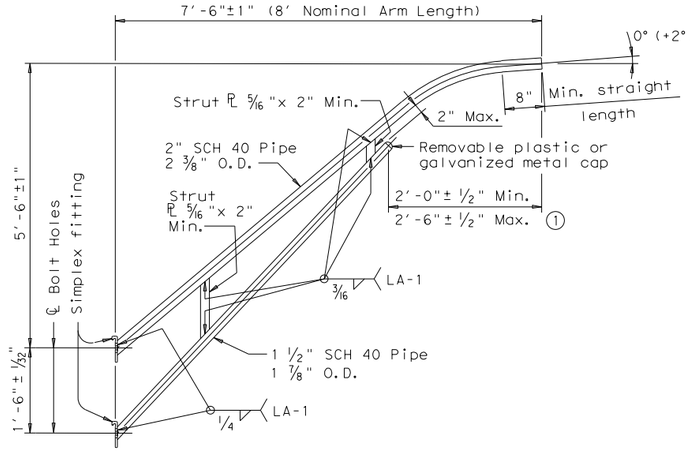
TS-FD-12 (MOD)

DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB

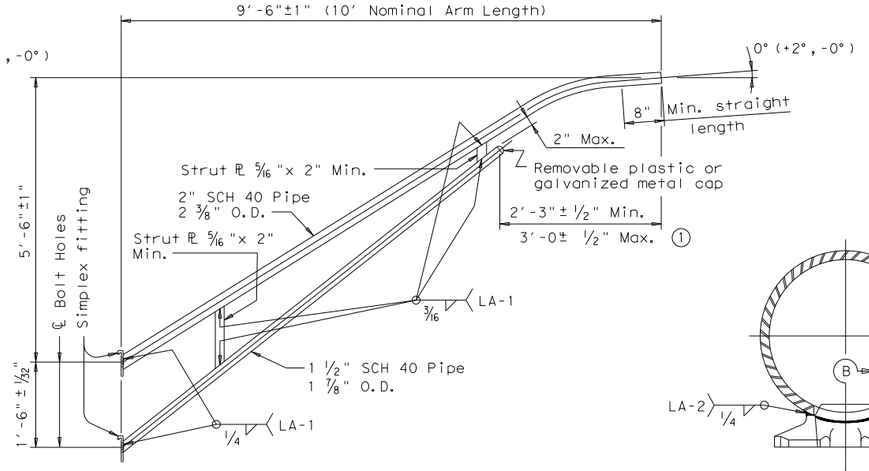
REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		177

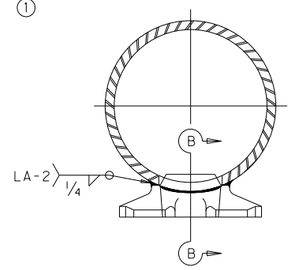
DATE:
FILE:



8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr.65-35 or A148 Gr.80-50, A576 Gr.1021 (3), or A36 (Arm only)
Arm Pipes	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50 (4), or A1011 HSLAS-F Gr.50 (4)
Arm Strut Plates (2)	ASTM A36, A572 Gr.50 (4), or A588
Misc.	ASTM designations as noted

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

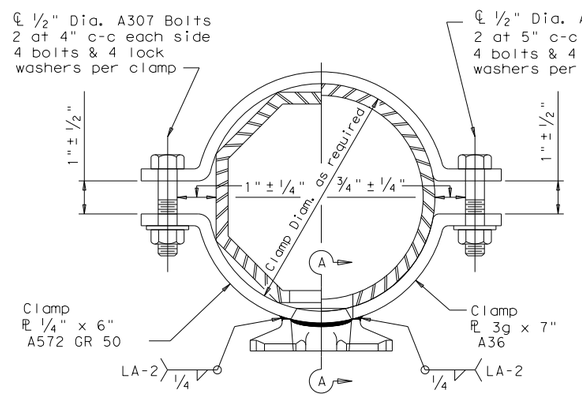
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified Fabricaton tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

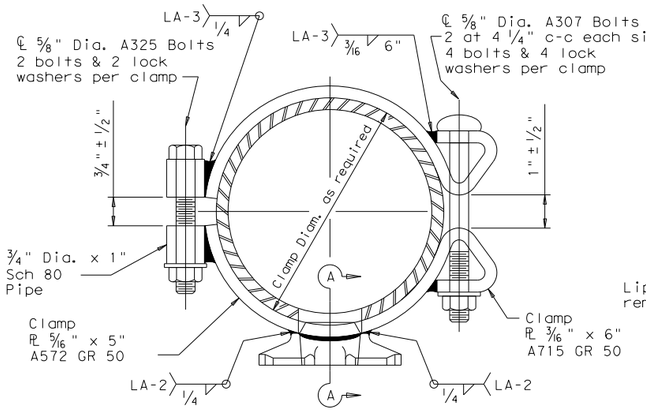
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



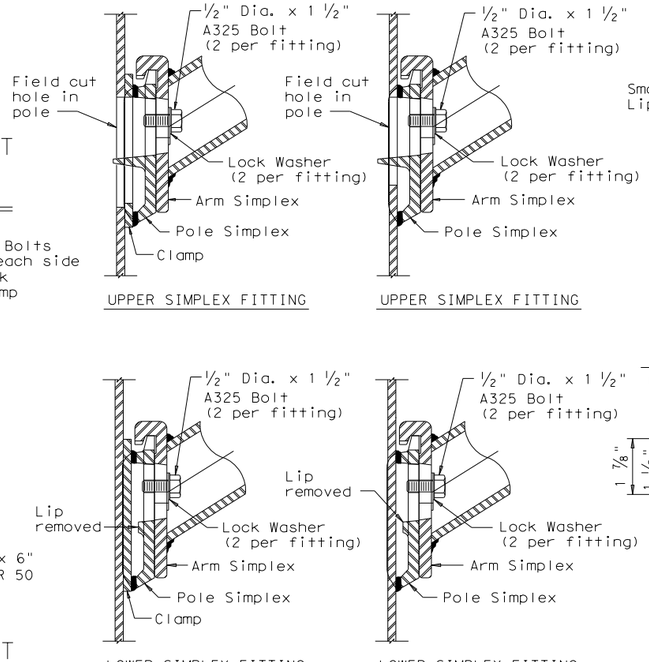
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



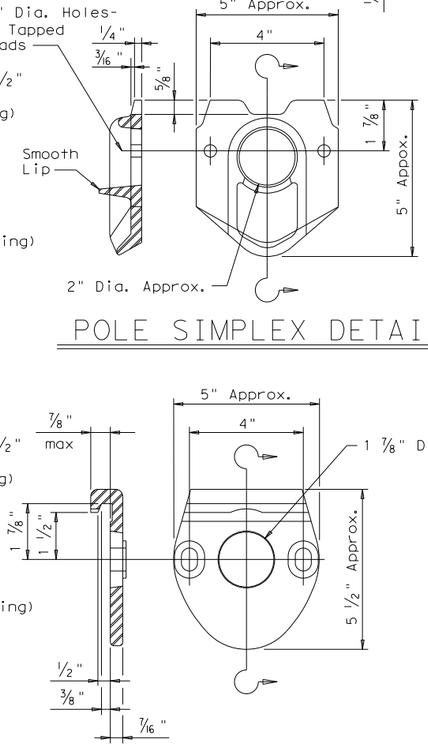
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



SECTON A-A

SECTON B-B



POLE SIMPLEX DETAIL

ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

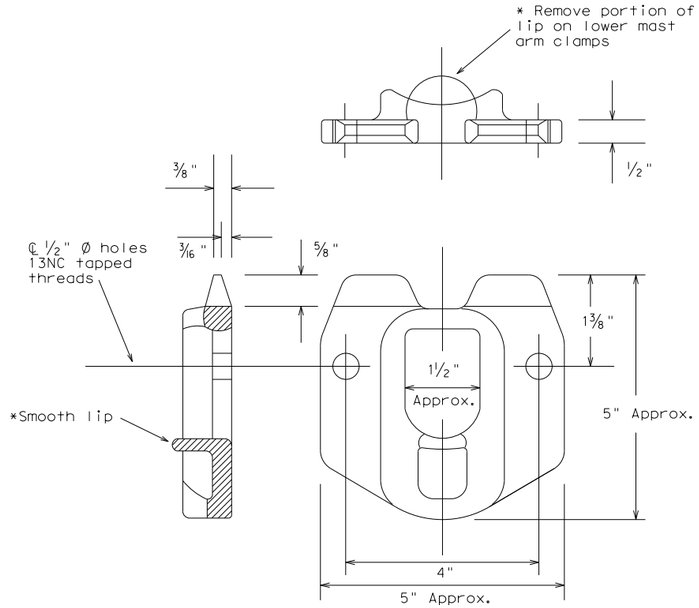
LUM-A-12

DN: LEH	CK: JSY	DW: LTT	CK: TEB

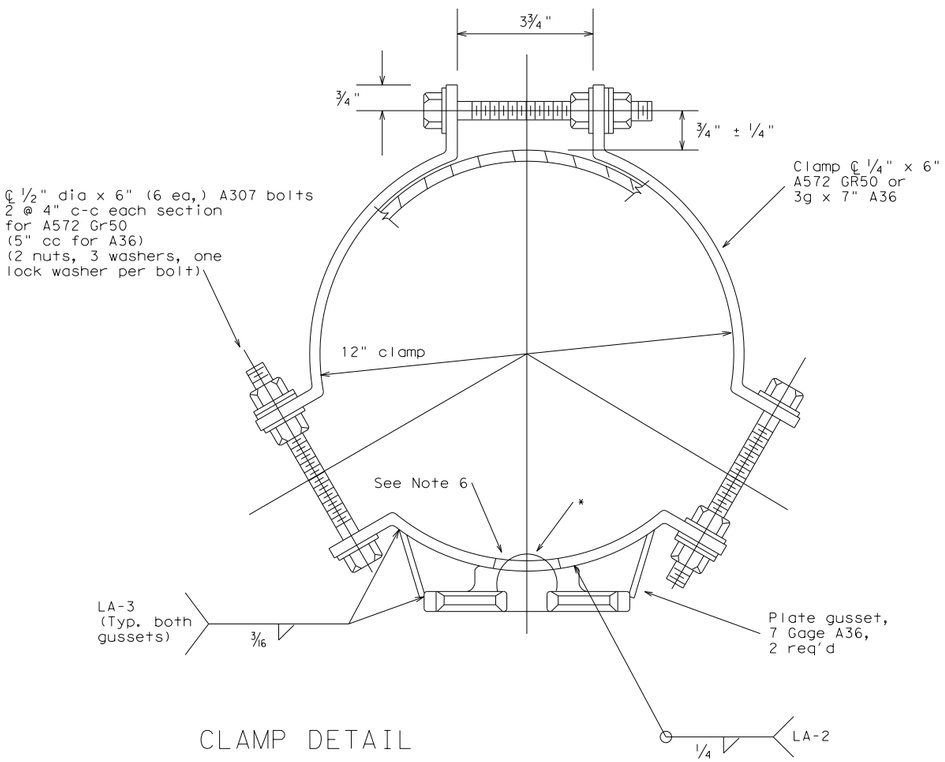
REVISIONS
5-96
1-99
1-12

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519

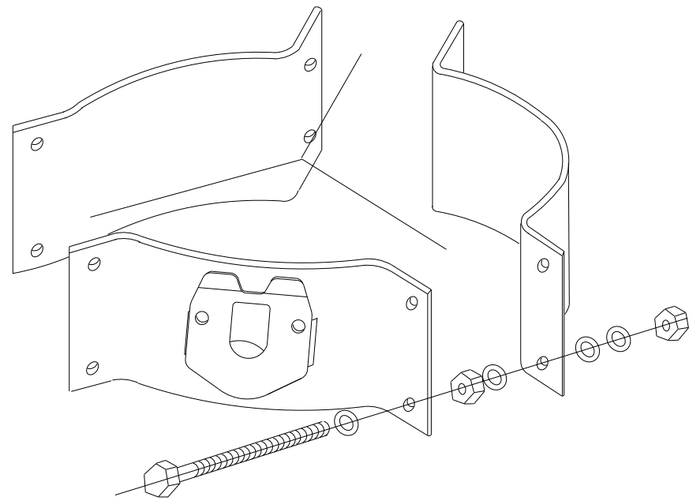
DIST	COUNTY	SHEET NO.
HOU	GALVESTON	178



POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

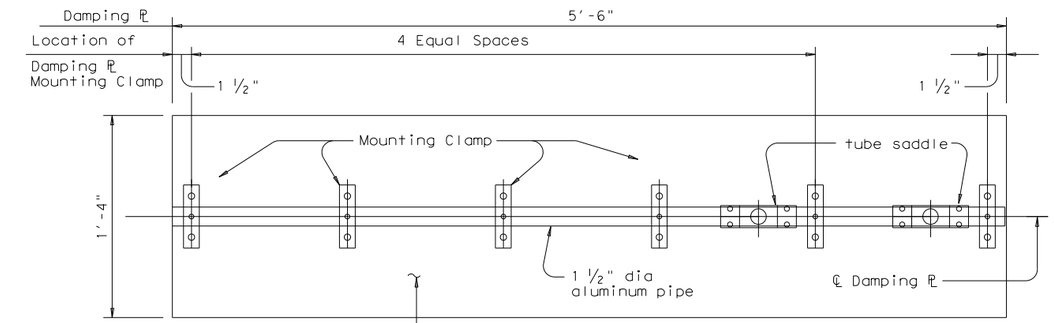
CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

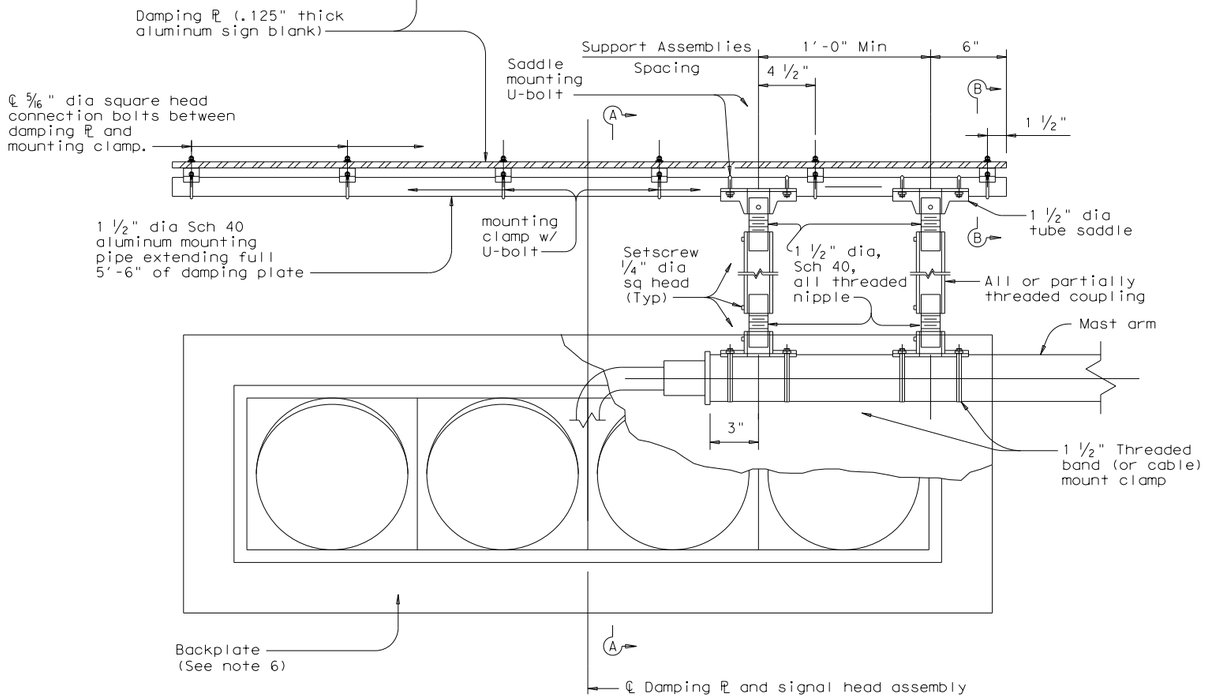
©TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99	0979	01	027	FM 519
1-12	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		179

DATE:
FILE:

DATE:
FILE:



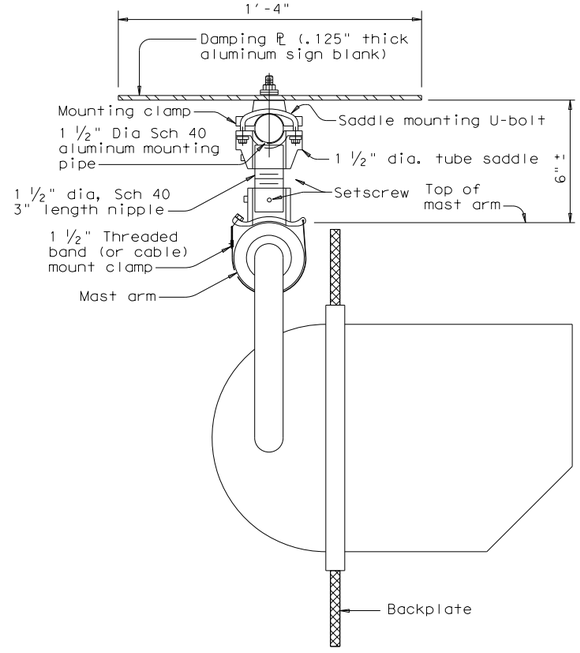
PLAN



ELEVATION

DAMPING PLATE MOUNTING DETAILS

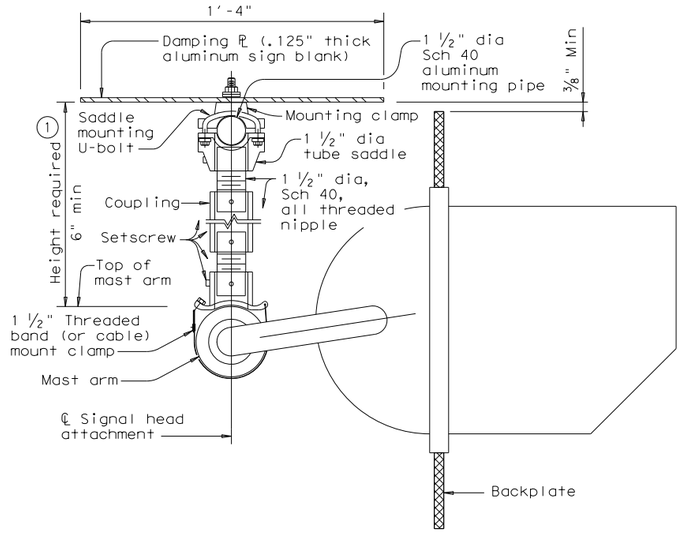
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

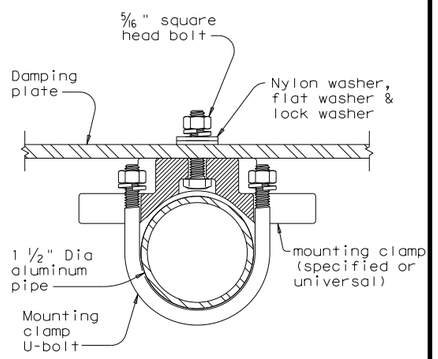


SECTION A-A

(Showing alternate placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"



SECTION B-B

(Showing damping plate attachment)

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".
5. Contractor will verify applicable field dimensions before the installation.
6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

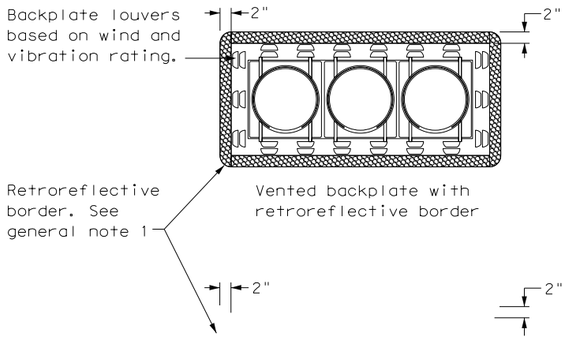
Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

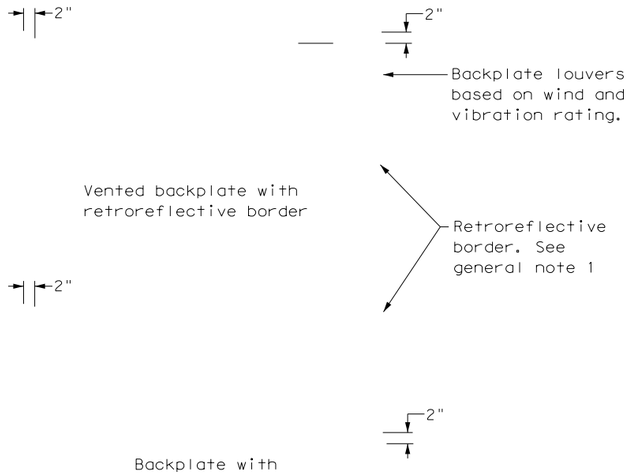
FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
6-20	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		180

DATE:
FILE:



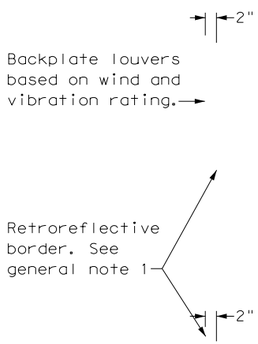
Backplate with retroreflective border

THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



Backplate with retroreflective border

FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



Vented backplate with retroreflective border

Backplate with retroreflective border

FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL

Backplate with retroreflective border

FIVE-SECTION HEAD
CLUSTER

Backplate with retroreflective border

PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE

TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		181

DATE:
FILE:

GENERAL NOTES:

1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.

2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.

3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.

4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.

5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".

6. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.

7. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."

8. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.

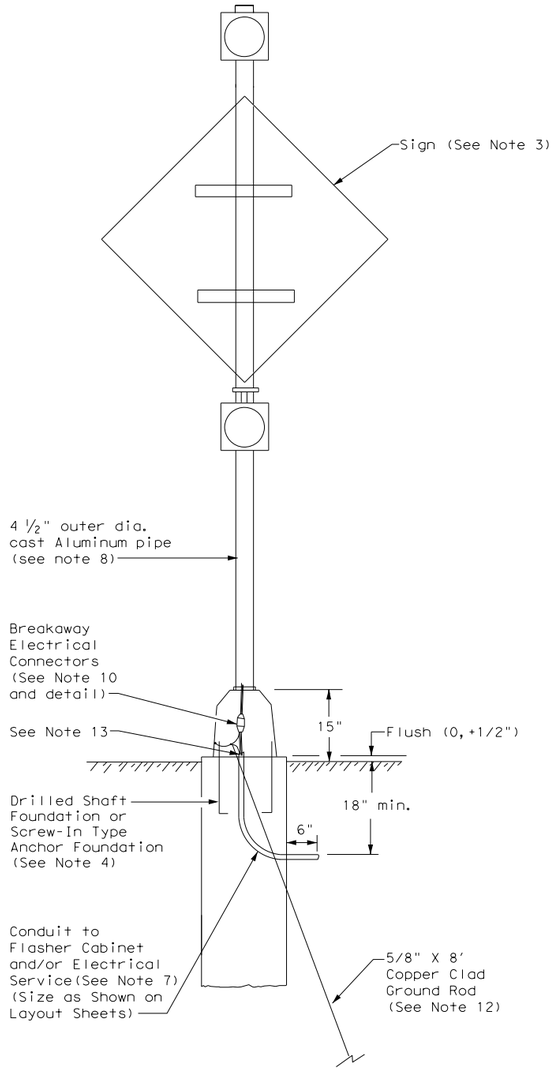
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.

10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

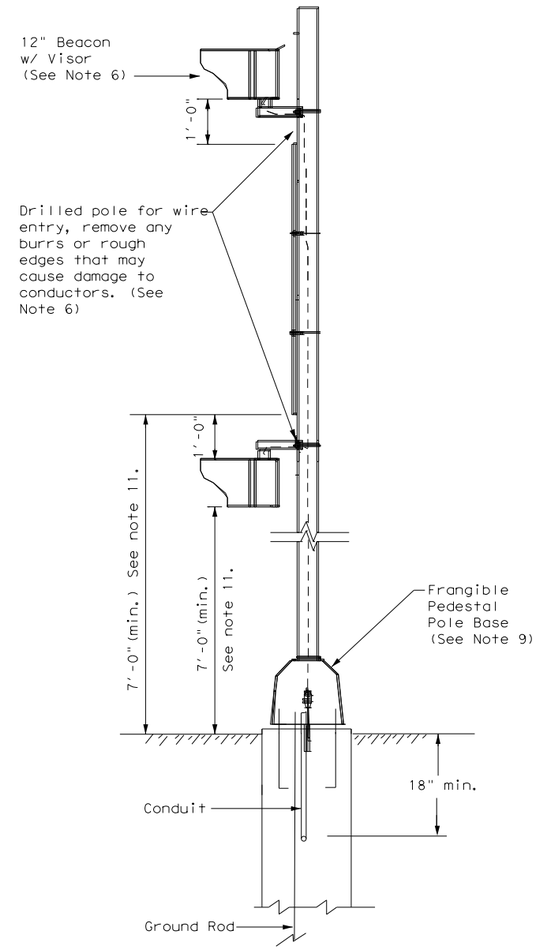
11. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.

12. Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.

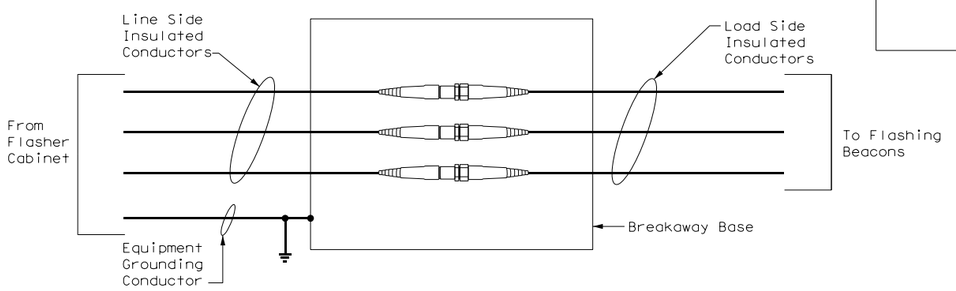
13. Ensure height of conduit and ground rod is below top of anchor bolts.



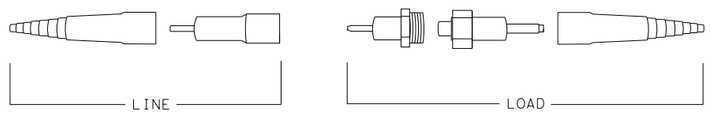
FRONT



SIDE



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW

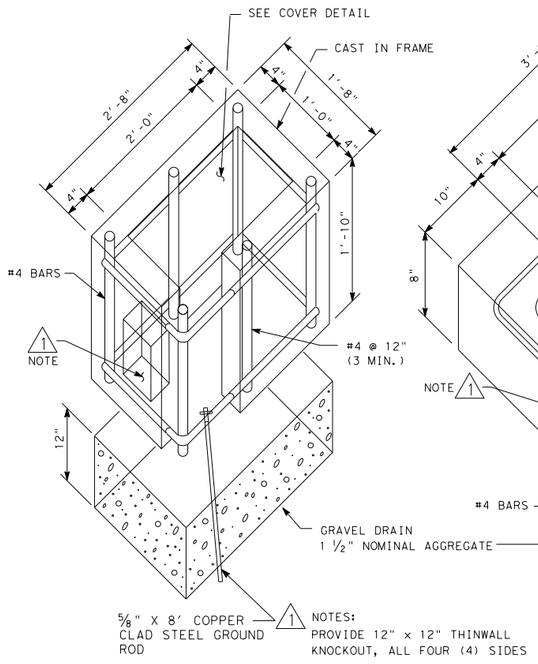
Texas Department of Transportation

Traffic Operations Division Standard

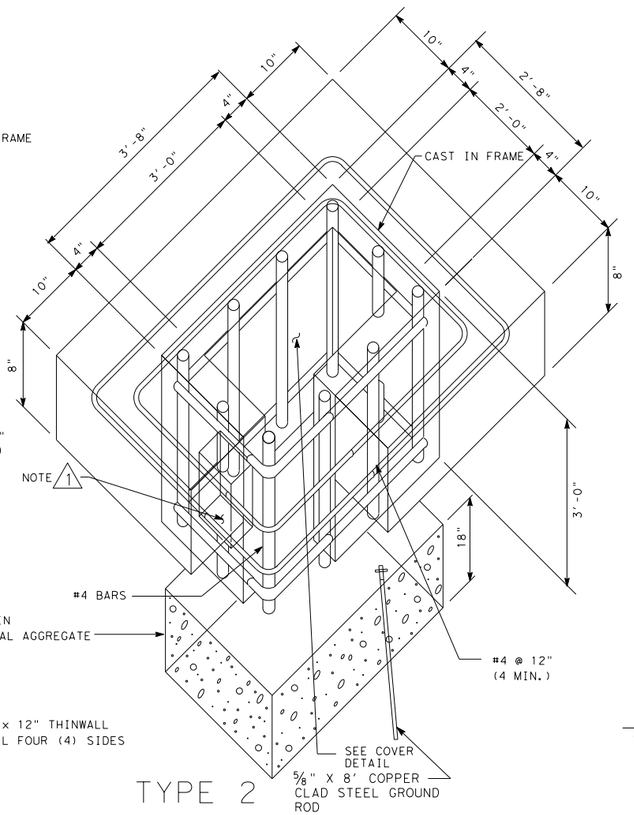
ROADSIDE FLASHING BEACON ASSEMBLY

RFBA-13

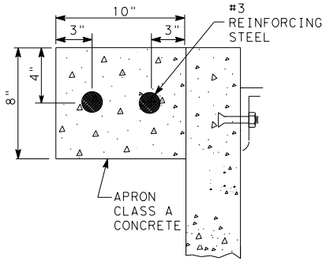
FILE: rfba-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS 5-93 12-04 10-93 3-13 4-98	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		182



TYPE 1
GROUND BOX



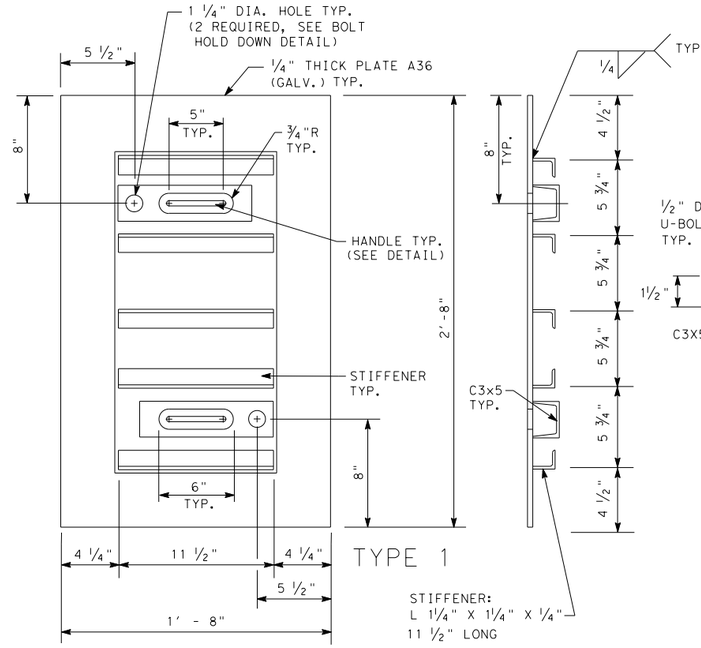
TYPE 2
GROUND BOX
W/APRON



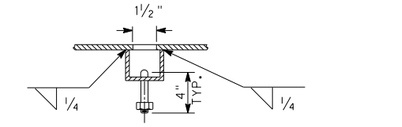
CONCRETE APRON

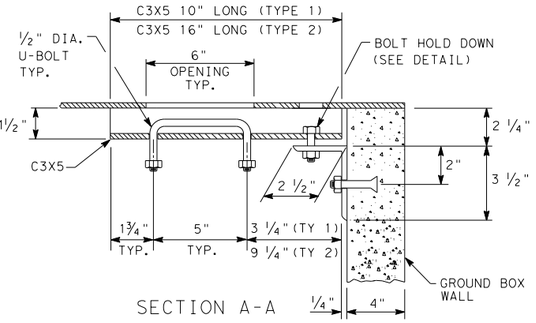
NOTES:

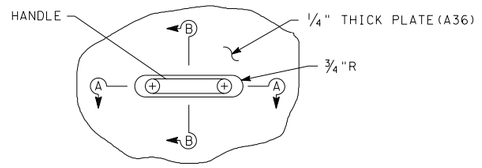
1. FURNISH REINFORCED CONCRETE GROUND BOXES CONSTRUCTED TO THE APPROXIMATE DIMENSIONS SHOWN ON THIS SHEET.
2. FURNISH GALVANIZED STEEL CHECKERED FLOOR PLATE GROUND BOX COVERS WITH 1 IN. RAISED LETTERS READING "TRAFFIC SIGNALS" OR "F. O. CABLE". SECURE COVERS TO THE GROUND BOX AS SHOWN ON THIS SHEET WITH ⅜ IN. DIA. (MIN.) BOLTS.
3. PROVIDE A GROUNDING LUG FOR STEEL COVERS WITH ½"-13 UNC FEMALE THREADS ON THE UNDERSIDE OF THE COVER.
4. FURNISH FLEXIBLE METAL BRAID TYPE GROUNDING STRAP. ENSURE THE STRAP IS NO LESS THAN 1 IN. IN WIDTH AND 5 FT. MIN. IN LENGTH TO ALLOW FOR GROUND BOX COVER REMOVAL FROM THE BOX WITHOUT DISCONNECTING THE GROUND STRAP.
5. AFTER PLACING GROUND BOX, FURNISH AND INSTALL BACKFILL FOR THE EXCAVATED AREA AND COMPACT THE FILL TO THE DENSITY OF THE SURROUNDING GROUND AS APPROVED BY THE ENGINEER.
6. AFTER INSTALLING CONDUIT THROUGH KNOCKOUT, GROUT REMAINING OPENING OF KNOCKOUT.
7. PLACE GROUND BOXES AS SHOWN ON LAYOUT SHEET. FURNISH ADDITIONAL GROUND BOXES IF REQUIRED.
8. PLACE TYPE 1 GROUND BOXES AT 350 FT. MAXIMUM SPACING. PLACE TYPE 2 GROUND BOXES AT 1,000 FT. MAXIMUM SPACING OR AS DIRECTED BY THE ENGINEER.
9. FURNISH CLASS "A" CONCRETE.



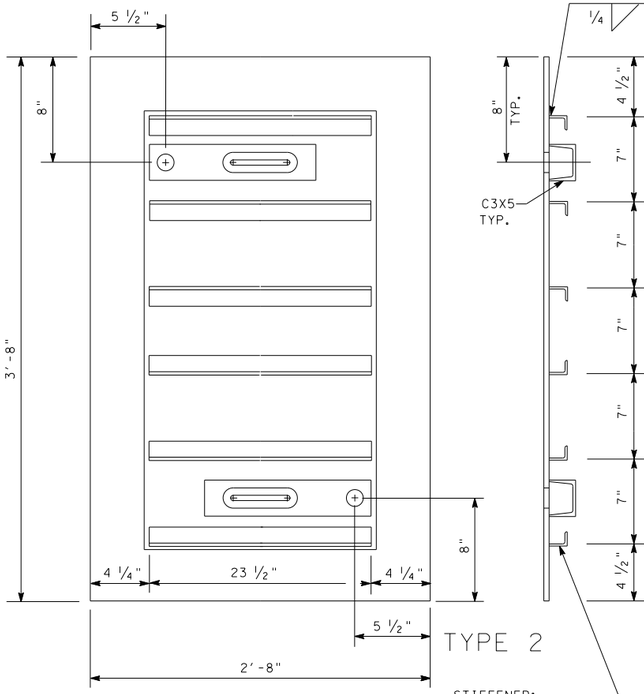
TYPE 1





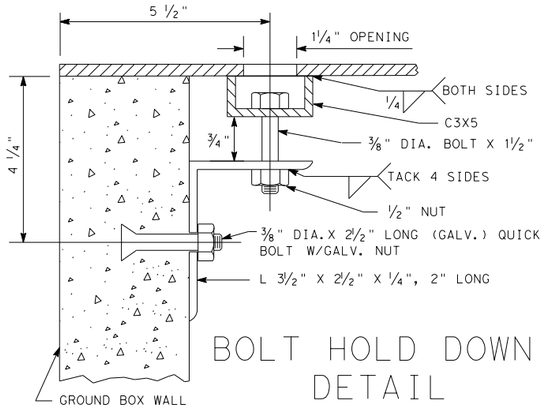


HANDLE DETAIL



TYPE 2

COVER DETAIL



BOLT HOLD DOWN DETAIL

(2 REQUIRED)

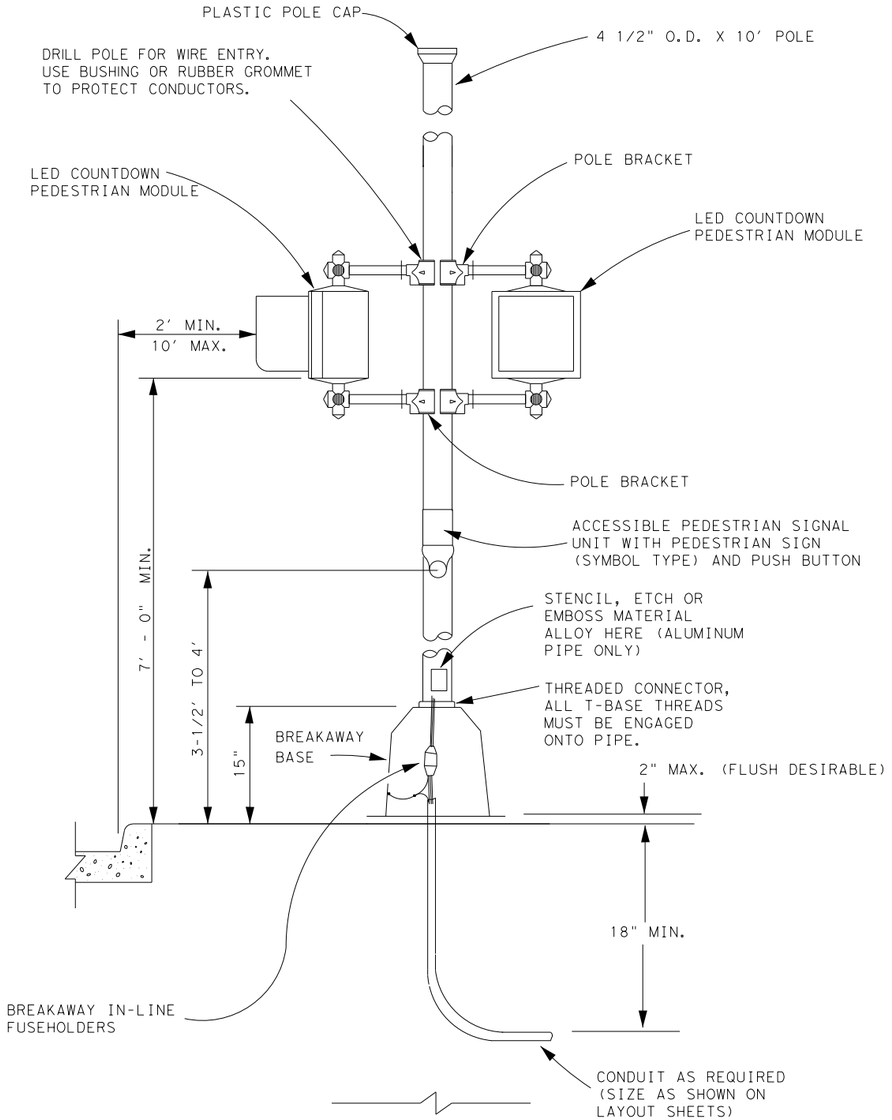
Texas Department of Transportation
Houston District

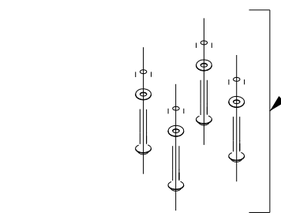
SIGNAL DETAILS/STANDARDS GROUND BOX DETAILS INSTALLATIONS

GBDI

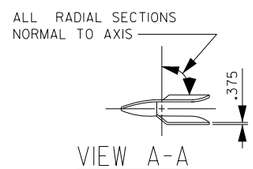
FILE:	DN:	CK:	DW:	CK:
©TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
08-04 REVISIONS	HOU	6	STP 2B23(207)TAPS	183
04-17 REVISIONS	COUNTY		CONTROL / SECT / JOB	HIGHWAY
	GALVESTON		0979 / 01 / 027	FM 519

STD-M2

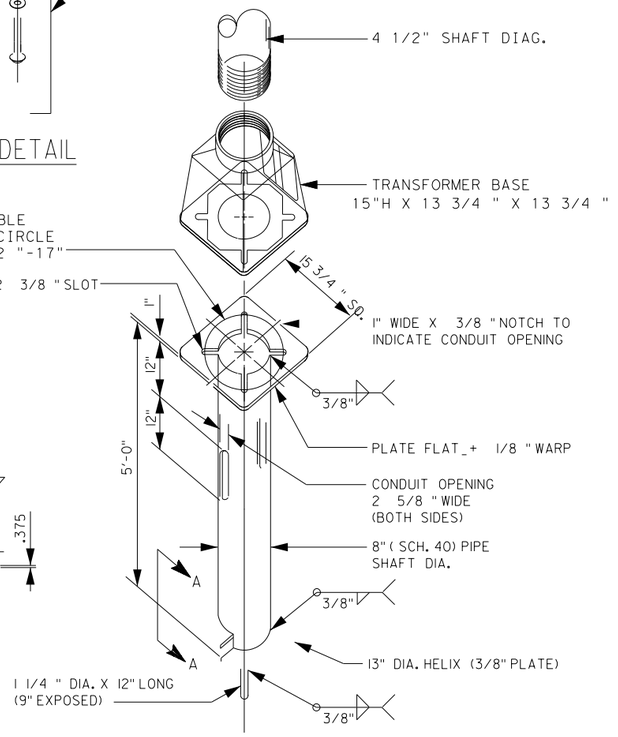




HARDWARE DETAIL



VIEW A-A



SCREW ANCHOR FOUNDATION DETAIL

NOTE:

SEE STANDARD (RFBA - 13) FOR NOTES AND
NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

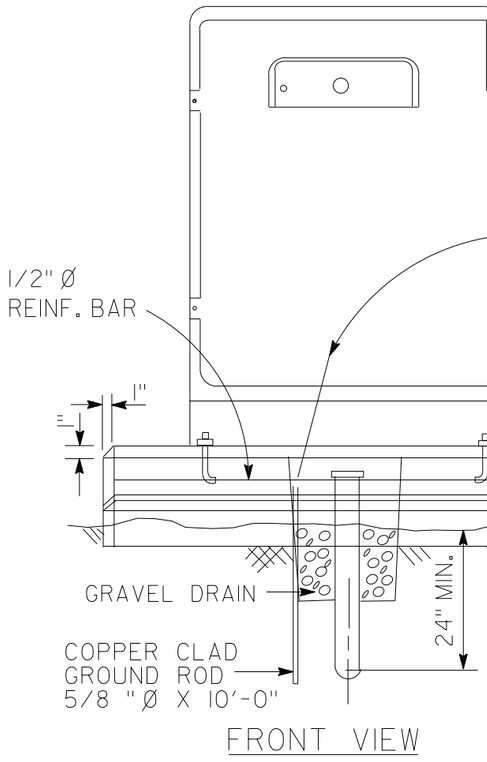
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED (APS) PEDESTRIAN SIGNALS

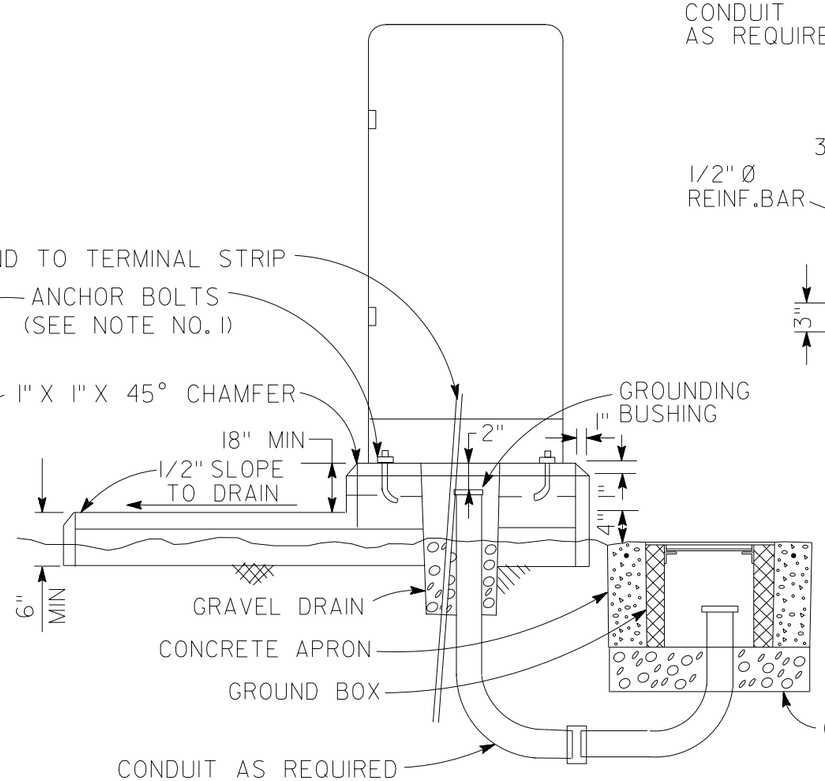
CD/PM(APS)PS

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2012	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 07-14 02-15	HOU	6	STP 2B23(207)TAPS	184
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	GALVESTON	0979	01	027	FM 519

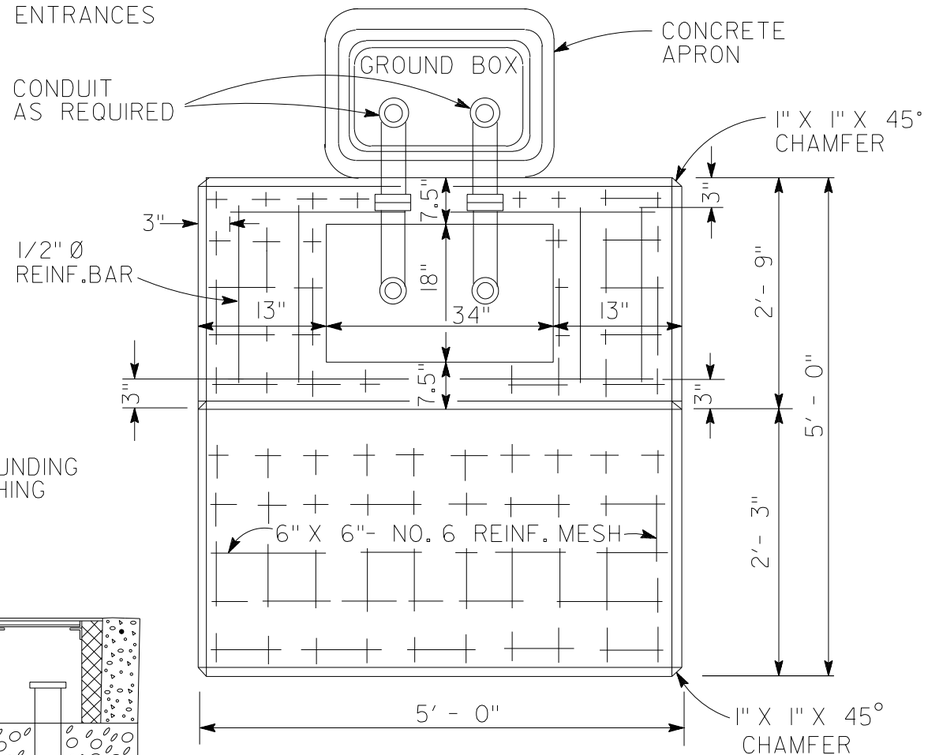
STD-M19



FRONT VIEW



SIDE VIEW



TOP VIEW
(LESS CABINET)

NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONTROLLER FOUNDATION DETAIL

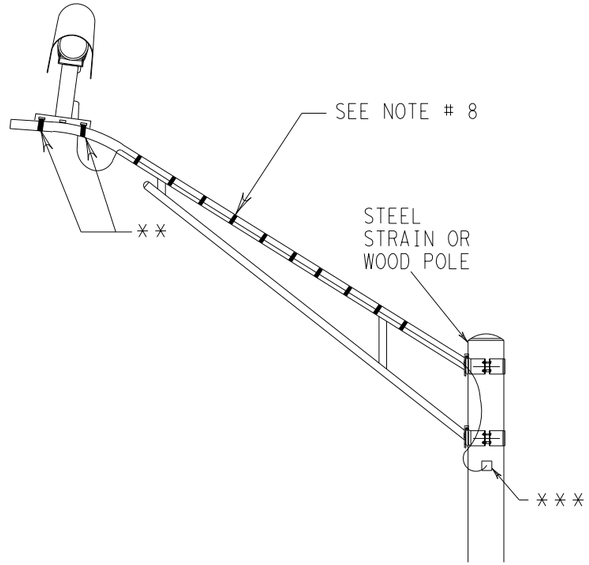
SD/SCFD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 08-04 03-07	HOU	6	STP 2B23(207)TAPS	185
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	GALVESTON	0979	01 027	FM 519

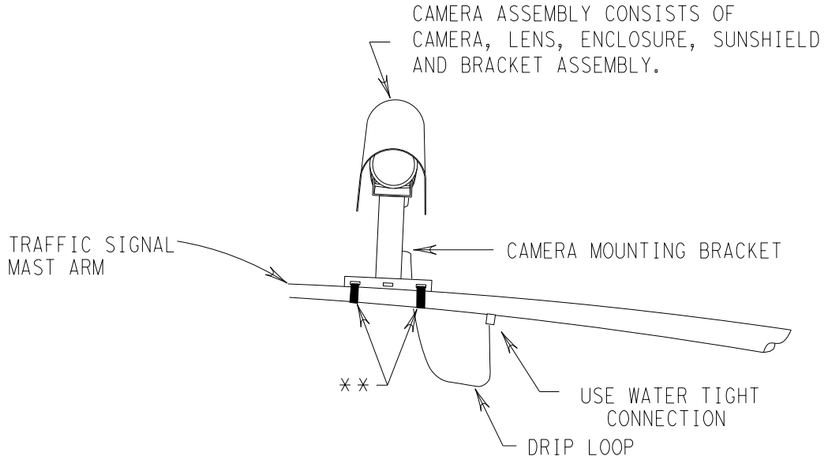
STD-M1

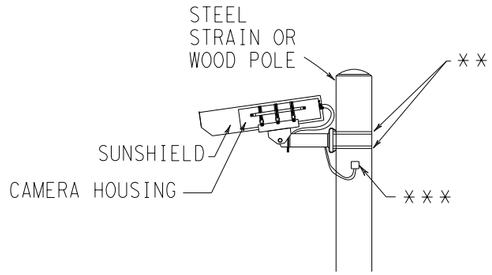
NOTES FOR VIDEO DETECTION:

1. INSTALL VIDEO DETECTION PROCESSOR UNIT INSIDE CONTROLLER CABINET.
2. INSTALL VIDEO DETECTION CAMERA & BRACKET AS DETAILED OR AS DIRECTED BY THE VIDEO DETECTION SUPPLIER.
3. MOUNT CAMERAS AS FAR OVER THE ROADWAY AS POSSIBLE.
4. USE ¾ IN. STAINLESS STEEL BANDING MATERIAL TO INSTALL CAMERA MOUNTS.
5. AIM CAMERA SO THAT HORIZON IS NOT VISIBLE IN THE FIELD OF VIEW.
6. INSTALL CAMERA ENCLOSURE ASSEMBLY SO THAT IT CAN ROTATE AFTER INSTALLATION TO PROVIDE PROPER ALIGNMENT.
7. PROVIDE WATER TIGHT CABLE ENTRY AND EXIT POINTS IN THE MAST ARM AND/OR POLES.
8. FOR VIVDS COAX AND POWER CABLES ATTACHED TO LUMINAIRE ARM, PROVIDE A METAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3/4-IN MINIMUM WIDTH AND TWO WRAPS AT 8 IN. MAXIMUM SPACING.

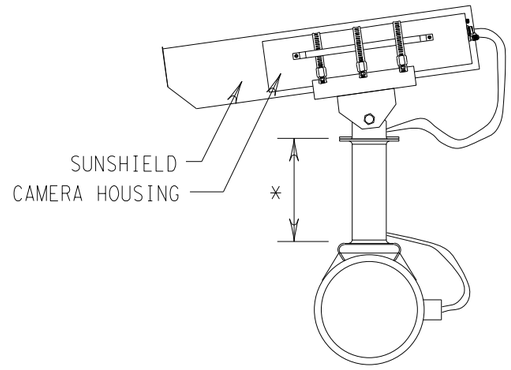


LUMINAIRE ARM MOUNT





POLE MOUNT

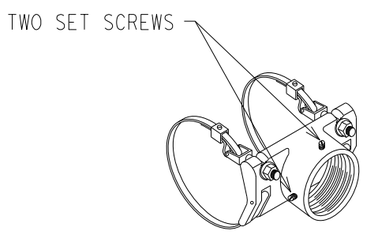


SIDE VIEW

* 4 FT. PIPE EXTENSION WHEN MOUNTED ON TRAFFIC SIGNAL MAST ARM.

** ¾ IN. (MIN) STAINLESS STEEL BANDING 2 PLACES MIN.

*** ENTRY INTO STEEL POLE OR CONDUIT WEATHERHEAD ON WOOD POLE



BAND MOUNT BRACKET DETAIL

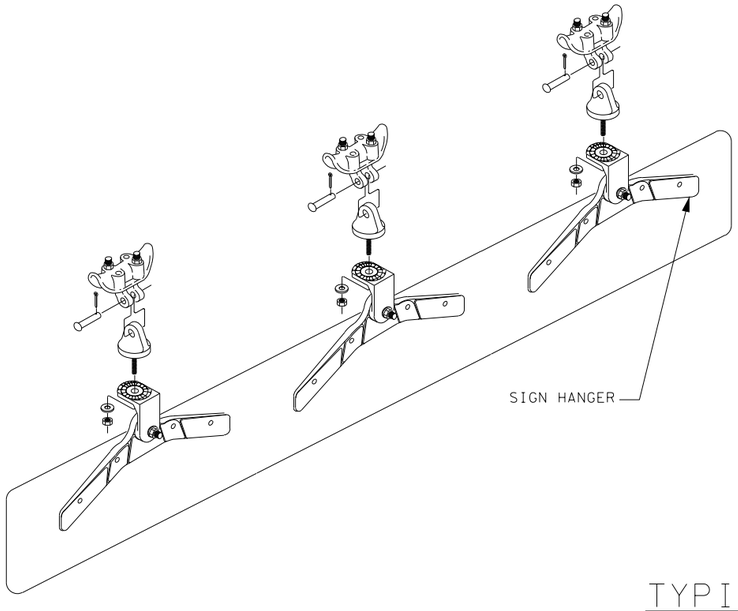
Texas Department of Transportation
Houston District

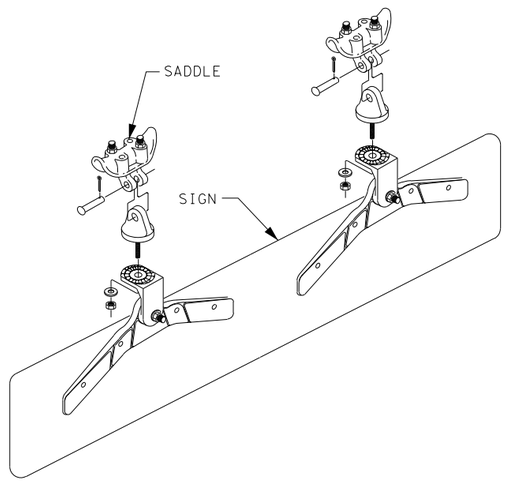
SIGNAL DETAILS/STANDARDS
VIVDS CAMERA
MOUNTING DETAILS

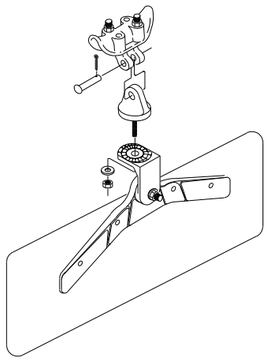
VC/MD

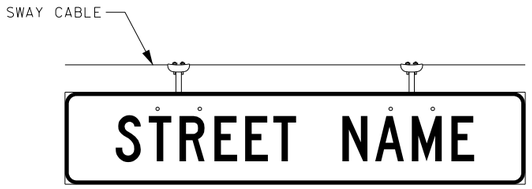
FILE:	DN:	CK:	DW:	CK:
© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 2B23(207)TAPS	186
02/2004 03/16/2006 09/2010	COUNTY	CONTROL	SECT JOB	HIGHWAY
	GALVESTON	0979	01 027	FM 519

STD-M13



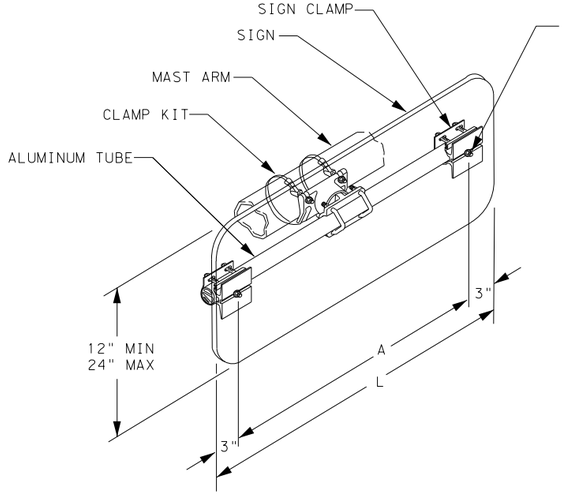


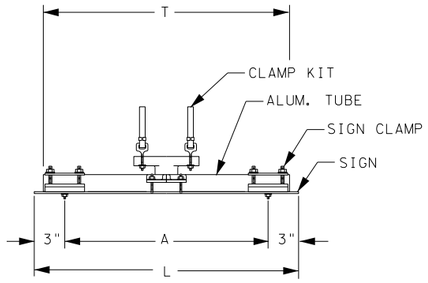


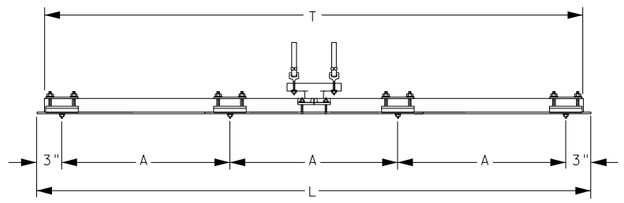


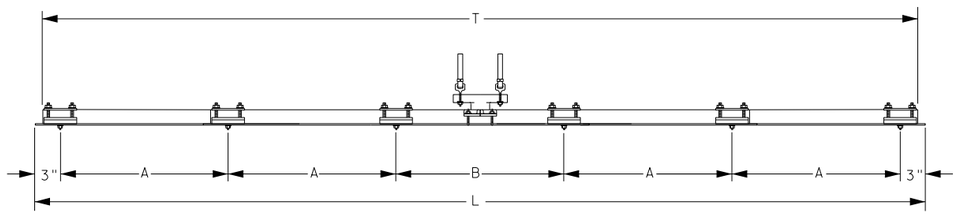
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"

SIGN CLAMP DETAIL

GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

FILE: Overhead-Sign-mount-det-sp04.dgn

Texas Department of Transportation
Houston District

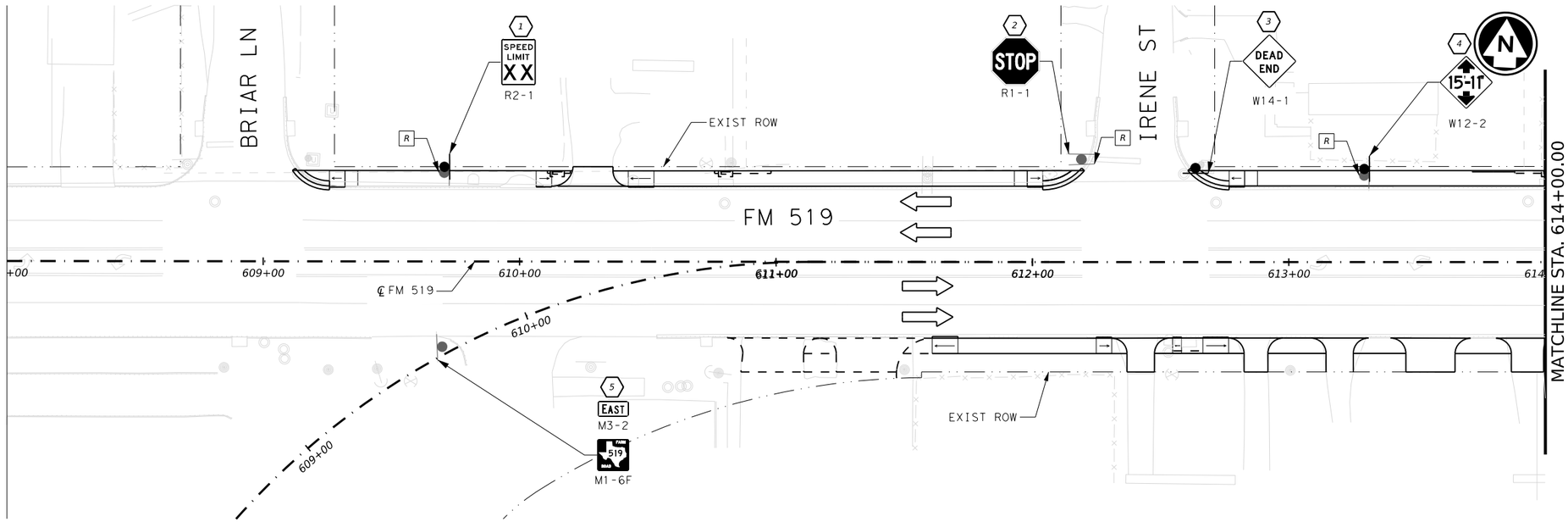
SIGNAL DETAILS/STANDARDS OVERHEAD STREET NAME SIGN MOUNTING DETAILS

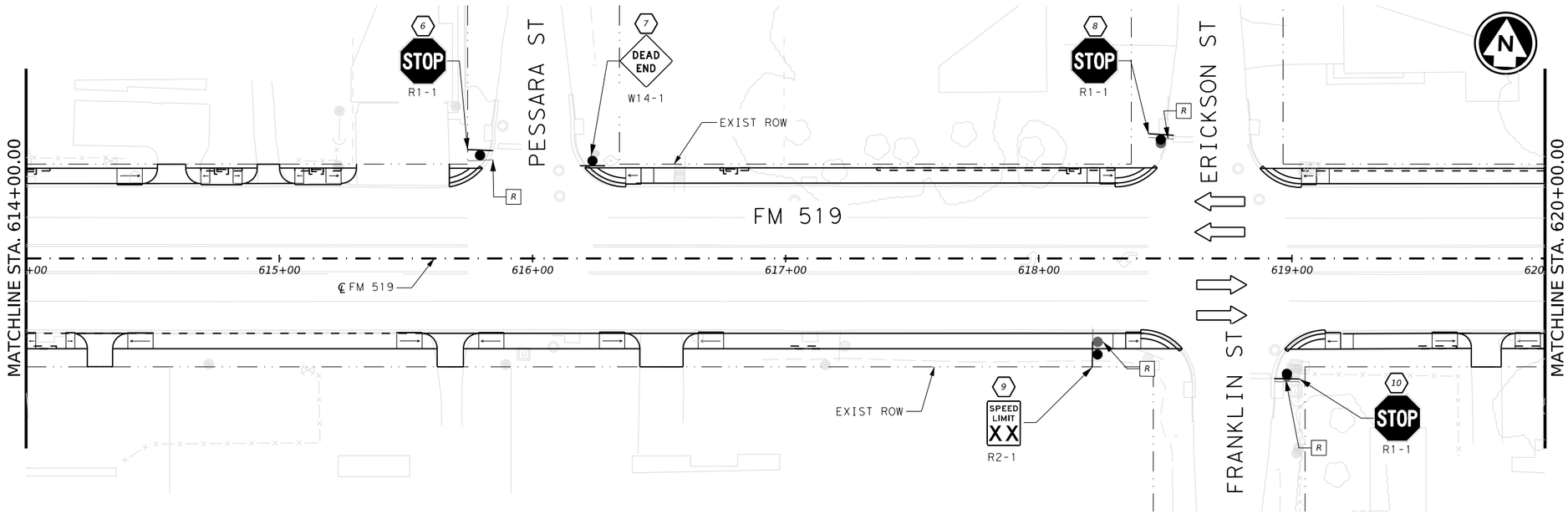
OSNS/MD

	DN:	CK:	DW:	CK:	
© TxDOT 2004	DIST	FED REG	PROJECT NO.		SHEET
	HOU	6	STP 2B23(207)TAPS		187
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	GALVESTON		0979	01	027	FM 519

STD-M12

100% SUBMITTAL





LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SIGNING LAYOUT
BEGIN TO STA 620+00

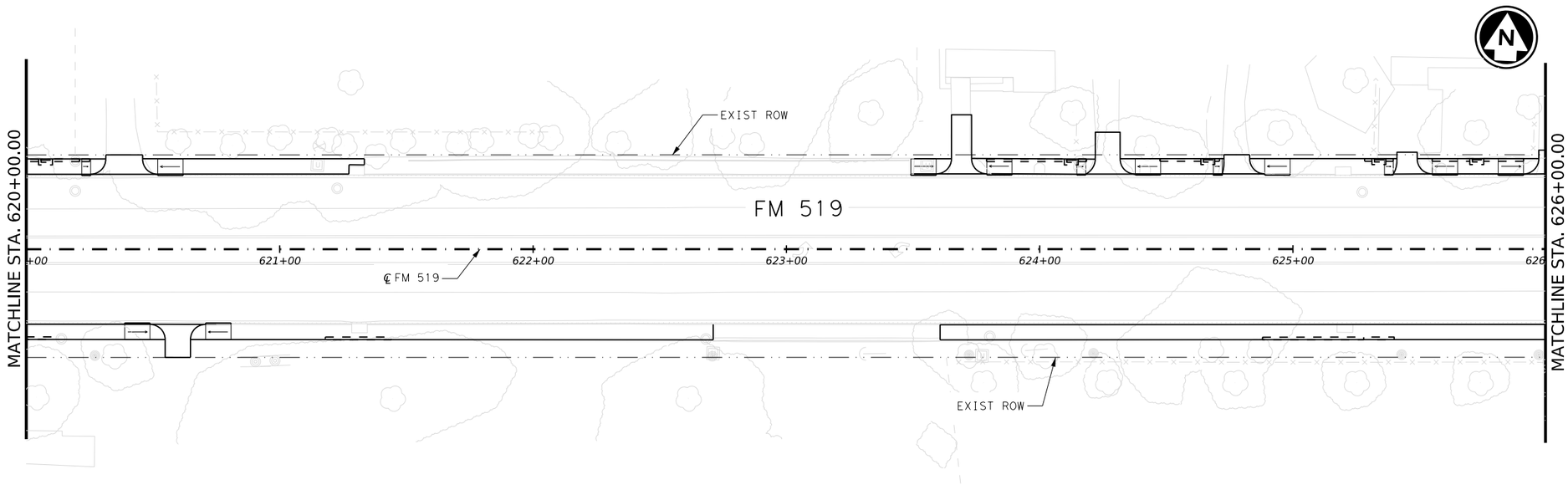
SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		188

DATE: 9/12/2023 10:41:30 AM
FILE: ...\8 Traffic\FM 519 SGN 01.dgn

100% SUBMITTAL

CK | DW | CK | DW

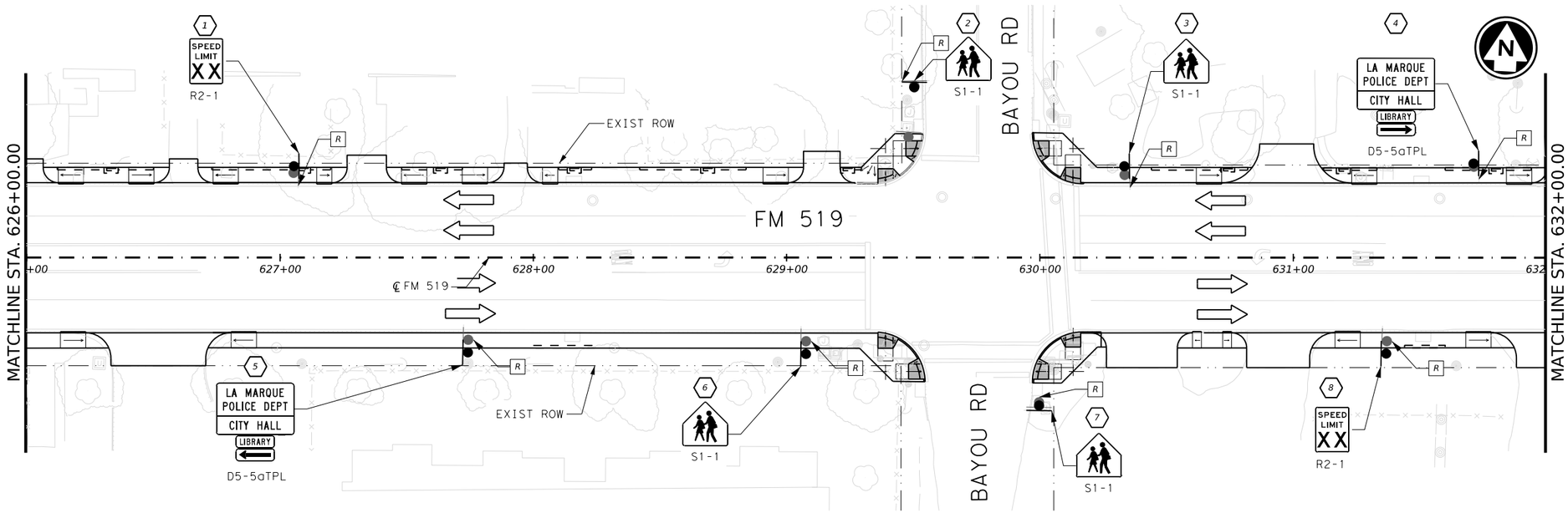


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

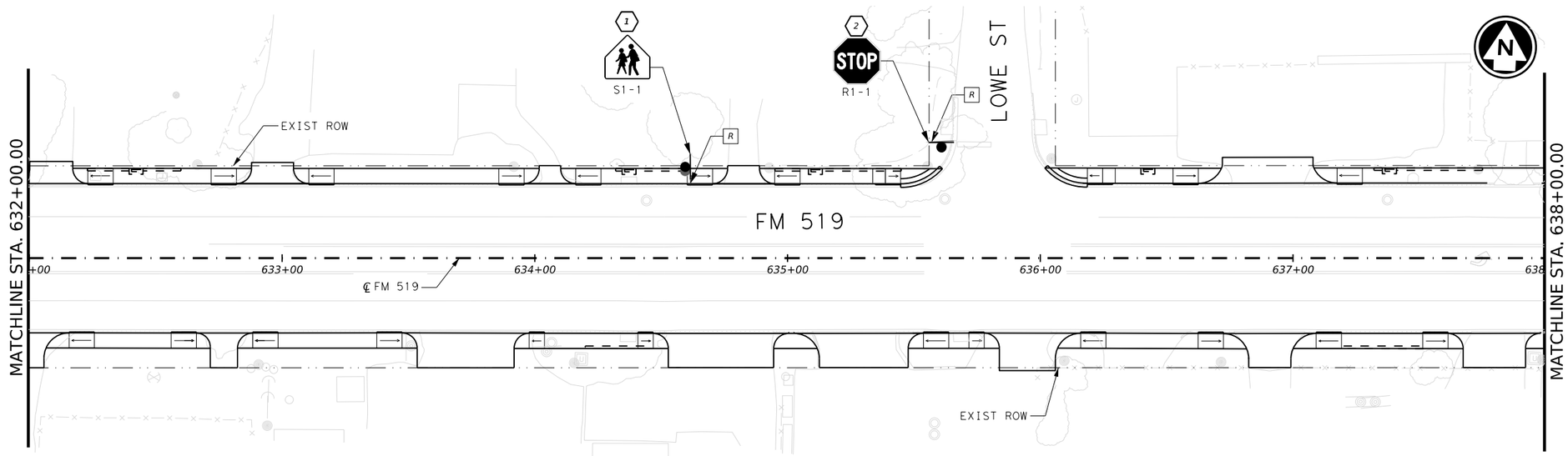
SIGNING LAYOUT STA 620+00 TO STA 632+00

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		189

DATE: 9/12/2023 10:41:59 AM
FILE: ...i8. Traffic\FM 519 SGN 02.dgn

100% SUBMITTAL

CK DW CK DW

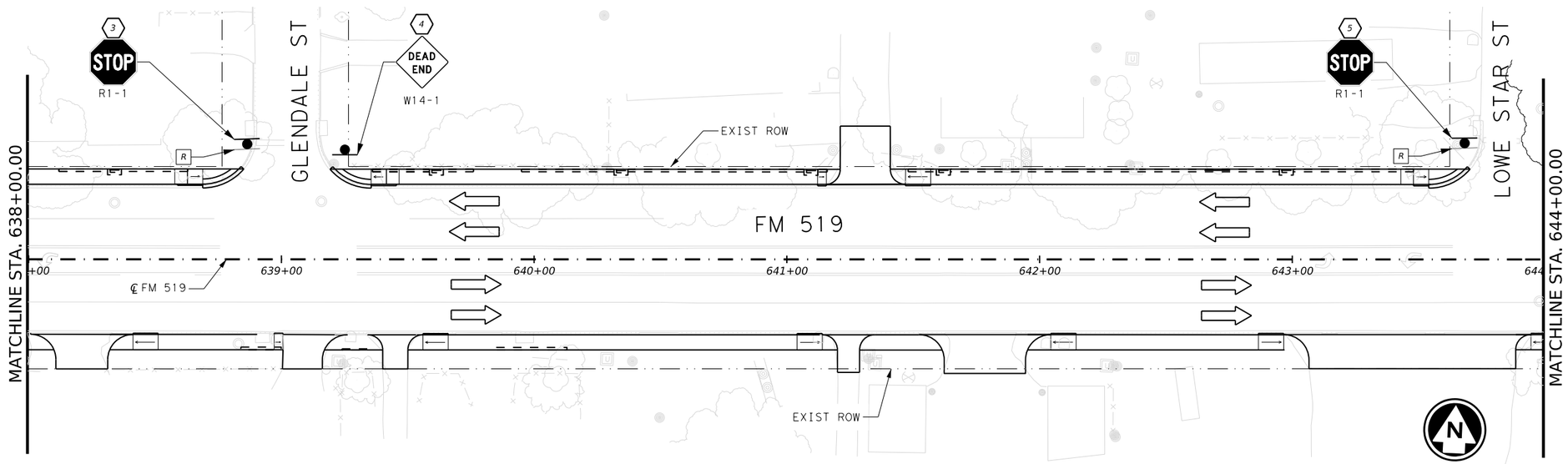


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)816-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SIGNING LAYOUT
STA 632+00 TO STA 644+00

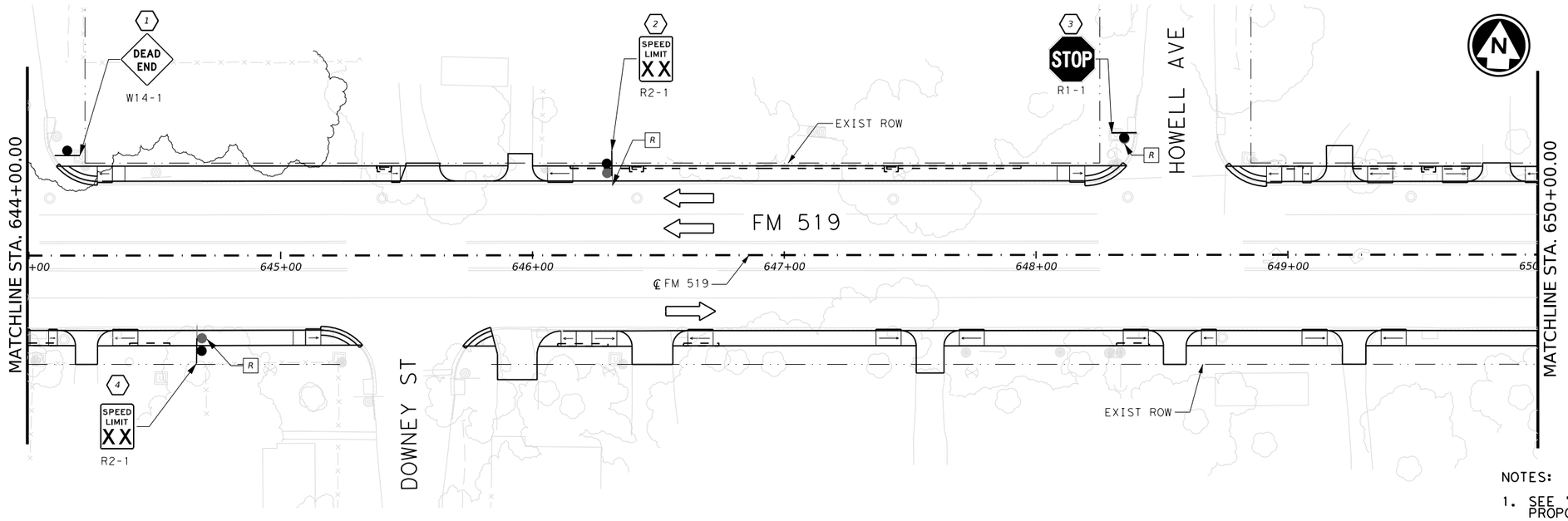
SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		190

DATE: DATE TIME
FILE: DOCUMENT NAME

100% SUBMITTAL

CK
DW
CK
DW

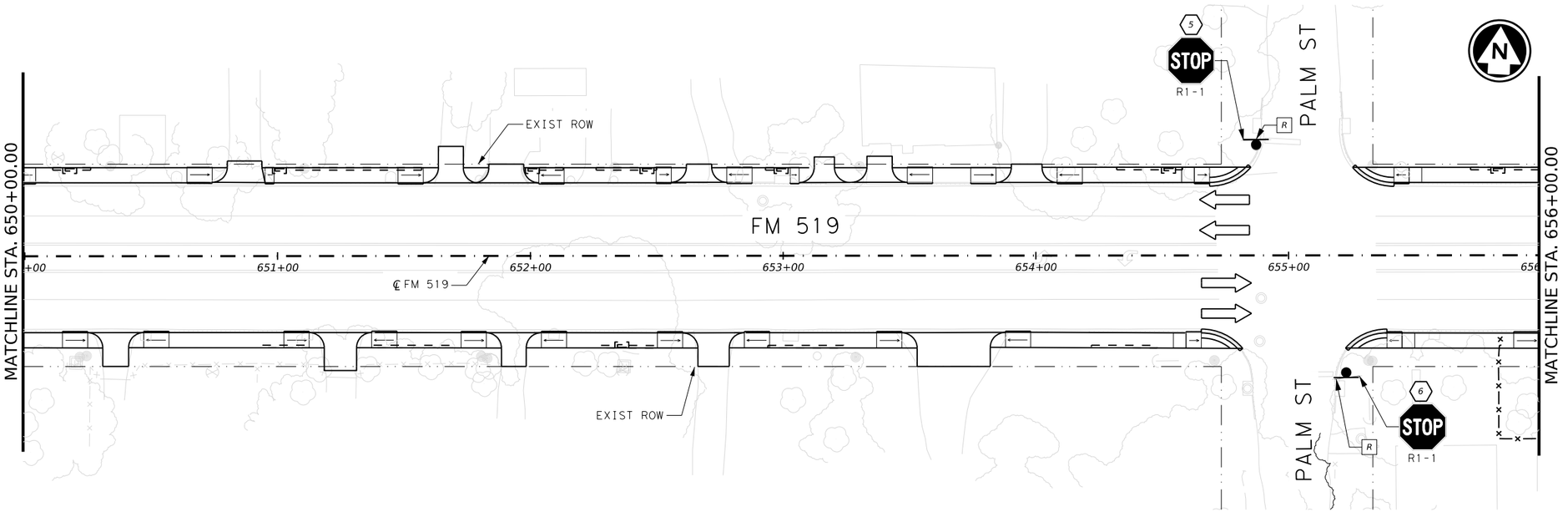


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED PROFESSIONAL ENGINEER

Lacey L Hebert, PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)816-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SIGNING LAYOUT
STA 644+00 TO STA 656+00

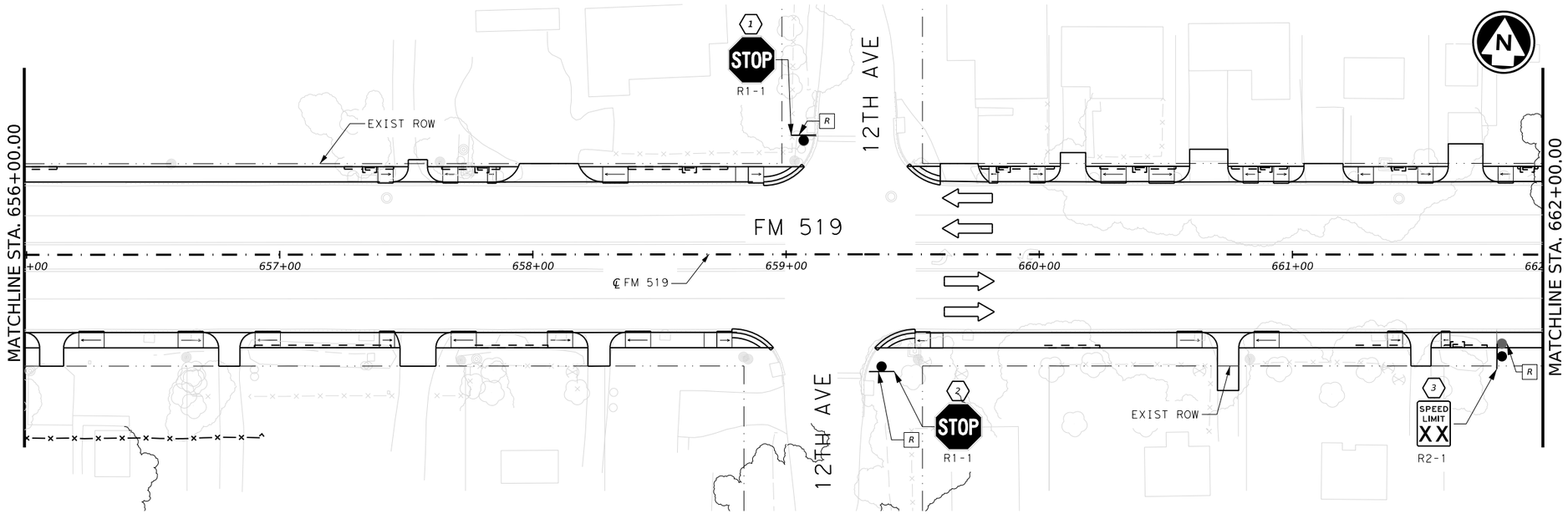
SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		191

DATE: DATE TIME
FILE: DOCUMENT NAME

100% SUBMITTAL

CK | DW | CK | DW

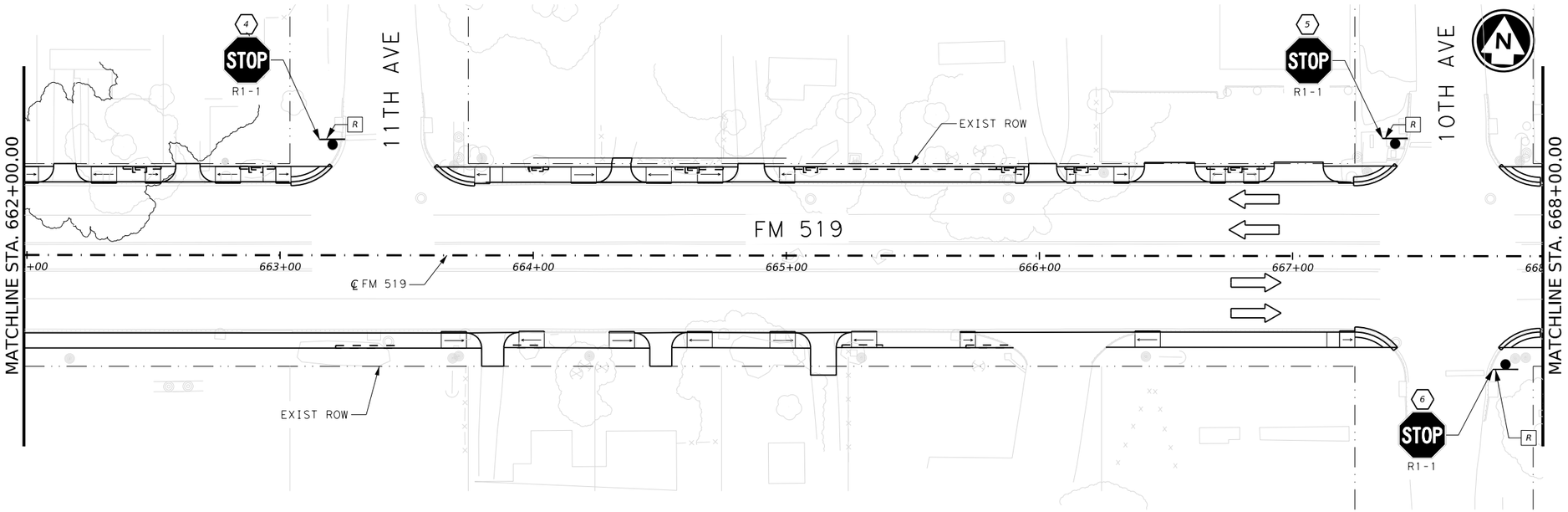


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

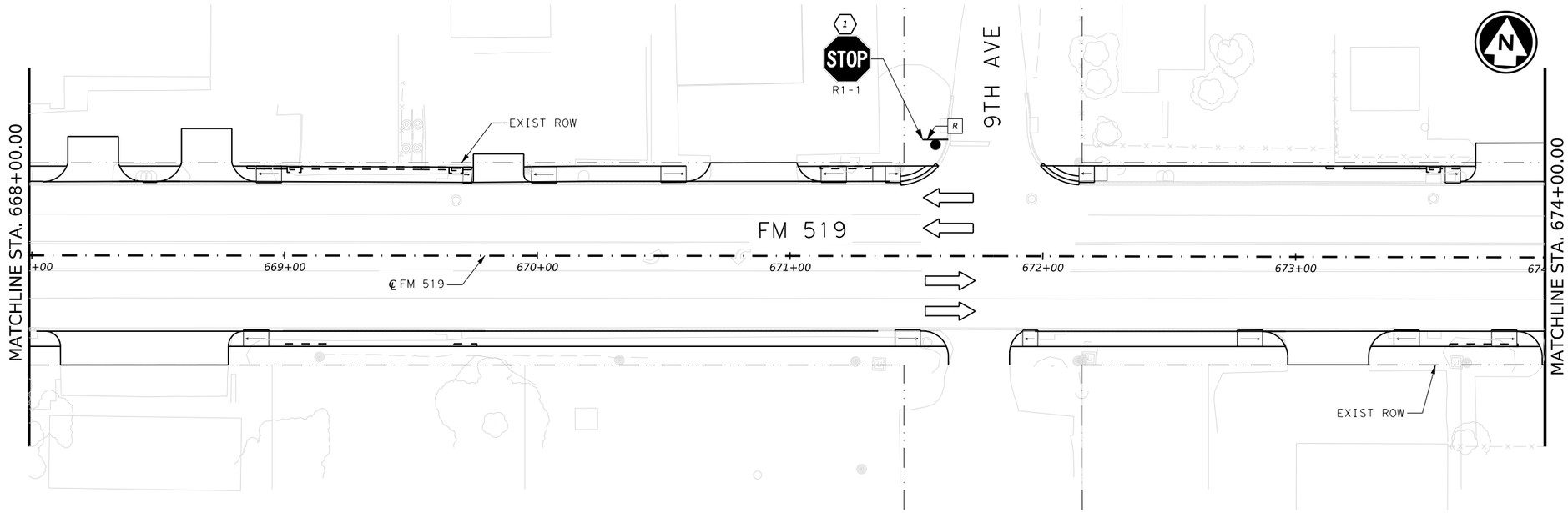
SIGNING LAYOUT
STA 656+00 TO STA 668+00

SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		192

DATE: 9/12/2023 10:44:02 AM
FILE: ...\8 Traffic\FM 519 SGN 05.dgn

100% SUBMITTAL

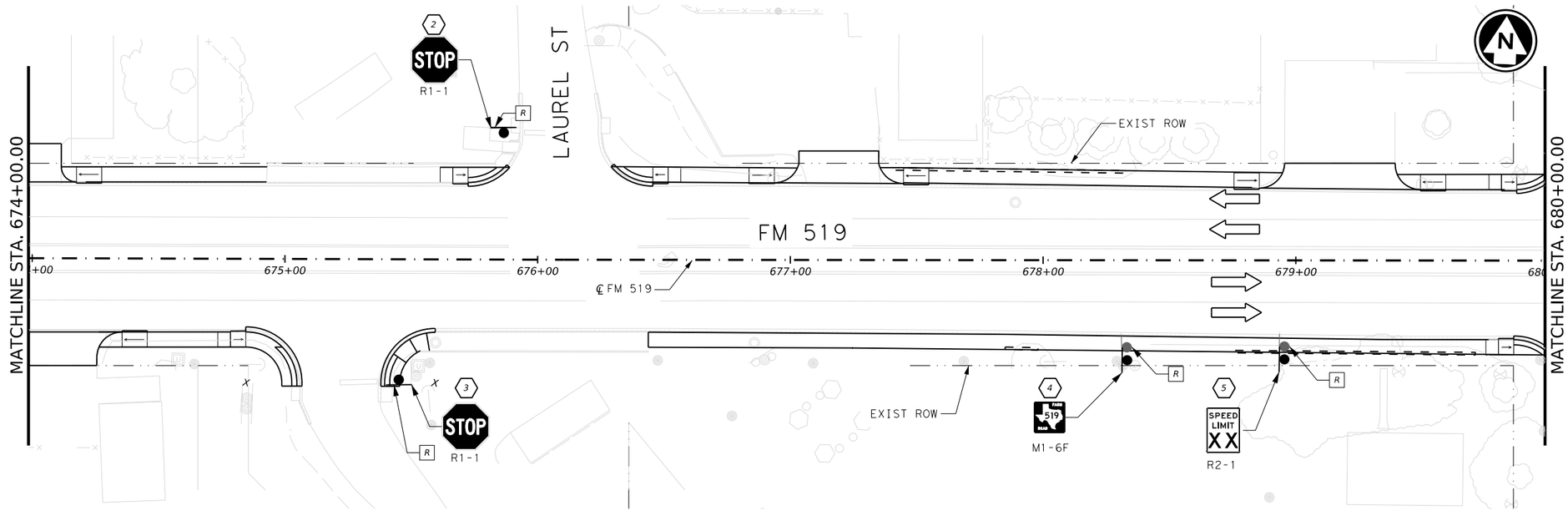


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

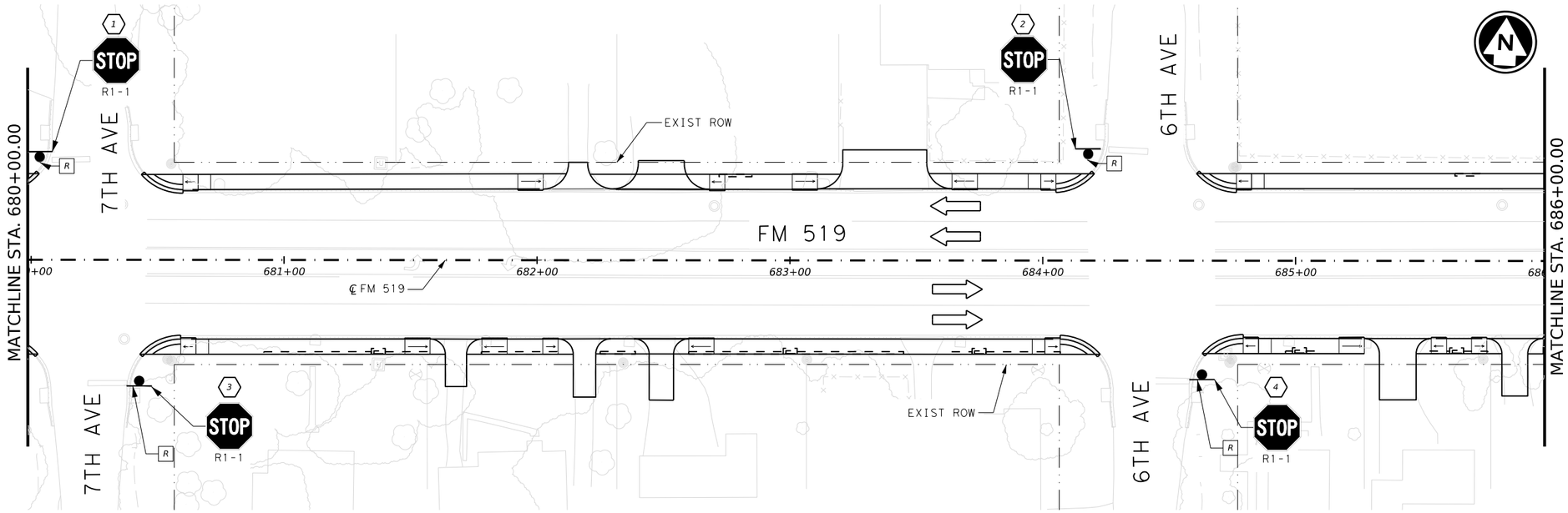
SIGNING LAYOUT
STA 668+00 TO STA 680+00

SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		193

DATE: 9/DATE/2023 10:44:51 AM
FILE: ...DESIGN\SHEETS\SIGNING\SGN 06.dgn

100% SUBMITTAL

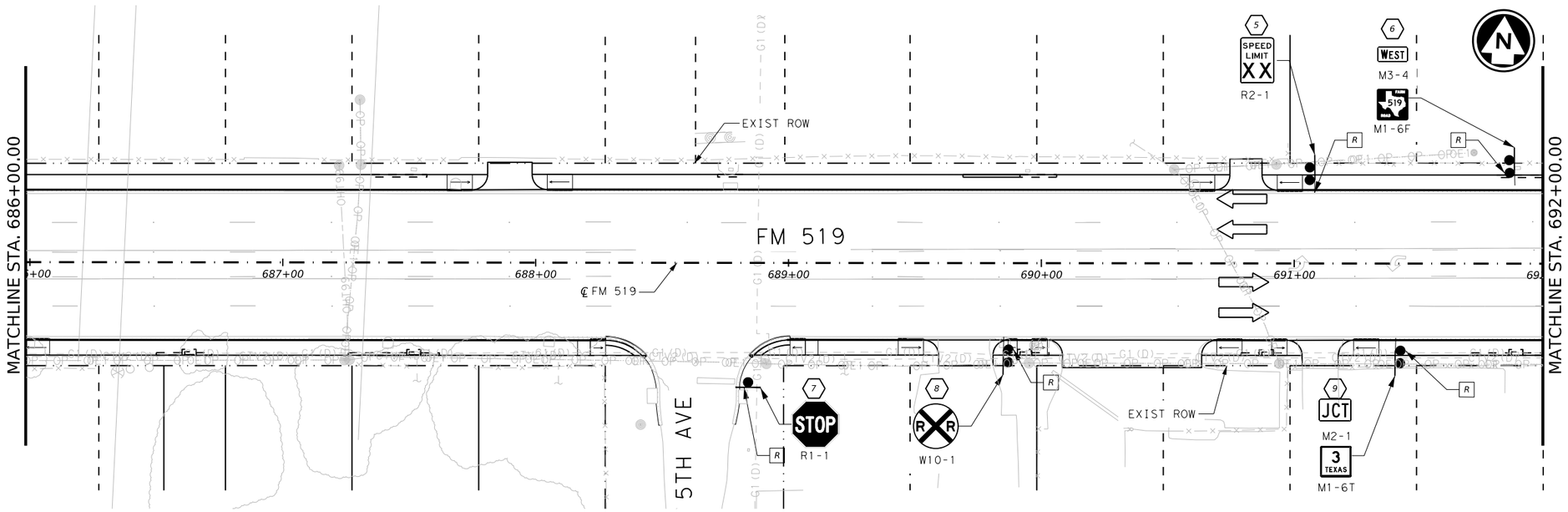


LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.



0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER
Lacey L Hebert PE
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

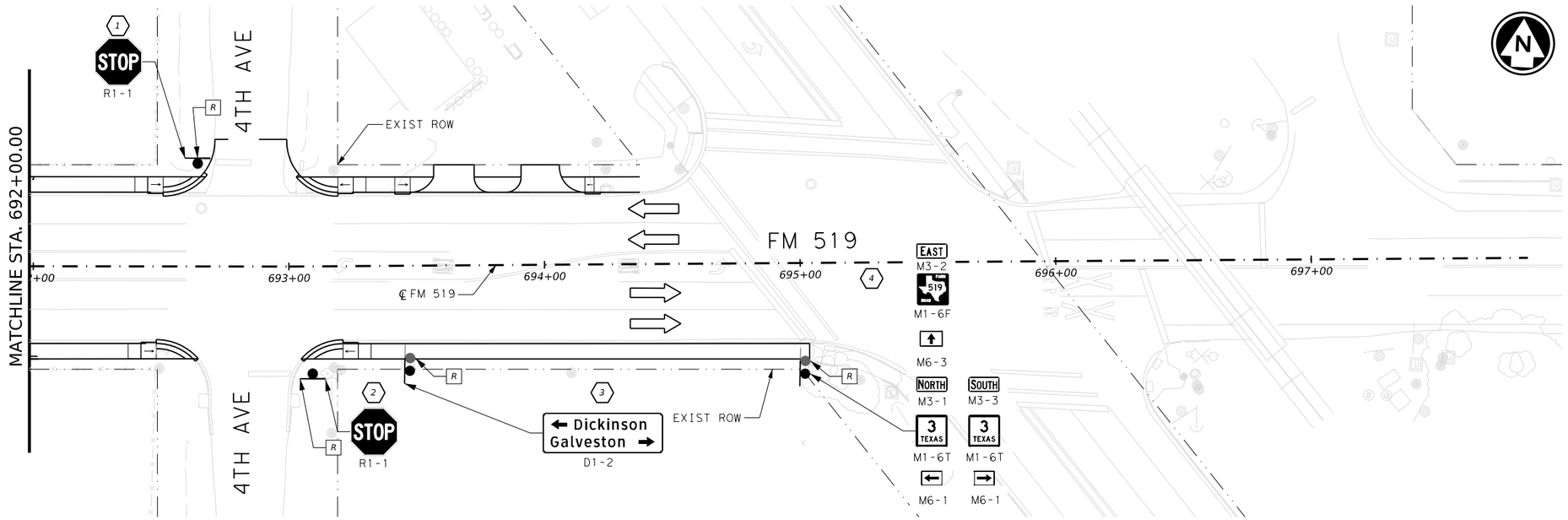
SIGNING LAYOUT
STA 680+00 TO STA 692+00

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		194

DATE: 9/DATE/2023 10:45:38 AM
FILE: ...DESIGN\SIGNING\SGN 07.dgn

100% SUBMITTAL



LEGEND

- PROPOSED SIGN
- EXIST SIGN
- EXIST TRAFFIC
- XX SIGN NUMBER
- R SIGN REMOVAL

NOTES:

1. SEE "SUMMARY OF SMALL SIGNS" FOR PROPOSED SIGN INFORMATION
2. SMALL SIGNS LOCATIONS ARE APPROXIMATE AND CAN BE ADJUSTED TO ACCOMODATE SITE CONDITIONS AS APPROVED BY THE ENGINEER.
3. ALL EXISTING SIGNS ARE TO REMAIN UNLESS NOTED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

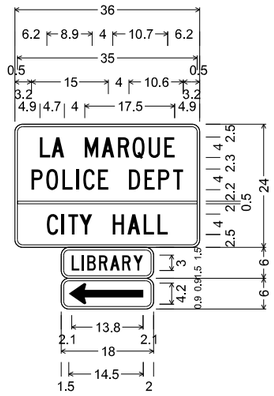
SIGNING LAYOUT
STA 692+00 TO END

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		195

DATE: 9/12/2023 10:46:23 AM
FILE: ...DESIGN\SIGNING\SGN 08.dgn

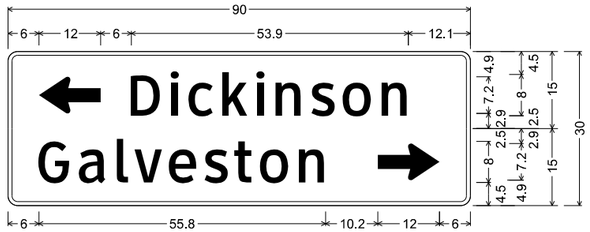
100% SUBMITTAL



D9-11bP_36x24;
1.5" Radius, 0.5" Border, White on Blue;
"LA MARQUE", C;
"POLICE DEPT", C;
"CITY HALL", C;

D9-1cP_18x6;
1.5" Radius, 0.5" Border, White on Blue;
"LIBRARY", C;

D5-5aTPL_18x6;
1.5" Radius, 0.5" Border, White on Blue;
Standard Arrow Custom 14.5" X 4.1" 180°;



D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°;
"Dickinson", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Galveston", ClearviewHwy-3-W;
Standard Arrow Custom 12.0" X 7.1" 0°;

STATE OF TEXAS
LACEY L. HEBERT
134840
LICENSED
PROFESSIONAL ENGINEER

Lacey L Hebert, PE 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

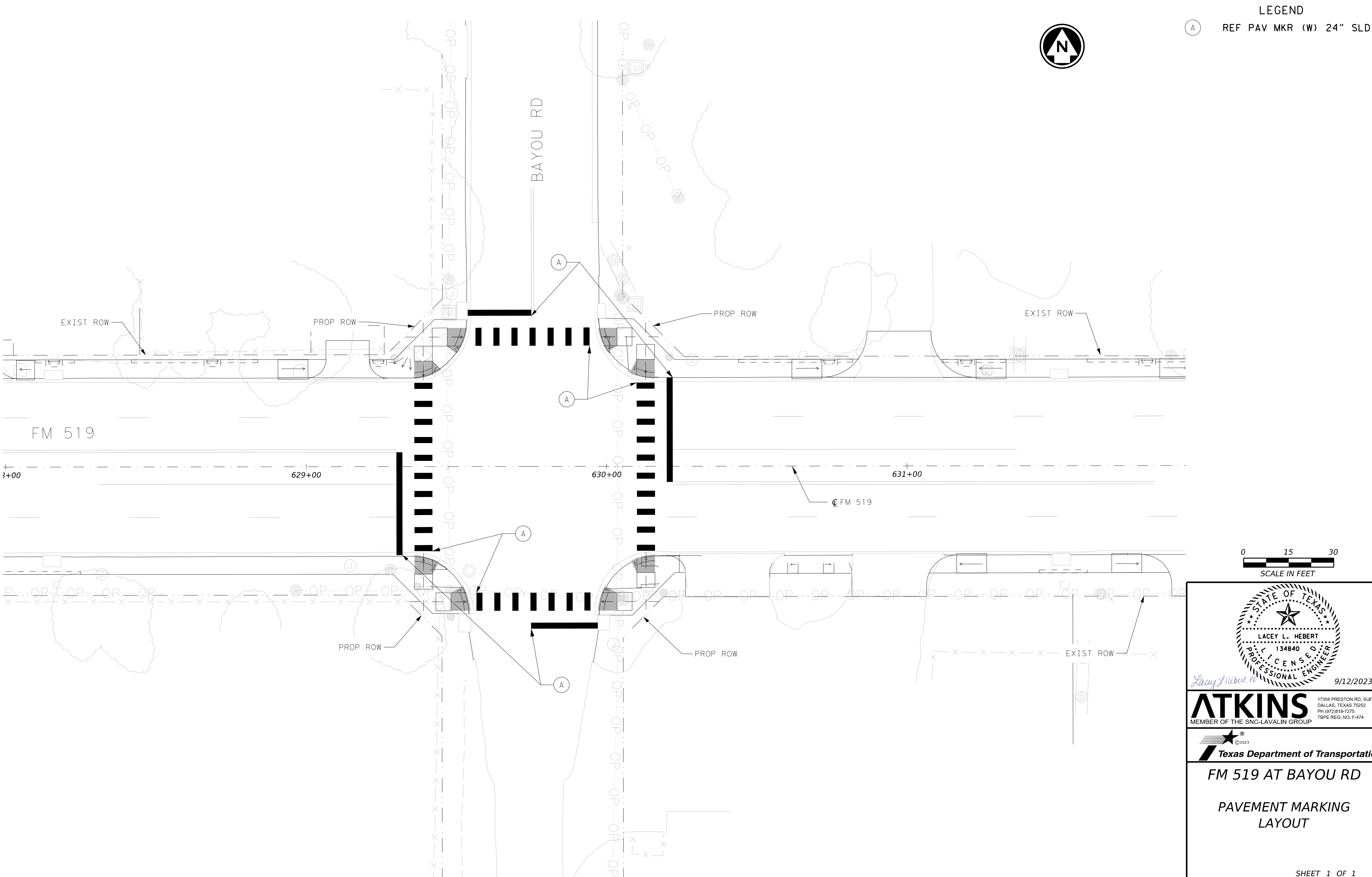
SMALL SIGN DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		196

DATE: 9/12/2023 10:46:56 AM
FILE: ...DOCUMENTS\SIGNAGE\SIGN DETAILS.dgn

100% SUBMITTAL



LACEY L. HEBERT
134840
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

©2023
Texas Department of Transportation

FM 519 AT BAYOU RD

PAVEMENT MARKING LAYOUT

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		197

DATE: 9/12/2023 10:49:56 AM
FILE: ...\FM 519 PM LAYOUT SHEET 01.dgn

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

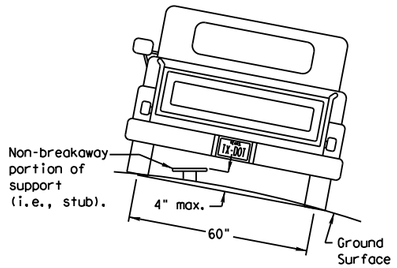
Post Type
- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

Anchor Type
- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation
- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
- IF REQUIRED
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

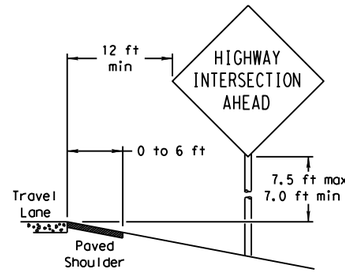
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

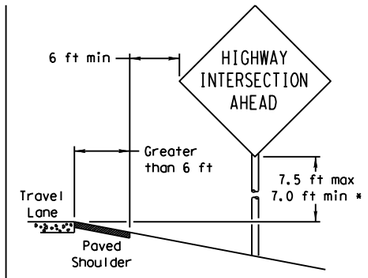
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

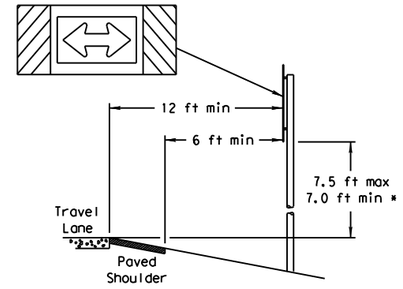
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



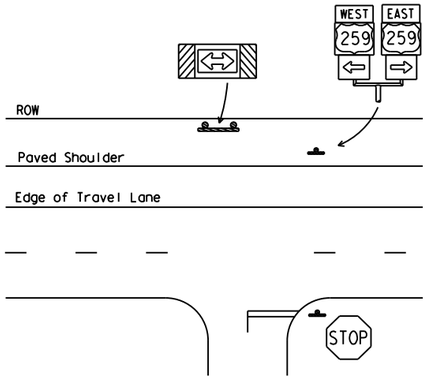
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

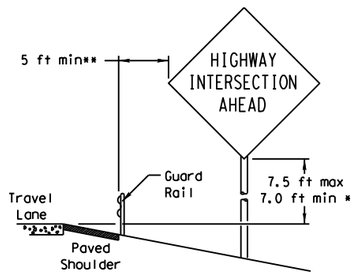
T-INTERSECTION



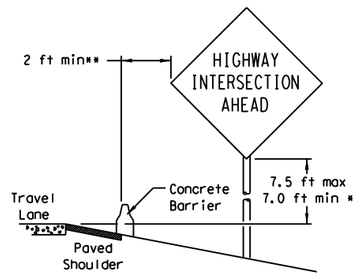
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

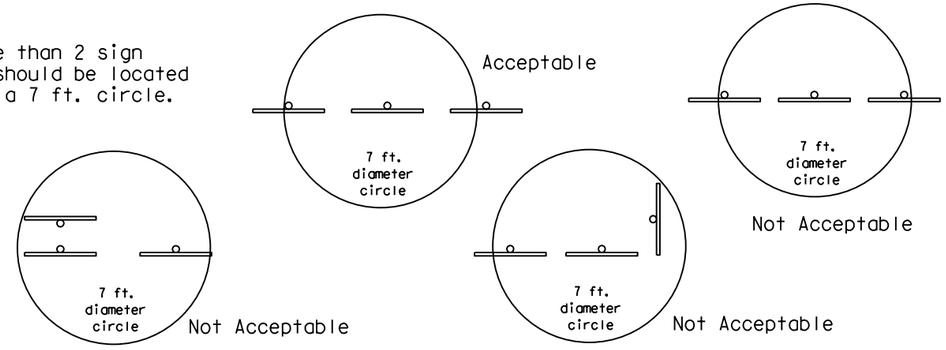
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

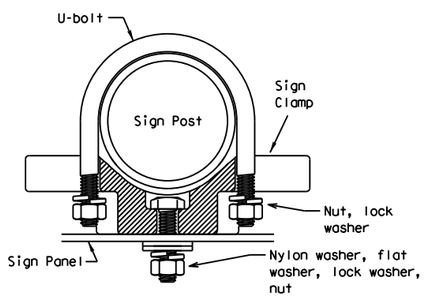
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

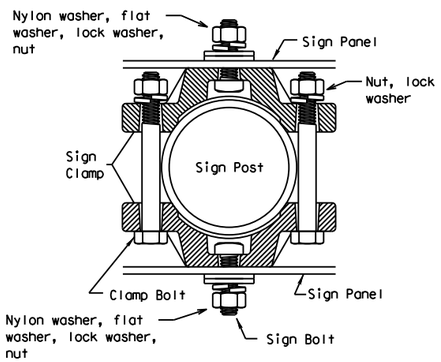


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

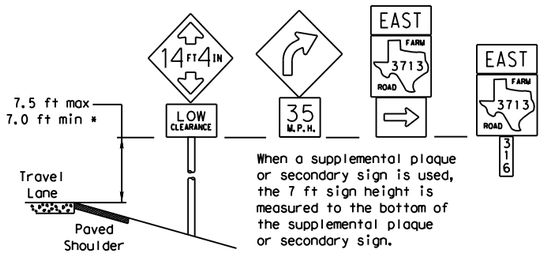
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



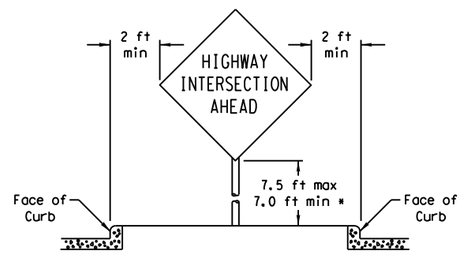
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



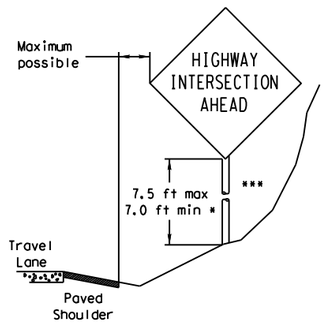
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

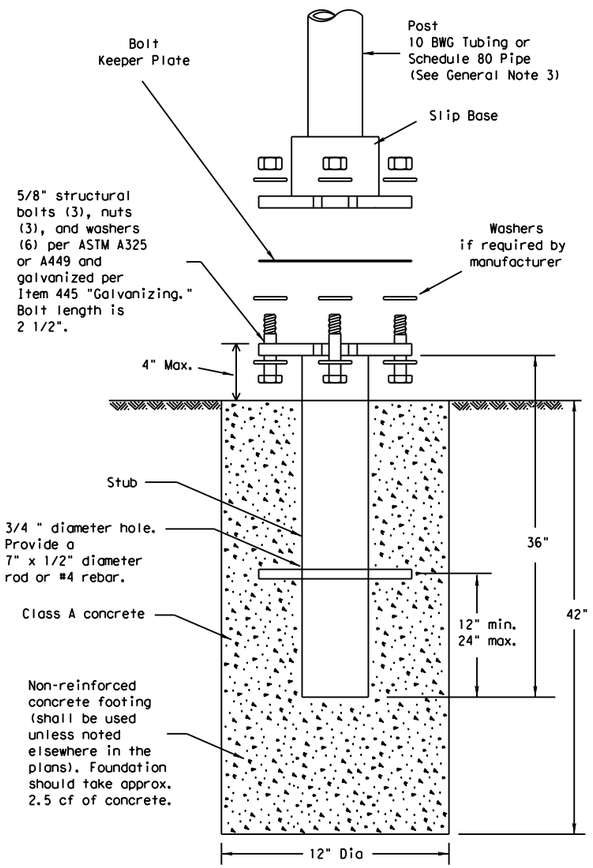
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		198

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

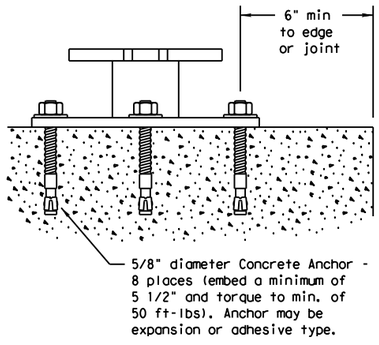
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

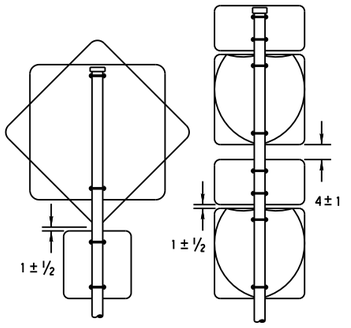
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519

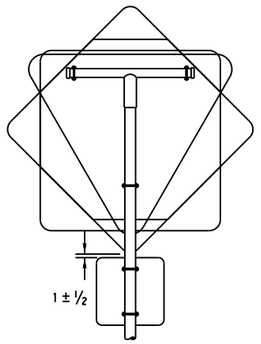
DIST	COUNTY	SHEET NO.
HOU	GALVESTON	199

26B

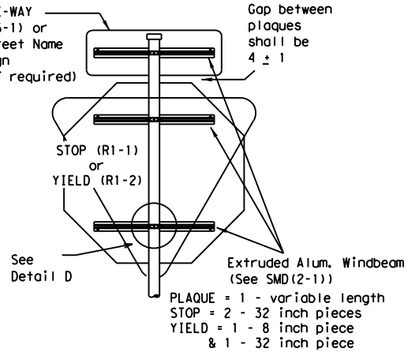
DATE:
FILE:



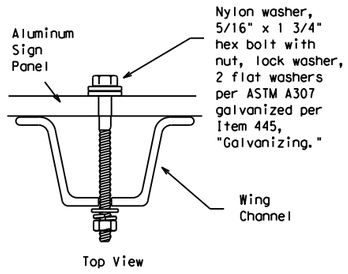
SM RD SGN ASSM TY XXXXX(1)XX(P)



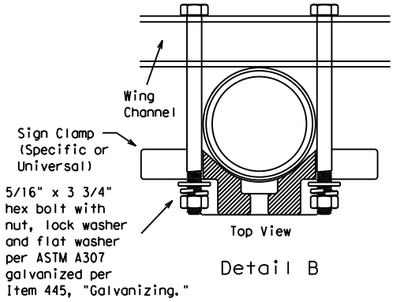
SM RD SGN ASSM TY XXXXX(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



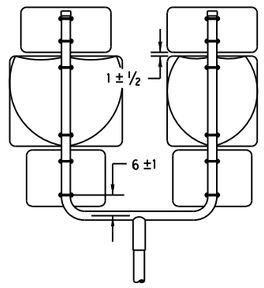
Detail B

GENERAL NOTES:

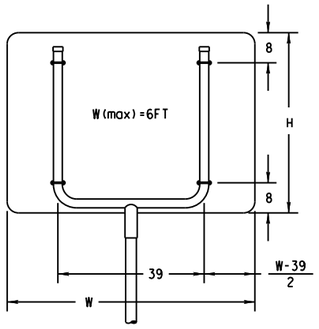
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

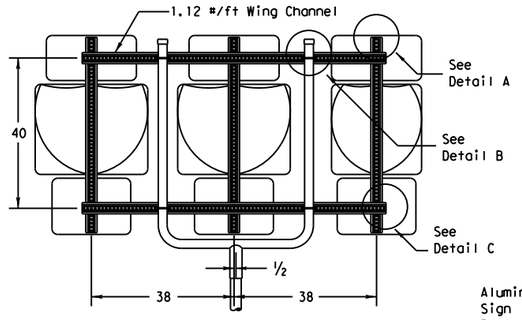
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



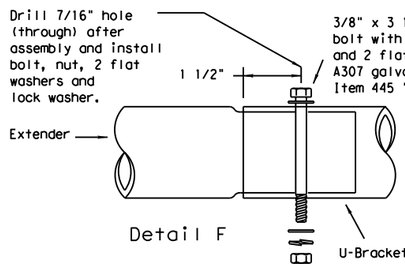
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

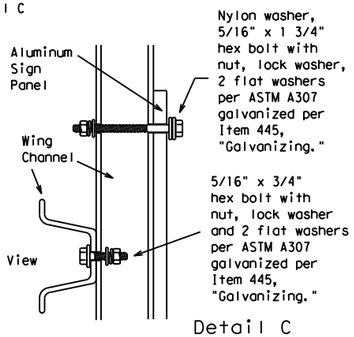


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

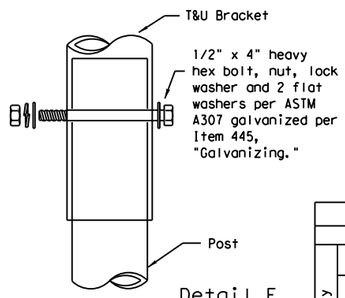


Detail F

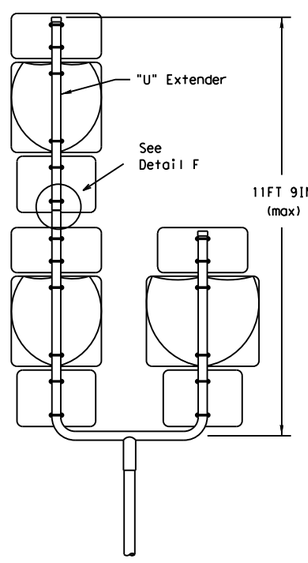
Splices shall only be allowed behind the sign substrate.



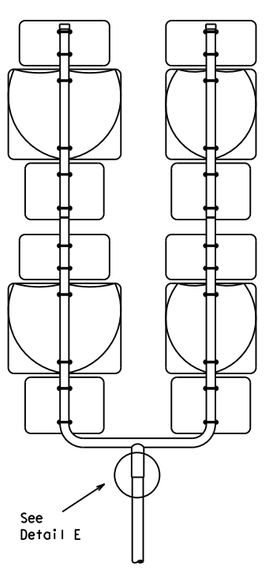
Detail C



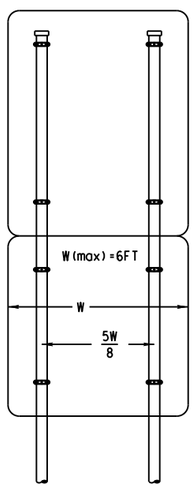
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

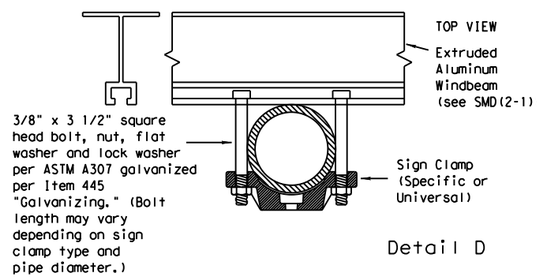


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

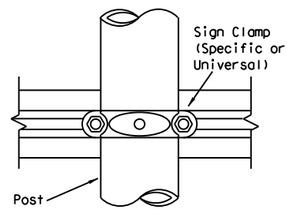


SM RD SGN ASSYM TY XXXXX(2)XX(P)

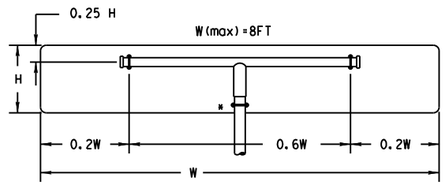
SIDE VIEW



Detail D



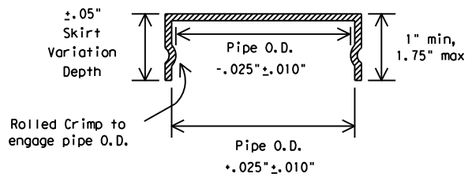
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519

DIST	COUNTY	SHEET NO.
HOU	GALVESTON	200

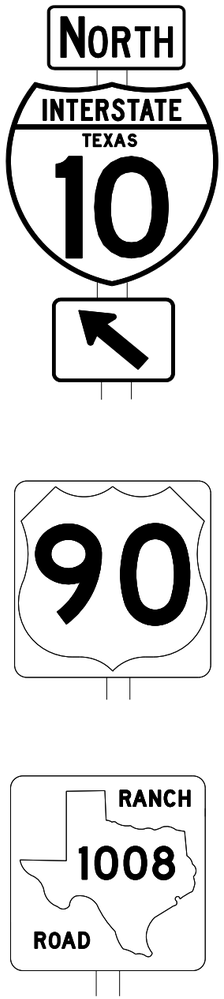
26C

DATE:
FILE:

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

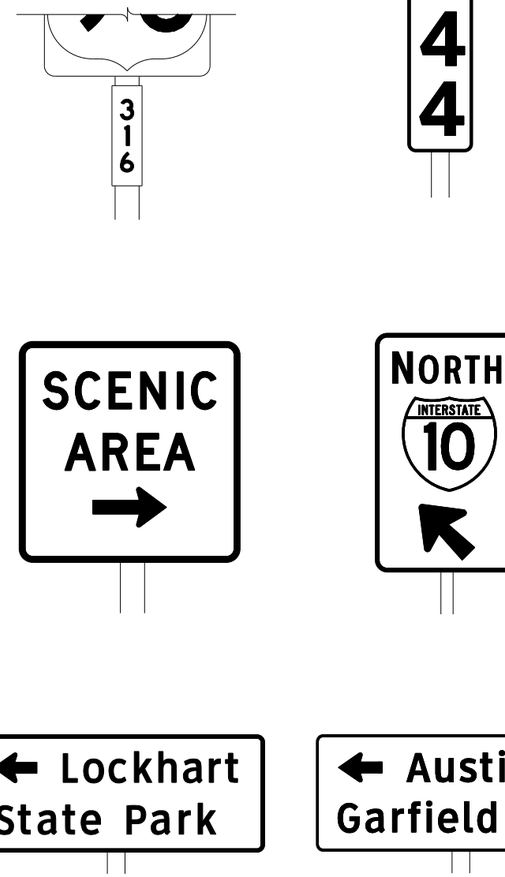
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

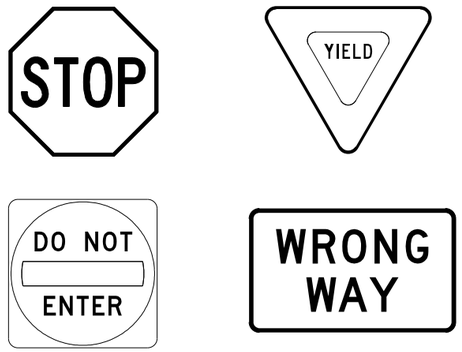
FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	GALVESTON		201

3

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

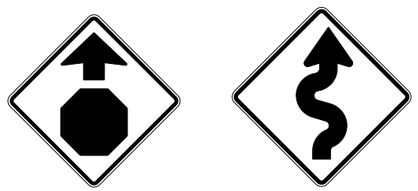
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	GALVESTON		202

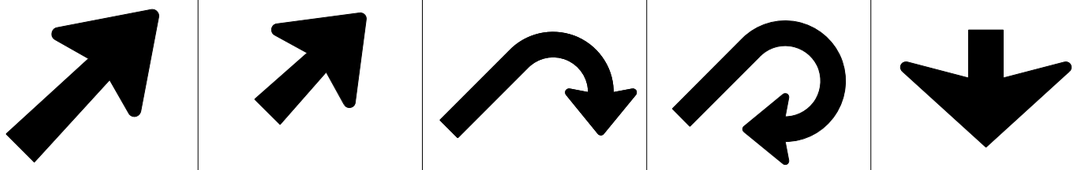
4

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



Type A | Type B | E-3 | E-4 | Down Arrow

TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

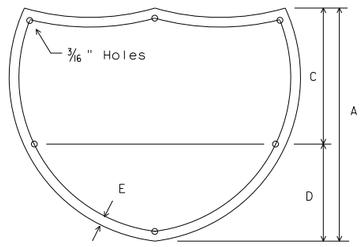
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

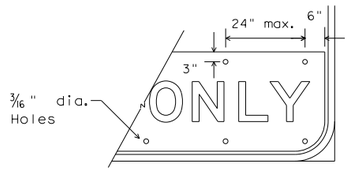
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

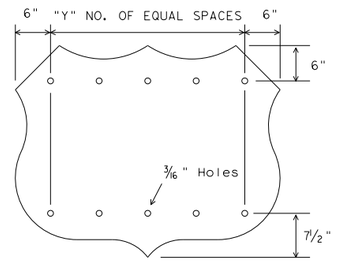


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

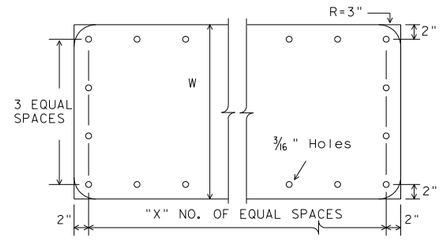


EXIT ONLY PANEL



U.S. ROUTE MARKERS

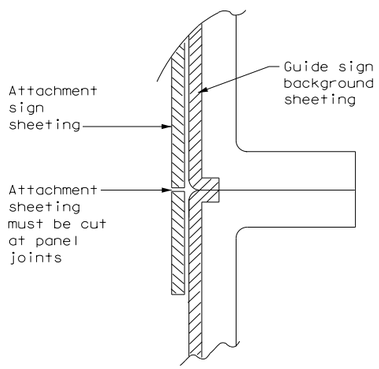
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



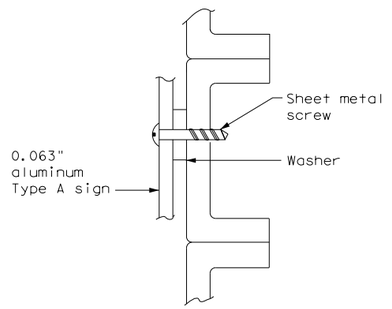
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

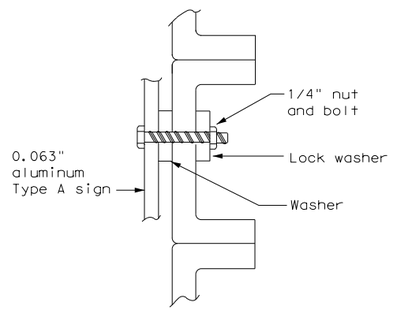
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT



NUT/BOLT ATTACHMENT

NOTE:

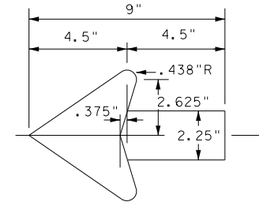
1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

NOTE:

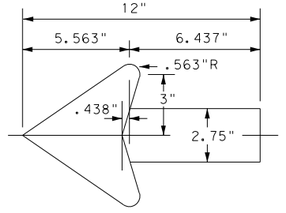
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

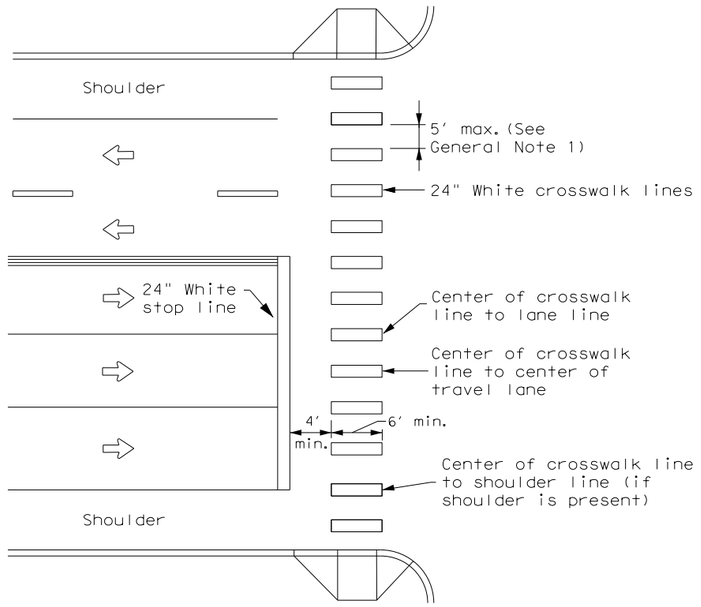
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	GALVESTON		203

DATE:
FILE:



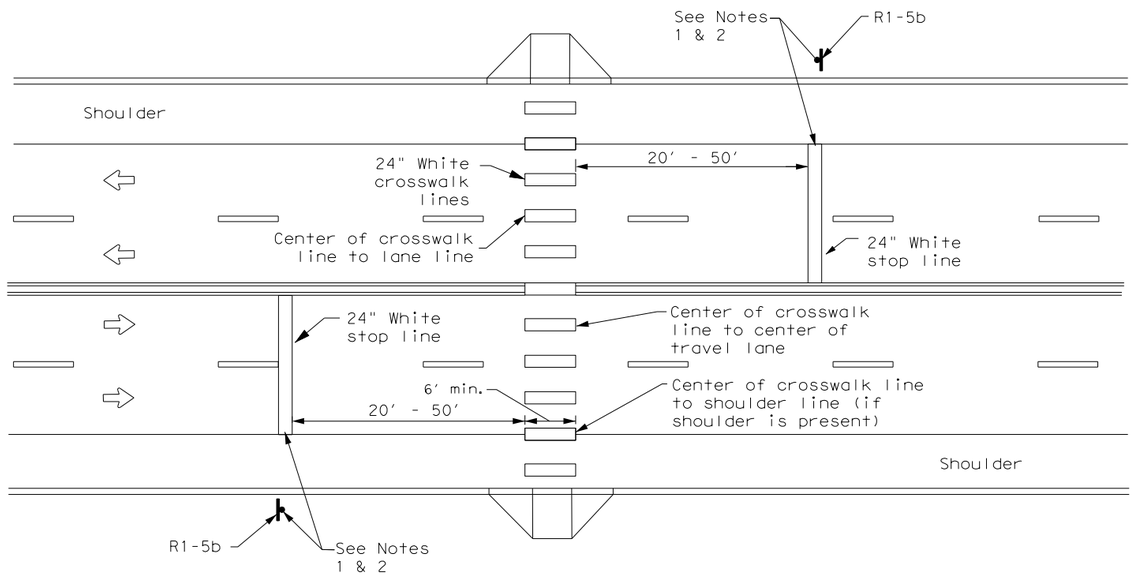
HIGH-VISIBILITY LONGITUDINAL CROSSWALK
AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6′ wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY
LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
6-20	DIST	COUNTY		SHEET NO.
6-22	HOU	GALVESTON		204
12-22				

220

100% SUBMITTAL

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
CSJ: 0979-01-027

1.2 PROJECT LIMITS:
From: EAST OF IH-45

To: SH-3

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 29.3577012 ,(Long) - 94.9796306

END: (Lat) 29.3583340 ,(Long) - 94.9510080

1.4 TOTAL PROJECT AREA (Acres): 15.23

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.51

1.6 NATURE OF CONSTRUCTION ACTIVITY:
CONSTRUCT 6 FOOT SIDEWALKS AND ASSOCIATED RAMPS ON EACH SIDE OF ROADWAY

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Edna loam, 0 to 1% slopes	Sta 609+00 to Sta 612+40, Sta 631+00 to Sta 369+00, Sta 669+00 to Sta 695+03.44; 100% loam, somewhat poorly drained, low rate of runoff, and moderate erosion potential
Kemah-Urban land complex	Sta 612+40 to Sta 631+40, Sta 639+00 to Sta 669+00; somewhat poorly drained, low rate of runoff, and moderate erosion potential

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

X PSLs determined during preconstruction meeting
☐ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

X Mobilization
X Install sediment and erosion controls
X Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
X Grading operations, excavation, and embankment
☐ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☐ Install proposed pavement per plans
X Install culverts, culvert extensions, SETs
☐ Install mow strip, MBGF, bridge rail
☐ Place flex base
X Rework slopes, grade ditches
X Blade windrowed material back across slopes
X Revegetation of unpaved areas
☐ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☐ Sediment laden stormwater from stormwater conveyance over disturbed area
☐ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☐ Transported soils from offsite vehicle tracking
☐ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☐ Sanitary waste from onsite restroom facilities
☐ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

X Development of plans and specifications
X Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
X Post Construction Site Notice
X Submit NOI/CSN to local MS4
X Perform SWP3 inspections
X Maintain SWP3 records and update to reflect daily operations
X Complete and submit Notice of Termination to TCEQ
X Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

X Day To Day Operational Control
X Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
X Post Construction Site Notice
X Submit NOI/CSN to local MS4
X Maintain schedule of major construction activities
X Install, maintain and modify BMPs
X Complete and submit Notice of Termination to TCEQ
X Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		205
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

100% SUBMITTAL

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ X Permanent Planting, Sodding or Seeding
- X ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- X ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- X ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☐ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☐ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- X Fire hydrant flushings
- X Irrigation drainage
- X Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- X Potable water sources
- X Springs
- X Uncontaminated groundwater
- X Water used to wash vehicles or control dust
- X Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		206
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

Additional Comments

An USACE IP Permit is required for the project.

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the area and contact the Engineer immediately.

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: May 20, 2022
FILE:

Version 2.1

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Galveston		207

100% SUBMITTAL

CK: DW: CK: DW:

SCF - 1495 LF THIS SHEET. TO BE PLACED AS DIRECTED BY ENGINEER.

12" ECL (10 LF) (TYP 5 PLACES)

8" ECL (10 LF) (TYP 5 PLACES)

12" ECL (10 LF) (TYP 9 PLACES)

8" ECL (10 LF) (TYP 11 PLACES)

BRIAR LN

IRENE ST

MAIN ST

PESSARA ST

ERICKSON ST

FRANKLIN ST

AT&T MH

N87°20'20.2"E

MATCHLINE STA. 614+00.00

MATCHLINE STA. 620+00.00

LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- ECL — EROSION CONTROL LOG (TEMP)
- SCF — SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
BEGIN TO STA 620+00

SHEET 1 OF 8

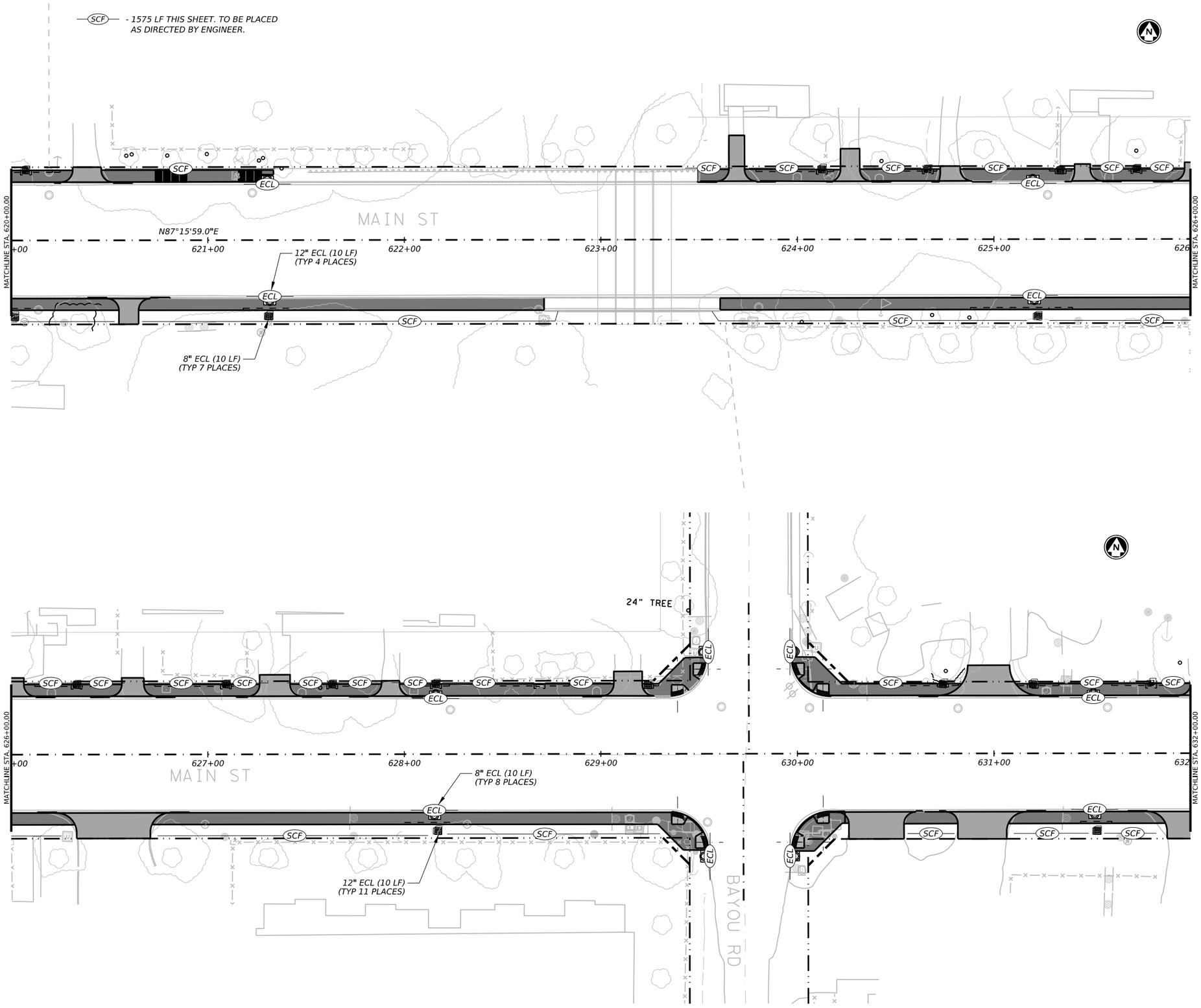
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		208

DATE: 2/12/2024 9:39:00 PM
FILE: ...\FM 519 SW3P 01.dgn

100% SUBMITTAL

CK: DW: CK: DW:

SCF - 1575 LF THIS SHEET. TO BE PLACED AS DIRECTED BY ENGINEER.



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- ECL — EROSION CONTROL LOG (TEMP)
- SCF — SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 620+00 TO STA 632+00

SHEET 2 OF 8

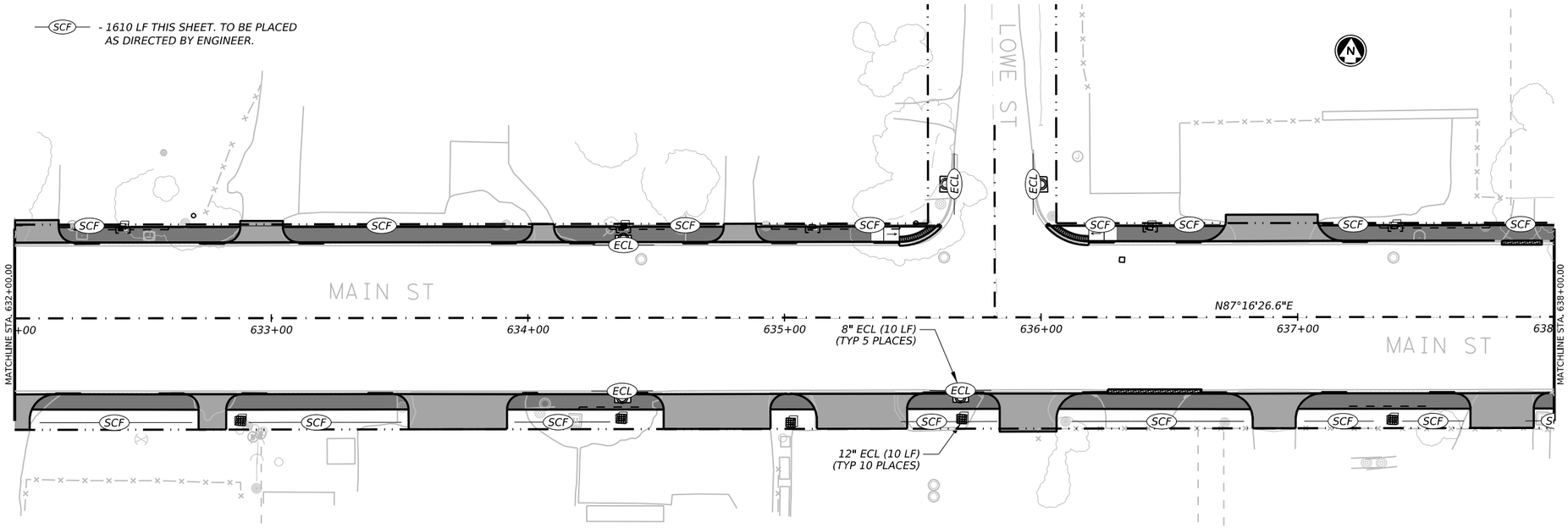
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		209

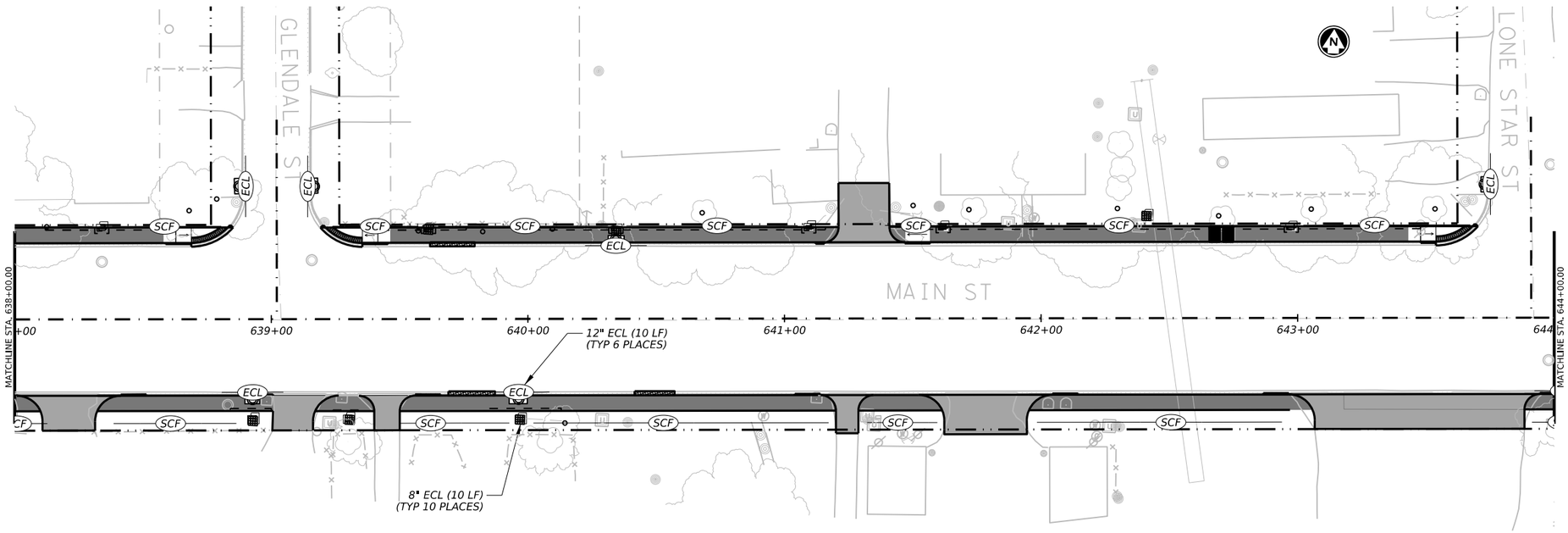
DATE: 2/12/2024 9:39:28 PM
FILE: ...\FM 519_SW3P 02.dgn

100% SUBMITTAL

CK: DW: CK: DW:

SCF - 1610 LF THIS SHEET. TO BE PLACED AS DIRECTED BY ENGINEER.





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- (ECL) EROSION CONTROL LOG (TEMP)
- (SCF) SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 632+00 TO STA 644+00

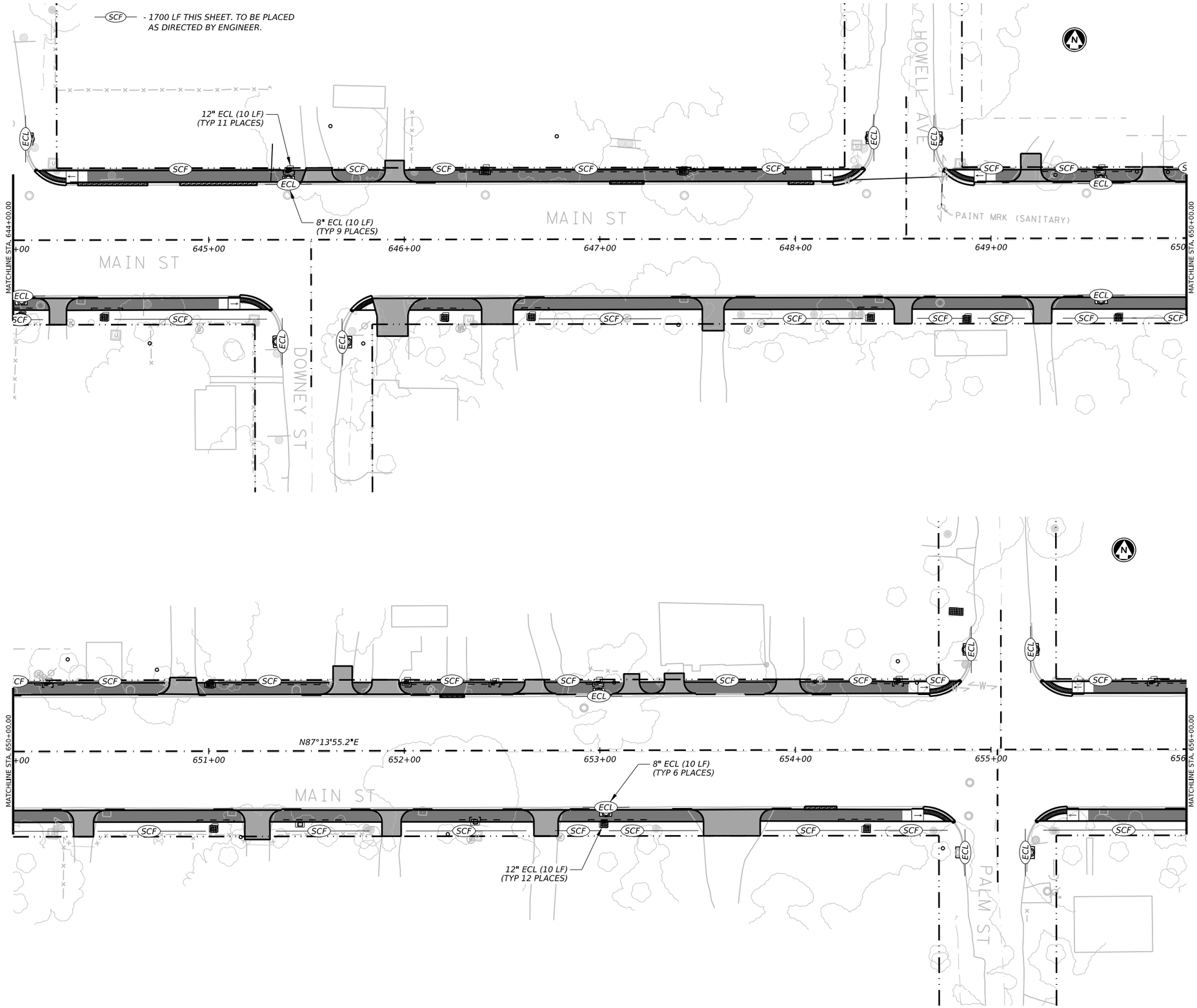
SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		210

DATE: 2/12/2024 9:39:56 PM
FILE: ...\FM 519_SW3P 03.dgn

100% SUBMITTAL

CK: CK: DW: DW:



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- (ECL) EROSION CONTROL LOG (TEMP)
- (SCF) SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 644+00 TO STA 656+00

SHEET 4 OF 8

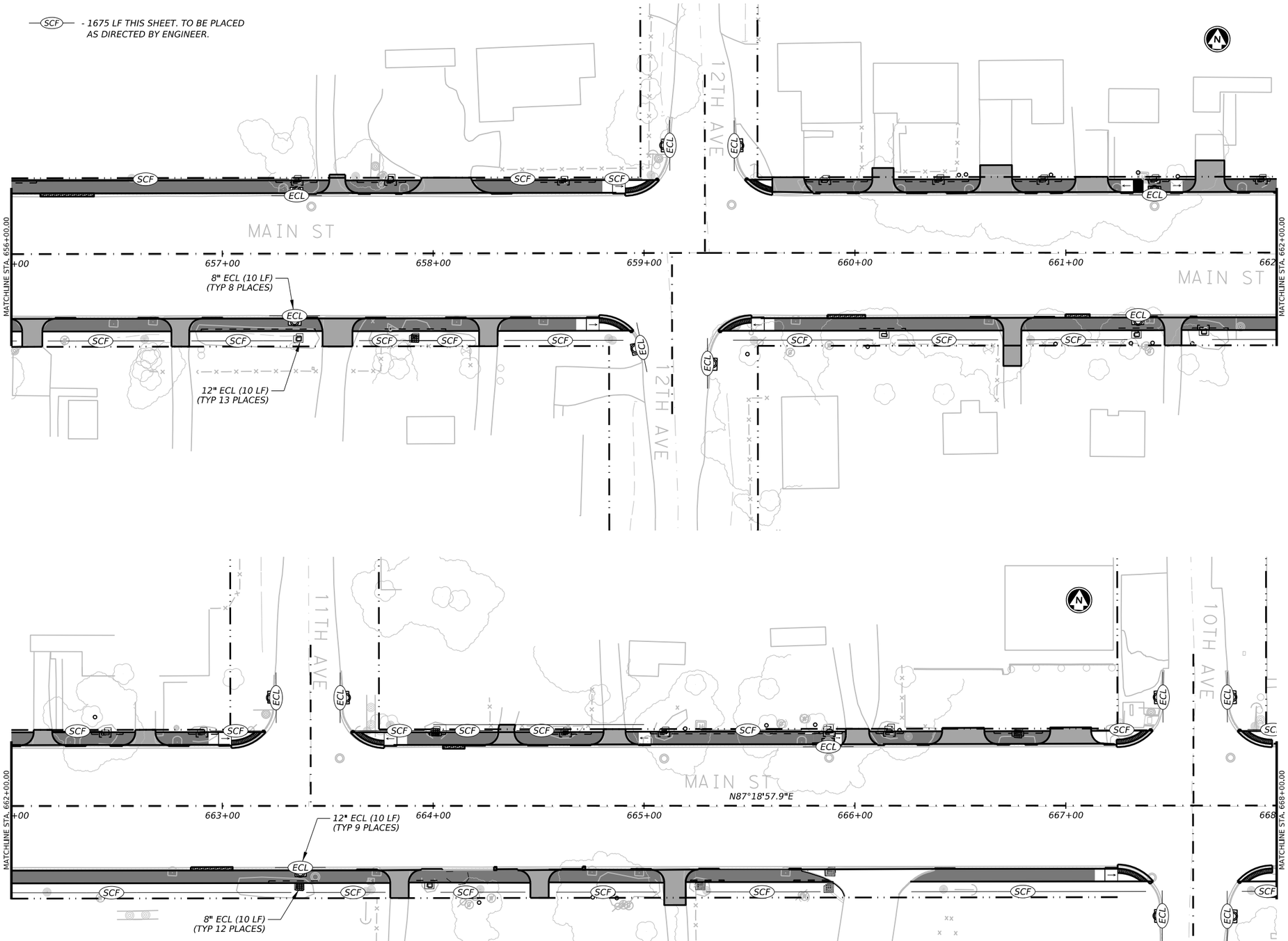
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		211

DATE: 2/12/2024 9:40:25 PM
FILE: ...\FM 519_SW3P 04.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:

SCF - 1675 LF THIS SHEET. TO BE PLACED AS DIRECTED BY ENGINEER.



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- ECL — EROSION CONTROL LOG (TEMP)
- SCF — SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 656+00 TO STA 668+00

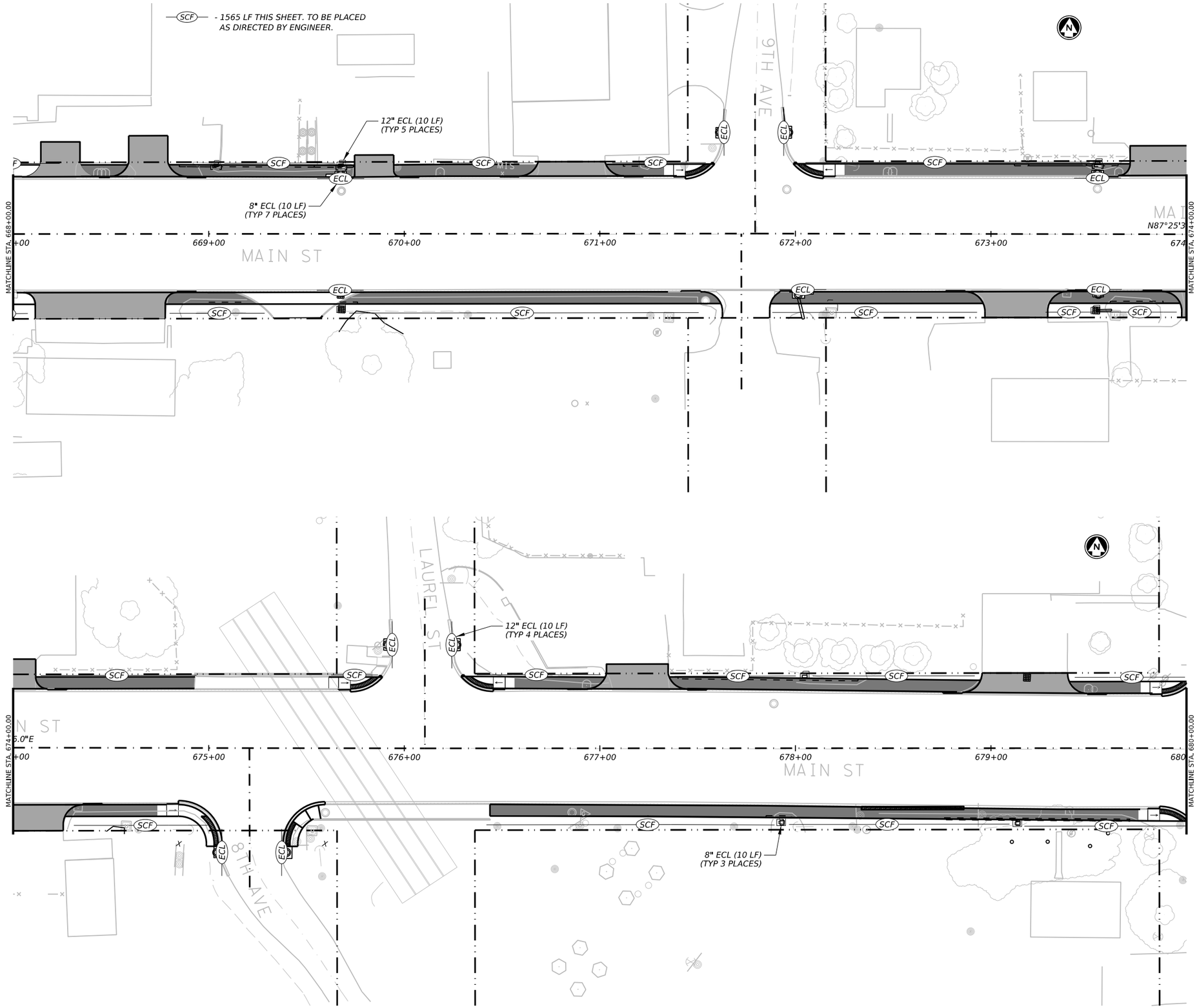
SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		212

DATE: 2/12/2024 9:40:55 PM
FILE: ...\FM 519_SW3P 05.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- (ECL) EROSION CONTROL LOG (TEMP)
- (SCF) SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 668+00 TO STA 680+00

SHEET 6 OF 8

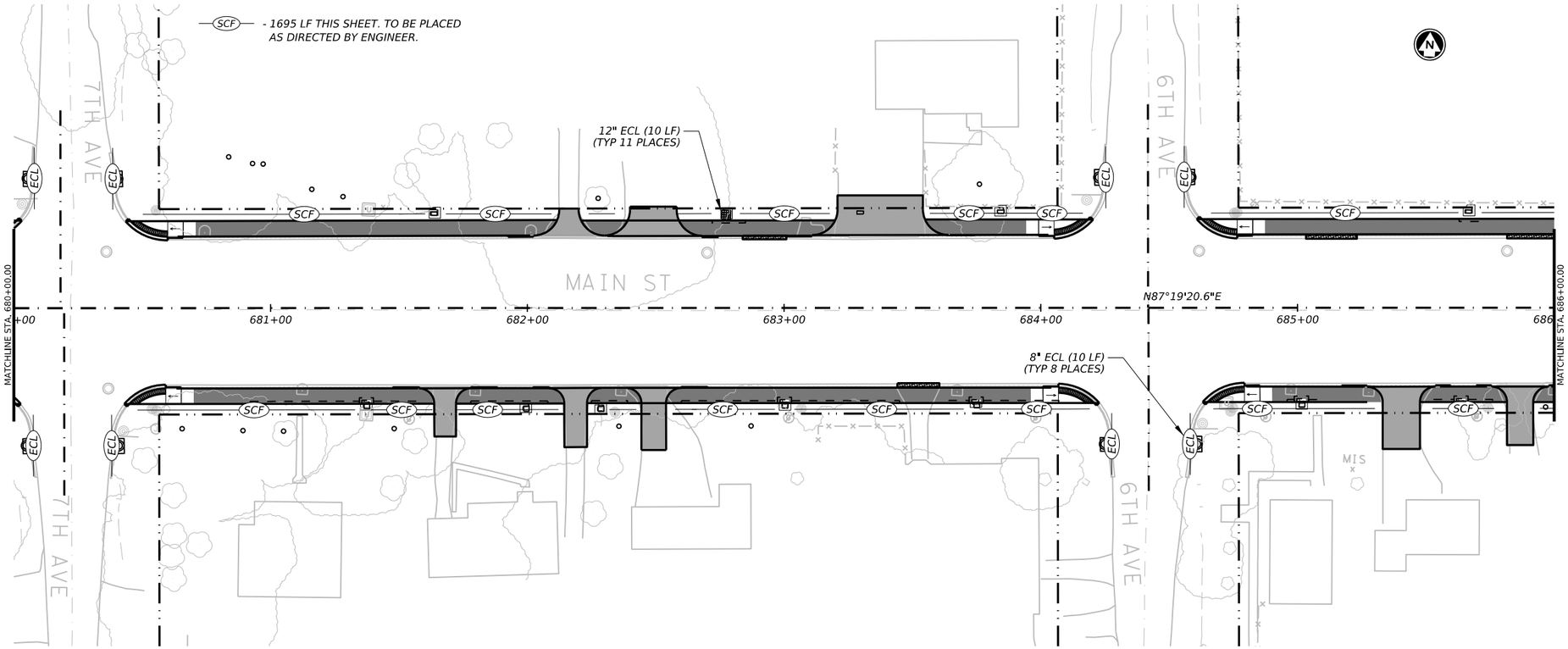
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		213

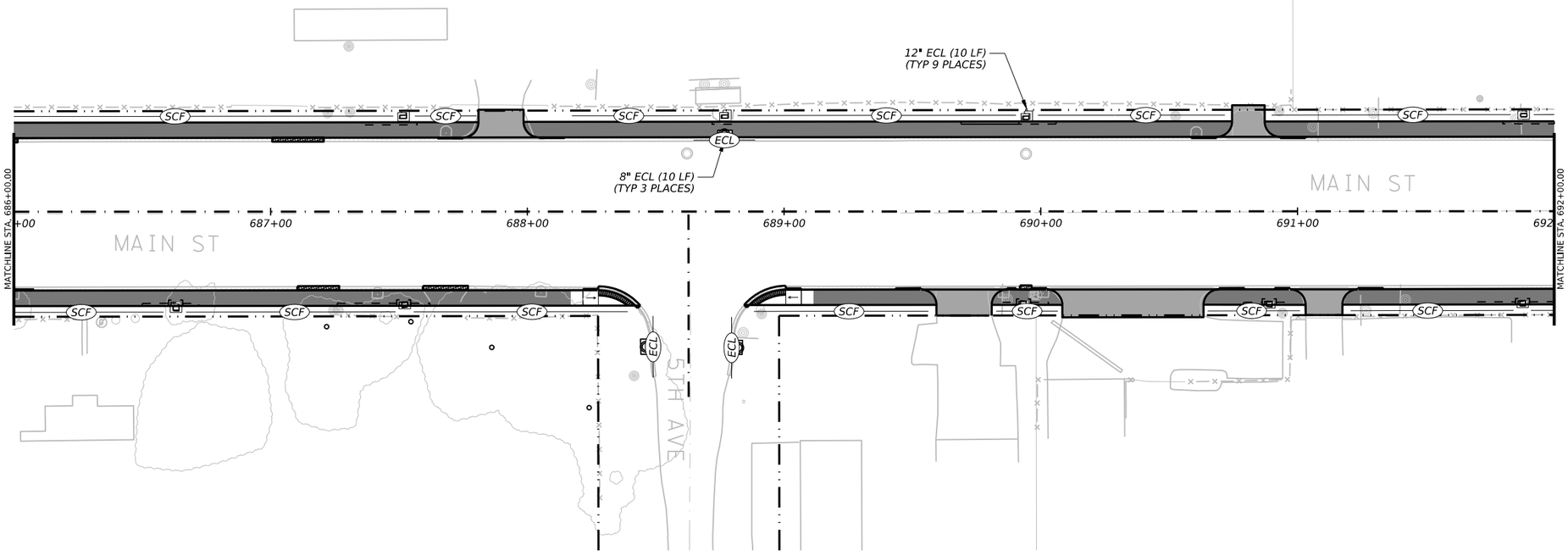
DATE: 2/12/2024 9:41:26 PM
FILE: ...\FM 519_SW3P 06.dgn

100% SUBMITTAL

CK: DW: CK: DW:

SCF - 1695 LF THIS SHEET. TO BE PLACED AS DIRECTED BY ENGINEER.





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- EROSION CONTROL LOG (TEMP)
- SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

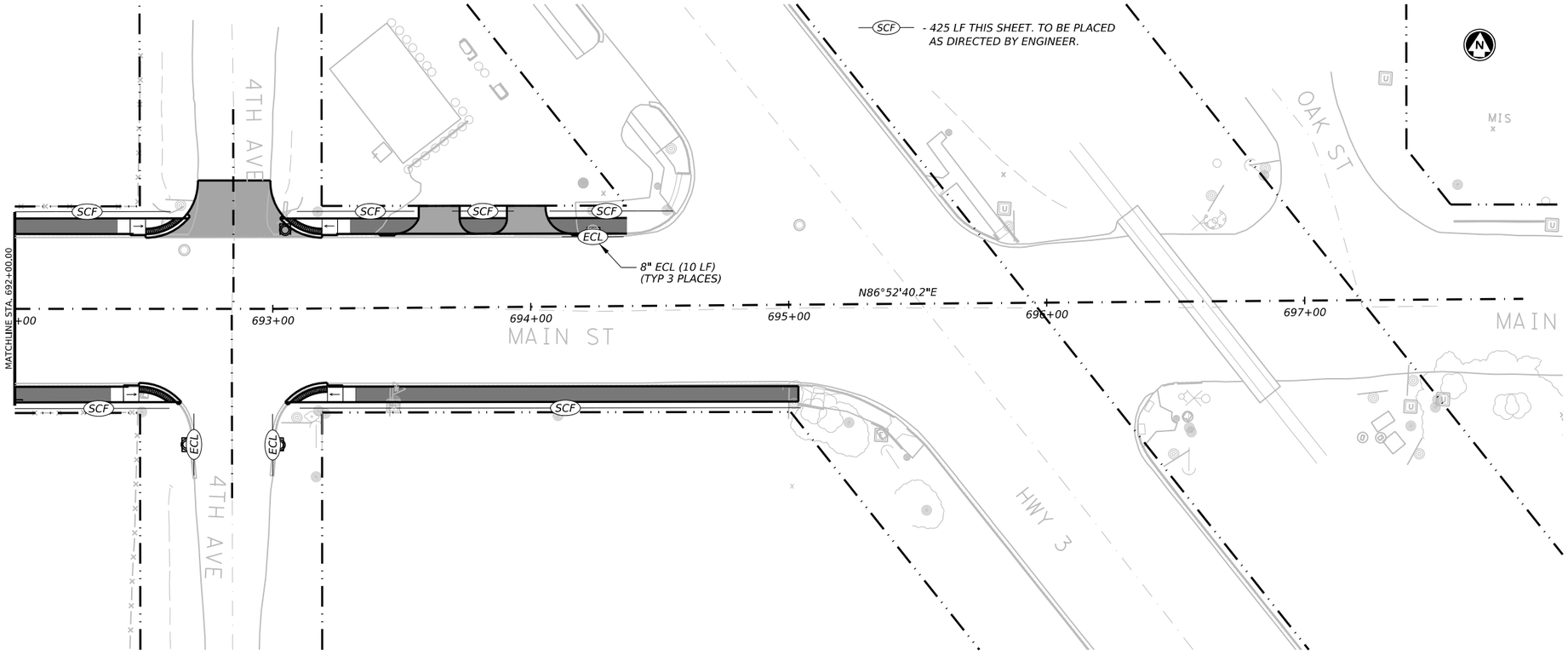
SW3P LAYOUT
STA 680+00 TO STA 692+00

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		214

DATE: 2/12/2024 9:41:58 PM
FILE: ...\FM 519_SW3P 07.dgn

100% SUBMITTAL



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- PROPOSED SIDEWALK CONSTR
- PROPOSED DRIVEWAY CONSTR
- PROPOSED CURB/GUTTER CONSTR
- (ECL) EROSION CONTROL LOG (TEMP)
- (SCF) SEDIMENT CONTROL FENCE (TEMP)

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E.
2/12/2024

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

SW3P LAYOUT
STA 692+00 TO END

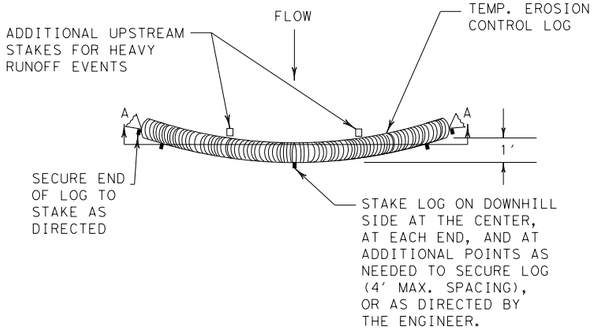
SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519

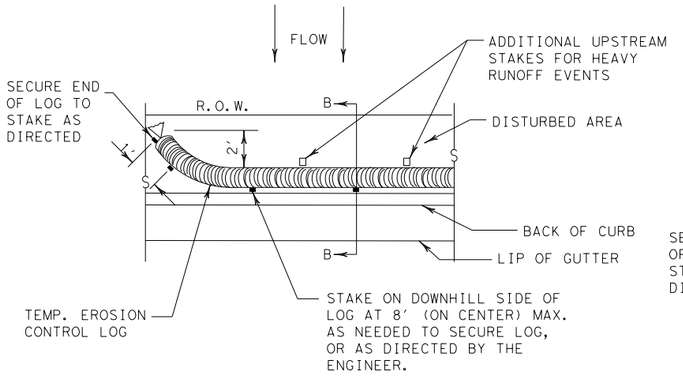
DIST	COUNTY	SHEET NO.
HOU	GALVESTON	215

DATE: 2/12/2024 9:42:30 PM
FILE: ...\FM 519 SW3P 08.dgn

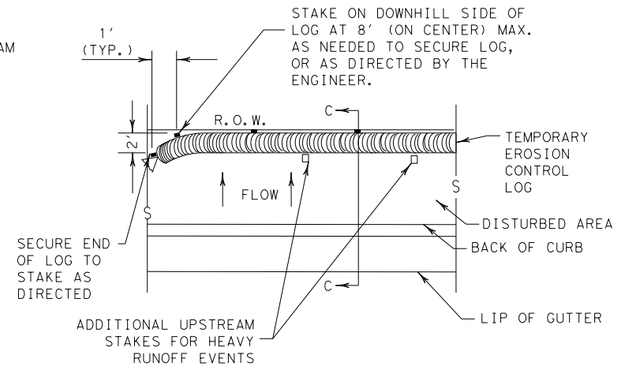
DATE: DATE TIME
FILE: DOCUMENT NAME



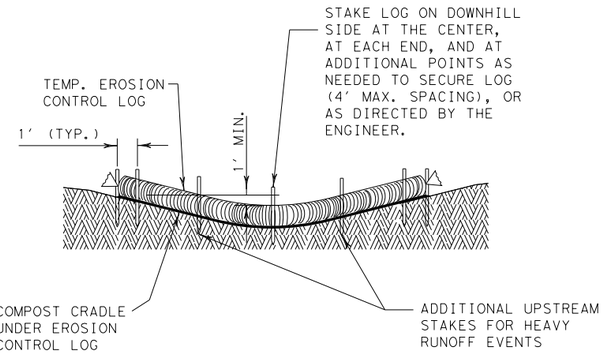
PLAN VIEW



PLAN VIEW



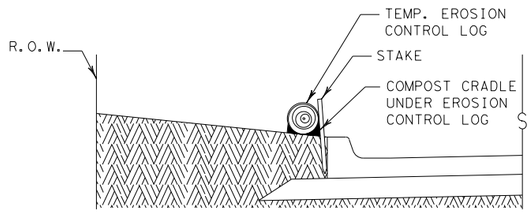
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

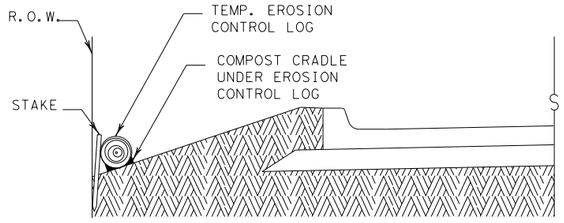
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

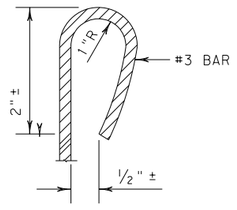
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

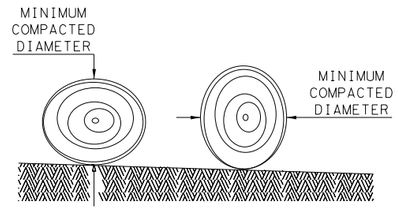
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

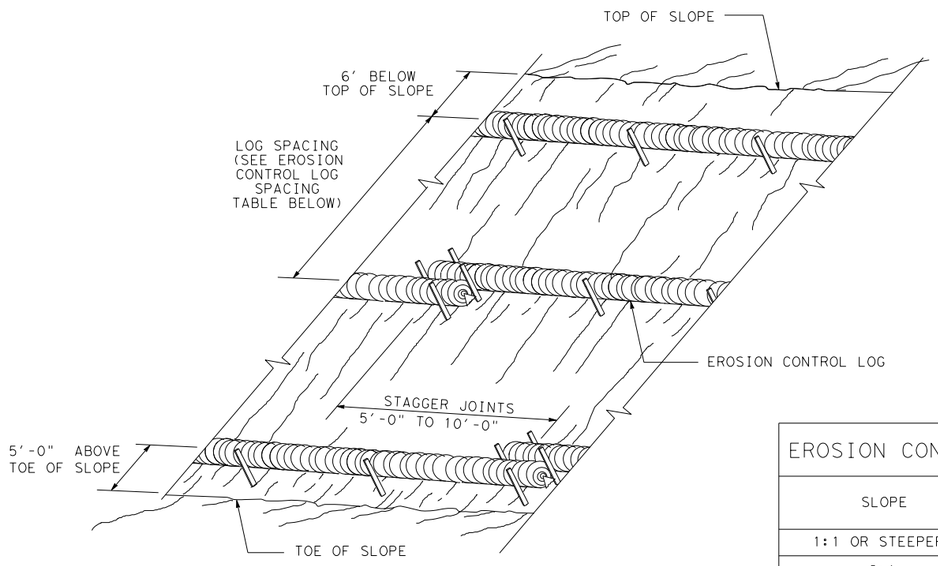
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

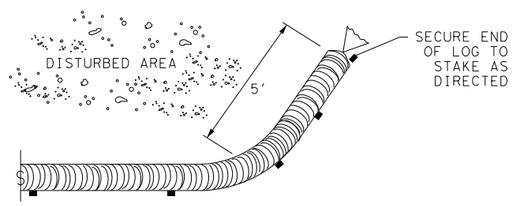
EC(9)-16

FILE: ec916		DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0979	01	027		FM 519	
		DIST	COUNTY			SHEET NO.	
		HOU	GALVESTON			216	



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

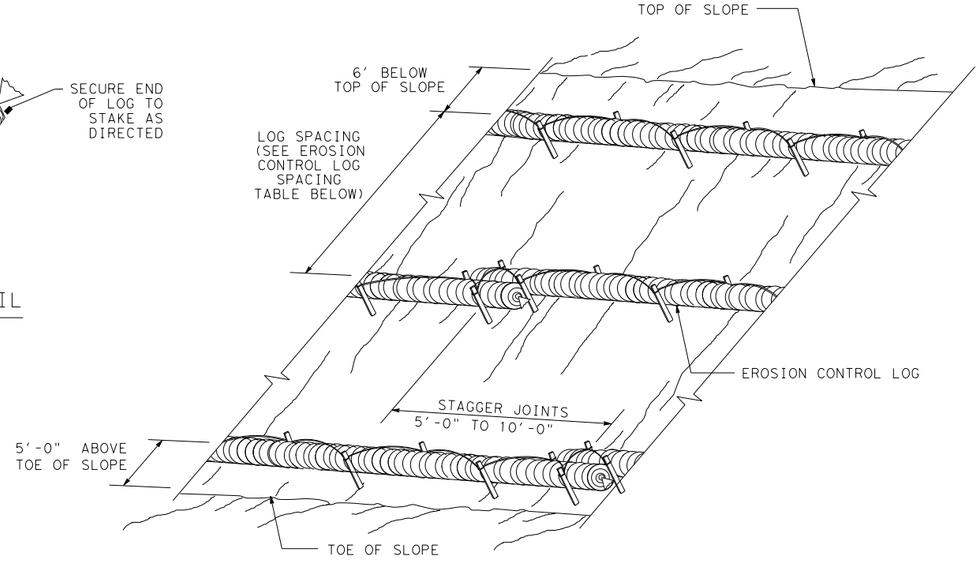
CL-SST



END SECTION RAP DETAIL

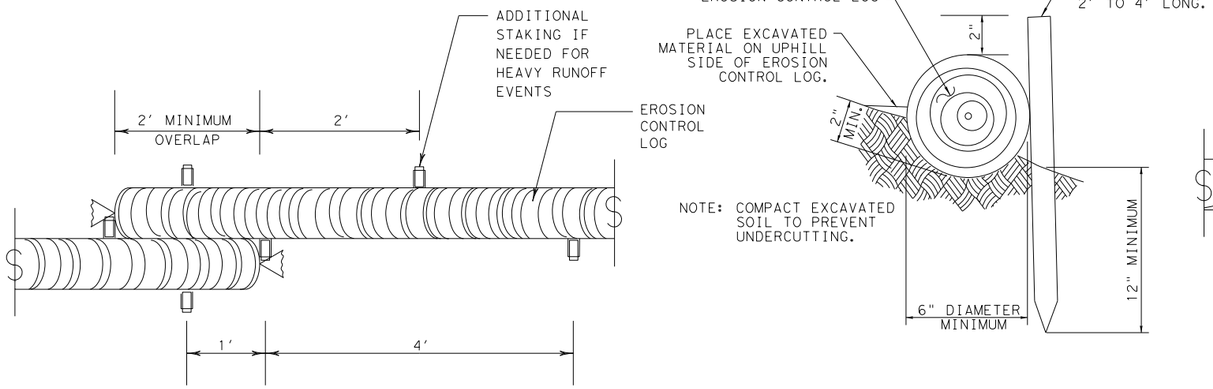
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

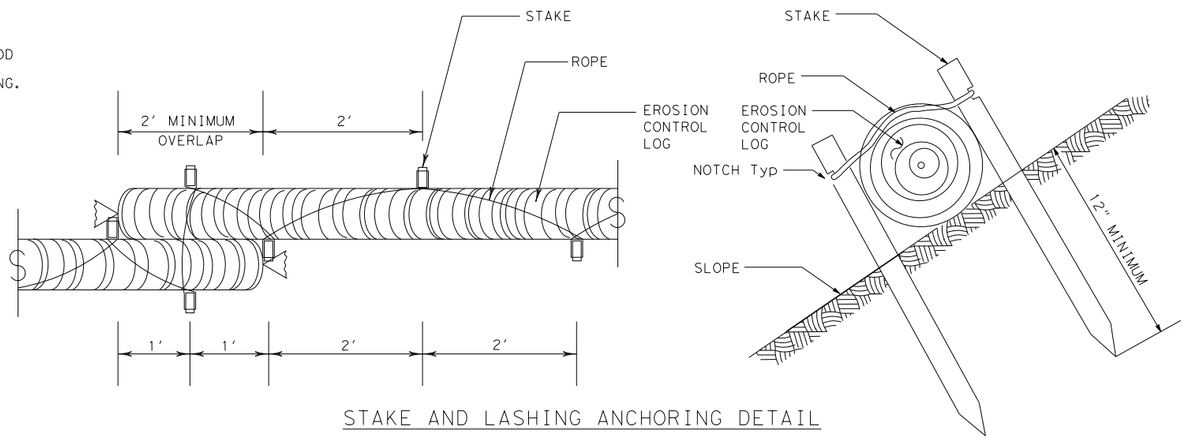
CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

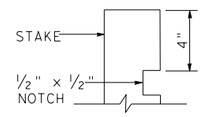
CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

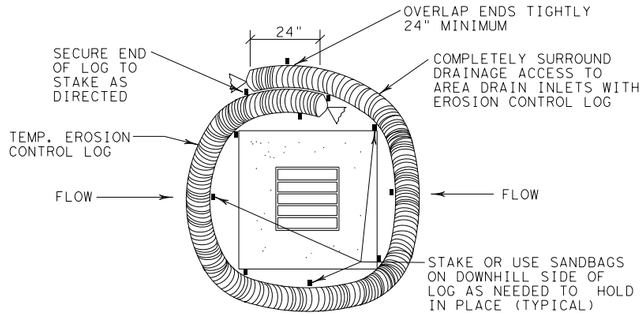
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

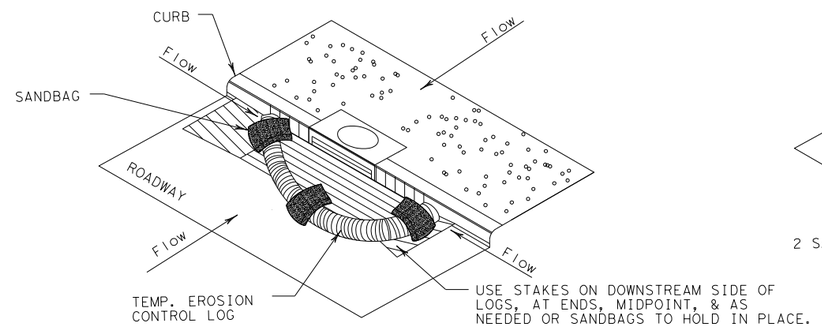
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0979	01	027	FM 519
	DIST	COUNTY		SHEET NO.
	HOU	GALVESTON		217

DATE: DATE TIME
FILE: DOCUMENT NAME



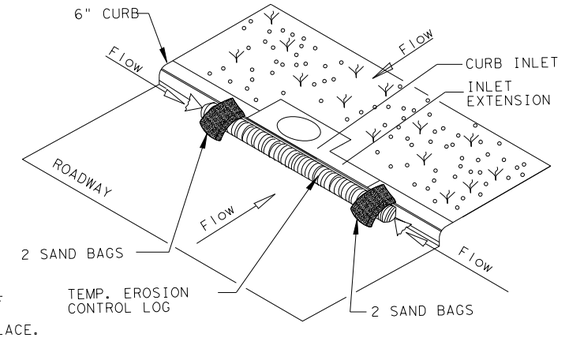
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

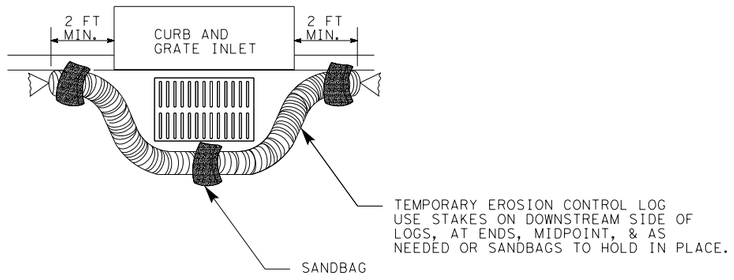
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

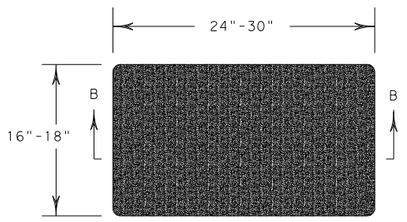
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

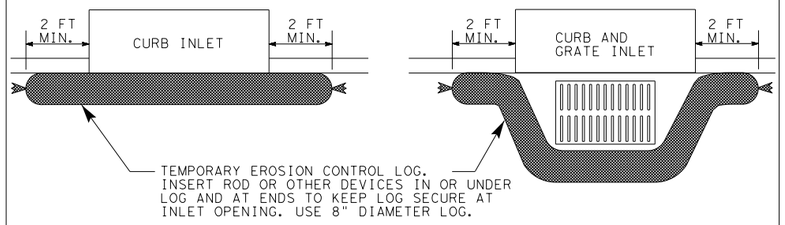
EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0979	01	027		FM 519		
	DIST	COUNTY				SHEET NO.	
	HOU	GALVESTON				218	

DATE: *DATE TIME*
FILE: *DOCUMENT NAME*

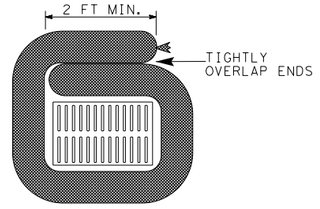
CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")

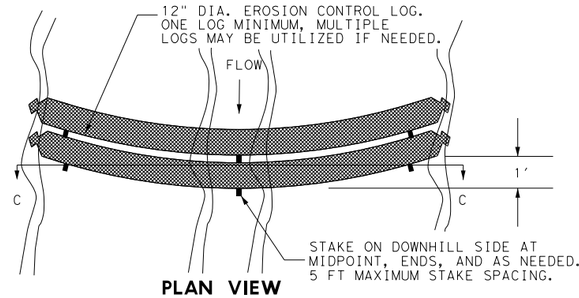


DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

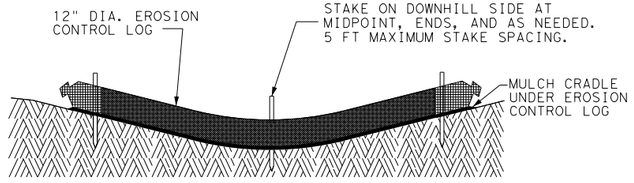
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

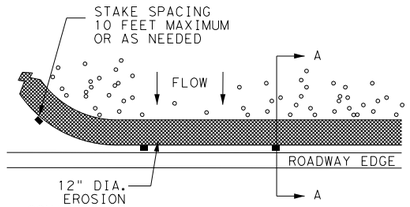


PLAN VIEW

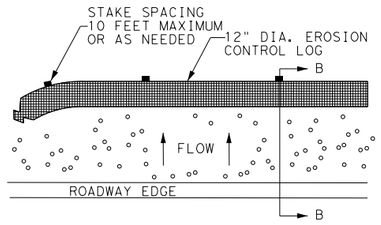


SECTION C-C

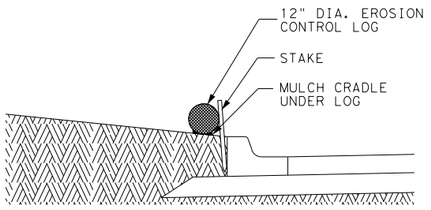
DRAINAGE SWALE OR DITCH



PLAN VIEW

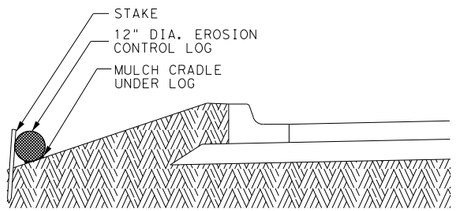


PLAN VIEW



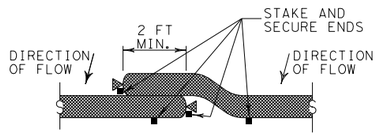
SECTION A-A

SLOPE TO ROADWAY EDGE



SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE



END OF LOG OVERLAP

MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:
Use mesh with ¼" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

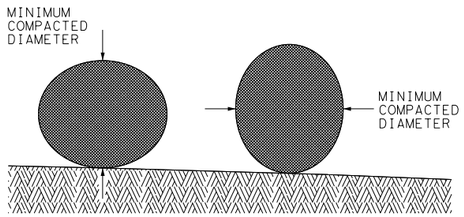
Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap should be cleaned when the capacity has been reduced by ½ or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation
Houston District

EROSION CONTROL LOG

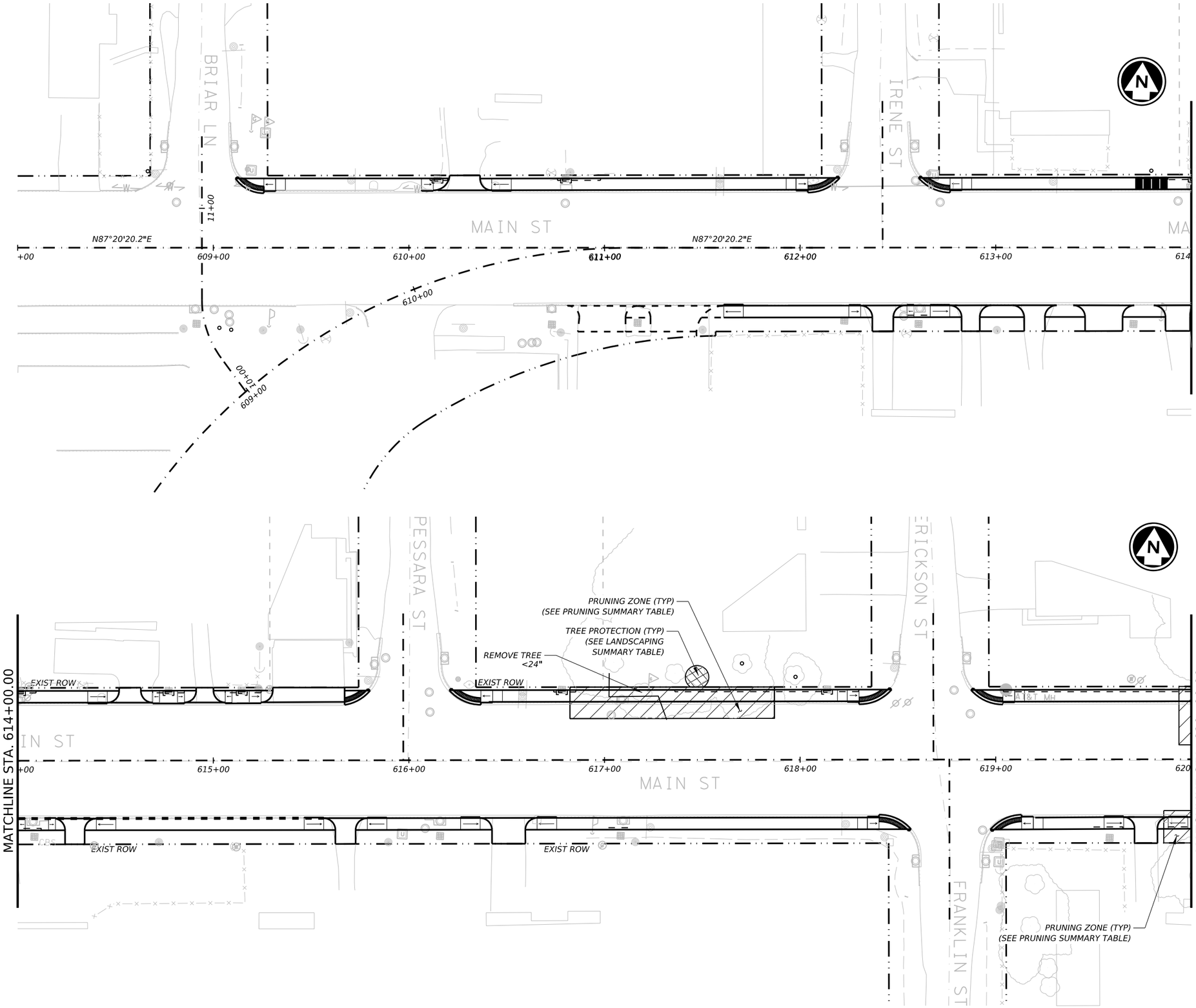
ECL-12

FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot			
©TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER				SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6	STP 2B23(207)TAPS				219
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	GALVESTON			0979	01	027	FM 519

STD G-4A

100% SUBMITTAL

DATE: 9/11/2023 9:41:31 PM
FILE: ...\FM 519 LSCP 01.dgn



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

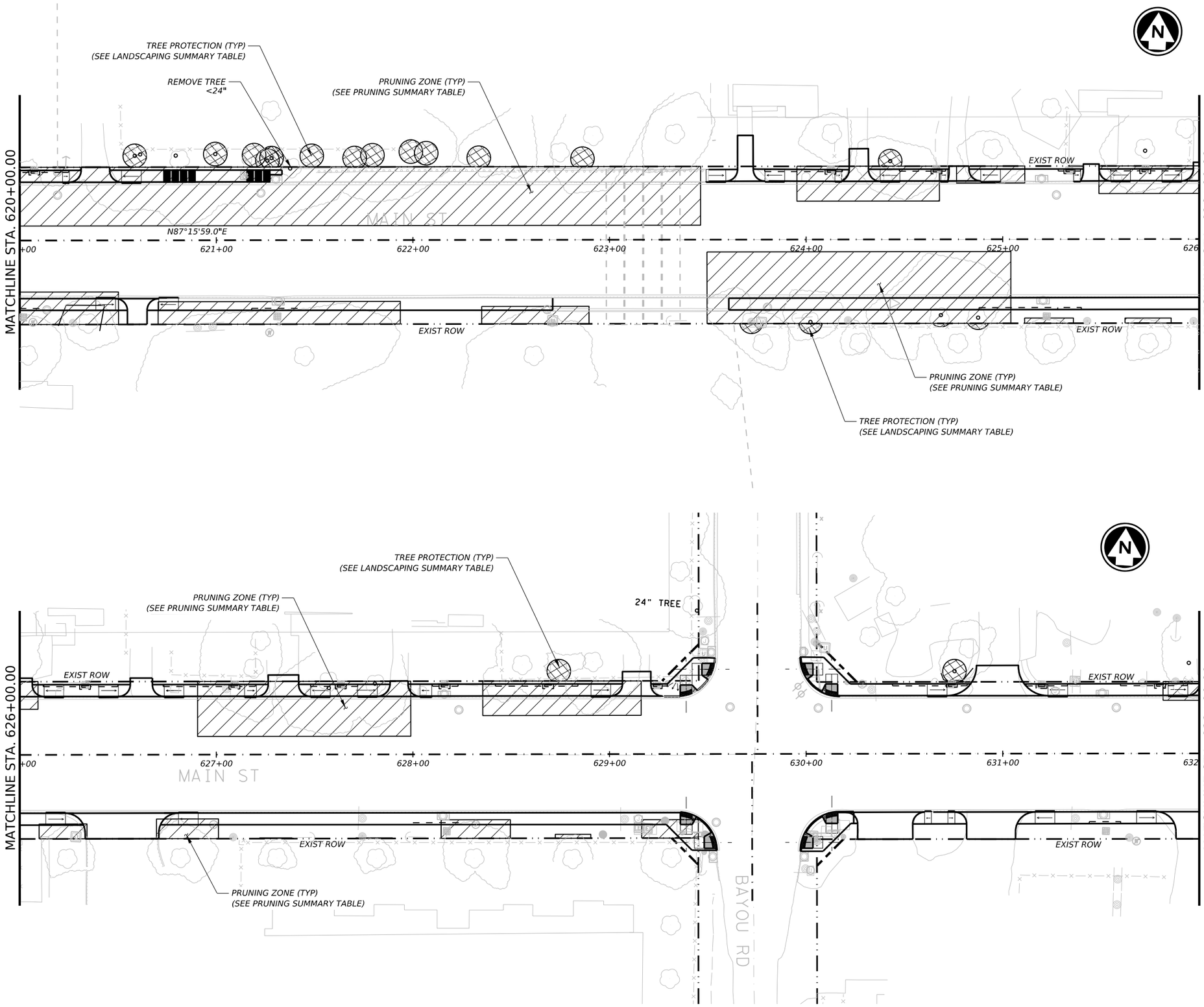
LANDSCAPING PLAN
BEGIN TO STA 620+00

SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		220

100% SUBMITTAL

CK:
DW:
CK:
DW:



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER
Randy W. Harris, P.E.
9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 620+00 TO STA 632+00

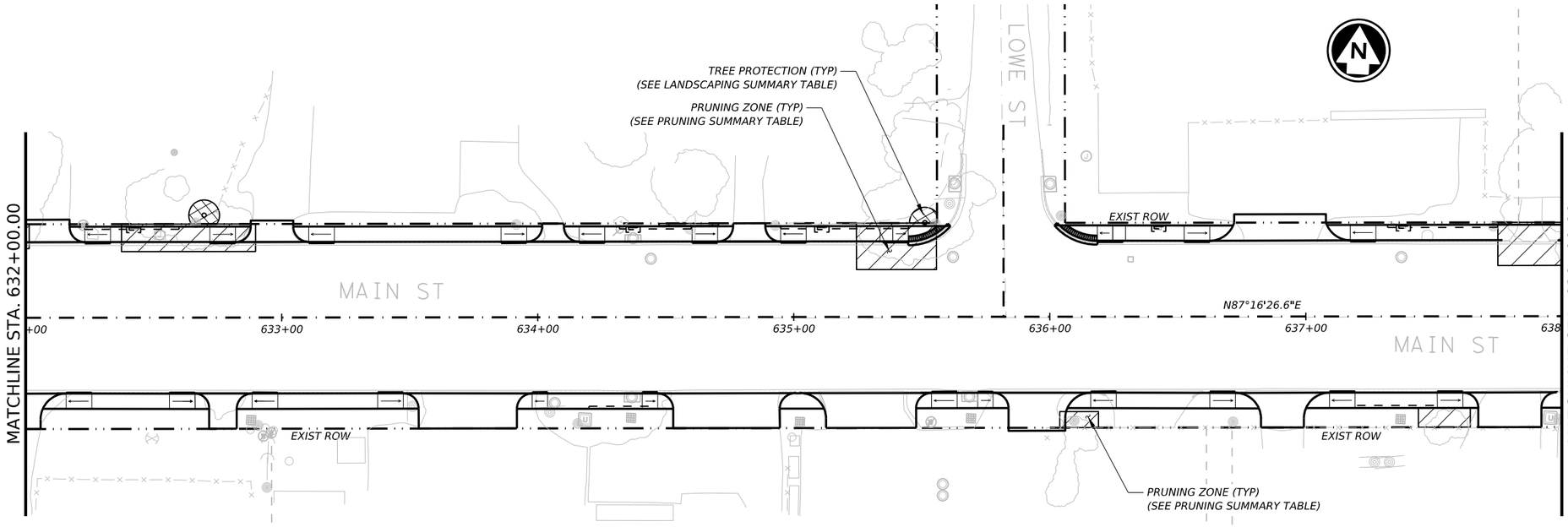
SHEET 2 OF 8

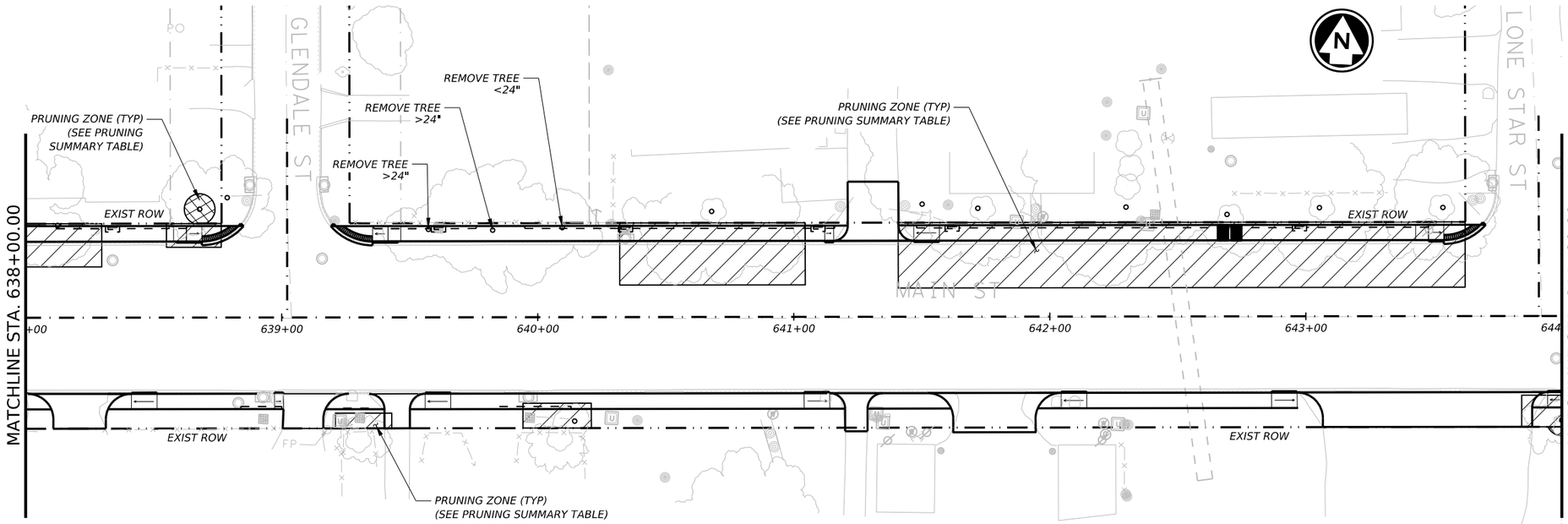
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		221

DATE: 9/11/2023 9:45:08 PM
FILE: ...\FM 519 \SCP 02.dgn

100% SUBMITTAL

DW: CK: DW: CK:





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 632+00 TO STA 644+00

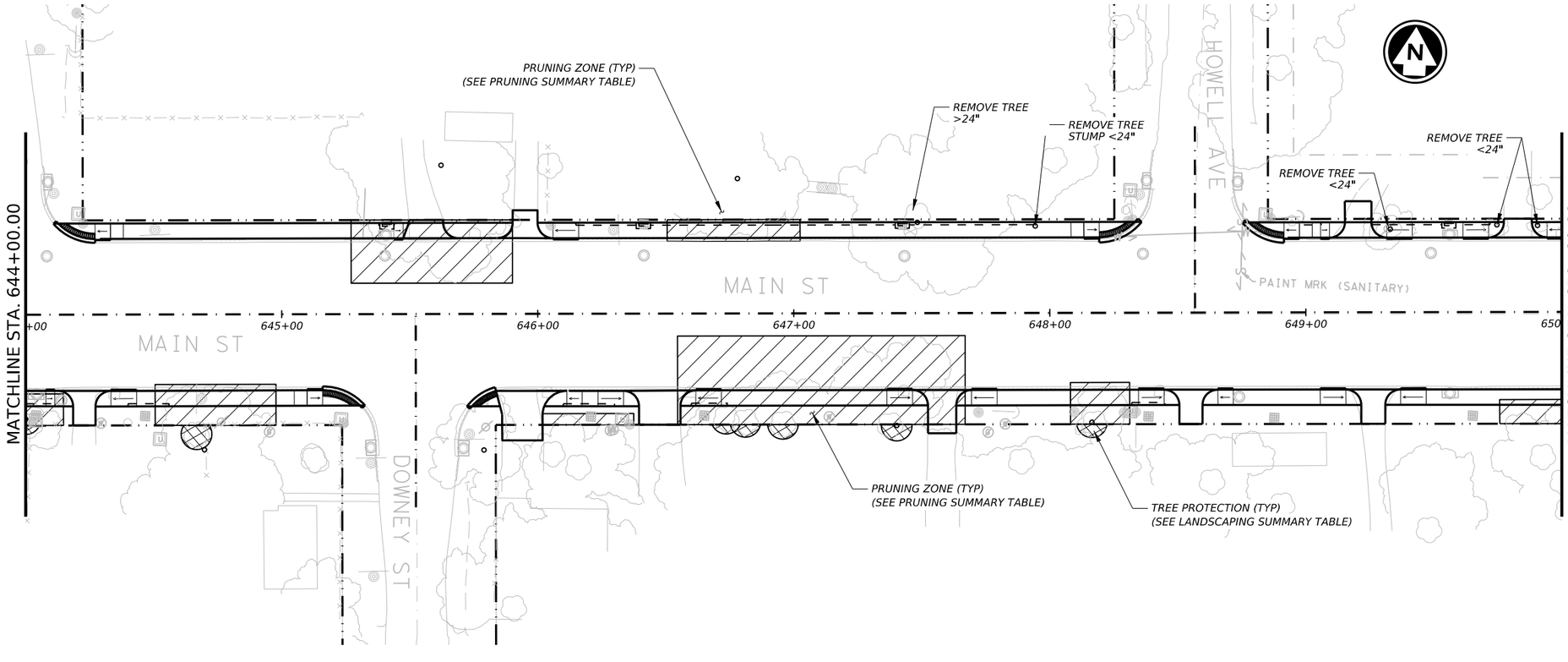
SHEET 3 OF 8

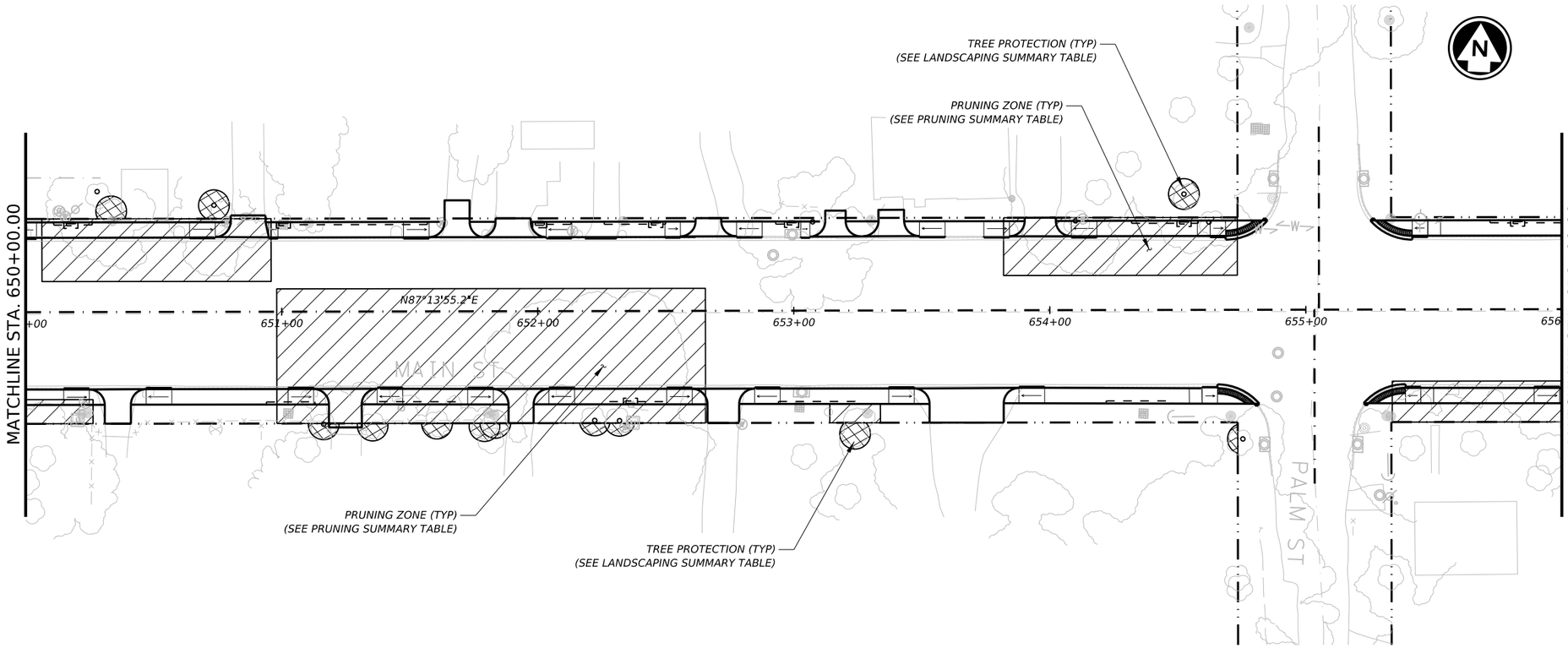
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		222

DATE: 9/11/2023 9:49:23 PM
FILE: ...\FM 519 LSCP 03.dgn

100% SUBMITTAL

CK: DW: CK: DW:





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 644+00 TO STA 656+00

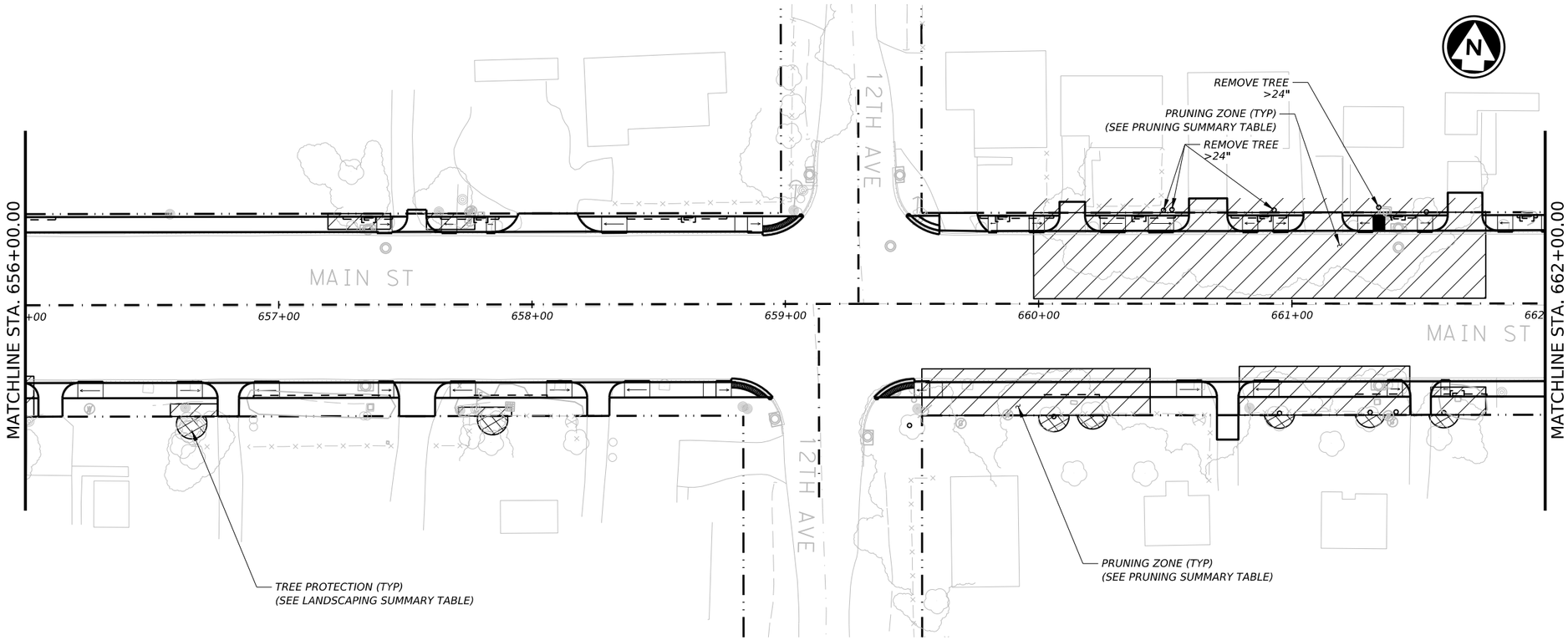
SHEET 4 OF 8

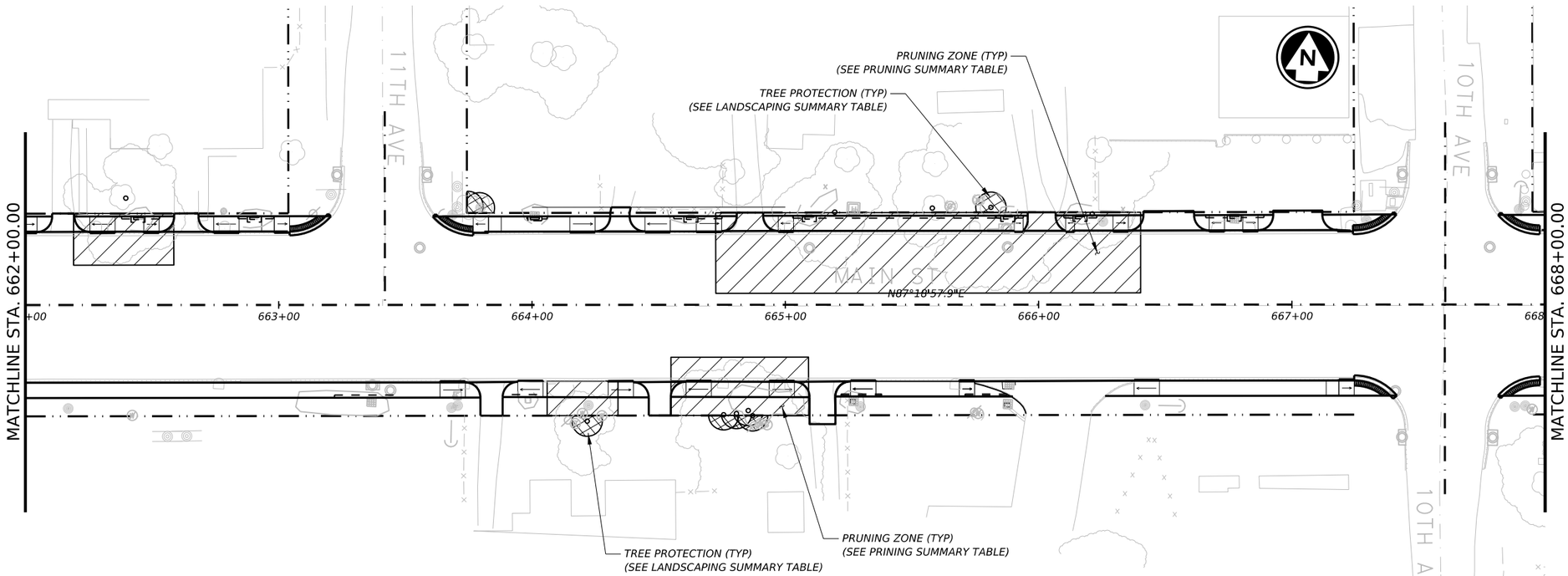
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		223

DATE: 9/11/2023 9:51:50 PM
FILE: ...\FM 519 LSCP 04.dgn

100% SUBMITTAL

DW: | CK: | DW: | CK:





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG: NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 656+00 TO STA 668+00

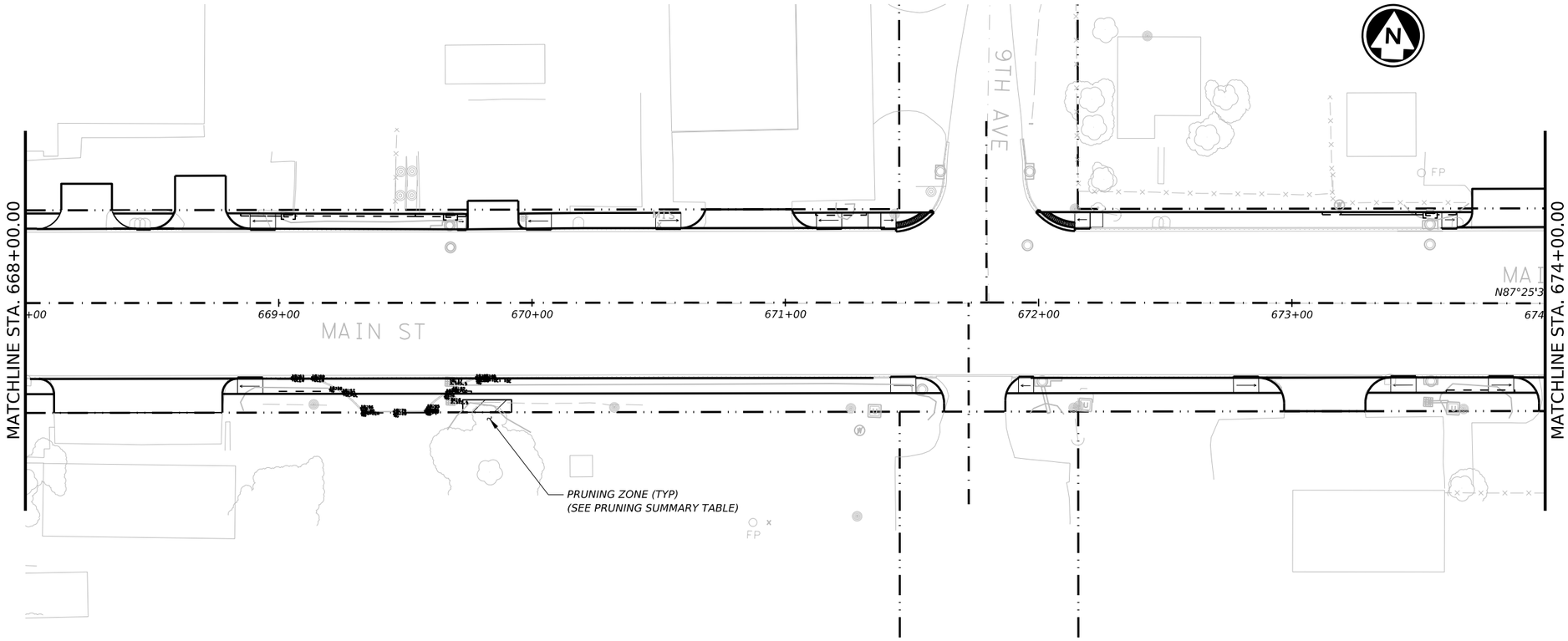
SHEET 5 OF 8

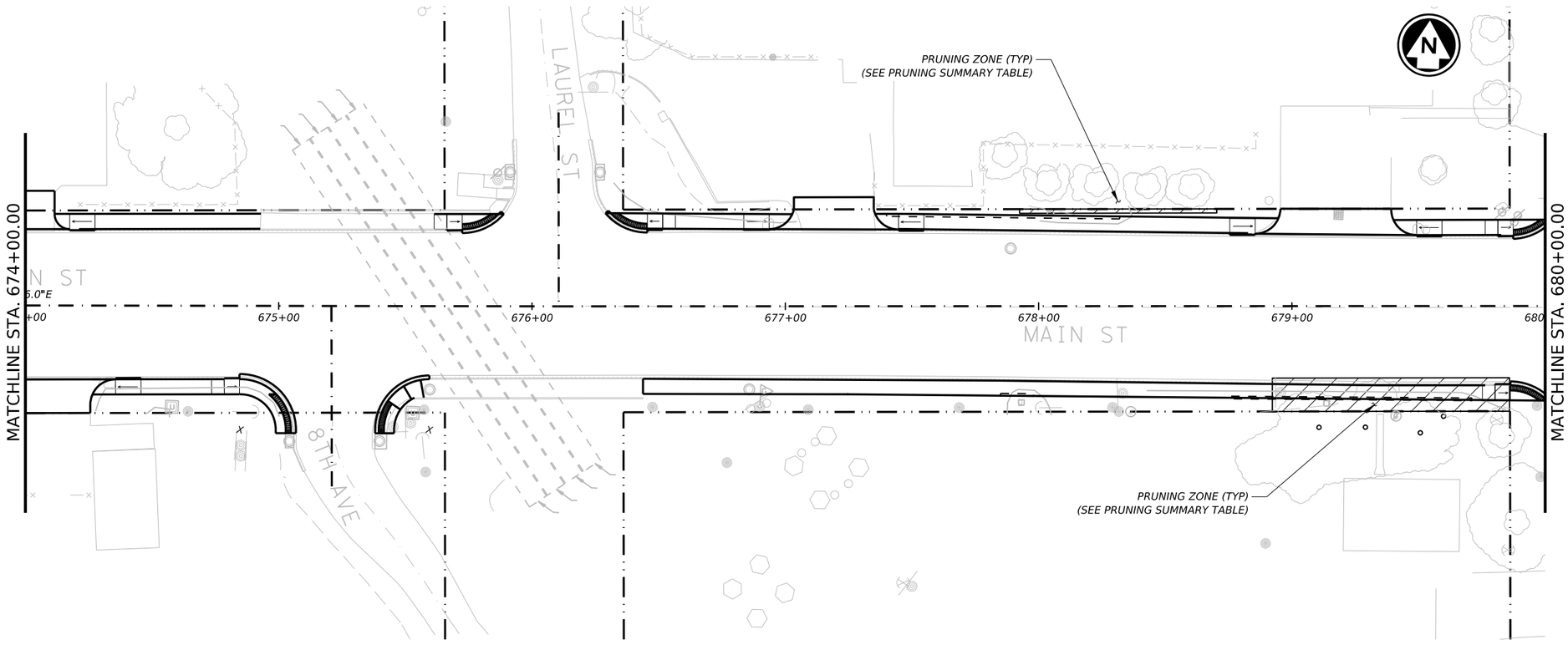
CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		224

DATE: 9/11/2023 9:54:08 PM
FILE: ...\FM 519 LSCP 05.dgn

100% SUBMITTAL

CK:
DW:
CK:
DW:





LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50
SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 668+00 TO STA 680+00

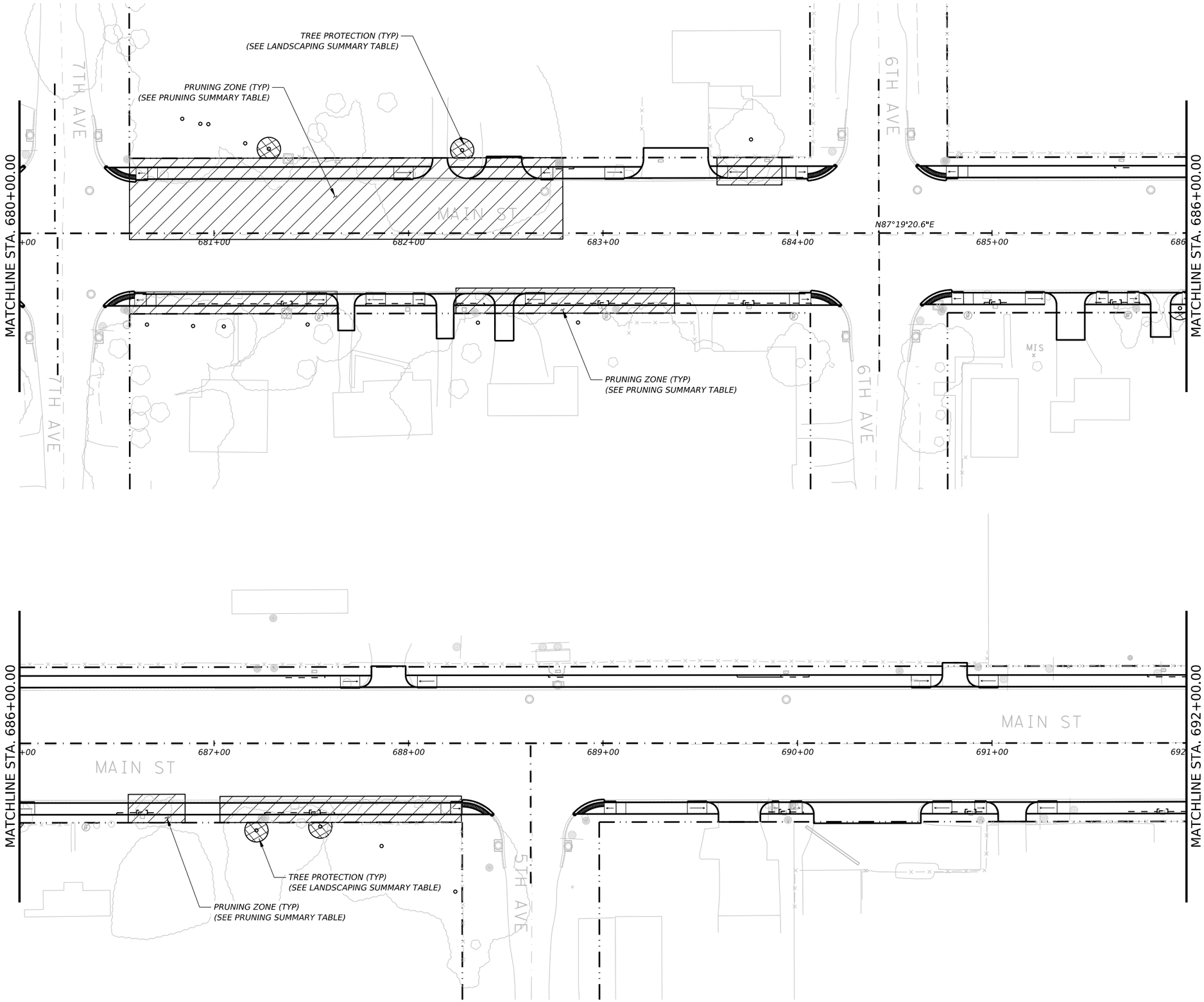
SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		225

DATE: 9/11/2023 9:56:41 PM
FILE: ...\FM 519 LSCP 06.dgn

100% SUBMITTAL

DW: CK: DW: CK:



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

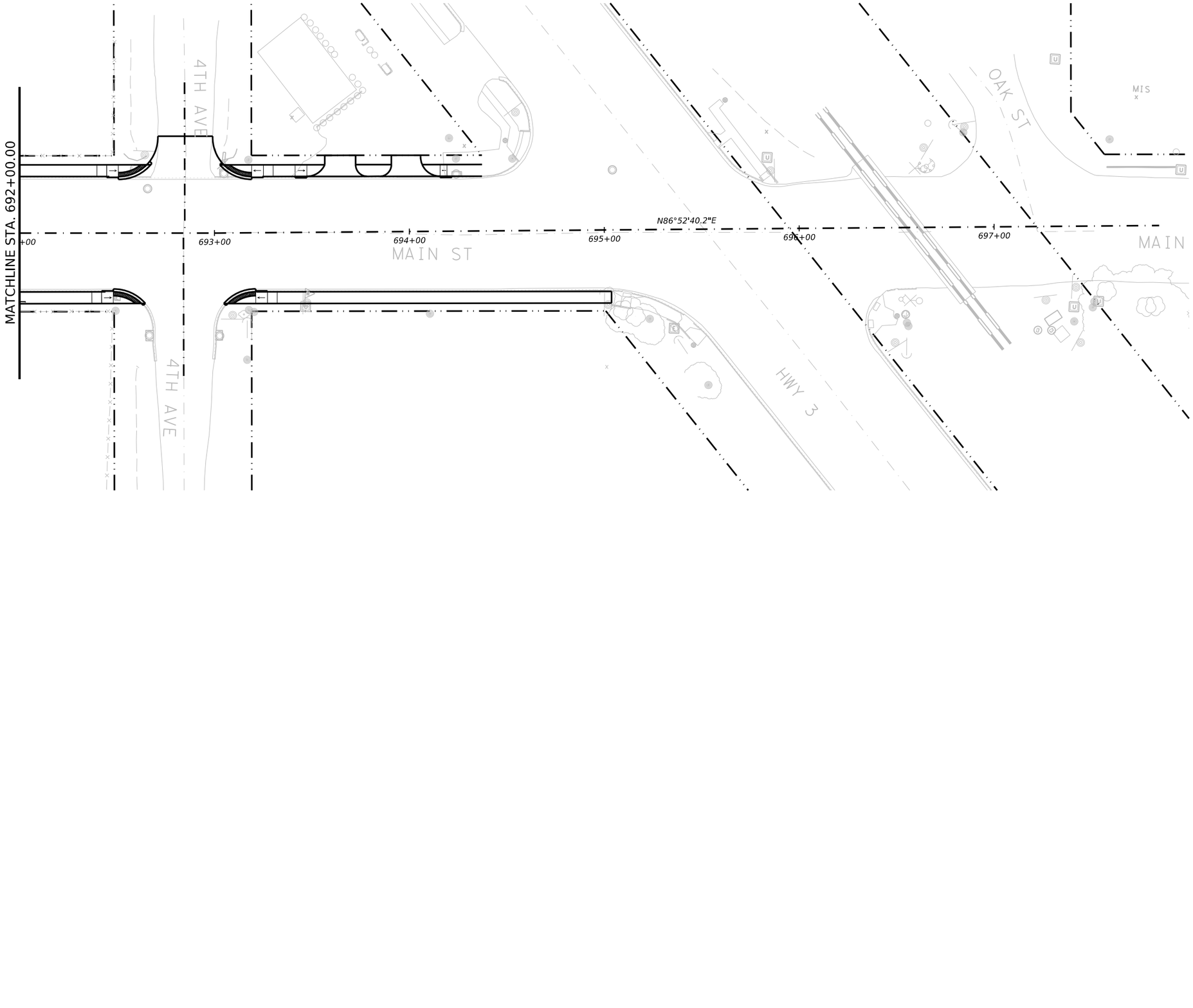
LANDSCAPING PLAN
STA 680+00 TO STA 692+00

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		226

DATE: 9/11/2023 9:59:32 PM
FILE: ...\FM 519 LSCP 07.dgn

100% SUBMITTAL



LEGEND

- EXISTING ROW
- PROPOSED ROW
- EXISTING TRAFFIC DIRECTION
- TREE TRIMMING / PRUNNING ZONE
- TREE PROTECTION REQ'D

NOTES:

1. ALL EROSION CONTROL MEASURES ARE TO REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, UNLESS OTHERWISE STATED.

0 25 50

SCALE IN FEET

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/11/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG. NO. F-474

Texas Department of Transportation

FM 519

LANDSCAPING PLAN
STA 692+00 TO END

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		227

DATE: 9/11/2023 10:02:39 PM
FILE: ...\FM 519 LSCP 08.dgn

100% SUBMITTAL

ITEM 751-6011 PRUNING - CYC

CLEAR ZONE (Tree Setbacks)	
Dimensions are minimum requirements and are not limited to the items listed, adjustments will be made to accomodate site conditions.	
DO NOT PLANT WITHIN SIGHT TRIANGLE	
46′	Travel Lane (shoulder section) with slopes greater than or equal to 5:1
32′	Travel Lane (shoulder section)with slope less than 5:1, Direct Connector, Highmast Lighting, Overhead Transmission Line, CTMS, AVI, Camera, Sensor, Antenna, and/or Other Warning Devices
18′	Ramp, Overhead Distribution Line
10′	Bridge Overhang, Concrete Barrier, Curb, Ground Boxes, Guard Rail, Culvert/Inlet, Manhole, Retaining Wall, Ditch, Right-of-way Line, Riprap, Fence, Large and Small Sign (See PLANTING, ESTABLISHMENT AND MAINTENANCE LAYOUT, Sheets 2 and 3 of 5 for sight triangles)

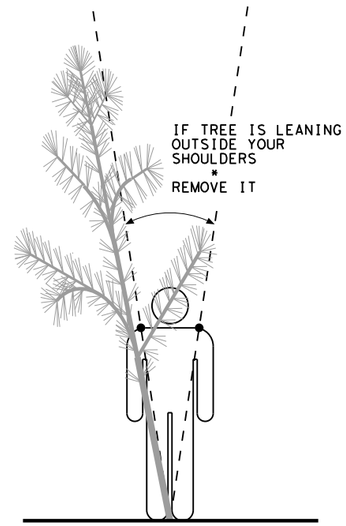
REQUIREMENTS FOR EXISTING TREES

GENERAL
1. Prior to any tree trimming, obtain the guidance and approval of the Engineer or the District Landscape Architect.
2. Perform all requirements described on this sheet unless otherwise shown.
3. Work will be limited to the redefined planting areas and adjacent 5′- 7′ perimeter mow edge.
4. Work includes removing trees and/or shrubs which may actually reduce the original planting area size and eliminate further maintenance of an area.
5. Work includes pruning and removal of plant material:
   - Prune in accordance with ANSI A300.
   - Remove plant materail stumps to existing grade.
   - Dispose of plant debris offsite
   - Remove any plant debris too large to chip from site.
   - Do not prune or remove more plant material than what can be chipped or removed the same day unless otherwise approved by Engineer.
   - Fill any holes from removal of dead plant material with topsoil, topsoil is incidental.
6. EACH CYCLE INCLUDES COMPLETING THE SPECIFIED WORK FOR ALL LOCATIONS IDENTIFIED WITHIN THE PROJECT LIMITS ONCE.

PRUNING AND REMOVALS
7. Prune all plants of any size, height, and diameter in the following conditions:
   - Within sight clearance areas for traffic and signage, see PLANT MAINTENANCE, Sheet 3, 4 AND 5 OF 6 (pruning related to signage applies to both exisiting and any new signs installed for the duration of contract.
   - With vertical clearance issues over any roadways and access routes (19′ Min.), 8′- 10′ width planting area perimeter (9′ Min.) and sidewalks (9′ Min.), see PLANT MAINTENANCE, Sheet 3 and 4 OF 6.
   - Prune all sucker growth and/or new limbs to maintain clear trunk in accordance with PLANT MAINTENANCE, Sheet 2 of 6.
   - Prune dead, dying or damaged branches/limbs (includes freeze and/or drought damage to any existing plant materail).
8. Remove all plants of any size, height, and diameter not conforming to PLANT MAINTENANCE, Sheet 4 and 5 of 6, and:
   - Remove dead, dying and non-viable plants with permanent structural damage.
   - Remove invasive or undesirable plants as described on this sheet.
   - Remove leaning trees more than Approx. 8" off center measured at a height of Approx. 5′ (see leaning tree removal image this sheet).
   - Remove any existing stumps to grade.
   - Remove crape myrtle, wax myrtle, etc. (multi-stemmed tree) located < 10′ from travel lane and along entire edge of sign site triangle.
   - Remove all vines from trees and shrubs and vines that have fallen from installed support structure(s).
   - Remove all vines from barriers, fences, retaining walls, sign structures, sound walls, etc. adjacent to planting areas unless otherwise noted on plans.

STAKES AND STRAPS
9. Remove all existing stakes, straps, guy wires, cables, and tags from site.

OTHER
10. Remove all litter and debris (rocks, tires, concrete, lumber, trash, bandit signs, etc.) located within planting areas.
11. Treat existing plants displaying evidence of insect, fungal, bacterial, or other negative indications - use appropriate methods and products for treatments.
12. Remove silt fence, erosion control logs, and staking associated with any planting area unless directed otherwise.
13. Access to some areas is constrained. No additional compensation is allowed for limited access.
14. Reference ITEM 5.10 INSPECTION OF THE TEXAS STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES 2014. At any time during all phases of the contract, any materials or work performed not in accordance with plans and specifications will be replaced and/or reworked until in compliance with no additional compensation.
15. Any adjustments due to the failure to comply with plans and specifications shown will be at Contractor's expense.
16. District Landscape Architect or Vegetation Specialist must approve completed work prior to acceptance and payment.



LEANING TREE REMOVAL

NTS

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/12/2023

PLANT MAINTENANCE

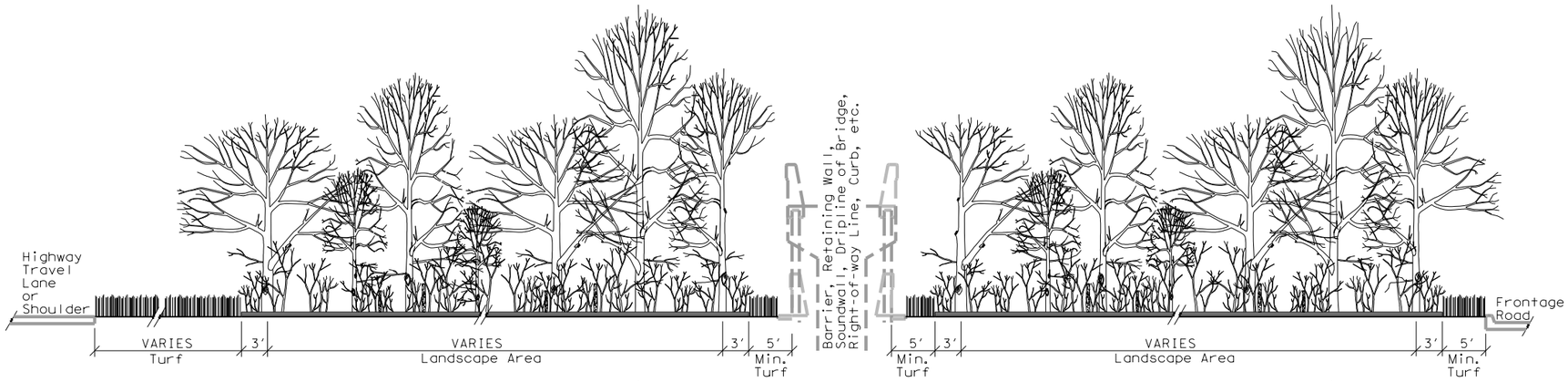
SHEET 1 OF 6

Texas Department of Transportation

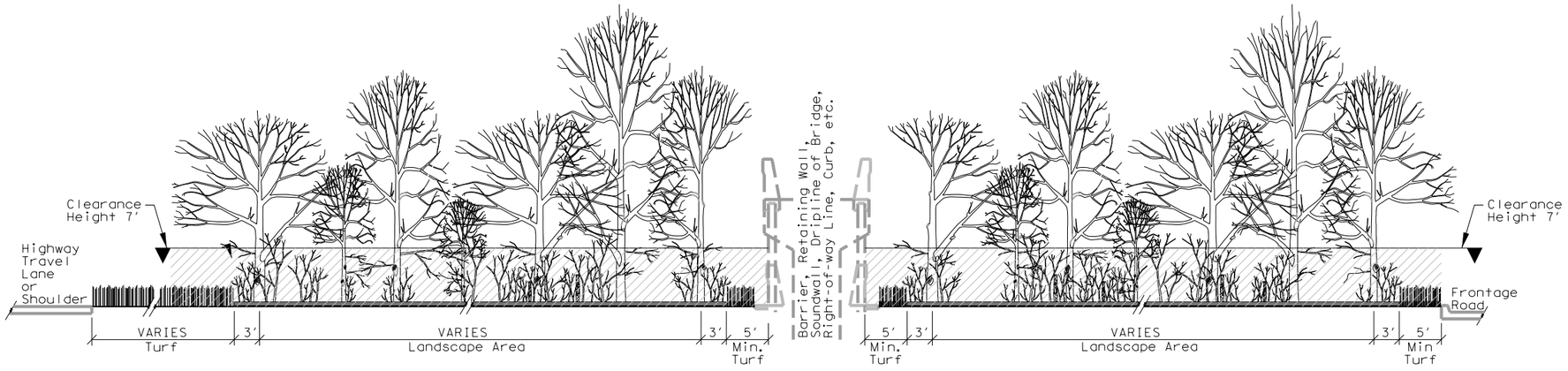
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		228
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

100% SUBMITTAL

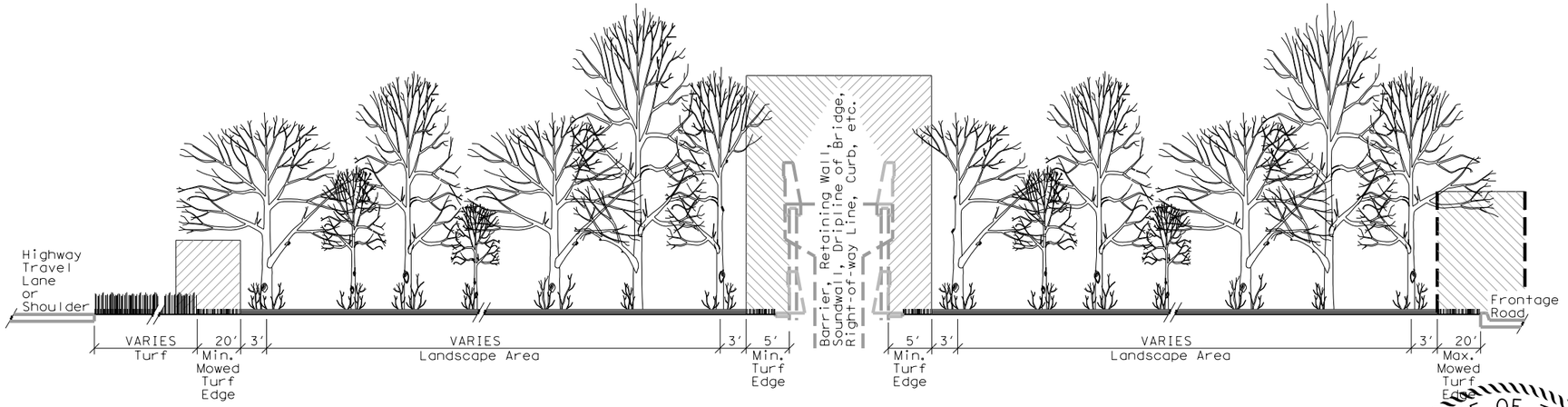
EXISTING CONDITION



PRUNE/REMOVAL REQUIREMENTS



FINAL CONDITION



PLANT MAINTENANCE - UNDERSTORY AND SUCKER GROWTH PRUNING, TRIMMING AND REMOVAL

NTS

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/12/2023

PLANT MAINTENANCE

SHEET 2 OF 6

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		229
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

100% SUBMITTAL

EXISTING CONDITION

PRUNE/REMOVAL REQUIREMENTS

FINAL CONDITION

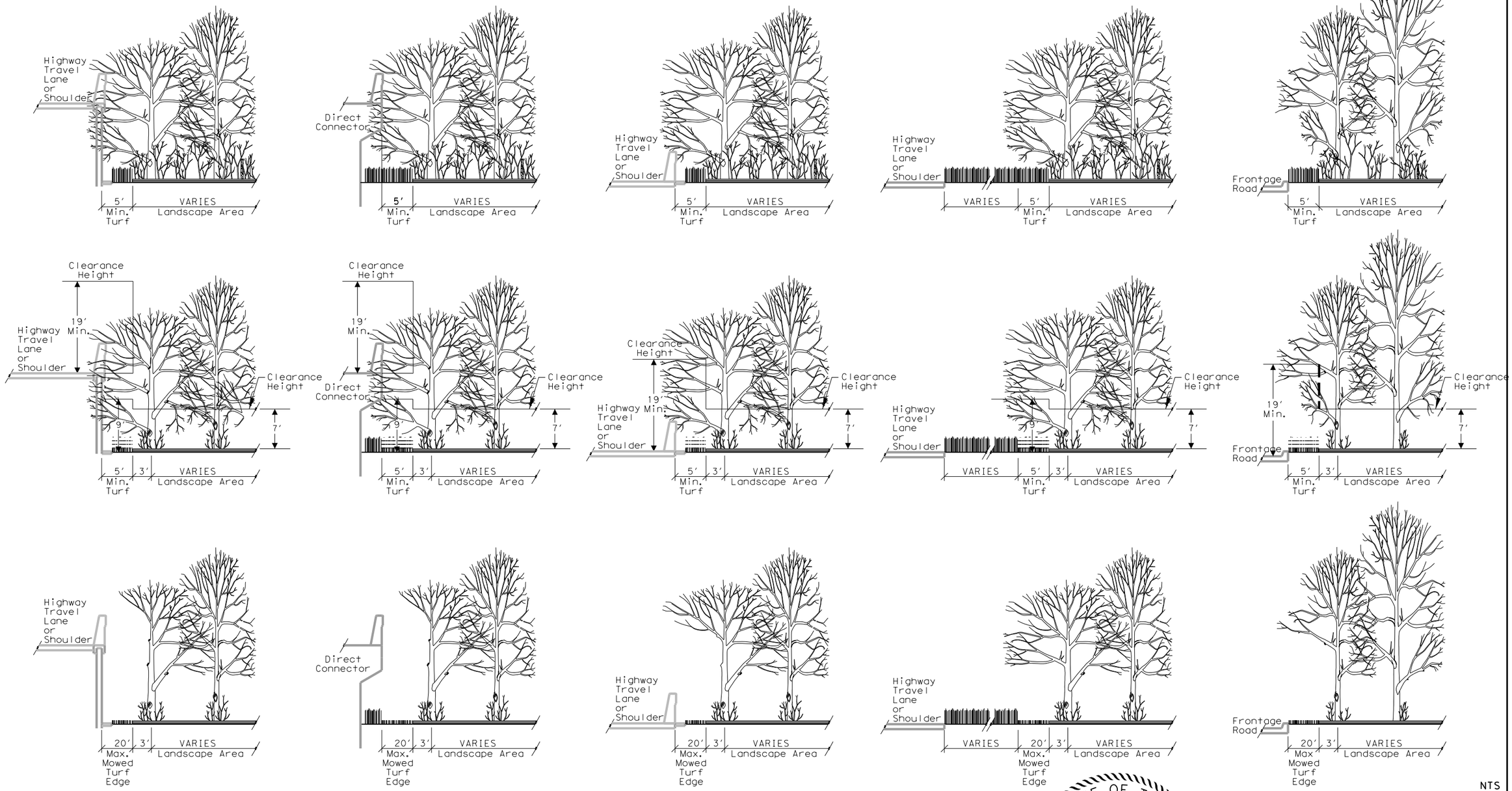
RETAINING WALL

DIRECT CONNECTOR

BARRIER

HIGHWAY SHOULDER

CURB



NTS

PLANT MAINTENANCE - EDGE PRUNING, TRIMMING AND REMOVAL

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/12/2023

PLANT MAINTENANCE

SHEET 3 OF 6

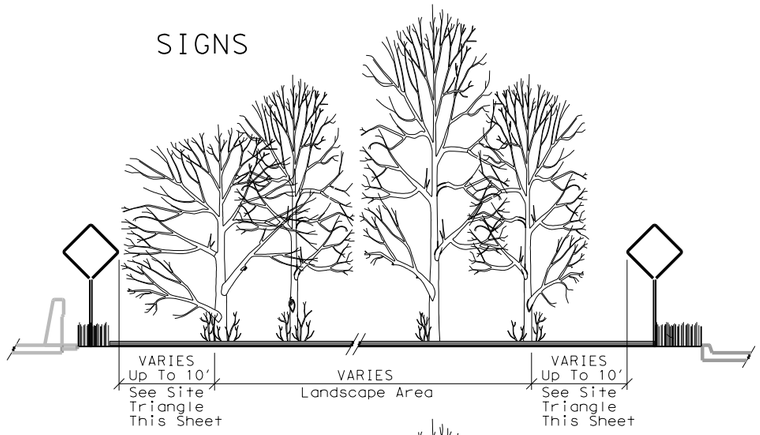
Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		230
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

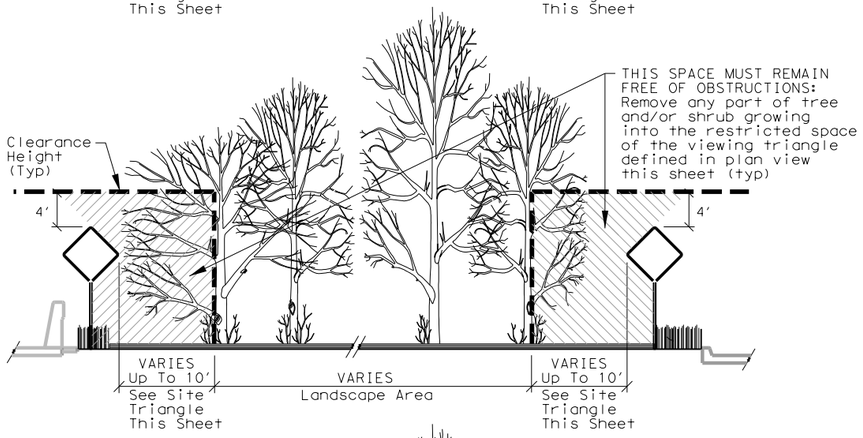
100% SUBMITTAL

SIGNS

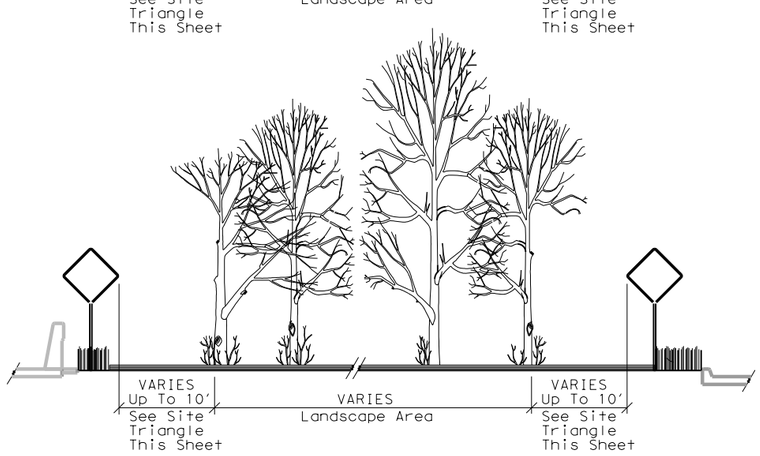
EXISTING CONDITION



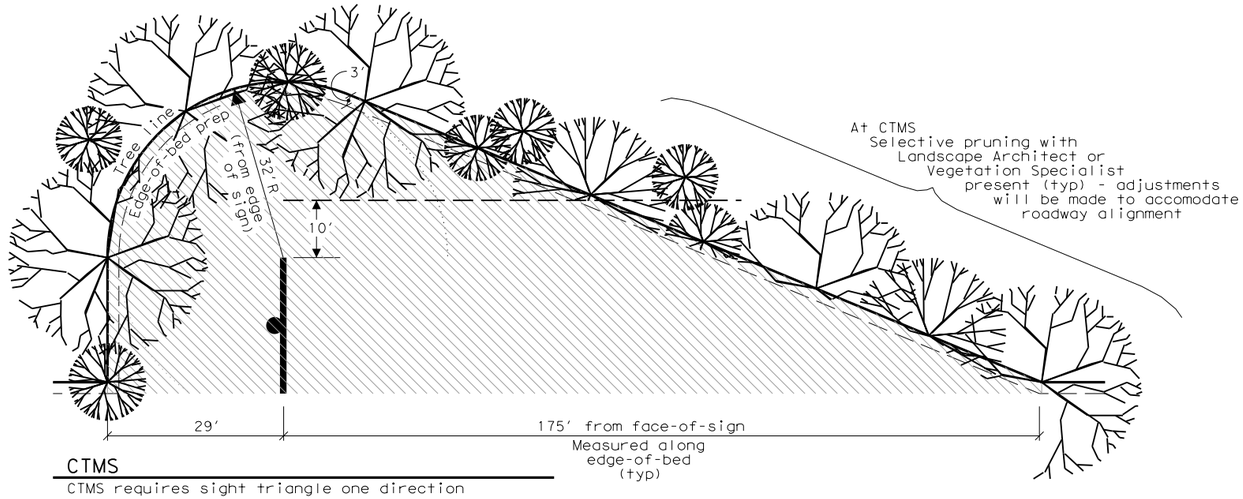
PRUNE/REMOVAL REQUIREMENTS



FINAL CONDITION

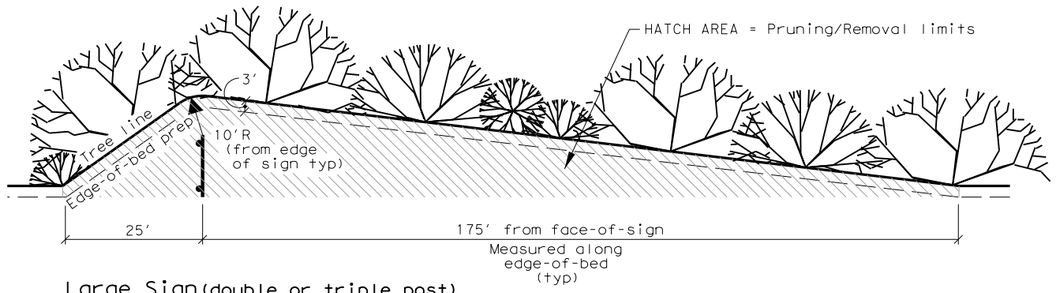


ELEVATION



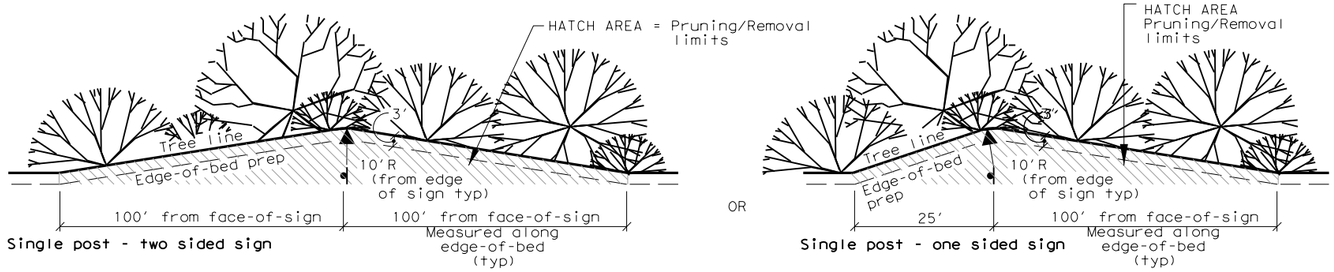
CTMS

CTMS requires sight triangle one direction



Large Sign (double or triple post)

Applies to ground mounted and structure mounted (rails, wall, columns, etc.) signs



Small Sign

Applies to ground mounted and structure mounted (rails, wall, columns, etc.) signs

PLAN

PLANT MAINTENANCE - SIGHT CLEARANCE FOR SIGNAGE

NTS

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED PROFESSIONAL ENGINEER

9/12/2023

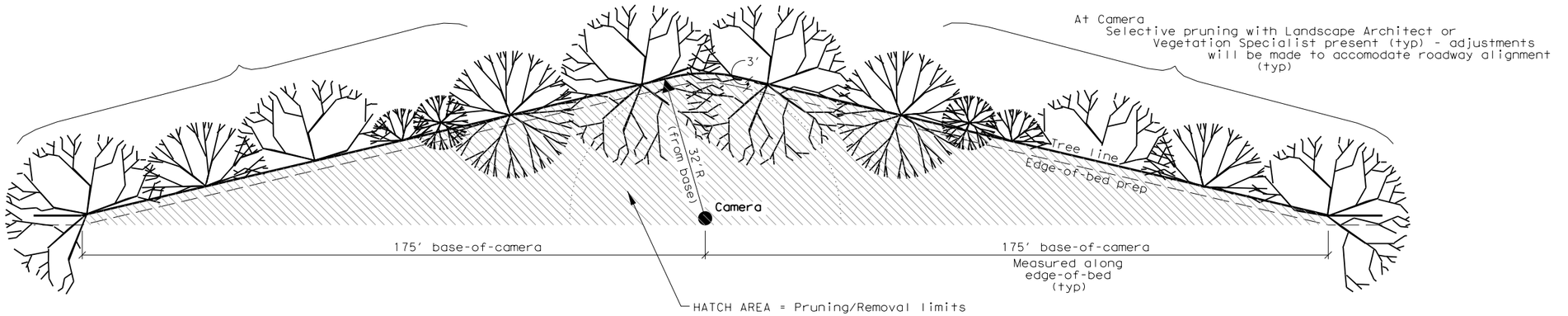
PLANT MAINTENANCE

SHEET 4 OF 6

Texas Department of Transportation

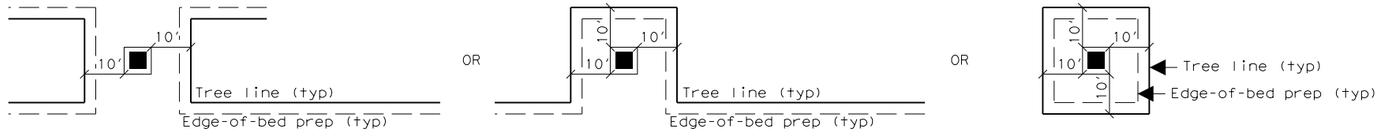
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		231
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

100% SUBMITTAL



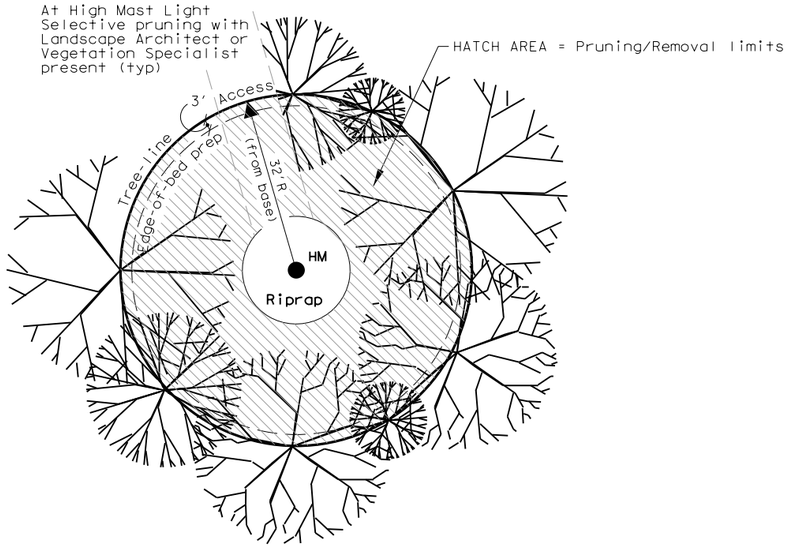
Camera

Camera requires sight triangle both directions



Ground Box, Inlet, Manhole, etc.

Include any riprap as part of structure



High Mast Lighting, etc.

High mast lighting, sensors, antennas, etc. require full or partial circle depending on location and access required - access will be determined in the field

PLANT MAINTENANCE - CAMERA, HIGHMAST LIGHTING AND DRAIN INLET CLEARANCE

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/12/2023

NTS

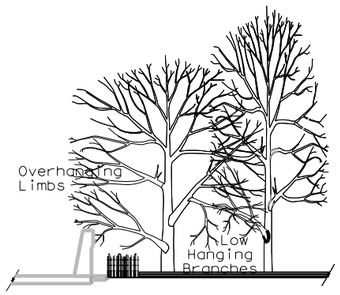
PLANT MAINTENANCE

SHEET 5 OF 6

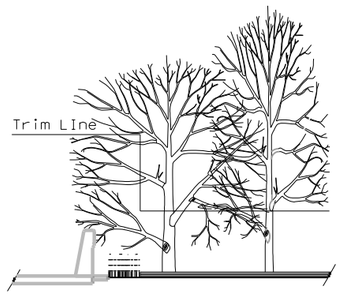
Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		232
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

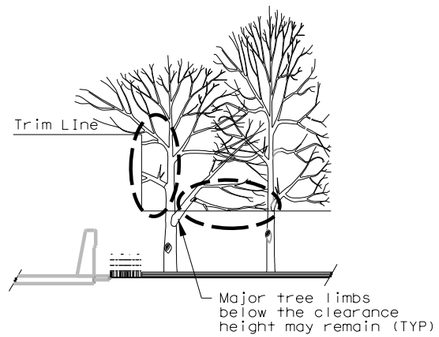
100% SUBMITTAL



EXISTING CONDITION



BRANCHES / LIMBS TO BE REMOVED

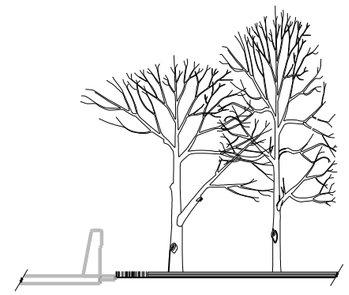


IMPROPERLY PRUNED TREES

Cut limbs at a major fork in the branch or, if the entire branch is encroaching into the area to be cleared, remove the branch at the trunk.

Do not leave a stub beyond the branch collar or cut through the branch collar when making pruning cuts.

The branch collar is generally visible, but if it is not, make the final cut approximately 1/2" from the parent branch or trunk, perpendicular to the branch or limb being removed.



PROPERLY PRUNED TREES

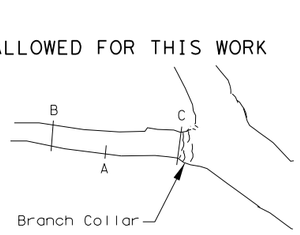
PLANT MAINTENANCE - BRANCH / LIMB REMOVAL

FLAILING EQUIPMENT IS NOT ALLOWED FOR THIS WORK

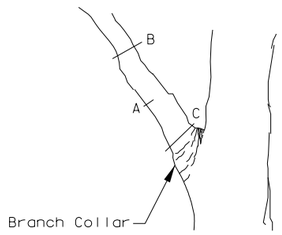
A - STEP 1
Cut 1/3 way through bottom of limb 8-12" above main stem or trunk

B - STEP 2
Remove limb 4-6" beyond the first cut

C - STEP 3
Remove stub with a smooth cut just beyond the branch collar of the removed limb



Tree Limb



Main Branch

PRUNING CUTS - LIMBS 2" IN DIAMETER AND GREATER

STATE OF TEXAS
FOROUD MORADI SARMEIDANI
107929
LICENSED
PROFESSIONAL ENGINEER

9/12/2023

NTS

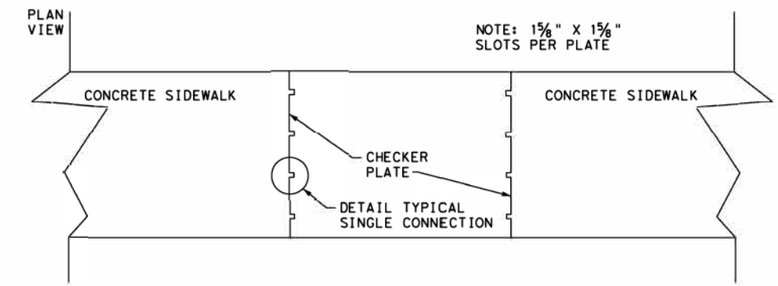
PLANT MAINTENANCE

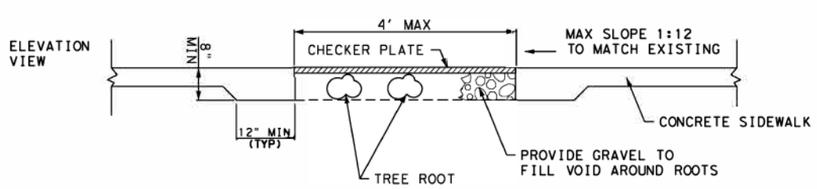
SHEET 6 OF 6

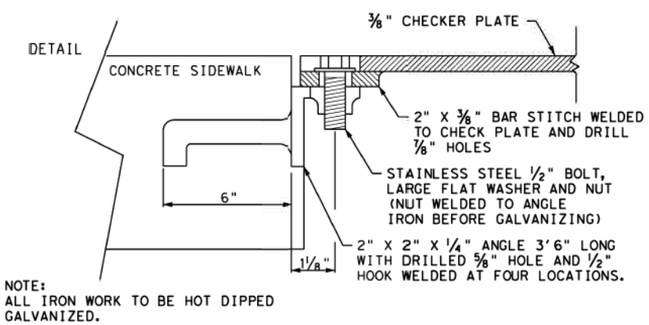
Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6	STP 2B23(207)TAPS		233
STATE	DIST.	COUNTY	
TEXAS	HOU	GALVESTON	
CONT.	SECT.	JOB	HIGHWAY NO.
0979	01	027	FM 519

100% SUBMITTAL



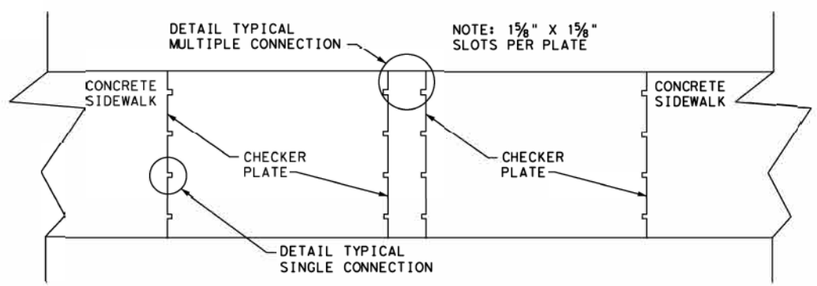


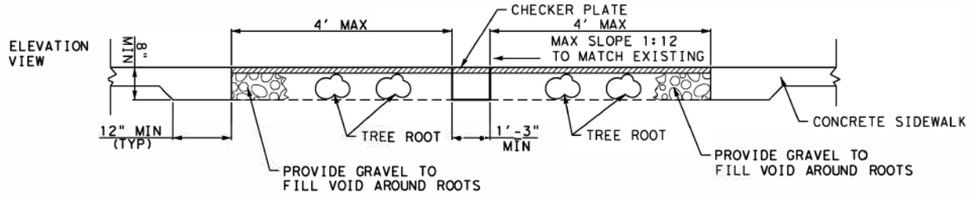


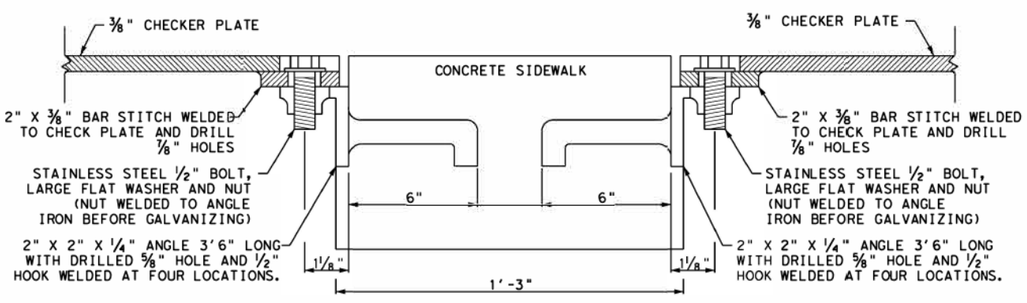
NOTE:
ALL IRON WORK TO BE HOT DIPPED GALVANIZED.

CHECKER PLATE CONNECTION DETAIL

CHECKER PLATE TREE ROOT PROTECTION SIDEWALK







CHECKER PLATE MULTIPLE CONNECTION DETAIL

NOTES:

1. CHECKER PLATE IS PAID UNDER ITEM 442 STR STEEL (NON BRIDGE).
2. GRAVEL AND THICKENED SIDEWALK AND CONCRETE CONNECTION IS SUBSIDIARY TO CHECK PLATE CONSTRUCTION.
3. ALL EXCAVATION AT TREE ROOTS TO BE DONE BY HAND.
4. CHECKER PLATE LOCATIONS TO BE FIELD VERIFIED PER FINAL ROOT LOCATIONS.
5. CONTRACTOR TO SUBMIT SAMPLES OF CHECKER PLATE FOR APPROVAL PRIOR TO CONSTRUCTION.

STATE OF TEXAS
RANDY W. HARRIS
93663
LICENSED
PROFESSIONAL ENGINEER

Randy W. Harris, P.E. 9/12/2023

ATKINS
MEMBER OF THE SNC-LAVALIN GROUP
17304 PRESTON RD, SUITE 1300
DALLAS, TEXAS 75252
PH (972)818-7275
TBPE REG NO. F-474

Texas Department of Transportation

FM 519

CHECKER PLATE DETAILS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0979	01	027	FM 519
DIST	COUNTY		SHEET NO.
HOU	GALVESTON		234

DATE: 9/12/2023 6:56:14 AM
FILE: ...\FM 519 LSCP STD Checker Plate.dgn

GENERAL TREE PROTECTION NOTES:

1. Protect and ensure the continued good health of existing trees identified on the plans or directed by the Engineer. Protective measures include providing, installing, maintaining and removing protective fences, bound wood planking, compost, berm pruning, boring, and watering.
2. Install tree protection before any heavy equipment arrives on the site and remains in place for the duration of the project.

PROTECTIVE FENCE

1. Critical Root Zone (CRZ)= 1 foot radius per 1 caliper inch of trunk diameter.
2. Place protective fence at the edge of the critical root zone of trees to be protected. Use 4 feet high orange plastic mesh or approved equivalent supported on steel T-posts. Use steel T-posts minimum of 6 feet long, spaced at intervals sufficient to keep fence pulled tight. Stretch smooth galvanized wire from post to post across the top of fence and draw tight. Attach plastic mesh to posts and top wire with aluminum tie wire or nylon ties.
3. No excavation, grading, filling, soil compaction, parking, or equipment storage is allowed within the fenced area.
4. When a construction zone overlaps the root zone due to lack of space, place fence within 2 feet of construction zone.
5. Install protective compost filter berm at base of protective fence as shown in detail and described in these notes under "Root Zone Protection". Compost filter berm functions as a protective filter from runoff associated with construction activities such as: concrete wash, erosion, fill, chemicals, cement and lime work and other activities.

VEGETATIVE WATERING FOR TREE PROTECTION

1. Water trees at a rate of 30 gallons per week for every week during construction activities. Watering is paid for separately under Item 168-6001 Vegetative Watering.

TRUNK PROTECTION

1. Where protective fence is located closer than 6 feet from a tree trunk from any direction, protect the tree trunk with bound wood planking. Wood planks may be construction grade lumber a minimum of 1 inch by 6 inch nominal. Band planks together with rope, band, or strap of sufficient gauge and quality to keep protective planking in place around tree trunk for the duration of the project. Install wood planks of sufficient length to protect the trunk to a height of 10 feet, or the height of the lowest major branching, whichever is less. Do not use nails, screws or other damaging attachment methods.

ROOT ZONE PROTECTION

1. Cover entire area of critical root zone with 4" depth of erosion control compost. Erosion control compost is paid for separately under Item 161-6009 Erosion Control Compost. See standard specification for compost requirements.
2. Install protective compost filter berm at base of protective fence along entire edge of critical root zone as shown on detail this sheet. Dimensions of compost filter berm are 1 foot tall, and 2 feet wide at base. Use erosion control compost for berm paid for under Item 161-6009 Erosion Control Compost. Maintain berm throughout project.
3. Vehicular traffic, stockpiling or storage of materials, parking of equipment and refueling equipment is prohibited in protected areas.

BORING, TRENCHING, GRADING, AND PRUNING

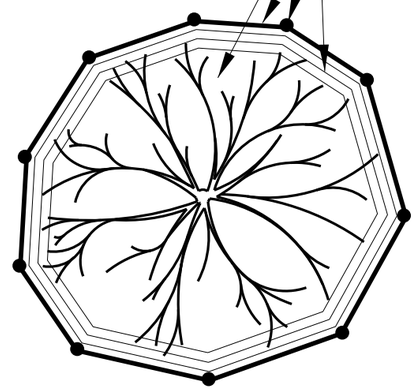
1. Where shown in plans, underground utilities crossing under protected areas will be bored beneath critical root zones. Avoid boring directly beneath root flare. Bore depth is 4 feet below existing grade.
2. No trenching, excavating, filling, or compaction is allowed within the critical root zone except as specifically identified in the plans and approved by the Engineer.
3. When existing grade must be cut within the critical root zone, contact the Engineer prior to beginning work. Before grading or excavation work, saw cut roots to the depth of the proposed disturbance along the edge of the proposed disturbance before excavation is begun.
4. Prune flush with soil any roots exposed by construction. Backfill root areas with good quality topsoil as soon as possible. If exposed root areas are not to be backfilled within two days, then cover with a minimum of six inches of erosion control compost. Erosion compost is paid for separately under Item 161-6009 Erosion Control Compost.
5. When grading within the critical root zone, use hand or small equipment and alter grade no more than two inches. No soil disturbance is allowed on the root flare under any circumstances.
6. Perform any pruning to provide clearance for structures, vehicular traffic, and construction equipment before construction damage might occur. Prune any limb damage within two hours of occurrence and according with ANSI A300-1995 standard.

MAINTENANCE OF TREE PROTECTION MATERIALS

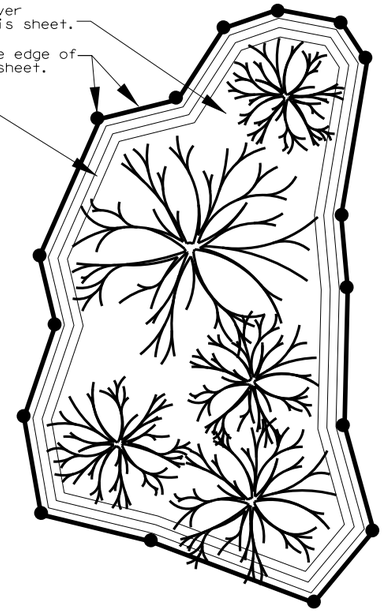
1. Maintain all tree protection materials throughout entire length of project. Repair damaged or affected tree protection materials. Additional erosion control compost may be required during the project and will be paid for separately.

REMOVAL OF TREE PROTECTION MATERIALS

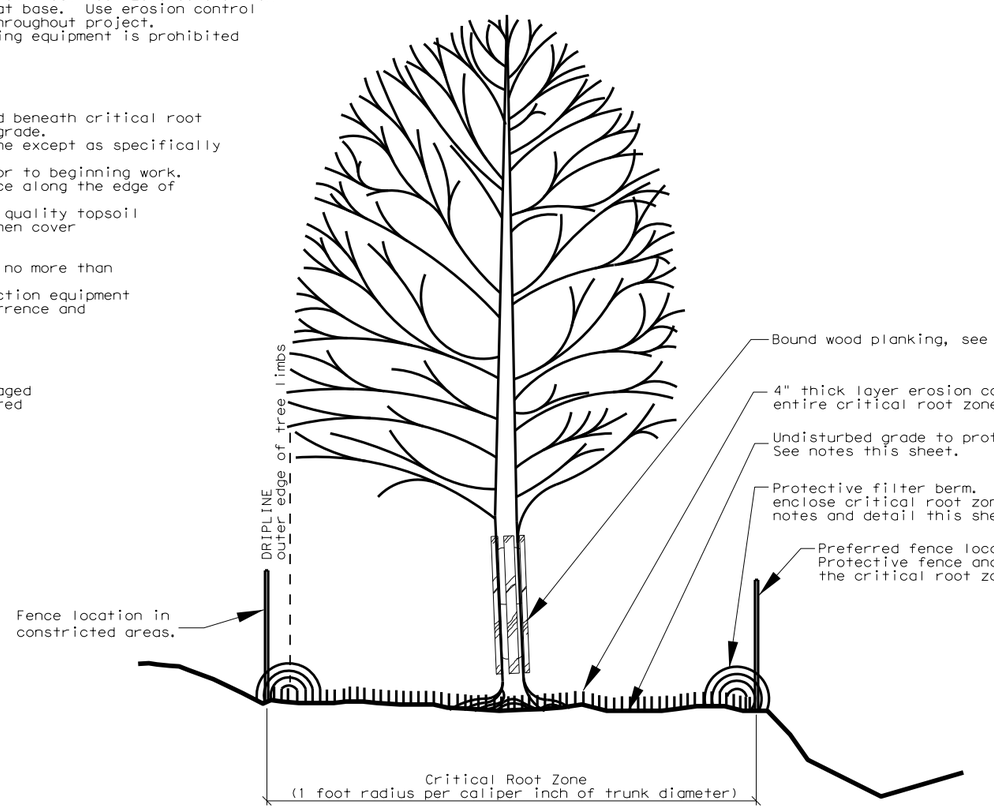
1. Remove and dispose of all protective fencing and trunk protection at end of project.



PLAN VIEW OF INDIVIDUAL TREE AND PROTECTIVE FENCE



PLAN VIEW OF TREE GROUP AND PROTECTIVE FENCE



TYPICAL TREE PROTECTION

REQUIRED ITEMS:

- Item 1004-6001 Tree Protection EA
- Item 1004-6002 Tree Protection AC
- Item 161-6009 Erosion Control Compost CY
- Item 168-6001 Vegetative Watering MG

Texas Department of Transportation
HOUSTON DISTRICT

TREE PROTECTION
SHEET 1 OF 1

Details not to scale

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 2B23(207)TAPS			235
REVISED: FEB 2015 FOR 2014 SPECS	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	GALVESTON	0979	01	027	FM 519

STD K-3

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING			
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre November, December, January, February: Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Oats (Avena sativa) - 72.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker(turfgrass) type seeder. Plant seed along the contour of the slopes. Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓		**164-6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	**164-6051 DRILL SEED(TEMP)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre November, December, January, February: Oats (Avena sativa - 72.0 lbs PLS/acre	
		✓	**164-6009 BROADCAST SEED(TEMP)(WARM) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
	✓	✓	**162-6003 STRAW OR HAY MULCH SY**	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal(see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	**166-6001 FERTILIZER AC** Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a **NON-CHEMICAL** fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day x 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING

DATE TIME
DOCUMENT NAME

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

FSSSCW-15

REVISIONS
10/2014 UPDATED TO 2014 SPECS
3/2015 MINOR CORRECTIONS
3/2023 ADDED SHEET ABBREVIATION

FILE: OCT 2014

ORIGINAL:

FED DIV	STATE	PROJECT NUMBER			SHEET
6	TEXAS	STP 2B23(207)TAPS			236
DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
12	GALVESTON	0979	01	027	FM 519