DATE: 7/5/2023
FILENAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\US82T*S*TITLE01.dgn

COUNTY BOWIE PROJ. NO. STP 2022(679)TAPS
HWY. NO. US 82 LETTING DATE SEPTEMBER 2023
DATE ACCEPTED

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	STP 2022(679)TAPS		1
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	BOWIE	
CONT.	SECT.	JOB	HIGHWAY NO.
0919	19	087	VARIOUS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL PROJECT NO: STP 2022(679) TAPS

BOWIE COUNTY
VARIOUS

LIMITS: FROM: ALONG US 82 FROM CR 4105
TO: SH 98

NET LENGTH OF PROJECT = 16,542.46 FT = 3.133 MI

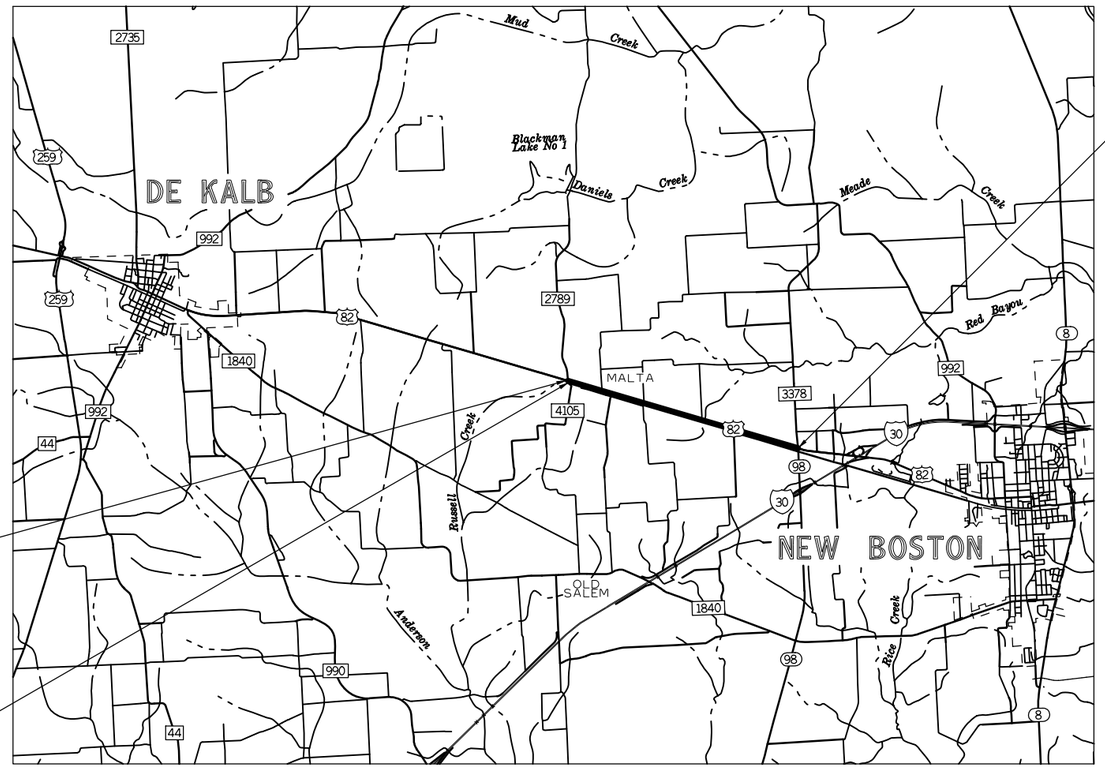
CSJ	FACILITY TYPE	DESIGN SPEED
0919-19-087	SHARED USE PATH	15 MPH

FOR THE CONSTRUCTION OF BICYCLE AND PEDESTRIAN IMPROVEMENTS

CONSISTING OF GRADING, BASE, PAVEMENT, SIGNING, AND PAVEMENT MARKINGS

INDEX OF SHEETS

SEE SHEET 2



BEGIN TRANSITION
CL US82TRAIL STA 902+26.44
CL US82TRAIL_T STA 2902+25.00

BEGIN PROJECT
STA: 903+40.00
BEGIN CSJ: 0919-19-087

END PROJECT
STA: 1067+68.90
END CSJ: 0919-19-087

TDLR Inspection Required

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED TDLR NO. TABS2023023391

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSING

SCALE IN MILES 0 0.5 1 2

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOV. 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, JULY 2022).

JMT TBPE REGISTRATION NO. F-16341

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

FINAL PLANS

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED & ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR: _____

CONTRACTOR ADDRESS: _____

LIST OF APPROVED FIELD CHANGES: _____

CONCURRENCE: 7/7/2023
DocuSigned by:
Bobby Howell
4F05F2864C974B4...
BOWIE COUNTY JUDGE

RECOMMENDED FOR LETTING: 7/7/2023
DocuSigned by:
Lori K. Medina, P.E.
3B337C5031074A4...
DISTRICT DIRECTOR OF TRANSPORTATION
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 7/7/2023
DocuSigned by:
Robert Hobbs, P.E.
23686C08B28F4A0...
DISTRICT ENGINEER

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

** THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

JULIUS C.U. SERRANO , P.E. 7/6/2023
NAME DATE

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
3EF5D1603925484...

7/6/2023

* THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

ROBERT J. RAMON , P.E. 7/6/2023
NAME DATE

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

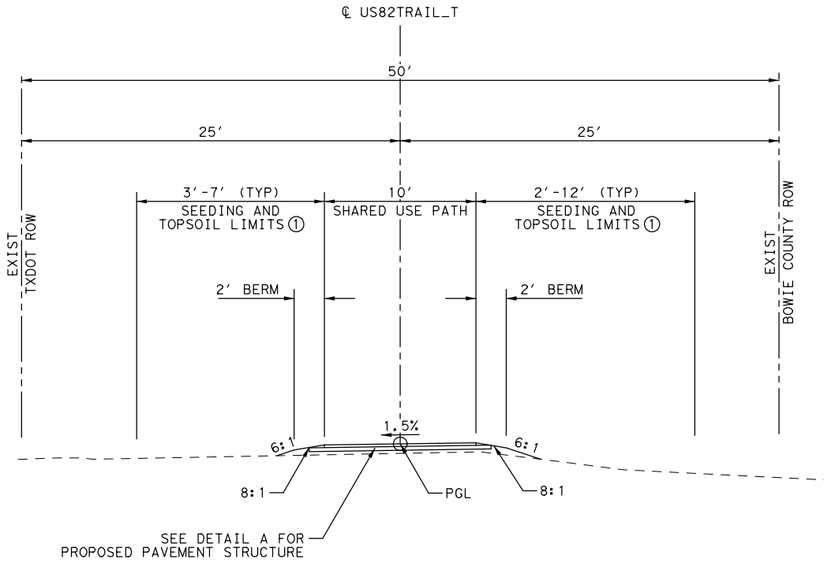
VARIOUS

INDEX OF SHEETS

SHEET 1 OF 1

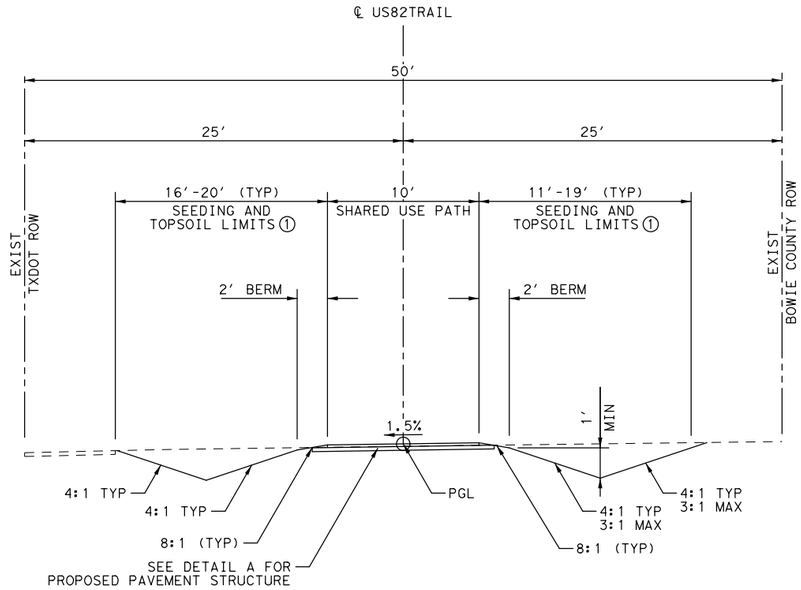
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	2
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\US82T*S*INDX01.dgn



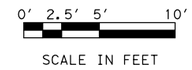
SHARED USE PATH TRANSITION - PROPOSED

STA 2902+25 TO STA 2903+40



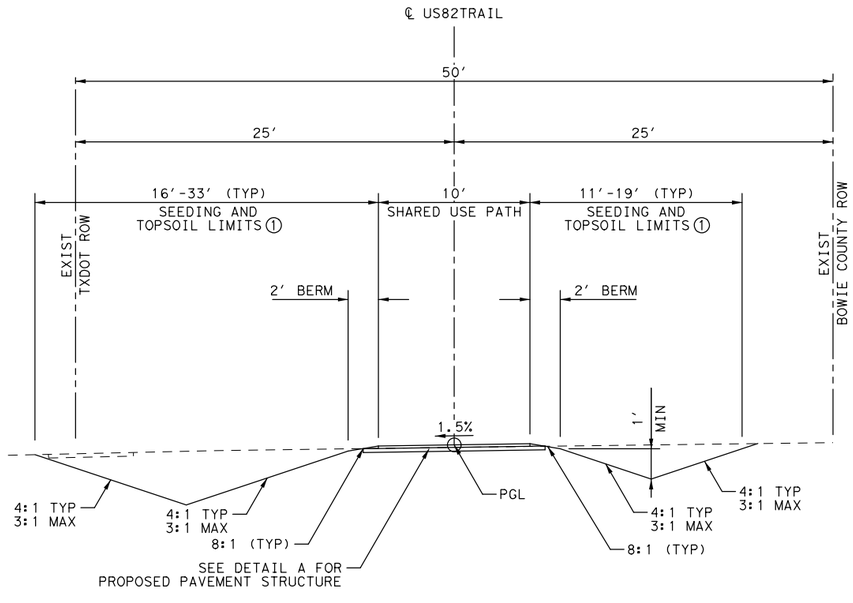
SHARED USE PATH - PROPOSED

STA 903+40 TO STA 915+50



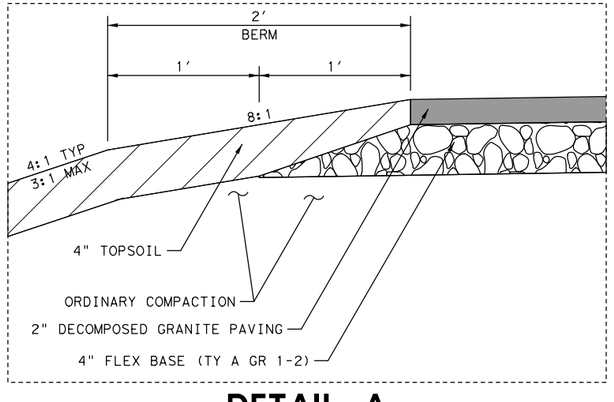
NOTES:

1. EXISTING TOPSOIL TO BE WINROWED AND REPLACED AT FINAL GRADES



SHARED USE PATH - PROPOSED

STA 915+50 TO STA 932+50
STA 969+00 TO STA 974+40
STA 993+20 TO STA 999+50
STA 1020+10 TO STA 1025+00



DETAIL A

PROPOSED PAVEMENT STRUCTURE
NOT TO SCALE

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

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VARIOUS

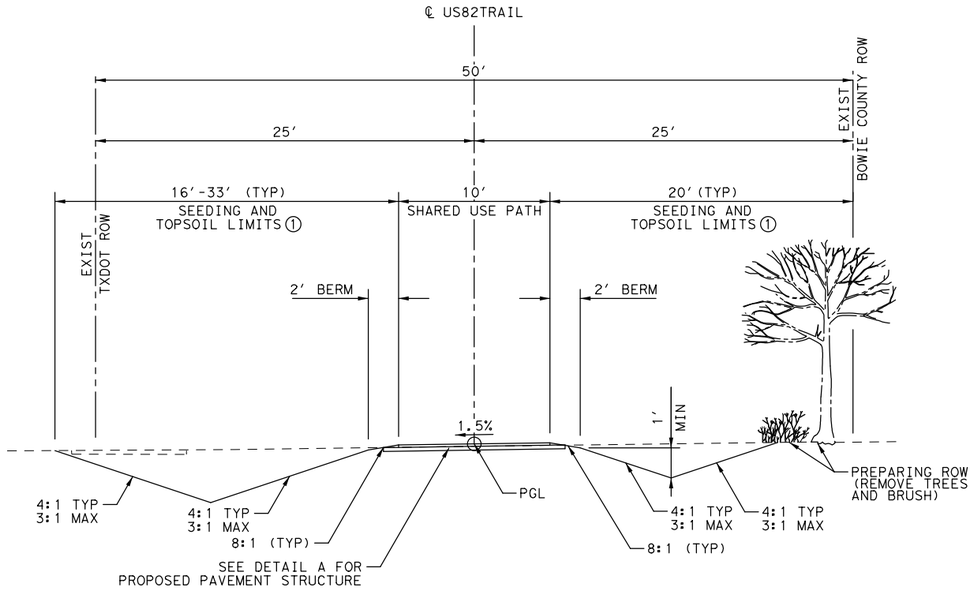
TYPICAL SECTIONS
PROPOSED

SCALE: 1" = 10'

SHEET 1 OF 2

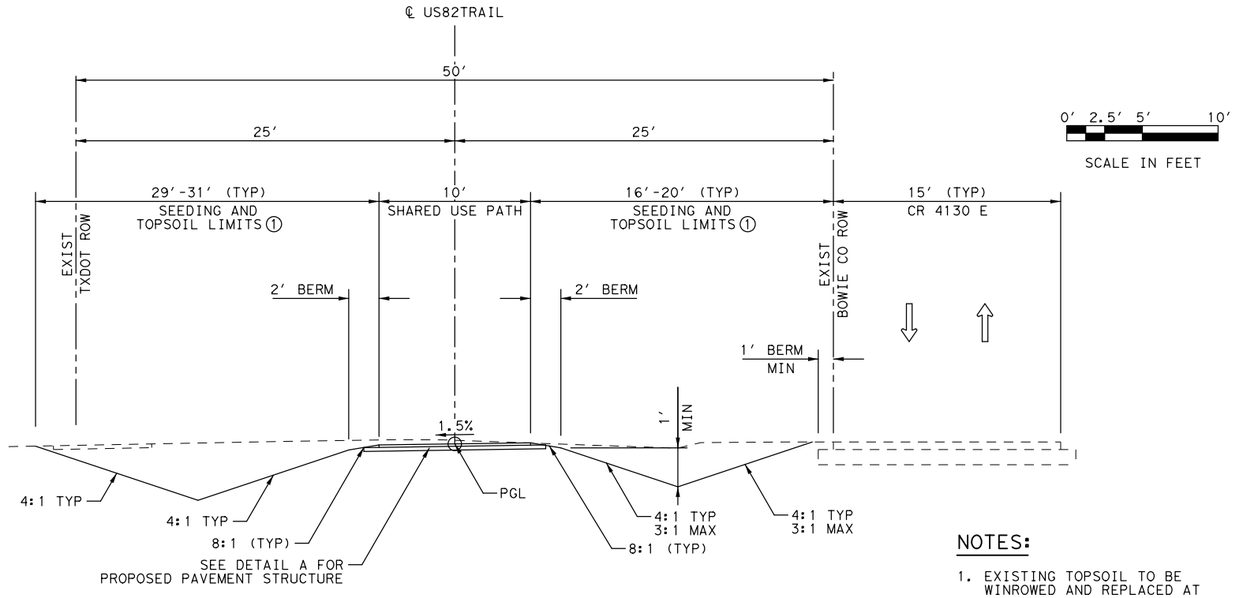
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	3
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\Typicals\US82T*S*TYP01



SHARED USE PATH - PROPOSED

STA 974+40 TO STA 993+20
STA 999+50 TO STA 1020+10

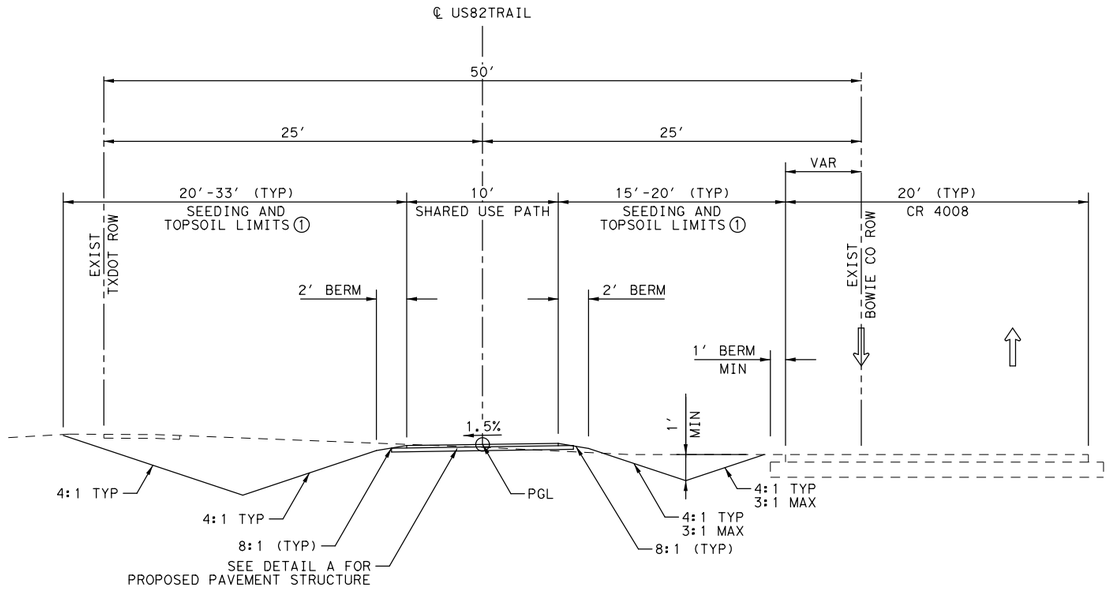


NOTES:

1. EXISTING TOPSOIL TO BE WINROWED AND REPLACED AT FINAL GRADES

SHARED USE PATH - PROPOSED

ADJACENT TO CR 4130 AND PRIVATE DRIVEWAY
STA 932+50 TO STA 969+00 *PREP ROW FROM 941+00 TO 965+40



SHARED USE PATH - PROPOSED

ADJACENT TO CR 4008
STA 1025+00 TO STA 1067+68.90

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

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VARIOUS

TYPICAL SECTIONS
PROPOSED

SCALE: 1" = 10' SHEET 2 OF 2

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	4
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\Typicals\US82T*S*TYP02

GENERAL NOTES:

General Requirements and Covenants:

Contractor questions on this project are to be addressed to the following individuals:

Tommy Bruce – Area Engineer
Tommy.Bruce@Txdot.gov
Dana Moore – Assistant Area Engineer
Dana.Moore@Txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

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

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

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

The project requires TDLR inspection. The design follows PROWAG guidelines for ADA compliance including midblock crossings (R302.6.2) that permits the cross slope to equal the existing cross street and driveway grades.

ITEM 5 – Control of the Work:

Prior to contract letting, bidders may request a free electronic copy of the files that contain the earthwork information from the District Office in Atlanta. If printed copies of the actual cross-sections in addition to, or instead of, the electronic files are requested, prospective bidders may purchase prints of earthwork cross sections from the District Office in Atlanta.

Place construction points, stakes, and marks at intervals of no more than 100 ft., or as directed. Place stakes and marks so as not to interfere with normal maintenance operations.

It is the Contractor's responsibility to verify the accuracy of any department provided control points prior to use.

Control: 0919-09-087
County: Bowie
Highway: VARIOUS

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/business/resources/highway/bridge/bridge-publications.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 Material:

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

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.

When requesting payments for material on hand, contractor's material storage facility will be within the Atlanta District.

Pre-qualified products can be found at http://www.txdot.gov/business/resources/producer-list.html

ITEM 7 – Legal Relations and Responsibilities:

This project is covered by a U.S. Army Corps of Engineers Nationwide 14 permit with no coordination. Obtain a copy of permit and conditions at the Engineer's office.

The total area disturbed for this project is 21.38 acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs) within 1 mile of the project limits will be used to 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 and to the local government that operates a separate storm sewer system.

The Contractor will not remove active nests from bridges and other structures during nesting season of the birds associated with the nests.

Transmit copies of correspondence between Contractor and resource agencies as listed in Article 7.7 "Preservation of Cultural and Natural Resources and the Environment".

The following significant traffic generator events have been identified:

- Run the Rail – Marathon and Half-Marathon is held on the second Saturday of October 2023.

Traffic handling for Run the Rail – Marathon and Half-Marathon will be the responsibility of the event organizer and will require coordination with construction activities.

ITEM 8 – Prosecution and Progress:

Working days will be charged in accordance with Section 8.3.1.4.

Provide progress schedules meeting the requirements of Section 8.5.2 in 2014 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

The Contractor will not have the option of working on the second Saturday of October while the Run the Rail – Marathon and Half-Marathon is underway. No working day will be charged on this day if the principal item of work cannot be started by 11:00 A.M.

ITEM 100 – Preparing Right of Way:

Do not burn trash, debris, etc. within the City limits without prior written city approval.

Preparing Right of Way limits are called out on Shared Use Path Plan & Profile sheets. Preparing Right of Way quantifies length of tree lines to be removed. See Tree Removal and Trimming Details for tree removal requirements. Other removal items are quantified individually.

Remove debris, vegetation, and other landscape features not designated for preservation, whether above or below ground.

Removal of live utility facilities is not included in this Item.

ITEM 110 - Excavation:

Compact subgrade in earth cut sections, in accordance with section 132.3.4.1.

As cut slopes are constructed, round off the tops of back slopes to blend into the natural ground.

Excavation of existing stabilized materials will be measured and paid for as excavation (roadway).

Remove abandoned underground utility lines encountered. This work will be subsidiary to the pertinent bid items.

Flare ditches to prevent erosion of the toe of slope in areas of transition from cut to fill.

ITEM 132 – Embankment:

Furnish material with an organic content less than 1.0%. The Engineer will test using UV-VIS equipment and procedure determined by TxDOT. Allow two weeks for testing.

Compact subgrade in earth cut sections, in accordance with section 132.3.4.1.

Test borrow sources and furnish results to the Engineer.

Remove deleterious material, organic matter, and sediment, etc., from all ponds, lakes, sloughs, channels, and existing roadway ditches prior to placement of embankment. This work will be subsidiary to this item.

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Beginning with the final lift of embankment, measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer's use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

ITEM 160 – Topsoil:

Windrow topsoil from the right of way. Finish slopes with a tracked vehicle running vertically up and down the slope.

Spread topsoil before placement of the surface course. Re-dress topsoil after placement of the surface course.

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 “Roadside Mowing” except for measurement and payment. This work will be subsidiary to pertinent bid items.

Repair topsoil, damaged by causes other than the Contractor’s operations, as directed using topsoil, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

ITEM 162 – Sodding for Erosion Control:

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 “Roadside Mowing” except for measurement and payment. This work will be subsidiary to pertinent bid items.

Repair mulch sod, damaged by causes other than the Contractor’s operations, as directed using mulch sod, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

ITEM 164 – Seeding for Erosion Control:

PERMANENT PLANTING MIXTURE

Species and Rates (lb. PLS/ac.)

(Season: February 1 to May 15)

Green Sprangletop	0.4
Bermudagrass	2.4
Sand Lovegrass	1.0
Lance-Leaf Coreopsis	1.25

(Season: September 1 to November 30)

Bermuda (Unhulled)	12
Crimson Clover	10

TEMPORARY SEEDING FOR EROSION CONTROL

Warm Season (Season: May 15 to August 31)

Bermudagrass	6
Foxtail Millet	34

Cool Season (Season: September 1 to November 30)

Tall Fescue	4.5
Oats	24
Wheat	34

Adjust the seeding mixture and rates if directed.

Inoculate crimson clover seed with a legume inoculant. Sow inoculated seed dry, with either hand operated or mechanical equipment, after the fertilizer is placed.

Do not use Bahia grass.

Use crimper immediately after spreading mulch. Apply ballast to machine to achieve an anchoring depth of 2 to 3 inches to form soil-binding mulch and to prevent loss or bunching of the mulch by wind. Anchor the machine to prevent the formation of ridges and ruts. Use coulters at least ten inches in diameter. Traverse slopes horizontally. The number of passes needed, not to exceed three, will be as directed. In areas where an anchoring machine cannot be used, the Department will require a tacking agent be used in the mulch as directed.

Use broadcast seeding for temporary erosion control, when and as directed. This will not be paid for directly but is subsidiary to the various bid items.

Use additional temporary seeding if permanent seeding is placed outside the optimum growing season shown for this item, if directed.

Finish slopes with a tracked vehicle running vertically up and down the slope.

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 “Roadside Mowing” except for measurement and payment. This work will be subsidiary to pertinent bid items.

Repair topsoil, damaged by causes other than the Contractor’s operations, as directed using topsoil, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

ITEM 166 - Fertilizer:

When seeding between September 1 and January 1, place one-half of the amount of fertilizer specified for seeding with the seeds and place the remainder the following spring unless otherwise directed. When seeding is placed between January 1 and June 1, place one-half the amount of fertilizer specified for seeding with the seeds and place the remainder 30 days later unless otherwise directed.

Apply fertilizer (13-13-13) at a rate of 300 lbs. /5000 sq. yds.

ITEM 247 – Flexible Base:

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Furnish material with an organic content less than 1.0%. The Engineer will test using UV-VIS equipment and procedure determined by TxDOT. Allow two weeks for testing.

The Engineer will test each stockpile. A minimum of 14 days will be required for testing after stockpile has been sampled.

Do not use iron ore.

Measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer's use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

Moist cure the layer by sprinkling in accordance with ITEM 204, "Sprinkling" until primed or the next successive course is placed. The Engineer will measure the moisture content in the upper two inches of the layer using Tex-115E Part I, Nuclear Gauge Method. When the moisture content at any location within a land is more than 2 percent points below optimum the Contractor will prime or cover with the next successive course within three days unless approved otherwise.

Furnish clean 5-gallon plastic buckets with lids and wire handles for sampling, transporting, and shipping aggregate and base to the District Lab.

ITEM 251 – Reworking Base Courses:

Stockpile salvaged base material within Bowie County right-of-way.

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Moist cure the layer by sprinkling in accordance with ITEM 204, "Sprinkling" until primed or the next successive course is placed. The Engineer will measure the moisture content in the upper two inches of the layer using Tex-115E Part I, Nuclear Gauge Method. When the moisture content at any location within a land is more than 2 percent points below optimum the Contractor will prime or cover with the next successive course within three days unless approved otherwise.

ITEM 421 – Hydraulic Cement Concrete:

The Department will furnish and maintain concrete compressive strength testing equipment.

Elevate curing tanks as directed.

The Engineer will determine flow lines of pipes under private driveways.
When a curing tank is provided the following information must be provided. All items must always be clearly legible and visible from all directions.

- Post and maintain the message "Caution Lime Solution, Eye and Skin Irritant".
- Provide a copy of the SDS sheet for the lime in use.
- Provide the personal protective equipment (PPE) listed below for Department use only: Face shield, a pair of chemical gloves at least 18 inches in length and a chemical apron. Store the SDS sheet and PPE in a clean dry location adjacent to the curing tank.
- Provide an eye wash station capable of providing a 15-minute flush as required by the United States Occupational Safety and Health Administration (OSHA). The eye wash station shall be located within ten feet of the curing tank. When a tank heater is required ensure that all electrical wiring, receptacles, and devices meet National Electrical Code and Underwriters Laboratories Inc. requirements.

ITEM 464 – Reinforced Concrete Pipe:

Backfill driveway culverts to obtain a minimum cover of 6 inches. Place backfill in accordance with section 132.3.4.1 "Ordinary Compaction" using approved equipment.

ITEM 467 – Safety End Treatments:

Provide precast safety end treatments with a toewall measuring at least 12 inches. Construct toewalls for cast-in-place safety end treatments as shown in the plans.

Remove trees, bushes, and underbrush as directed. This work will be subsidiary to the pertinent bid items.

ITEM 496 – Removing Structures:

All structures removed under this item become the property of the contractor.

Remove culverts, storm sewers, manholes, and inlets in proper sequence to maintain traffic and drainage.

ITEM 502 – Barricades, Signs, and Traffic Handling:

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.

The Contractor's responsible person (CRP) will be responsible for ensuring that the signs and traffic control devices are in place and functioning properly.

The CRP will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Notify the Engineer in writing of the name, address, and telephone number of this employee or these employees.

Maintenance of driveways and intersections will not be paid for directly but is subsidiary to the pertinent bid items.

Restrict the movement of equipment across traffic lanes to an absolute minimum.

Use strobe lights or rotating beacons on all motorized equipment, operating on or adjacent to the road surface.

No equipment will be left within 30 feet of the travel way. Equipment and/or obstructions within 30 feet of the travel way will be removed.

ITEM 506 – Temporary Erosion, Sedimentation, and Environmental Controls:

Sprinkle water for dust control. Meet the requirements of Item 204, "Sprinkling" except for measurement and payment. Sprinkling will be considered subsidiary to this Item.

ITEM 644 – Sign Identification Decals:

Type A signs will be made of flat aluminum.

Existing sign assemblies will be removed after the proposed sign is installed. Contractor will leave existing sign in place while proposed sign goes up. The existing sign will be removed immediately after the proposed sign is installed.

For this project, the standard triangular slip base two bolt casting will be used. This casting must be furnished from an approved manufacturer.

Erect the proposed signs an appropriate distance from adjacent signs in accordance with the Texas MUTCD, as directed and as shown on the plans.

Verify the elevation difference between the edge of the travel lane and bottom of the sign.

Do not remove existing sign assemblies until signs are ready to be installed on new mounts.

ITEM 6185 –Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA):

The shadow vehicle with truck mounted attenuator (TMA) will not be optional but will be required as shown on the appropriate traffic control plan sheets.

A total of one (1) shadow vehicle with TMA will be required for work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMA's needed for the project.

SPECIFICATION DATA
TEST TO BE IN ACCORDANCE WITH DEPARTMENT OF TRANSPORTATION TEST METHODS

		GRADING REQUIREMENTS PERCENT RETAINED - SIEVES				SOIL CONSTANTS		
						L.L		P.I.
ITEM	DESCRIPTION	2-1/2"	1-3/4"	No. 4	No. 40	MAX.	MAX.	MIN.
132	Embankment (Type C)					50	25	4

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0919-19-087 **DISTRICT** Atlanta **COUNTY** Bowie
HIGHWAY Various

			CONTROL SECTION JOB		**0919-19-087**		**0919-19-094**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00186019**		**R00013260**			
			COUNTY		**Bowie**					
			HIGHWAY		**Various**					
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	63.800				63.800	
	100-6004	PREPARING ROW(TREE)(12" TO 24" DIA)		EA	4.000				4.000	
	105-6011	REMOVING STAB BASE AND ASPH PAV (2"-6")		SY	106.000				106.000	
	110-6001	EXCAVATION (ROADWAY)		CY	16,981.000				16,981.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)		CY	3,364.000				3,364.000	
	160-6001	FURNISHING AND PLACING TOPSOIL (4")		STA	165.500				165.500	
	162-6002	BLOCK SODDING		SY	137.000				137.000	
	164-6054	BOND FBR MTRX SEED (PERM)(RURAL)(SAND)		SY	68,338.000				68,338.000	
	164-6055	BONDED FBR MTRX SEED (TEMP)(WARM)		SY	34,169.000				34,169.000	
	164-6056	BONDED FBR MTRX SEED (TEMP)(COOL)		SY	34,169.000				34,169.000	
	168-6001	VEGETATIVE WATERING		MG	1,093.300				1,093.300	
	169-6004	SOIL RETENTION BLANKETS (CL 1) (TY D)		SY	1,614.000				1,614.000	
	247-6041	FL BS (CMP IN PLC)(TYA GR1-2)(FNAL POS)		CY	2,194.000				2,194.000	
	251-6478	REWORK BS MTL (TY B) (9-18") (ORD COMP)		SY	101.000				101.000	
	400-6006	CUT & RESTORING PAV		SY	325.000				325.000	
	401-6001	FLOWABLE BACKFILL		CY	3.000				3.000	
	402-6001	TRENCH EXCAVATION PROTECTION		LF	86.000				86.000	
	420-6010	CL A CONC (PLUG)		EA	2.000				2.000	
	464-6003	RC PIPE (CL III)(18 IN)		LF	436.000				436.000	
	464-6005	RC PIPE (CL III)(24 IN)		LF	468.000				468.000	
	464-6008	RC PIPE (CL III)(36 IN)		LF	48.000				48.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)		EA	1.000				1.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)		EA	10.000				10.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)		EA	8.000				8.000	
	467-6389	SET (TY II) (24 IN) (RCP) (3: 1) (P)		EA	2.000				2.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)		EA	4.000				4.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)		EA	10.000				10.000	
	467-6448	SET (TY II) (36 IN) (RCP) (3: 1) (C)		EA	2.000				2.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)		EA	2.000				2.000	
	496-6006	REMOV STR (HEADWALL)		EA	4.000				4.000	
	496-6007	REMOV STR (PIPE)		LF	238.000				238.000	
	500-6001	MOBILIZATION		LS	1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	12.000				12.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)		LF	258.000				258.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)		LF	18.000				18.000	
	506-6011	ROCK FILTER DAMS (REMOVE)		LF	276.000				276.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)		SY	877.000				877.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0919-19-087 **DISTRICT** Atlanta **COUNTY** Bowie
HIGHWAY Various

				CONTROL SECTION JOB	0919-19-087		0919-19-094		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00186019		R00013260			
				COUNTY	Bowie					
				HIGHWAY	Various					
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY		877.000				877.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF		5,669.000				5,669.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF		5,669.000				5,669.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF		740.000				740.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF		740.000				740.000	
	531-6001	CONC SIDEWALKS (4")	SY		296.000				296.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA		10.000				10.000	
	3099-6001	DECOMPOSED GRANITE PAVING MATERIALS	SY		17,891.000				17,891.000	
	5084-6002	INSTALL REMOVABLE BOLLARD	EA		28.000				28.000	
	6185-6002	TMA (STATIONARY)	DAY		185.000				185.000	
	7332-6001	MOBILIZATION	LS				1.000		1.000	
	7332-6002	1 1/2" C901 DR 9 POLYETHELENE TUBING	LF				115.000		115.000	
	7332-6008	8" C900 DR 18 PVC	LF				653.000		653.000	
	7332-6009	8" RJ C900 DR 18 PVC	LF				340.000		340.000	
	7332-6014	CONCRETE ENCASEMENT OF PIPE	LF				234.000		234.000	
	7332-6015	6" TAPPING SLEEVE AND VALVE	LF				1.000		1.000	
	7332-6018	5 1/4" FLUSH ASSY WITH VALVE & FITTINGS	LF				1.000		1.000	
	7332-6019	TESTING/FLUSHING LOCATION	EA				0.780		0.780	
	7332-6020	DUCTILE IRON FITTINGS	TON				1.000		1.000	
	7332-6021	CUST SVCS TRANSFER & METER RELO	EA				1.000		1.000	
	7332-6024	ASPHALT DRIVEWAY REPAIR	LF				1.000		1.000	
	7332-6025	RESEEDING DISTURBED AREAS	LF				234.000		234.000	
	7332-6029	3” RJ SDR 21 CL 200 PVC	LF				236.000		236.000	
	7332-6033	8” DIRECTIONAL DRILL	LF				73.000		73.000	
	7332-6036	6” STEEL ENCASEMENT	LF				220.000		220.000	
	7332-6037	6” DRY BORE	LF				220.000		220.000	
	7332-6042	14” STEEL ENCASEMENT	LF				251.000		251.000	
	7332-6043	14” DRY BORE	LF				249.000		249.000	
	7332-6044	SAND EMBEDMENT	LF				35.100		35.100	
	7332-6046	ABAN EX 6” WATERLINE WITH CELLULAR GRT	LF				1,125.000		1,125.000	
	7332-6048	ABAN EX 2” WATERLINE WITH CELLULAR GRT	LF				75.000		75.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS		1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS		1.000				1.000	

SUMMARY OF EARTHWORK ITEMS			
		110 6001	132 6005
FROM STA	TO STA	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C)
		CY	CY
CSJ 0919-19-087			
902+00.00	903+00.00	7	21
903+00.00	904+00.00		88
904+00.00	905+00.00	17	128
905+00.00	906+00.00	33	49
906+00.00	907+00.00	45	11
907+00.00	908+00.00	60	2
908+00.00	909+00.00	67	2
909+00.00	910+00.00	75	2
910+00.00	911+00.00	71	7
911+00.00	912+00.00	57	7
912+00.00	913+00.00	57	2
913+00.00	914+00.00	59	1
914+00.00	915+00.00	52	1
915+00.00	916+00.00	27	8
916+00.00	917+00.00	29	25
917+00.00	918+00.00	71	18
918+00.00	919+00.00	103	2
919+00.00	920+00.00	99	3
920+00.00	921+00.00	81	4
921+00.00	922+00.00	83	3
922+00.00	923+00.00	92	1
923+00.00	924+00.00	98	0
924+00.00	925+00.00	91	0
925+00.00	926+00.00	80	1
926+00.00	927+00.00	77	1
927+00.00	928+00.00	77	1
928+00.00	929+00.00	78	1
929+00.00	930+00.00	79	1
930+00.00	931+00.00	71	3
931+00.00	932+00.00	66	3
932+00.00	933+00.00	74	3
933+00.00	934+00.00	55	5
934+00.00	935+00.00	28	7
935+00.00	936+00.00	31	11
936+00.00	937+00.00	36	24
937+00.00	938+00.00	43	18
938+00.00	939+00.00	61	1
939+00.00	940+00.00	68	3
940+00.00	941+00.00	55	13
941+00.00	942+00.00	47	15
942+00.00	943+00.00	48	8
943+00.00	944+00.00	59	4
944+00.00	945+00.00	125	1
945+00.00	946+00.00	161	1
946+00.00	947+00.00	140	2
947+00.00	948+00.00	131	6
948+00.00	949+00.00	136	6
949+00.00	950+00.00	146	2
950+00.00	951+00.00	135	9
951+00.00	952+00.00	132	18
952+00.00	953+00.00	158	11
953+00.00	954+00.00	149	3
954+00.00	955+00.00	131	3
955+00.00	956+00.00	75	1
956+00.00	957+00.00	90	0
957+00.00	958+00.00	161	0
958+00.00	959+00.00	155	0
959+00.00	960+00.00	174	0
960+00.00	961+00.00	166	3
961+00.00	962+00.00	119	12
962+00.00	963+00.00	101	19
963+00.00	964+00.00	105	19
964+00.00	965+00.00	122	19
965+00.00	966+00.00	146	18
966+00.00	967+00.00	149	11
967+00.00	968+00.00	124	5
968+00.00	969+00.00	131	2
969+00.00	970+00.00	79	3
970+00.00	971+00.00	73	4
971+00.00	972+00.00	153	2
972+00.00	973+00.00	154	2
973+00.00	974+00.00	138	1
974+00.00	975+00.00	96	18
975+00.00	976+00.00	108	18
976+00.00	977+00.00	184	0
977+00.00	978+00.00	208	0
978+00.00	979+00.00	228	0
979+00.00	980+00.00	270	0
980+00.00	981+00.00	257	0
981+00.00	982+00.00	124	0
982+00.00	983+00.00	78	8
983+00.00	984+00.00	155	17
984+00.00	985+00.00	188	9
985+00.00	986+00.00	177	0
986+00.00	987+00.00	176	0

SUMMARY OF EARTHWORK ITEMS			
		110 6001	132 6005
FROM STA	TO STA	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C)
		CY	CY
CSJ 0919-19-087			
987+00.00	988+00.00	190	0
988+00.00	989+00.00	174	0
989+00.00	990+00.00	138	6
990+00.00	991+00.00	108	59
991+00.00	992+00.00	120	93
992+00.00	993+00.00	139	59
993+00.00	994+00.00	156	44
994+00.00	995+00.00	188	82
995+00.00	996+00.00	157	132
996+00.00	997+00.00	53	100
997+00.00	998+00.00	6	23
998+00.00	999+00.00	19	26
999+00.00	1000+00.00	105	11
1000+00.00	1001+00.00	128	5
1001+00.00	1002+00.00	83	2
1002+00.00	1003+00.00	92	14
1003+00.00	1004+00.00	117	30
1004+00.00	1005+00.00	127	58
1005+00.00	1006+00.00	131	73
1006+00.00	1007+00.00	149	61
1007+00.00	1008+00.00	131	39
1008+00.00	1009+00.00	263	17
1009+00.00	1010+00.00	274	18
1010+00.00	1011+00.00	111	40
1011+00.00	1012+00.00	82	45
1012+00.00	1013+00.00	64	29
1013+00.00	1014+00.00	62	17
1014+00.00	1015+00.00	58	18
1015+00.00	1016+00.00	65	18
1016+00.00	1017+00.00	123	8
1017+00.00	1018+00.00	112	50
1018+00.00	1019+00.00	48	194
1019+00.00	1020+00.00	61	278
1020+00.00	1021+00.00	90	233
1021+00.00	1022+00.00	55	99
1022+00.00	1023+00.00	52	90
1023+00.00	1024+00.00	76	140
1024+00.00	1025+00.00	69	62
1025+00.00	1026+00.00	87	26
1026+00.00	1027+00.00	105	17
1027+00.00	1028+00.00	94	12
1028+00.00	1029+00.00	77	16
1029+00.00	1030+00.00	78	18
1030+00.00	1031+00.00	78	19
1031+00.00	1032+00.00	93	10
1032+00.00	1033+00.00	95	4
1033+00.00	1034+00.00	84	6
1034+00.00	1035+00.00	80	14
1035+00.00	1036+00.00	91	13
1036+00.00	1037+00.00	106	4
1037+00.00	1038+00.00	150	1
1038+00.00	1039+00.00	177	0
1039+00.00	1040+00.00	173	0
1040+00.00	1041+00.00	176	0
1041+00.00	1042+00.00	161	0
1042+00.00	1043+00.00	164	1
1043+00.00	1044+00.00	159	2
1044+00.00	1045+00.00	125	3
1045+00.00	1046+00.00	105	2
1046+00.00	1047+00.00	99	1
1047+00.00	1048+00.00	81	1
1048+00.00	1049+00.00	74	2
1049+00.00	1050+00.00	90	11
1050+00.00	1051+00.00	101	22
1051+00.00	1052+00.00	105	15
1052+00.00	1053+00.00	95	8
1053+00.00	1054+00.00	97	9
1054+00.00	1055+00.00	110	12
1055+00.00	1056+00.00	115	11
1056+00.00	1057+00.00	118	6
1057+00.00	1058+00.00	93	5
1058+00.00	1059+00.00	68	4
1059+00.00	1060+00.00	62	18
1060+00.00	1061+00.00	61	19
1061+00.00	1062+00.00	56	5
1062+00.00	1063+00.00	46	4
1063+00.00	1064+00.00	51	3
1064+00.00	1065+00.00	51	1
1065+00.00	1066+00.00	32	2
1066+00.00	1067+00.00	16	2
1067+00.00	1068+00.00	11	1
CSJ 0919-19-087		16981	3364
PROJECT TOTALS		16981	3364

TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SUMMARY OF EARTHWORK QUANTITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	7
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

SUMMARY OF SHARED USE PATH ITEMS

SHT NO.	STATION LIMITS	100 6002 PREPARING ROW	100 6004 PREPARING ROW (TREE) (12" TO 24" DIA)	105 6011 REMOVING STAB BASE AND ASPH PAV (2"-6")	247 6041 FL BS (CMP IN PLC) (TYA GR1-2) (FNAL POS)	251 6478 REWORK BS MTL (TY B) (9-18") (ORD COMP)	400 6006 CUT & RESTORING PAV	401 6001 FLOWABLE BACKFILL	420 6010 CL A CONC (PLUG)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)	531 6001 CONC SIDEWALKS (4")	644 6060 IN SM RD SN SUP&AM TYTWT (1)WS (P)	3099 6001 DECOMPOSED GRAVITE PAVING MATERIALS	5084 6002 INSTALL REMOVABLE BOLLARD
		STA	EA	SY	CY	SY	SY	CY	EA	EA	LF	SY	EA	SY	EA
CSJ 0919-19-087															
TRANSITION P&P	2902+25 TO 2903+40				16									130	
P&P SHT 1 OF 30	903+00 TO 909+00				67			3	2		26	44	2	551	4
P&P SHT 2 OF 30	909+00 TO 914+50				75									611	
P&P SHT 3 OF 30	914+50 TO 920+00				67							31	2	552	4
P&P SHT 4 OF 30	920+00 TO 925+50				75									611	
P&P SHT 5 OF 30	925+50 TO 931+00				75									611	
P&P SHT 6 OF 30	931+00 TO 936+50				65		59					56	2	529	4
P&P SHT 7 OF 30	936+50 TO 942+00	1.0			75						33			611	
P&P SHT 8 OF 30	942+00 TO 947+50	5.5			75									611	
P&P SHT 9 OF 30	947+50 TO 953+00	5.5			75									611	
P&P SHT 10 OF 30	953+00 TO 958+50	5.5			64		70					56	2	527	4
P&P SHT 11 OF 30	958+50 TO 964+00	5.5			75									611	
P&P SHT 12 OF 30	964+00 TO 969+00	1.4			68									556	
P&P SHT 13 OF 30	969+00 TO 975+00	0.6			72		106					39		587	4
P&P SHT 14 OF 30	975+00 TO 980+50	5.5			75									611	
P&P SHT 15 OF 30	980+50 TO 986+00	5.5			69		36					32		561	4
P&P SHT 16 OF 30	986+00 TO 991+50	5.5			75									611	
P&P SHT 17 OF 30	991+50 TO 997+00	1.7			75									611	
P&P SHT 18 OF 30	997+00 TO 1002+50	3.0			75									611	
P&P SHT 19 OF 30	1002+50 TO 1008+00	5.5			75									611	
P&P SHT 20 OF 30	1008+00 TO 1013+50	5.5			75									611	
P&P SHT 21 OF 30	1013+50 TO 1019+00	5.5		106	75					2	67			611	
P&P SHT 22 OF 30	1019+00 TO 1024+50	1.1			67		54			2	85	38	2	546	4
P&P SHT 23 OF 30	1024+50 TO 1030+00				75									611	
P&P SHT 24 OF 30	1030+00 TO 1035+50		2		75									611	
P&P SHT 25 OF 30	1035+50 TO 1041+00				75									611	
P&P SHT 26 OF 30	1041+00 TO 1046+50		1		75									611	
P&P SHT 27 OF 30	1046+50 TO 1052+00				75									611	
P&P SHT 28 OF 30	1052+00 TO 1057+50				75									611	
P&P SHT 29 OF 30	1057+50 TO 1063+00				75									611	
P&P SHT 30 OF 30	1063+00 TO END				64									521	
DRIVEWAY GRADING DETAIL			1			101					27				
CSJ 0919-19-087 TOTALS		63.8	4	106	2194	101	325	3	2	4	238	296	10	17891	28
PROJECT TOTALS		63.8	4	106	2194	101	325	3	2	4	238	296	10	17891	28

SUMMARY OF TCP ITEMS

SHEET NO.	STATION LIMITS	6185 6002 TMA (STATIONARY)
		DAY
SHARED USE PATH TCP		
CSJ 0919-19-087 TOTALS		185
PROJECT TOTALS		185

TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SUMMARY OF SHARED USE PATH QUANTITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	8
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/7/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\Quantities\US82T*SUM*SUP01.dgn

		SUMMARY OF DRAINAGE ITEMS											
		402 6001	464 6003	464 6005	464 6008	466 6097	467 6358	467 6363	467 6389	467 6390	467 6395	467 6448	467 6450
		TRENCH EXCAVATION PROTECTION	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	HEADWALL (CH - PW - 0) (DIA= 24 IN)	SET (TY II) (18 IN) (RCP) (4: 1) (C)	SET (TY II) (18 IN) (RCP) (6: 1) (P)	SET (TY II) (24 IN) (RCP) (3: 1) (P)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	SET (TY II) (24 IN) (RCP) (6: 1) (P)	SET (TY II) (36 IN) (RCP) (3: 1) (C)	SET (TY II) (36 IN) (RCP) (4: 1) (C)
		LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA
CROSS CULVERTS													
CULVERT SUMMARY TABLE													
CSJ 0919-19-087			108	66	48	1	10			4		2	2
PARALLEL CULVERTS													
CULVERT SUMMARY TABLE													
CSJ 0919-19-087		86	328	402				8	2		10		
CSJ 0919-19-087 TOTALS		86	436	468	48	1	10	8	2	4	10	2	2
PROJECT TOTALS		86	436	468	48	1	10	8	2	4	10	2	2

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\Quantities\US82T*SUM*DRN01.dgn

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	9
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

SUMMARY OF EROSION CONTROL ITEMS

SHEET NO.	STATION LIMITS	160 6001 FURNISHING AND PLACING TOPSOIL (4")	162 6002 BLOCK SODDING	164 6054 BOND FBR MTRX SEED (PERM) (RURAL) (SAND)	164 6055 BONDED FBR MTRX SEED (TEMP) (WARM)	164 6056 BONDED FBR MTRX SEED (TEMP) (COOL)	166 FERTILIZER	168 6001 VEGETATIVE WATERING	169 6004 SOIL RETENTION BLANKETS (CL 1) (TY D)	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6003 ROCK FILTER DAMS (INSTALL) (TY 3)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1)	506 6024 CONSTRUCTION EXITS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)	506 6041 BIODEG EROSN CONT LOGS (INSTL) (12")	506 6043 BIODEG EROSN CONT LOGS (REMOVE)
		STA	SY	SY	SY	SY	TON	MG	SY	LF	LF	LF	SY	SY	LF	LF	LF	LF
CSJ 0919-19-087																		
ECP SHT 1 OF 16	902+25 TO 909+00	6.8	6	1852	926	926	0.06	29.6		24		24	111	111	706	706	68	68
ECP SHT 2 OF 16	909+00 TO 920+00	11.0		3052	1526	1526	0.09	48.8							399	399	51	51
ECP SHT 3 OF 16	920+00 TO 931+00	11.0		3246	1623	1623	0.10	51.9							1022	1022		
ECP SHT 4 OF 16	931+00 TO 942+00	11.0	22	3268	1634	1634	0.10	52.3		48		48	222	222	401	401	68	68
ECP SHT 5 OF 16	942+00 TO 953+00	11.0		5430	2715	2715	0.16	86.9										
ECP SHT 6 OF 16	953+00 TO 964+00	11.0	18	5138	2569	2569	0.15	82.2	195	30		30	222	222			34	34
ECP SHT 7 OF 16	964+00 TO 975+00	11.0	18	4842	2421	2421	0.15	77.5		30		30						
ECP SHT 8 OF 16	975+00 TO 986+00	11.0	18	5552	2776	2776	0.17	88.8	420	30		30			167	167	17	17
ECP SHT 9 OF 16	986+00 TO 997+00	11.0		6212	3106	3106	0.19	99.4	236						320	320	81	81
ECP SHT 10 OF 16	997+00 TO 1008+00	11.0		5290	2645	2645	0.16	84.6			18	18			583	583	51	51
ECP SHT 11 OF 16	1008+00 TO 1019+00	11.0	26	5716	2858	2858	0.17	91.5	295	36		36			679	679	102	102
ECP SHT 12 OF 16	1019+00 TO 1030+00	11.0	16	5184	2592	2592	0.16	82.9	299	30		30	222	222	128	128	64	64
ECP SHT 13 OF 16	1030+00 TO 1041+00	11.0		4686	2343	2343	0.14	75.0									68	68
ECP SHT 14 OF 16	1041+00 TO 1052+00	11.0	6	3830	1915	1915	0.11	61.3		18		18			451	451	68	68
ECP SHT 15 OF 16	1052+00 TO 1063+00	11.0	7	3938	1969	1969	0.12	63.0	169	12		12	100	100	483	483	68	68
ECP SHT 16 OF 16	1063+00 TO END	4.7		1102	551	551	0.03	17.6							330	330		
CSJ 0919-19-087 TOTALS		165.5	137	68338	34169	34169	2.06	1093.3	1614	258	18	276	877	877	5669	5669	740	740
PROJECT TOTALS		165.5	137	68338	34169	34169	2.06	1093.3	1614	258	18	276	877	877	5669	5669	740	740

*NOTE 1

NOTES:

1. 13-13-13 FERTILIZER, 300 LB/5,000 SQ YD OF SEED. FOR CONTRACTOR'S INFORMATION ONLY.

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SUMMARY OF EROSION CONTROL QUANTITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	10
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\1. General\Quantities\US82T*SUM*EC01.dgn

PHASE 0 GENERAL NOTES

CONTRACTOR SHALL PROVIDE A SCHEDULE OF CONSTRUCTION ACTIVITIES INCLUDING STAGING OF LOCATIONS AND ANTICIPATED CONSTRUCTION DURATIONS.

THE CONTRACTOR SHALL PLACE EQUIPMENT AND STOCKPILES OUTSIDE OF US 82, FM 3378 AND COUNTY ROAD CLEAR ZONE. PLACE WORK ZONE SIGNING AND CHANNELIZING DEVICES PER TXDOT STANDARD TCP(2-1)-18 FOR INCIDENTAL WORK WITHIN THE CLEAR ZONE.

CONSTRUCTION/TEMPORARY DRAINAGE: THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE IS MAINTAINED THROUGH EACH STEP.

PLACE WORK ZONE SIGNING AND SW3P MEASURES PRIOR TO BEGINNING WORK.

CLOSE NORTHEAST TEXAS TRAIL. PLACE BARRICADE AND "SIDEWALK CLOSED" SIGN (R9-9) 100-FT UPSTREAM AND DOWNSTREAM OF THE PROPOSED WORK. ADVANCE NOTIFICATION OF TRAIL CLOSURES SHALL BE PROVIDED TO THE MAINTAINING AGENCY.

DURING NON-WORK PERIODS EDGE OF PAVEMENT CHANNELIZING DEVICES AND UTILITY WORK AHEAD SIGNS (CW 21-7) SHALL BE IN PLACE.

USE TXDOT STANDARD SHEET TCP (2-1)-18-TCP (2-1A) FOR WORK INSIDE TXDOT ROW.

THE CONTRACTOR SHALL WORK FROM WEST (LINE L) TO EAST (LINE A).

PHASE 1 GENERAL NOTES

CONSTRUCTION PHASING SHALL BE SEGMENTED BEGINNING FROM WEST TO EAST. EACH INDIVIDUAL STEP IS ESTIMATED TO BE COMPLETE WITHIN 90 CALENDAR DAYS AND SHALL TAKE NO LONGER THAN 120 CALENDAR DAYS IN DURATION. CONTACT THE ENGINEER AND AREA OFFICER IF THE CONSTRUCTION TIME FOR ANY SEGMENT IS EXPECTED TO EXCEED 120 CALENDAR DAYS.

ADVANCE NOTIFICATION OF TRAIL CLOSURES SHALL BE PROVIDED TO THE MAINTAINING AGENCY.

THE CONTRACTOR SHALL PLACE EQUIPMENT AND STOCKPILES OUTSIDE OF US 82 CLEAR ZONE (30 FEET FROM EDGE OF TRAVELWAY). PLACE WORK ZONE SIGNING AND CHANNELIZING DEVICES PER TXDOT STANDARD TCP(2-1)-18 FOR INCIDENTAL WORK WITHIN US 82 CLEAR ZONE.

CONSTRUCTION/TEMPORARY DRAINAGE: THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE IS MAINTAINED THROUGH EACH STEP.

PHASE 1 STEP 1

OBJECTIVE: CONSTRUCT SHARED USE PATH FROM STA 902+26.44 TO STA 956+36.

1. CLOSE NORTHEAST TEXAS TRAIL THROUGH THESE LIMITS. PLACE BARRICADE AND "SIDEWALK CLOSED" SIGN (R9-9) AS DIRECTED ON TCP LAYOUT SHEETS. ESTABLISH PROJECT LIMITS BY INSTALLING TRAFFIC CONTROL DEVICES AS PROPOSED ON TCP LAYOUT SHEETS.
2. PLACE EROSION CONTROL DEVICES AS NEEDED IN ACCORDANCE WITH SWP3 LAYOUTS.
3. PLACE WORK ZONE SIGNING AND CHANNELIZING DEVICES AS PER TXDOT BC AND TCP STANDARDS, THE LATEST EDITION OF TEXAS MUTCD AND AS DIRECTED ON TCP LAYOUT SHEETS.
4. MAINTAIN CONTINUOUS ACCESS TO EACH ADJACENT PROPERTY AND SIDE STREETS DURING CONSTRUCTION.
5. INSTALL CONSTRUCTION EXITS AT CR 4105 (NEAR STA 904+00, EAST SIDE ONLY), CR 4104, AND CR 4102 (WEST SIDE ONLY).
6. CONSTRUCT SHARED USE PATH AND ASSOCIATED GRADING. REMOVE AND REPLACE SMALL DIAMETER CROSS CULVERTS. INSTALL DRIVEWAY PIPES.
   a. CONDUCT ONE-LANE TWO-WAY TRAFFIC CONTROL ALONG CR 4130 IN AREA OF CONSTRUCTION ZONE DURING WORK OPERATIONS ACCORDING TO STANDARD TCP(2-2B)-18 AND TCP(ATL-21)-14. CR 4130 WILL BE OPEN TO TWO-WAY TRAFFIC DURING NON-WORKING HOURS.
7. REMOVE TRAFFIC CONTROL AND EROSION CONTROL DEVICES. MAKE SHARED USE PATH AVAILABLE TO PUBLIC THROUGH THESE LIMITS.

PHASE 1 STEP 2

OBJECTIVE: CONSTRUCT SHARED USE PATH FROM STA 956+36 TO STA 1023+00.

1. CLOSE NORTHEAST TEXAS TRAIL THROUGH THESE LIMITS. PLACE BARRICADE AND "SIDEWALK CLOSED" SIGN (R9-9) AS DIRECTED ON TCP LAYOUT SHEETS. ESTABLISH PROJECT LIMITS BY INSTALLING TRAFFIC CONTROL DEVICES AS PROPOSED ON TCP LAYOUT SHEETS.
2. PLACE EROSION CONTROL DEVICES AS NEEDED IN ACCORDANCE WITH SWP3 LAYOUTS.
   a. NOTE PROPOSED PROTECTION AT RED BAYOU WETLAND (NEAR STA 998+00).
3. PLACE WORK ZONE SIGNING AND CHANNELIZING DEVICES AS PER TXDOT BC AND TCP STANDARDS, THE LATEST EDITION OF TEXAS MUTCD AND AS DIRECTED ON TCP LAYOUT SHEETS.
4. MAINTAIN CONTINUOUS ACCESS TO EACH ADJACENT PROPERTY AND SIDE STREETS DURING CONSTRUCTION.
5. INSTALL CONSTRUCTION EXITS AT CR 4102 (EAST SIDE ONLY) AND CR 4007 (WEST SIDE ONLY).
6. CONSTRUCT SHARED USE PATH AND ASSOCIATED GRADING. RE-GRADE DRIVEWAY AT STA 969+50. REMOVE AND REPLACE SMALL DIAMETER CROSS CULVERTS. INSTALL DRIVEWAY PIPES.
7. REMOVE TRAFFIC CONTROL AND EROSION CONTROL DEVICES. MAKE SHARED USE PATH AVAILABLE TO PUBLIC THROUGH THESE LIMITS.

PHASE 1 STEP 3

OBJECTIVE: CONSTRUCT SHARED USE PATH FROM STA 1023+00 TO END PROJECT.

1. CLOSE NORTHEAST TEXAS TRAIL THROUGH THESE LIMITS. PLACE BARRICADE AND "SIDEWALK CLOSED" SIGN (R9-9) AS DIRECTED ON TCP LAYOUT SHEETS. ESTABLISH PROJECT LIMITS BY INSTALLING TRAFFIC CONTROL DEVICES AS PROPOSED ON TCP LAYOUT SHEETS.
2. PLACE EROSION CONTROL DEVICES AS NEEDED IN ACCORDANCE WITH SWP3 LAYOUTS.
3. PLACE WORK ZONE SIGNING AND CHANNELIZING DEVICES AS PER TXDOT BC AND TCP STANDARDS, THE LATEST EDITION OF TEXAS MUTCD AND AS DIRECTED ON TCP LAYOUT SHEETS.
4. MAINTAIN CONTINUOUS ACCESS TO EACH ADJACENT PROPERTY AND SIDE STREETS DURING CONSTRUCTION.
5. INSTALL CONSTRUCTION EXITS AT CR 4007 (EAST SIDE ONLY) AND US 82 AT STA 1059+00.
   a. CONSTRUCTION EXIT ALONG US 82 REQUIRES PLACEMENT OF TRUCKS ENTERING ROADWAY SIGN (CW27-1T). USE TXDOT STANDARD SHEET TCP (1-1)-18 FOR INSTALLATION AND REMOVAL OF CONSTRUCTION EXIT.
6. CONSTRUCT SHARED USE PATH AND ASSOCIATED GRADING. REMOVE AND REPLACE SMALL DIAMETER CROSS CULVERTS. INSTALL DRIVEWAY PIPES.
   a. CONDUCT ONE-LANE TWO-WAY TRAFFIC CONTROL ALONG CR 4008 IN AREA OF CONSTRUCTION ZONE DURING WORK OPERATIONS ACCORDING TO STANDARD TCP(2-2B)-18 AND TCP(ATL-21)-14. CR 4008 WILL BE OPEN TO TWO WAY TRAFFIC DURING NON-WORKING HOURS.

REMOVE TRAFFIC CONTROL AND EROSION CONTROL DEVICES. MAKE SHARED USE PATH AVAILABLE TO PUBLIC THROUGH THESE LIMITS.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

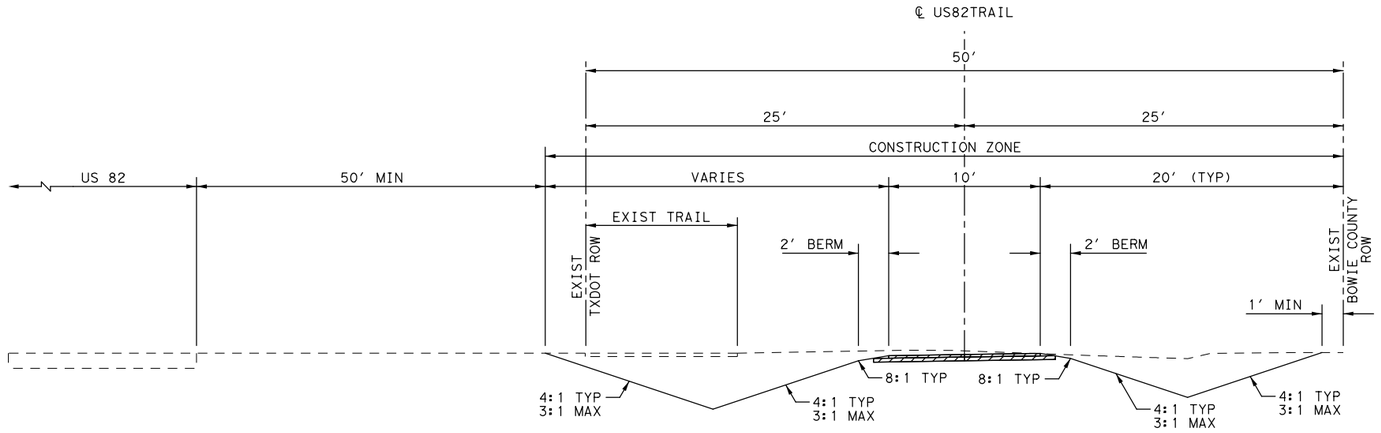
VARIOUS

TCP
CONSTRUCTION SEQUENCE

SHEET 1 OF 1

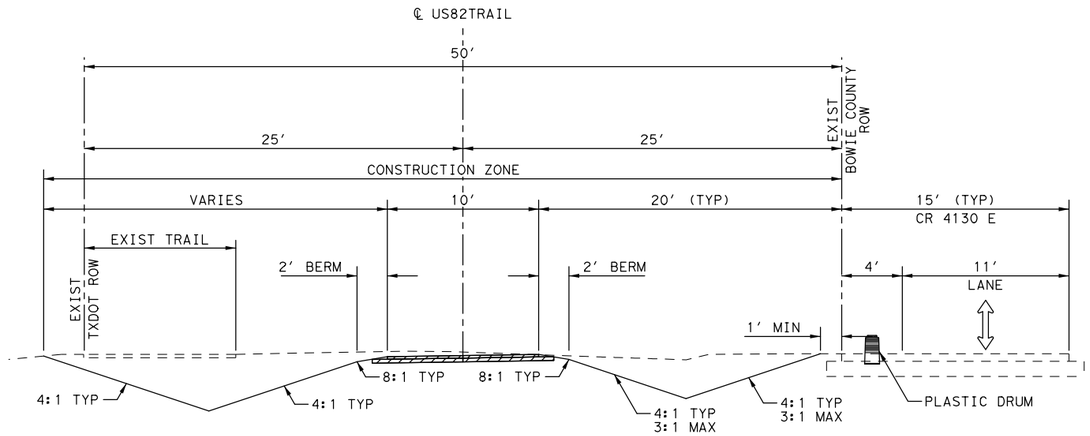
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	11
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Sequence of Construction\US82T*S*SUP*TCP_NAR.dgn



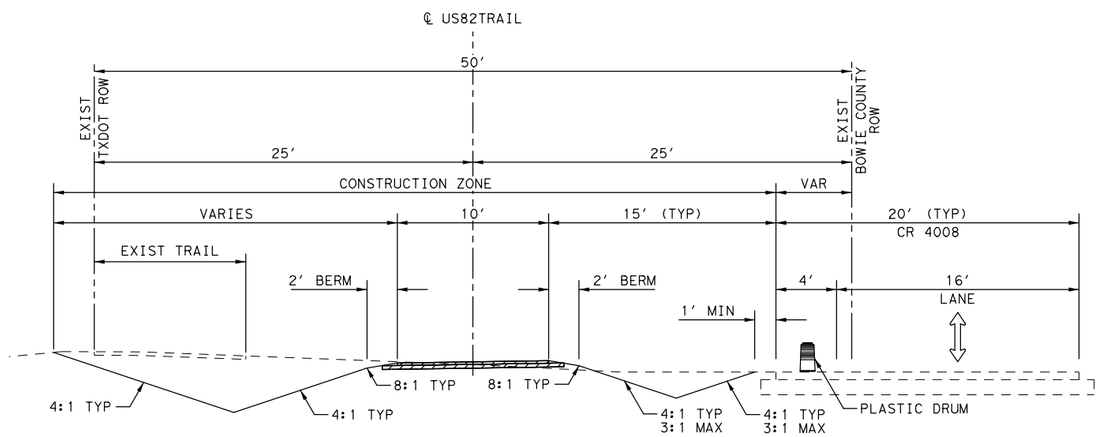
PHASE 1 TCP TYPICAL SECTION

SHARED USE PATH
STA 902+26 TO STA 916+00
STA 969+00 TO STA 1025+00



PHASE 1 TCP TYPICAL SECTION

SHARED USE PATH ADJACENT TO CR 4130 AND PRIVATE DRIVEWAY
STA 916+00 TO STA 969+00



PHASE 1 TCP TYPICAL SECTION

SHARED USE PATH ADJACENT TO CR 4008
STA 1025+00 TO STA 1067+40.93

0′ 2.5′ 5′ 10′

SCALE IN FEET

LEGEND

CONSTRUCTION THIS STEP

NOTES:

1. CONDUCT TWO-WAY ONE-LANE WORK OPERATIONS ACCORDING TO STD TCP (2-2B)-18 THROUGH LIMITS SHOWN ON LAYOUTS. ROADS OPEN TO TWO-WAY TRAFFIC DURING NON-WORKING HOURS.

STATE OF TEXAS
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7/5/2023

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TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

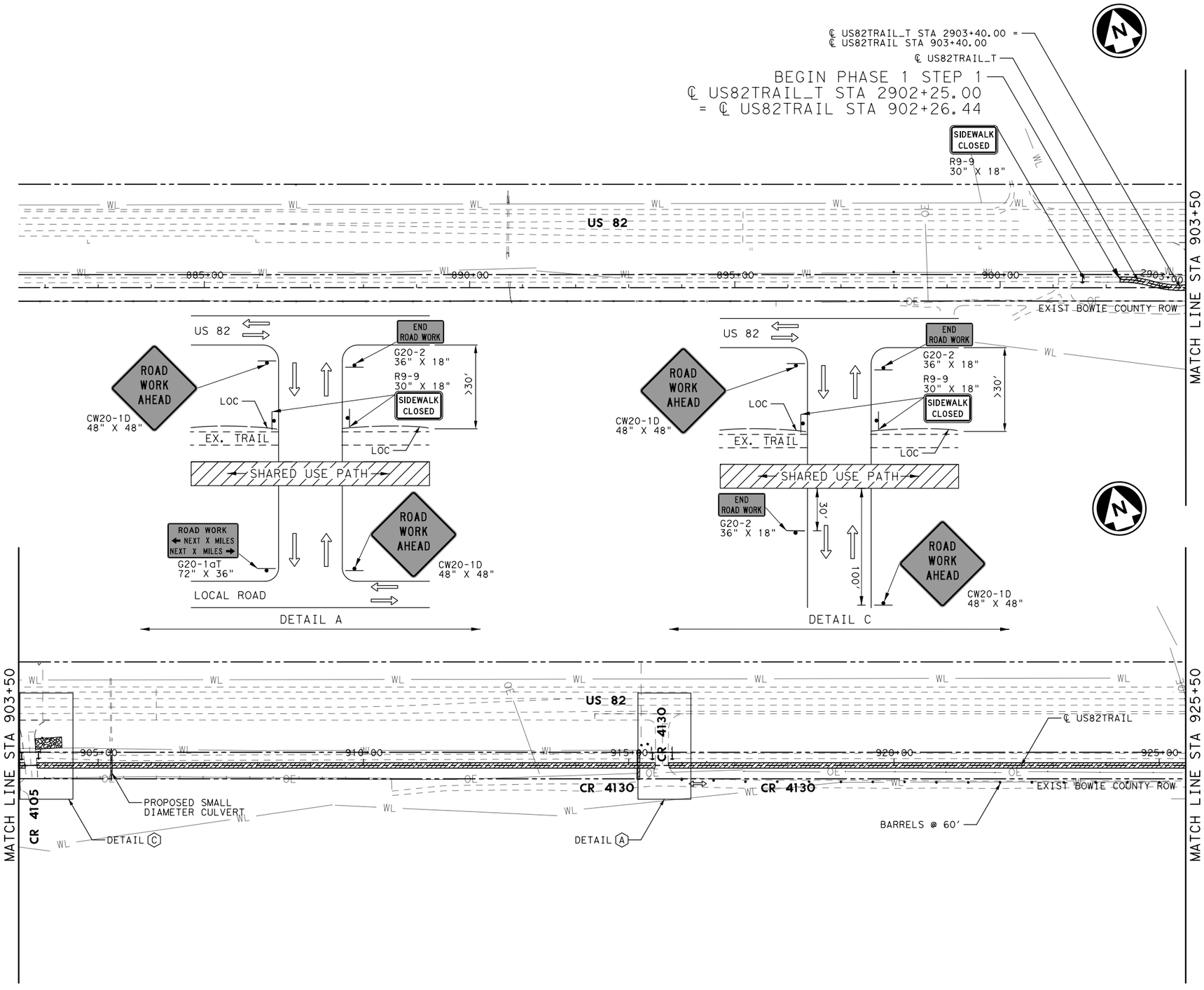
VARIOUS

TCP
TYPICAL SECTIONS

SCALE: 1" = 10′ SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	12
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Typicals\US82T*S*TCP*TYP01.dgn



0′ 100′ 200′

SCALE IN FEET

LEGEND

- CONSTRUCTION THIS STEP
- CONSTRUCTION EXITS THIS STEP
- EXIST DIRECTIONAL ARROW
- BARRICADE
- CHANNELIZING DEVICE
- EXIST NE TEXAS TRAIL

NOTES:

1. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
2. INSTALL SMALL DIAMETER CULVERT, CUT AND RESTORE PAVEMENT. SEE TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS FOR MORE INFORMATION.
3. SEE SWP3 LAYOUT SHEETS FOR PROPOSED TEMPORARY EROSION CONTROL.

STATE OF TEXAS
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PROFESSIONAL ENGINEER

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

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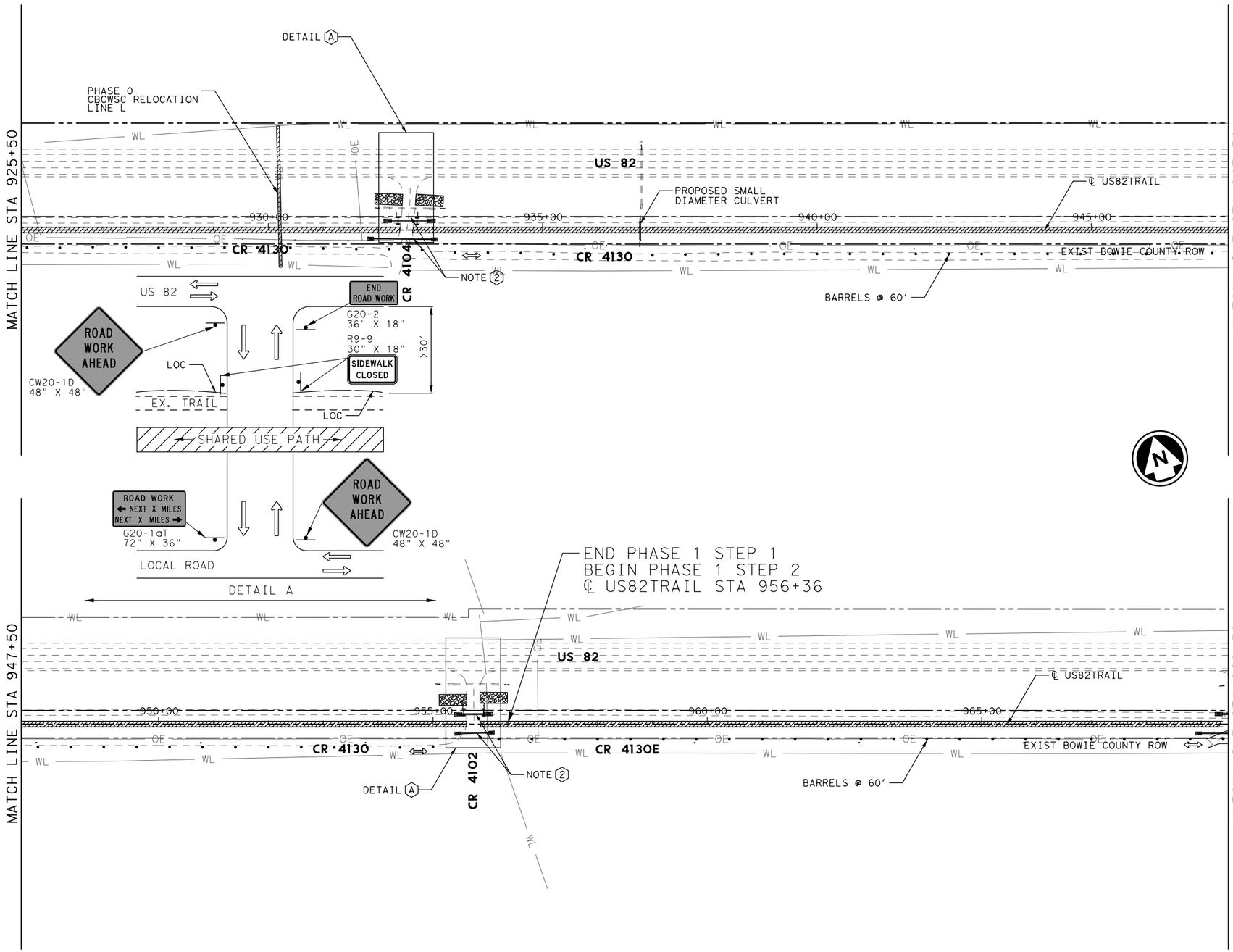
VARIOUS

TRAFFIC CONTROL PLAN LAYOUTS BEGIN TO STA 925+50

SCALE: 1" = 200′ SHEET 1 OF 5

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	13
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Layouts\US82T*S*SUP*TCP*LAY10.dgn



0′ 100′ 200′

SCALE IN FEET

LEGEND

- CONSTRUCTION THIS STEP
- CONSTRUCTION EXITS THIS STEP
- EXIST DIRECTIONAL ARROW
- BARRICADE
- CHANNELIZING DEVICE
- EXIST NE TEXAS TRAIL

NOTES:

1. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
2. INSTALL SMALL DIAMETER CULVERT, CUT AND RESTORE PAVEMENT. SEE TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS FOR MORE INFORMATION.
3. SEE SWP3 LAYOUT SHEETS FOR PROPOSED TEMPORARY EROSION CONTROL.

STATE OF TEXAS
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7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

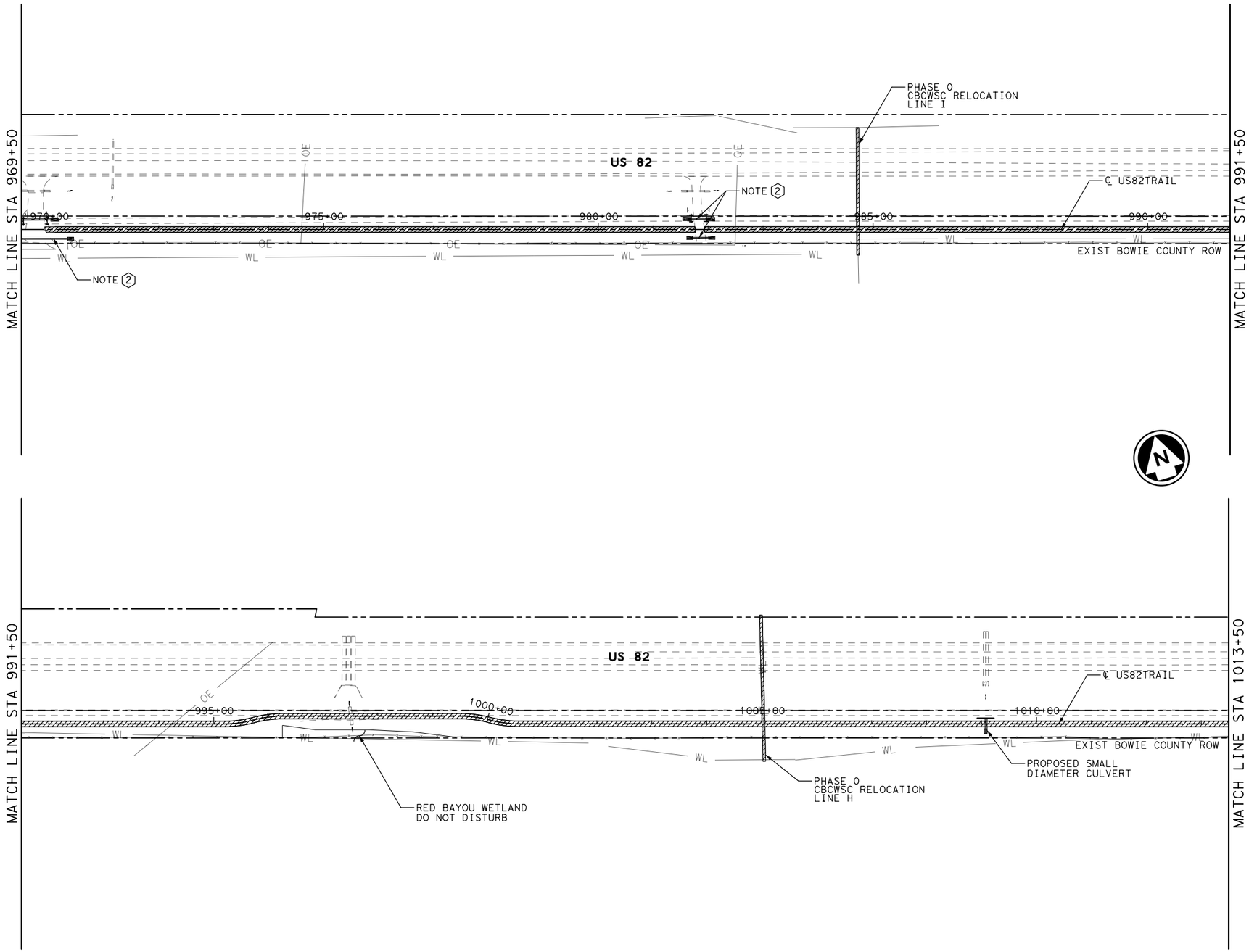
VARIOUS

TRAFFIC CONTROL PLAN LAYOUTS STA 925+50 TO STA 969+50

SCALE: 1" = 200′ SHEET 2 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	14
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Layouts\US82T*S**SUP*TCP*LAY11.dgn



0′ 100′ 200′

SCALE IN FEET

LEGEND

- CONSTRUCTION THIS STEP
- CONSTRUCTION EXITS THIS STEP
- EXIST DIRECTIONAL ARROW
- BARRICADE
- CHANNELIZING DEVICE
- EXIST NE TEXAS TRAIL

NOTES:

1. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
2. INSTALL SMALL DIAMETER CULVERT, CUT AND RESTORE PAVEMENT. SEE TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS FOR MORE INFORMATION.
3. SEE SWP3 LAYOUT SHEETS FOR PROPOSED TEMPORARY EROSION CONTROL.

STATE OF TEXAS
ROBERT J. RAMON
111661
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7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

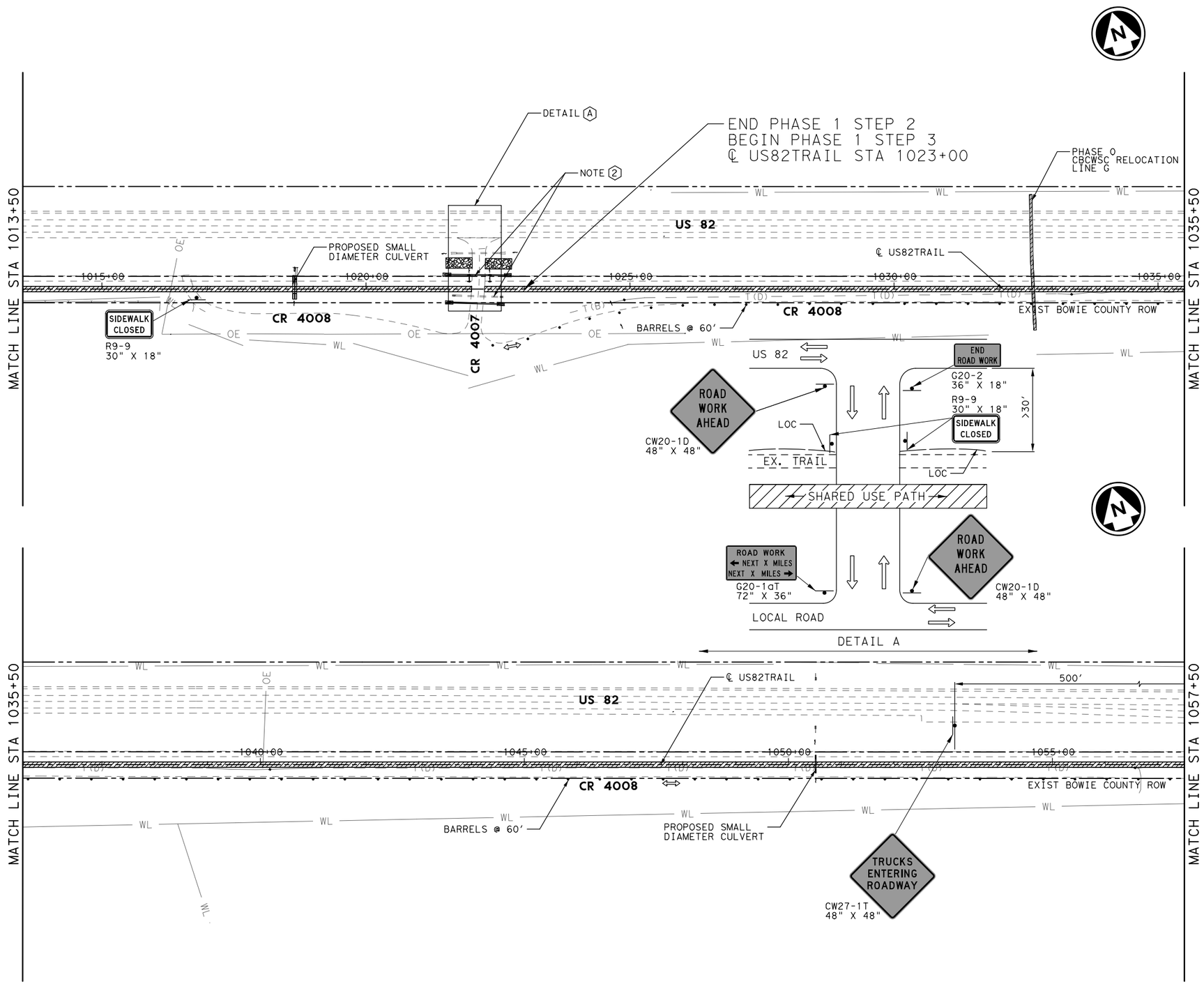
VARIOUS

TRAFFIC CONTROL PLAN
LAYOUTS
STA 969+50 TO STA 1013+50

SCALE: 1" = 200′ SHEET 3 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	15
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Layouts\US82T*S*SUP*TCP*LAY12.dgn



0′ 100′ 200′

SCALE IN FEET

LEGEND

- CONSTRUCTION THIS STEP
- CONSTRUCTION EXITS THIS STEP
- EXIST DIRECTIONAL ARROW
- BARRICADE
- CHANNELIZING DEVICE
- EXIST NE TEXAS TRAIL

NOTES:

1. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
2. INSTALL SMALL DIAMETER CULVERT, CUT AND RESTORE PAVEMENT. SEE TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS FOR MORE INFORMATION.
3. SEE SWP3 LAYOUT SHEETS FOR PROPOSED TEMPORARY EROSION CONTROL.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

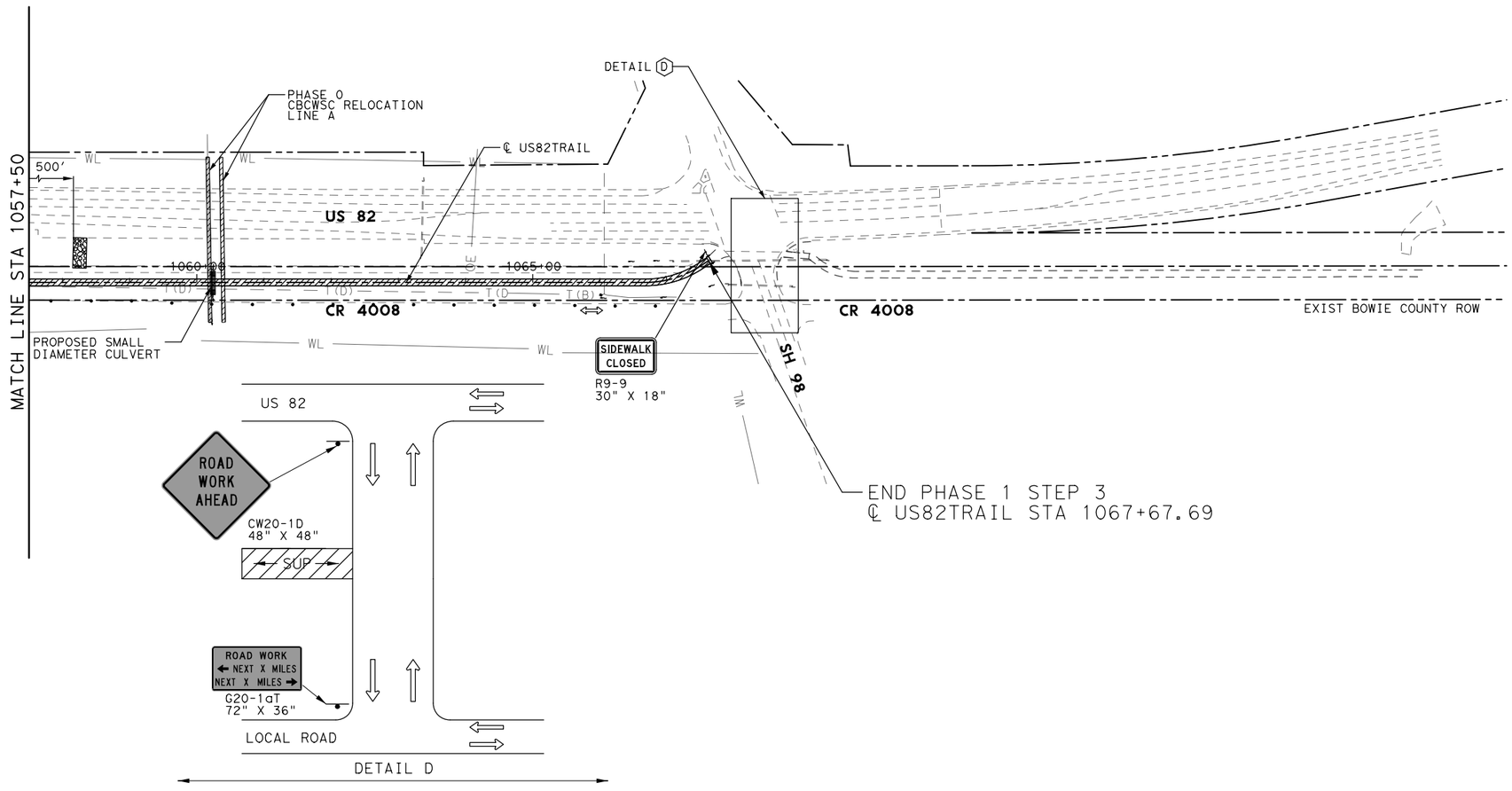
VARIOUS

TRAFFIC CONTROL PLAN LAYOUTS STA 1013+50 TO STA 1057+50

SCALE: 1" = 200′ SHEET 4 OF 5

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	16
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Layouts\US82T*S**SUP*TCP*LAY13.dgn



0′ 100′ 200′

SCALE IN FEET

LEGEND

- CONSTRUCTION THIS STEP
- CONSTRUCTION EXITS THIS STEP
- EXIST DIRECTIONAL ARROW
- BARRICADE
- CHANNELIZING DEVICE
- EXIST NE TEXAS TRAIL

NOTES:

1. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
2. INSTALL SMALL DIAMETER CULVERT, CUT AND RESTORE PAVEMENT. SEE TRAFFIC CONTROL PLAN MISCELLANEOUS DETAILS FOR MORE INFORMATION.
3. SEE SWP3 LAYOUT SHEETS FOR PROPOSED TEMPORARY EROSION CONTROL.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

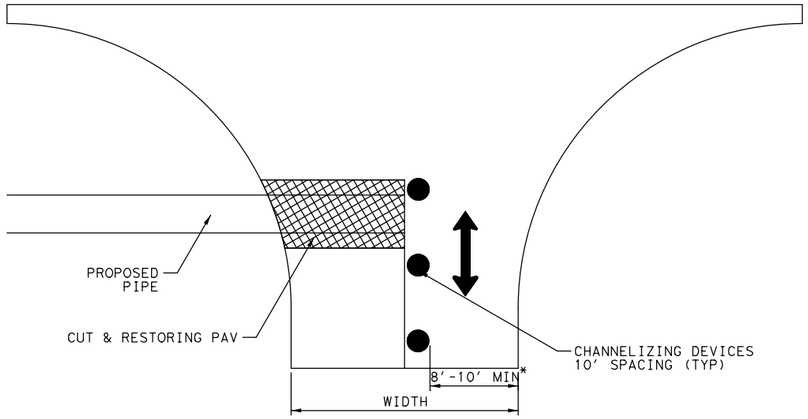
VARIOUS

TRAFFIC CONTROL PLAN LAYOUTS STA 1057+50 TO END

SCALE: 1" = 200′ SHEET 5 OF 5

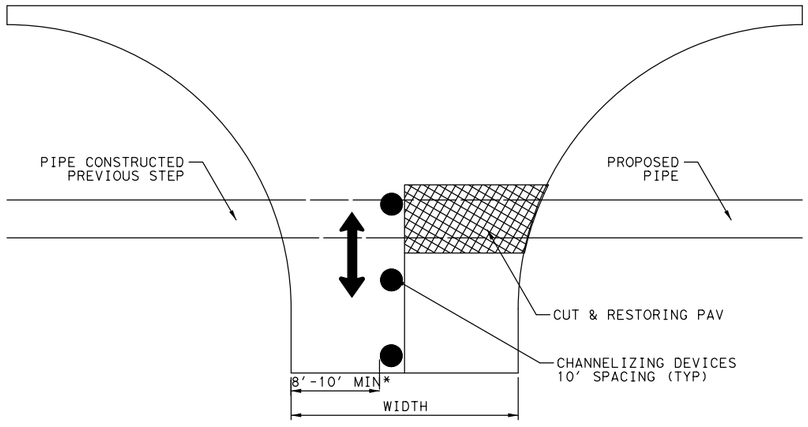
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	17
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\Layouts\US82T*S*SUP*TCP*LAY14.dgn



DRIVEWAYS & CROSS STREETS - STEP 1

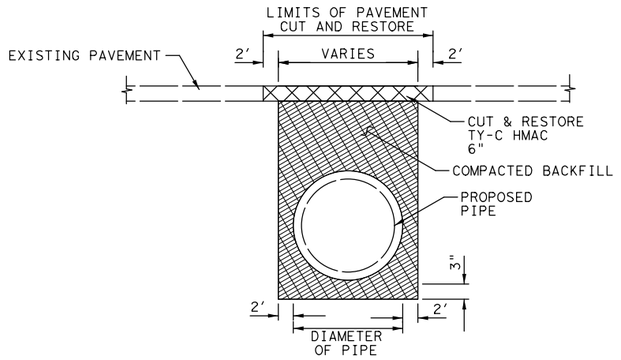
NTS



* SEE NOTE 2

DRIVEWAYS & CROSS STREETS - STEP 2

NTS



CUT & RESTORE DETAIL (CROSS STREETS & DRIVEWAYS)

NTS

NOTES:

1. TY-C HMAC TO BE USED FOR RESTORING PAVEMENT. MATERIAL SUBSIDARY TO CUT & RESTORING PAV ITEM 400.
2. MINIMUM TRAVEL WIDTH FOR CROSS STREETS IS 10'. MINIMUM TRAVEL WIDTH FOR DRIVEWAYS IS 8'.IF DRIVEWAYS ARE LESS THAN 16' WIDE, THE PROPERTY OWNER WILL NEED TO NOTIFIED THAT A DAYTIME CLOSURE OF THE DRIVEWAY WILL BE NECESSARY FOR PIPE INSTALLATION.
3. CONDUCT TWO-WAY ONE-LANE WORK OPERATIONS ACCORDING TO STD TCP(2-2B)-18 AND TCP(ATL-21)-14. ROADS OPEN TO TWO-WAY TRAFFIC DURING NON-WORKING HOURS.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

TCP
MISCELLANEOUS DETAILS
PARALLEL CULVERT PHASING

SCALE: NTS SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	18
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\2. TCP\US82T*S*SUP*DET*TCP01.dgn

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FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Mail to SH 98)\2. TCP\Standards\bc-21.dgn

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

Texas Department of Transportation | Traffic Safety Division Standard

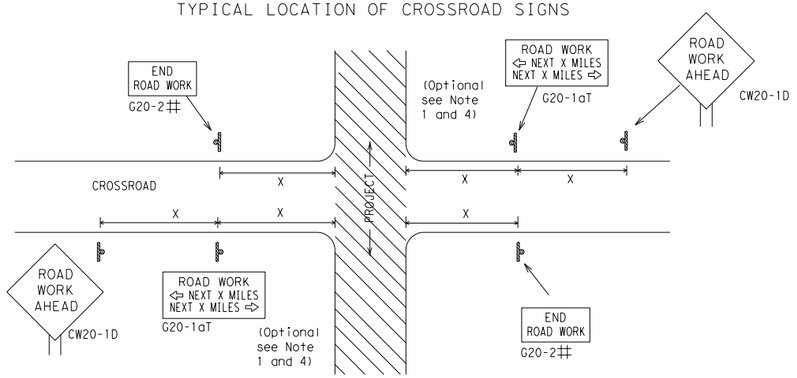
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	ATL	BOWIE		19

DATE: 7/5/2023 5:58:16 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\PlanSet (Main to SH 98)\2. TCP\Standards\bc-21.dgn

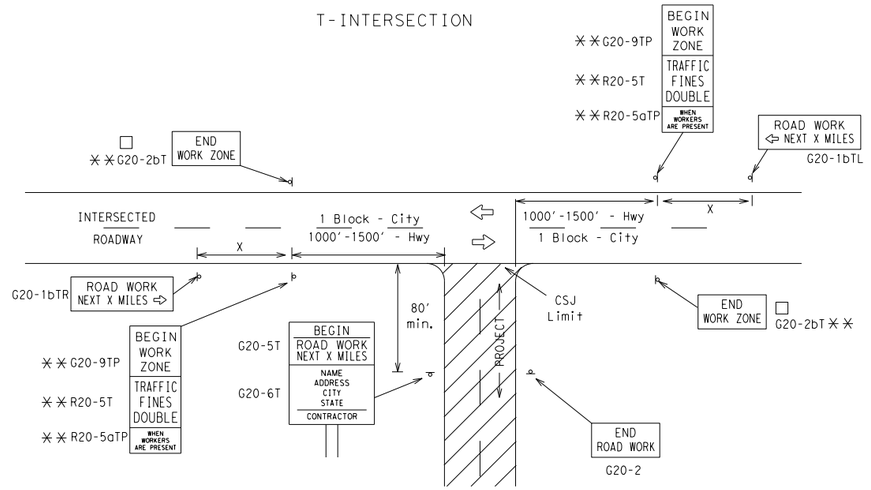
TYPICAL LOCATION OF CROSSROAD SIGNS



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.

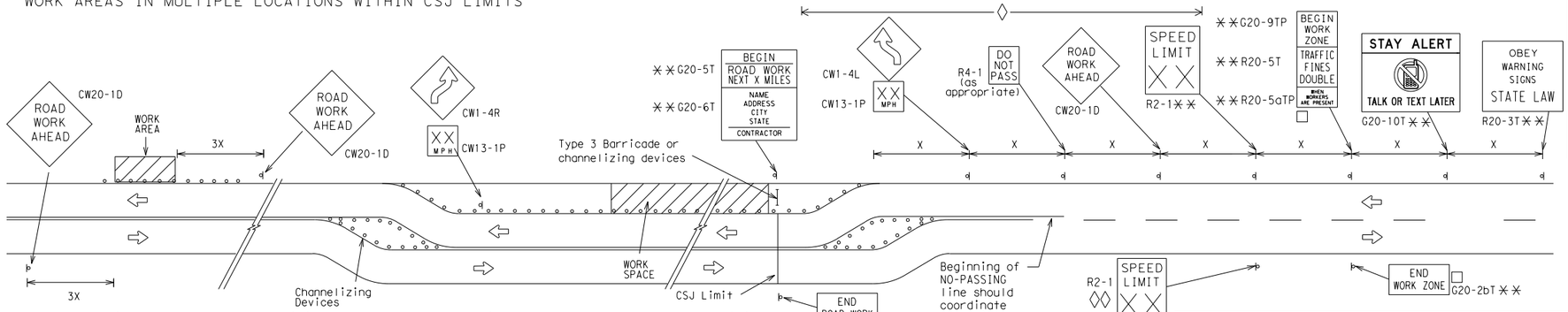
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

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.

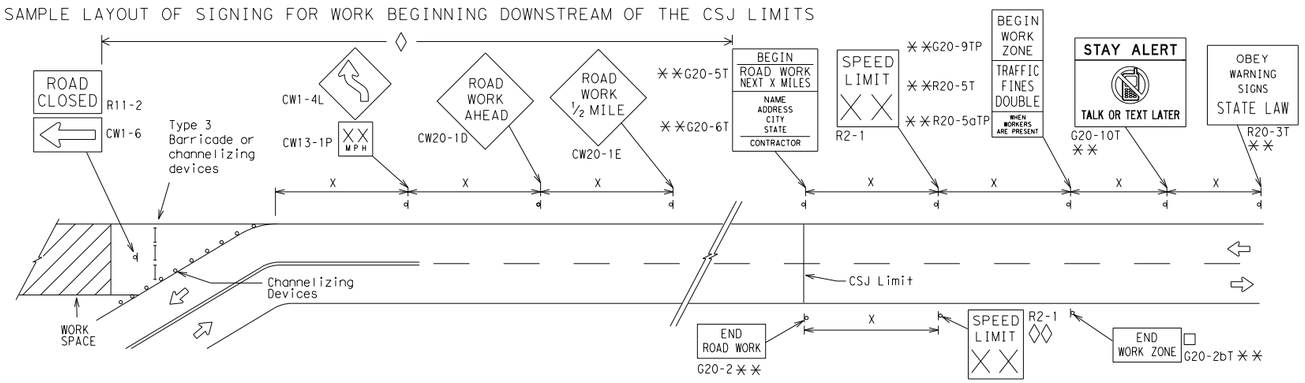
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE 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 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

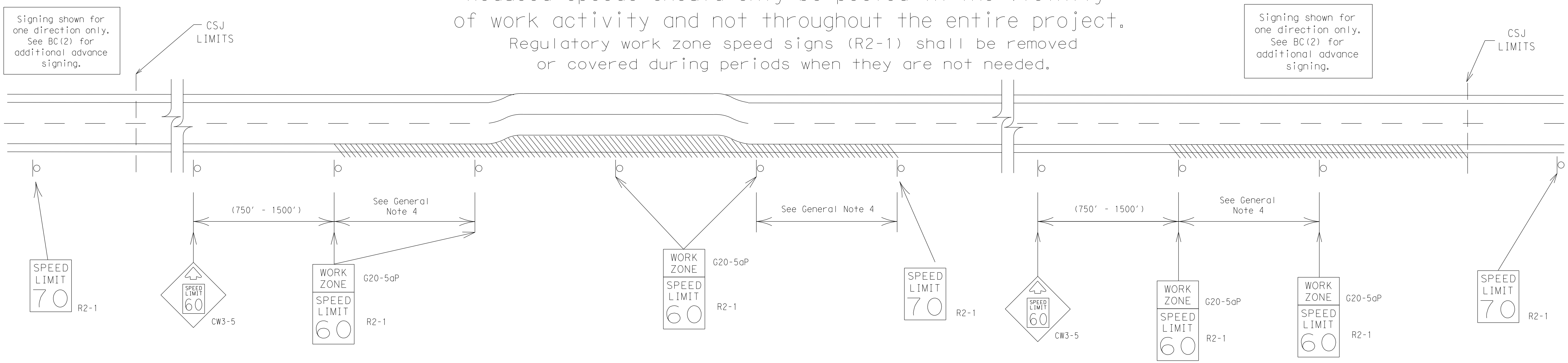
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		20

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

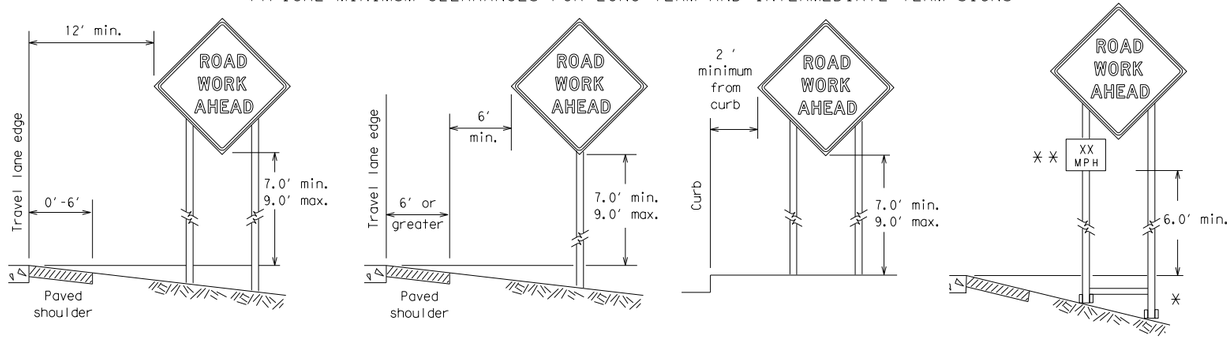
BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0919	19	087	VARIOUS	
9-07 8-14	DIST		COUNTY	SHEET NO.	
7-13 5-21	ATL		BOWIE	21	

97

DATE: 7/5/2023 5:58:18 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Mail to SH 98)\2. TCP\Standards\bc-21.dgn

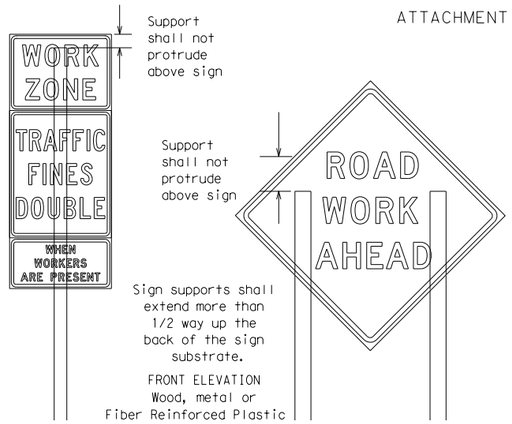
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

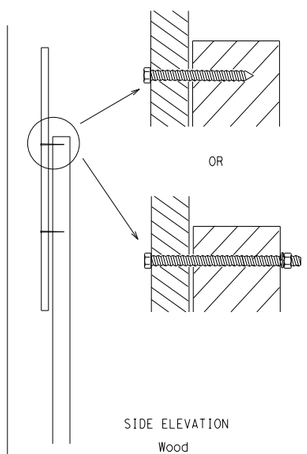


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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





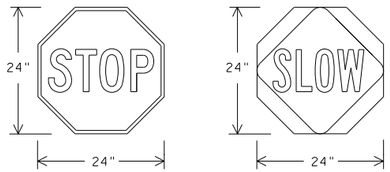
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.



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	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		22

DATE: 7/5/2023 5:58:18 PM
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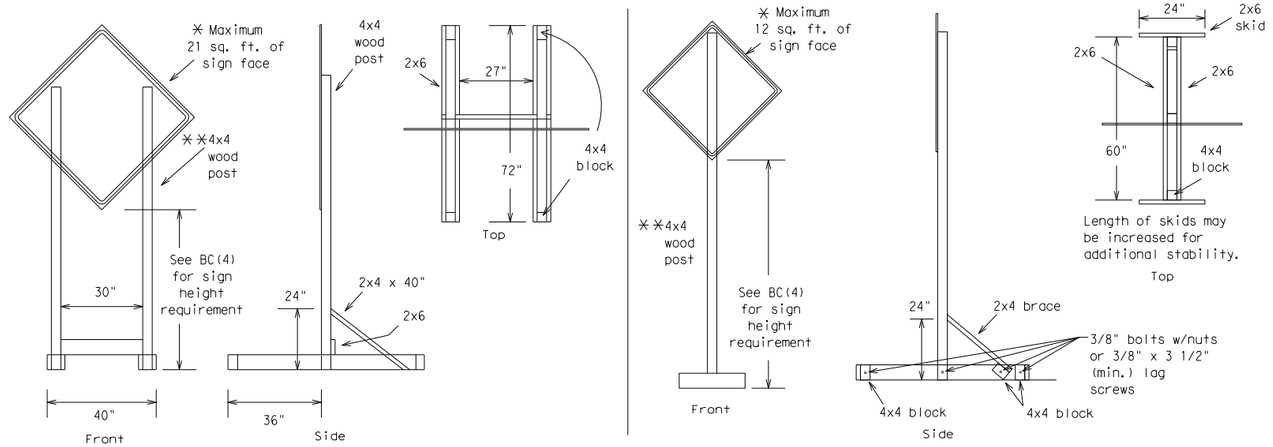
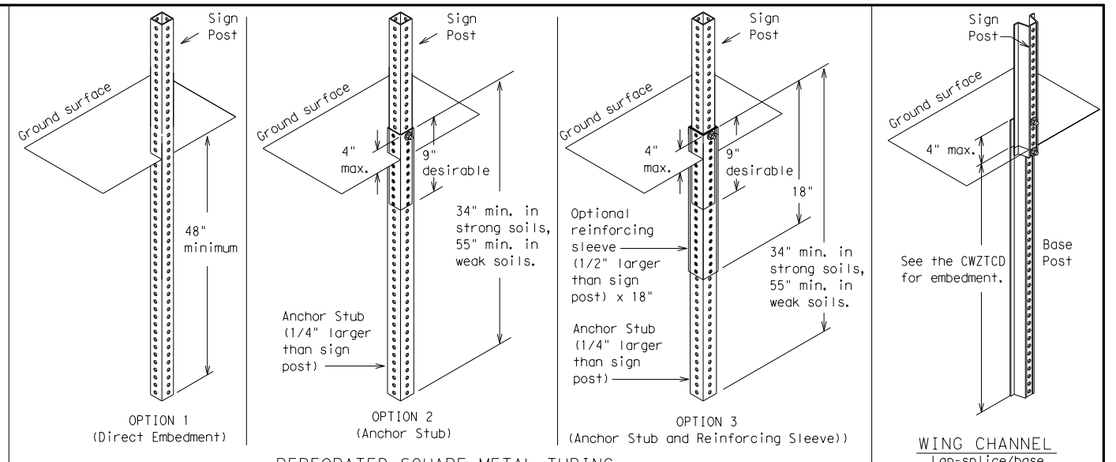


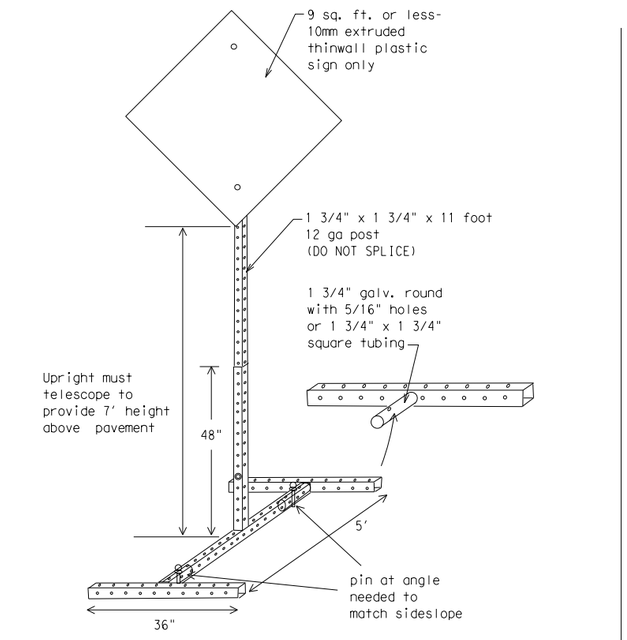
SKID MOUNTED WOOD SIGN SUPPORTS

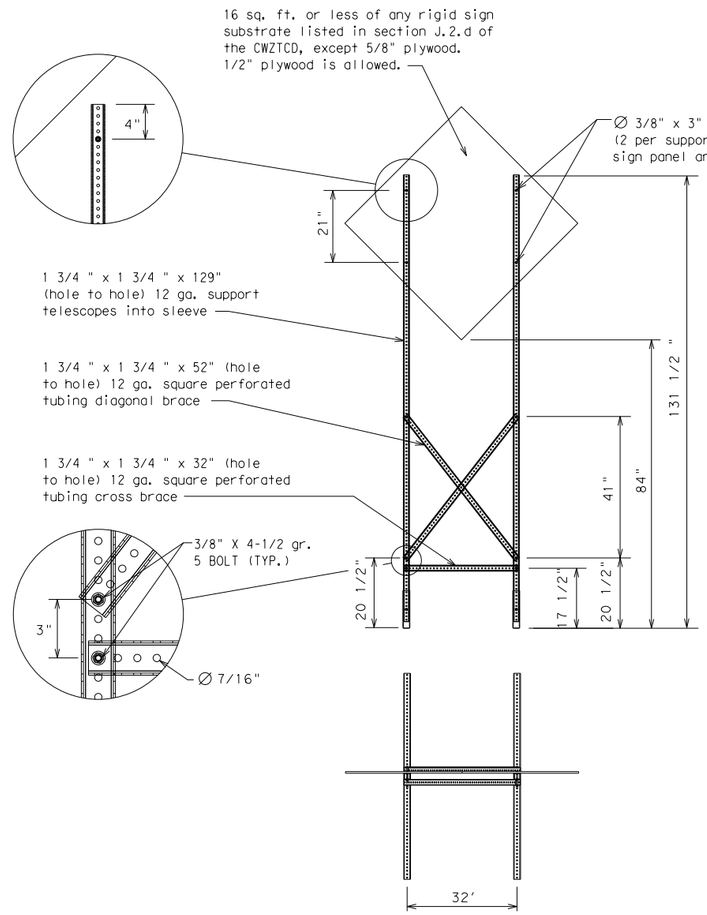
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

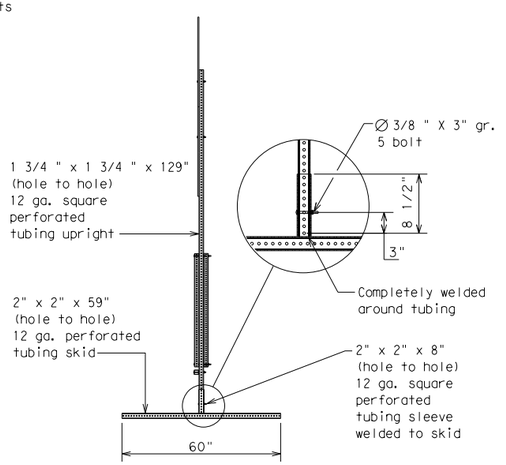


GROUND MOUNTED SIGN SUPPORTS

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.

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	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		23

DATE: 7/5/2023 5:58:19 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Mail to SH 98)\2. TCP\Standards\bc-21.dgn

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	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		24

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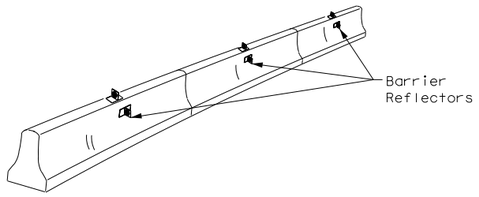
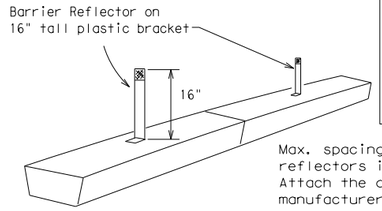
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

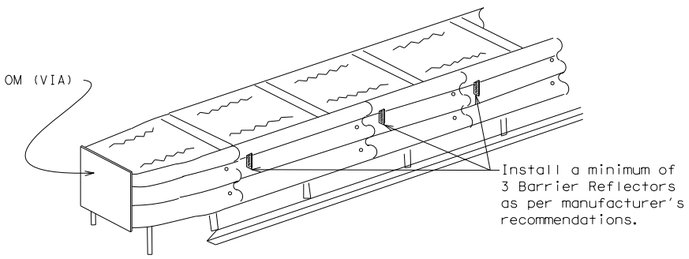


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

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.

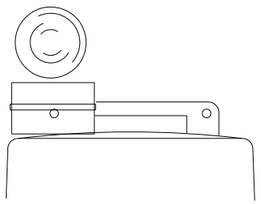


DELINEATION OF END TREATMENTS

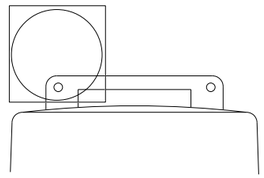
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

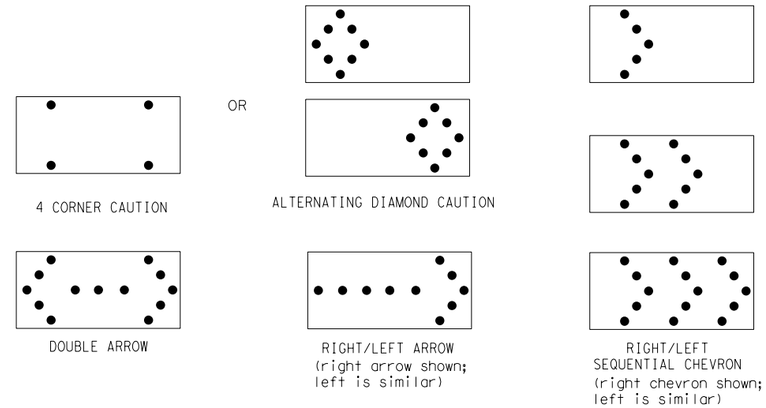
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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:



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

RIGHT/LEFT ARROW
(right arrow shown;
left is similar)

RIGHT/LEFT
SEQUENTIAL CHEVRON
(right chevron shown;
left is similar)

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	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		25

101

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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:

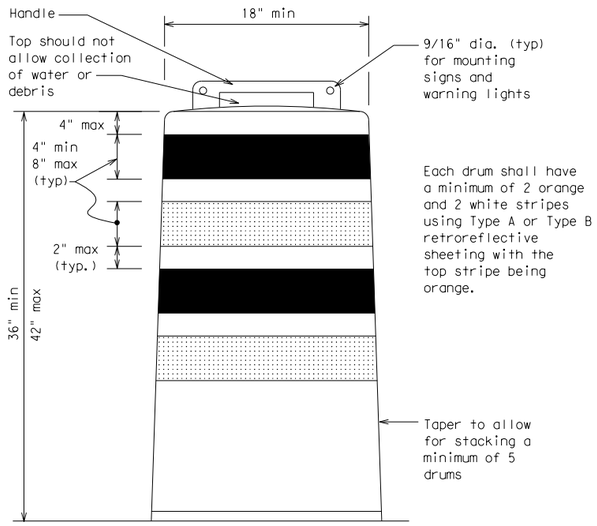
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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.

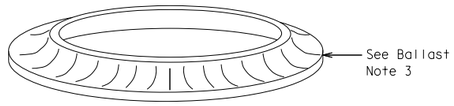
RETROREFLECTIVE SHEETING

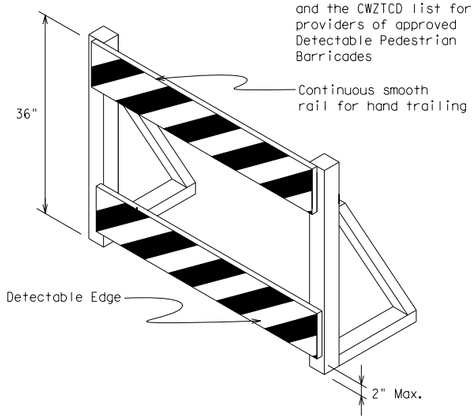
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall 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.

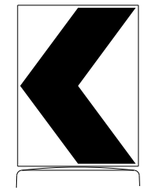




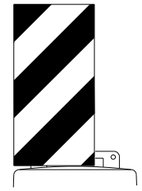


DETECTABLE PEDESTRIAN BARRICADES

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	0919	19	087	VARIOUS
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ATL	BOWIE		26
7-13				

102

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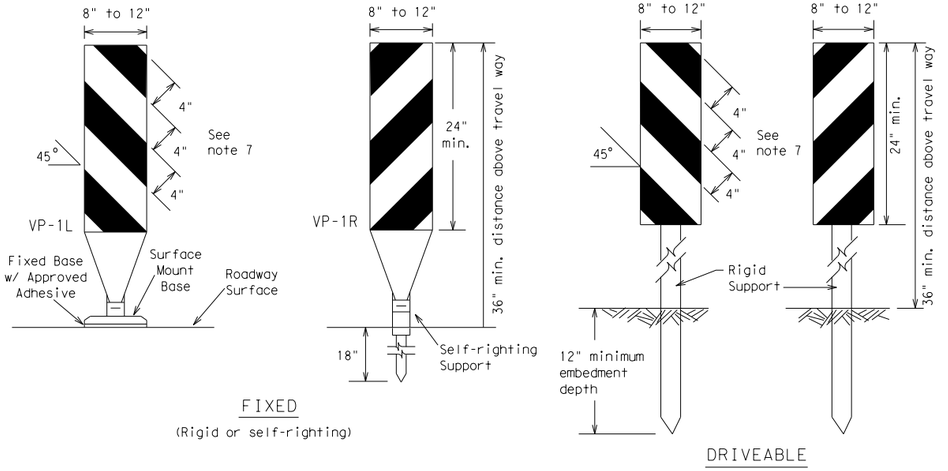
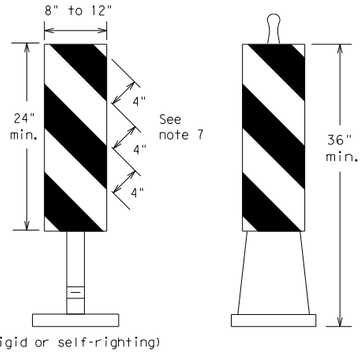


FIXED

(Rigid or self-righting)

DRIVEABLE

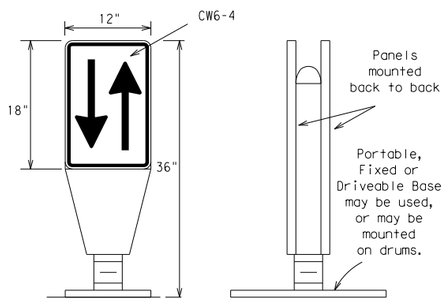


(Rigid or self-righting)

PORTABLE

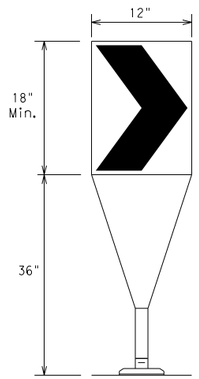
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



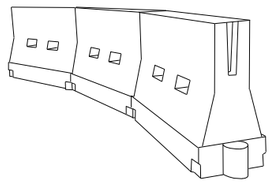
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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 ✳✳			Suggested Maximum Spacing of Channelizing Devices	
		10′ Offset	11′ Offset	12′ Offset	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
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		27

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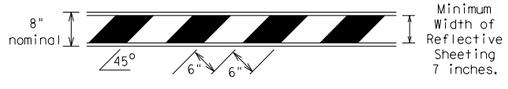
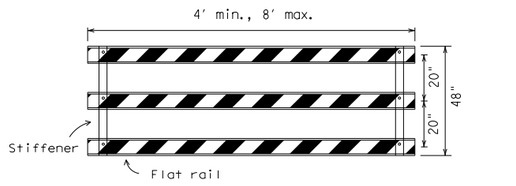
TYPE 3 BARRICADES

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.



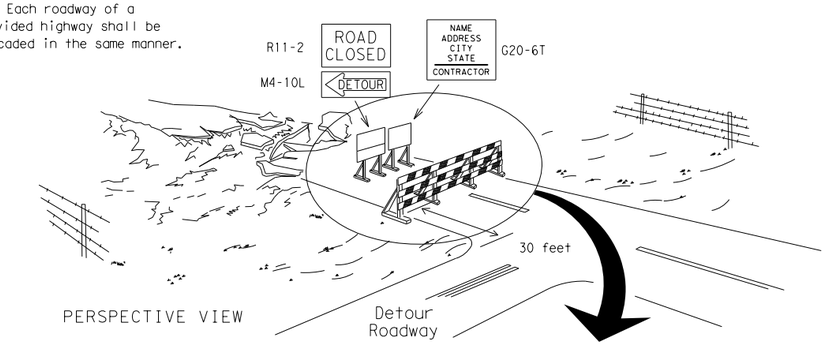
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

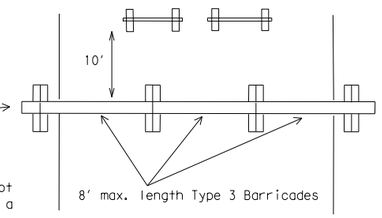
Each roadway of a divided highway shall be barricaded in the same manner.



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.

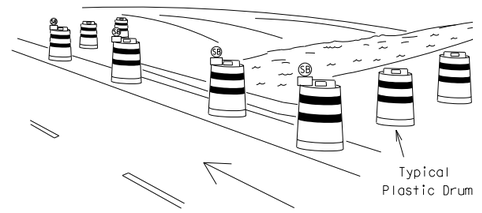
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

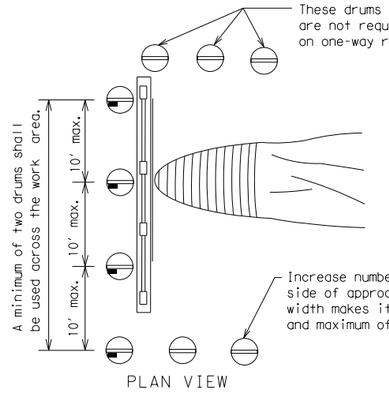
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

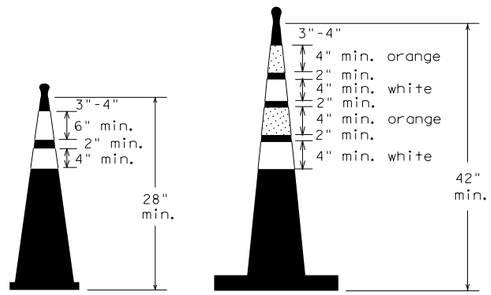
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.



PLAN VIEW

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

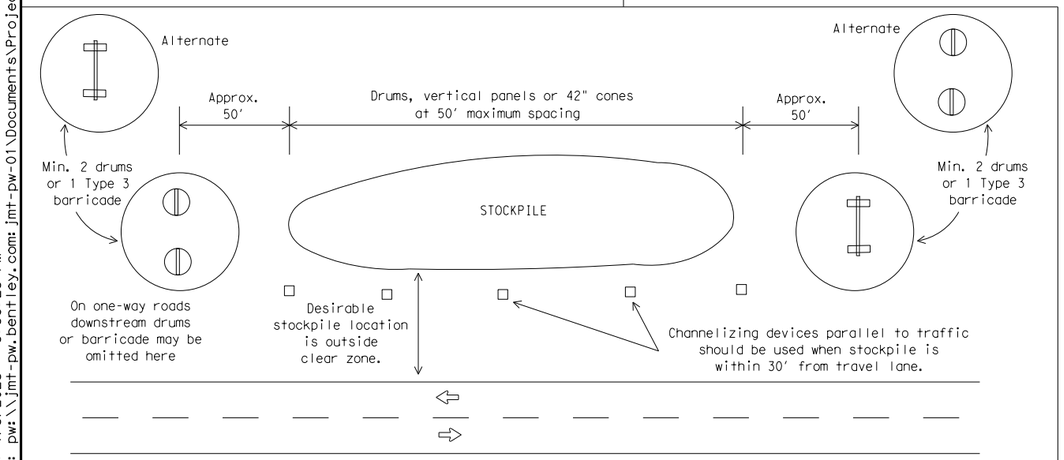
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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	0919	19	087	VARIOUS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	BOWIE		28

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.

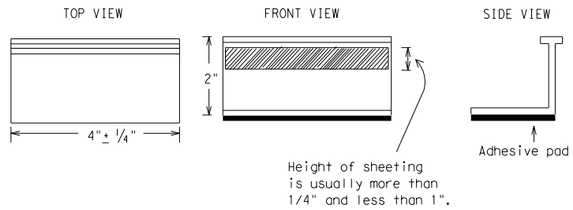
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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	0919	19	087	VARIOUS
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	ATL	BOWIE		29
11-02 8-14				

105

DATE: 7/5/2023 5:58:24 PM
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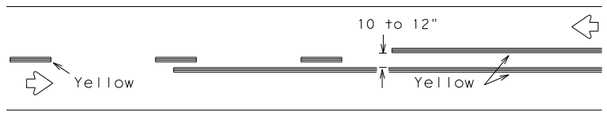
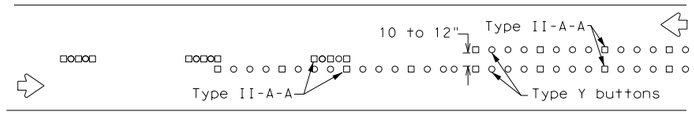
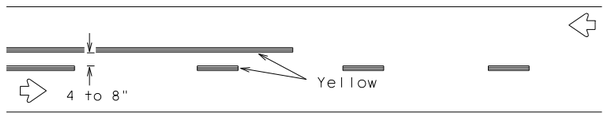
PAVEMENT MARKING PATTERNS



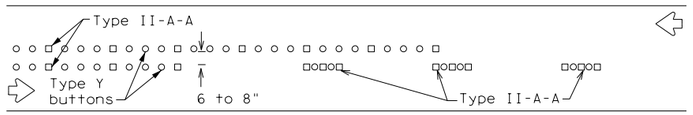
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



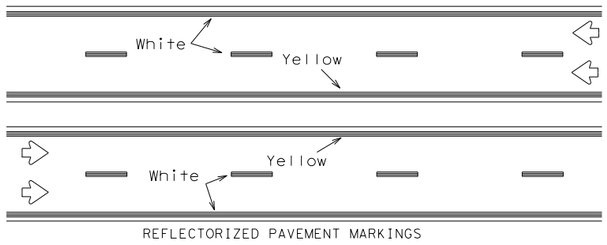
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



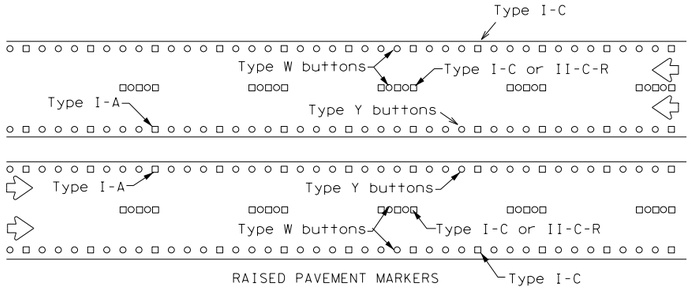
RAISED PAVEMENT MARKERS - PATTERN B

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



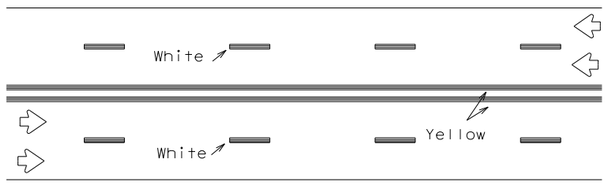
REFLECTORIZED PAVEMENT MARKINGS



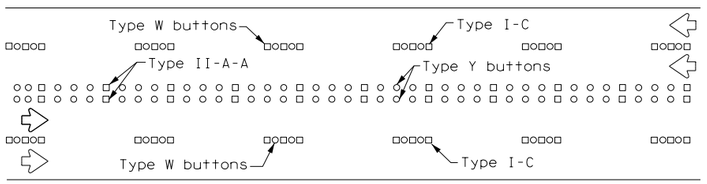
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



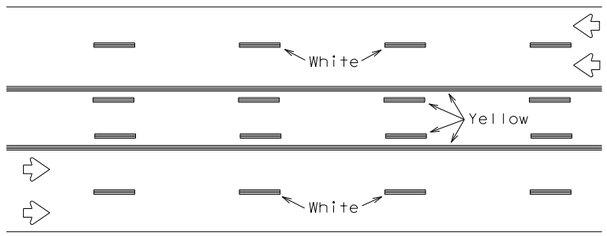
REFLECTORIZED PAVEMENT MARKINGS



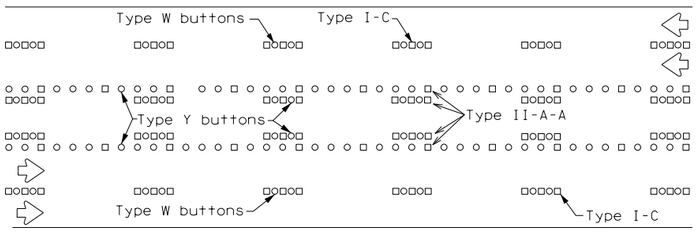
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

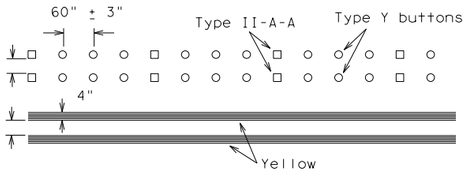
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

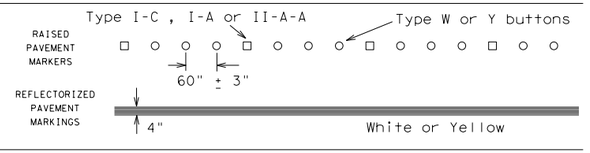
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

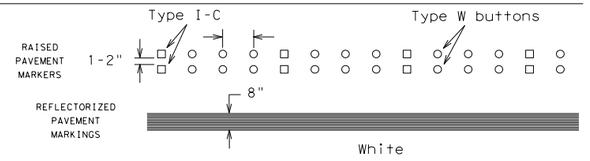


EDGE LINE OR SINGLE NO-PASSING LINE



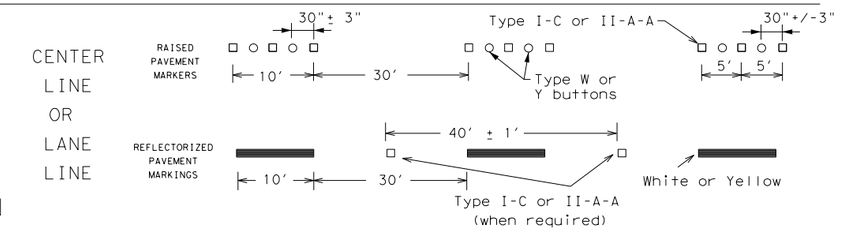
WIDE LINE

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

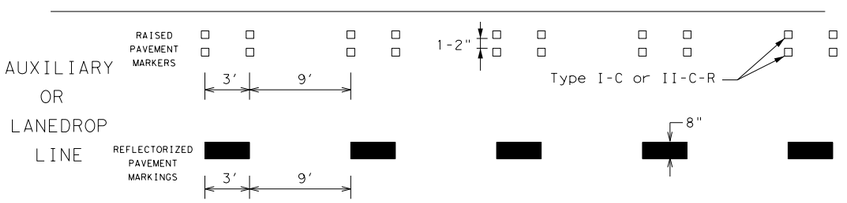


BROKEN LINES

CENTER LINE OR LANE LINE

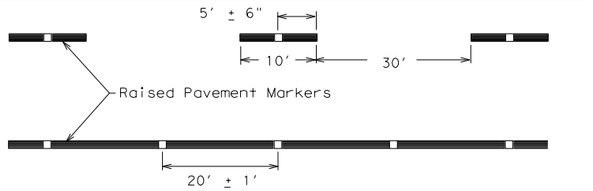


AUXILIARY OR LANEDROP LINE



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."

SHEET 12 OF 12

Texas Department of Transportation

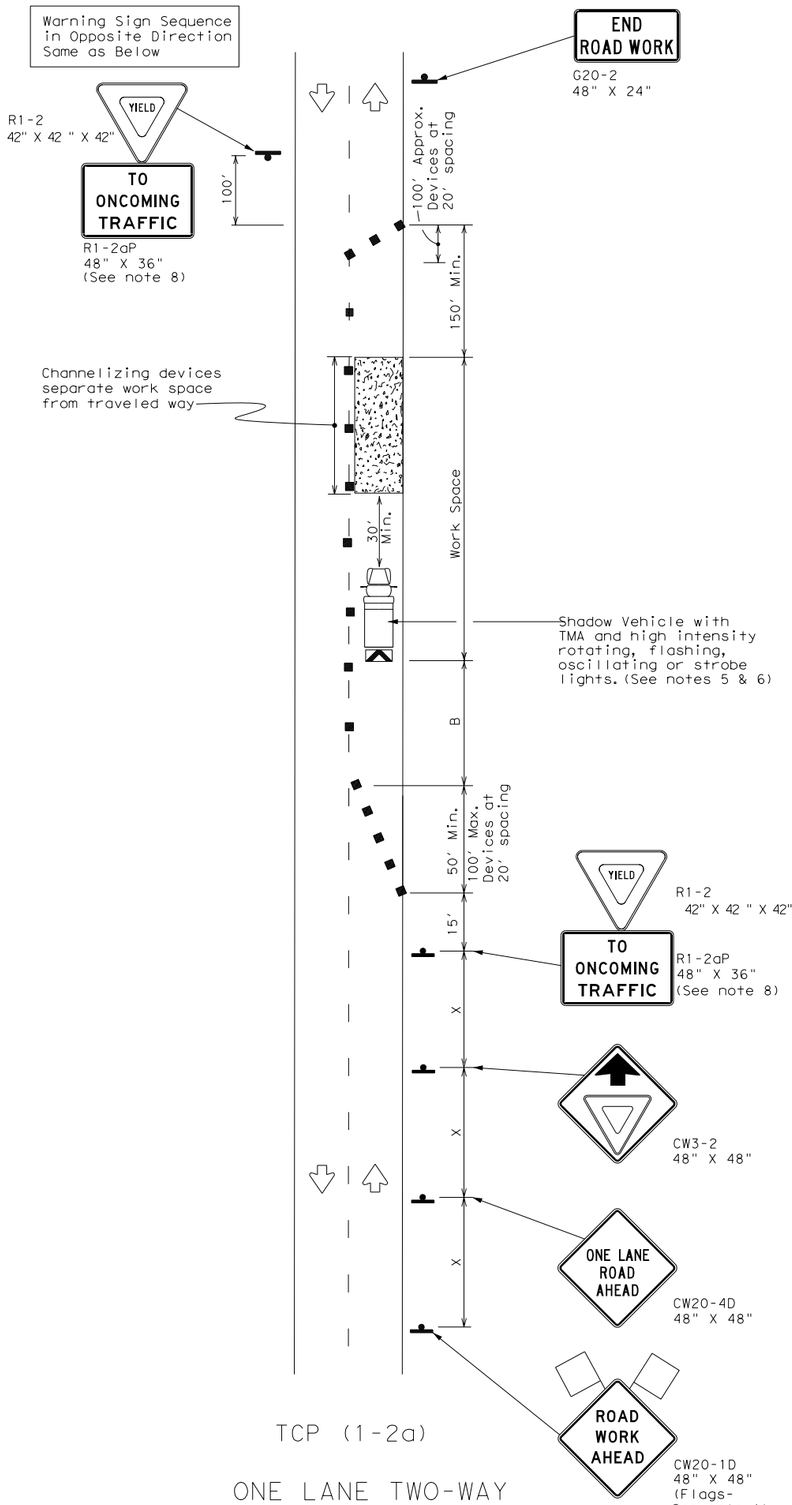
Traffic Safety Division Standard

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	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		30

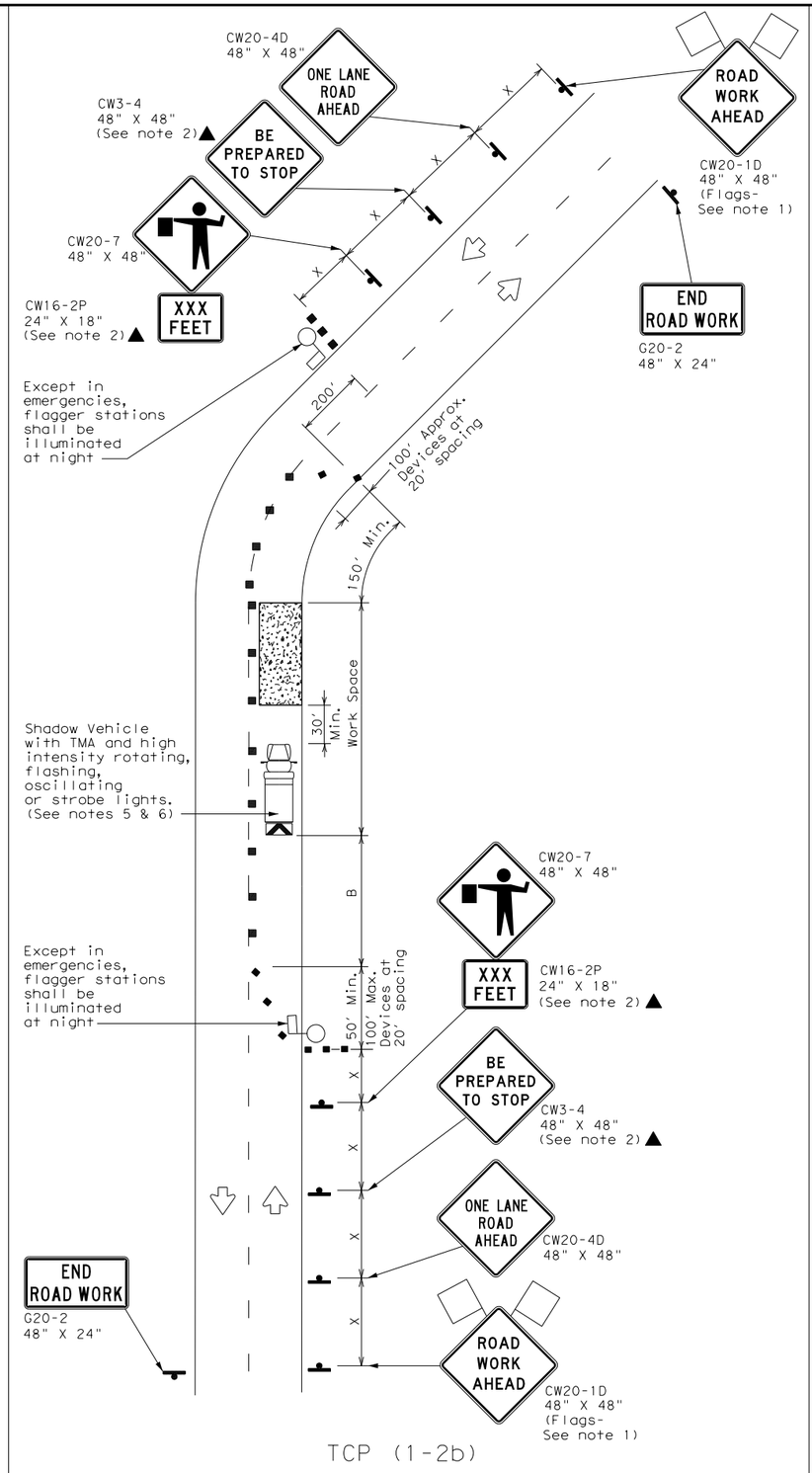
106



TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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"	Stopping Sight Distance
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* 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 CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
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 off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0919	19	087	VARIOUS
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	ATL	BOWIE		31

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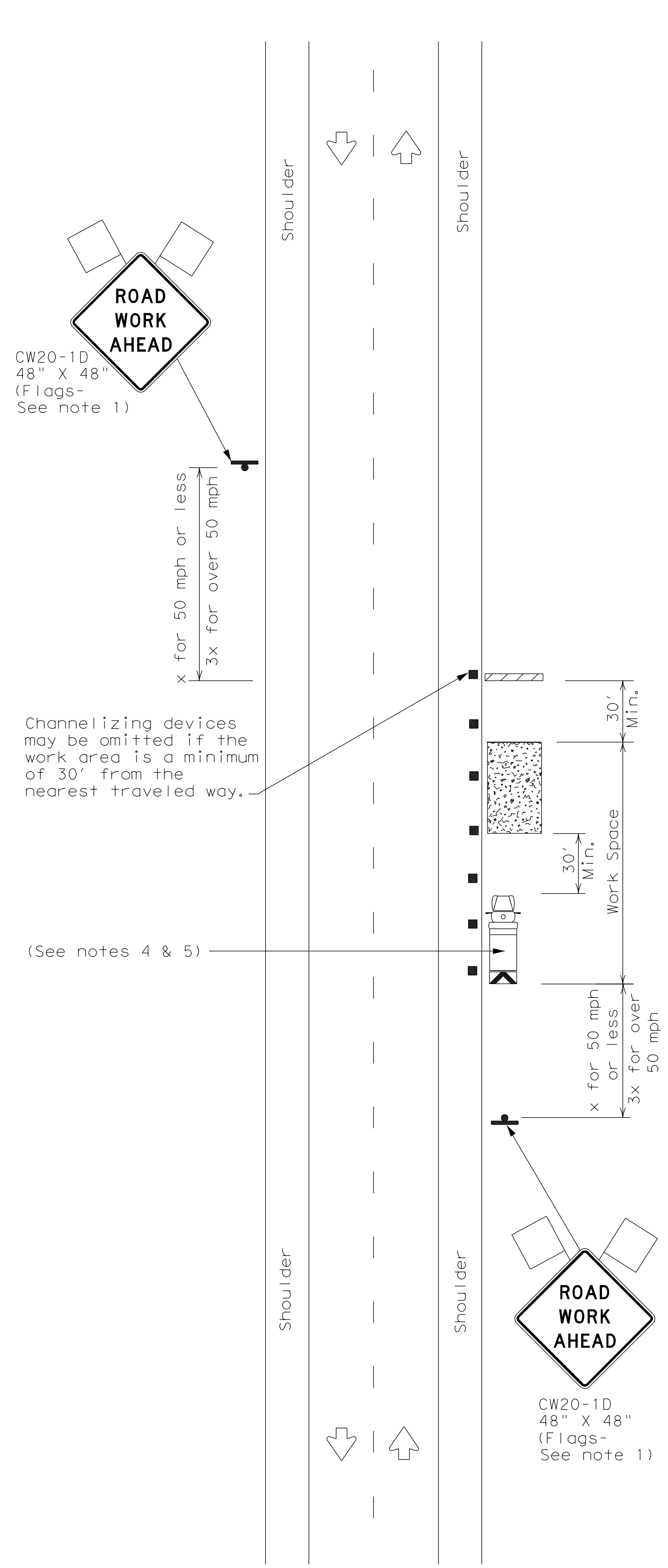
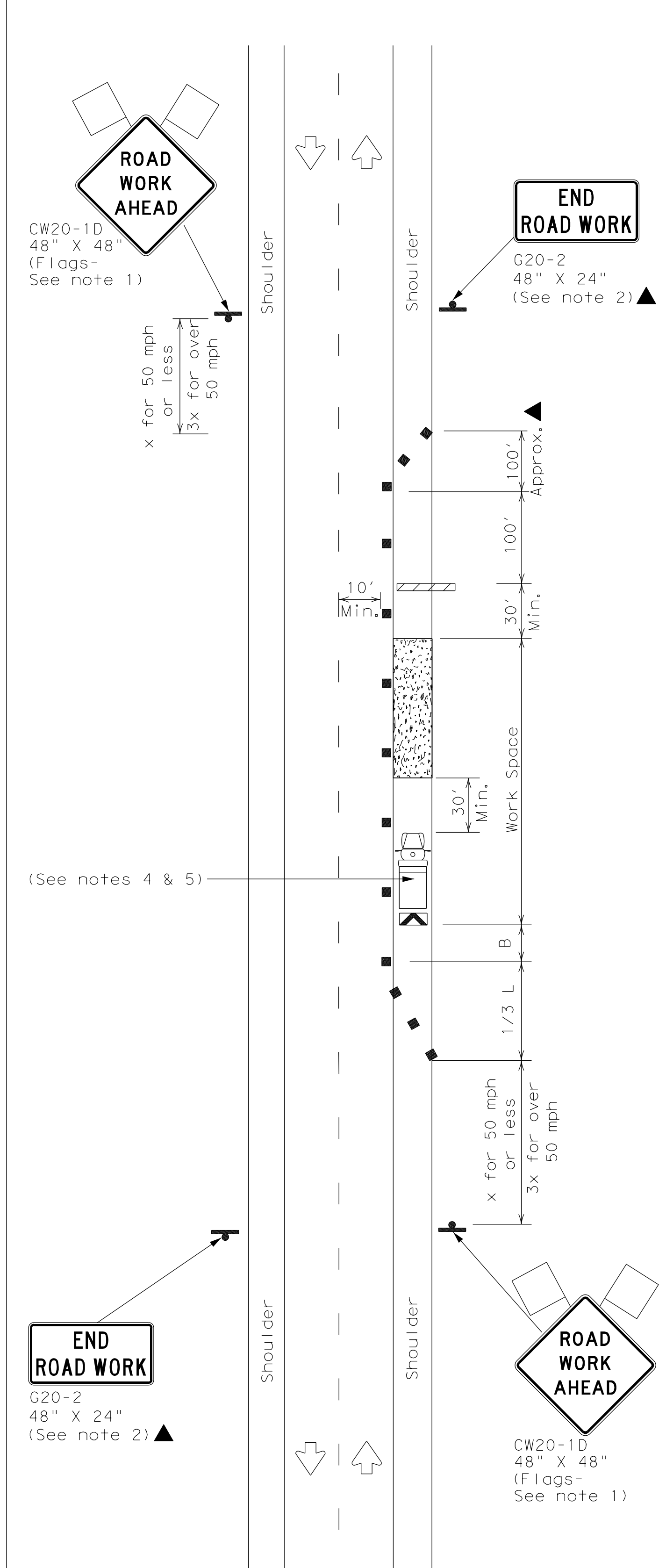


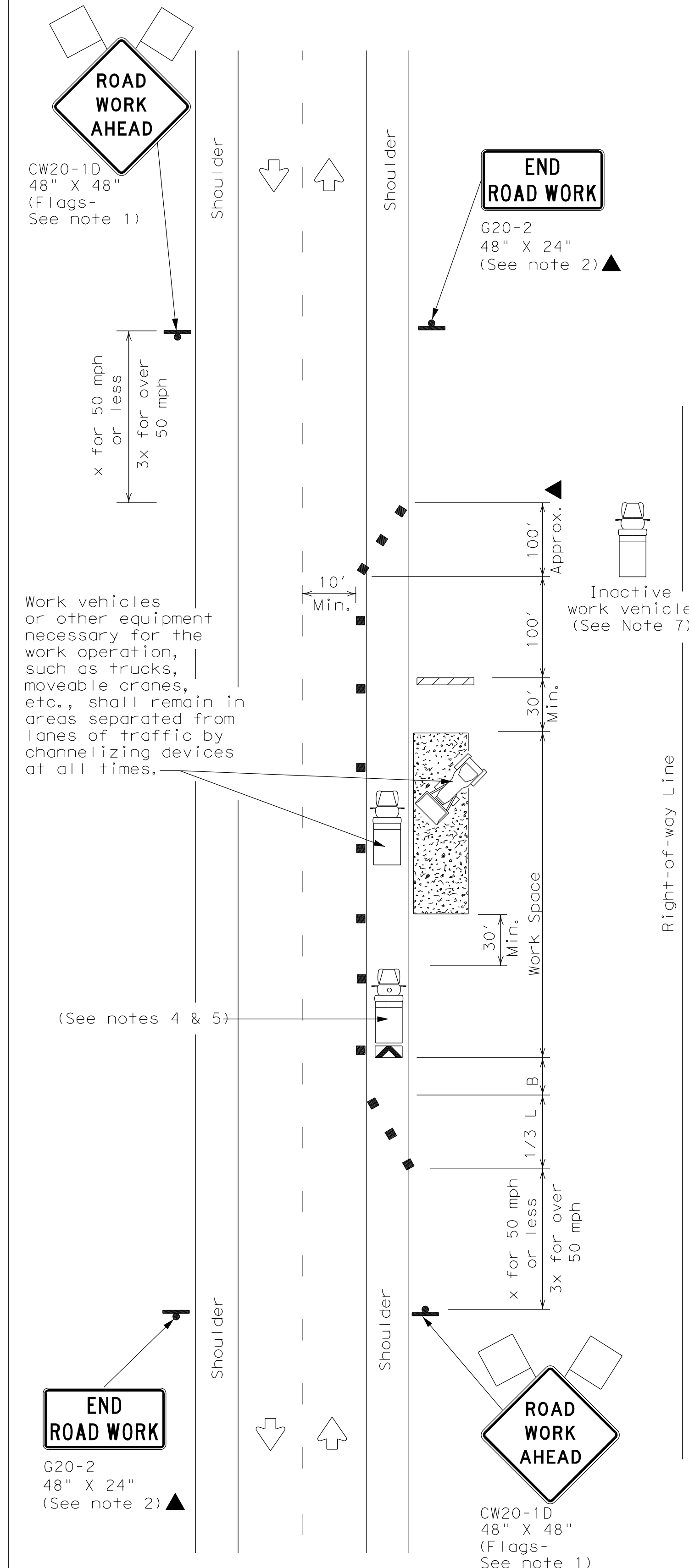
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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 in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. 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 a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT 0919	SECT 19	JOB 087	HIGHWAY VARIOUS
REVISIONS 2-94 4-98 / 8-95 2-12 / 1-97 2-18	DIST ATL	COUNTY BOWIE		SHEET NO. 32

161

DATE: 7/5/2023 5:58:59 PM
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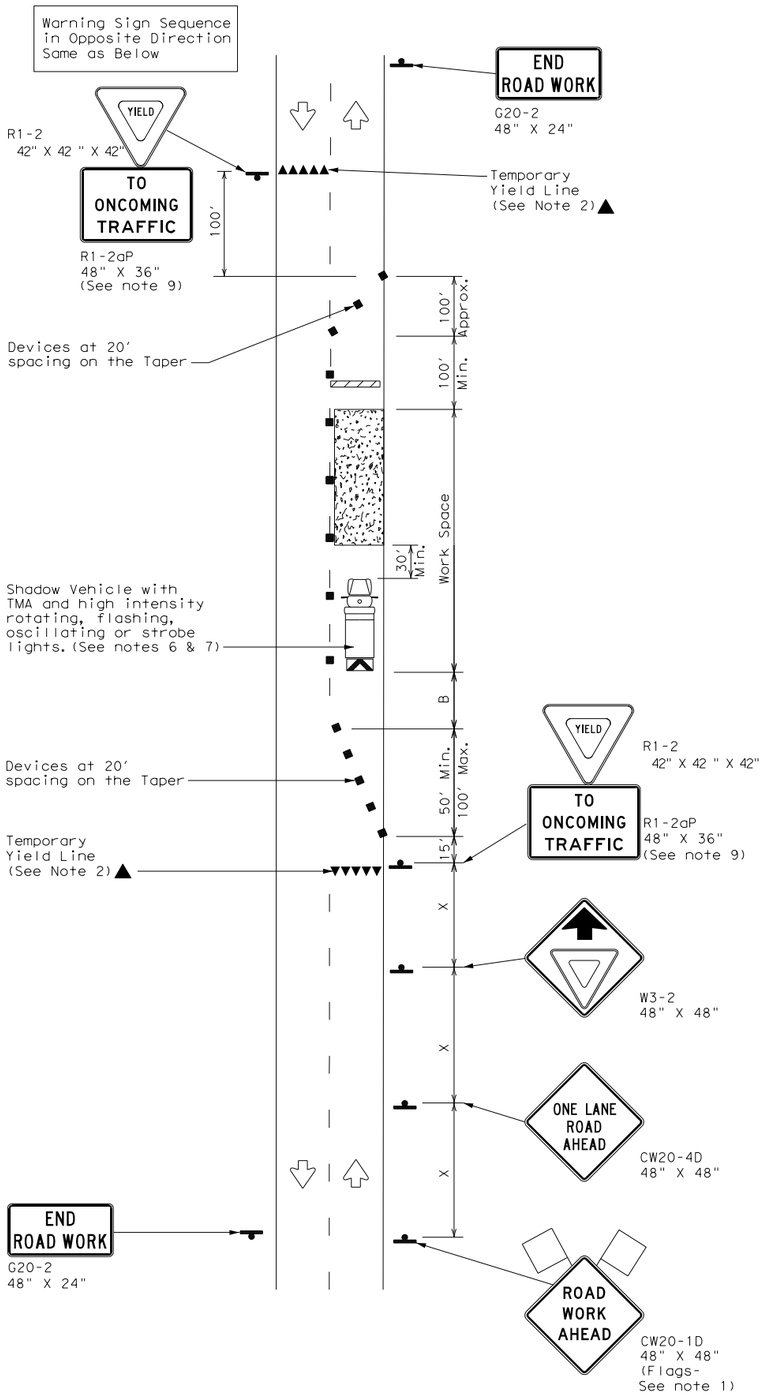
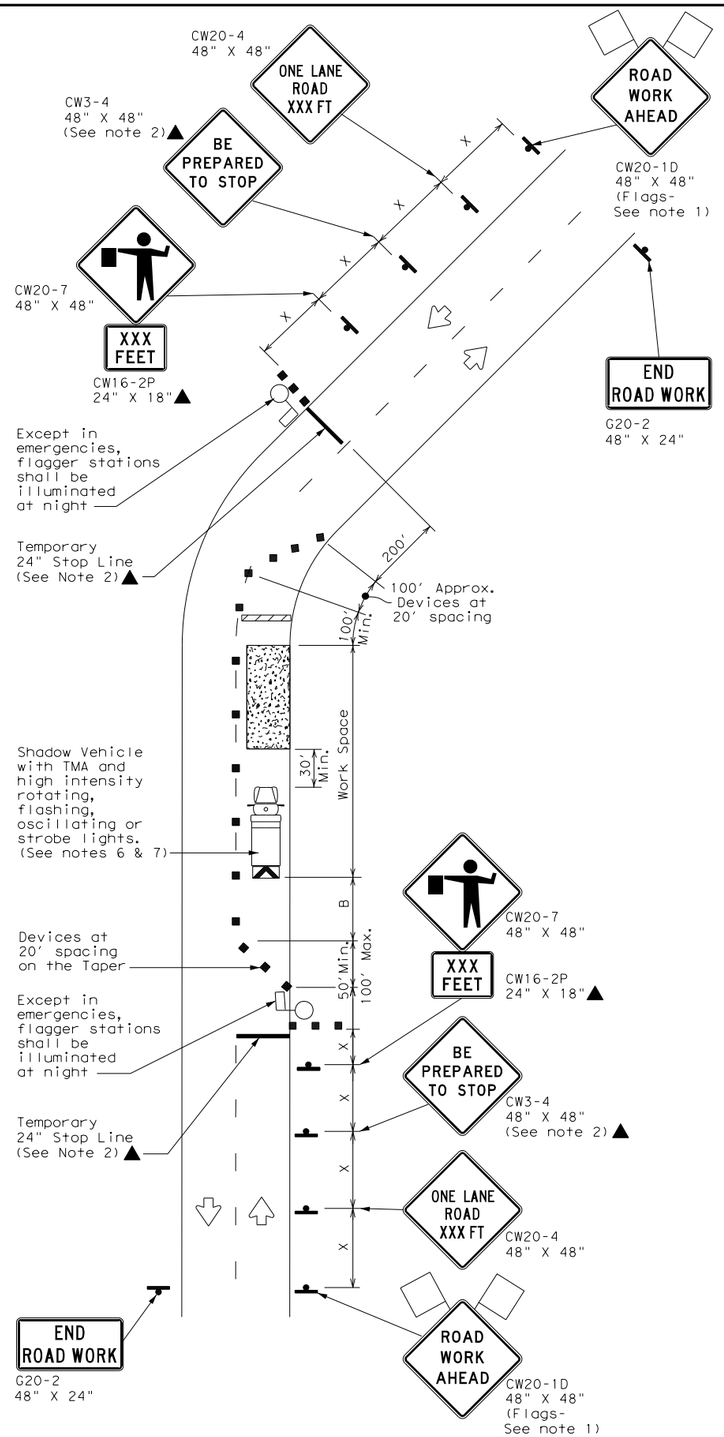


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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"	Stopping Sight Distance
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

* 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 CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. 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.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation

Traffic Operations Division Standard

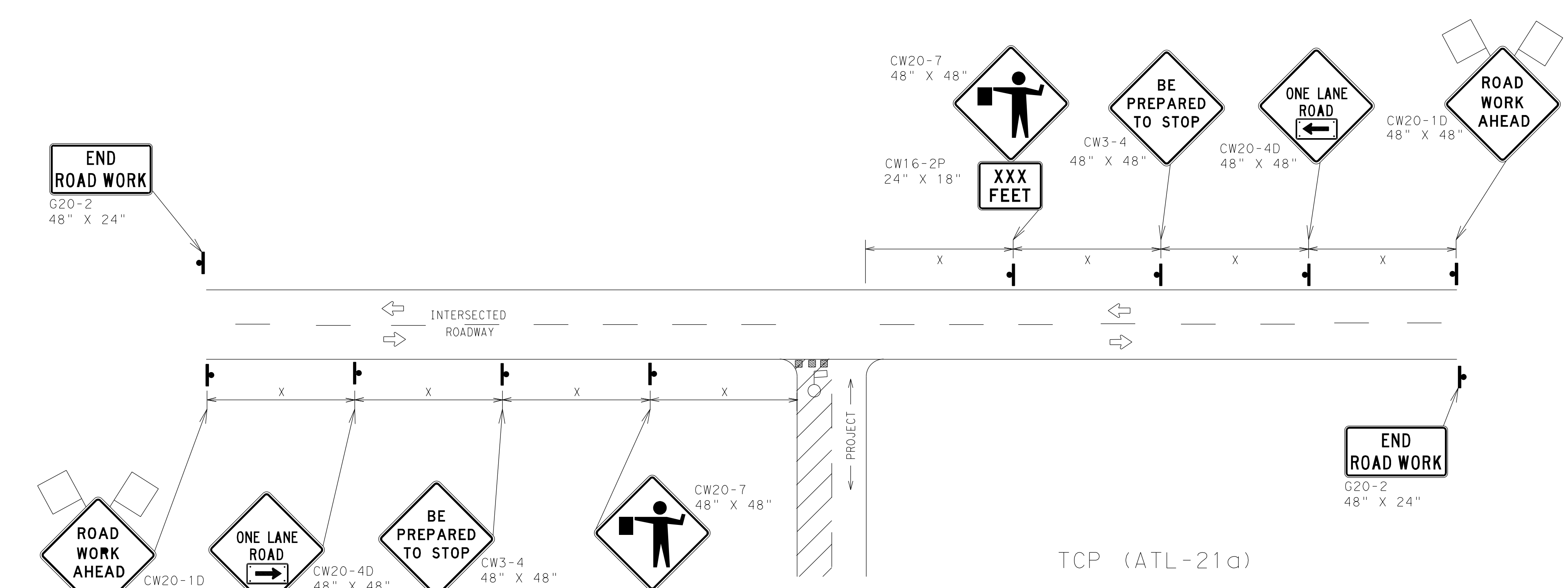
TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		33

162

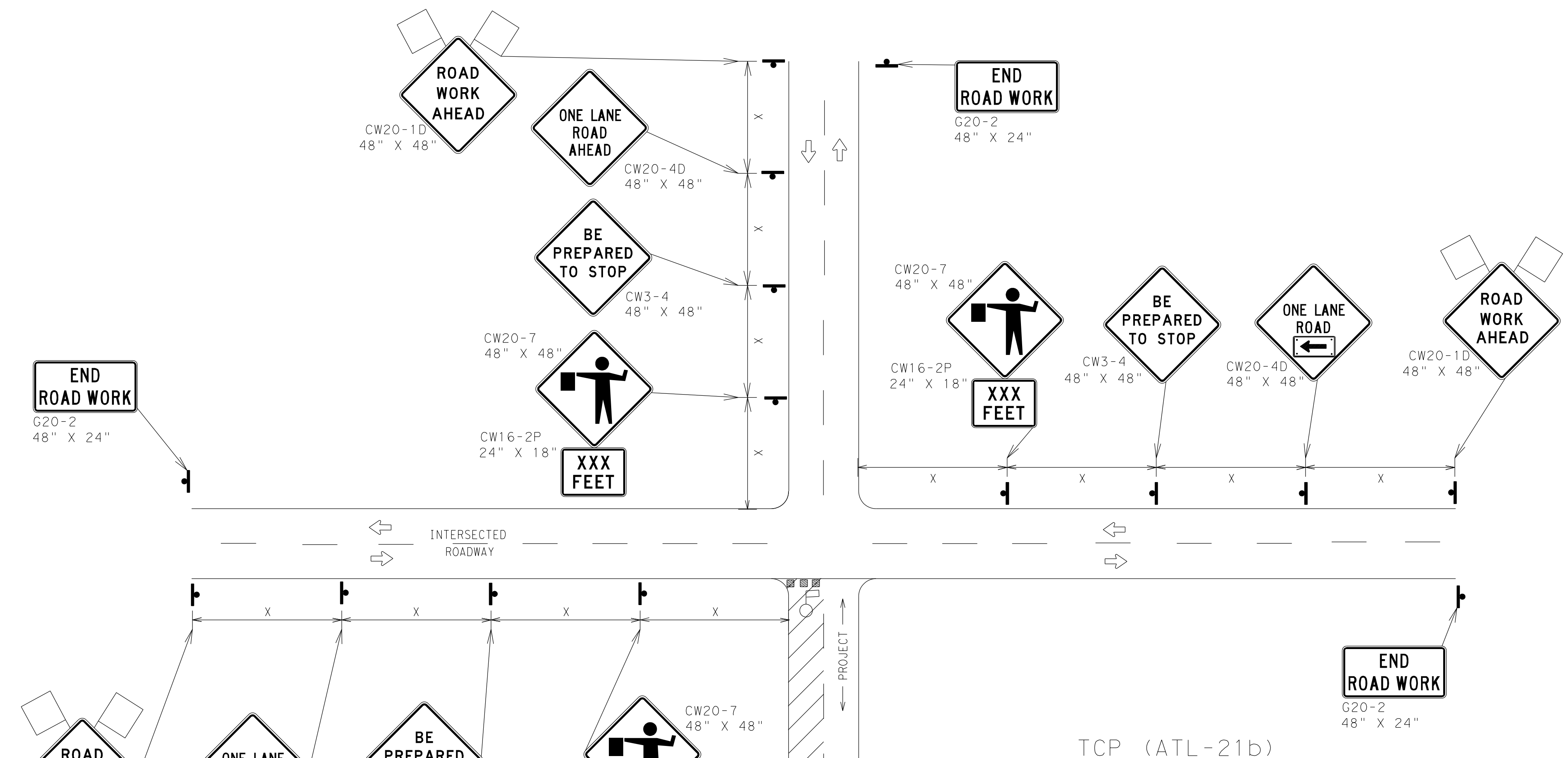
DATE: 7/5/2023 5:59:11 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\SUP\4 Design Plan Set (Mod to SH 98)\2_TCP\Standards\TCP (ATL-21) One-Way Traffic At Inters



TCP (ATL-21a)

ONE-WAY TRAFFIC AT INTERSECTION

T-INTERSECTION



TCP (ATL-21b)

ONE-WAY TRAFFIC AT INTERSECTION

CROSSROAD INTERSECTION

LEGEND

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

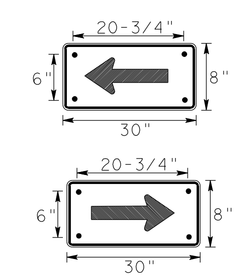
Posted Speed ✱	Formula	Minimum Desirable Taper Lengths ✱✱			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

✱ 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. All traffic control devices illustrated are REQUIRED unless approved by the Engineer.
2. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
3. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
4. High level warning flags should be used on advance warning signs during daytime operations.
5. See BC Standards for additional sign details.
6. Drums are the typical channelizing device. Cones or other devices may be used if approved by the Engineer. Channelizing devices shall also be in accordance with "WORKSHEET FOR EDGE CONDITION TREATMENT TYPES."
7. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.
8. Flaggers should use two-way radios or other methods of communication to control traffic.
9. Length of work area should be based on the ability of flaggers to communicate.
10. Work nearest the intersection should be done during the lowest traffic volume hours, when nature of the work allows.
11. Work in the vicinity of the intersection should be prioritized through completion so signage and flagman can be moved from the intersection as work progresses away from the intersection.
12. On multiple lane highways, an additional flagman may be needed on each approach as directed by the Engineer.



LEFT & RIGHT ARROWS ON VINYL SNAP-ON PATCHES 30" X 8"

Texas Department of Transportation
Atlanta District Standard

TRAFFIC CONTROL PLAN ONE-WAY TRAFFIC AT INTERSECTION

TCP (ATL-21)-14

FILE: atl-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST		COUNTY	SHEET NO.
	ATL		BOWIE	34

021

TXDOT GPS CONTROL POINT 0190156

Local Name (if any):	CONTROL 1			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod found in concrete flush with the ground.				

Intervisible Point:	0190157	Surveyed From:	a) TxDOT VRS NETWORK
Grid Bearing:	N 73°37'24" W		b)
Grid Distance (FT):	1075.41		c)

Directions from Major Highway Intersection to Control Point

From the intersection of US 82 and SH 89 go Northwest along US 82 approximately 468' to the monument on the Northeast side of US 82. Located 14.4' Southwest of a telephone pedestal, 24.8' Northwest of a culvert, and 42.1' Northeast of the Northeast edge of pavement of US 82.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐		
Scale Factor:	0.9998996507	Combined Factor:	0.9998849374	Mapping Angle:	2°11'49"		
Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)		
State:	Texas	N:	7242585.9670	1.000120	N:	7243455.0773	
Zone:	TXNC						
Code:	4202	E:	3196528.1825		E:	3196911.7659	

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC	Latitude:	33°28'24.77857"	395.83
DATA	Longitude:	94°28'18.14445"	

TXDOT GPS CONTROL POINT 0190157

Local Name (if any):	CONTROL 2			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod found in concrete flush with the ground.				

Intervisible Point:	0190156	Surveyed From:	a) TxDOT VRS NETWORK
Grid Bearing:	S 73°37'24" E		b)
Grid Distance (FT):	1075.41		c)

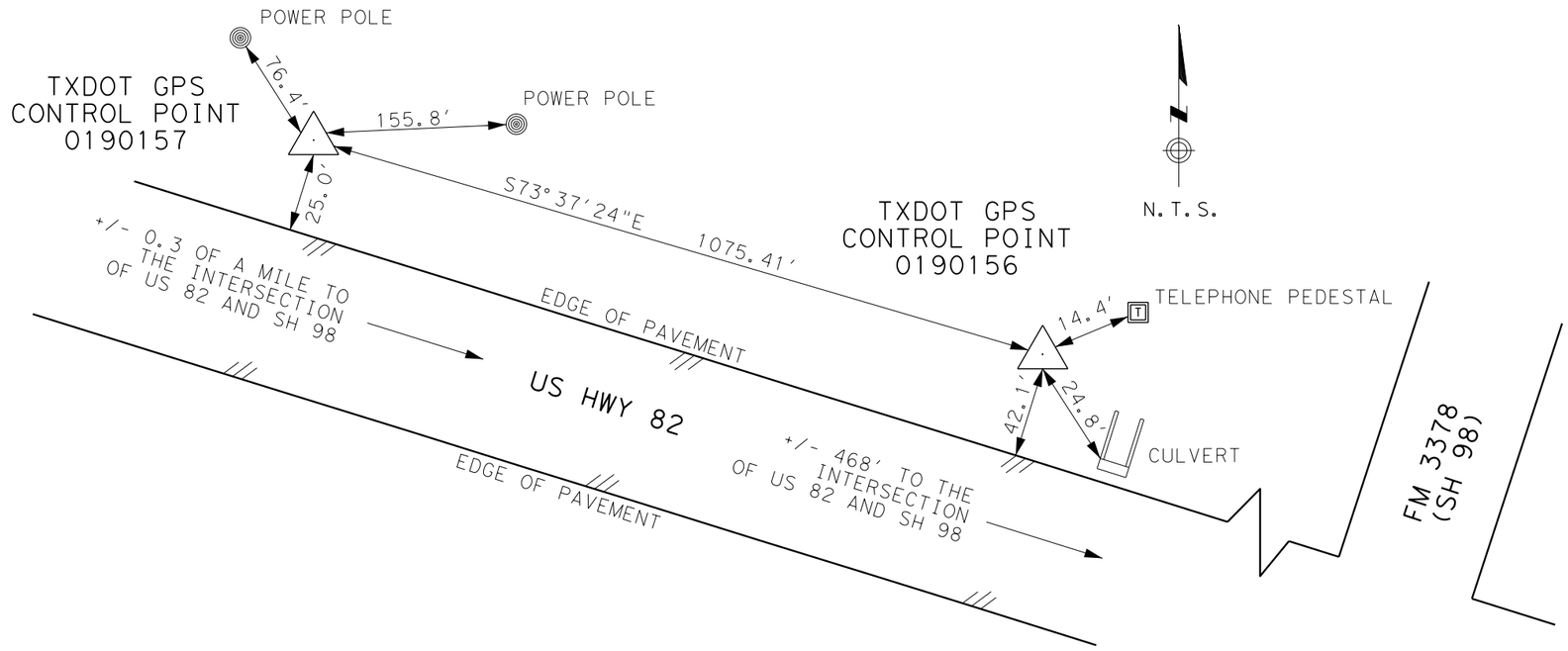
Directions from Major Highway Intersection to Control Point

From the intersection of US 82 and SH 89 go Northwest along US 82 approximately 0.3 of a mile to the monument on the Northeast side of US 82. Located 25.0' Northeast of the Northeast edge of pavement of US 82, 76.4' Southeast of a power pole, and 155.8' West of another power pole.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐		
Scale Factor:	0.9998997715	Combined Factor:	0.9998850434	Mapping Angle:	2°11'43"		
Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)		
State:	Texas	N:	7242889.1401	1.000120	N:	7243758.2868	
Zone:	TXNC						
Code:	4202	E:	3195496.5289		E:	3195879.9885	

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC	Latitude:	33°28'28.16716"	396.13
DATA	Longitude:	94°28'30.17828"	



STATE OF TEXAS
REGISTERED
ERIC A. KREINER
5320
PROFESSIONAL
LAND SURVEYOR
06/23/2023

SURVEY CONTROL POINT DATA

SHEET 1 OF 3

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SAM™
Surveying and Mapping, LLC. (SAM)
1341 W. Mockingbird Lane, Suite 400W
Dallas, Tx 75247 - (214) 631-7888
FIRM REGISTRATION NO. F-1937
TBPLS REGISTRATION NO. 10064301

FED. RD. DIV. NO.	PROJECT NUMBER		SHEET NO.
6			34
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0919	19	087	US 82

FILE:
DATE: TIME:
PROJECT DIRECTORY:

TXDOT GPS CONTROL POINT 0190158

Local Name (if any):	CONTROL 3			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod found in concrete flush with the ground.				

Intervisible Point:	0190159	Surveyed From:	a) TxDOT VRS NETWORK
Grid Bearing:	N 72°49'16" W		b)
Grid Distance (FT):	1162.46		c)

Directions from Major Highway Intersection to Control Point

From the intersection of US 82 and FM 2789 go Northwest along US 82 approximately 470' to the monument on the Northeast side of US 82. Located 18.0' Northeast of the Northeast edge of pavement of US 82, 76.8' West of a power pole, and 65.1' East of a "SPEED LIMIT 55" sign.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐
Scale Factor:	0.9999016246	Combined Factor:	0.9998865464	Mapping Angle:	2°10'07"

Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)	
State:	Texas	N:	7247481.9522	1.000120	N:	7248351.6498
Zone:	TXNC					
Code:	4202	E:	3180520.3816		E:	3180902.0444

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC	Latitude:	33°29'19.21775"	403.41
DATA	Longitude:	94°31'24.81241"	

TXDOT GPS CONTROL POINT 0190159

Local Name (if any):	CONTROL 4			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod found in concrete flush with the ground.				

Intervisible Point:	0190158	Surveyed From:	a) TxDOT VRS NETWORK
Grid Bearing:	S 72°49'16" E		b)
Grid Distance (FT):	1162.46		c)

Directions from Major Highway Intersection to Control Point

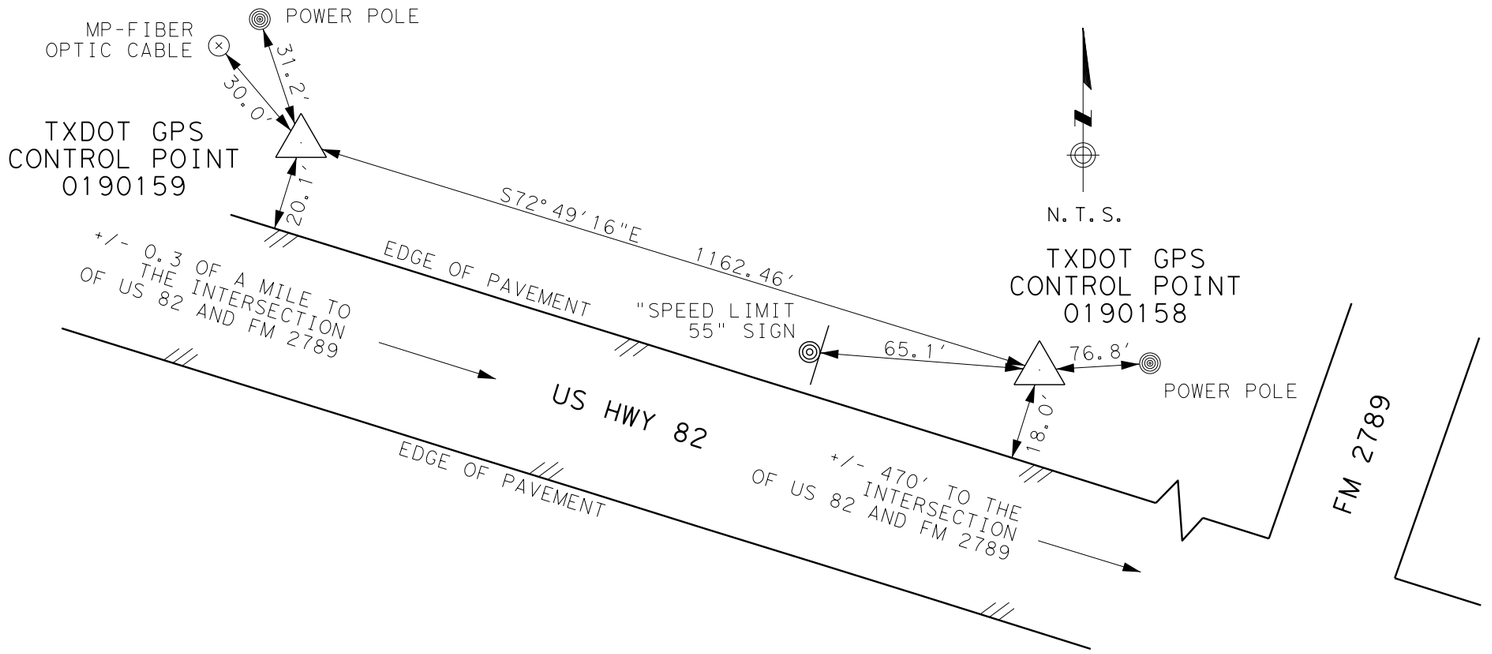
From the intersection of US 82 and FM 2789 go Northwest along US 82 approximately 0.3 of a mile to the monument on the Northeast side of US 82. Located 20.1' Northeast of the Northeast edge of pavement of US 82, 30.0' Southeast of a fiber optic cable marker post, and 31.2' Southeast of a power pole.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐
Scale Factor:	0.9999017653	Combined Factor:	0.9998868666	Mapping Angle:	2°10'00"

Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)	
State:	Texas	N:	7247825.2510	1.000120	N:	7248694.9900
Zone:	TXNC					
Code:	4202	E:	3179409.9168		E:	3179791.4462

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC	Latitude:	33°29'23.02756"	399.64
DATA	Longitude:	94°31'37.76235"	



STATE OF TEXAS REGISTERED ERIC A. KREINER 5320 PROFESSIONAL LAND SURVEYOR

06/23/2023

SURVEY CONTROL POINT DATA

SHEET 2 OF 3

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Dallas, Tx 75247 - (214) 631-7888
FIRM REGISTRATION NO. F-1937
TBPLS REGISTRATION NO. 10064301

FED. RD. DIV. NO.	PROJECT NUMBER		SHEET NO.
6			35
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0919	19	087	US 82

TXDOT GPS CONTROL POINT 0190161

Local Name (if any):	CONTROL 6			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod set in concrete flush with the ground.				

Intervisible Point:	0190160	Surveyed From:	a) WDS NETWORK
Grid Bearing:	N 87°43'59" E		b)
Grid Distance (FT):	1434.35		c)

Directions from Major Highway Intersection to Control Point

From the intersection of US 82 and Ed Jackson Ln go East along US 82 approximately 92' to the monument on the side of US 82. Located 16.3' North of the North edge of pavement of US 82, 23.4' Northwest of a "STOP" sign, and Southeast of a power pole.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐
Scale Factor:	0.9999036953	Combined Factor:	0.9998886412	Mapping Angle:	2°07'34"

Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)	
State:	Texas	N:	7252159.8508	1.000120	N:	7253030.1102
Zone:	TXNC					
Code:	4202	E:	3156514.5833		E:	3156893.3647

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC DATA	Latitude:	33°30'14.36886"	403.03
	Longitude:	94°36'06.0331"	

TXDOT GPS CONTROL POINT 0190160

Local Name (if any):	CONTROL 5			Date:	11/29/22
Project Name:	US 82	Project CSJ:	0046-04-057	County:	BOWIE
Project Limits:	FM 1840 TO SH 98				
Monument Type:	3 1/4" TxDOT Aluminum Disk on a 5/8" Iron Rod set in concrete flush with the ground.				

Intervisible Point:	0190161	Surveyed From:	a) WDS NETWORK
Grid Bearing:	S 87°43'59" W		b)
Grid Distance (FT):	1434.35		c)

Directions from Major Highway Intersection to Control Point

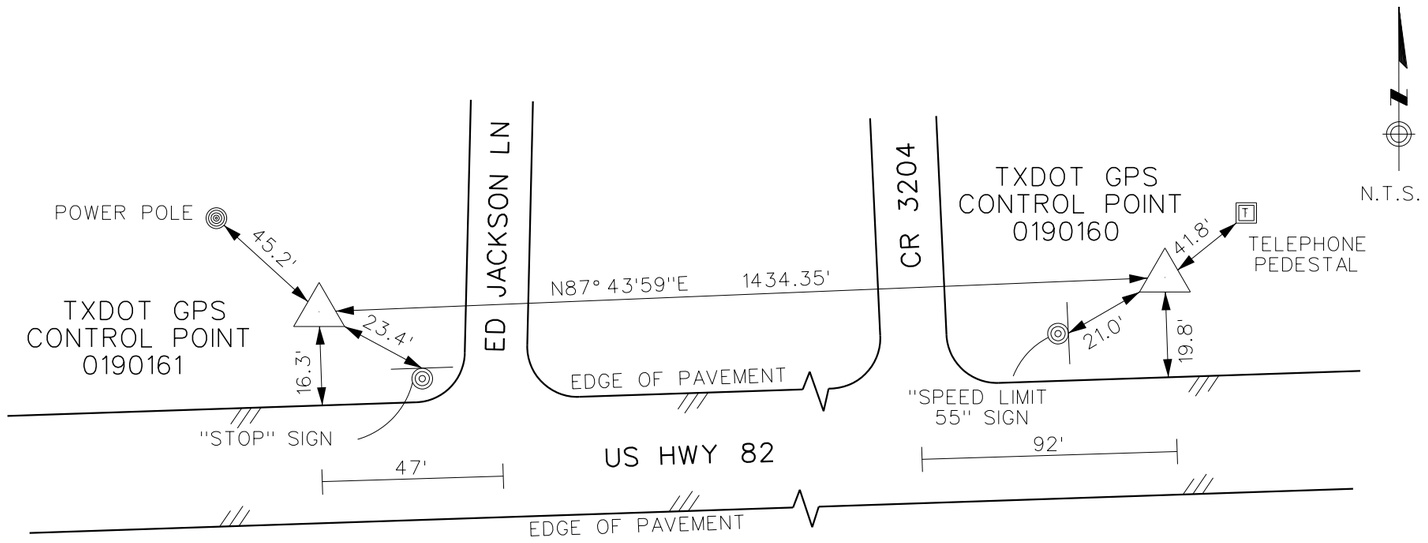
From the intersection of US 82 and CR 3204 go East along US 82 approximately 92' to the monument on the North of US 82. Located 19.8' North of the North edge of pavement of US 82, 21.0' Northeast of a "SPEED LIMIT 55" sign, 41.8' Southwest of a telephone pedestal.

Adjusted Horizontal Control Data

Order:		Survey Method:	GPS ☑	TRAV ☐	OTHER ☐
Scale Factor:	0.9999036966	Combined Factor:	0.9998882731	Mapping Angle:	2°07'43"

Texas State Plane Grid Data NAD83 (1993)		Grid Coordinates (U.S. Survey Feet)		TXDOT Surface Adjustment Factor	Surface Coordinates (U.S. Survey Feet)	
State:	Texas	N:	7252216.5800	1.000120	N:	7253086.8460
Zone:	TXNC					
Code:	4202	E:	3157947.6413		E:	3158326.5947

	Position	NAD83 (1983)	ELEV (FT)
GEODETIC DATA	Latitude:	33°30'14.40341"	410.69
	Longitude:	94°35'49.09512"	



STATE OF TEXAS
REGISTERED
ERIC A. KREINER
5320
PROFESSIONAL
LAND SURVEYOR

07/06/23

Eric A. Kreiner
Registered Professional Land Surveyor
No. 5320

TBPLS # 10064301

SAM
Surveying and Mapping, LLC. (SAM)
1341 W. Mockingbird Lane, Suite 400W
Dallas, Tx 75247 - (214) 631-7888
FIRM REGISTRATION NO. F-1937
TBPLS REGISTRATION NO. 10064301

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SURVEY CONTROL DATA POINT

SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MM	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS MM	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK SAM	TEXAS	ATL	BOWIE	37
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: July 06, 2023 FILENAME: H&V Sheet_US 82.dgn

US 82 SUP TRANSITION

Beginning chain US82TRAIL_T description

Point 207 N 7,248,020.0707 E 3,181,470.7566 Sta 2902+25.00

Course from 207 to PC US82TRAIL_T_3 S 72° 10′ 29.80" E Dist 6.1291

Curve Data						
Curve US82TRAIL_T_3						
P.I. Station	2902+57.84	N	7,248,010.0194	E	3,181,502.0160	
Delta =	15° 12′ 42.35"	(RT)				
Degree =	28° 38′ 52.40"					
Tangent =	26.7066					
Length =	53.0991					
Radius =	200.0000					
External =	1.7752					
Long Chord =	52.9433					
Mid. Ord. =	1.7596					
P.C. Station	2902+31.13	N	7,248,018.1946	E	3,181,476.5915	
P.T. Station	2902+84.23	N	7,247,995.4595	E	3,181,524.4047	
C.C.		N	7,247,827.7954	E	3,181,415.3692	
Back = S	72° 10′ 29.81" E					
Ahead = S	56° 57′ 47.45" E					
Chord Bear = S	64° 34′ 08.63" E					

Curve Data						
Curve US82TRAIL_T_4						
P.I. Station	2903+12.30	N	7,247,980.1574	E	3,181,547.9347	
Delta =	15° 58′ 38.87"	(LT)				
Degree =	28° 38′ 52.40"					
Tangent =	28.0681					
Length =	55.7719					
Radius =	200.0000					
External =	1.9599					
Long Chord =	55.5913					
Mid. Ord. =	1.9409					
P.C. Station	2902+84.23	N	7,247,995.4595	E	3,181,524.4047	
P.T. Station	2903+40.00	N	7,247,971.9233	E	3,181,574.7678	
C.C.		N	7,248,163.1236	E	3,181,633.4403	
Back = S	56° 57′ 47.45" E					
Ahead = S	72° 56′ 26.32" E					
Chord Bear = S	64° 57′ 06.88" E					

Ending chain US82TRAIL_T description

US 82 SUP

Beginning chain US82TRAIL description

Point 320 N 7,250,491.4778 E 3,173,378.6492 Sta 817+65.36

Course from 320 to 321 S 72° 54′ 41.41" E Dist 8,387.3049

Point 321 N 7,248,026.8815 E 3,181,395.6716 Sta 901+52.66

Course from 321 to PC US82TRAIL_56 S 72° 56′ 26.32" E Dist 9,367.4390

Curve Data						
Curve US82TRAIL_56						
P.I. Station	995+46.79	N	7,245,270.9982	E	3,190,376.4736	
Delta =	15° 12′ 12.97"	(LT)				
Degree =	28° 38′ 52.40"					
Tangent =	26.6921					
Length =	53.0706					
Radius =	200.0000					
External =	1.7733					
Long Chord =	52.9150					
Mid. Ord. =	1.7577					
P.C. Station	995+20.10	N	7,245,278.8286	E	3,190,350.9560	
P.T. Station	995+73.17	N	7,245,270.1338	E	3,190,403.1518	
C.C.		N	7,245,470.0289	E	3,190,409.6284	
Back = S	72° 56′ 26.32" E					
Ahead = S	88° 08′ 39.29" E					
Chord Bear = S	80° 32′ 32.81" E					

Curve Data						
Curve US82TRAIL_57						
P.I. Station	995+99.86	N	7,245,269.2694	E	3,190,429.8299	
Delta =	15° 12′ 12.97"	(RT)				
Degree =	28° 38′ 52.40"					
Tangent =	26.6921					
Length =	53.0706					
Radius =	200.0000					
External =	1.7733					
Long Chord =	52.9150					
Mid. Ord. =	1.7577					
P.C. Station	995+73.17	N	7,245,270.1338	E	3,190,403.1518	
P.T. Station	996+26.24	N	7,245,261.4390	E	3,190,455.3475	
C.C.		N	7,245,070.2387	E	3,190,396.6751	
Back = S	88° 08′ 39.29" E					
Ahead = S	72° 56′ 26.32" E					
Chord Bear = S	80° 32′ 32.81" E					

Course from PT US82TRAIL_57 to PC US82TRAIL_60 S 72° 56′ 26.32" E Dist 325.0000

Curve Data						
Curve US82TRAIL_60						
P.I. Station	999+77.89	N	7,245,158.2786	E	3,190,791.5240	
Delta =	15° 10′ 44.60"	(RT)				
Degree =	28° 38′ 52.40"					
Tangent =	26.6485					
Length =	52.9849					
Radius =	200.0000					
External =	1.7675					
Long Chord =	52.8301					
Mid. Ord. =	1.7521					
P.C. Station	999+51.24	N	7,245,166.0962	E	3,190,766.0480	
P.T. Station	1000+04.23	N	7,245,144.0631	E	3,190,814.0642	
C.C.		N	7,244,974.8960	E	3,190,707.3755	
Back = S	72° 56′ 26.32" E					
Ahead = S	57° 45′ 41.72" E					
Chord Bear = S	65° 21′ 04.02" E					

Curve Data						
Curve US82TRAIL_61						
P.I. Station	1000+30.87	N	7,245,129.8482	E	3,190,836.6035	
Delta =	15° 10′ 42.36"	(LT)				
Degree =	28° 38′ 52.40"					
Tangent =	26.6474					
Length =	52.9827					
Radius =	200.0000					
External =	1.7674					
Long Chord =	52.8279					
Mid. Ord. =	1.7519					
P.C. Station	1000+04.23	N	7,245,144.0631	E	3,190,814.0642	
P.T. Station	1000+57.21	N	7,245,122.0306	E	3,190,862.0784	
C.C.		N	7,245,313.2303	E	3,190,920.7529	
Back = S	57° 45′ 41.72" E					
Ahead = S	72° 56′ 24.08" E					
Chord Bear = S	65° 21′ 02.90" E					

Course from PT US82TRAIL_61 to 322 S 72° 56′ 24.08" E Dist 4,135.5554

Point 322 N 7,243,908.7719 E 3,194,815.6618 Sta 1041+92.76

Course from 322 to PC US82TRAIL_66 S 72° 57′ 32.07" E Dist 2,474.9767

Curve Data						
Curve US82TRAIL_66						
P.I. Station	1067+13.48	N	7,243,170.0573	E	3,197,225.7050	
Delta =	33° 54′ 56.27"	(LT)				
Degree =	38° 11′ 49.87"					
Tangent =	45.7389					
Length =	88.7909					
Radius =	150.0000					
External =	6.8185					
Long Chord =	87.5003					
Mid. Ord. =	6.5220					
P.C. Station	1066+67.74	N	7,243,183.4614	E	3,197,181.9743	
P.T. Station	1067+56.53	N	7,243,183.3343	E	3,197,269.4745	
C.C.		N	7,243,326.8757	E	3,197,225.9329	
Back = S	72° 57′ 32.07" E					
Ahead = N	73° 07′ 31.67" E					
Chord Bear = S	89° 55′ 00.20" E					

Course from PT US82TRAIL_66 to 323 N 73° 07′ 31.67" E Dist 12.3717

Point 323 N 7,243,186.9255 E 3,197,281.3135 Sta 1067+68.90

Ending chain US82TRAIL description

7/5/2023

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Texas Department of Transportation

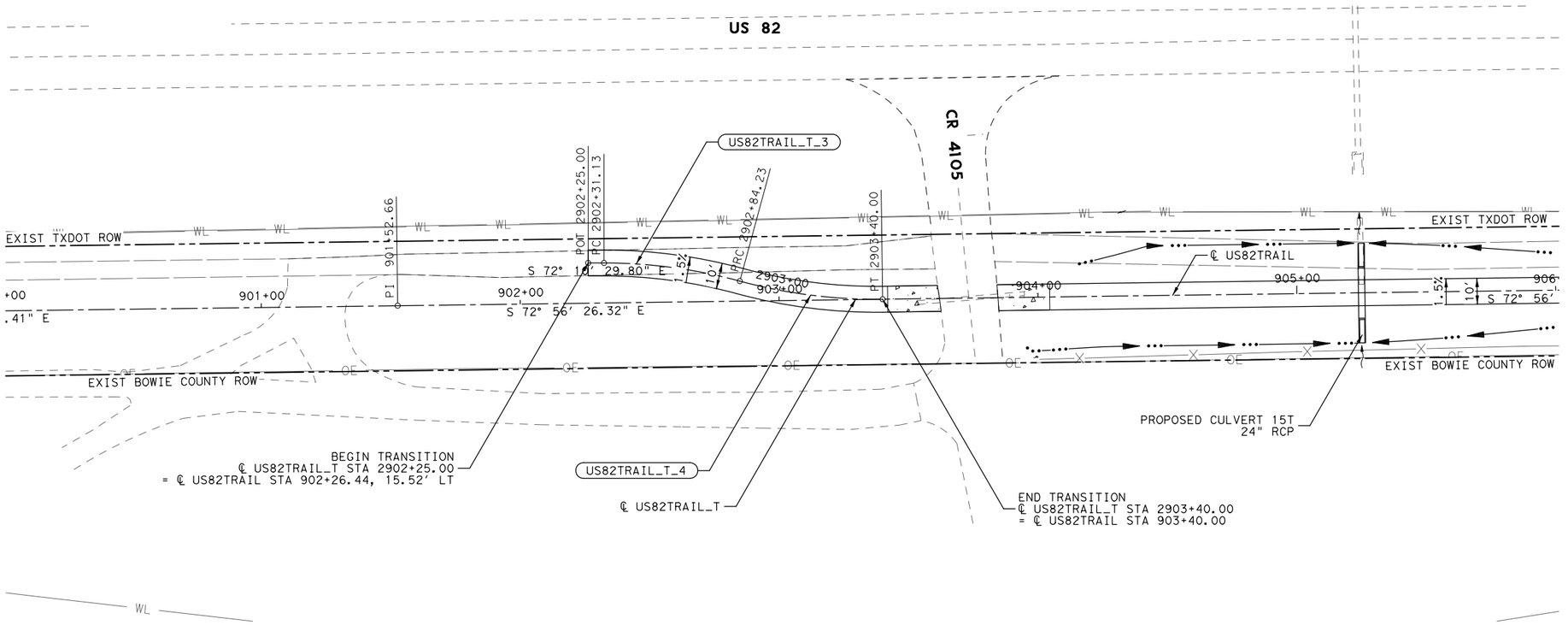
VARIOUS

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	38
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\HALN DATA\US82T*S*SUP*HAD01.dgn



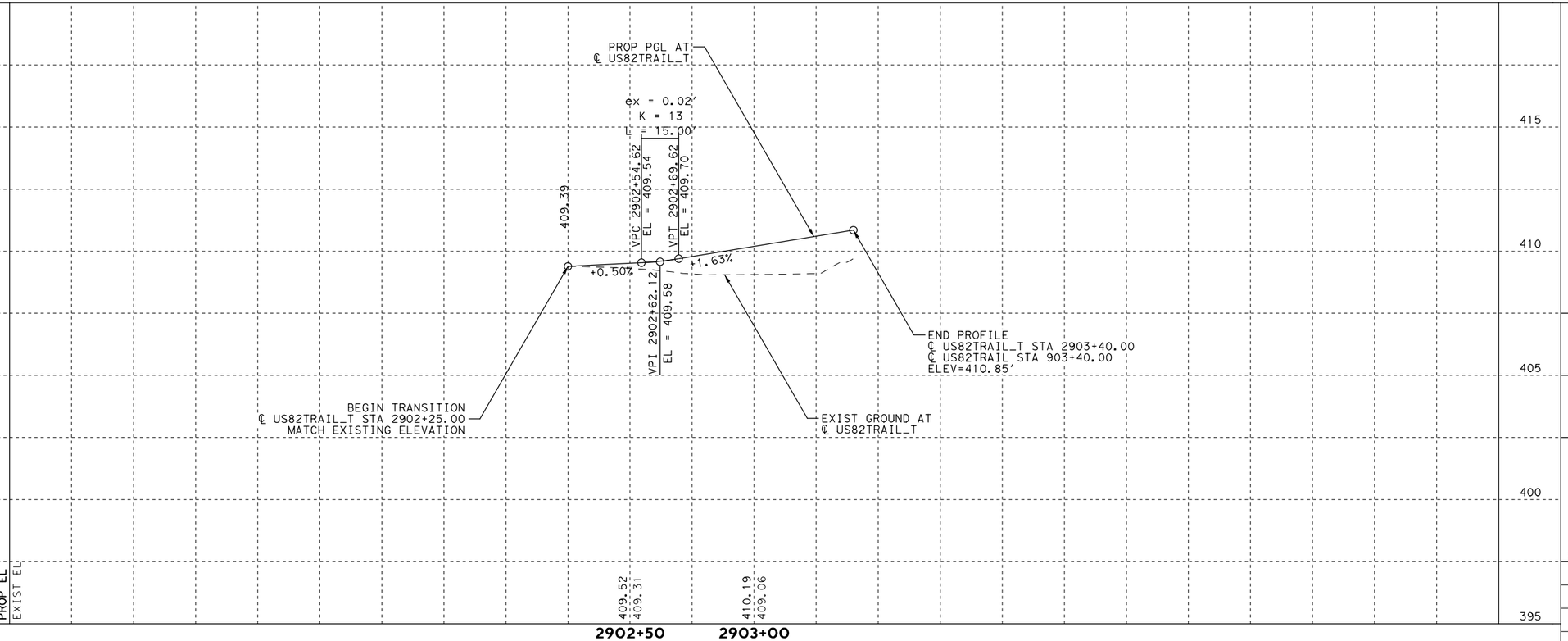
HORZ 0' 25' 50'
VERT 0' 2.5' 5'
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. SEE PLAN AND PROFILE SHEET 1 FOR ℄ US82TRAIL INFORMATION.



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STATE OF TEXAS

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

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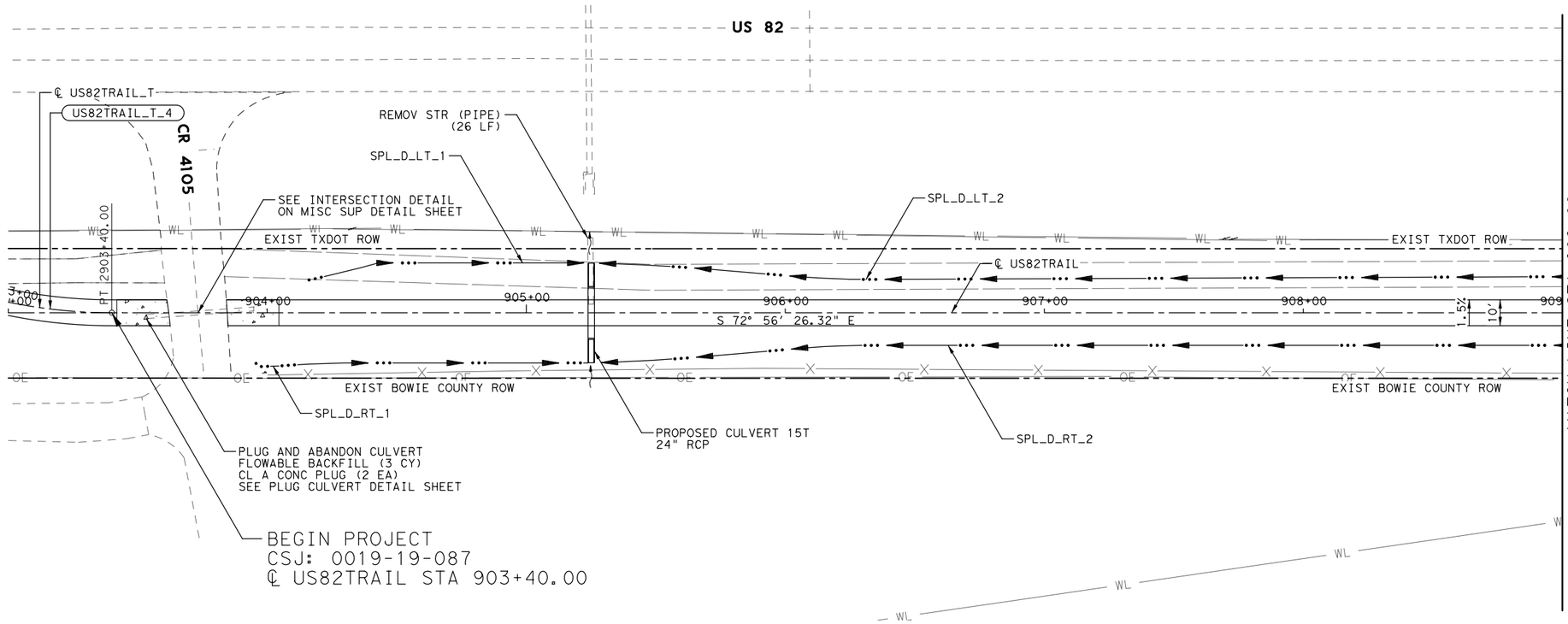
VARIOUS

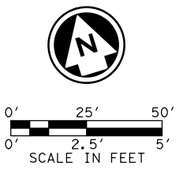
PLAN AND PROFILE
SUP TRANSITION

SCALE: 1" = 50' H, 1" = 5' V — SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	39
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*TRANS*PP01.dgn



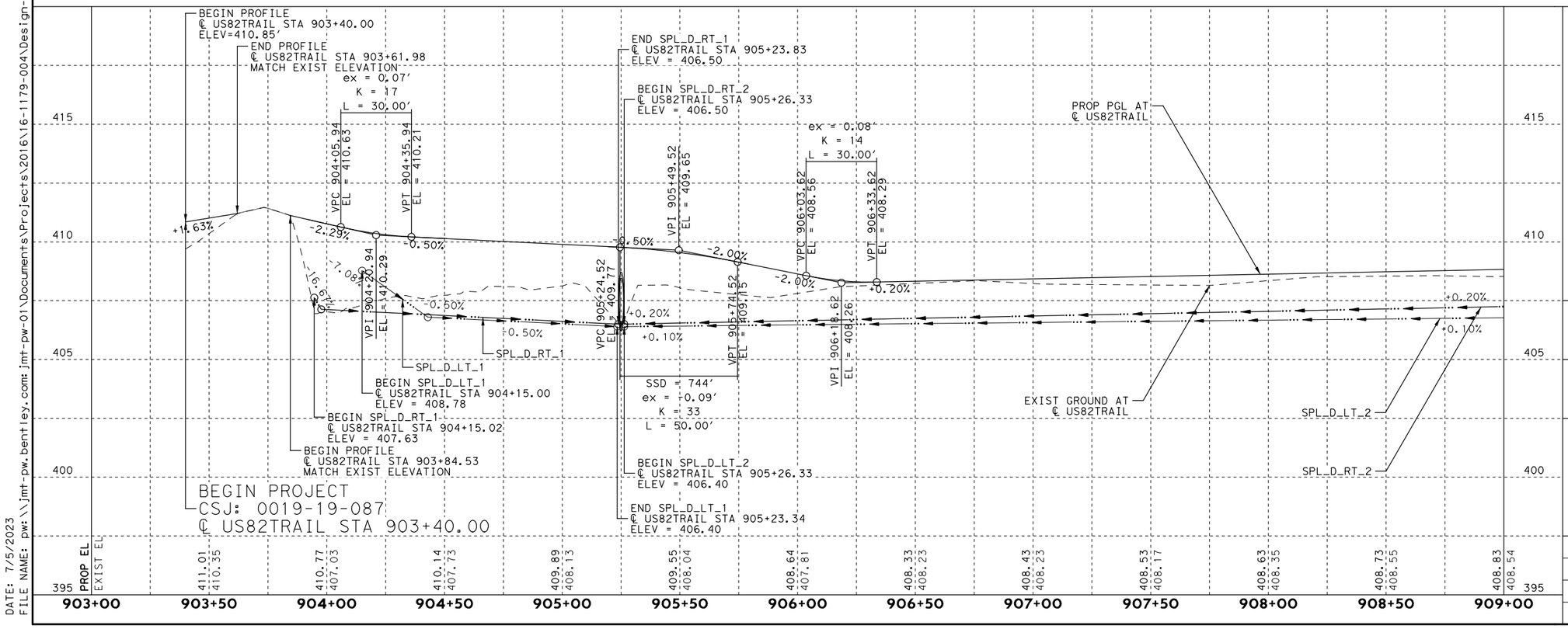


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.
7. SEE PLAN AND PROFILE SUP TRANSITION SHEET 1 FOR ℄ US82TRAIL_T INFORMATION.



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STATE OF TEXAS

7/5/2023

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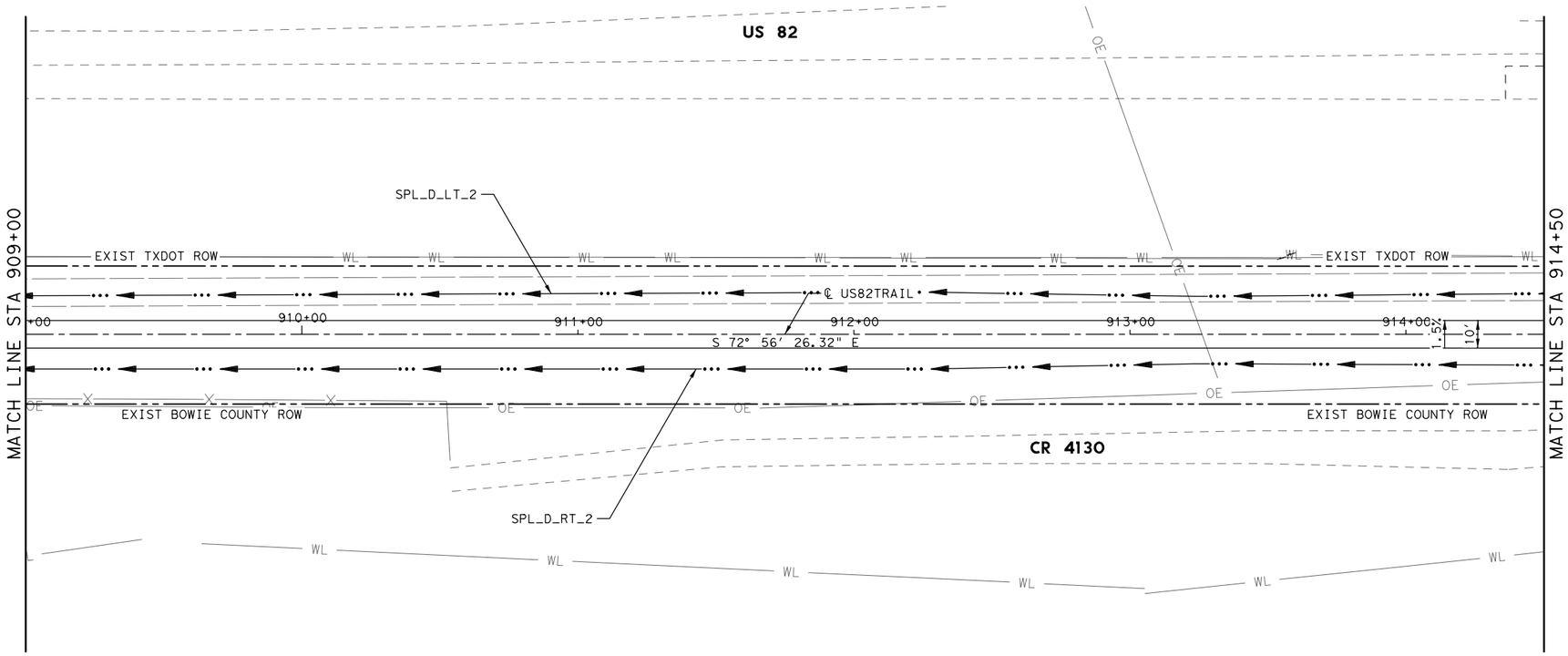
VARIOUS

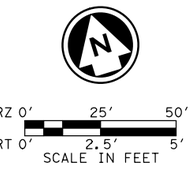
PLAN AND PROFILE
BEGIN TO STA 909+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 1 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	40
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP070.dgn



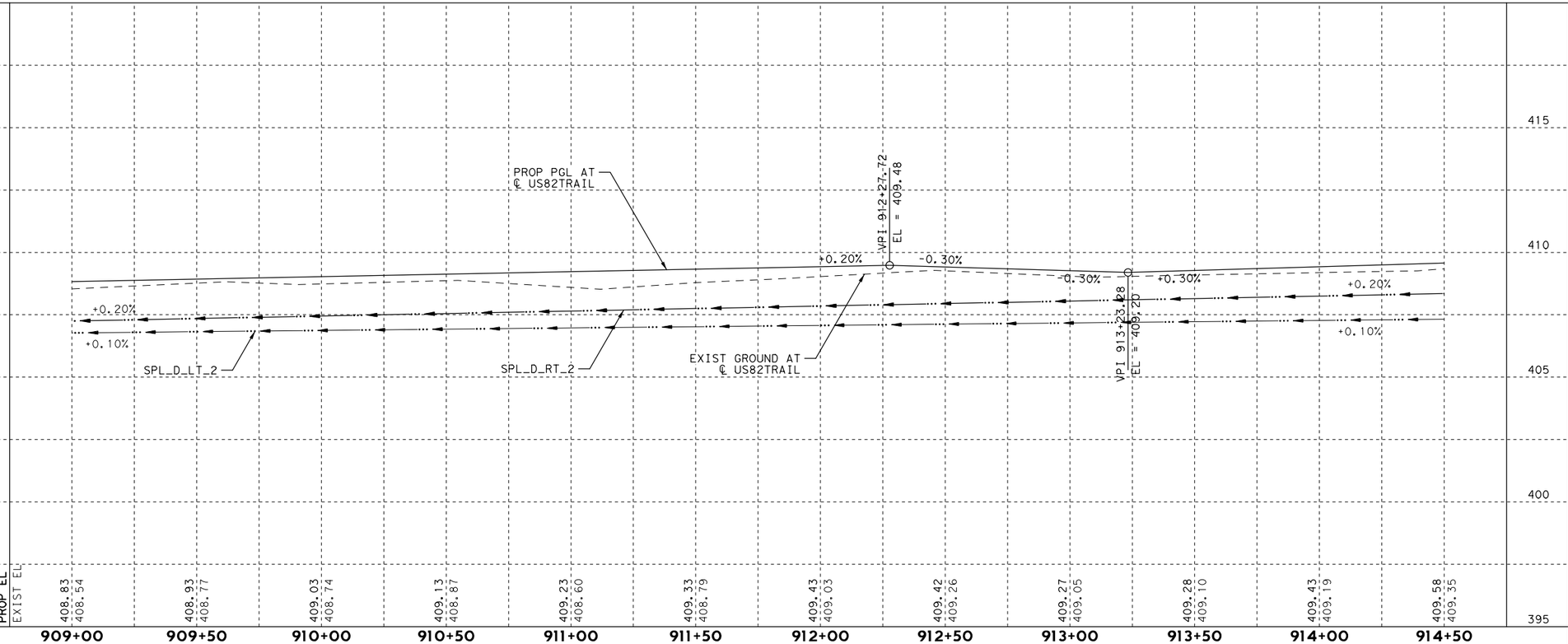


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

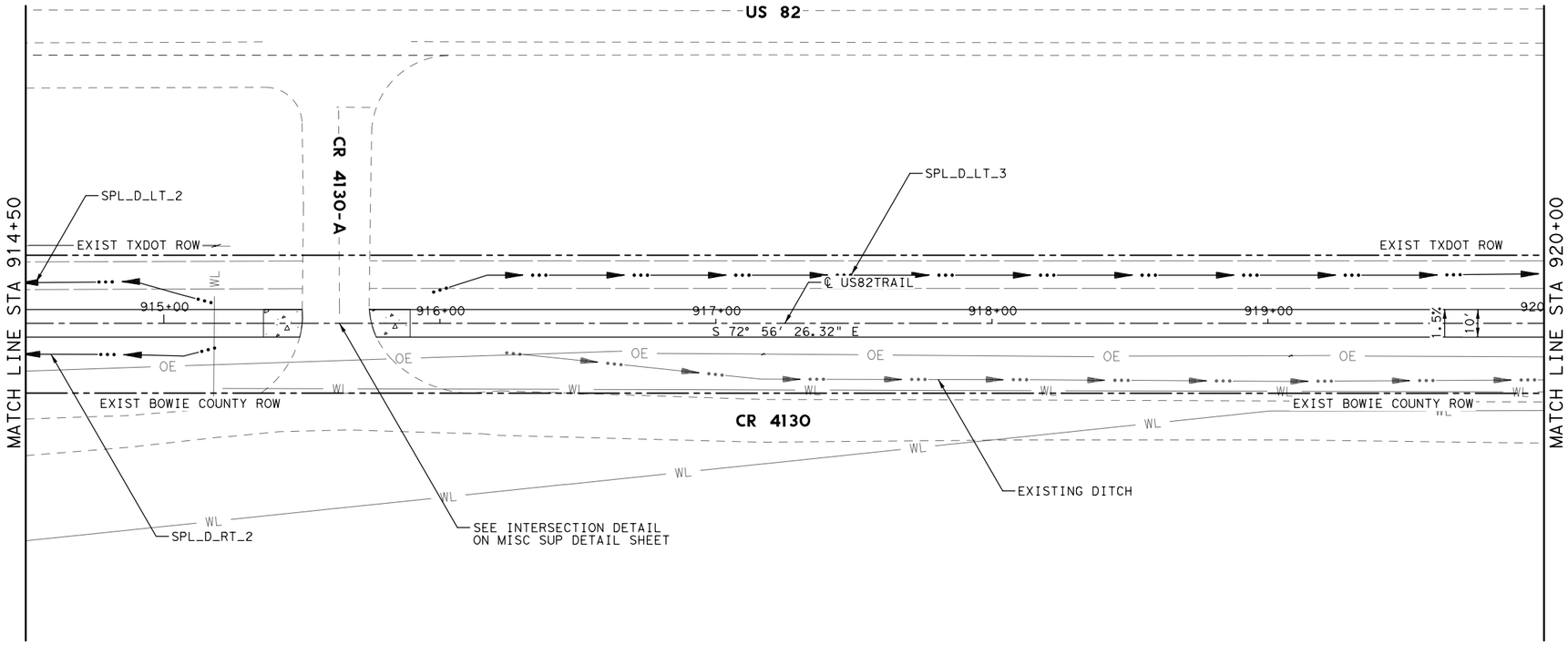
VARIOUS

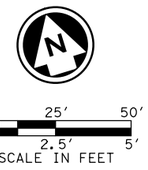
PLAN AND PROFILE
STA 909+00 TO STA 914+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 2 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	41
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP071.dgn



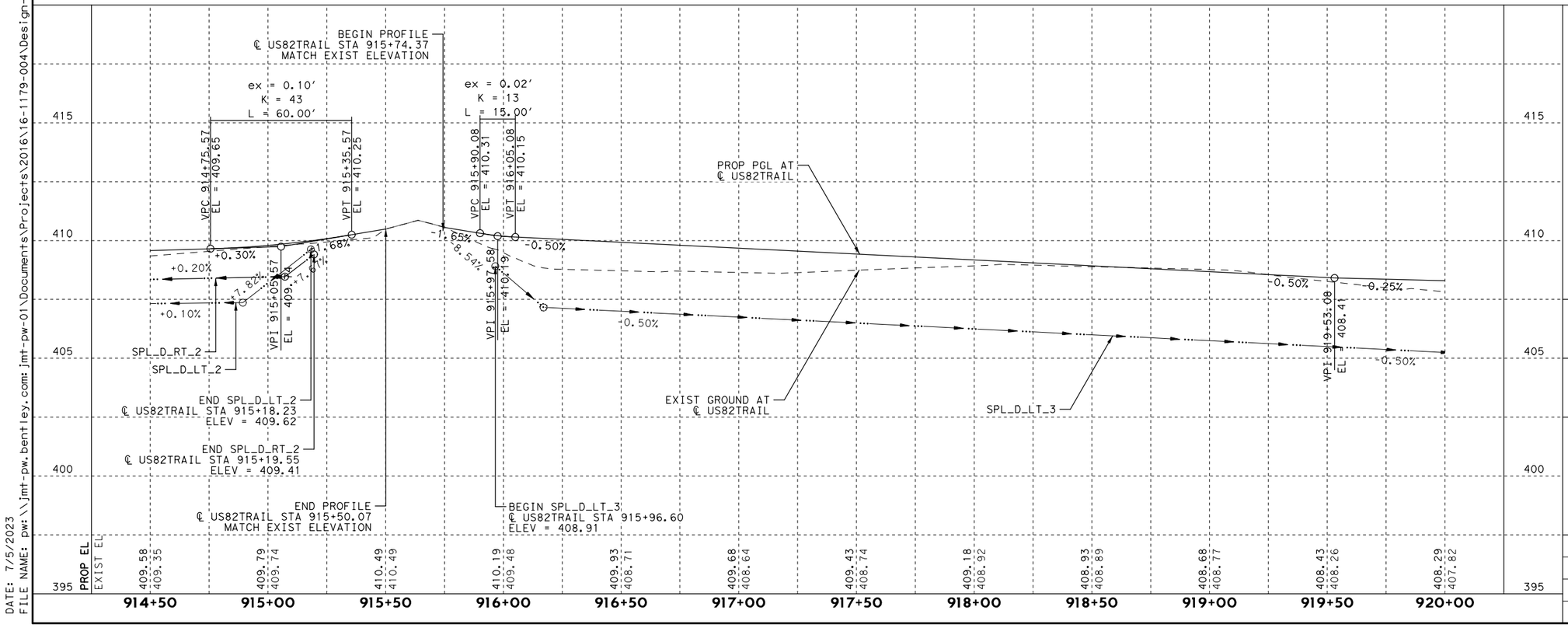


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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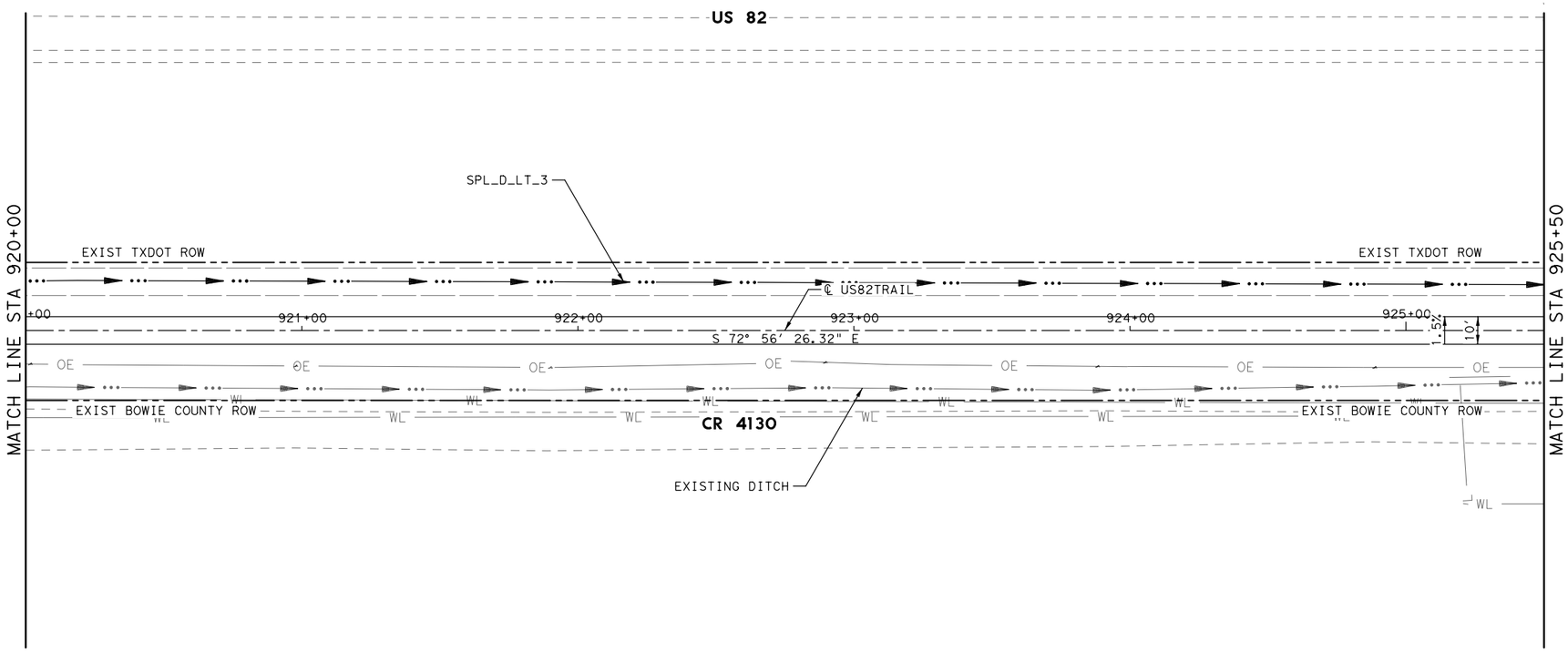
VARIOUS

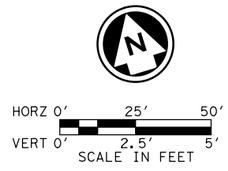
PLAN AND PROFILE
STA 914+50 TO STA 920+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 3 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	42
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP072.dgn



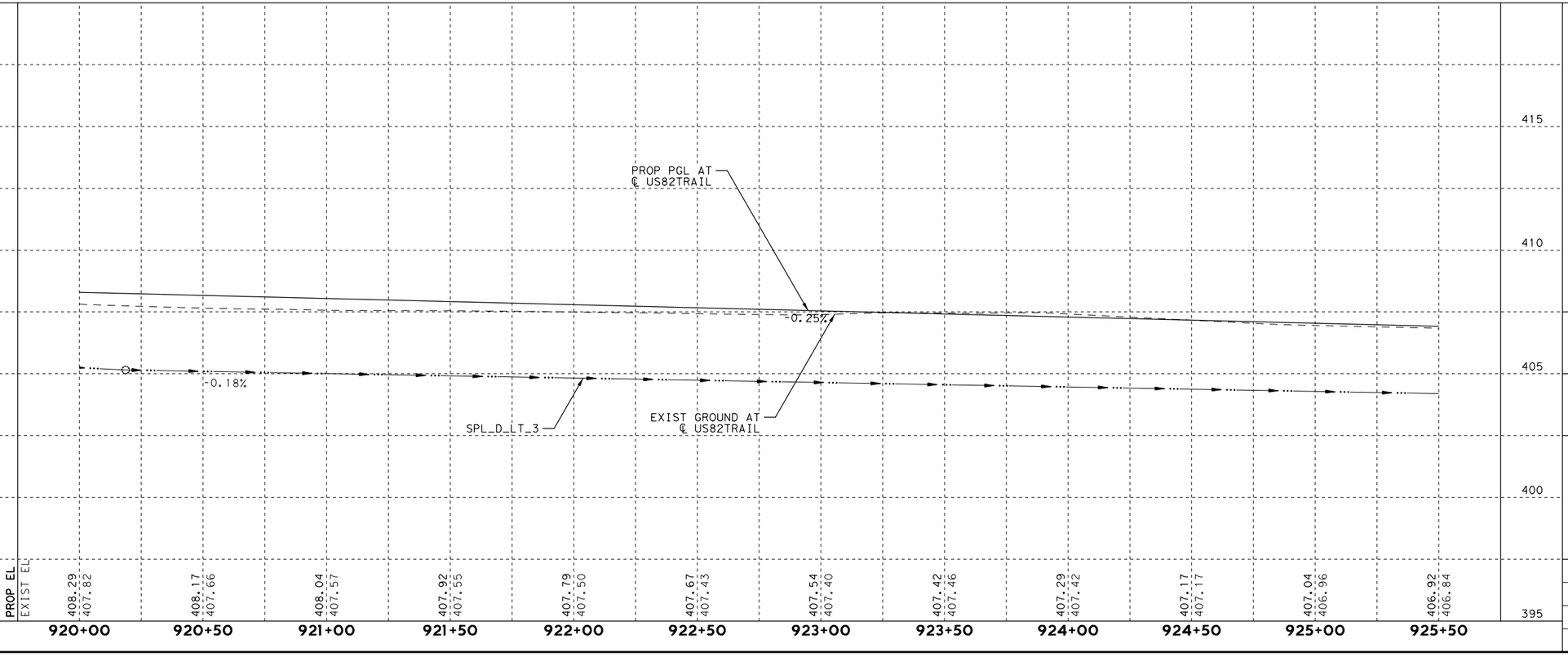


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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STATE OF TEXAS

7/5/2023

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Texas Department of Transportation

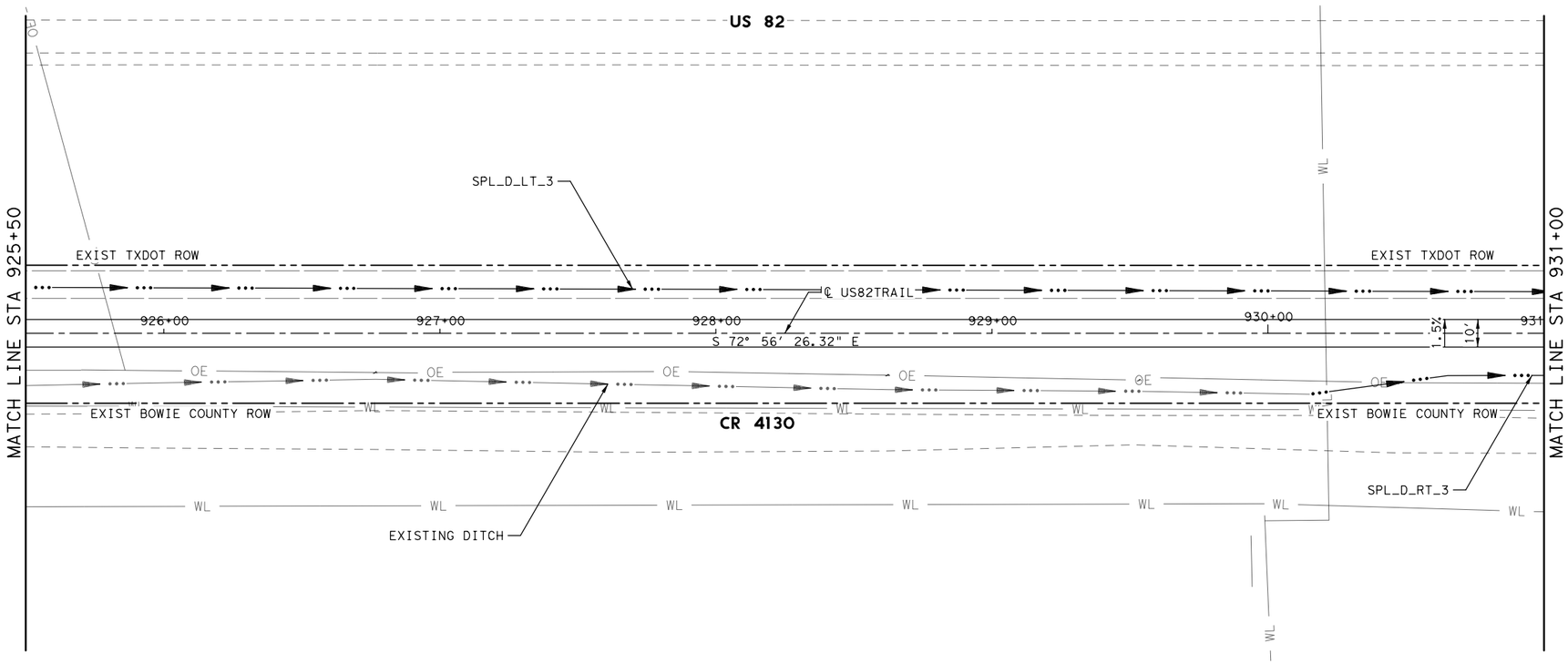
VARIOUS

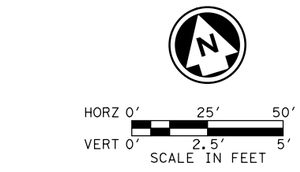
PLAN AND PROFILE
STA 920+00 TO STA 925+50

SCALE: 1" = 50' H, 1" = 5' V

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	43
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP073.dgn



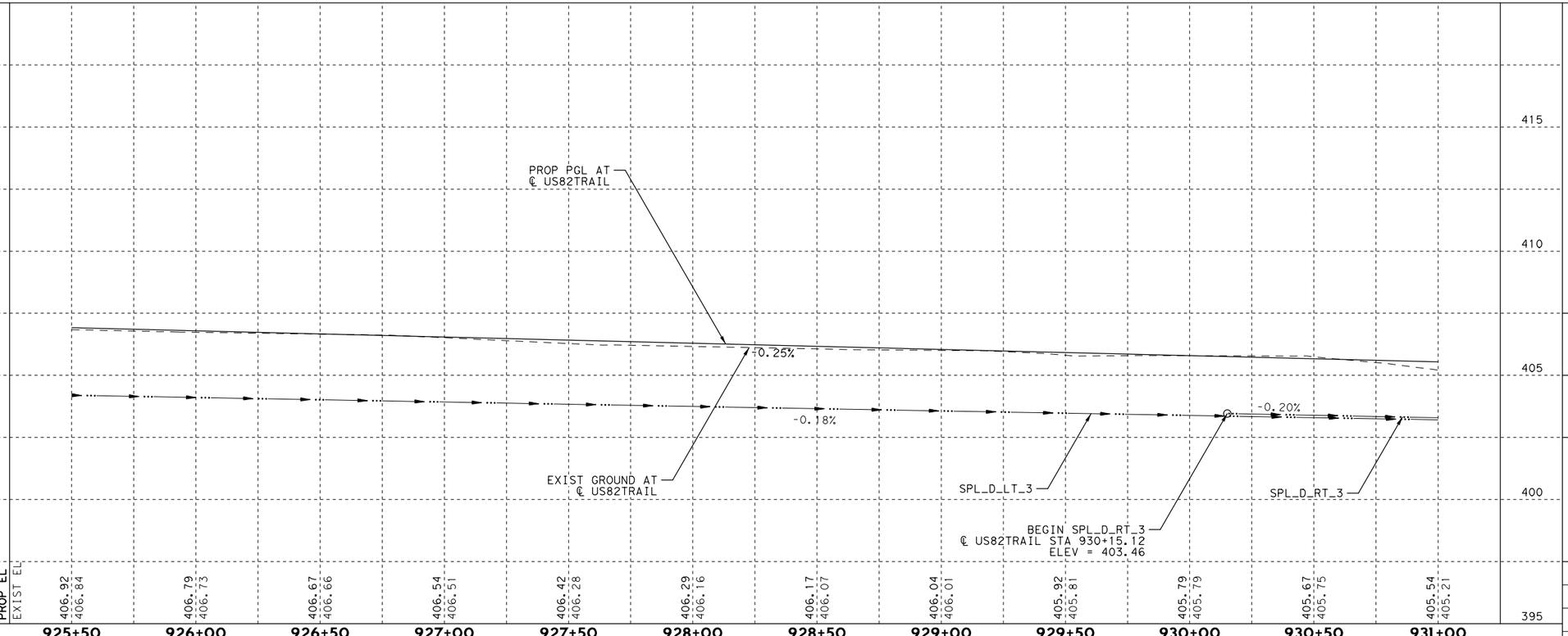


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

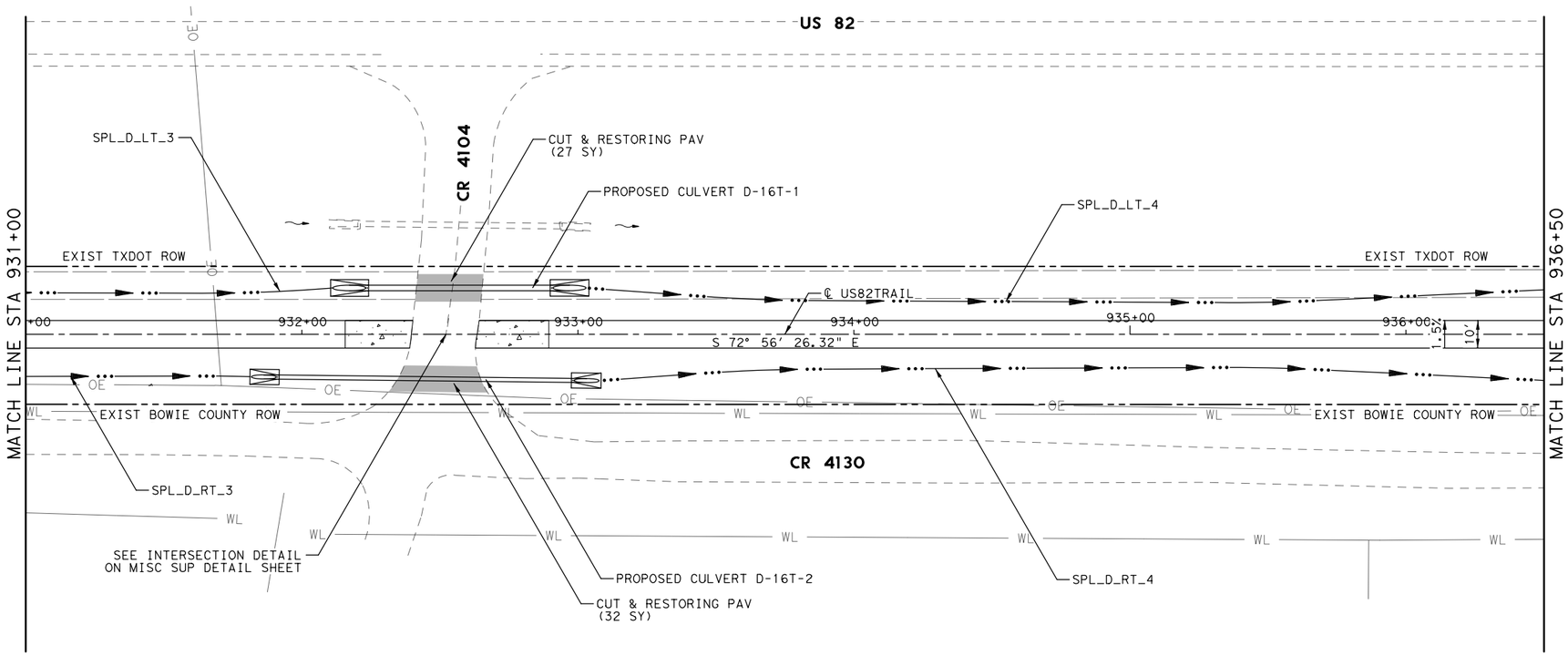
VARIOUS

PLAN AND PROFILE
STA 925+50 TO STA 931+00

SCALE: 1" = 50' H, 1" = 5' V

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	44
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP074.dgn



HORZ 0' 25' 50'
VERT 0' 2.5' 5'
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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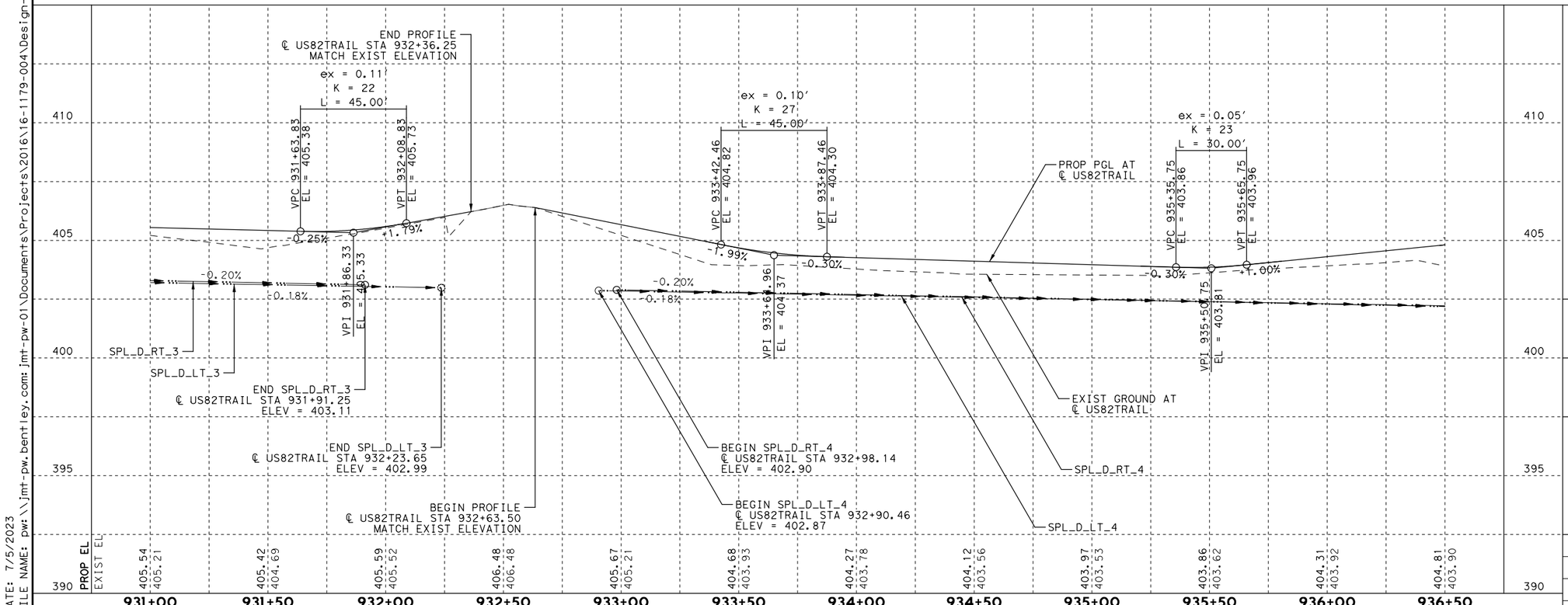
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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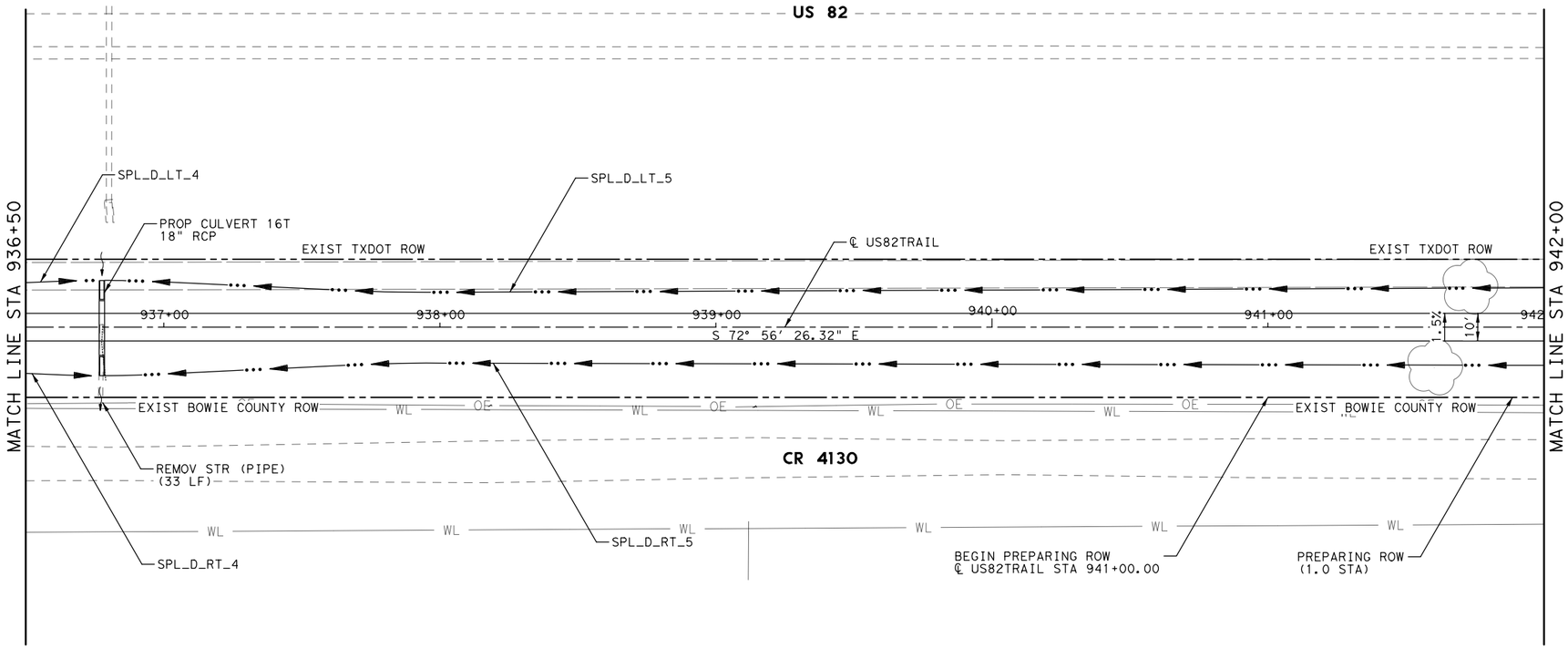
VARIOUS

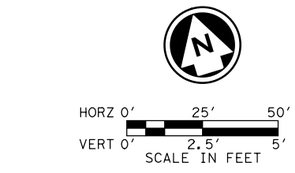
PLAN AND PROFILE
STA 931+00 TO STA 936+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 6 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	45
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP075.dgn



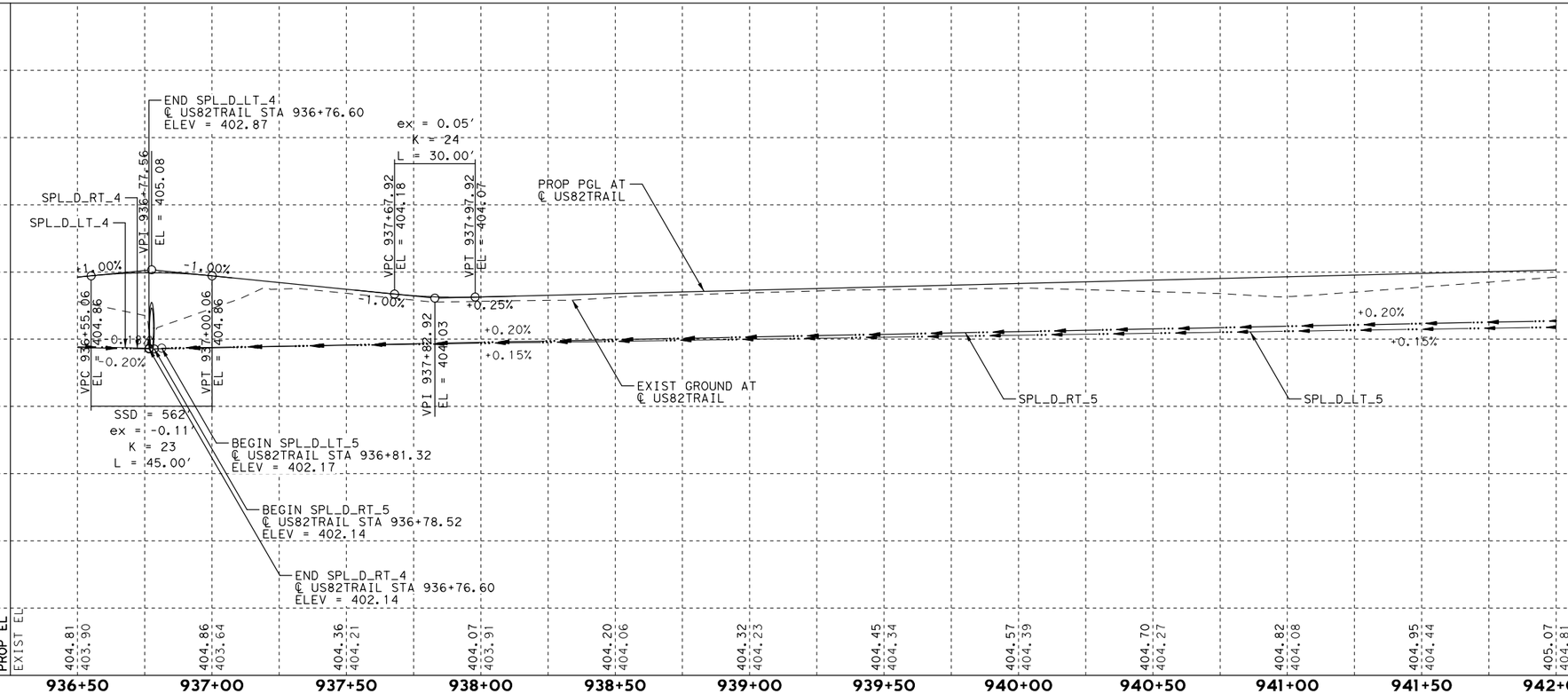


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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Texas Department of Transportation

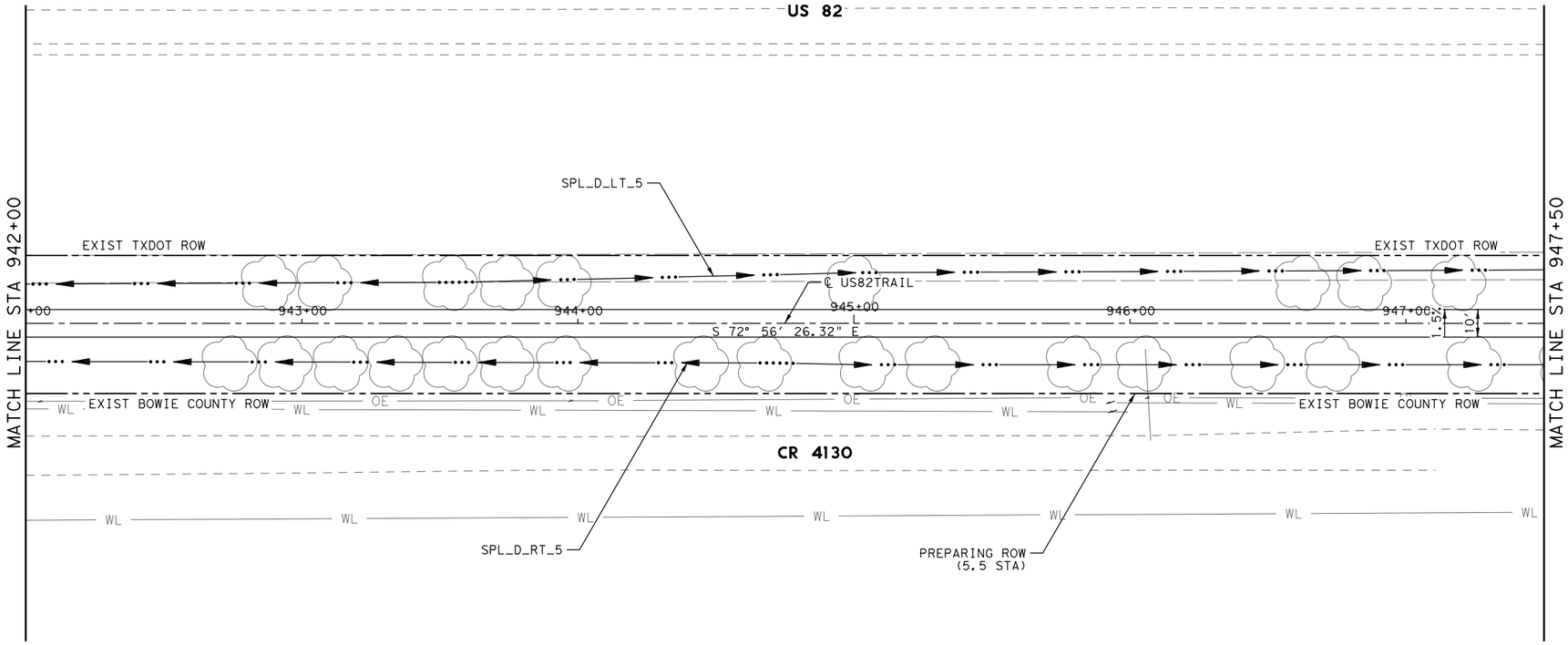
VARIOUS

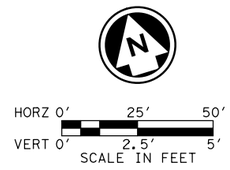
PLAN AND PROFILE
STA 936+50 TO STA 942+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 7 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	46
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP076.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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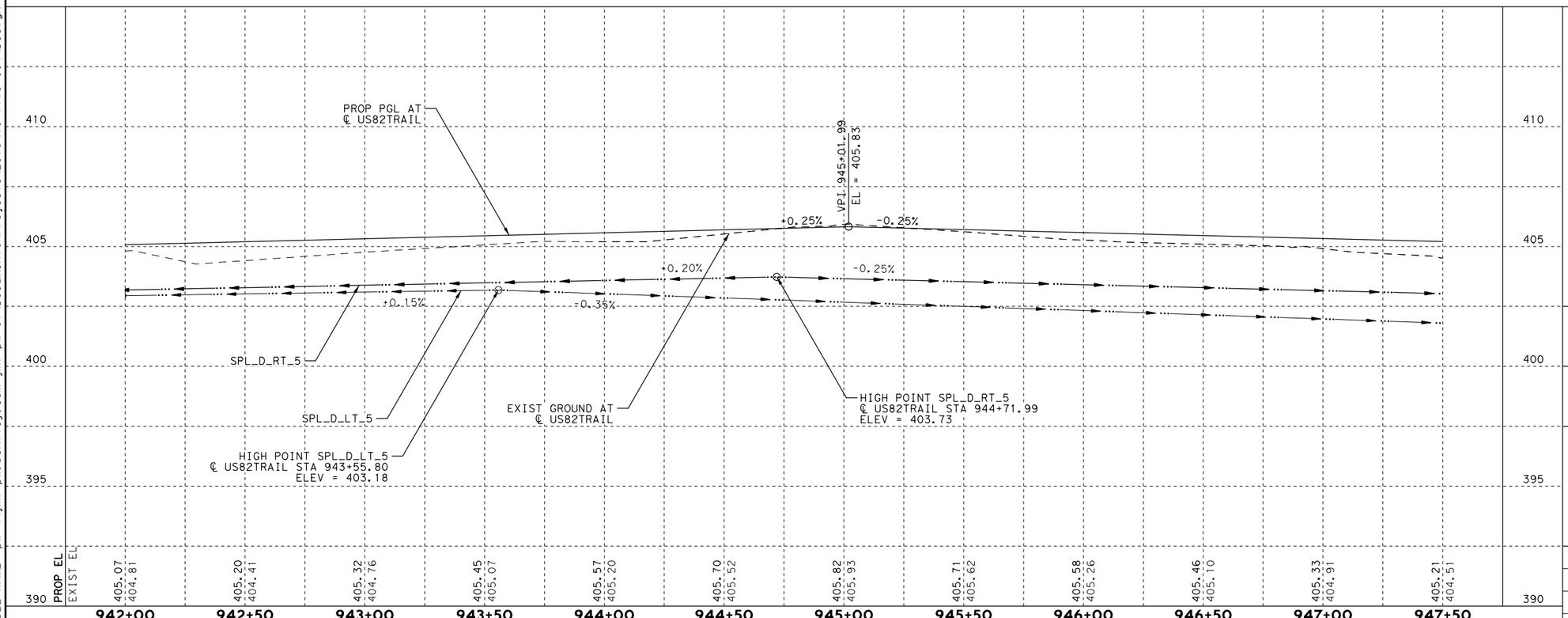

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JMT TBPE REGISTRATION NO. F-16341

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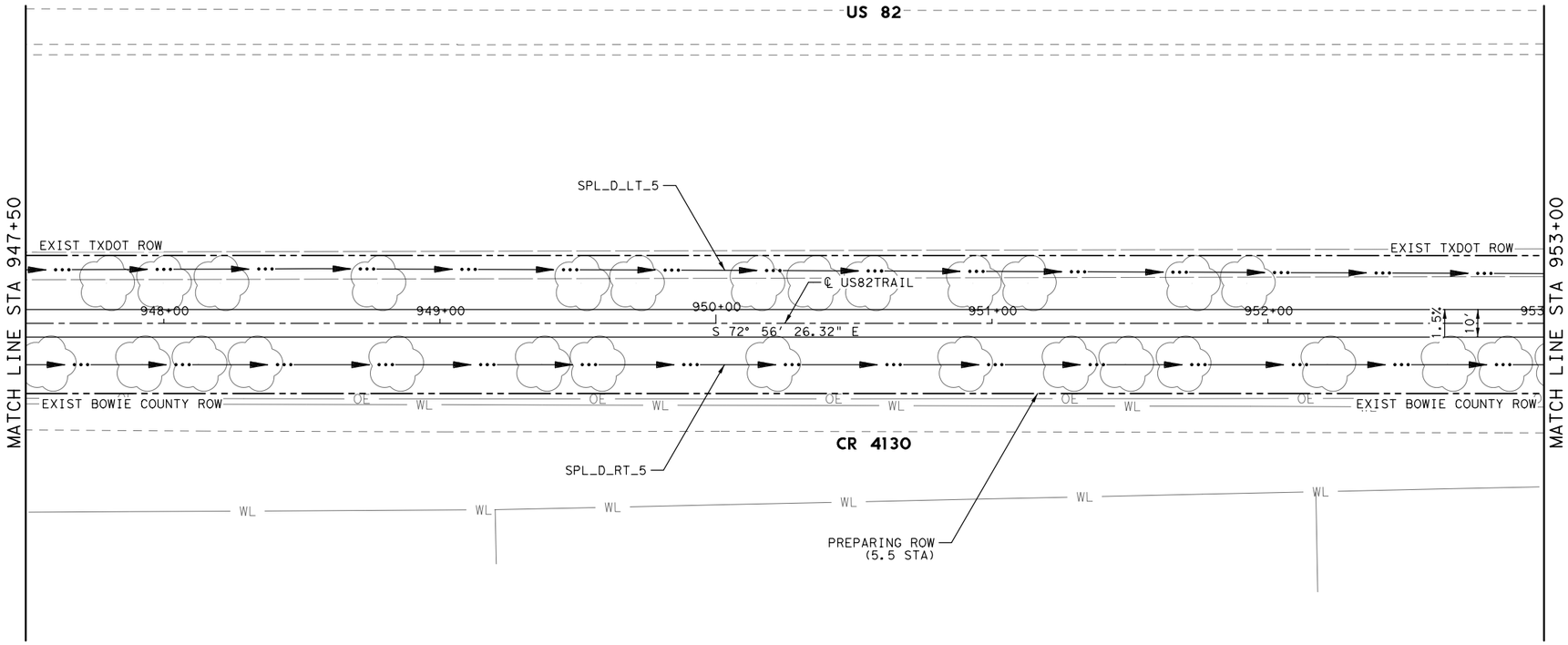
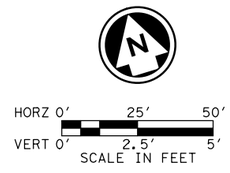
VARIOUS

PLAN AND PROFILE
STA 942+00 TO STA 947+50

SCALE: 1" = 50' H, 1" = 5' V

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	47
JMT	0919	19	087	





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
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3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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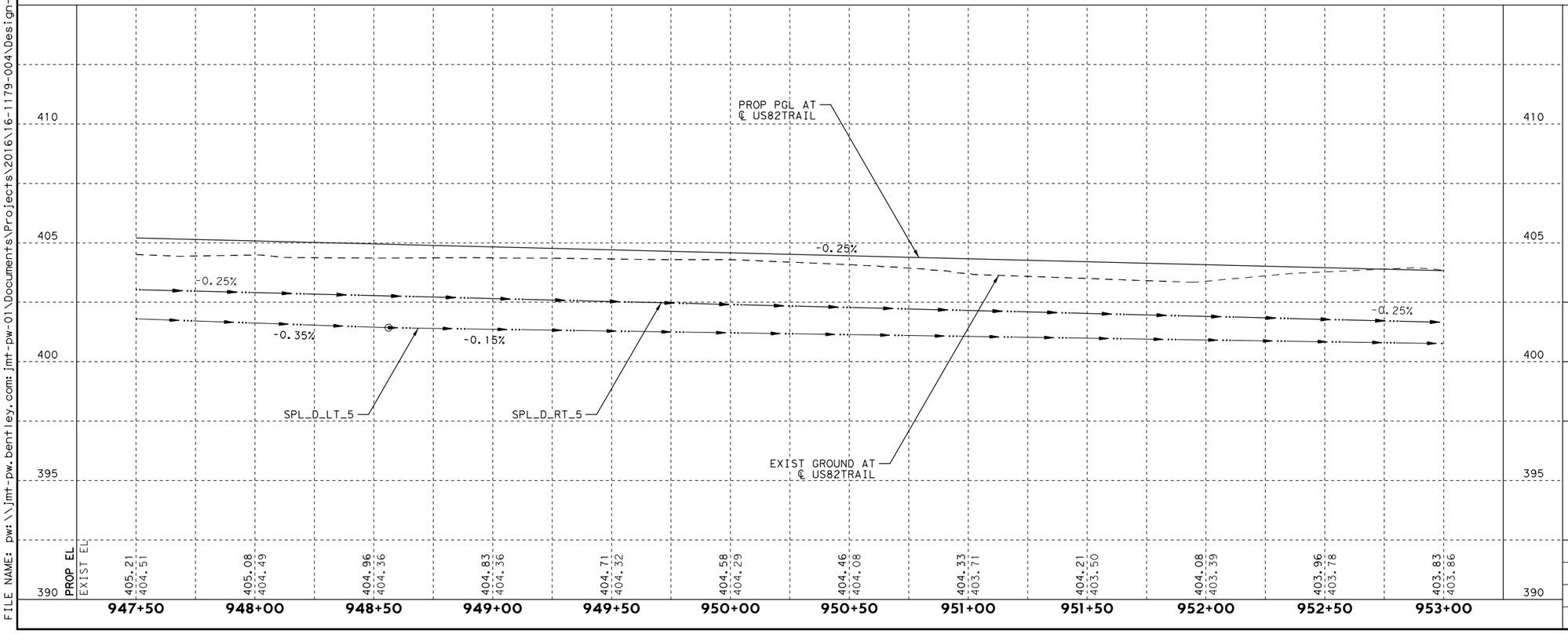

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STATE OF TEXAS

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VARIOUS

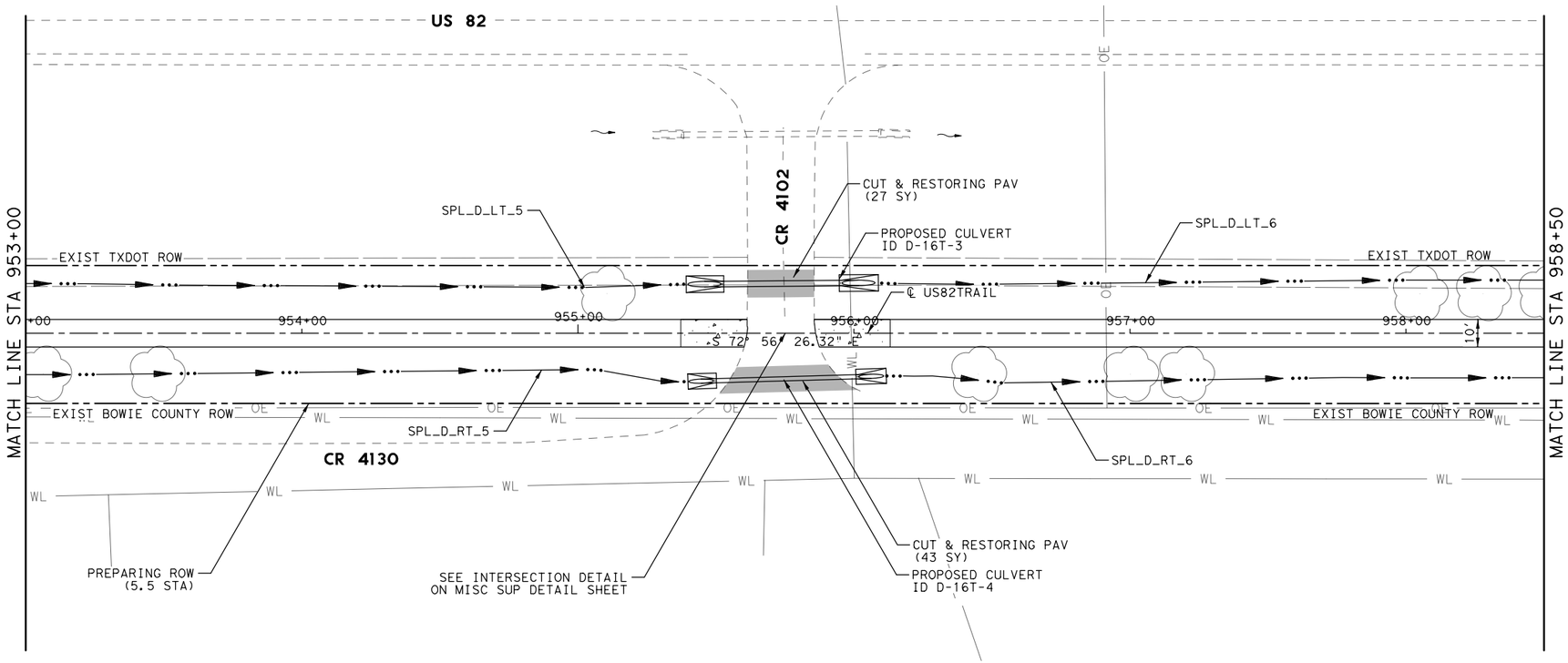
PLAN AND PROFILE
STA 947+50 TO STA 953+00

SCALE: 1" = 50' H, 1" = 5' V

SHEET 9 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	48
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP078.dgn



HORZ 0′ 25′ 50′
VERT 0′ 2.5′ 5′
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
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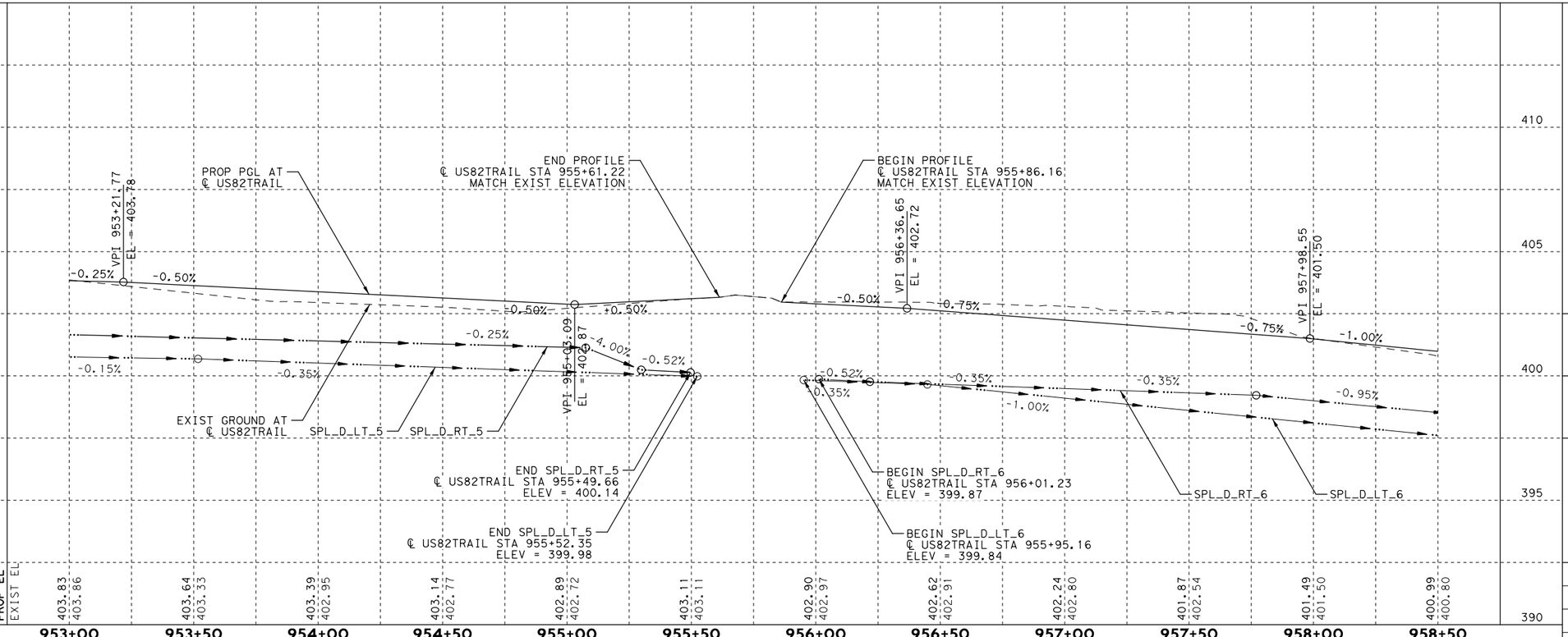

STATE OF TEXAS
ROBERT J. RAMON
111661
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7/5/2023

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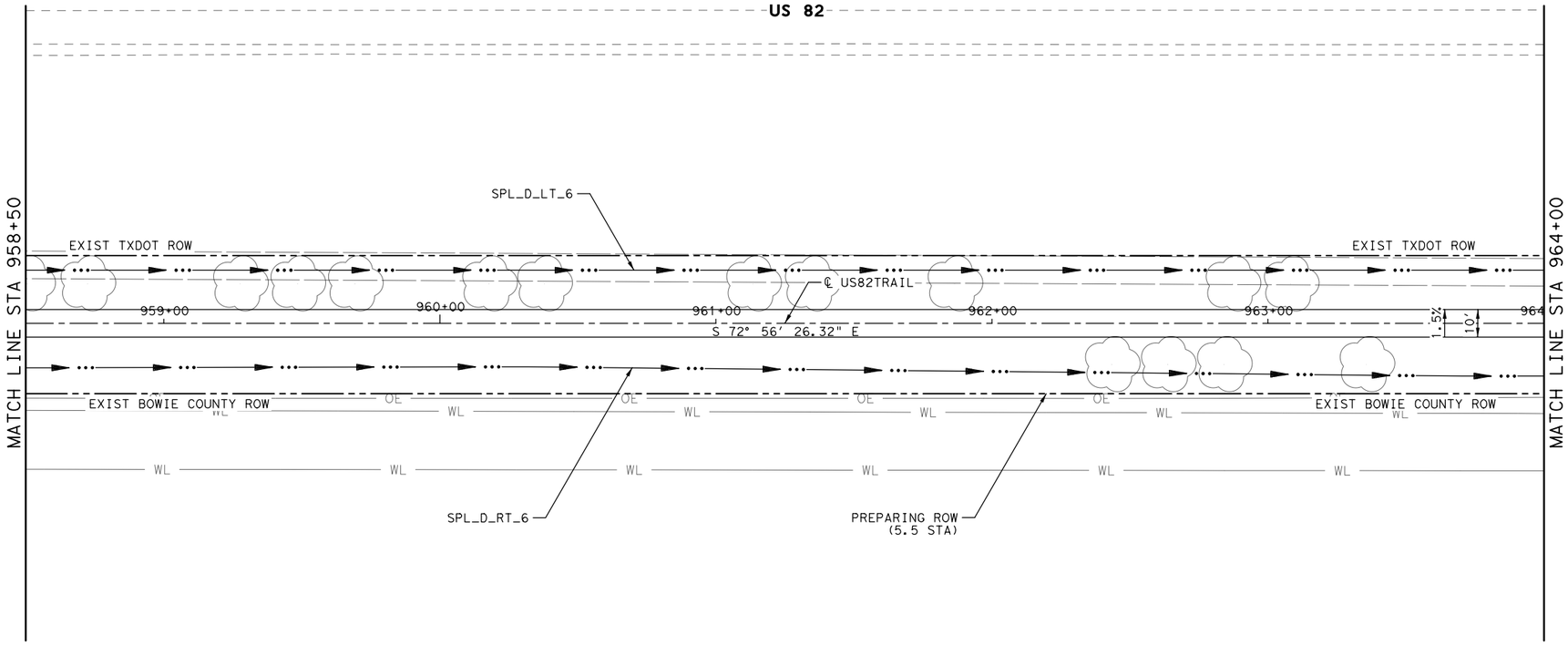
VARIOUS

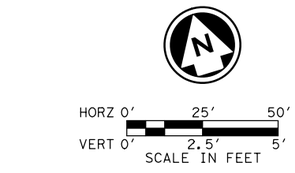
PLAN AND PROFILE
STA 953+00 TO STA 958+50

SCALE: 1" = 50′ H, 1" = 5′ V SHEET 10 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	49
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP079.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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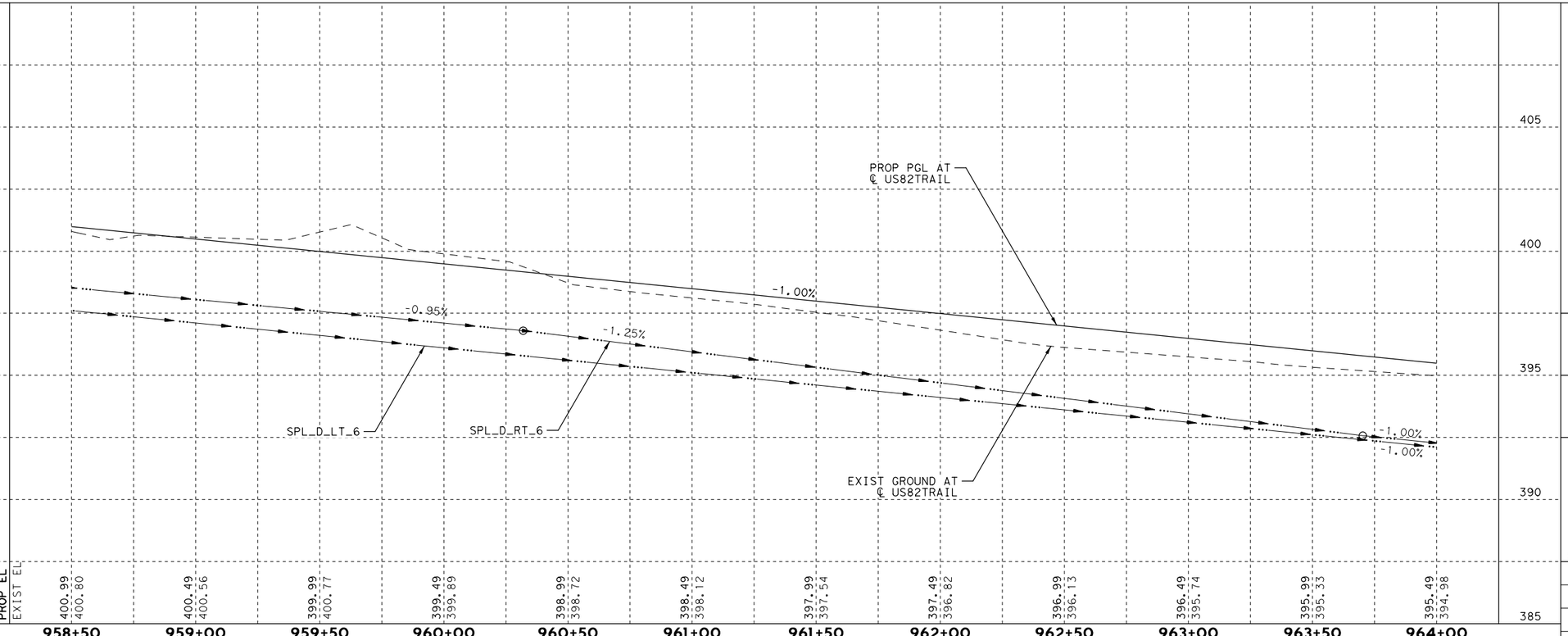
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



STATE OF TEXAS
ROBERT J. RAMON
111661
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PROFESSIONAL ENGINEER

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

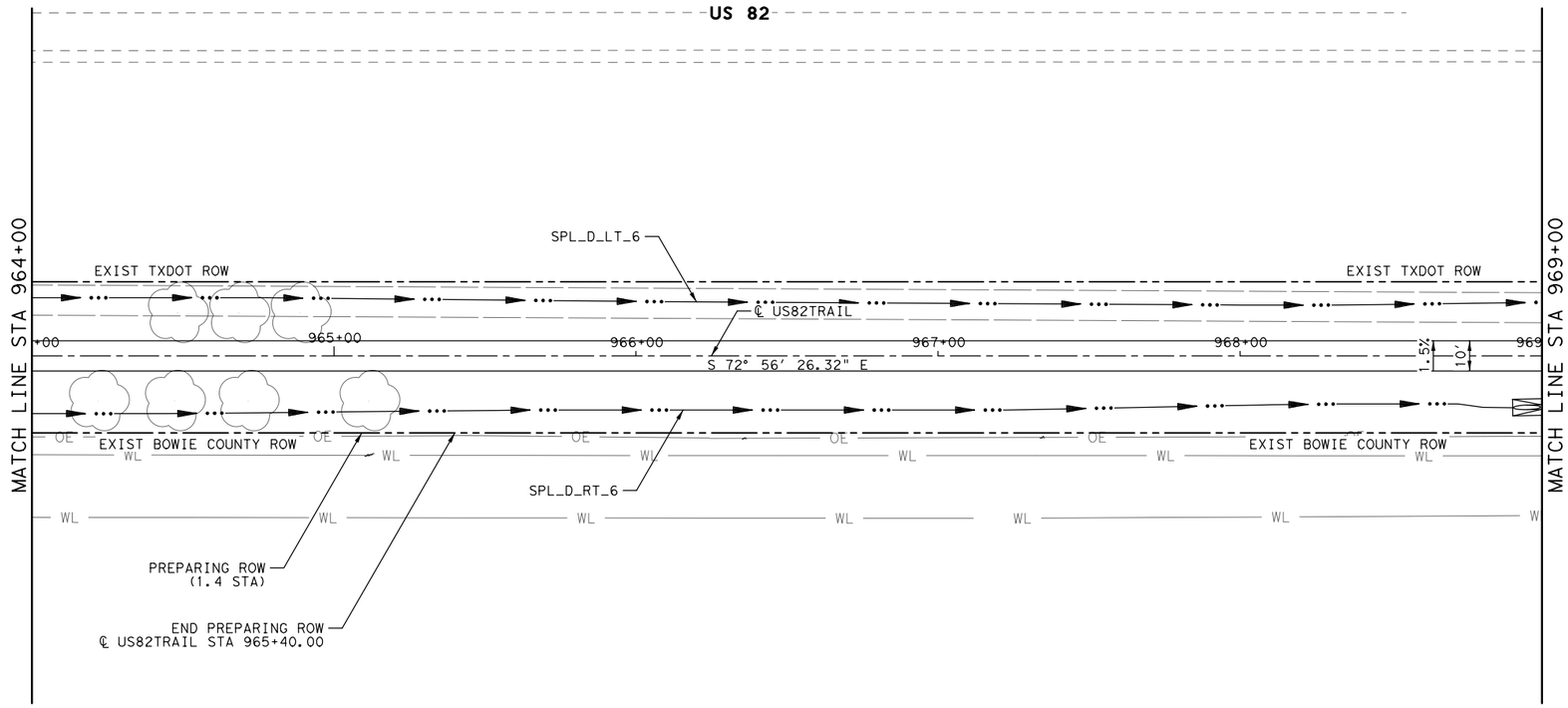
VARIOUS

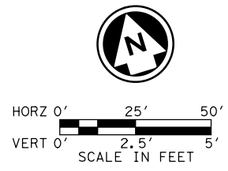
PLAN AND PROFILE
STA 958+50 TO STA 964+00

SCALE: 1" = 50' H, 1" = 5' V

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	50
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP080.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
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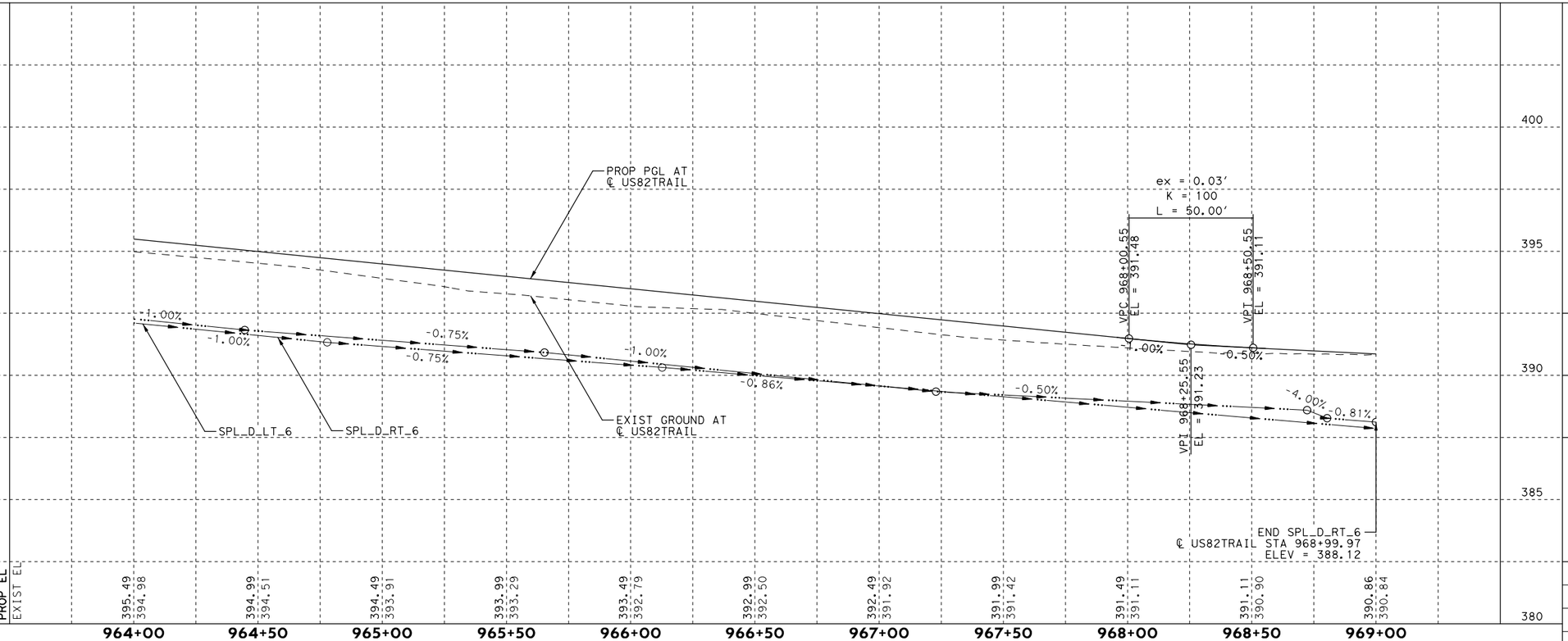

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STATE OF TEXAS

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

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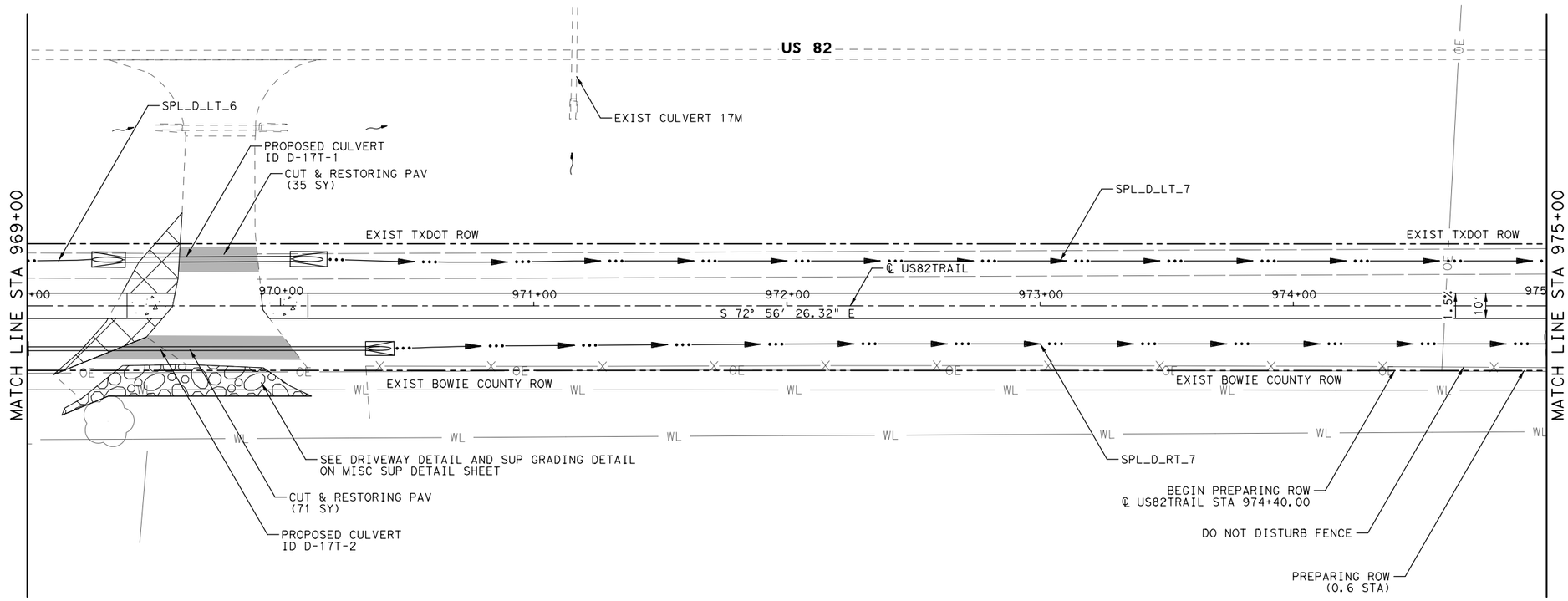
VARIOUS

PLAN AND PROFILE
STA 964+00 TO STA 969+00

SCALE: 1" = 50' H, 1" = 5' V SHEET 12 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	51
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP081.dgn



HORZ 0' 25' 50'
VERT 0' 2.5' 5'
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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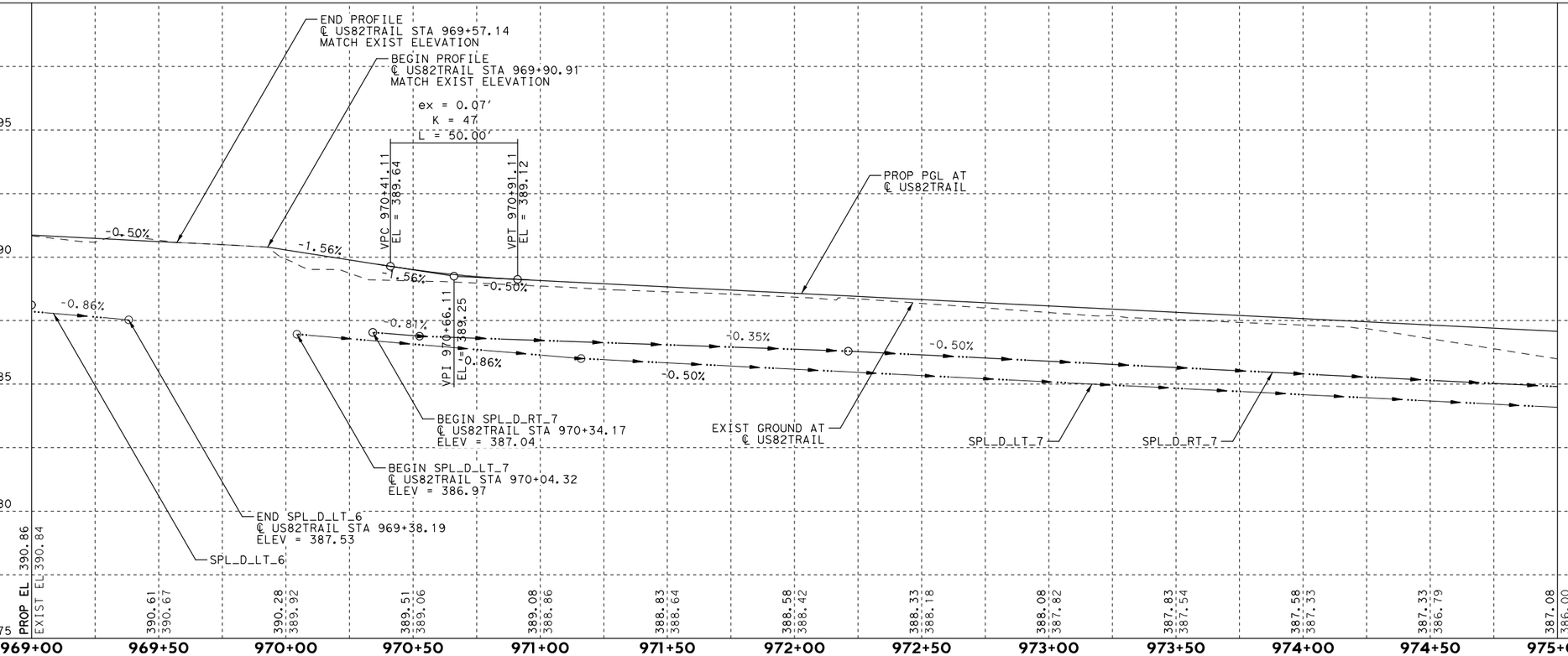

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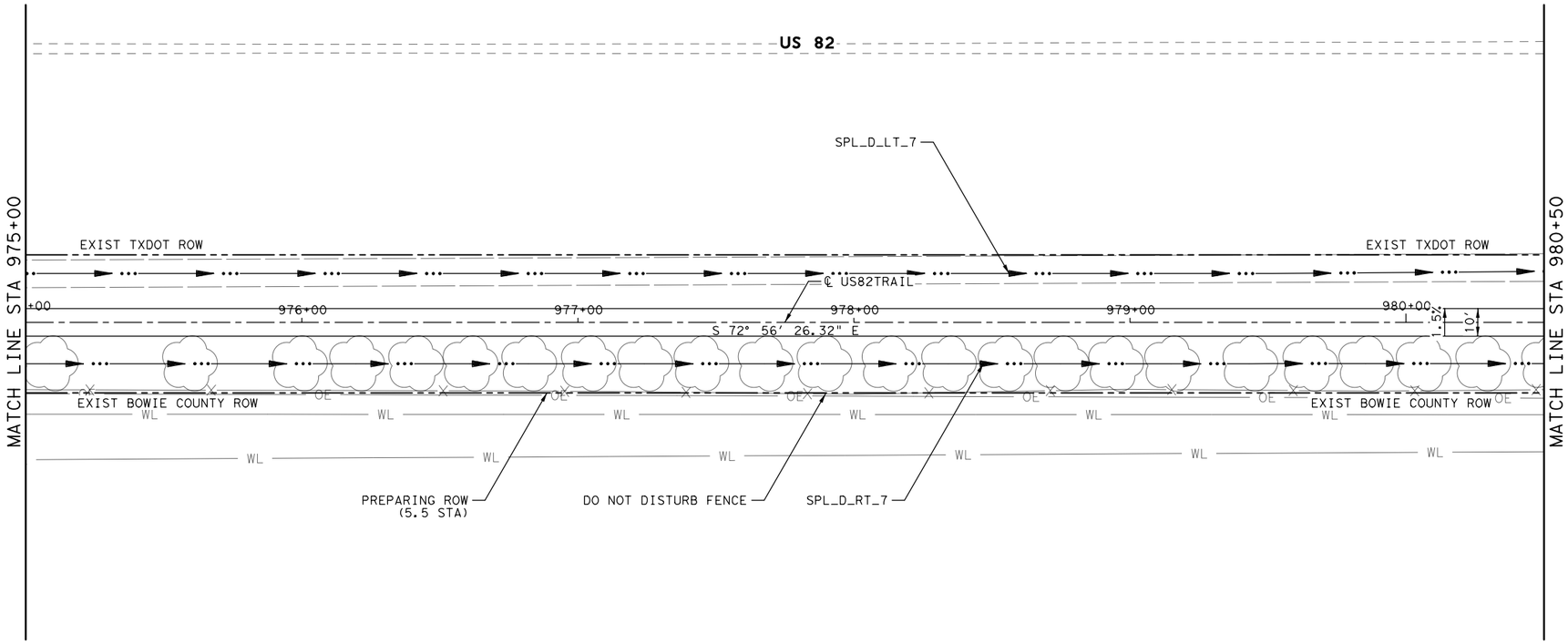
VARIOUS

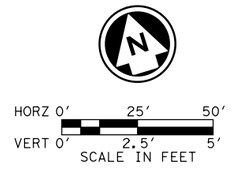
PLAN AND PROFILE
STA 969+00 TO STA 975+00

SCALE: 1" = 50' H, 1" = 5' V SHEET 13 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	52
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP082.dgn



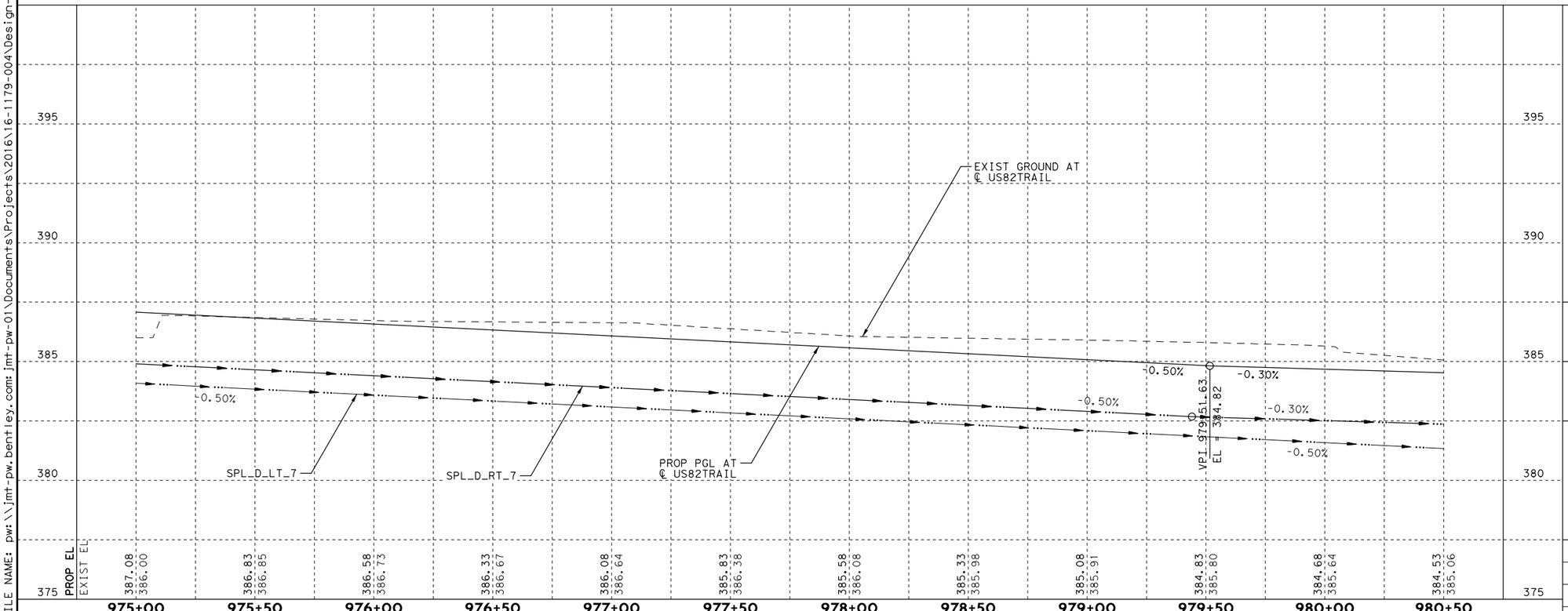


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



ROBERT J. RAMON
111661
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

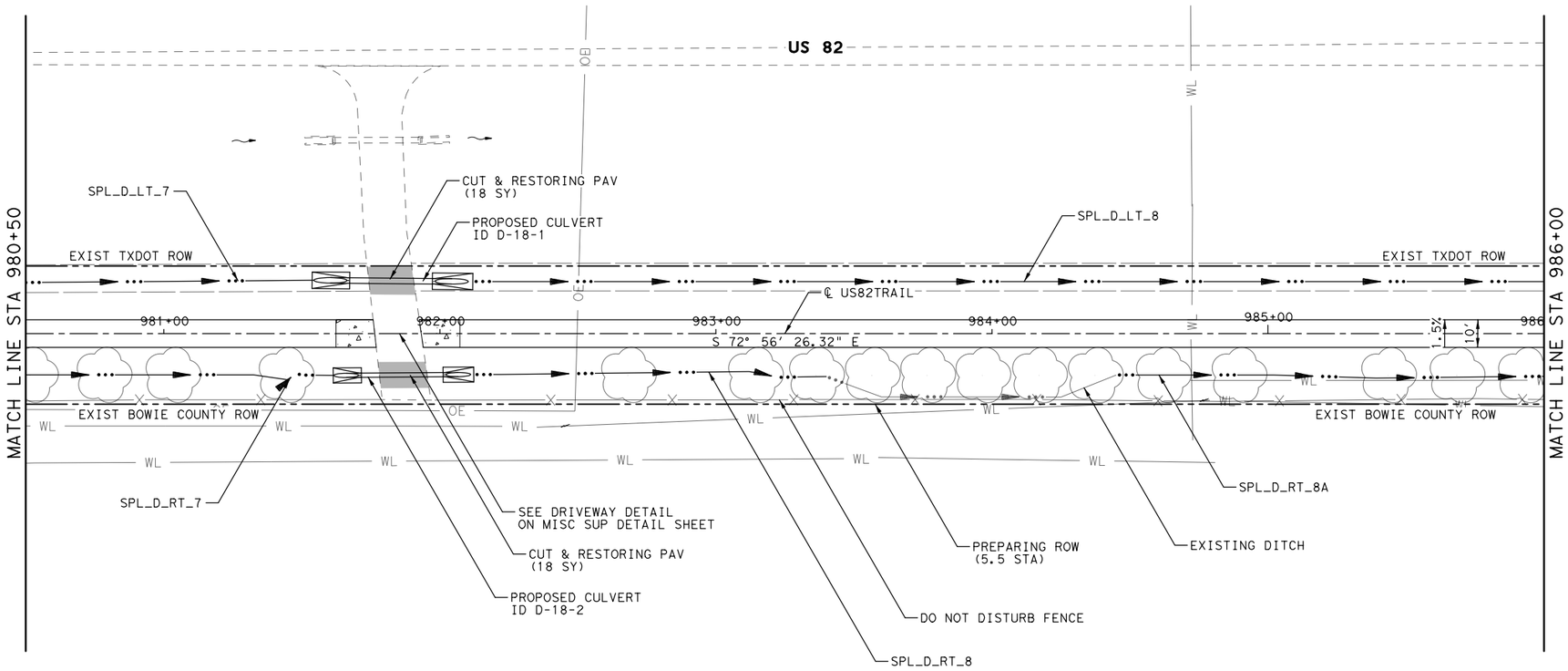
VARIOUS

PLAN AND PROFILE
STA 975+00 TO STA 980+50

SCALE: 1" = 50' H, 1" = 5' V

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	53
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP083.dgn

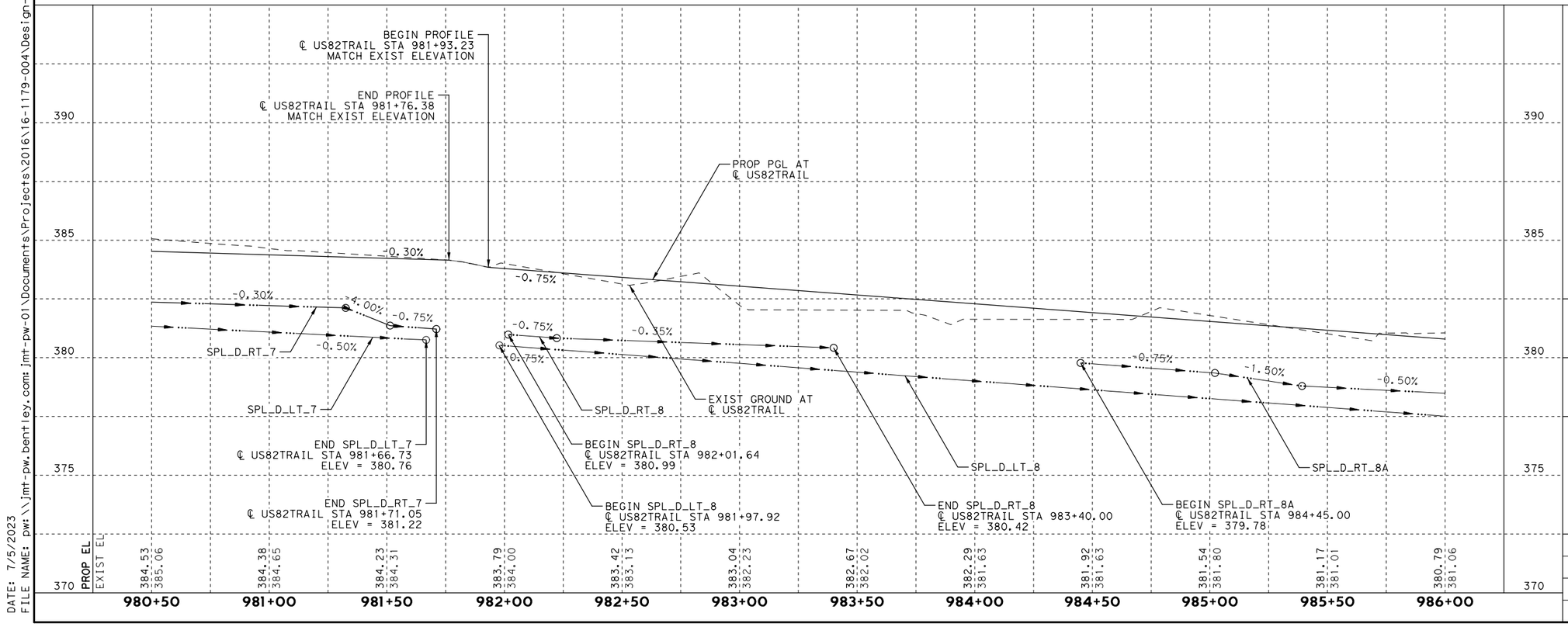


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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STATE OF TEXAS

7/5/2023

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TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

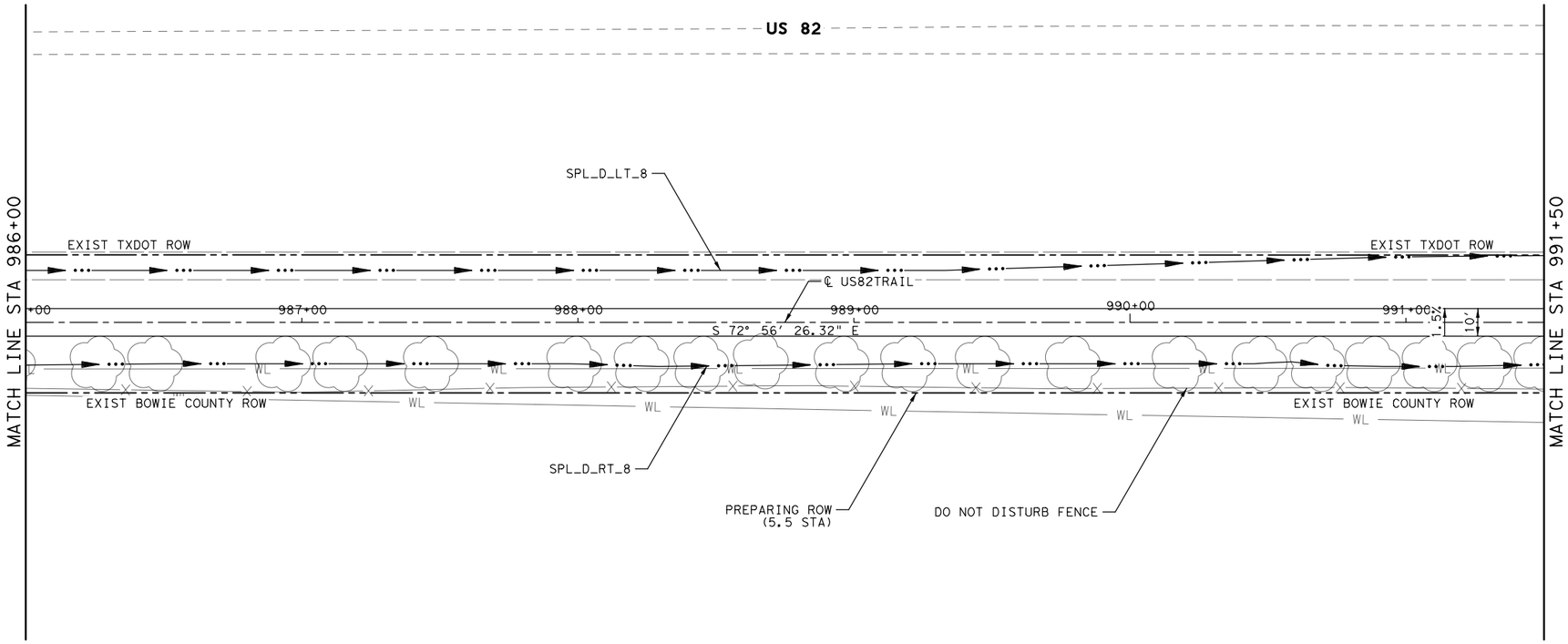
VARIOUS

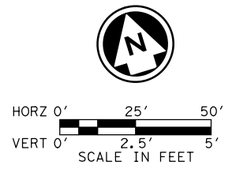
PLAN AND PROFILE
STA 980+50 TO STA 986+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 15 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	54
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP084.dgn



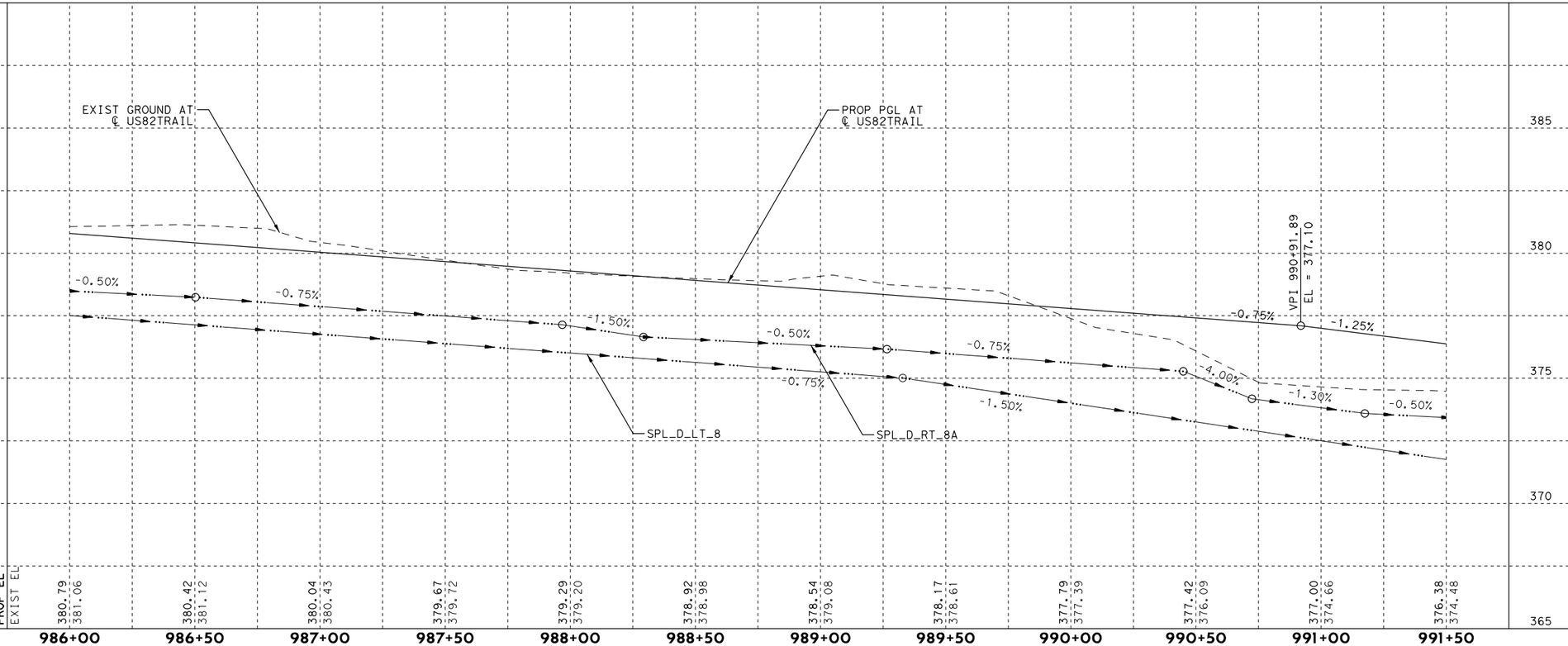


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



STATE OF TEXAS
ROBERT J. RAMON
111661
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PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

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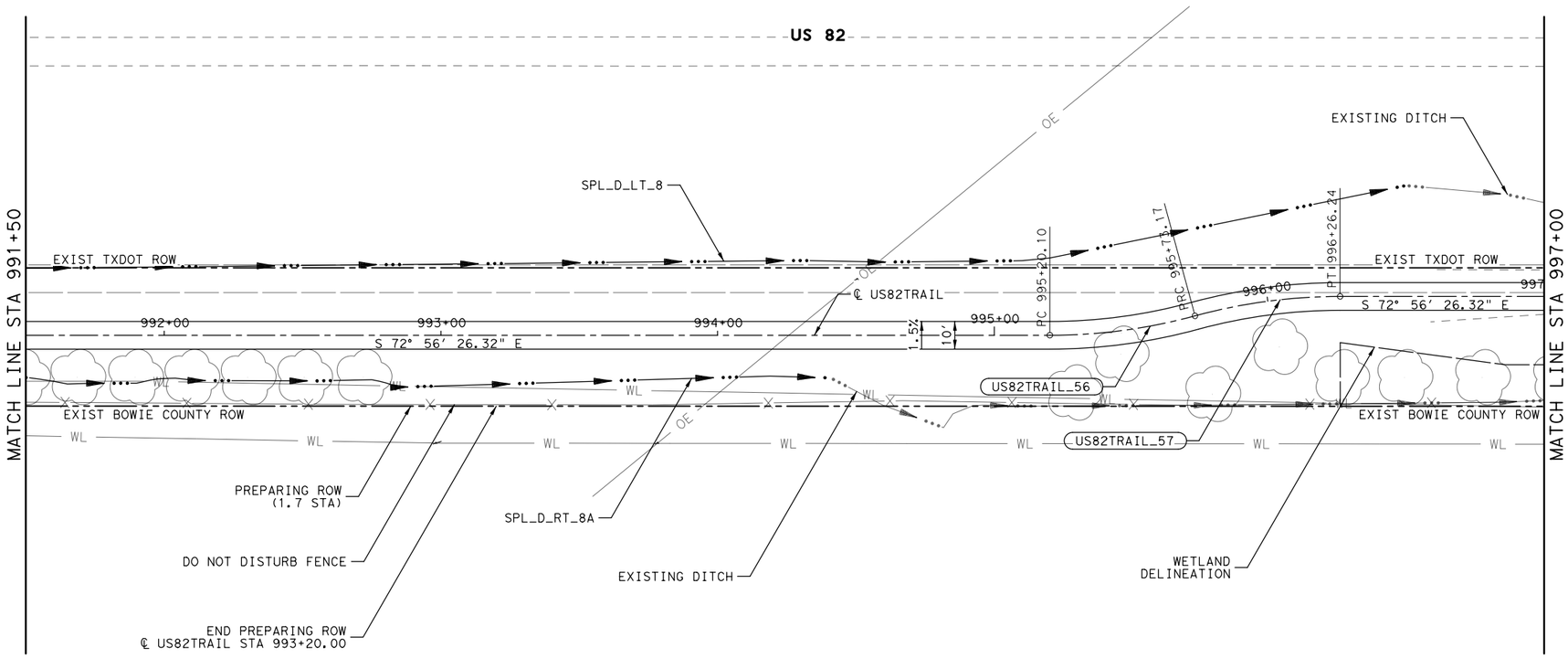
VARIOUS

PLAN AND PROFILE
STA 986+00 TO STA 991+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 16 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	55
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP085.dgn



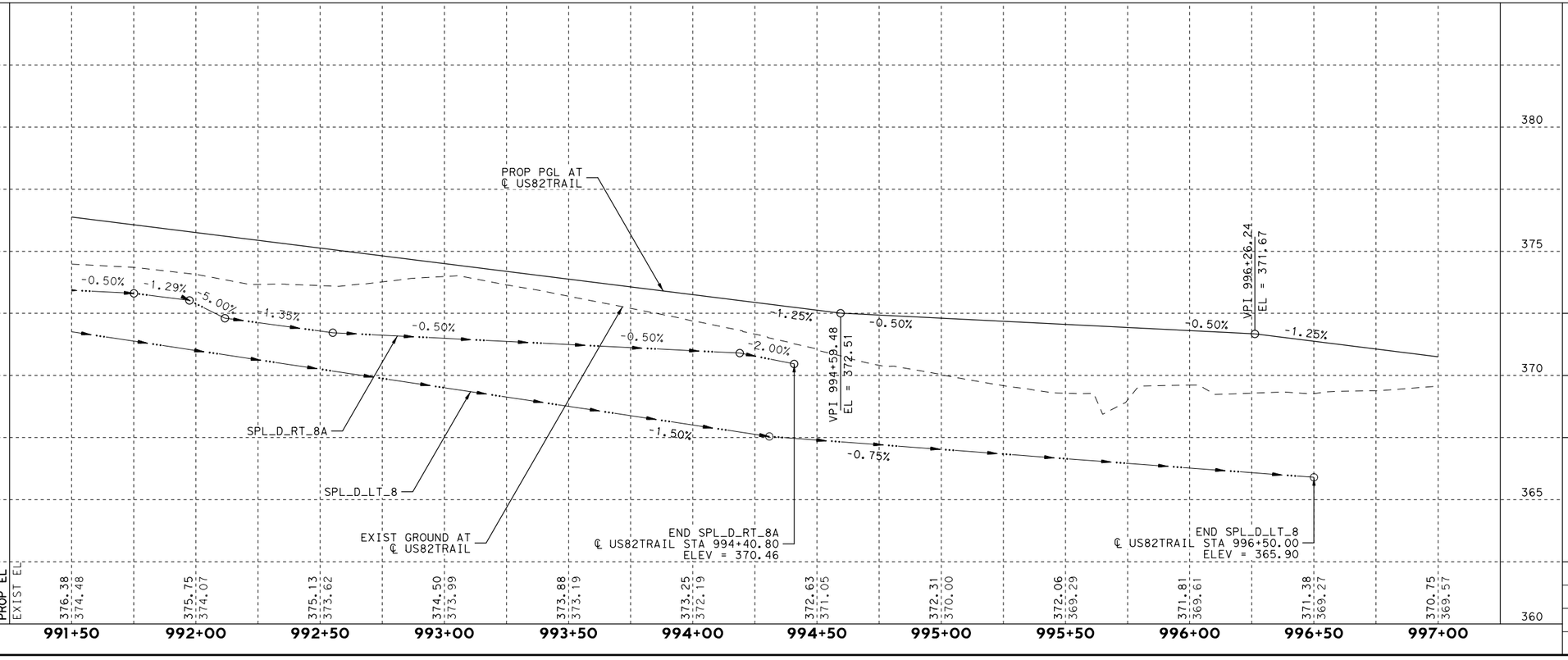
HORZ 0' 25' 50'
VERT 0' 2.5' 5'
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



STATE OF TEXAS
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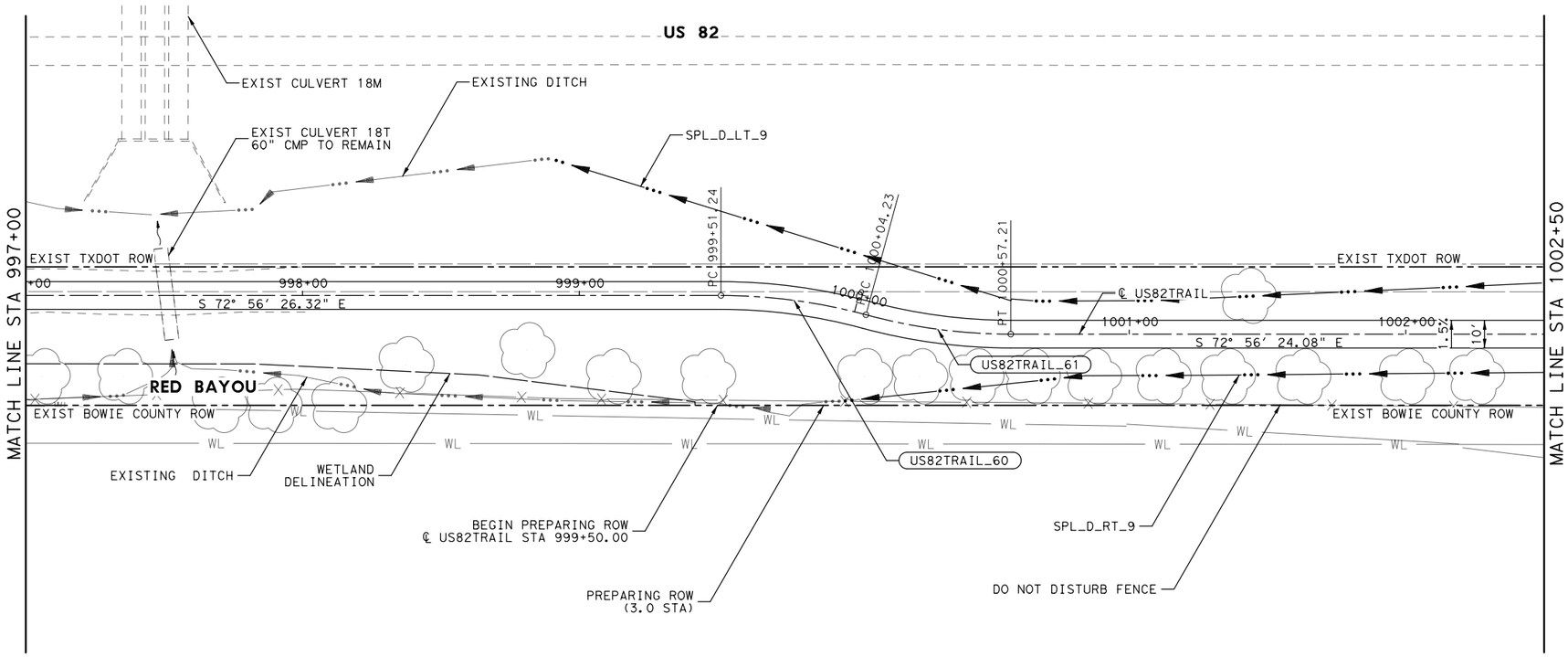
VARIOUS

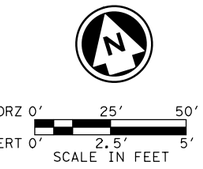
PLAN AND PROFILE
STA 991+50 TO STA 997+00

SCALE: 1" = 50' H, 1" = 5' V SHEET 17 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	56
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP086.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
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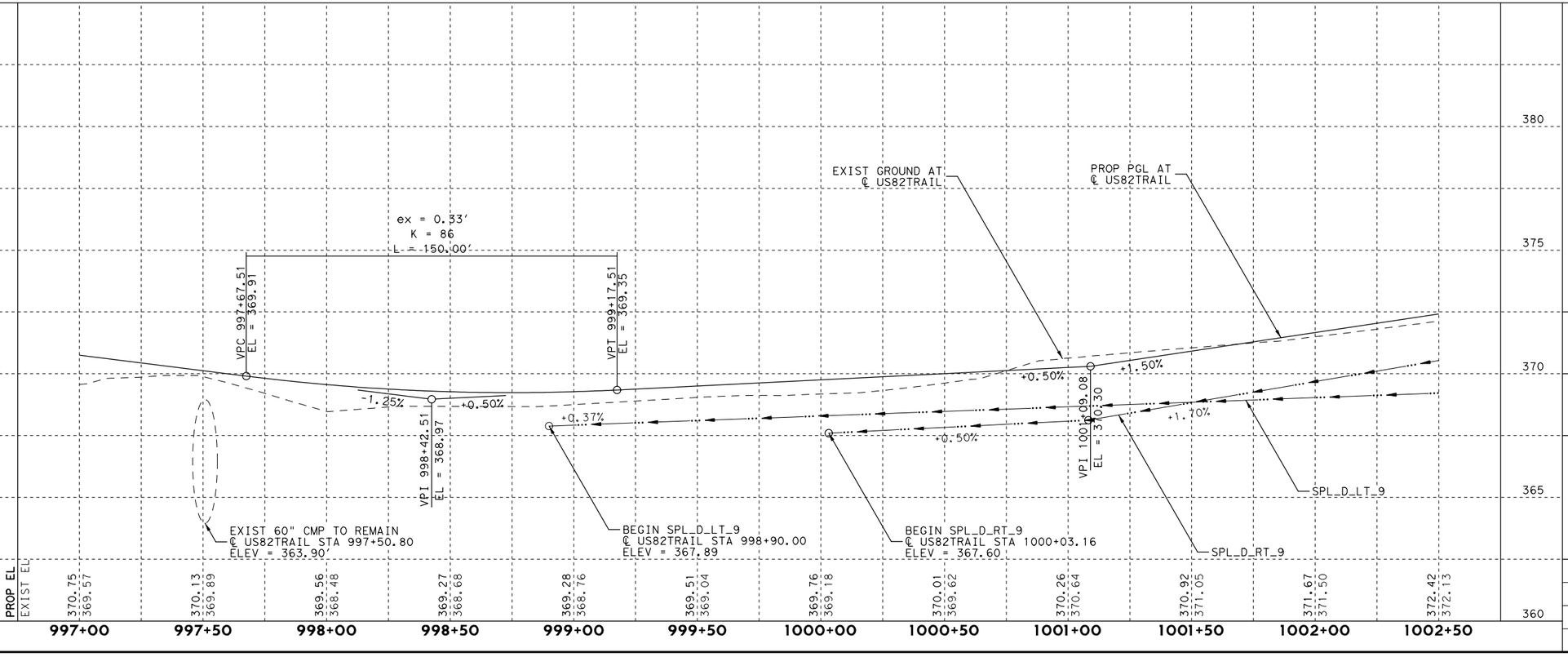
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP087.dgn

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED PROFESSIONAL ENGINEER

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

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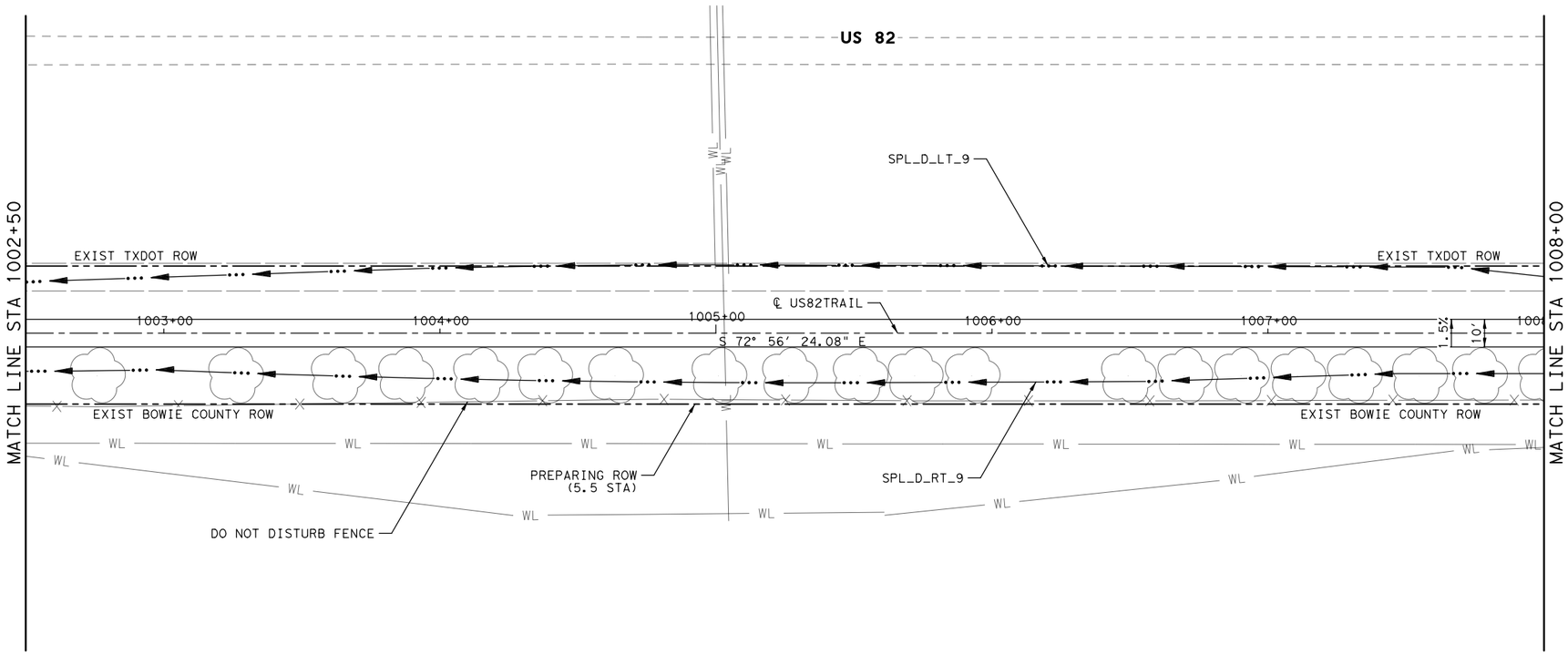
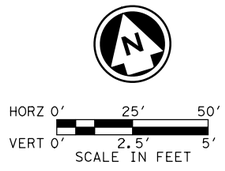
VARIOUS

PLAN AND PROFILE
STA 997+00 TO STA 1002+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 18 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	57
JMT	0919	19	087	
CHECK				





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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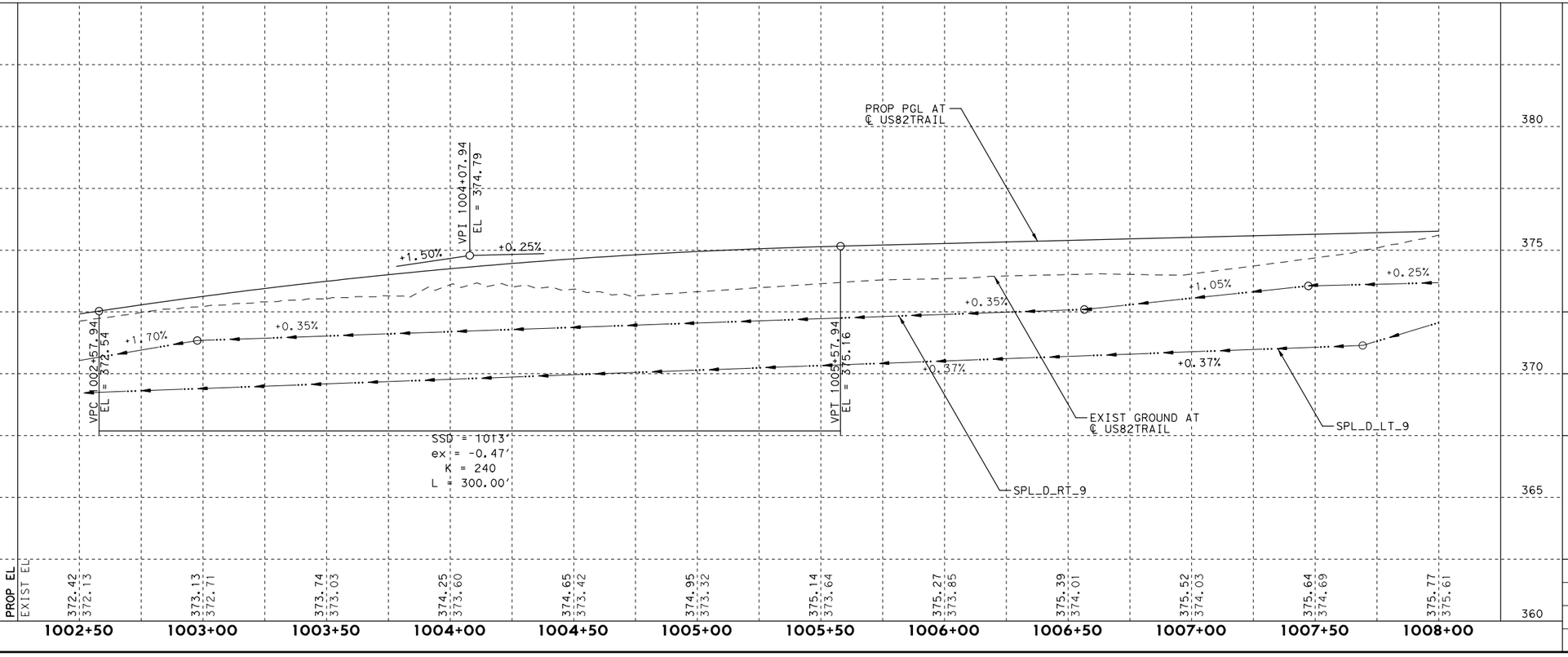
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



STATE OF TEXAS
ROBERT J. RAMON
111661
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7/5/2023

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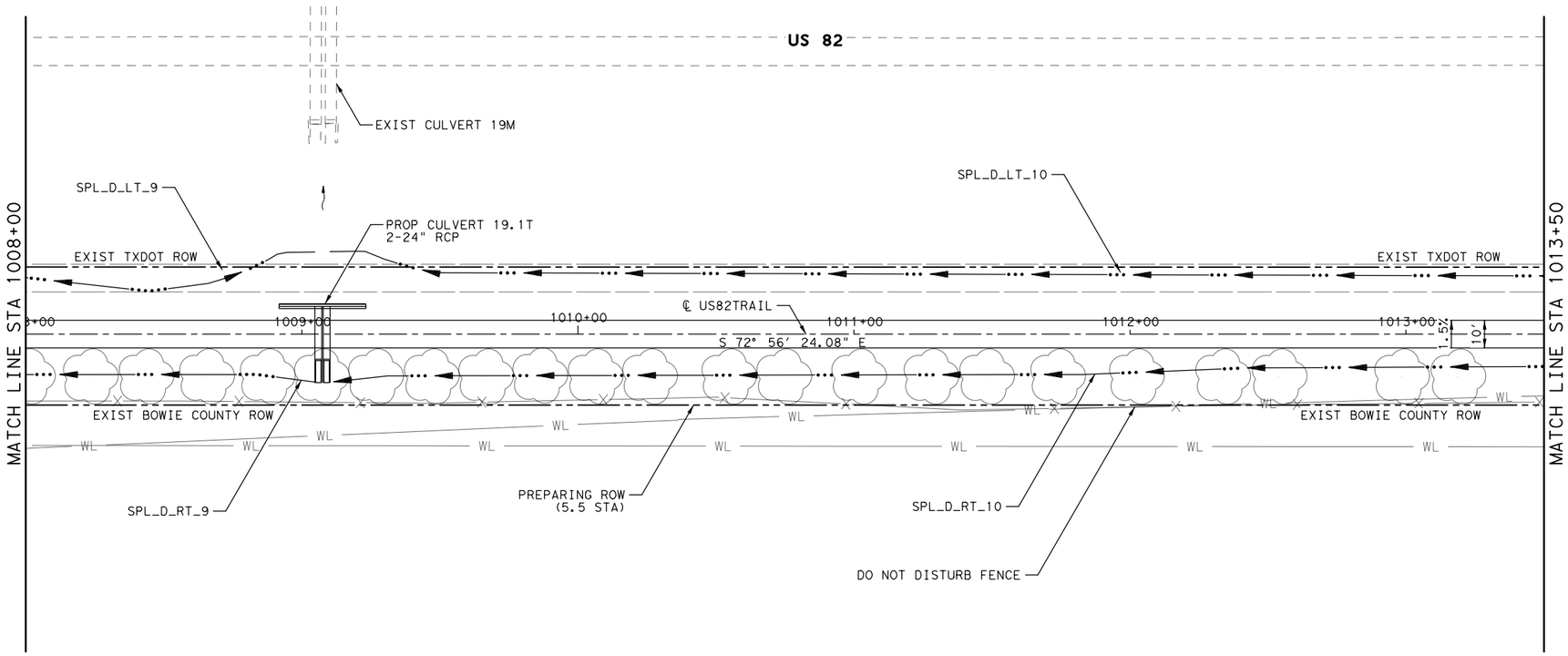
VARIOUS

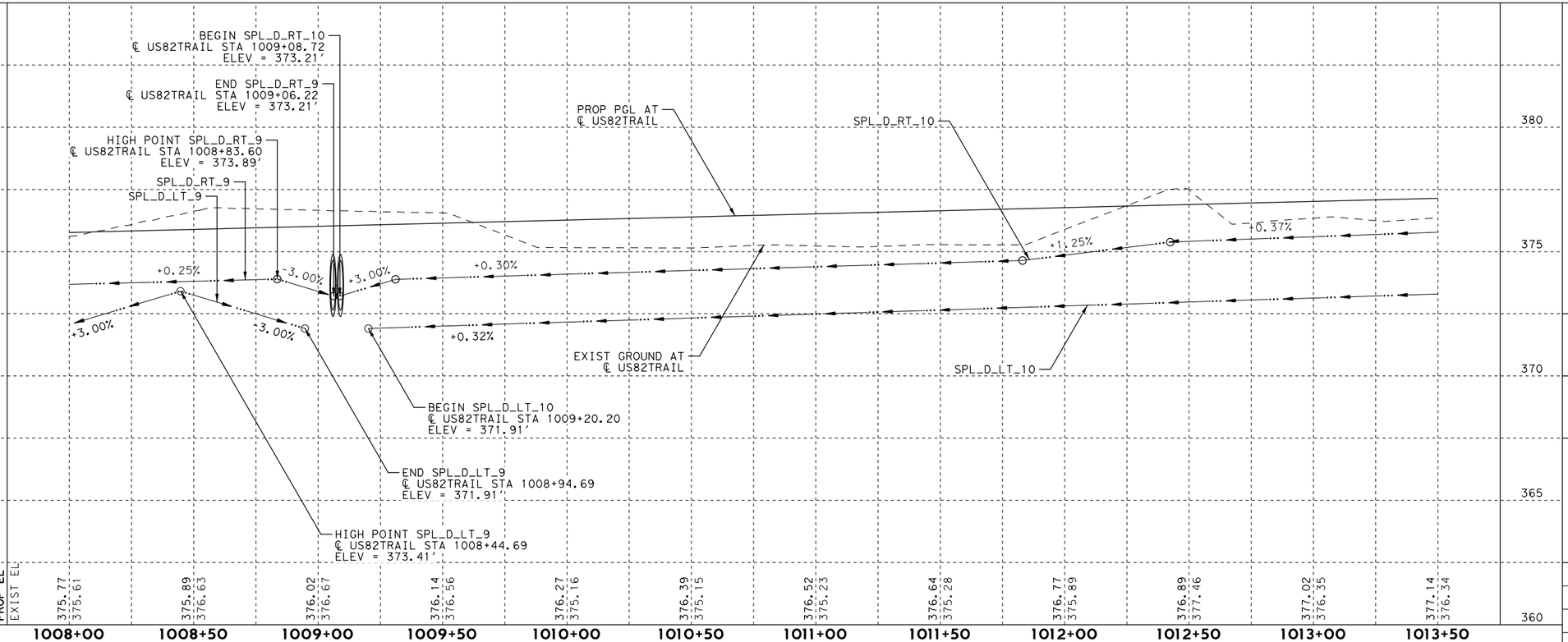
PLAN AND PROFILE
STA 1002+50 TO STA 1008+00

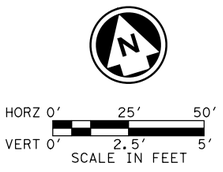
SCALE: 1" = 50' H, 1" = 5' V — SHEET 19 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	58
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP088.dgn







LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

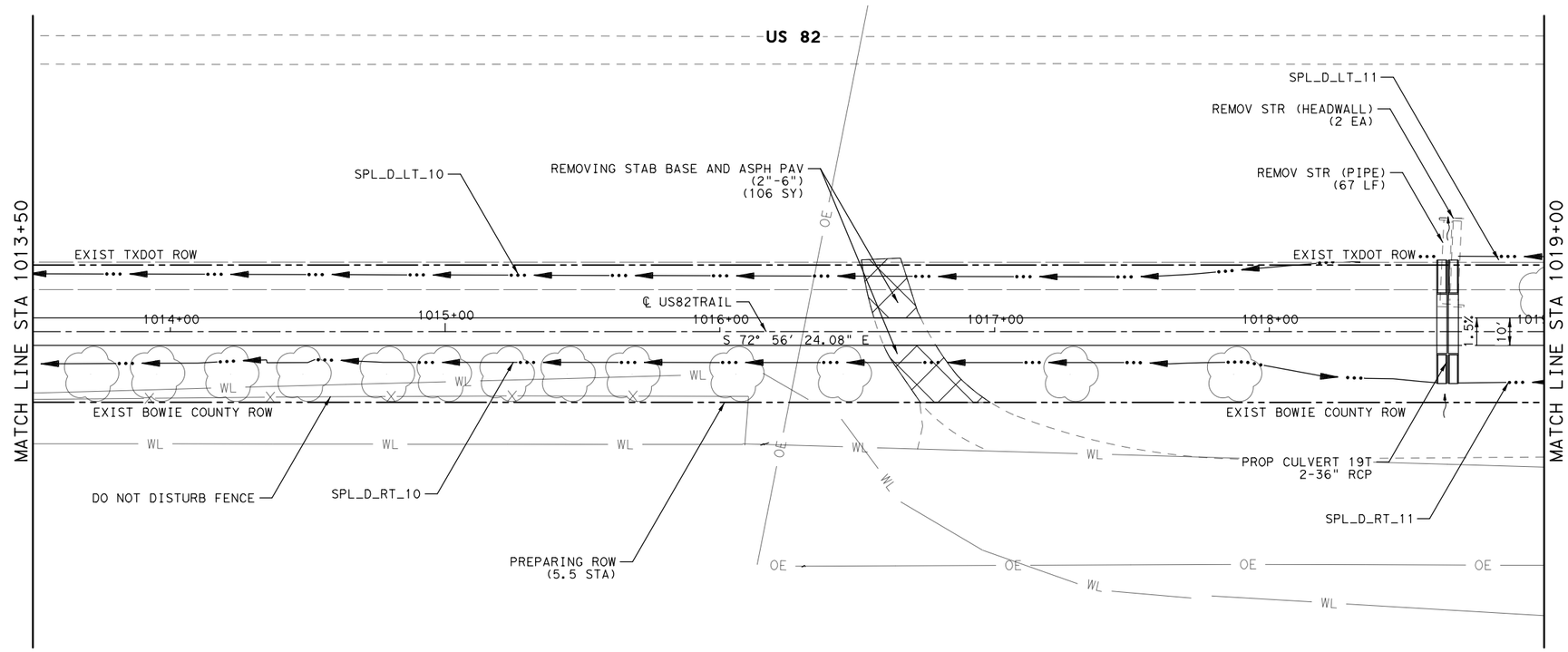
VARIOUS

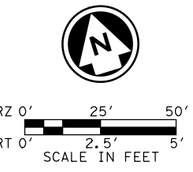
PLAN AND PROFILE
STA 1008+00 TO STA 1013+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 20 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	59
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP089.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
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3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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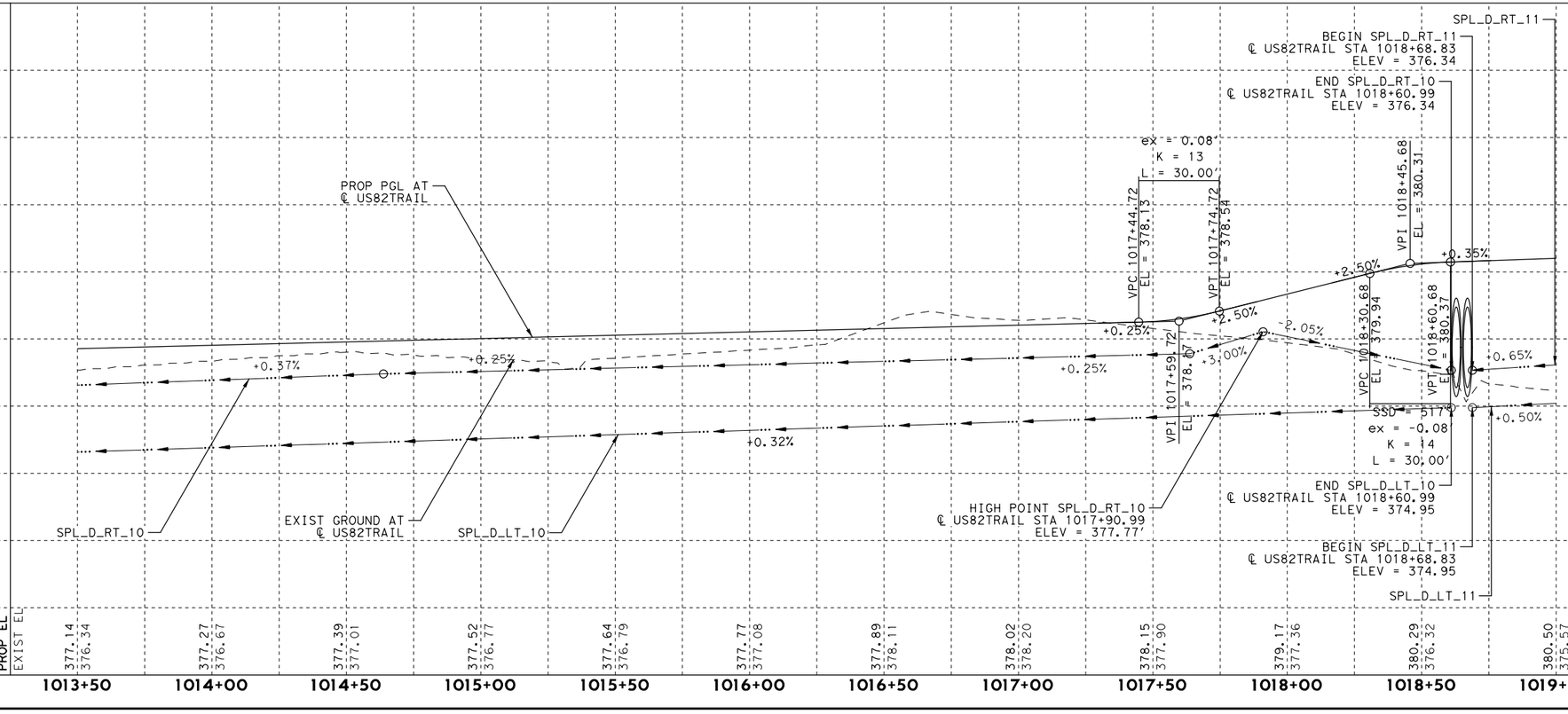

STATE OF TEXAS
ROBERT J. RAMON
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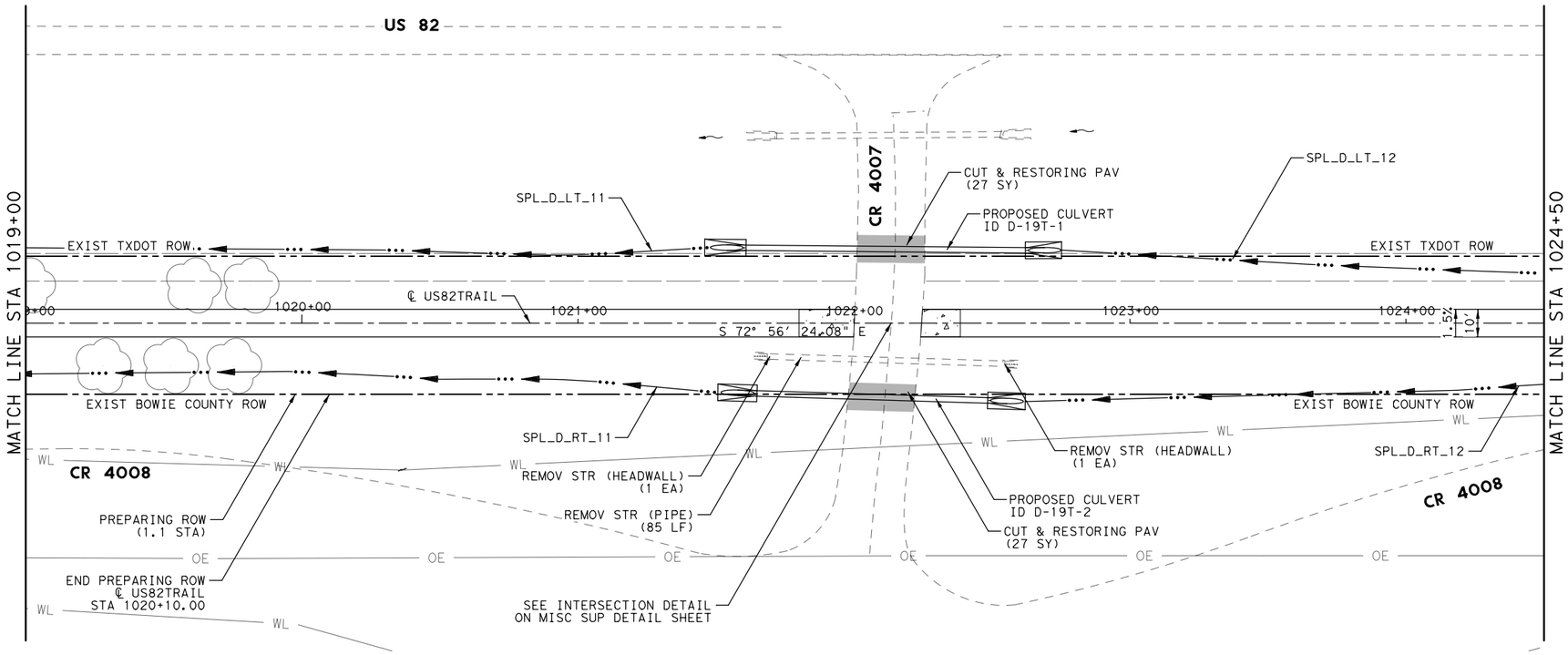
VARIOUS

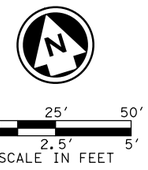
PLAN AND PROFILE
STA 1013+50 TO STA 1019+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 21 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	60
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP090.dgn



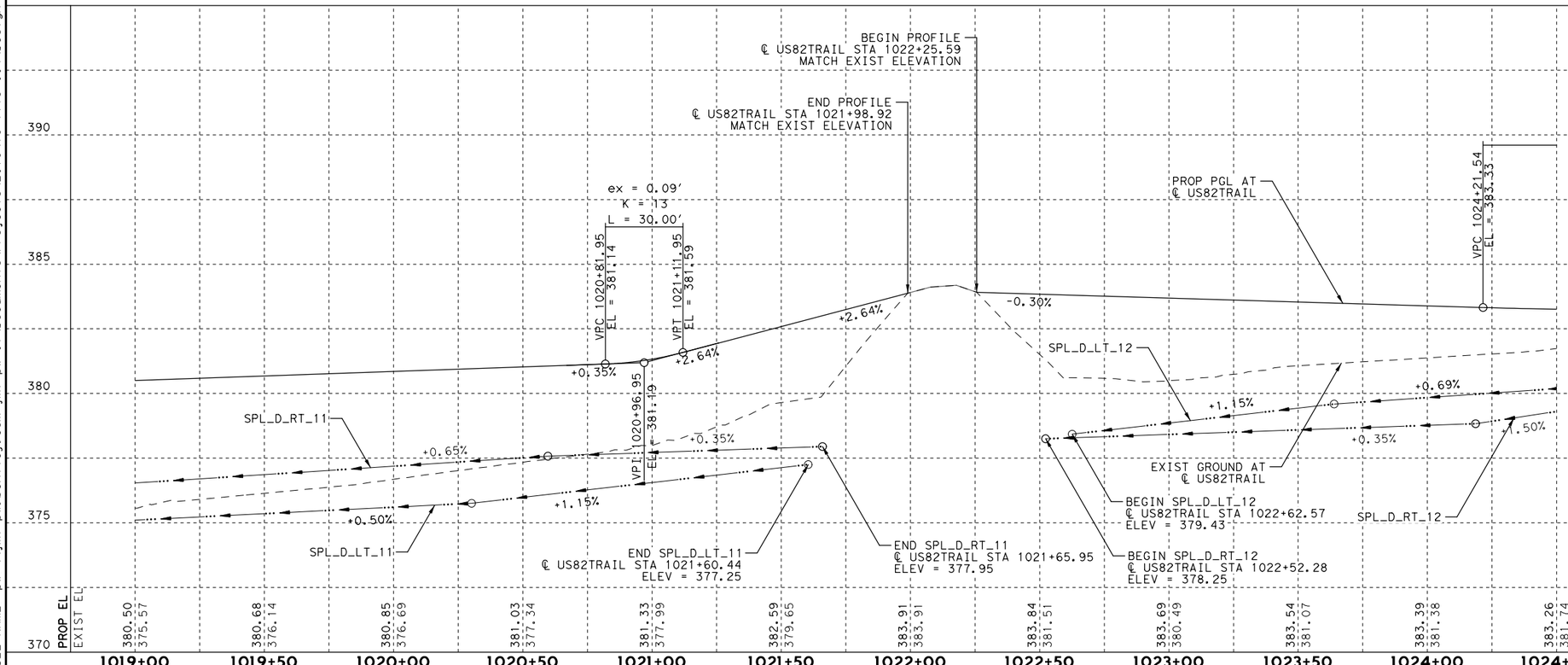


LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.
7. AREA NORTH OF CR 4008 IS BOWIE COUNTY PROPERTY, NO RIGHT OF ENTRY REQUIRED.



STATE OF TEXAS
ROBERT J. RAMON
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LICENSED PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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JMT TBPE REGISTRATION NO. F-16341

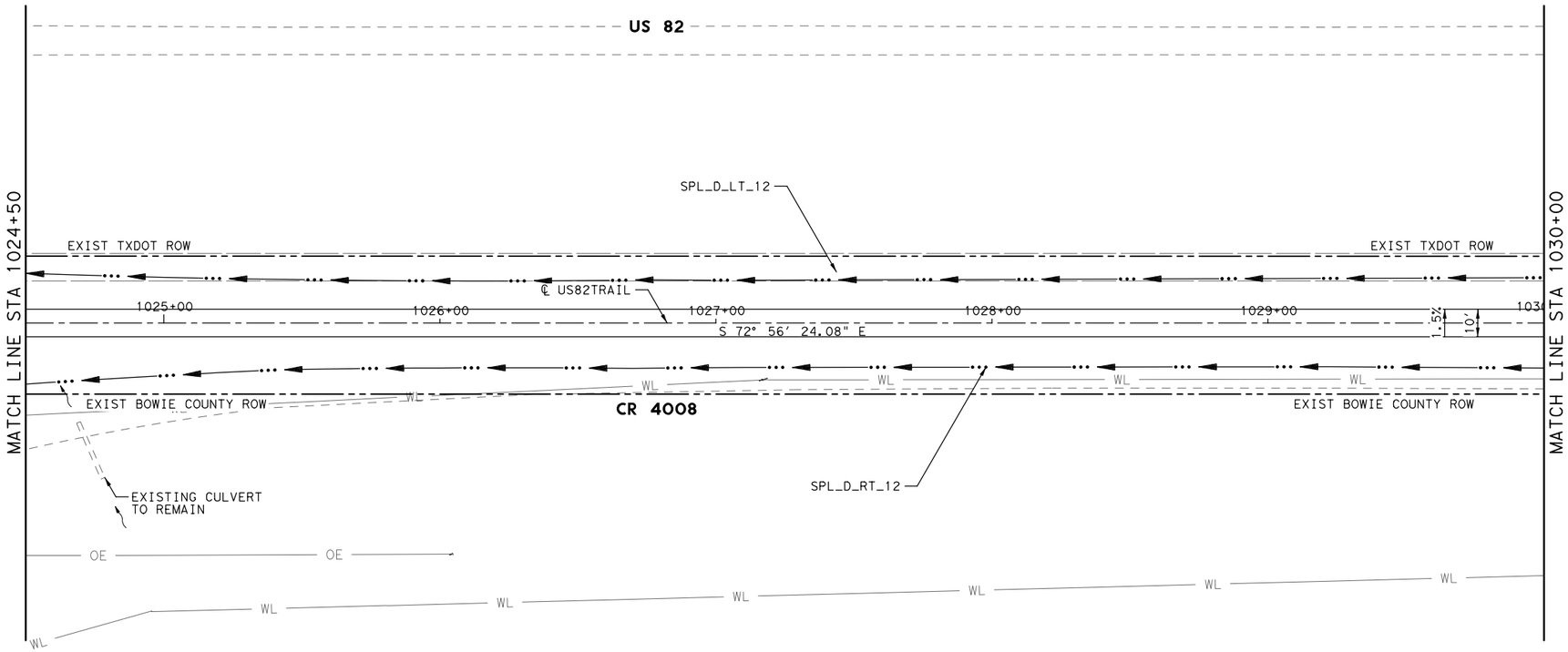
VARIOUS

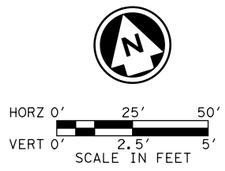
PLAN AND PROFILE
STA 1019+00 TO STA 1024+50

SCALE: 1" = 50' H, 1" = 5' V SHEET 22 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	61
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP091.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
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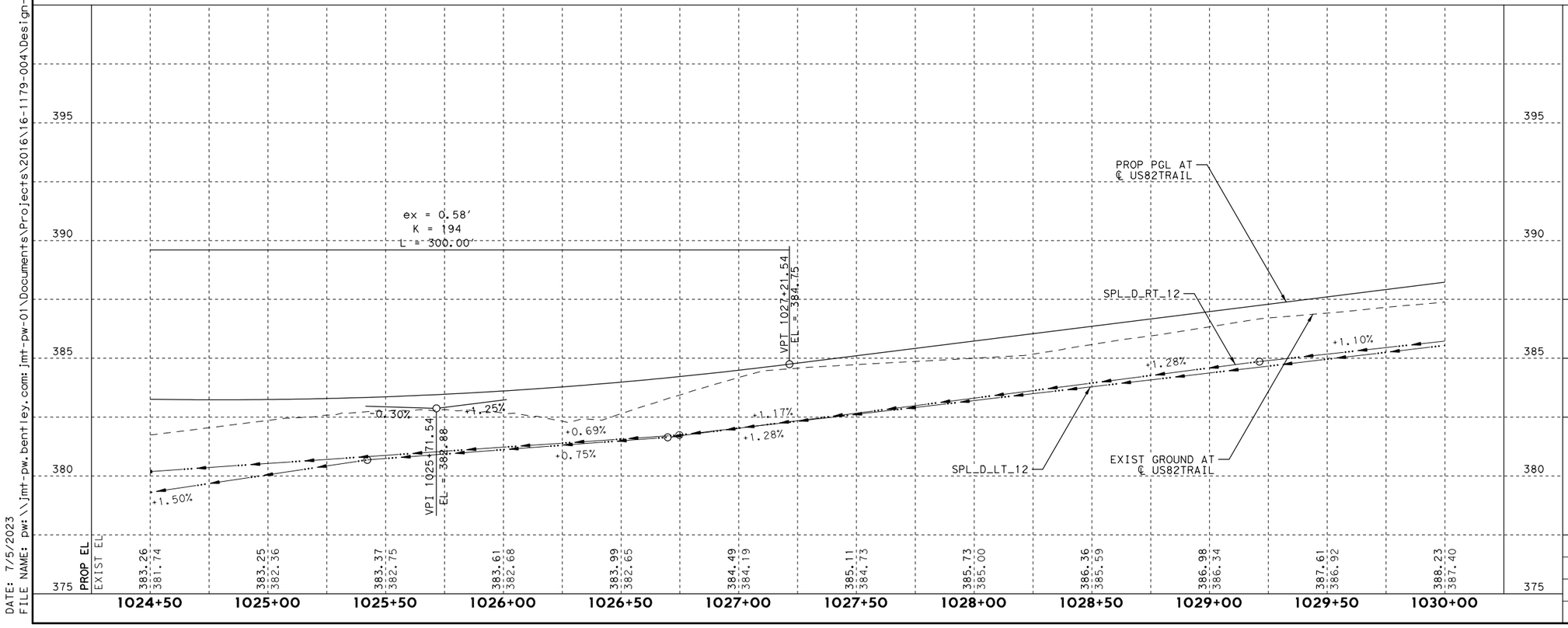
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
4. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



ROBERT J. RAMON
111661
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

7/5/2023

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TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

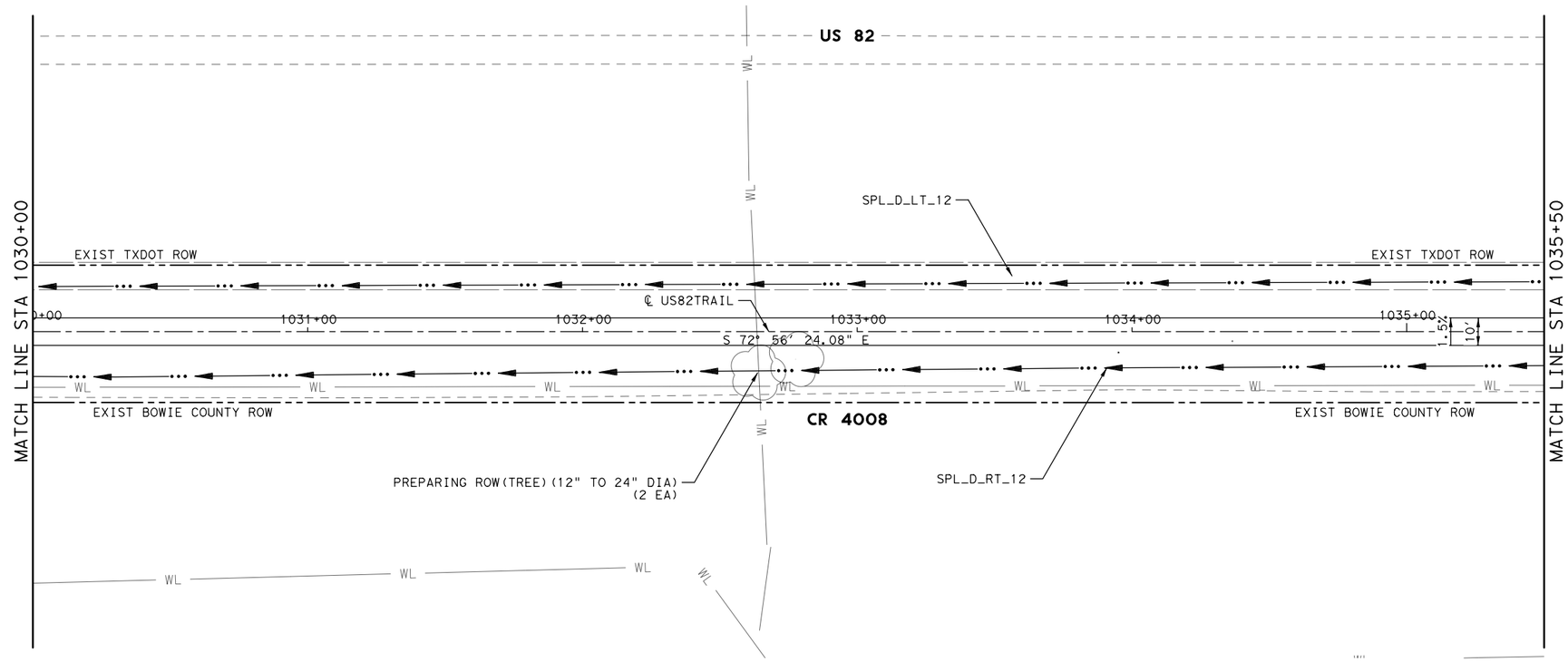
PLAN AND PROFILE
STA 1024+50 TO STA 1030+00

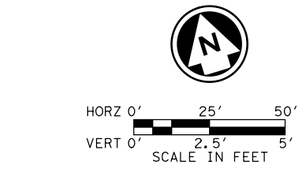
SCALE: 1" = 50' H, 1" = 5' V

SHEET 23 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	62
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP092.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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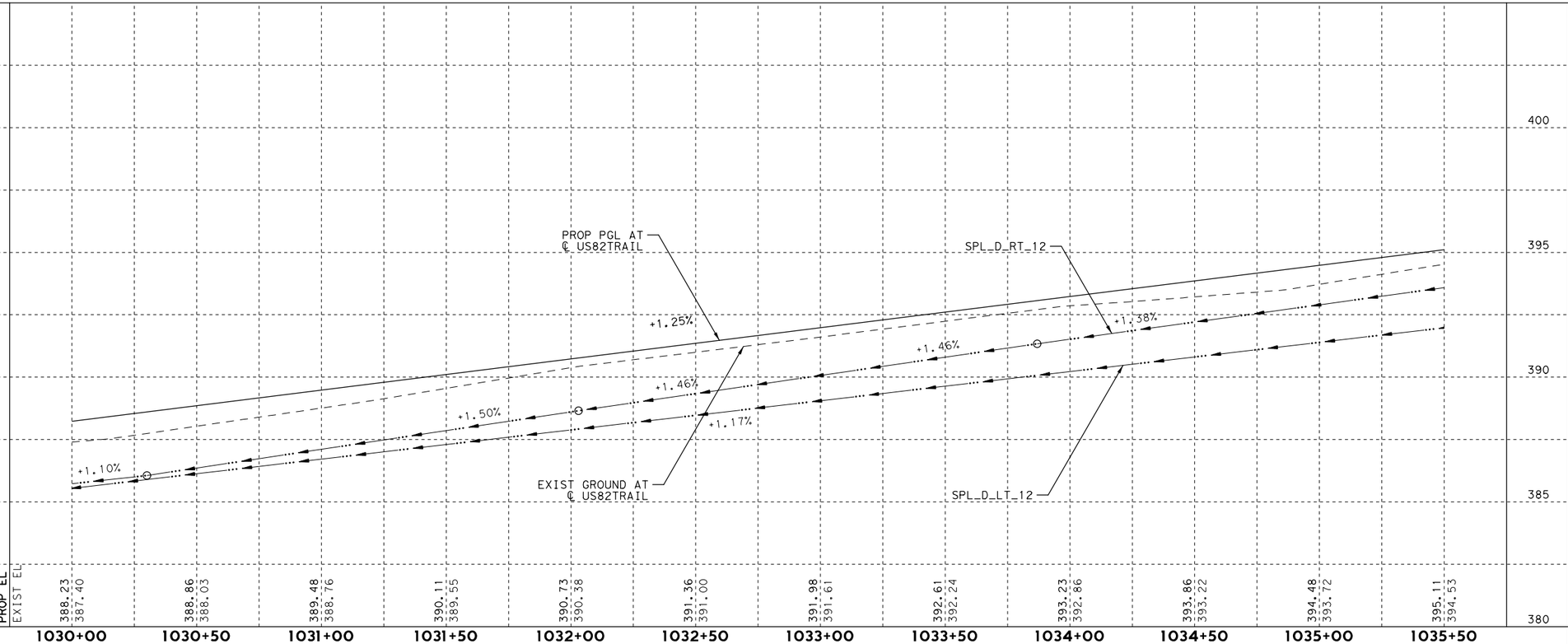
5. ALL DIMENSIONS AND OFFSETS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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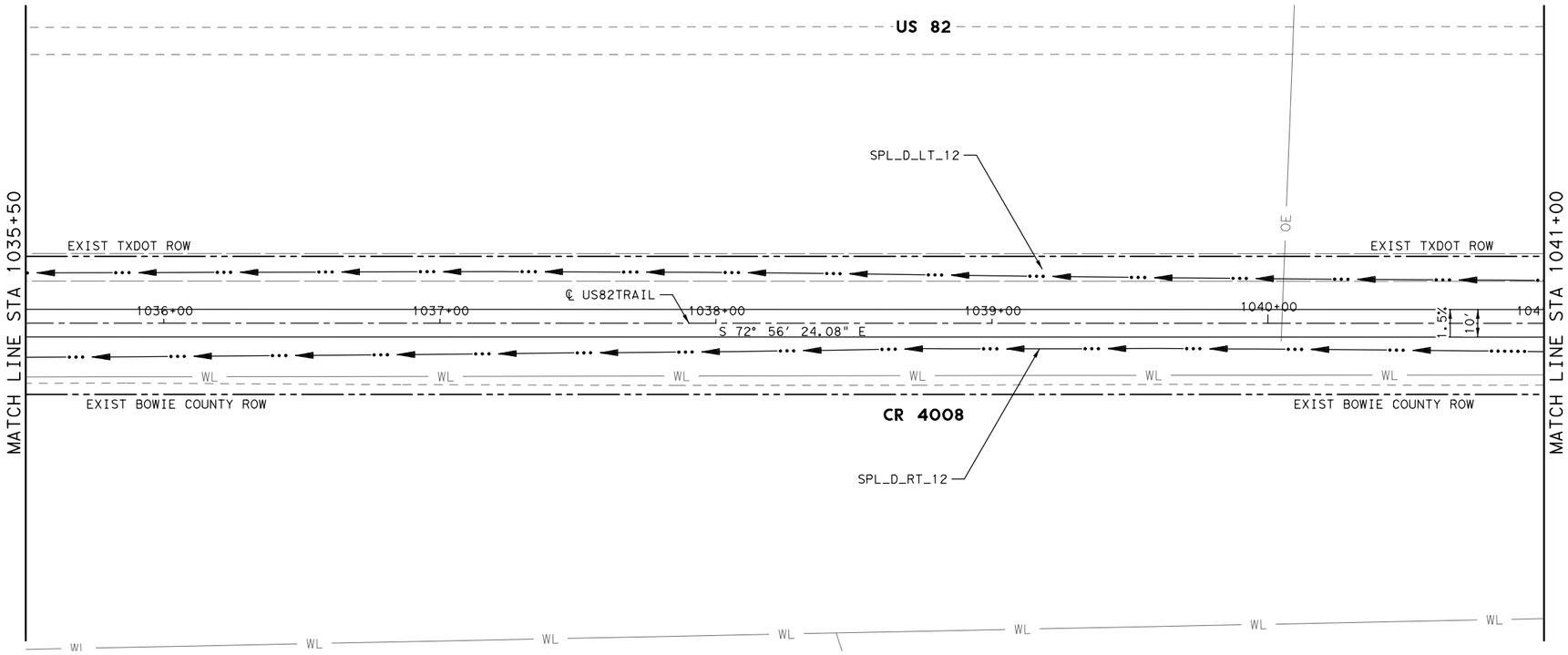
VARIOUS

PLAN AND PROFILE
STA 1030+00 TO STA 1035+50

SCALE: 1" = 50' H, 1" = 5' V SHEET 24 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	63
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP093.dgn



HORZ 0′ 25′ 50′
VERT 0′ 2.5′ 5′
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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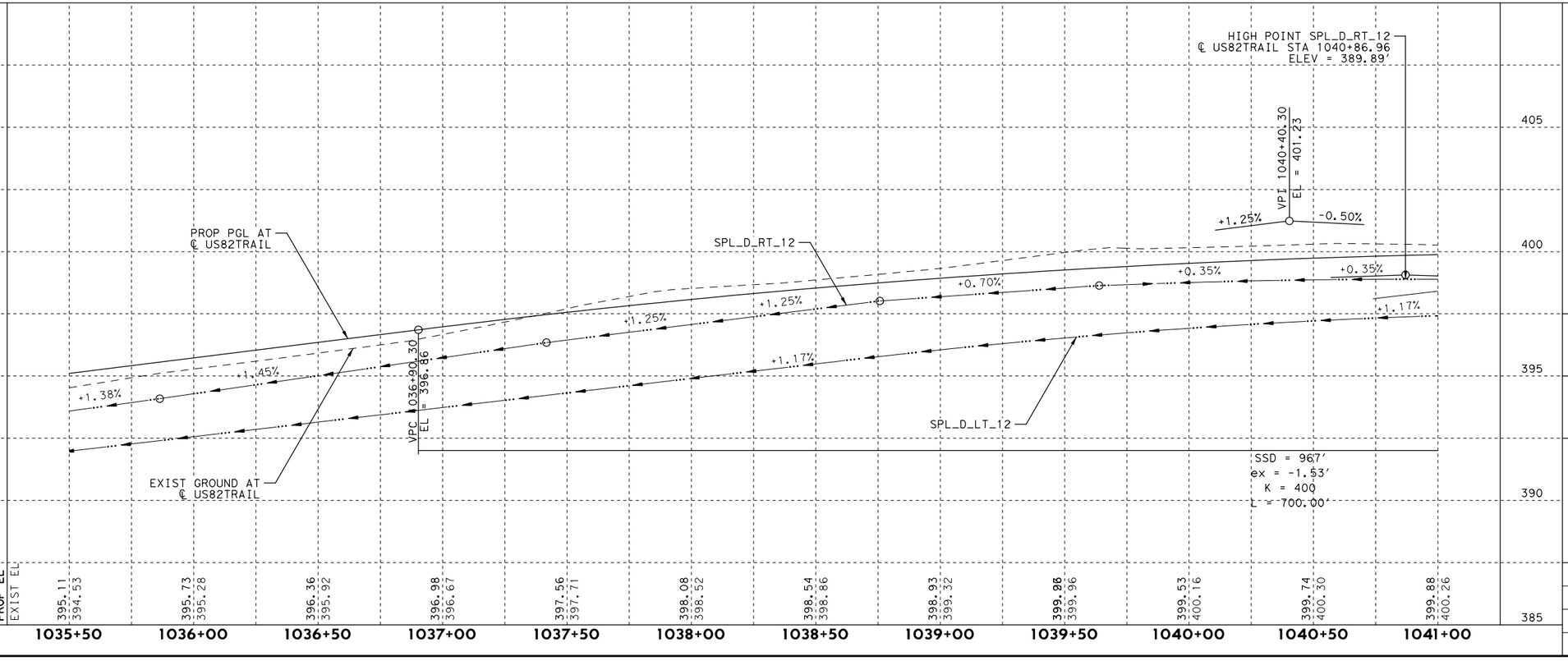
6. LOCATIONS OF EXISTING TREES ARE APPROXIMATE.



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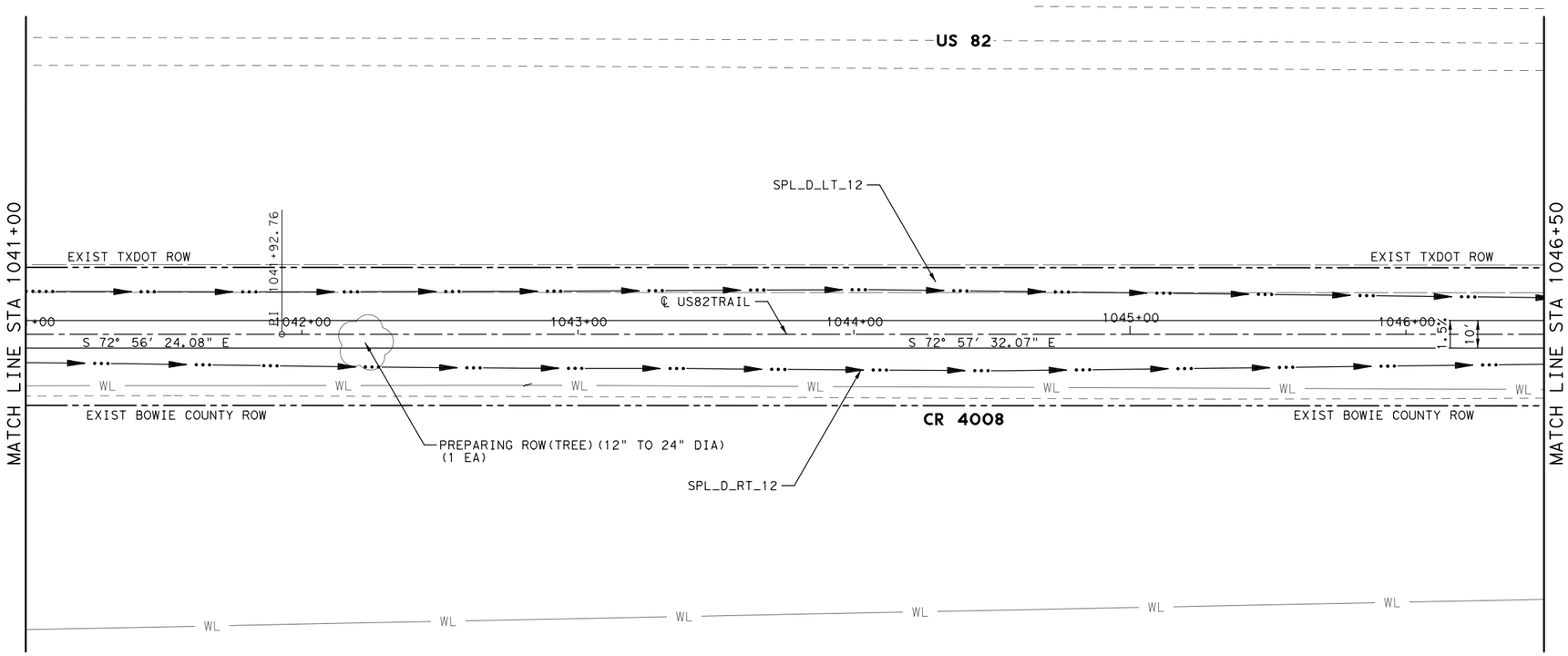
VARIOUS

PLAN AND PROFILE
STA 1035+50 TO STA 1041+00

SCALE: 1" = 50' H, 1" = 5' V SHEET 25 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	64
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP094.dgn



HORZ 0′ 25′ 50′
VERT 0′ 2.5′ 5′
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
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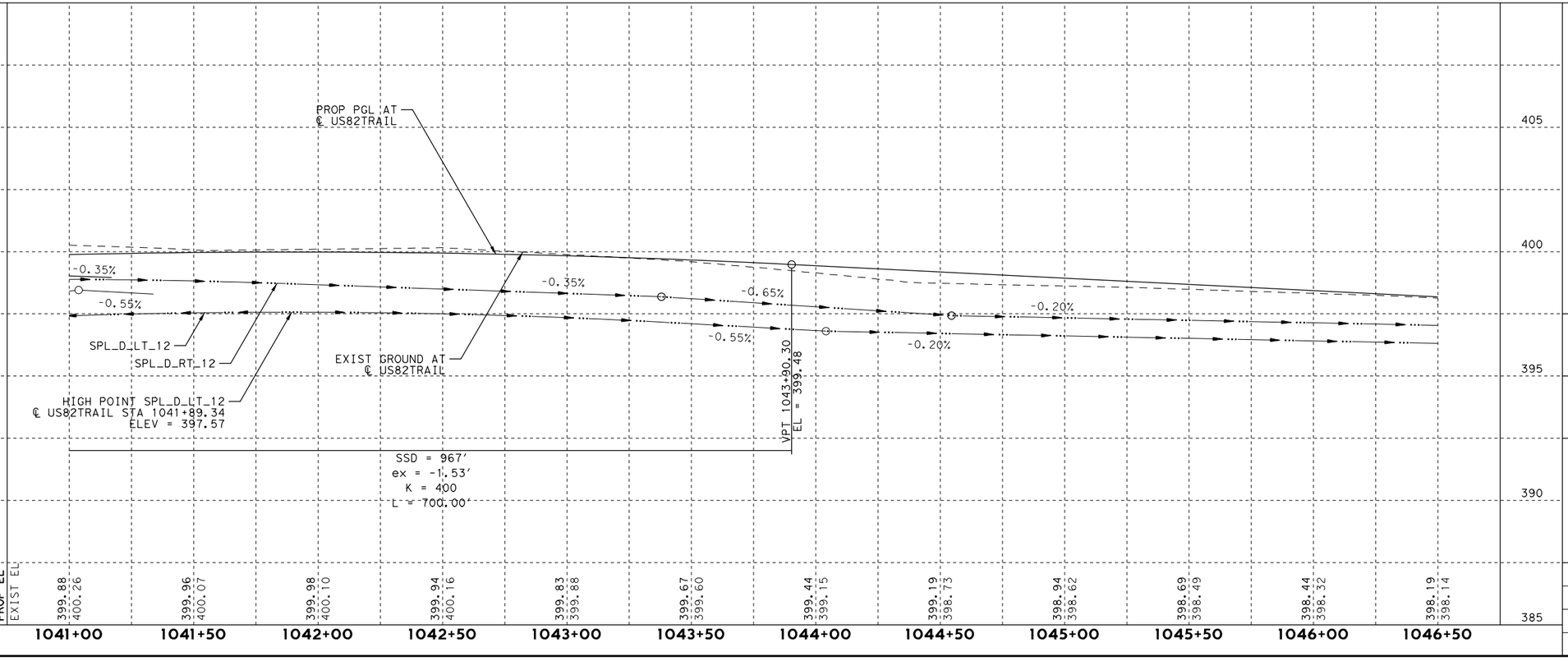

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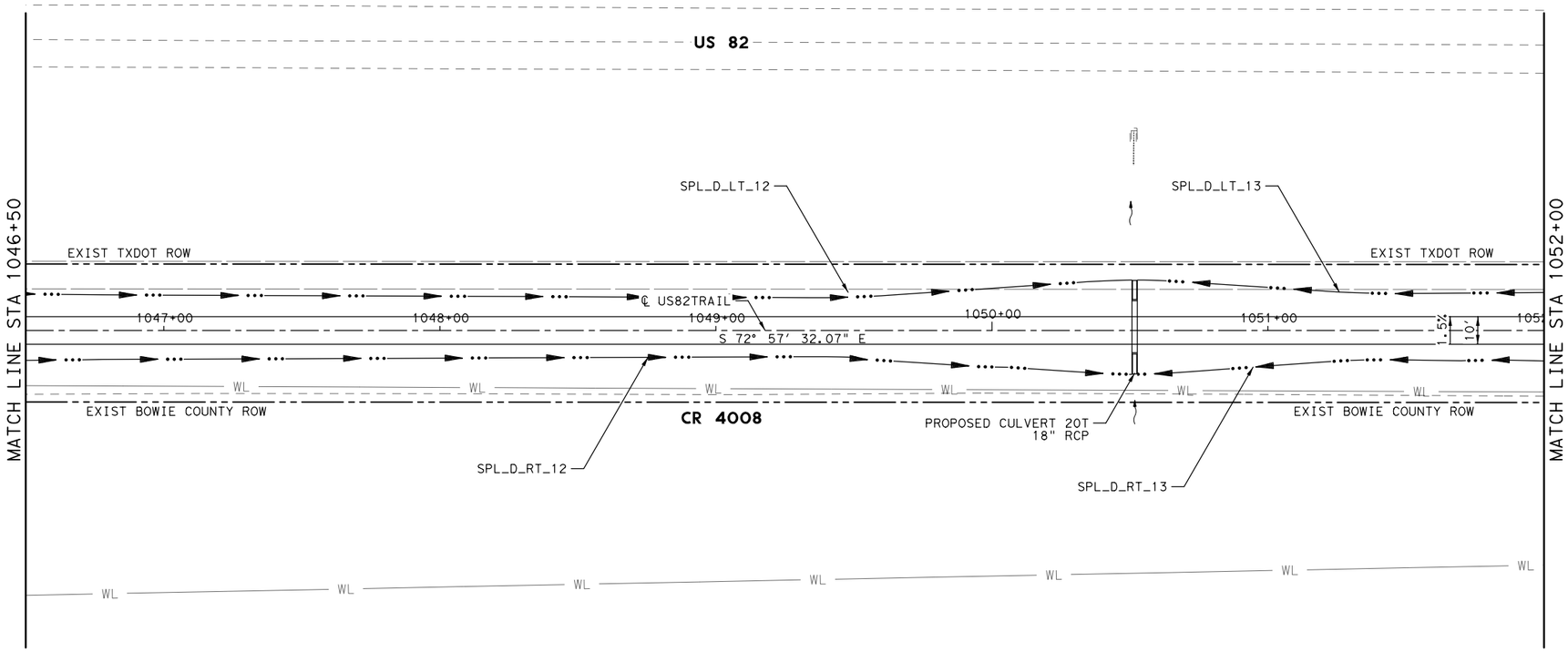
VARIOUS

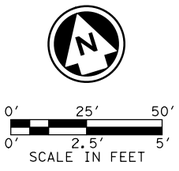
PLAN AND PROFILE
STA 1041+00 TO STA 1046+50

SCALE: 1" = 50′ H, 1" = 5′ V SHEET 26 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	65
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP095.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
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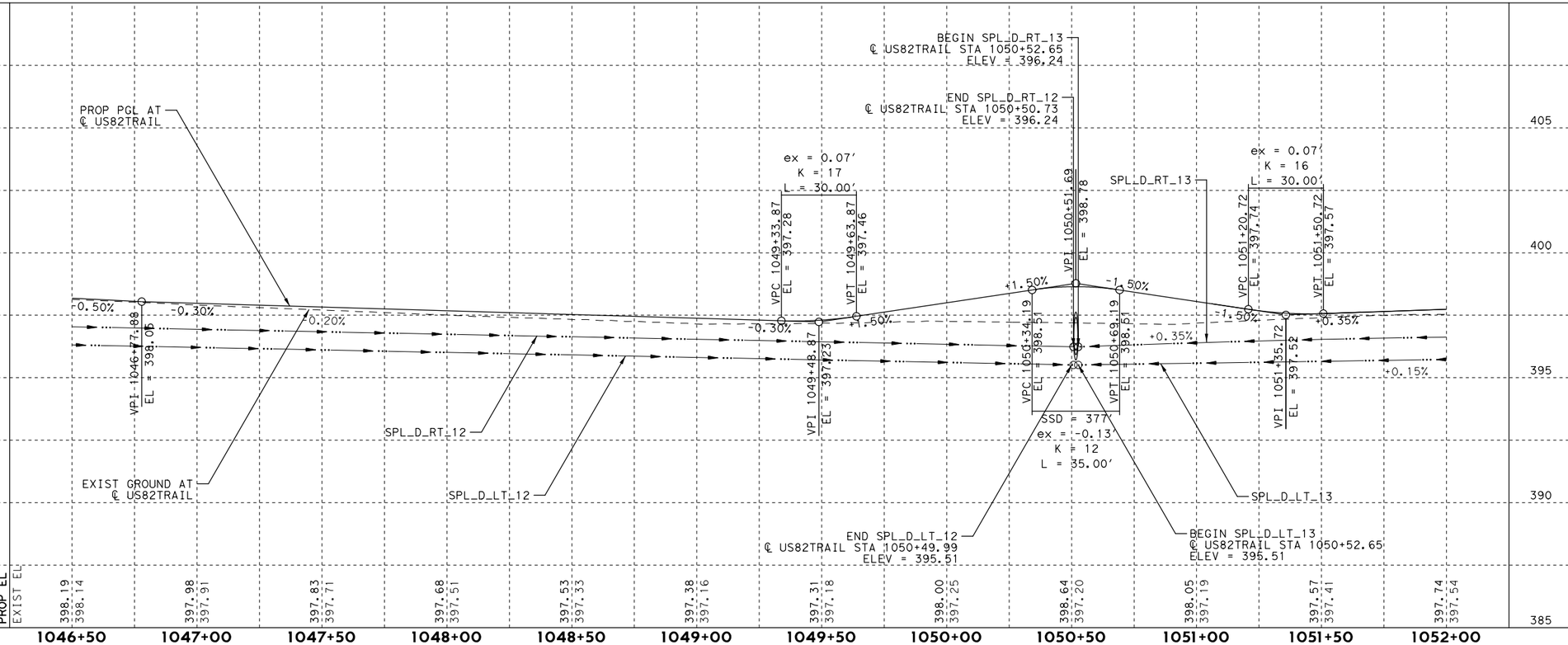

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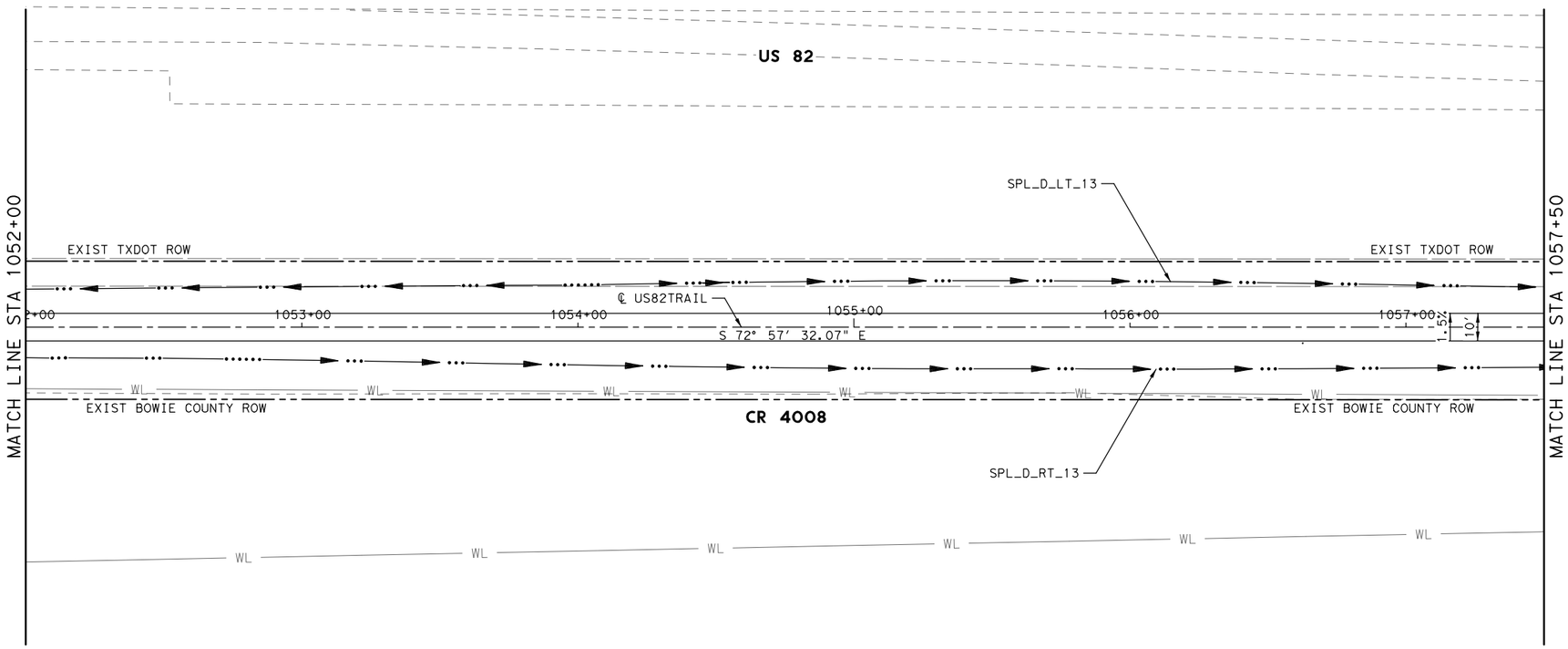
VARIOUS

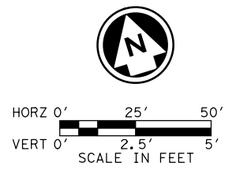
PLAN AND PROFILE
STA 1046+50 TO STA 1052+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 27 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	66
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP096.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
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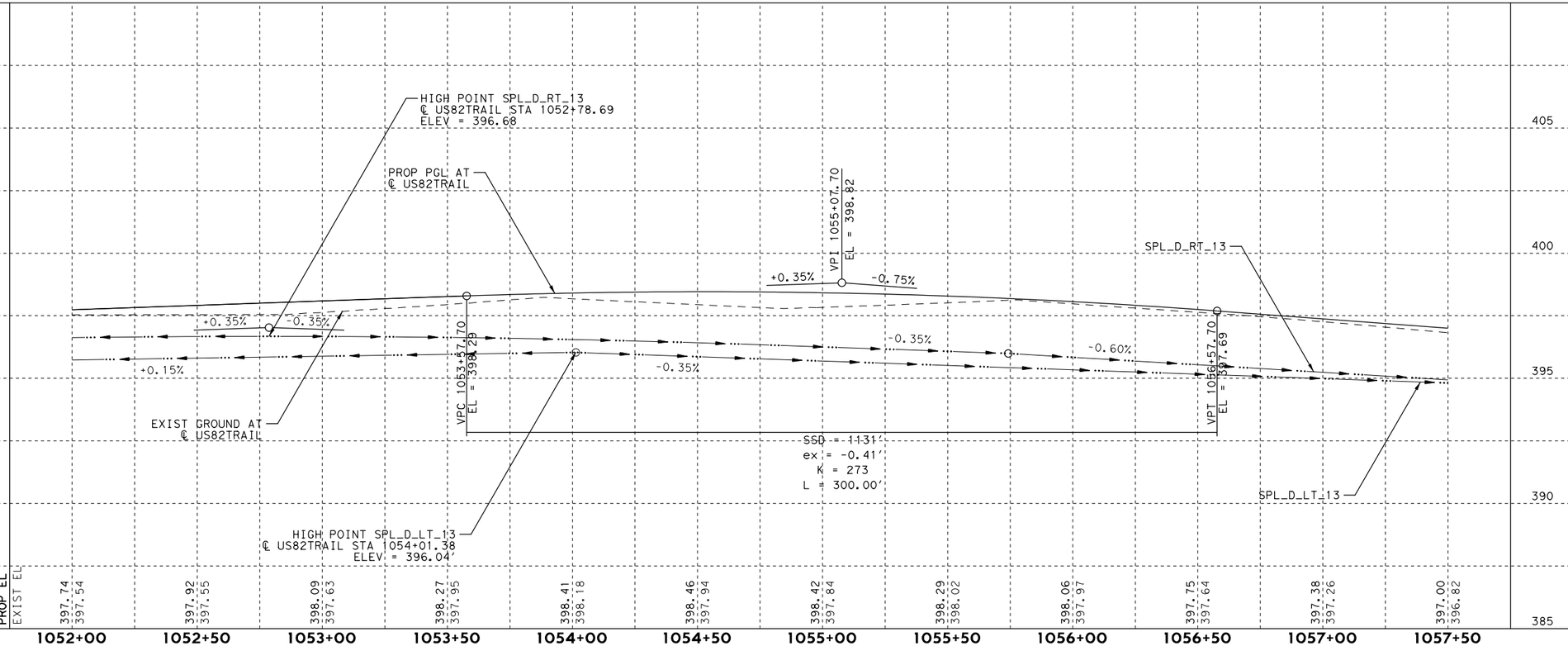

STATE OF TEXAS
ROBERT J. RAMON
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7/5/2023

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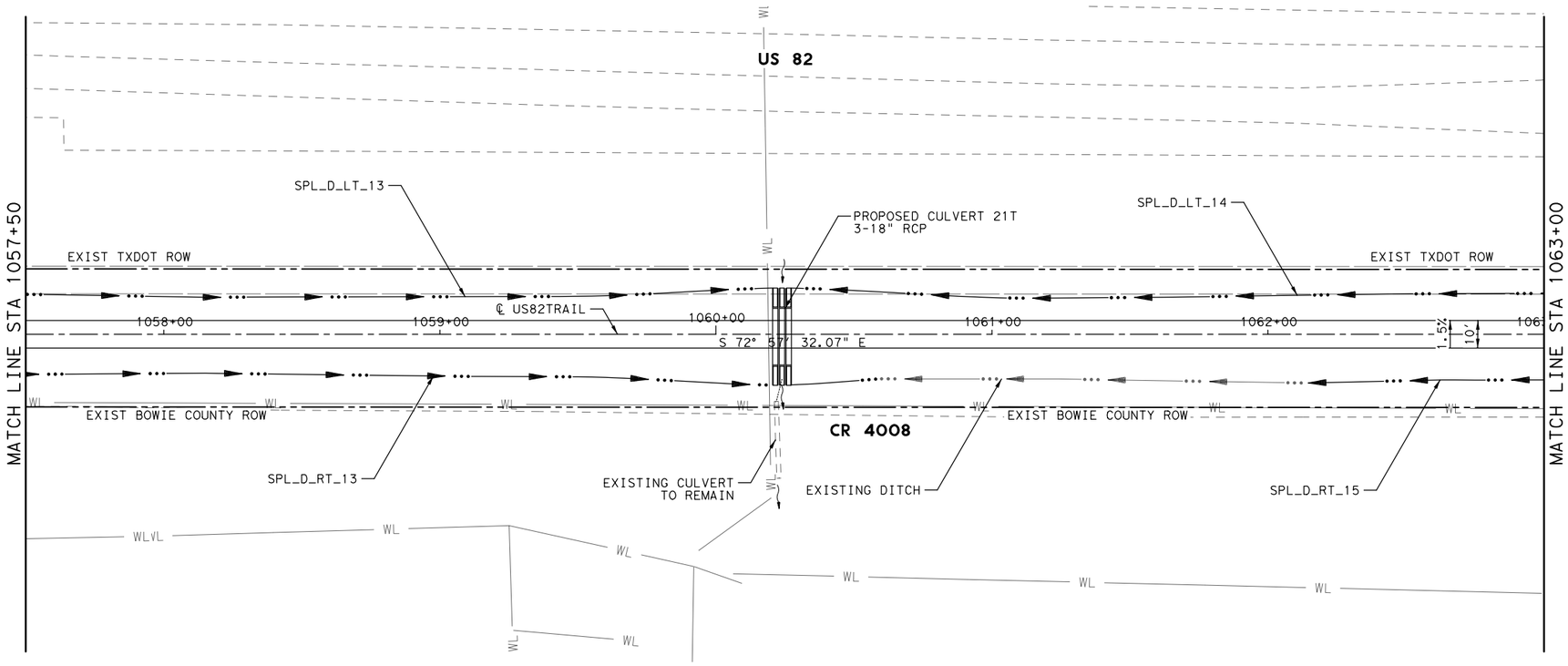
VARIOUS

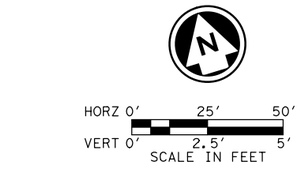
PLAN AND PROFILE
STA 1052+00 TO STA 1057+50

SCALE: 1" = 50' H, 1" = 5' V — SHEET 28 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	67
JMT	0919	19	087	
CHECK				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP097.dgn





LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
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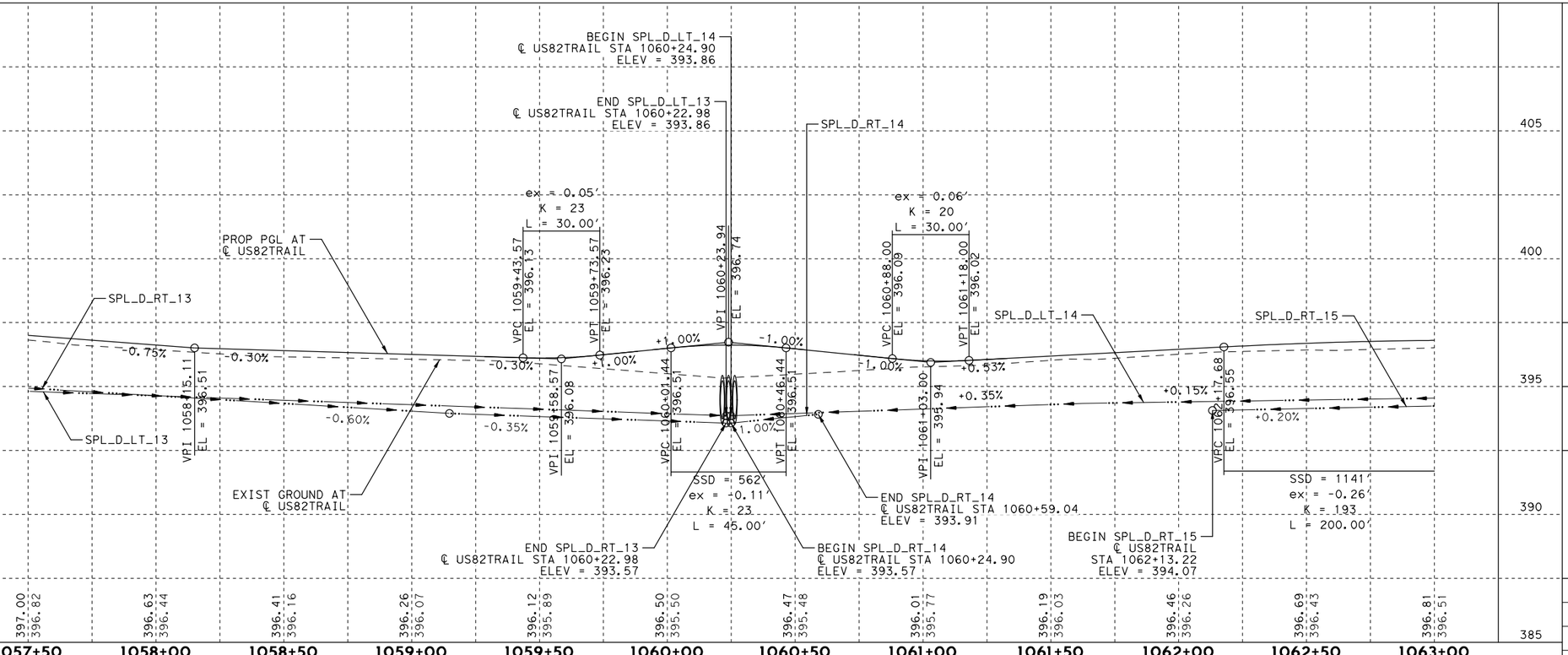

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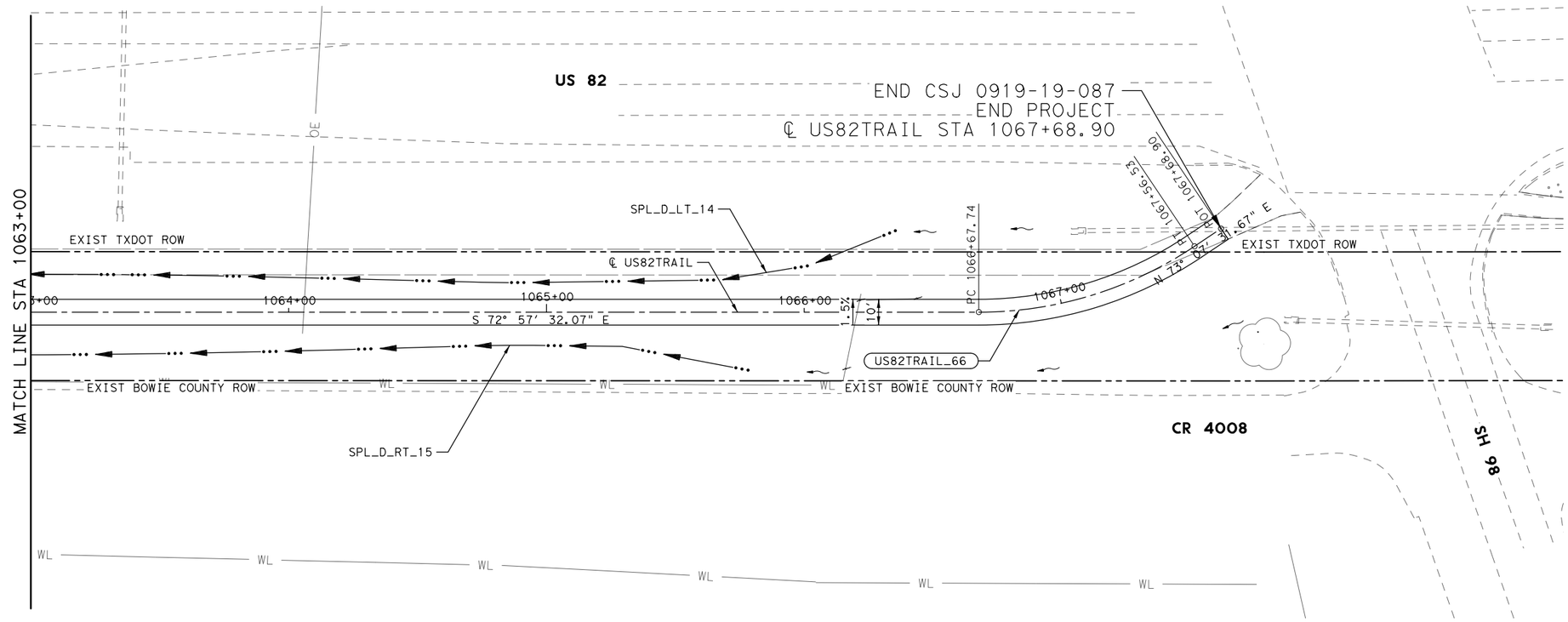
VARIOUS

PLAN AND PROFILE
STA 1057+50 TO STA 1063+00

SCALE: 1" = 50' H, 1" = 5' V — SHEET 29 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	
CHECK	CONTROL	SECTION	JOB	68
JMT	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP098.dgn



HORZ 0′ 25′ 50′
VERT 0′ 2.5′ 5′
SCALE IN FEET

LEGEND

- CONCRETE (TY A)
- PROP DITCH FLOW LINE
- FLOW ARROW
- XXXX_X CURVE ID LABEL
- EXIST NE TEXAS TRAIL
- EXISTING TREE

NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE ALIGNMENT DATA SHEETS FOR SHARED USE PATH GEOMETRIC DATA.
3. SEE DRAINAGE DETAILS FOR ADDITIONAL INFORMATION.
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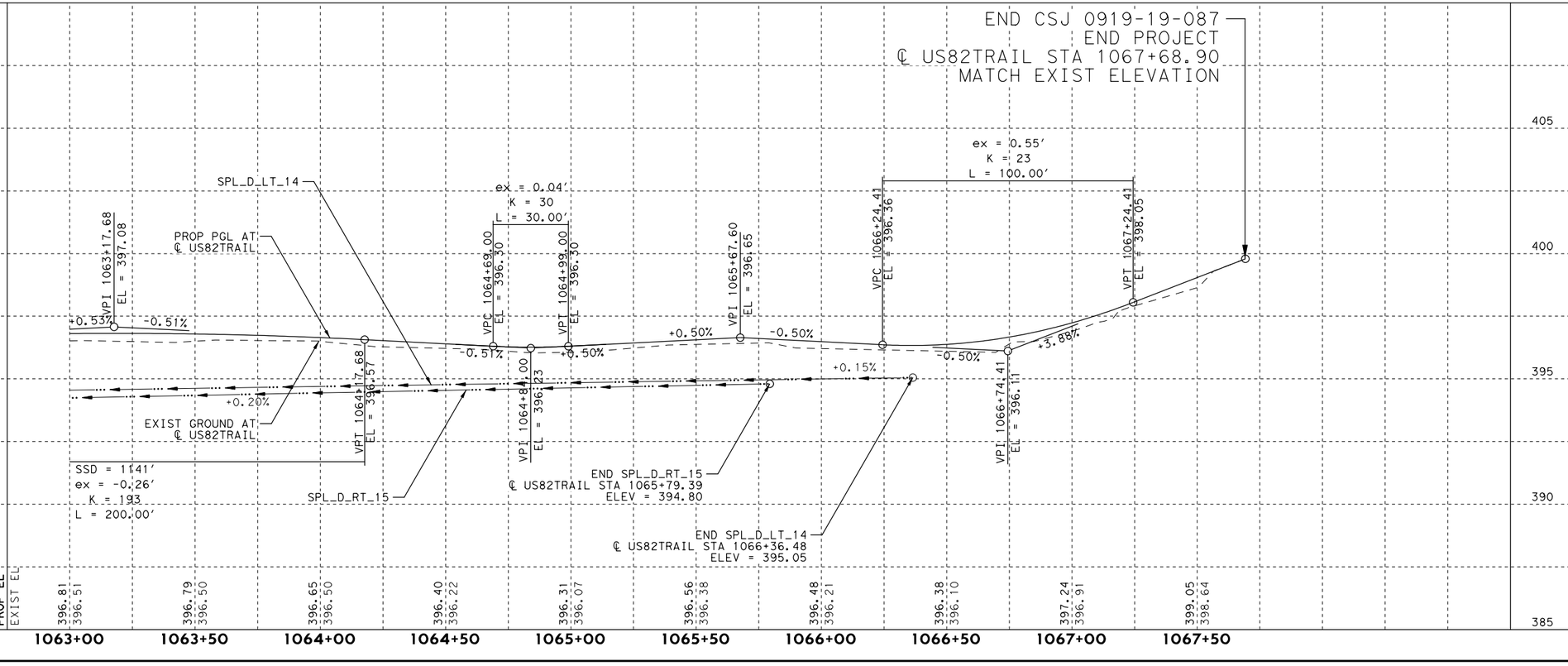

STATE OF TEXAS
ROBERT J. RAMON
111661
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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

PLAN AND PROFILE
STA 1063+00 TO END

SCALE: 1" = 50′ H, 1" = 5′ V SHEET 30 OF 30

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	69
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\US82T*S*SUP*PP099.dgn

RIGHT DITCHES		
DITCH NAME	STATION	ELEVATION
SPL_D_RT_01	903+94.66	407.63'
	903+97.65	407.13'
	905+23.83	406.50'
SPL_D_RT_02	905+26.33	406.50'
	915+07.21	408.46'
	915+19.55	409.41'
SPL_D_RT_03	930+15.12	403.46'
	931+91.25	403.11'
SPL_D_RT_04	932+98.14	402.90'
	936+76.60	402.14'
SPL_D_RT_05	936+78.52	402.14'
	944+71.99	403.73'
	955+07.54	401.14'
	955+29.83	400.25'
	955+49.66	400.14'
SPL_D_RT_06	956+01.23	399.87'
	956+21.70	399.77'
	957+76.96	399.22'
	960+31.97	396.80'
	963+70.23	392.57'
	964+44.66	391.83'
	965+65.33	390.92'
	967+22.89	389.35'
	968+72.25	388.60'
	968+80.30	388.28'
	968+99.97	388.12'
SPL_D_RT_07	970+34.17	387.04'
	970+52.55	386.89'
	972+21.12	386.30'
	979+44.08	382.68'
	981+32.51	382.12'
	981+51.36	381.37'
	981+71.05	381.22'
SPL_D_RT_08	982+01.64	380.99'
	982+22.27	380.83'
	983+40.00	380.42'
SPL_D_RT_08A	984+45.00	379.78'
	985+02.14	379.35'
	985+39.18	378.80'
	986+50.28	378.24'
	987+96.81	377.14'
	988+29.24	376.65'
	989+26.53	376.17'
	990+44.92	375.28'
	990+72.35	374.18'
	991+17.45	373.60'
	991+75.08	373.31'
	991+97.42	373.02'
	992+11.68	372.31'
	992+55.11	371.72'
	994+18.99	370.90'
	994+40.80	370.46'

RIGHT DITCHES		
DITCH NAME	STATION	ELEVATION
SPL_D_RT_09	1000+03.16	367.60'
	1001+08.22	368.12'
	1002+97.67	371.34'
	1006+56.57	372.60'
	1007+47.21	373.55'
	1008+83.60	373.89'
	1009+06.22	373.21'
SPL_D_RT_10	1009+08.72	373.21'
	1009+31.10	373.89'
	1011+83.05	374.64'
	1012+42.42	375.38'
	1014+63.79	376.20'
	1017+63.69	376.95'
	1017+90.99	377.77'
	1018+60.99	376.34'
SPL_D_RT_11	1018+68.83	376.34'
	1020+59.72	377.58'
	1021+65.95	377.95'
SPL_D_RT_12	1022+52.28	378.25'
	1024+18.66	378.83'
	1025+42.20	380.69'
	1026+69.81	381.64'
	1029+21.19	384.86'
	1030+30.05	386.06'
	1032+03.03	388.65'
	1033+86.88	391.34'
	1035+86.35	394.09'
	1037+41.75	396.34'
	1038+75.72	398.02'
	1039+63.88	398.64'
	1039+86.96	398.72'
	1040+86.96	399.07'
	1041+86.96	398.72'
	1040+86.96	398.89'
	1043+37.96	398.19'
	1044+54.52	397.43'
	1050+50.73	396.24'
SPL_D_RT_13	1050+52.65	396.24'
	1050+78.69	396.33'
	1052+78.69	397.03'
	1054+78.69	396.33'
	1052+78.69	396.68'
	1055+74.22	396.00'
	1059+14.78	393.95'
	1060+22.98	393.57'
SPL_D_RT_14	1060+24.90	393.57'
	1060+59.04	393.91'
SPL_D_RT_15	1062+13.22	394.07'
	1065+79.39	394.80'

NOTES:

1. SEE DITCH COMPUTATIONS SHEET FOR VERTICAL POINT OF INTERSECTION FOR LEFT DITCH.

STATE OF TEXAS
ROBERT J. RAMON
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PROFESSIONAL ENGINEER

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3EF5D1603925484...
7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

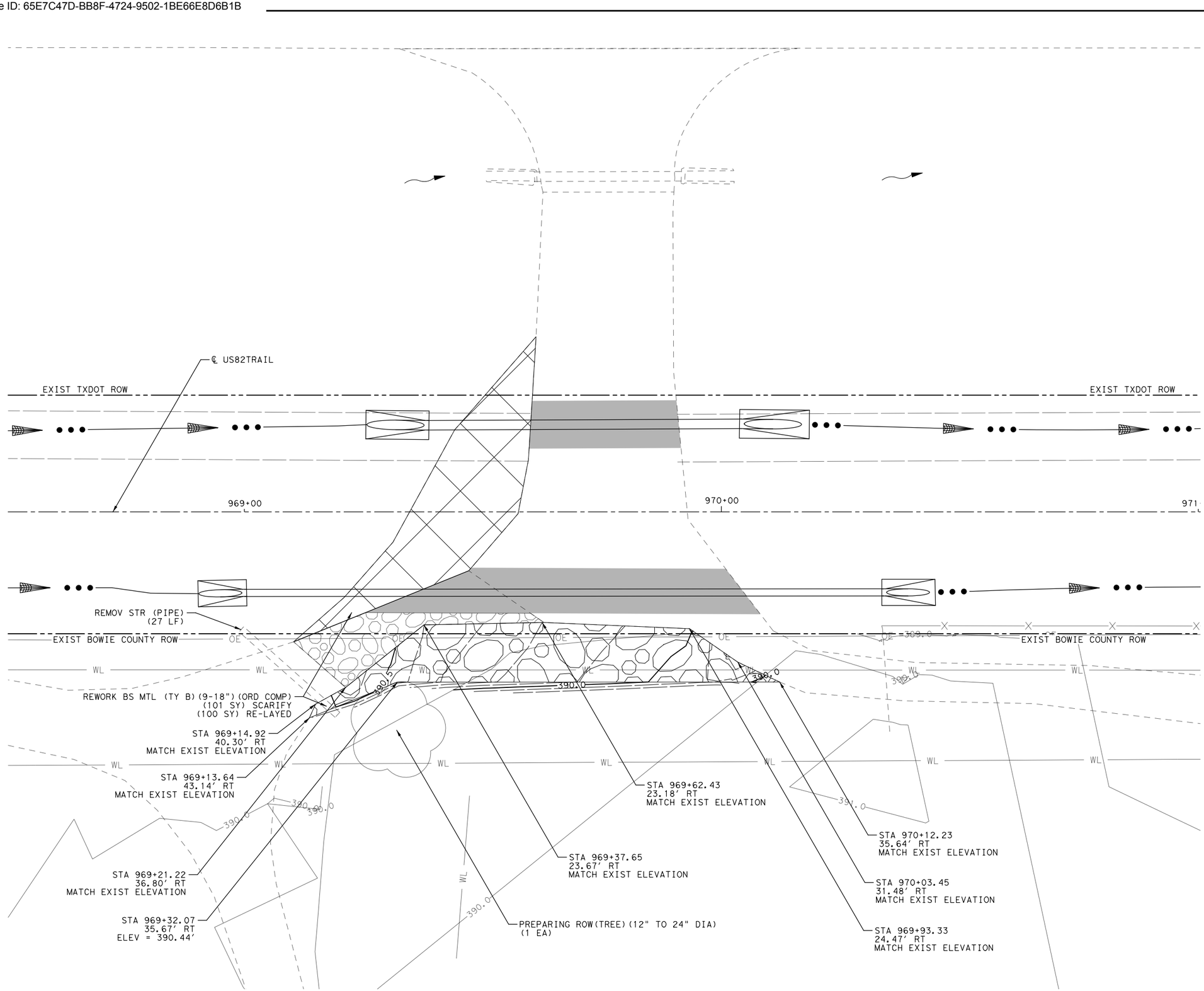
VARIOUS

DITCH SUMMARY TABLE

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	70
CHECK JMT	CONTROL 0919	SECTION 19	JOB 087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Details\US82T*S*DITCH*TABLE01.dgn



0′ 10′ 20′

SCALE IN FEET

LEGEND

- —400— PROPOSED CONTOURS (0.5′)
- PROPOSED CONTOURS (0.1′)
- EXISTING CONTOURS (1.0′)
- FLOW ARROW
- RE-LAYED GRAVEL
- EXISTING GRAVEL TO REMAIN
- SCARIFIED GRAVEL
- CUT & RESTORE PAVEMENT

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA FOR CURVE DATA AND ALIGNMENT INFORMATION.
2. ALL DIMENSIONS ARE TO THE EDGE OF PAVEMENT UNLESS NOTED OTHERWISE.
3. POINTS ARE SHOWN AT CRITICAL POINTS (PC, PT, ETC.) UNLESS NOTED OTHERWISE.
4. SEE PLAN AND PROFILE SHEETS FOR PAYMENT AND ADDITIONAL INFORMATION.
5. ALL STATIONS AND OFFSETS ARE MEASURED FROM ℄ US82TRAIL UNLESS NOTED OTHERWISE.
6. EXISTING GROUND ELEVATIONS OUTSIDE OF BOWIE COUNTY ROW LINES ARE APPROXIMATE AND BASED ON 2017 TNRIS CONTOURS.

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7/5/2023

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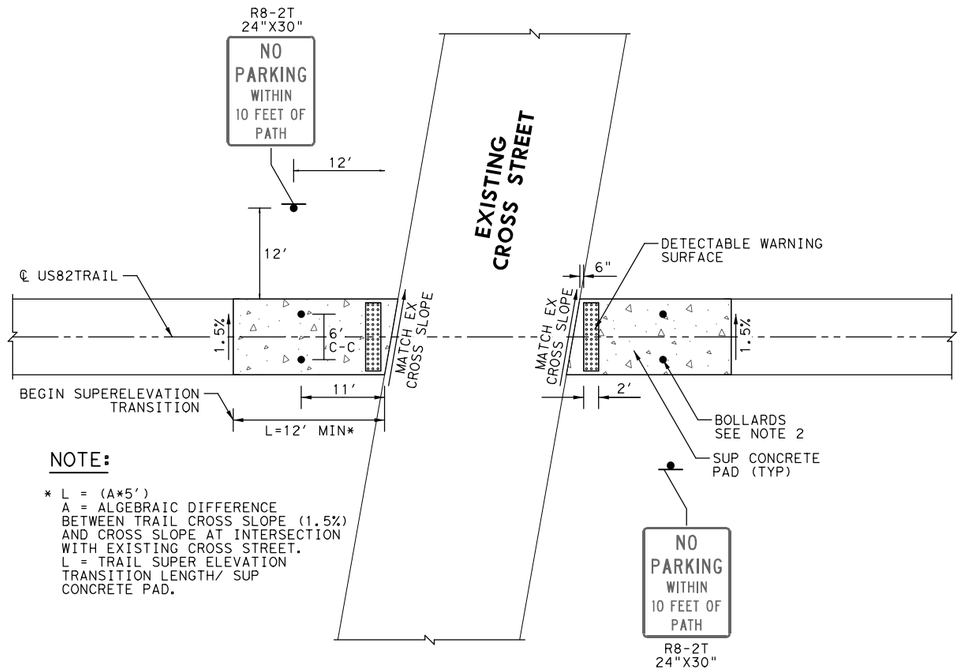
VARIOUS

DRIVEWAY GRADING DETAIL

SCALE: 1" = 20′ SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	71
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

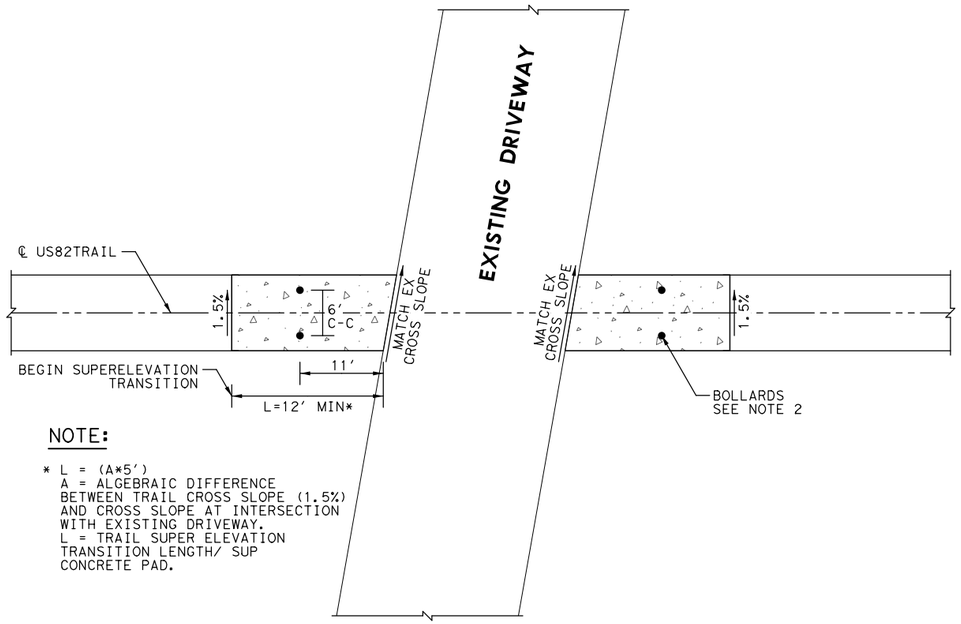
DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Details\US82T*S*SUP*DET*GRAD01.dgn



NOTE:

* L = (A*5')
A = ALGEBRAIC DIFFERENCE BETWEEN TRAIL CROSS SLOPE (1.5%) AND CROSS SLOPE AT INTERSECTION WITH EXISTING CROSS STREET.
L = TRAIL SUPER ELEVATION TRANSITION LENGTH/ SUP CONCRETE PAD.

INTERSECTION DETAIL



NOTE:

* L = (A*5')
A = ALGEBRAIC DIFFERENCE BETWEEN TRAIL CROSS SLOPE (1.5%) AND CROSS SLOPE AT INTERSECTION WITH EXISTING DRIVEWAY.
L = TRAIL SUPER ELEVATION TRANSITION LENGTH/ SUP CONCRETE PAD.

DRIVEWAY DETAIL

NOTES:

1. SEE "MISCELLANEOUS SUP DETAILS - CONCRETE SUP" SHEET FOR MORE INFORMATION ON CONCRETE PAD.
2. SEE "MISCELLANEOUS SUP DETAILS - BOLLARDS" SHEET FOR MORE INFORMATION ON BOLLARDS.
3. SEE TYPICAL SECTIONS FOR SHARED USE PATH PAVEMENT SECTION.
4. PAYMENT FOR DETECTABLE WARNING SURFACE IS SUBSIDIARY TO CONCRETE SUP PAD.
5. R8-2T SMALL SIGN SUPPORTS SHALL BE PAID FOR USING ITEM 644 6060. SEE SUMMARY OF QUANTITIES FOR PAYMENT AND LOCATIONS.

SUP SUPER ELEVATION CROSS SLOPE TRANSITIONS

EXIST STREET/ DRIVEWAY	BEGIN TRANSITION AT ℄ US82TRAIL	BEGIN CROSS SLOPE	END TRANSITION AT ℄ US82TRAIL	END CROSS SLOPE	TRANSITION LENGTH "L" (FT)
CR 4105	903+43.94	1.50%	903+61.94	-2.29%	20
	903+84.53	-2.32%	904+05.53	1.50%	20
CR 4130-A	915+38.11	1.50%	915+50.11	0.66%	14
	915+75.23	-0.33%	915+87.23	1.50%	14
CR 4104	932+15.69	1.50%	932+39.69	-2.99%	24
	932+63.50	-3.43%	932+89.50	1.50%	26
CR 4102	955+37.27	1.50%	955+61.27	-2.69%	24
	955+86.15	-3.39%	956+13.15	1.50%	27
PRIVATE ROAD	969+39.45	1.50%	969+57.45	-1.06%	18
	969+92.85	-1.28%	970+10.85	1.50%	18
DRIVEWAY	981+64.38	1.50%	981+76.38	-0.48%	14
	981+93.23	-0.77%	982+07.23	1.50%	14
CR 4007	1021+80.13	1.50%	1022+00.13	-2.38%	20
	1022+24.52	-0.97%	1022+38.52	1.50%	14

STATE OF TEXAS
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7/5/2023

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TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

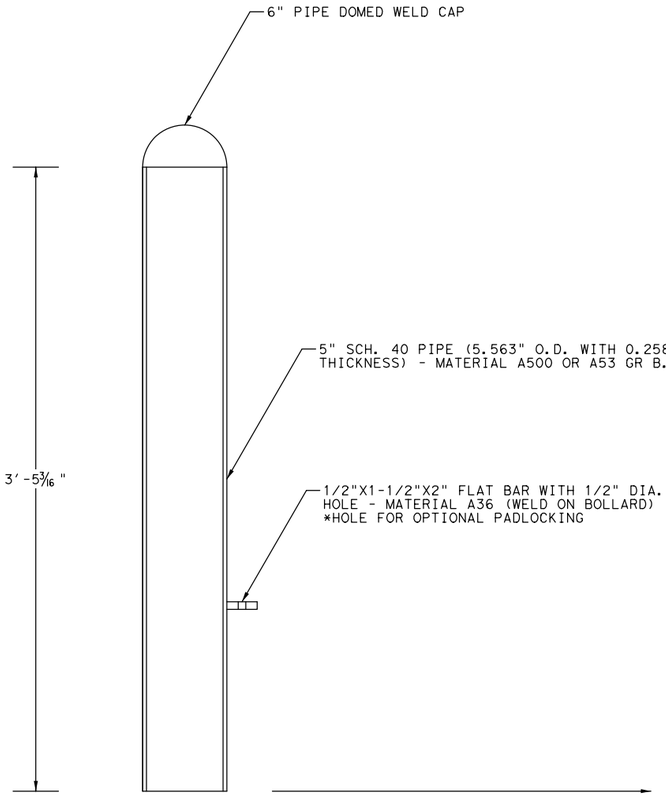
MISCELLANEOUS SUP DETAILS

INTERSECTIONS AND DRIVEWAYS

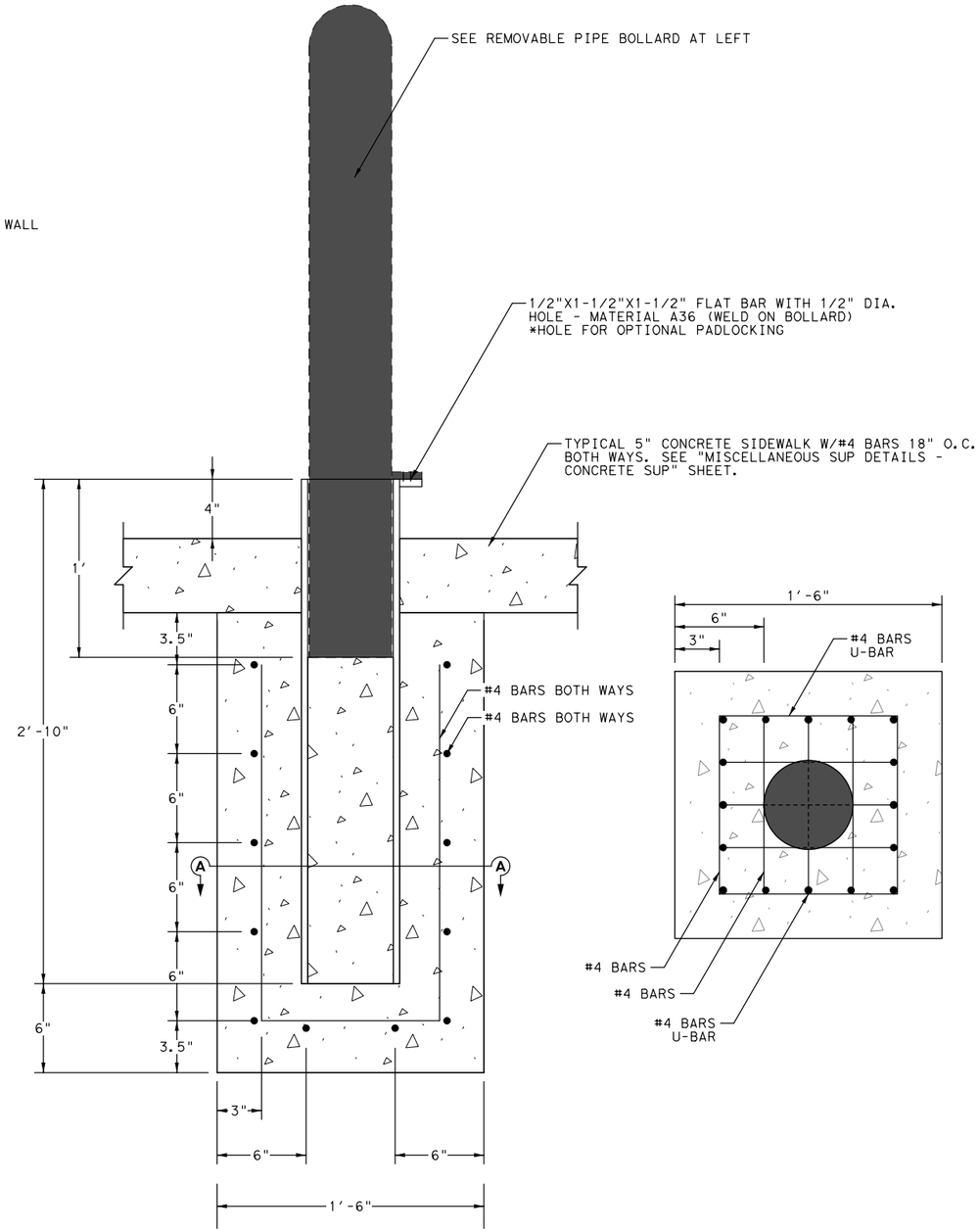
SCALE: NTS — SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	72
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Details\US82T*S*SUP*DET*MISC01.dgn



REMOVABLE PIPE BOLLARD



PIPE BOLLARD SLEEVE

SECTION A-A

NOTES:

1. CONCRETE SHALL BE CLASS A UNLESS NOTED OTHERWISE.
2. DEFORMED REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60. ALL REINFORCING BAR DIMENSIONS ON THE DETAILED DRAWINGS ARE TO CENTER OF BAR EXCEPT WHERE OTHERWISE NOTED AND ARE SUBJECT TO FABRICATION AND CONSTRUCTION TOLERANCES.

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7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

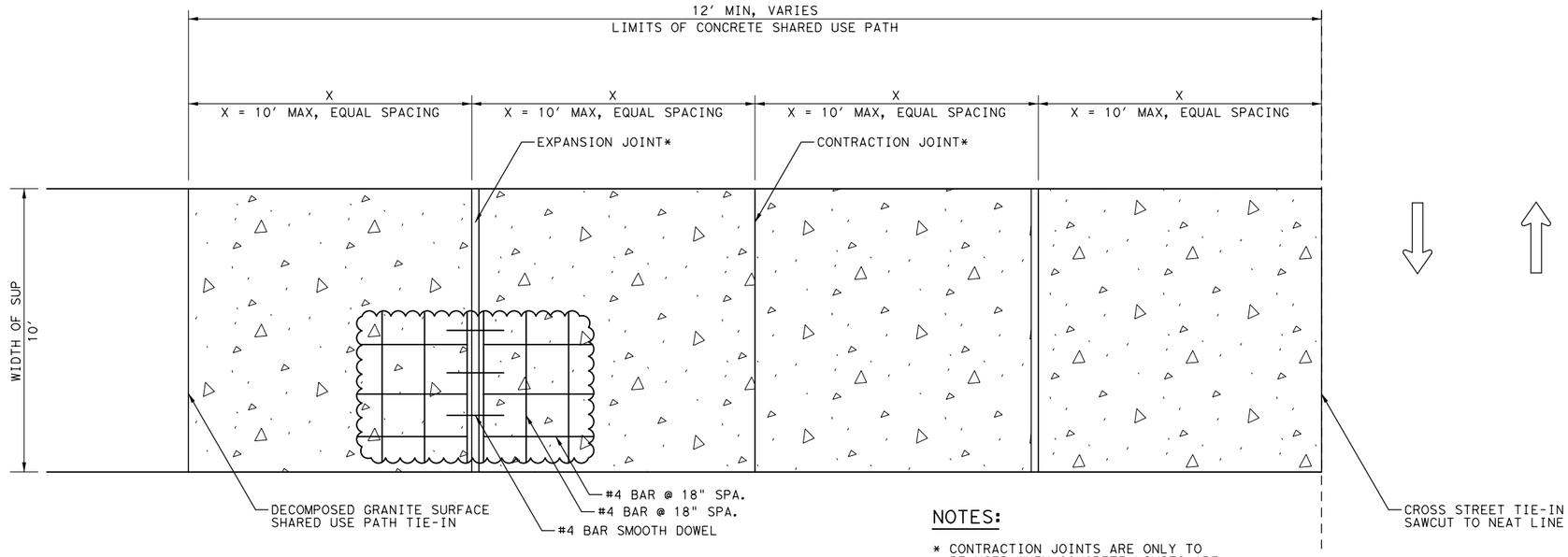
VARIOUS

MISCELLANEOUS SUP DETAILS

BOLLARDS

SCALE: NTS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	73
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	



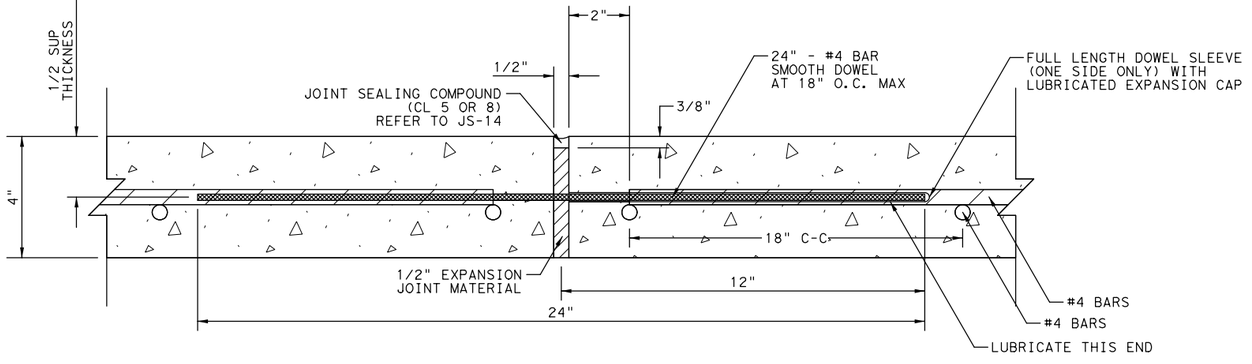
PLAN VIEW

NOTES:

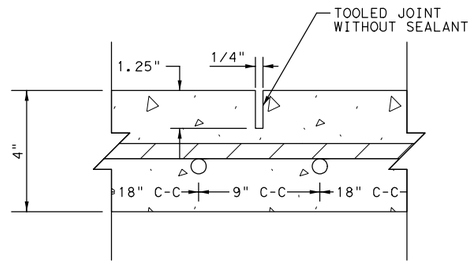
* CONTRACTION JOINTS ARE ONLY TO BE USED WHEN CONCRETE LIMITS ARE GREATER THAN 30' IN LENGTH. SOLELY EXPANSION JOINTS TO BE USED WHEN LIMITS ARE 30' OR LESS.

NOTES:

1. CONCRETE SHARED USE PATH SHALL BE PAID FOR AS CONCRETE SIDEWALKS (4"). ALL MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH ITEM 531 "SIDEWALKS."



EXPANSION JOINT



CONTRACTION JOINT

SUP CONCRETE PAD QUANTITIES

EXIST STREET/ DRIVEWAY	BEGIN TRANSITION AT ℄ US82TRAIL	END TRANSITION AT ℄ US82TRAIL	CONCRETE PAD (SY)
CR 4105	903+43.94	903+61.94	22
	903+84.53	904+05.53	22
CR 4130-A	915+38.11	915+50.11	16
	915+75.23	915+87.23	15
CR 4104	932+15.69	932+39.69	27
	932+63.50	932+89.50	29
CR 4102	955+37.27	955+61.27	26
	955+86.15	956+13.15	30
PRIVATE ROAD	969+39.45	969+57.45	19
	969+92.85	970+10.85	20
DRIVEWAY	981+64.38	981+76.38	16
	981+93.23	982+07.23	16
CR 4007	1021+80.13	1022+00.13	22
	1022+24.52	1022+38.52	16

STATE OF TEXAS
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7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

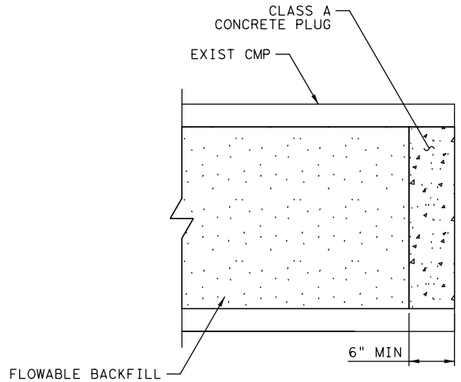
MISCELLANEOUS SUP DETAILS

CONCRETE SUP

SCALE: NTS SHEET 3 OF 3

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	
CHECK JMT	CONTROL	SECTION	JOB	74
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Details\US82T*S*SUP*DET*MISC03.dgn



CONCRETE PLUG
NTS

NOTES:

1. FLOWABLE BACKFILL IS TO BE USED TO FILL ABANDONED PIPE AS INDICATED ON PLANS.

STATE OF TEXAS
JULIUS C.U. SERRANO
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7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

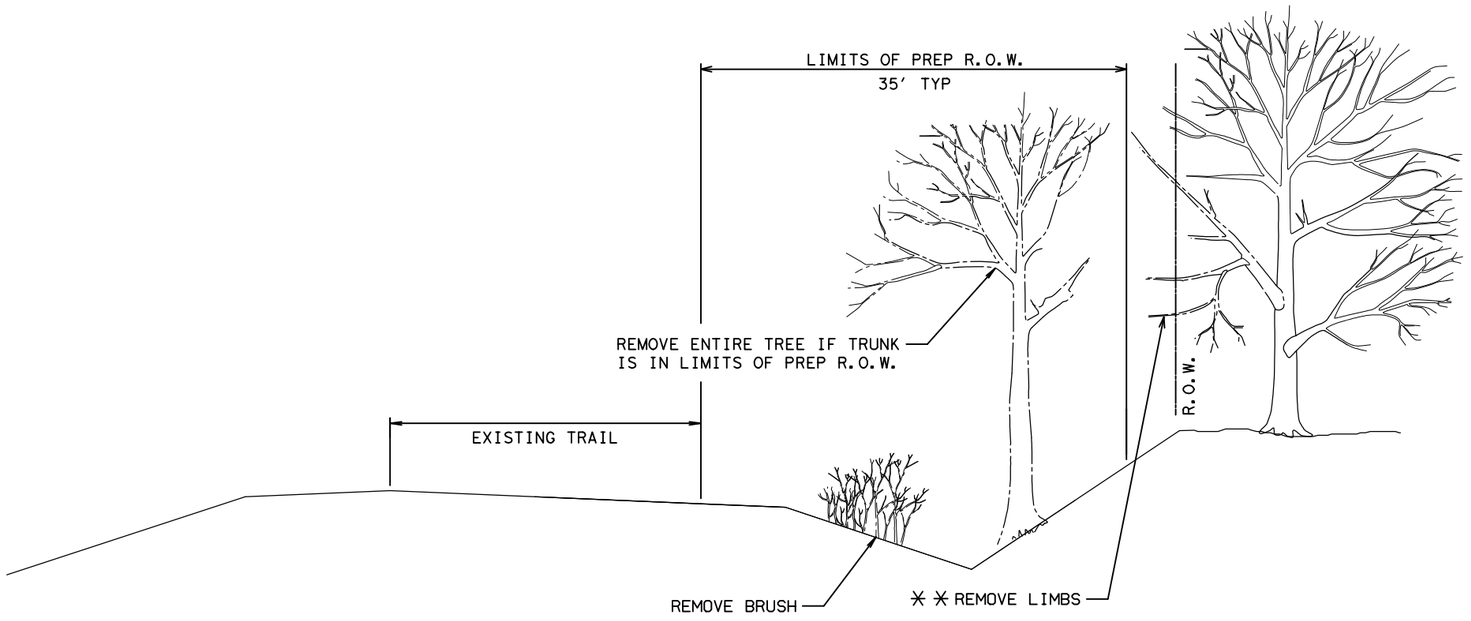
VARIOUS

PLUG CULVERT DETAIL

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	75
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*MISC*DET00.dgn

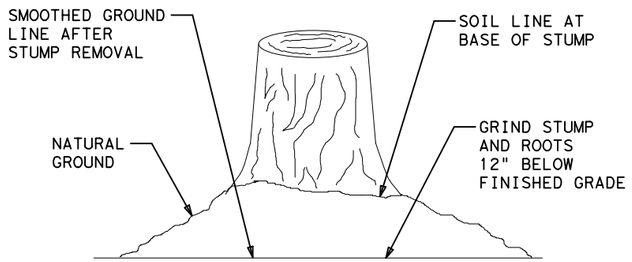


TYPICAL REMOVAL AND TRIM DETAIL

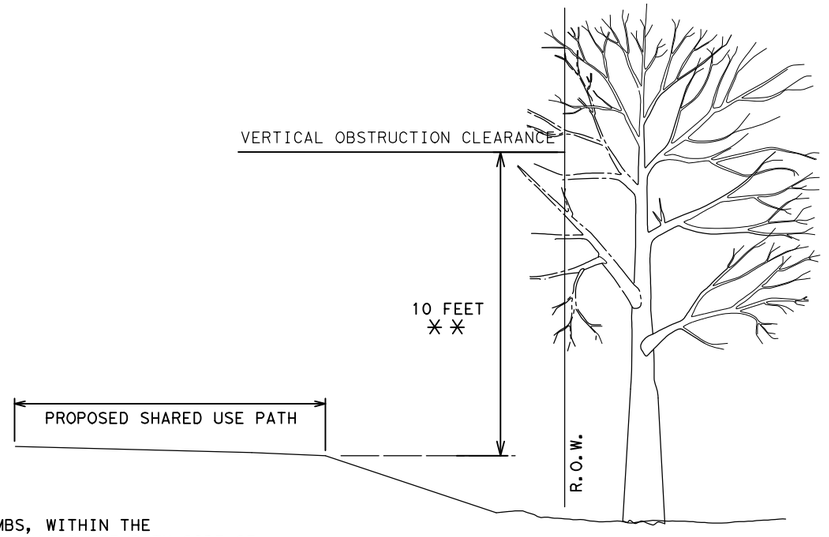
NOTE: AREAS THAT ARE DISTURBED DURING TREE REMOVAL OR TRIMMING SHALL BE SEEDED WITH THE SAME SEED FOUND ELSEWHERE IN THE PLANS.

DO NOT TRIM OR REMOVE LIMBS OR BRUSH PAST THE R.O.W. WITH OUT RIGHT-OF-ENTRY PERMIT.

EXACT LIMITS AND QUANTITIES TO BE VERIFIED IN THE FIELD.



STUMP GRINDING DETAIL



** TRIM AND REMOVE ALL TREE LIMBS, WITHIN THE OBSTRUCTION CLEARANCE ON THE SHARED USE PATH SIDE OF THE TRUNK 10 FEET ABOVE THE SHARED USE PATH ELEVATION REMOVE TO TRUNK.

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7/6/2023

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TREE REMOVAL AND TRIMMING DETAILS

NOT TO SCALE

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0919	19	087	VARIOUS
DIST	COUNTY		SHEET NO.
ATL	BOWIE		76

DATE: 7/6/2023 5:20:48 PM
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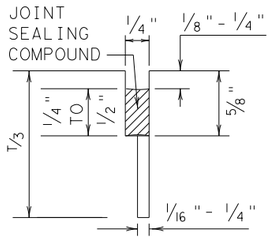
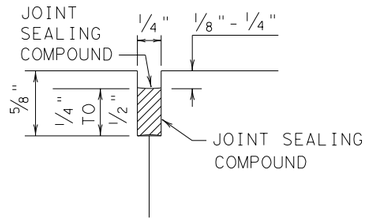
DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Standards\js14.dgn

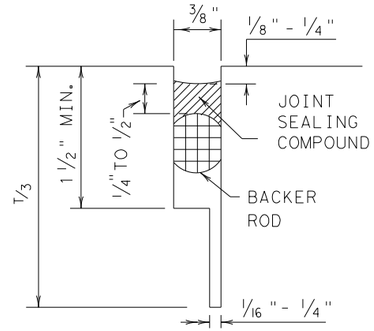
METHOD B: JOINT SEALING COMPOUND



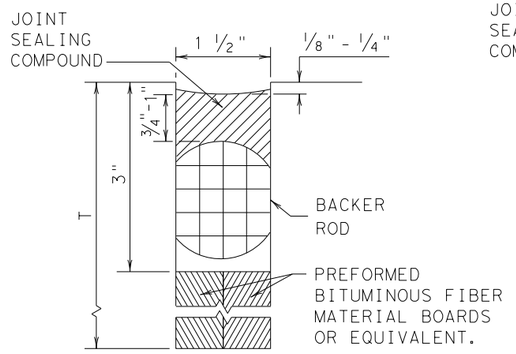
LONGITUDINAL SAWED CONTRACTION JOINT



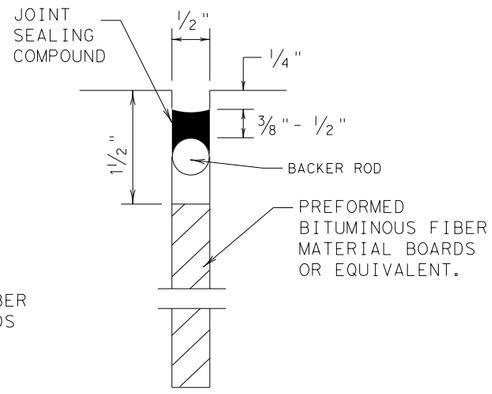
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

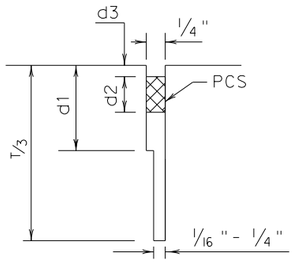


TRANSVERSE FORMED EXPANSION JOINT

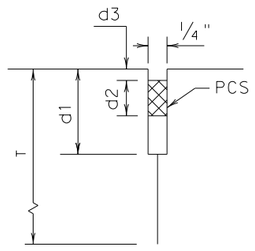


FORMED ISOLATION JOINT

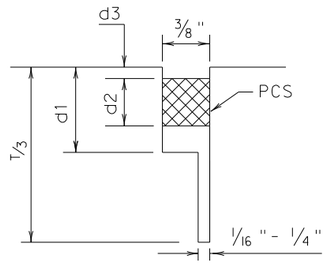
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



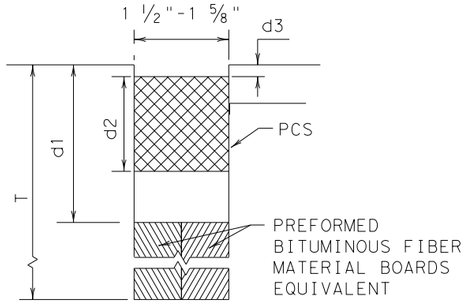
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation | Design Division Standard

CONCRETE PAVING DETAILS

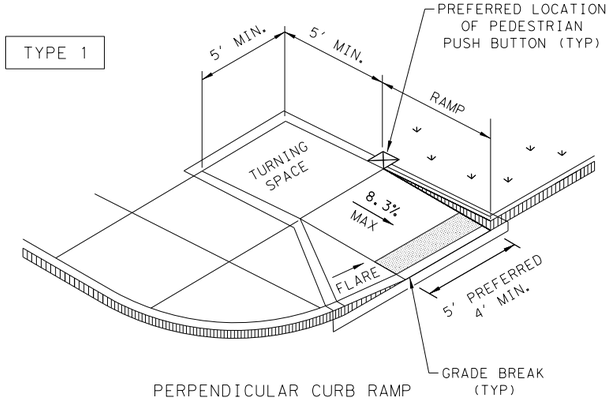
JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		77

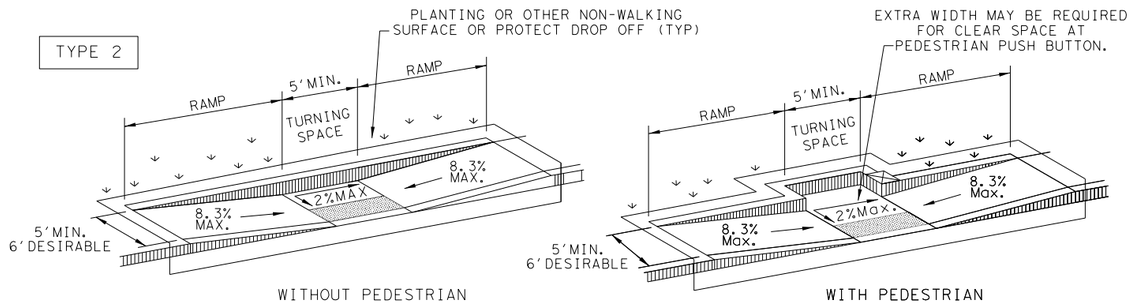
DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Standards\ped18.dgn

TYPE 1



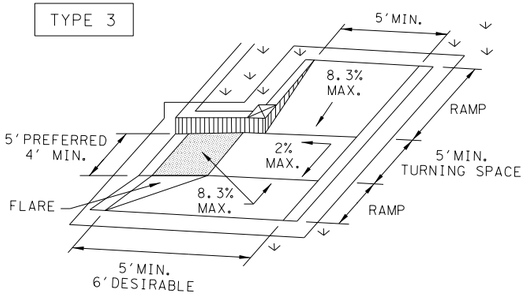
PERPENDICULAR CURB RAMP

TYPE 2

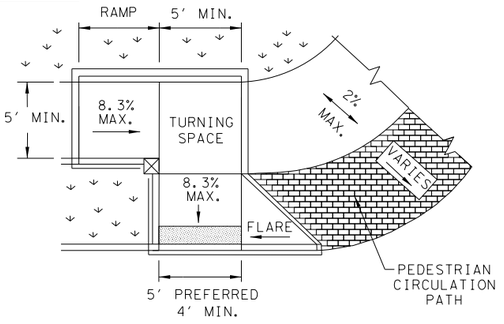


PARALLEL CURB RAMP

TYPE 3

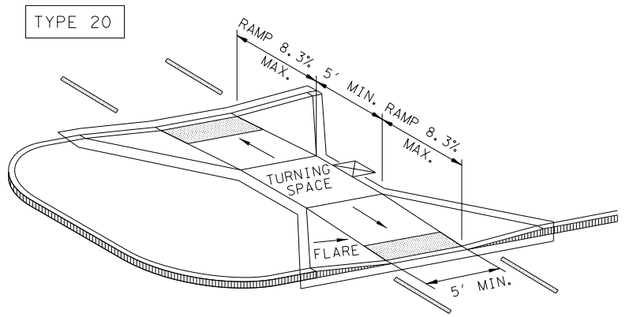


TYPE 6



COMBINATION CURB RAMPS

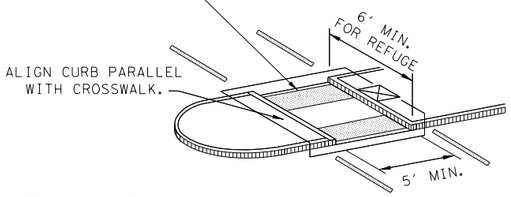
TYPE 20



CURB RAMPS AT MEDIAN ISLANDS

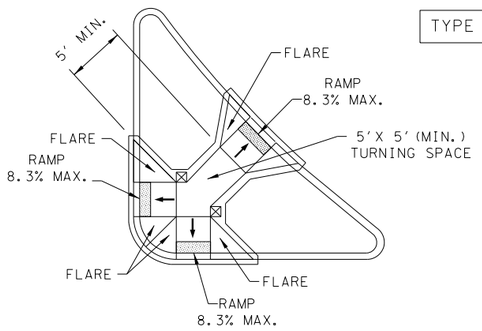
INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.

TYPE 21



NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

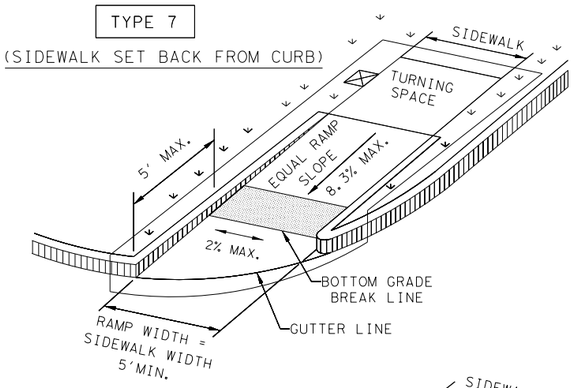
TYPE 22



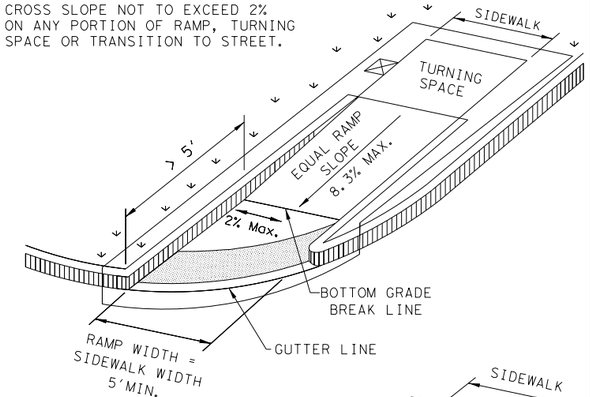
COMBINATION ISLAND RAMPS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

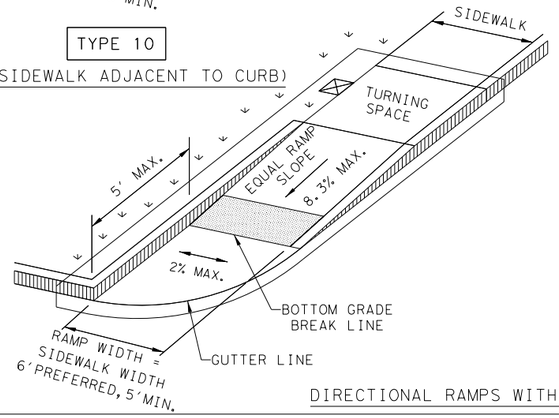


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

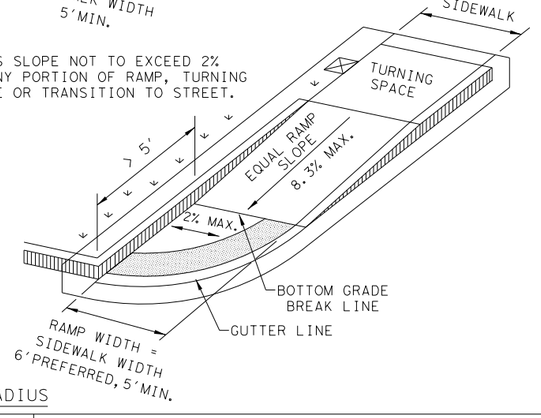


TYPE 10

(SIDEWALK ADJACENT TO CURB)

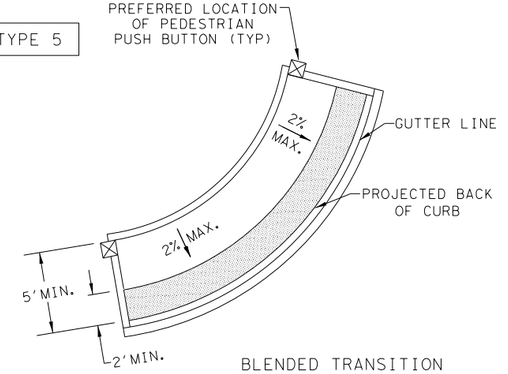


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



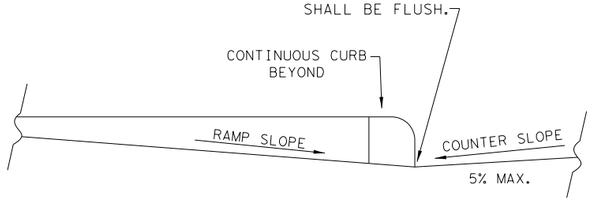
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



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

SHEET 1 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	0919	19	087	VARIOUS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		78

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Standards\ped18.dgn

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

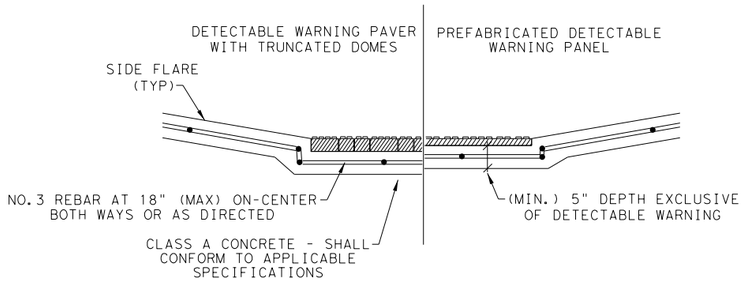
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material 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.

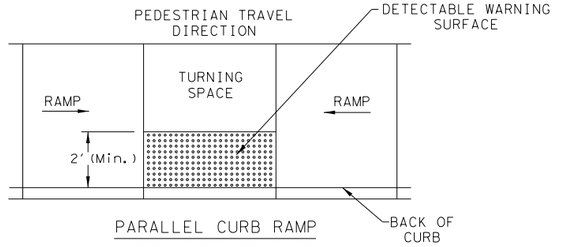
SIDEWALKS

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.

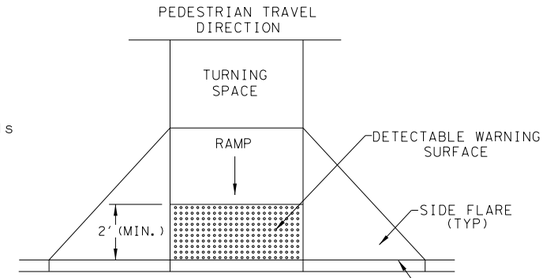


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

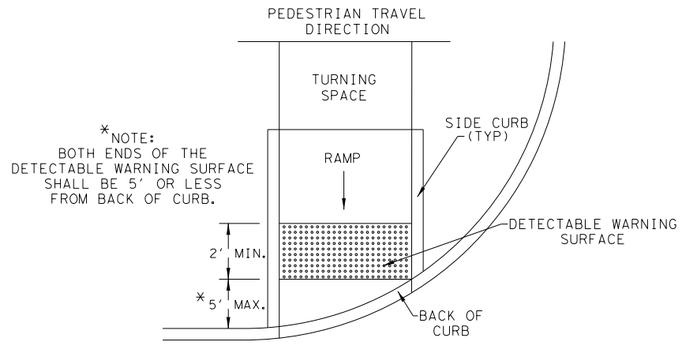
DETECTABLE WARNING SURFACE DETAILS



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

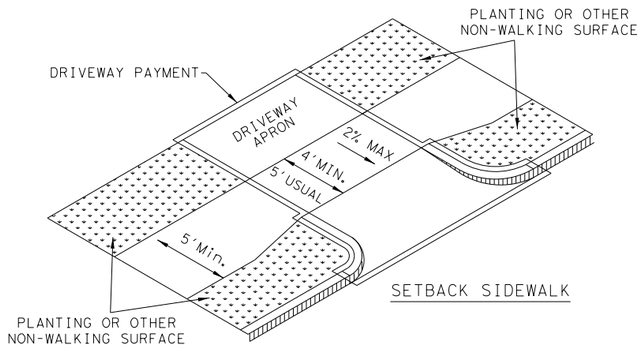
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

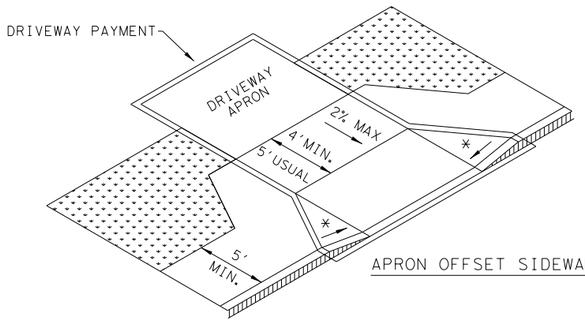
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0919	19	087		VARIOUS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.
	ATL	BOWIE			79

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Standards\ped18.dgn

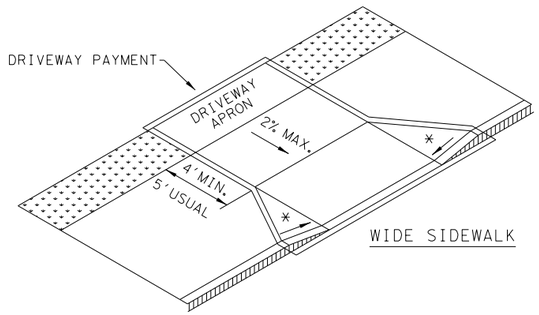
SIDEWALK TREATMENT AT DRIVEWAYS



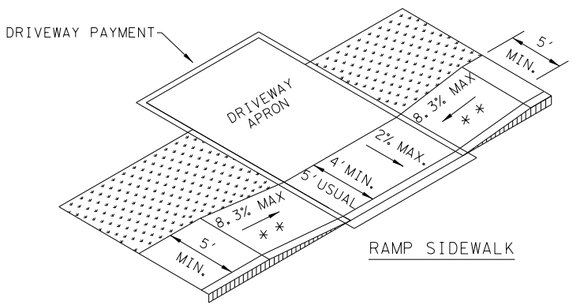
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

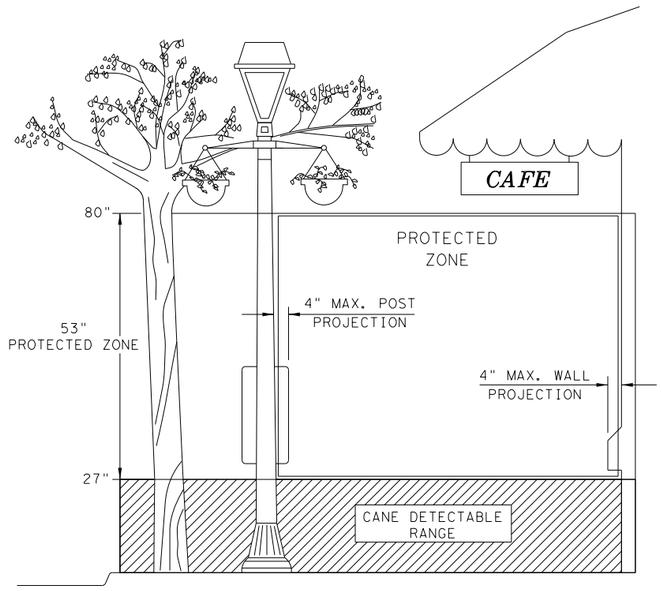


RAMP SIDEWALK

NOTES:

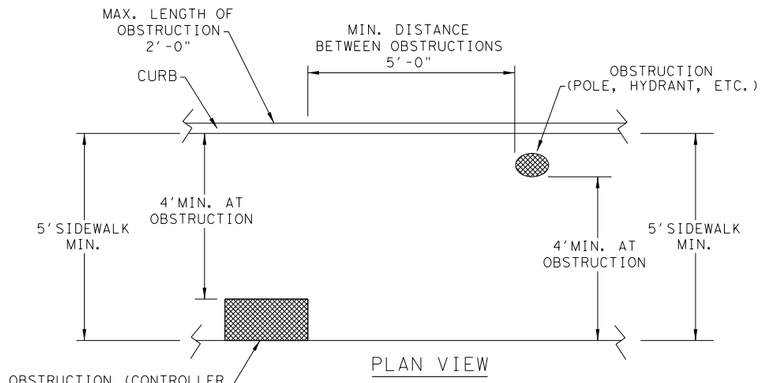
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * 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

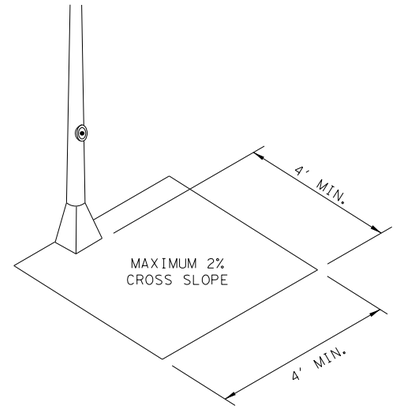
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



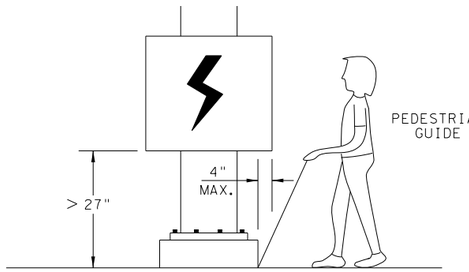
PLAN VIEW

PLACEMENT OF STREET FIXTURES

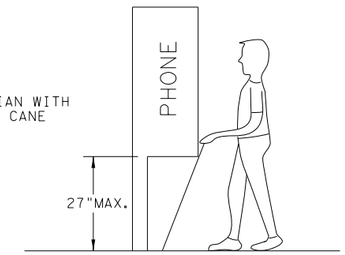
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



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

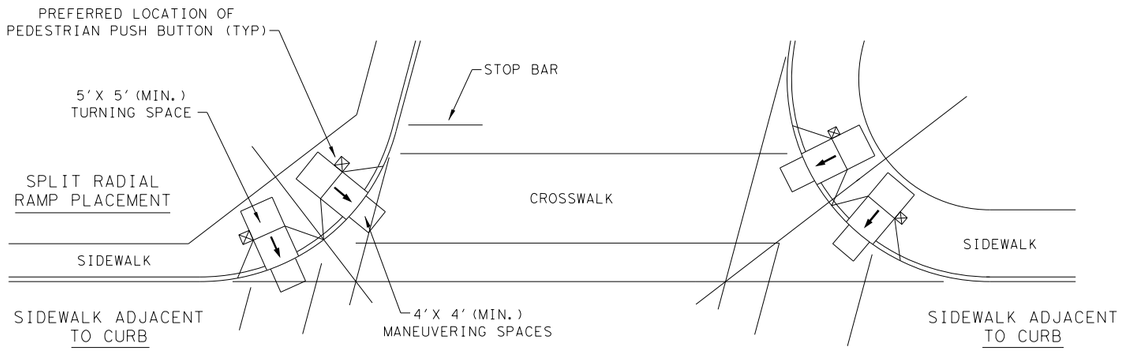
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0919	19	087		VARIOUS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY			SHEET NO.
	ATL	BOWIE			80

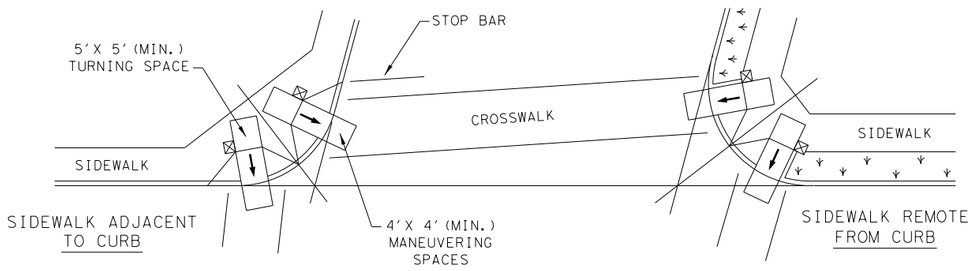
DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\3. Roadway\Standards\ped18.dgn

TYPICAL CROSSING LAYOUTS

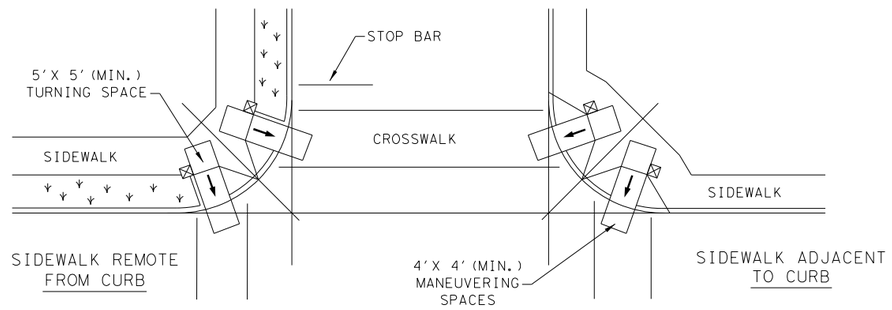
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



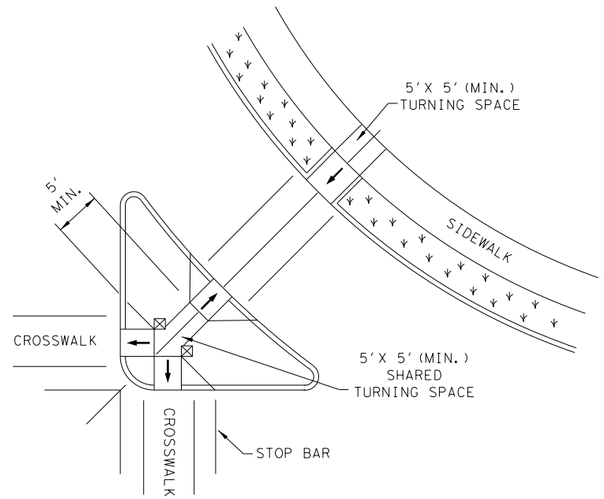
SKEWED INTERSECTION WITH "LARGE" RADIUS



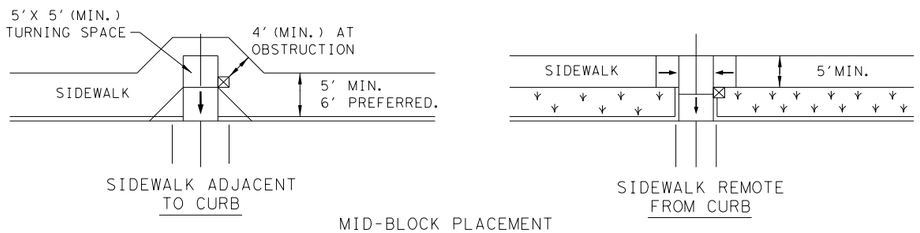
SKEWED INTERSECTION WITH "SMALL" RADIUS



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.

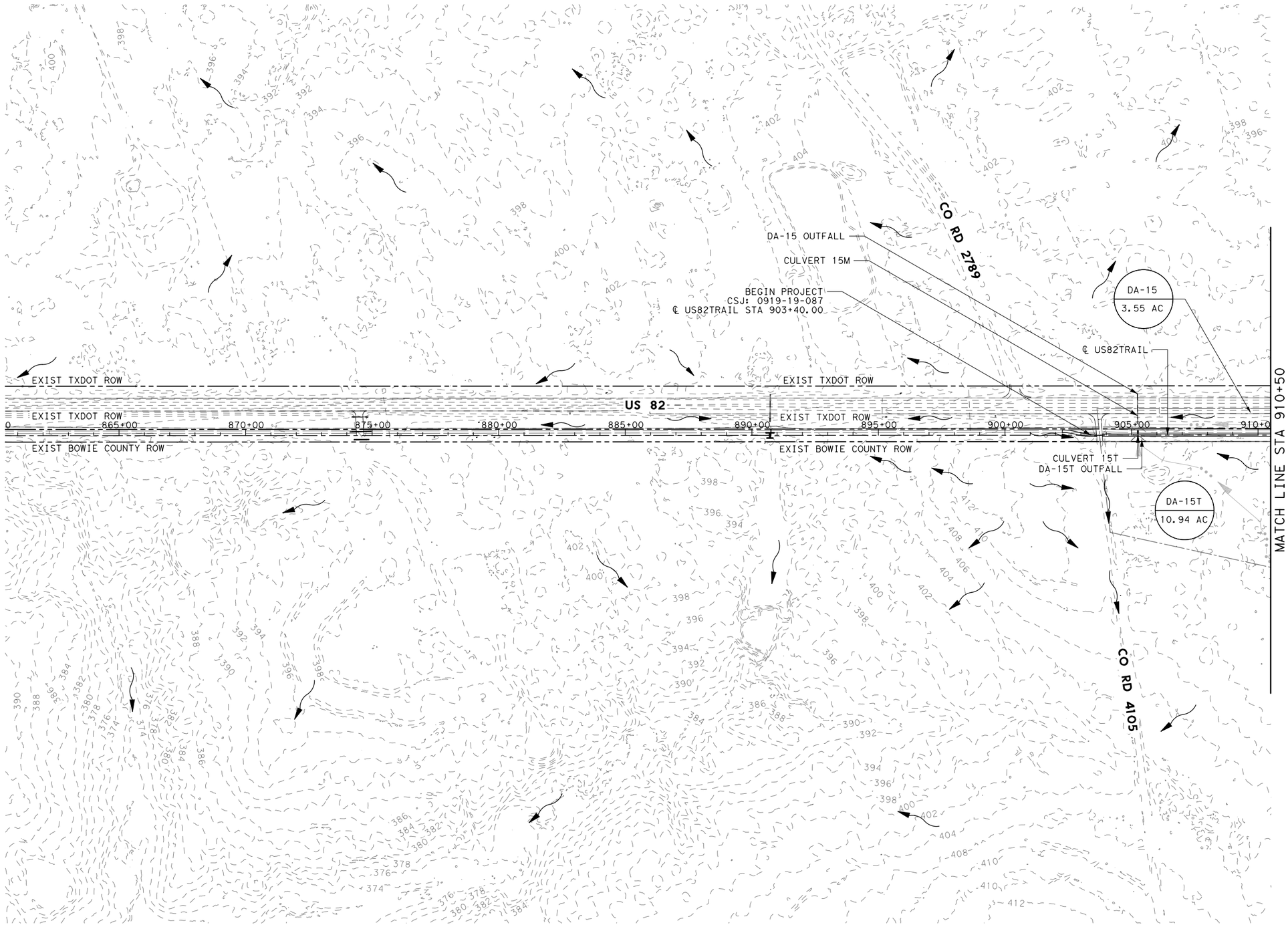
SHEET 4 OF 4

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	0919	19	087	VARIOUS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		81



0′ 100′ 200′ 400′

SCALE IN FEET

LEGEND

- STR/DA-XX / XX.XX AC — AREA ID
- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX — CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
2. NRCS WEB SOIL SURVEY WAS USED TO DETERMINE PERCENTAGE BREAKDOWN OF HYDROLOGIC SOIL GROUPS FOR CURVE NUMBER COMPUTATIONS.
3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

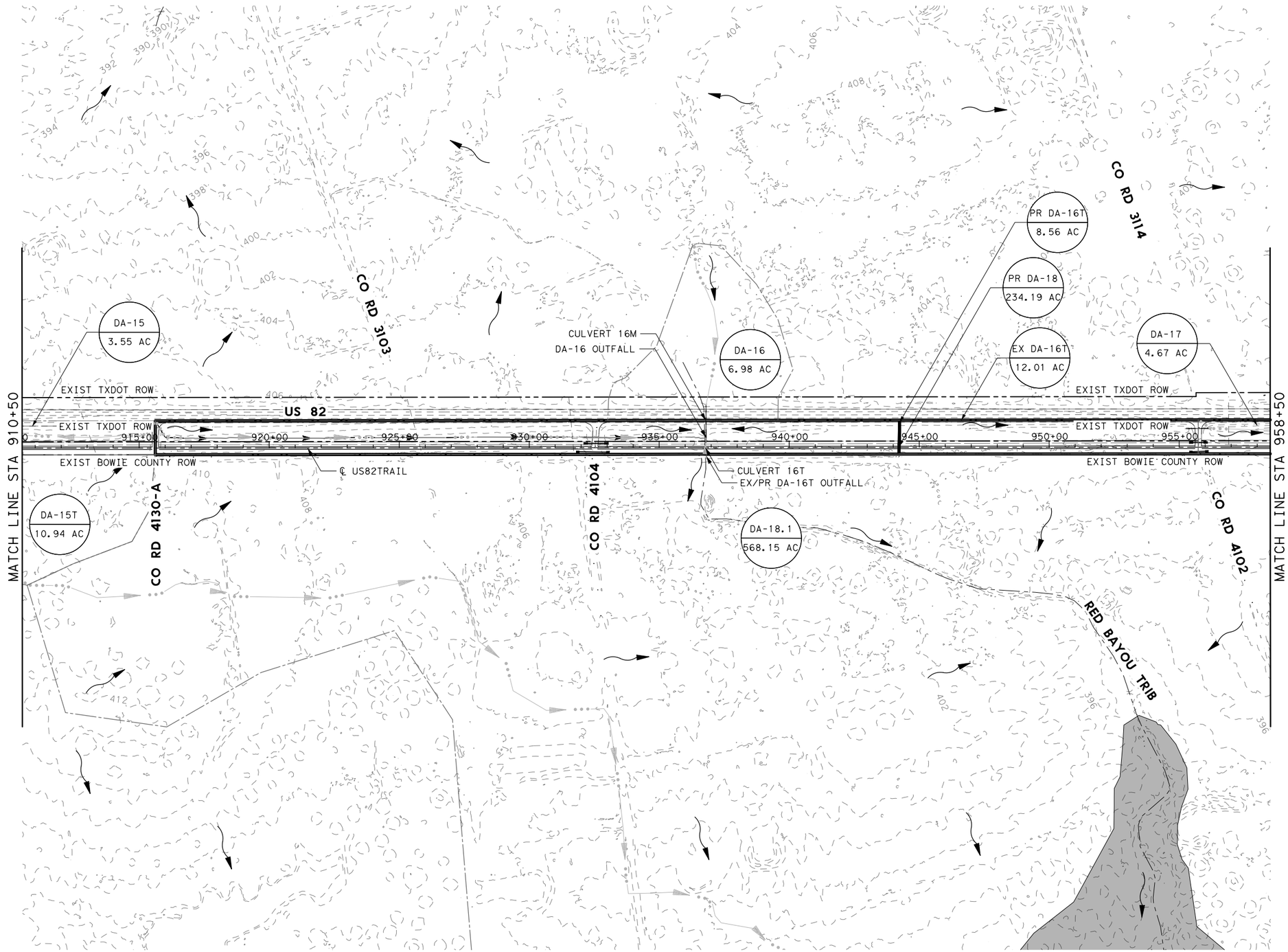
VARIOUS

DRAINAGE AREA MAP
BEGIN TO STA 910+50

SHEET 1 OF 6

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	82
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA06.dgn



0′ 100′ 200′ 400′

SCALE IN FEET

LEGEND

- STR/DA-XX / XX.XX AC — AREA ID
- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX — CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
2. NRCS WEB SOIL SURVEY WAS USED TO DETERMINE PERCENTAGE BREAKDOWN OF HYDROLOGIC SOIL GROUPS FOR CURVE NUMBER COMPUTATIONS.
3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.
4. FEMA DESIGNATED ZONE A LIMITS PER FEMA FIRM MAP NUMBER 48037C0300D, DATED OCTOBER 19, 2010, BOWIE COUNTY, AND INCORPORATED AREAS.
5. SEE DRAINAGE AREA RED BAYOU TRIBUTARY FOR DRAINAGE AREAS 18, 18.1, AND 18.2.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

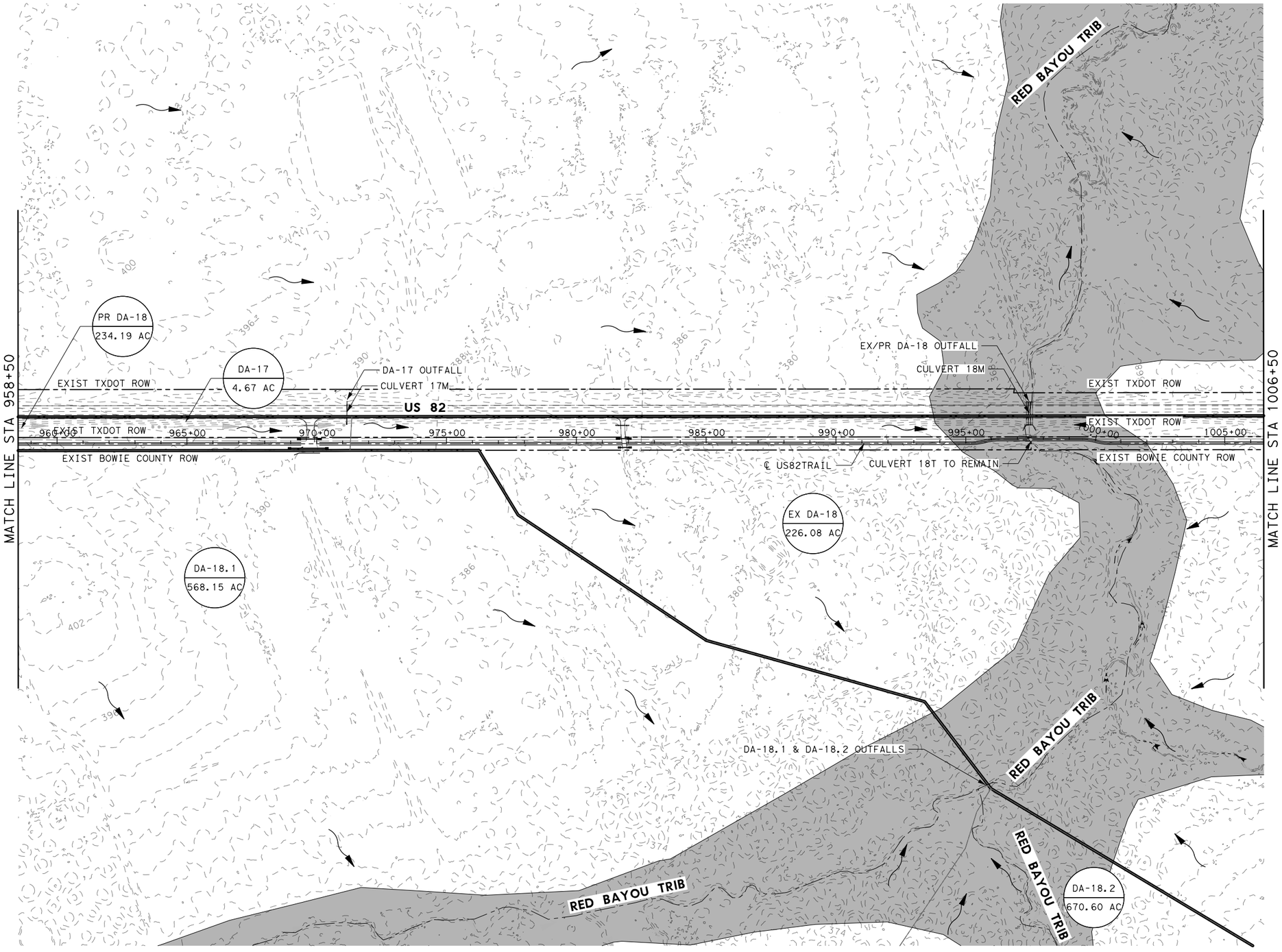
VARIOUS

DRAINAGE AREA MAP
STA 910+50 TO STA 958+50

SHEET 2 OF 6

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	83
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA07.dgn



0′ 100′ 200′ 400′

SCALE IN FEET

LEGEND

- STR/DA-XX / XX.XX AC — AREA ID
- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX — CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
2. NRCS WEB SOIL SURVEY WAS USED TO DETERMINE PERCENTAGE BREAKDOWN OF HYDROLOGIC SOIL GROUPS FOR CURVE NUMBER COMPUTATIONS.
3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.
4. FEMA DESIGNATED ZONE A LIMITS PER FEMA FIRM MAP NUMBER 48037C0300D, DATED OCTOBER 19, 2010, BOWIE COUNTY, AND INCORPORATED AREAS.
5. SEE DRAINAGE AREA RED BAYOU TRIBUTARY FOR DRAINAGE AREAS 18, 18.1, AND 18.2.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

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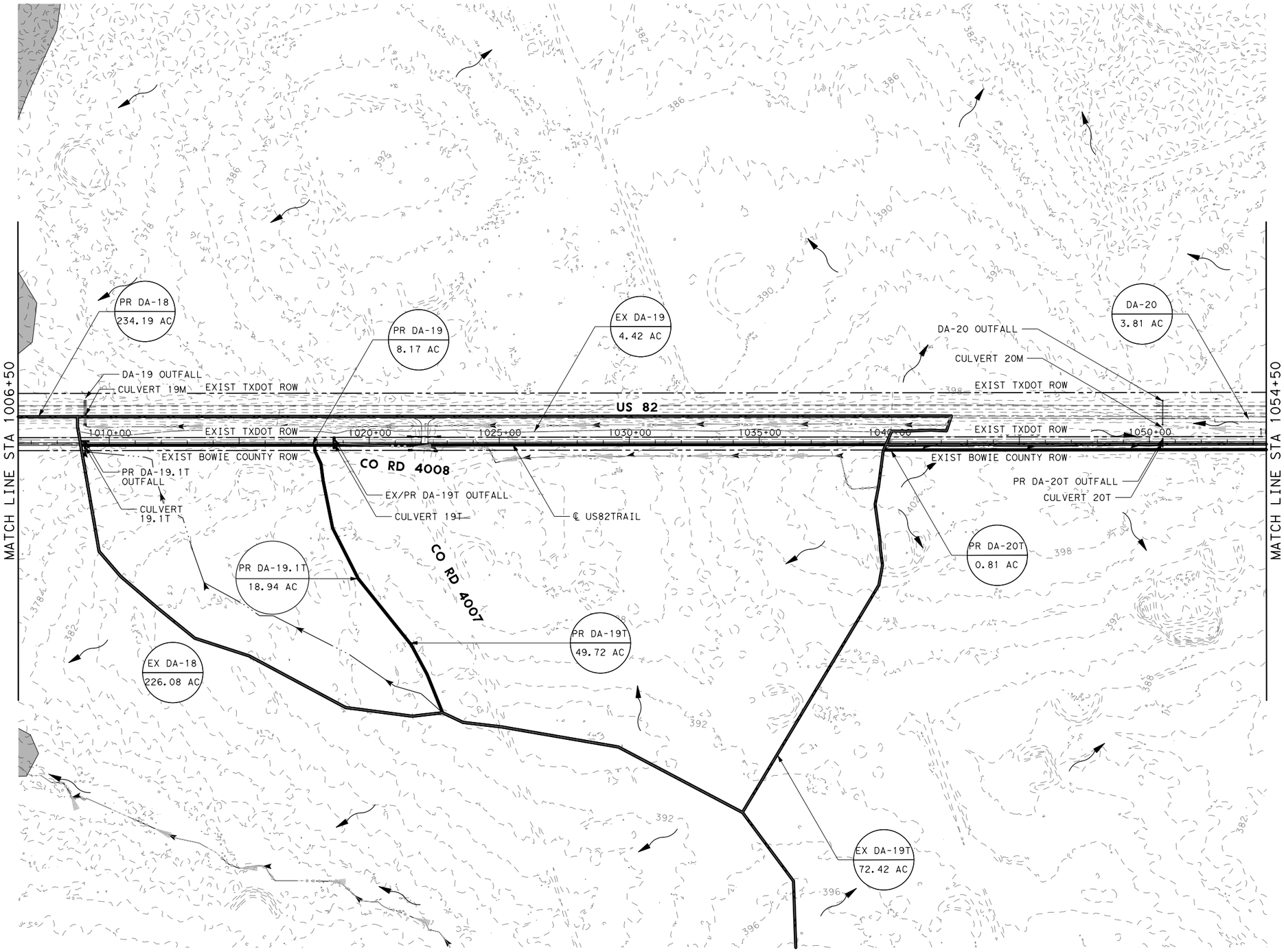
VARIOUS

DRAINAGE AREA MAP
STA 958+50 TO STA 1006+50

SHEET 3 OF 6

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	84
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA08.dgn



0' 100' 200' 400'

SCALE IN FEET

LEGEND

STR/DA-XX
XX.XX AC — AREA ID

- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX — CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
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3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.
4. FEMA DESIGNATED ZONE A LIMITS PER FEMA FIRM MAP NUMBER 48037C0300D, DATED OCTOBER 19, 2010, BOWIE COUNTY, AND INCORPORATED AREAS.
5. SEE DRAINAGE AREA RED BAYOU TRIBUTARY FOR DRAINAGE AREAS 18, 18.1, AND 18.2.

STATE OF TEXAS
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Texas Department of Transportation

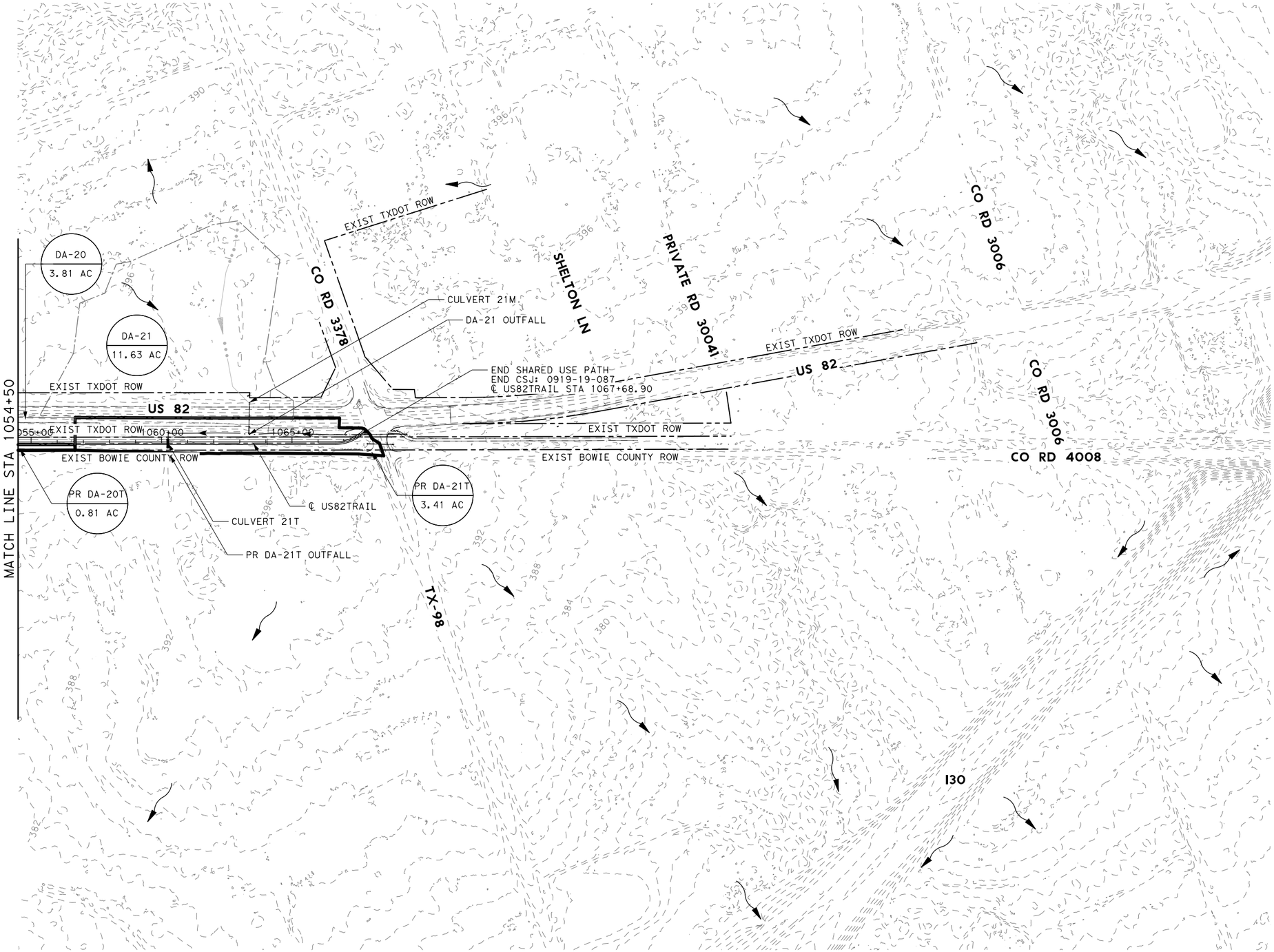
VARIOUS

DRAINAGE AREA MAP
STA 1006+50 TO STA 1054+50

SHEET 4 OF 6

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	85
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA09.dgn



0′ 100′ 200′ 400′

SCALE IN FEET

LEGEND

- STR/DA-XX / XX.XX AC — AREA ID
- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX — CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
2. NRCS WEB SOIL SURVEY WAS USED TO DETERMINE PERCENTAGE BREAKDOWN OF HYDROLOGIC SOIL GROUPS FOR CURVE NUMBER COMPUTATIONS.
3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.
4. FEMA DESIGNATED ZONE A LIMITS PER FEMA FIRM MAP NUMBER 48037C0300D, DATED OCTOBER 19, 2010, BOWIE COUNTY, AND INCORPORATED AREAS.

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VARIOUS

DRAINAGE AREA MAP
STA 1054+50 TO END

SHEET 5 OF 6

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	86
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA10.dgn

0′ 250′ 500′ 1000′

SCALE IN FEET

LEGEND

STR-XX
XX.XX AC — AREA ID

- FLOW DIRECTION
- EXISTING DRAINAGE AREA BOUNDARY
- PROPOSED DRAINAGE AREA BOUNDARY
- XXX CONTOURS
- STREAM CENTERLINE
- EX TIME OF CONCENTRATION PATH
- PR TIME OF CONCENTRATION PATH
- EXISTING ROW
- EXIST BOWIE COUNTY ROW
- FEMA FLOOD ZONE A

NOTES:

1. 2017 TNRIS CONTOURS ARE SHOWN AT 2-FT INTERVALS.
2. NRCS WEB SOIL SURVEY WAS USED TO DETERMINE PERCENTAGE BREAKDOWN OF HYDROLOGIC SOIL GROUPS FOR CURVE NUMBER COMPUTATIONS.
3. CULVERTS APPENDED WITH "T" ARE PROPOSED CULVERTS UNLESS NOTED OTHERWISE. CULVERTS APPENDED WITH "M" ARE EXISTING US 82 CULVERTS TO REMAIN.
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VARIOUS

DRAINAGE AREA MAP
RED BAYOU TRIBUTARY

SCALE: 1" = 1000′ SHEET 6 OF 6

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	87
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Area Maps\US82T*S*DRN*DA11.dgn

CSJ 0919-19-087 (℄ US82TRAIL STA 903+40 TO END)

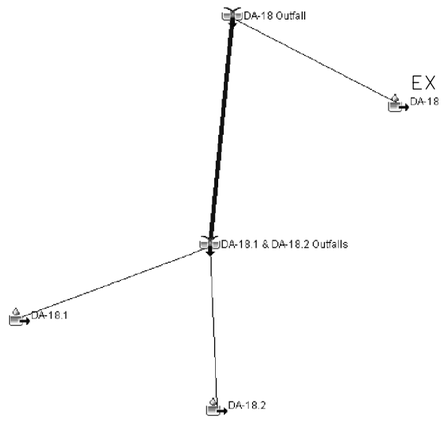
EXISTING RATIONAL METHOD RESULTS (DA < 200 ACRES)														
DRAINAGE ID	DRAINAGE AREA (ACRES)	RUNOFF COEFFICIENT	TC (MINUTES)	2-YR INTENSITY (IN/HR)	2-YR DISCHARGE (CFS)	5-YR INTENSITY (IN/HR)	5-YR DISCHARGE (CFS)	10-YR INTENSITY (IN/HR)	10-YR DISCHARGE (CFS)	25-YR INTENSITY (IN/HR)	25-YR DISCHARGE (CFS)	50-YR INTENSITY (IN/HR)	50-YR DISCHARGE (CFS)	100-YR INTENSITY (IN/HR)	100-YR DISCHARGE (CFS)
DA-15	3.55	0.58	12.6	4.16	8	5.25	11	6.05	12	7.10	14	7.86	16	8.61	18
DA-15T	10.94	0.38	31.5	2.60	11	3.27	14	3.77	16	4.41	19	4.88	20	5.33	22
DA-16	6.98	0.42	33.3	2.54	7	3.21	9	3.70	11	4.32	13	4.78	14	5.22	15
EX DA-16T	12.01	0.46	22.0	3.25	18	4.10	23	4.73	26	5.54	30	6.13	34	6.70	37
DA-17	4.67	0.49	10.0	4.55	10	5.75	13	6.64	15	7.79	18	8.63	20	9.46	22
EX DA-19	4.42	0.44	22.7	3.20	6	4.04	8	4.65	9	5.45	10	6.03	12	6.59	13
EX DA-19T	72.42	0.38	43.8	2.22	62	2.81	78	3.24	90	3.79	105	4.19	116	4.58	127
DA-20	3.81	0.49	17.8	3.53	7	4.44	8	5.12	10	6.00	11	6.64	12	7.28	14
DA-21	11.63	0.43	34.2	2.46	12	3.11	16	3.59	18	4.23	21	4.69	24	5.16	26

CSJ 0919-19-087 (℄ US82TRAIL STA 903+40 TO END)

EXISTING HEC-HMS RESULTS (DA > 200 ACRES)*												
DRAINAGE ID	DRAINAGE AREA (SQ. MI.)	DRAINAGE AREA (ACRES)	COMPOSITE CN VALUE	TC (MINUTES)	LAG TIME (MIN)	INITIAL ABSTRACTION (IN)	IMPERVIOUS COVER (%)	2-YEAR PEAK DISCHARGE (CFS)	5-YEAR PEAK DISCHARGE (CFS)	10-YEAR PEAK DISCHARGE (CFS)	25-YEAR PEAK DISCHARGE (CFS)	50-YEAR PEAK DISCHARGE (CFS)
EX DA-18	0.35	226.08	65	115	68.7	1.1	2.21%	72	131	181	253	312
DA-18.1	0.89	568.15	67	80	48.1	1.0	2.43%	259	458	623	857	1044
DA-18.2	1.05	670.60	66	139	83.6	1.0	1.36%	202	361	494	684	836
DA-18.1 & DA-18.2 Outfalls	1.94	1239.04	-		-	-	-	414	737	1008	1395	1706
DA-18 Outfall	2.29	1464.96	-		-	-	-	484	865	1186	1643	2009

* SEE HEC-HMS DIAGRAM

HEC-HMS DIAGRAM



NOTES:

1. FLOWS WERE DETERMINED USING RATIONAL METHOD AND NRCS HYDROGRAPH METHOD. COMPUTATIONS CALCULATED USING BENTLEY POWER GEOPAK (DRAINAGE) V8i SS10 AND HEC-HMS 4.4.
2. TIME OF CONCENTRATION (TC) WAS COMPUTED USING NRCS METHOD.
3. MINIMUM TIME OF CONCENTRATION USED IS 10 MINUTES.
4. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.
5. REFER TO CULVERT NOTES ON HYDRAULIC DATA SHEETS FOR COMBINED RUNOFF DESCRIPTION AT STRUCTURES.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

RUNOFF COMPUTATIONS
CROSS CULVERTS

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	88
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*DRN*HYDRO-DATA.dgn

CSJ 0919-19-087 (℄ US82TRAIL STA 903+40 TO END)

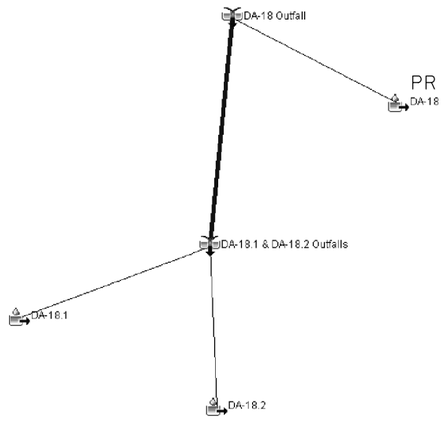
PROPOSED RATIONAL METHOD RESULTS (DA < 200 ACRES)														
DRAINAGE ID	DRAINAGE AREA (ACRES)	RUNOFF COEFFICIENT	TC (MINUTES)	2-YR INTENSITY (IN/HR)	2-YR DISCHARGE (CFS)	5-YR INTENSITY (IN/HR)	5-YR DISCHARGE (CFS)	10-YR INTENSITY (IN/HR)	10-YR DISCHARGE (CFS)	25-YR INTENSITY (IN/HR)	25-YR DISCHARGE (CFS)	50-YR INTENSITY (IN/HR)	50-YR DISCHARGE (CFS)	100-YR INTENSITY (IN/HR)	100-YR DISCHARGE (CFS)
PR DA-16T	8.56	0.46	22.0	3.16	12	3.98	16	4.59	18	5.39	21	5.97	23	6.55	26
PR DA-19	8.17	0.38	22.7	3.11	10	3.92	12	4.52	14	5.30	16	5.88	18	6.45	20
PR DA-19.1T	18.94	0.36	13.9	3.97	27	4.99	34	5.74	39	6.72	46	7.44	51	8.14	56
PR DA-19T	49.72	0.38	43.8	2.12	40	2.68	50	3.10	58	3.65	69	4.05	76	4.46	84
PR DA-20T	0.81	0.40	10.0	4.55	1	5.71	2	6.57	2	7.68	2	8.48	3	9.27	3
PR DA-21T	3.41	0.58	11.9	4.24	8	5.33	11	6.13	12	7.17	14	7.93	16	8.67	17

CSJ 0919-19-087 (℄ US82TRAIL STA 903+40 TO END)

PROPOSED HEC-HMS RESULTS (DA > 200 ACRES)*												
DRAINAGE ID	DRAINAGE AREA (SQ. MI.)	DRAINAGE AREA (ACRES)	COMPOSITE CN VALUE	TC (MINUTES)	LAG TIME (MIN)	INITIAL ABSTRACTION (IN)	IMPERVIOUS COVER (%)	2-YEAR PEAK DISCHARGE (CFS)	5-YEAR PEAK DISCHARGE (CFS)	10-YEAR PEAK DISCHARGE (CFS)	25-YEAR PEAK DISCHARGE (CFS)	50-YEAR PEAK DISCHARGE (CFS)
PR DA-18	0.37	234.19	65	115	68.7	1.1	2.85%	75	137	189	264	325
DA-18.1	0.89	568.15	67	78	46.8	1.0	2.43%	259	458	623	857	1044
DA-18.2	1.05	670.60	66	139	83.6	1.0	1.36%	202	361	494	684	836
DA-18.1 & DA-18.2 Outfalls	1.94	1239.04	-		-	-	-	414	737	1008	1395	1706
DA-18 Outfall	2.30	1473.28	-		-	-	-	487	871	1194	1654	2022

* SEE HEC-HMS DIAGRAM

HEC-HMS DIAGRAM



NOTES:

1. FLOWS WERE DETERMINED USING RATIONAL METHOD AND NRCS HYDROGRAPH METHOD. COMPUTATIONS CALCULATED USING BENTLEY POWER GEOPAK (DRAINAGE) V8i SS10 AND HEC-HMS 4.4.
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4. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.
5. REFER TO CULVERT NOTES ON HYDRAULIC DATA SHEETS FOR COMBINED RUNOFF DESCRIPTION AT STRUCTURES.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

RUNOFF COMPUTATIONS
CROSS CULVERTS

SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	89
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*DRN*HYDRO-DATA02.dgn

CSJ 0919-19-087

US 82 SHARED USE PATH - PROPOSED LT DITCH COMPUTATIONS

DITCH ID	FROM ℄ US82TRAIL STATION	FROM FLOWLINE ELEVATION (FT)	TO ℄ US82TRAIL STATION	TO FLOWLINE ELEVATION (FT)	DITCH GRADE (FT/FT)	LINING	BOTTOM WIDTH (FT)	DITCH DEPTH (FT)	FRONT SLOPE (H:1)	BACK SLOPE (H:1)	MANNING'S N	DITCH CAPACITY (CFS)	VELOCITY (FPS)	DESIGN SHEAR STRESS (PSF)	ALLOWABLE SHEAR STRESS (PSF)	DESIGN 5-YR FLOW (CFS)	CONTRIBUTING DRAINAGE AREA TO DITCH
SPL_D_LT_1	904+15.00	408.78	904+42.93	406.80	-0.071	CLASS B	0	0.33	4	4	0.035	1	3.30	1.44	2.10	1	DA-15T
	904+42.93	406.80	905+23.34	406.40	-0.005	CLASS B	0	1.29	4	4	0.035	15	2.19	0.40	2.10	14	DA-15T
SPL_D_LT_2	905+26.33	406.40	914+89.34	407.36	-0.001	CLASS B	0	1.52	4	4	0.035	10.2	1.10	0.10	2.10	10.2	DA-15T
	914+89.34	407.36	915+18.23	409.62	-0.078	CLASS B	0	0.30	4	4	0.035	1	3.28	1.46	2.10	1	DA-15T
SPL_D_LT_3	915+96.60	408.91	916+17.08	407.16	-0.085	CLASS B	0	0.30	4	4	0.035	1	3.43	1.60	2.10	1	DA-16 & PR DA-16T
	916+17.08	407.16	920+18.70	405.15	-0.005	CLASS B	0	2.02	4	4	0.035	48	2.96	0.63	2.10	25	DA-16 & PR DA-16T
	920+18.70	405.15	932+10.42	402.99	-0.002	CLASS B	0	5.44	4	4	0.035	408	3.44	0.61	2.10	25	DA-16 & PR DA-16T
SPL_D_LT_4	932+90.46	402.87	936+76.60	402.17	-0.002	CLASS B	0	2.34	4	4	0.035	43	1.96	0.26	2.10	25	DA-16 & PR DA-16T
SPL_D_LT_5	936+81.32	402.17	943+55.80	403.18	0.002	CLASS B	0	1.50	4	4	0.035	12	1.33	0.14	2.10	8	DA-16 & PR DA-16T
	943+55.80	403.18	948+56.20	401.43	-0.004	CLASS B	0	2.98	4	4	0.035	114	3.21	0.65	2.10	13	DA-17
	948+56.20	401.43	953+51.76	400.69	-0.002	CLASS B	0	2.62	4	4	0.035	53	1.93	0.24	2.10	13	DA-17
	953+51.76	400.69	955+52.35	399.98	-0.004	CLASS B	0	2.71	4	4	0.035	88	3.01	0.59	2.10	13	DA-17
SPL_D_LT_6	955+95.16	399.84	956+44.83	399.66	-0.004	CLASS B	0	2.67	4	4	0.035	85	2.99	0.58	2.10	13	DA-17
	956+44.83	399.66	964+77.88	391.33	-0.010	CLASS B	0	2.95	4	4	0.035	188	5.39	1.84	2.10	13	DA-17
	964+77.88	391.33	966+12.68	390.32	-0.008	CLASS B	0	2.72	4	4	0.035	131	4.42	1.27	2.10	13	DA-17
	966+12.68	390.32	969+38.19	387.53	-0.009	CLASS B	0	2.91	4	4	0.035	168	4.95	1.56	2.10	13	DA-17
SPL_D_LT_7	970+04.32	386.97	971+16.08	386.01	-0.009	CLASS B	0	2.66	4	4	0.035	131	4.65	1.42	2.10	13	DA-17
	971+16.08	386.01	981+66.73	380.76	-0.005	CLASS B	0	3.11	4	4	0.035	153	3.95	0.97	2.10	19	DA-18 (UP TO ROW)
SPL_D_LT_8	981+97.92	380.53	989+32.83	375.01	-0.008	CLASS B	0	2.53	4	4	0.035	107	4.21	1.18	2.10	19	DA-18 (UP TO ROW)
	989+32.83	375.01	994+30.80	367.55	-0.015	ROCK RIPRAP	0	2.98	4	4	0.025	329	9.30	2.79	5.00	19	DA-18 (UP TO ROW)
	994+30.80	367.55	996+50.00	365.90	-0.008	CLASS B	0	2.93	4	4	0.035	163	4.65	1.37	2.10	19	DA-18 (UP TO ROW)
SPL_D_LT_9	998+90.00	367.89	1007+69.21	371.15	0.004	CLASS B	0	1.26	31	4	0.035	53	1.90	0.29	2.10	34	PR DA-19.1T
	1007+69.21	371.15	1008+44.69	373.41	-0.004	CLASS B	0	3.49	4	4	0.035	179	3.67	0.81	2.10	34	PR DA-19.1T
	1008+44.69	373.41	1008+94.69	371.91	-0.004	CLASS B	0	2.70	4	4	0.035	90	3.09	0.62	2.10	34	PR DA-19.1T
SPL_D_LT_10	1009+20.03	371.61	1018+60.99	374.95	0.004	CLASS B	0	3.05	4	4	0.035	122	3.29	0.68	2.10	34	PR DA-19.1T
SPL_D_LT_11	1018+68.83	374.95	1020+30.21	375.76	0.005	CLASS B	35	2.11	6	6	0.035	422	4.20	0.66	2.10	50	PR DA-19T
	1020+30.21	375.76	1021+60.44	377.25	0.012	ROCK RIPRAP	0	3.01	4	4	0.025	297	8.20	2.16	5.00	50	PR DA-19T
SPL_D_LT_12	1022+62.57	378.43	1023+63.92	379.59	0.015	ROCK RIPRAP	0	2.97	4	4	0.025	329	9.30	2.78	5.00	50	PR DA-19T
	1023+63.92	379.59	1026+74.76	381.74	0.007	CLASS B	0	2.13	4	4	0.035	65	3.60	0.92	2.10	50	PR DA-19T
	1026+74.76	381.74	1038+66.25	395.68	0.012	CLASS B	0	2.65	4	4	0.035	153	5.43	1.94	2.10	50	PR DA-19T
	1038+66.25	395.68	1043+41.25	397.15	0.003	CLASS B	0	2.67	4	4	0.035	80	2.81	0.52	2.10	2	PR DA-20T
	1043+41.25	397.15	1044+04.07	396.81	-0.005	CLASS B	0	2.29	4	4	0.035	70	3.37	0.78	2.10	2	PR DA-20T
	1044+04.07	396.81	1050+50.73	395.51	-0.002	CLASS B	0	2.71	4	4	0.035	67	2.28	0.34	2.10	2	PR DA-20T
SPL_D_LT_13	1050+52.65	395.51	1054+01.38	396.04	0.001	CLASS B	0	2.71	4	4	0.035	58	1.97	0.25	2.10	2	PR DA-20T
	1054+01.38	396.04	1060+22.98	393.86	-0.003	CLASS B	0	1.89	4	4	0.035	34	2.37	0.41	2.10	26	DA-21 & PR DA-21T
SPL_D_LT_14	1060+24.90	393.86	1061+62.32	394.34	0.004	CLASS B	0	2.07	4	4	0.035	43	2.52	0.45	2.10	16	DA-21 & PR DA-21T
	1061+62.32	394.34	1066+36.49	395.05	0.002	CLASS B	0	1.59	4	4	0.035	14	1.38	0.15	2.10	13	DA-21 & PR DA-21T

NOTES:

1. THE DESIGN 5-YEAR FLOW USED FOR DITCH ANALYSIS IS BASED ON PEAK FLOW CALCULATIONS OF CONTRIBUTING DRAINAGE AREAS. REFER TO THE RUNOFF COMPUTATION SHEET FOR ADDITIONAL INFORMATION.
2. DITCH COMPUTATIONS ARE BASED ON PROPOSED DITCH GEOMETRY NEEDED FOR SUP GRADING WITHIN ROW. DITCH GEOMETRIES WERE NOT OPTIMIZED FOR A 5-YR DESIGN FLOW.
3. SEE DITCH SUMMARY TABLE FOR VERTICAL POINT OF INTERSECTION FOR RIGHT DITCH.
4. DITCHES LINED WITH RIPRAP WILL BE CONSTRUCTED IN CSJ 0046-04-062.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

DITCH COMPUTATIONS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	90
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*DRN*DITCH-CALS.dgn

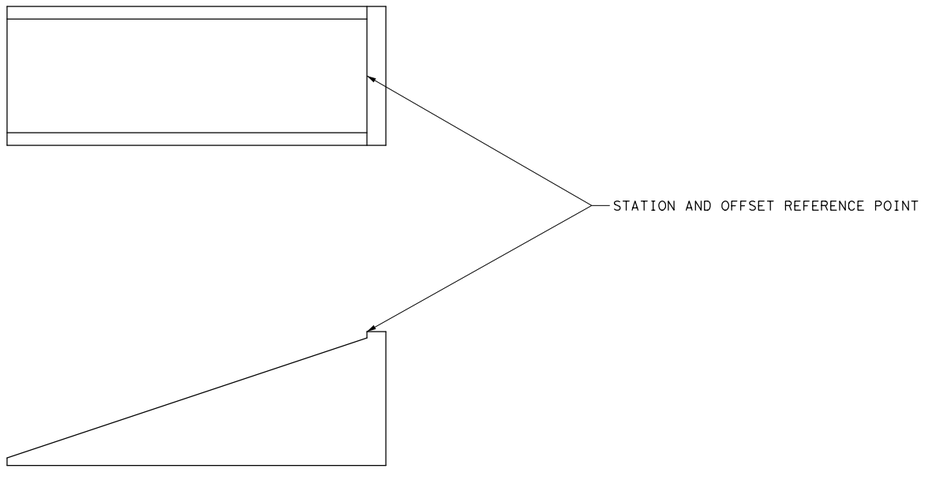
CSJ 0919-19-087

US 82 SHARED USE PATH - PROPOSED CROSS CULVERT SUMMARY TABLE														
		UPSTREAM			BREAK			DOWNSTREAM						
℄ US82TRAIL ALIGNMENT STATION	CROSS CULVERT ID	℄ US82TRAIL STATION	OFFSET	FL	℄ US82TRAIL STATION	OFFSET	FL	℄ US82TRAIL STATION	OFFSET	FL	CULVERT SIZE	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)
905+25.08	15T	905+25.08	10.31 RT	406.50	-	-	-	905+25.08	10.14 LT	406.40	1-24 IN RCP		22	
936+77.56	16T	936+77.56	10.04 LT	402.17	-	-	-	936+77.56	10.74 RT	402.14	1-18 IN RCP	22		
1009+07.47	19.1T	1009+07.47	9.59 RT	372.94	-	-	-	1009+07.47	10.75 LT	372.31	2-24 IN RCP		44	
1018+64.91	19T	1018+64.91	8.46 RT	376.23	1018+64.91	01.48 RT	374.95	1018+64.91	14.11 LT	374.94	2-36 IN RCP			48
1050+51.69	20T	1050+51.69	8.59 RT	396.24	1050+51.69	3.61 RT	395.60	1050+51.69	11.25 LT	395.51	1-18 IN RCP	20		
1060+23.94	21T	1060+23.94	9.87 LT	393.86	-	-	-	1060+23.94	11.64 RT	393.57	3-18 IN RCP	66		
PROJECT TOTAL												108	66	48

US 82 SHARED USE PATH - PROPOSED CROSS CULVERT SUMMARY TABLE						
℄ US82TRAIL ALIGNMENT STATION	CROSS CULVERT ID	HEADWALL (CH - PW - O) (DIA= 24 IN)	SET (TY II) (18 IN) (RCP) (4:1) (C)	SET (TY II) (24 IN) (RCP) (4:1) (C)	SET (TY II) (36 IN) (RCP) (3:1) (C)	SET (TY II) (36 IN) (RCP) (4:1) (C)
905+25.08	15T	-	-	2	-	-
936+77.56	16T	-	2	-	-	-
1009+07.47	19.1T	1	-	2	-	-
1018+64.91	19T	-	-	-	2	2
1050+51.69	20T	-	2	-	-	-
1060+23.94	21T	-	6	-	-	-
PROJECT TOTAL		1	10	4	2	2

PLAN

PROFILE



CULVERT END TREATMENT STATION AND OFFSET REFERENCE POINT

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

CROSS CULVERT SUMMARY TABLE

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	91
CHECK JMT	CONTROL 0919	SECTION 19	JOB 087	

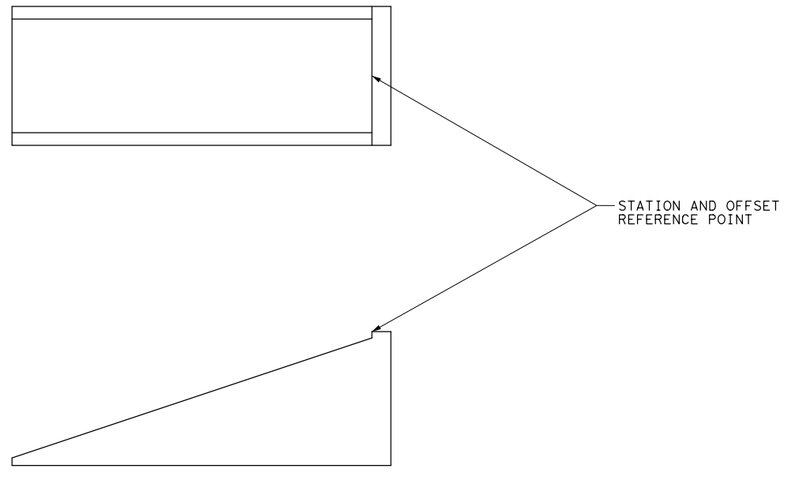
DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*DRN*TRAIL-SUMMARY.dgn

CSJ 0919-19-087

US 82 SHARED USE PATH - PROPOSED CROSS STREET AND DRIVEWAY CULVERTS SUMMARY TABLE														
℄ US82TRAIL ALIGNMENT STATION	CULVERT ID	UPSTREAM			DOWNSTREAM			CULVERT SIZE	TRENCH EXCAVATION PROTECTION (FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	SET TY(II) (18 IN)(RCP) (6:1)(P)	SET TY(II) (24 IN)(RCP) (3:1)(P)	SET TY(II) (24 IN)(RCP) (6:1)(P)
		℄ US82TRAIL STATION	OFFSET (FT)	FL (FT)	℄ US82TRAIL STATION	OFFSET (FT)	FL (FT)							
932+57	D-16T-1	932+23.69	16.76 LT	402.99	932+90.46	16.77 LT	402.87	1-24 IN RCP			68			2
932+45	D-16T-2	931+91.25	15.53 RT	403.11	932+98.14	16.75 RT	402.90	1-18 IN RCP		108		2		
955+74	D-16T-3	955+52.36	17.81 LT	399.98	955+95.16	18.14 LT	399.84	1-24 IN RCP			44			2
955+75	D-16T-4	955+49.69	17.26 RT	400.14	956+01.24	15.81 RT	399.87	1-18 IN RCP		52		2		
969+71	D-17T-1	969+38.19	18.15 LT	387.53	970+04.32	18.46 LT	386.97	1-24 IN RCP			68			2
969+67	D-17T-2	968+99.97	16.96 RT	388.12	970+34.14	16.86 RT	387.04	1-18 IN RCP		136		2		
981+82	D-18-1	981+66.84	19.18 LT	380.75	981+97.79	18.92 LT	380.52	1-24 IN RCP			32			2
981+86	D-18-2	981+71.07	15.12 RT	381.22	982+01.66	14.91 RT	380.99	1-18 IN RCP		32		2		
1022+12	D-19T-1	1021+60.45	27.31 LT	378.43	1022+62.61	26.39 LT	377.25	1-24 IN RCP			104			2
1022+07	D-19T-2	1022+48.89	27.99 RT	378.26	1021+64.36	25.42 RT	377.94	1-24 IN RCP	86		86		2	
PROJECT TOTAL									86	328	402	8	2	10

PLAN

PROFILE



CULVERT END TREATMENT STATION AND OFFSET REFERENCE POINT

NTS

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
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7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

CROSS STREET AND DRIVEWAY CULVERT SUMMARY TABLE

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	92
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\US82T*S*DRN*CROSS-SUMMARY.dgn

HY-8 CULVERT ANALYSIS REPORT
EXISTING CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
408.15	5 YR	14	2	12	9
408.17	25 YR	19	3	16	2
408.19	100 YR	22	4	18	2
408.02	Overtopping	0	0	0	Overtopping

CULVERT NOTES

Culvert 15T uses DA-15T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	14	2	408.15	0.78	1.61	1-S1f	0.51	0.53	2.00	2.00	0.75	0.00
25 YR	19	3	408.17	0.93	1.63	1-S1f	0.60	0.63	2.00	2.00	1.04	0.00
100 YR	22	4	408.19	0.99	1.65	1-S1f	0.64	0.67	2.00	2.00	1.18	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 408.02 ft
Roadway Surface: Gravel
Roadway Top Width: 16.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 408.12 ft

Straight Culvert
Inlet Elevation (invert): 406.54 ft, Outlet Elevation (invert): 406.12 ft
Culvert Length: 25.63 ft, Culvert Slope: 0.0164

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 406.54 ft
Outlet Station: 25.63 ft
Outlet Elevation: 406.12 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
408.93	5 YR	14	14	0	1
409.38	25 YR	19	19	0	1
409.70	100 YR	22	22	0	25
409.69	Overtopping	22	22	0	Overtopping

CULVERT NOTES

Culvert 15T uses DA-15T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	14	14	408.93	2.14	2.43	4-FFf	1.38	1.34	2.00	2.00	4.46	0.00
25 YR	19	19	409.38	2.79	2.88	4-FFf	2.00	1.57	2.00	2.00	6.05	0.00
100	22	22	409.70	3.20	3.17	4-FFf	2.00	1.66	2.00	2.00	6.87	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 409.84 ft
Roadway Surface: Paved
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 408.40 ft

Straight Culvert
Inlet Elevation (invert): 406.50 ft, Outlet Elevation (invert): 406.40 ft
Culvert Length: 22.00 ft, Culvert Slope: 0.0045

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 406.50 ft
Outlet Station: 22.00 ft
Outlet Elevation: 406.40 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 15T

SHEET 1 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	93
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-2

HY-8 CULVERT ANALYSIS REPORT
EXISTING CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
404.22	5 YR	32	5	27	6
404.28	25 YR	43	5	38	3
404.31	100 YR	52	6	46	2
404.00	Overtopping	4	4	0	Overtopping

CULVERT NOTES

Culvert 16T uses combined flows from DA-16 and EX DA-16T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	32	5	404.22	1.35	1.67	3-M1f	1.01	0.84	1.50	1.50	2.70	0.00
25 YR	43	5	404.28	1.40	1.73	3-M1f	1.05	0.86	1.50	1.50	2.85	0.00
100 YR	52	6	404.31	1.50	1.76	4-FFf	1.14	0.90	1.50	1.50	3.13	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 404.00 ft
Roadway Surface: Gravel
Roadway Top Width: 12.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 403.76 ft

Straight Culvert
Inlet Elevation (invert): 402.55 ft, Outlet Elevation (invert): 402.26 ft
Culvert Length: 28.17 ft, Culvert Slope: 0.0103

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 402.55 ft
Outlet Station: 28.17 ft
Outlet Elevation: 402.26 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
405.01	5 YR	25	12	13	7
405.06	25 YR	34	12	22	3
405.10	100 YR	41	12	29	3
404.89	Overtopping	12	12	0	Overtopping

CULVERT NOTES

Culvert 16t uses combined flows from DA-16 and PR DA-16T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	25	12	405.01	2.84	2.80	4-FFf	1.50	1.32	1.50	1.50	6.83	0.00
25 YR	34	12	405.06	2.89	2.84	4-FFf	1.50	1.32	1.50	1.50	6.92	0.00
100 YR	41	12	405.10	2.93	2.86	4-FFf	1.50	1.33	1.50	1.50	6.99	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 405.04 ft
Roadway Surface: Gravel
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 403.64 ft

Straight Culvert
Inlet Elevation (invert): 402.17 ft, Outlet Elevation (invert): 402.14 ft
Culvert Length: 22.00 ft, Culvert Slope: 0.0014

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 402.17 ft
Outlet Station: 22.00 ft
Outlet Elevation: 402.14 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
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7/6/2023

JMT TBPE REGISTRATION NO. F-163341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 16T

SHEET 2 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	94
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-2

HY-8 CULVERT ANALYSIS REPORT
EXISTING CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
370.97	5 YR	891	171	720	10
372.05	25 YR	1681	193	1488	4
372.94	100 YR	2444	209	2235	3
369.16	Overtopping	107	107	0	Overtopping

CULVERT NOTES

Culvert 18T uses combined flows from DA-16, EX DA-16t, and DA-18 flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	891	171	370.97	7.34	7.23	7-JA2c	-1.00	3.74	3.74	0.00	10.55	0.00
25 YR	1681	193	372.05	8.42	7.84	7-JA2c	-1.00	3.97	3.97	0.00	11.26	0.00
100 YR	2444	209	372.94	9.31	8.35	7-JA2c	-1.00	4.12	4.12	0.00	11.81	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 369.16 ft
Roadway Surface: Gravel
Roadway Top Width: 26.71 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 364.32 ft

Straight Culvert
Inlet Elevation (invert): 363.63 ft, Outlet Elevation (invert): 364.32 ft
Culvert Length: 33.14 ft, Culvert Slope: -0.0208

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 363.63 ft
Outlet Station: 33.13 ft
Outlet Elevation: 364.32 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 5.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

EXISTING STRUCTURE TO REMAIN

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-163341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 18T

SHEET 3 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	95
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-21

NO EXISTING STRUCTURE

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
375.43	5 YR	34	34	0	1
376.02	25 YR	46	42	4	14
376.09	100 YR	56	43	13	4
375.96	Overtopping	41	41	0	Overtopping

CULVERT NOTES

Culvert 19.1T uses PR DA-19.1T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	34	34	375.43	2.48	2.16	5-S2n	0.87	1.48	1.08	2.00	9.52	0.00
25 YR	46	42	376.02	3.07	2.57	5-S2n	0.98	1.64	1.23	2.00	10.06	0.00
100 YR	56	43	376.09	3.14	2.61	5-S2n	0.99	1.65	1.24	2.00	10.12	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 375.96 ft
Roadway Surface: Paved
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 374.31 ft

Straight Culvert
Inlet Elevation (invert): 372.94 ft, Outlet Elevation (invert): 372.31 ft
Culvert Length: 22.00 ft, Culvert Slope: 0.0287

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 372.94 ft
Outlet Station: 22.00 ft
Outlet Elevation: 372.31 ft
Number of Barrels: 2

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
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7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 19.1T

SHEET 4 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	96
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-21T).docx

HY-8 CULVERT ANALYSIS REPORT
EXISTING CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
377.10	5 YR	78	78	0	1
377.39	25 YR	105	90	15	7
377.49	100 YR	127	93	33	4
377.24	Overtopping	84	84	0	Overtopping

CULVERT NOTES

Culvert 19T uses EX DA-19T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	78	78	377.10	3.36	3.86	4-FFf	3.00	2.03	3.00	3.00	5.52	0.00
25 YR	105	90	377.39	3.86	4.15	4-FFf	3.00	2.18	3.00	3.00	6.34	0.00
100 YR	127	93	377.49	4.03	4.25	4-FFf	3.00	2.22	3.00	3.00	6.61	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 377.24 ft
Roadway Surface: Gravel
Roadway Top Width: 26.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 376.20 ft

Straight Culvert
Inlet Elevation (invert): 373.24 ft, Outlet Elevation (invert): 373.20 ft
Culvert Length: 33.45 ft, Culvert Slope: 0.0012

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 373.24 ft
Outlet Station: 33.45 ft
Outlet Elevation: 373.20 ft
Number of Barrels: 2

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
378.56	5 YR	50	50	0	1
379.11	25 YR	69	69	0	1
379.58	100 YR	84	84	0	1
380.28	Overtopping	103	103	0	Overtopping

CULVERT NOTES

Culvert 19T uses PR DA-19T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	50	50	378.56	2.33	2.02	1-JS1f	0.00	1.13	3.00	3.00	3.54	0.00
25 YR	69	69	379.11	2.89	2.29	1-JS1f	0.00	1.13	3.00	3.00	4.88	0.00
100 YR	84	84	379.58	3.35	2.57	5-S2n	0.00	1.13	1.42	3.00	12.79	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 380.11 ft
Roadway Surface: Paved
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 377.94 ft

Single Broken-back Culvert
Inlet Elevation (invert): 376.23ft,
Break Elevation (invert): 374.95 ft,
Outlet Elevation (invert): 374.94 ft
Culvert Length: 24.00 ft,
Upper Culvert Section Slope: 0.1832
Steep Culvert Section Slope: 0.0002

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 376.23 ft
Break Station: 6.98 ft
Break Elevation: 374.95 ft
Outlet Station: 24.00 ft
Outlet Elevation: 374.94 ft
Number of Barrels: 2

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 3.00 ft
Upper Section Material: Concrete
Lower Section Material: Concrete
Embedment: 0.00 in
Upper Section Manning's n: 0.0120
Lower Section Manning's n: 0.0120
Culvert Type: Single Broken-back
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED
PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 19T

SHEET 5 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	97
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-21

NO EXISTING STRUCTURE

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
396.96	5 YR	2	2	0	1
397.16	25 YR	3	3	0	1
397.16	100 YR	3	3	0	1
398.62	Overtopping	11	11	0	Overtopping

CULVERT NOTES

Culvert 20T uses combined flows from PR DA-20T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	2	2	396.96	0.72	0.0*	1-S2n	0.00	0.53	0.00	0.00	6.08	0.00
25 YR	3	3	397.16	0.92	0.03	1-S2n	0.00	0.53	0.00	0.00	6.82	0.00
100 YR	3	3	397.16	0.92	0.03	1-S2n	0.00	0.55	0.00	0.00	6.82	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 398.62 ft
Roadway Surface: Paved
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 395.51 ft

Single Broken-back Culvert
Inlet Elevation (invert): 396.24 ft,
Break Elevation (invert): 395.60 ft,
Outlet Elevation (invert): 395.51 ft
Culvert Length: 20.00 ft,
Upper Culvert Section Slope: 0.1286
Steep Culvert Section Slope: 0.0060

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 396.24 ft
Break Station: 4.98 ft
Break Elevation: 395.60 ft
Outlet Station: 20.00 ft
Outlet Elevation: 395.51 ft
Number of Barrels: 1

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Upper Section Material: Concrete
Lower Section Material:
Embedment: 0.00 in
Upper Section Manning's n: 0.0120
Lower Section Manning's n: 0.0120
Culvert Type: Single Broken-back
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
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7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

HYDRAULICS COMPUTATIONS
CULVERT 20T

SHEET 6 OF 7

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	98
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-20T).dgn

NO EXISTING STRUCTURE

HY-8 CULVERT ANALYSIS REPORT
PROPOSED CONDITIONS

SUMMARY OF CULVERT FLOWS AT CROSSING

HW Elev (ft)	Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	Rdwy Q (cfs)	Iterations
395.89	5 YR	27	27	0	1
396.55	25 YR	35	35	0	37
396.63	100 YR	43	36	7	5
396.54	Overtopping	35	35	0	Overtopping

CULVERT NOTES

Culvert 21T uses combined flows from DA-21 and PR DA-21T flows. Flow calculations may be seen on runoff computations sheets.

CULVERT SUMMARY TABLE

Storm Freq.	Total Q (cfs)	Culvert Q (cfs)	HW Elev (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	TW Depth (ft)	Outlet Velocity (ft/s)	TW Velocity (ft/s)
5 YR	27	27	395.89	2.03	1.95	5-JS1f	0.89	1.16	1.50	1.50	5.09	0.00
25 YR	35	35	396.55	2.69	2.44	5-JS1f	1.07	1.30	1.50	1.50	6.55	0.00
100 YR	43	36	396.63	2.77	2.49	5-JS1f	1.09	1.31	1.50	1.50	6.70	0.00

ROADWAY DATA

Roadway Profile Shape: Constant Roadway
Crest Length: 100.00 ft
Crest Elevation: 396.54 ft
Roadway Surface: Paved
Roadway Top Width: 10.00 ft

TAILWATER DATA

Tailwater Channel Option:
Enter Constant Tailwater
Constant Tailwater Elevation: 395.07 ft

Straight Culvert
Inlet Elevation (invert): 393.86 ft, Outlet Elevation (invert): 393.57 ft
Culvert Length: 22.00 ft, Culvert Slope: 0.0132

SITE DATA

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 393.86 ft
Outlet Station: 22.00 ft
Outlet Elevation: 393.57 ft
Number of Barrels: 3

CULVERT DATA

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

NOTES:

1. CULVERT HYDRAULICS WAS ANALYZED USING FHWA'S HY-8 VERSION 7.50.
2. EXISTING TRAIL CULVERTS WERE REPLACED WITH SAME SIZE PIPE IN PROPOSED CONDITIONS. PROPOSED CULVERTS WERE ANALYZED TO ASSURE NO ADVERSE IMPACTS TO ADJACENT PROPERTIES AND HYDRAULIC PERFORMANCE OF US 82 ROADWAY CULVERTS.

STATE OF TEXAS
JULIUS C.U. SERRANO
137241
LICENSED PROFESSIONAL ENGINEER

7/6/2023

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

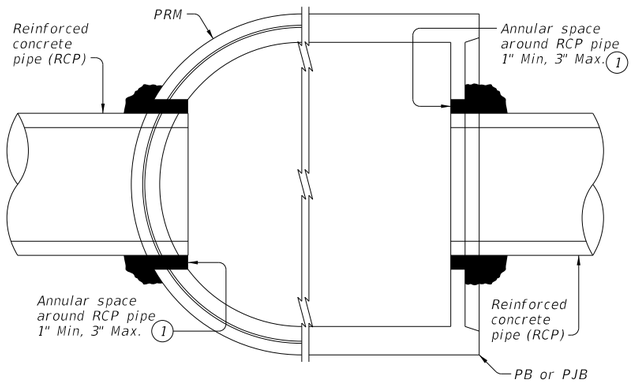
HYDRAULICS COMPUTATIONS
CULVERT 21T

SHEET 7 OF 7

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	99
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/6/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\5. Drainage\Drainage Trail HY-8 Data Sheets (15T-21T).docx

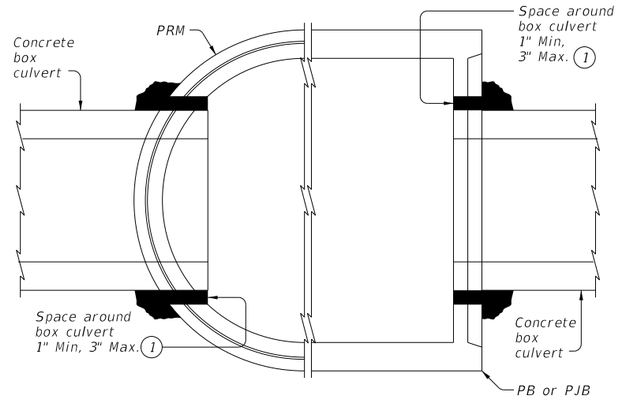
DATE: 7/6/2023 9:45:44 AM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\PLan Set (Malta to SH 98)\S. Drainage\Drainage Standards\pbgcstd1-20.dgn



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

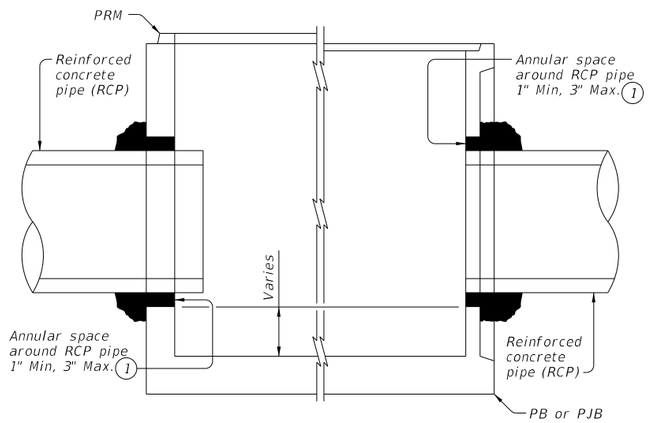
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

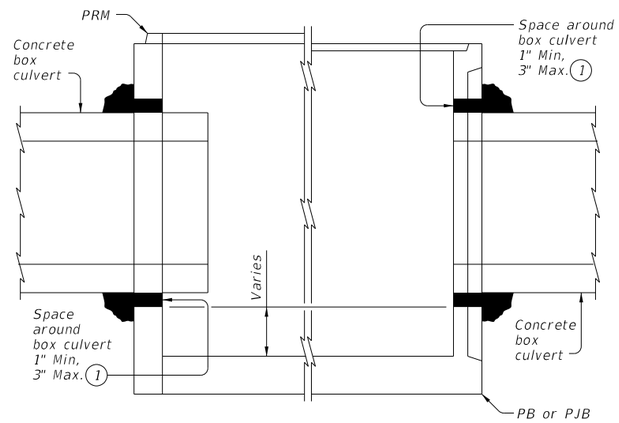
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

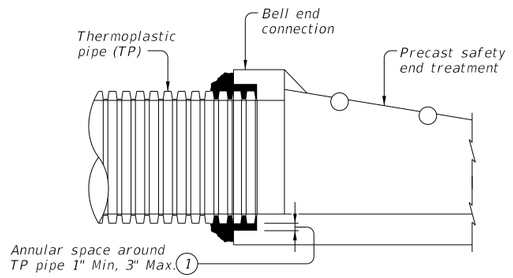
TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

(1) Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

CONSTRUCTION NOTES:

Do not grout rubber gasket joints without Manufacturer's recommendations.

Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

GENERAL NOTES:

See applicable standards for notes and details not shown:
- Precast Base (PB)
- Precast Junction Box (PJB)
- Precast Round Manhole (PRM)
- Precast Safety End Treatments C/D Square (PSET-SC)
- Precast Safety End Treatments P/D Square (PSET-SP)

Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".

Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".

Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.

Payment for grouted connections is considered subsidiary to other bid Items.

Texas Department of Transportation

Bridge Division Standard

PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

FILE: pbgcstd1-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		100

DATE: 7/6/2023 9:45:56 AM
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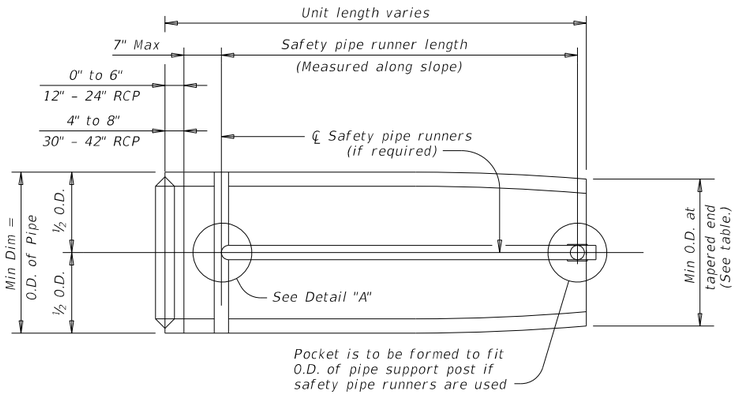
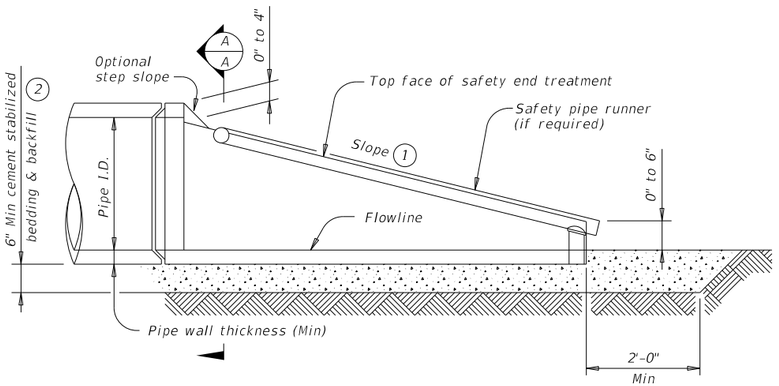


PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

(Showing spigot end connection.)

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES			
Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' – 2"	3" STD	3.500"	3.068"
15' – 6"	3 ½" STD	4.000"	3.548"
20' – 10"	4" STD	4.500"	4.026"
35' – 4"	5" STD	5.563"	5.047"

(1) Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.

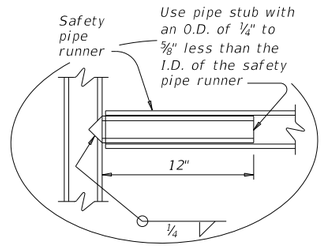
(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".

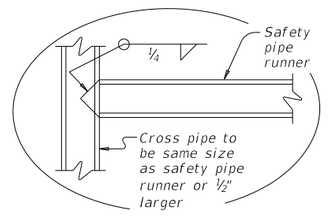
(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' – 0"	≤ 45°	No	≤ 45°	No
					4:1	2' – 8"				
					6:1	4' – 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' – 10"	≤ 45°	No	≤ 45°	No
					4:1	3' – 9"				
					6:1	5' – 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
					4:1	4' – 10"				
					6:1	7' – 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' – 3"	≤ 45°	No	≤ 30°	No
					4:1	7' – 0"			> 30°	Yes
					6:1	10' – 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' – 3"	≤ 15°	No	≤ 15°	No
					4:1	8' – 2"	> 15°	Yes	> 15°	Yes
					6:1	12' – 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' – 10"	= 0°	No	≥ 0°	Yes
					4:1	10' – 4"	> 0°	Yes		
					6:1	15' – 4"				
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' – 6"	≥ 0°	Yes	≥ 0°	Yes
					4:1	12' – 6"				
					6:1	18' – 7"				

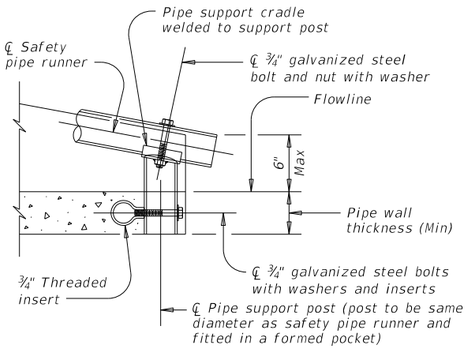


OPTION A



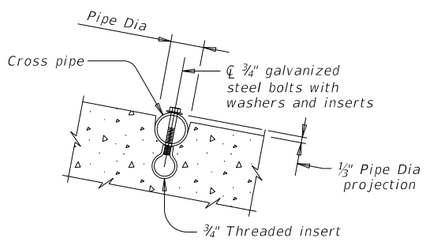
OPTION B

DETAIL A



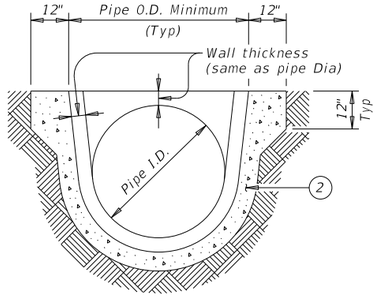
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

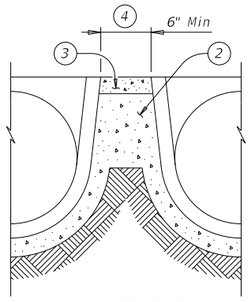


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

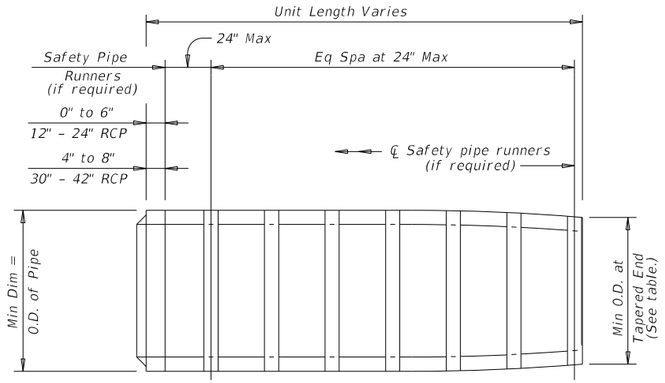
PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

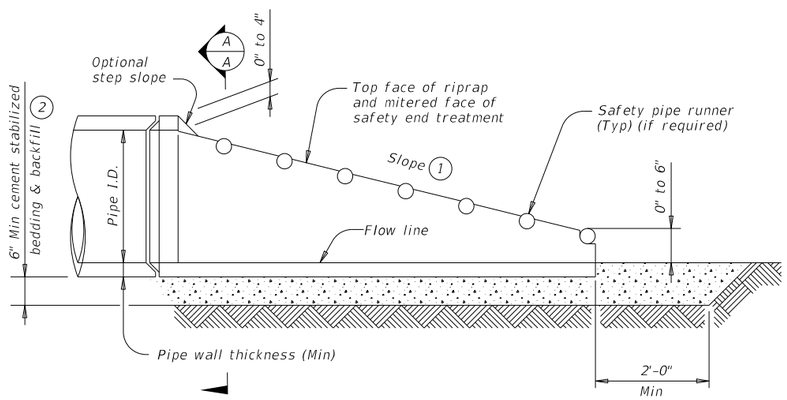
FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		101

DATE: 7/6/2023 9:46:09 AM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\Plan Set (Malta to SH 98)\S. Drainage\Drainage Standards\psetrpss-20.dgn



PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)



LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)

(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

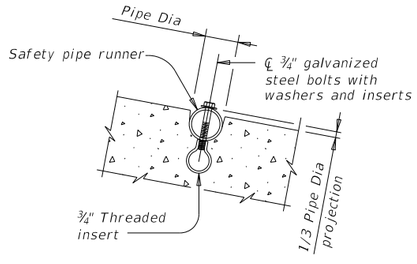
(3) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

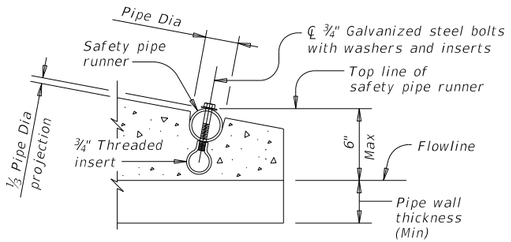
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'-0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'-8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'-3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'-6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'-1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'-4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'-7"	Yes	Yes	4" STD	4.500"	4.026"

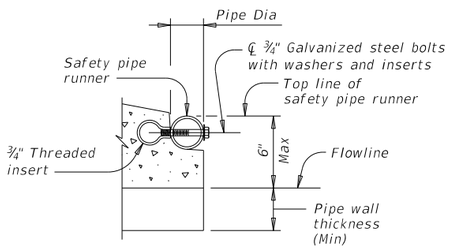


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



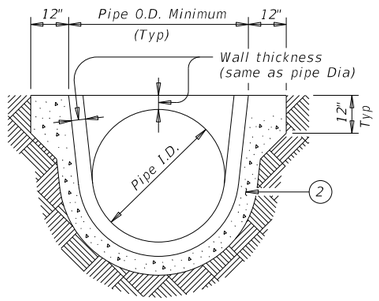
OPTION A



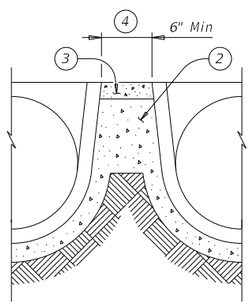
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Texas Department of Transportation

Bridge Division Standard

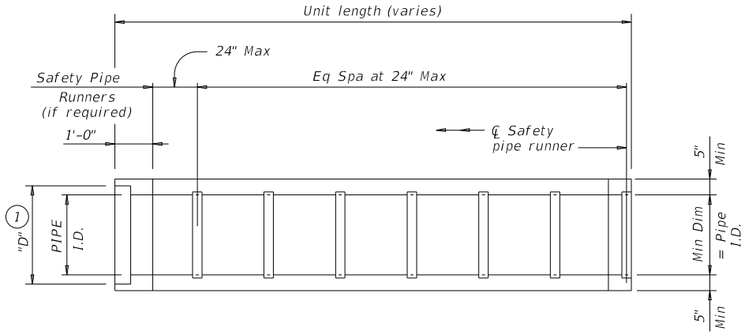
PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

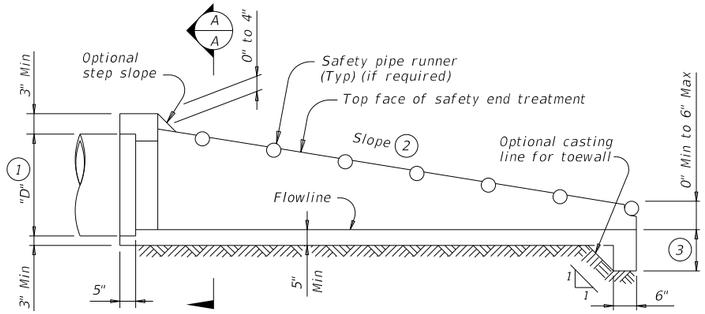
FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		102

DATE: 7/6/2023 9:46:21 AM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\Plan Set (Malta to SH 98)\S. Drainage\Drainage Standards\psetspss-21.dgn



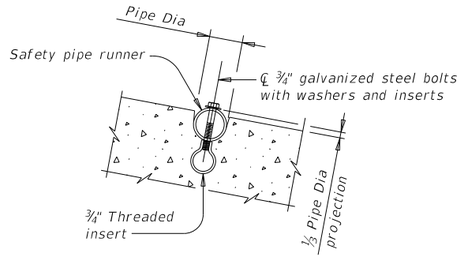
PLAN

(Showing bell end connection.)



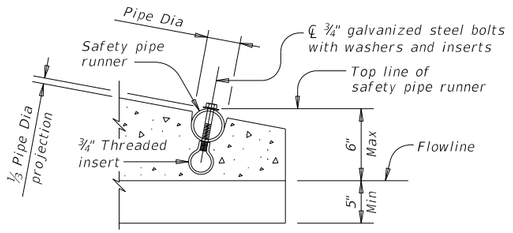
LONGITUDINAL ELEVATION

(Showing bell end connection.)

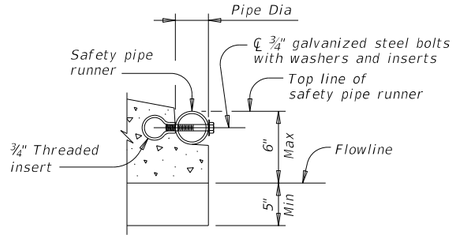


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



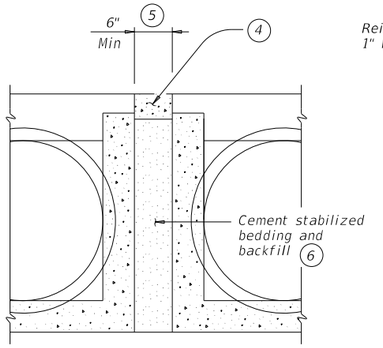
OPTION A



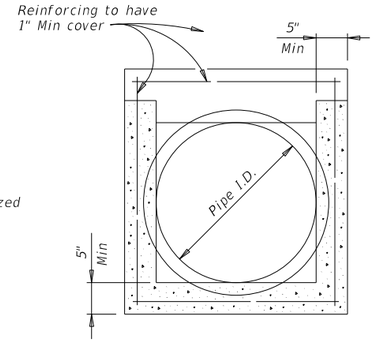
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

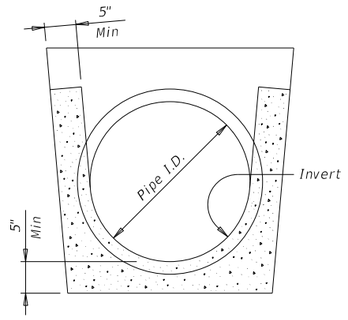
(If required)



MULTIPLE PIPE INSTALLATION

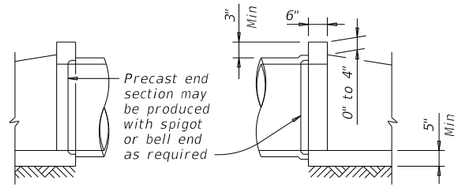


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

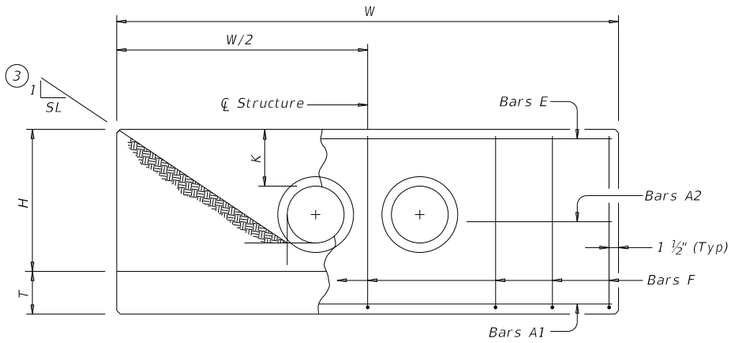
PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		103

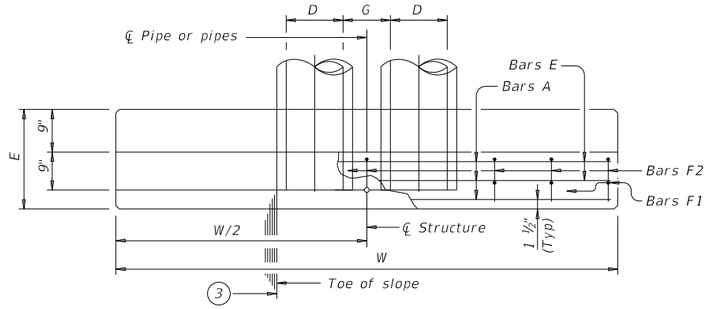
DATE: 7/6/2023 9:46:34 AM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\S. Drainage\Drainage Standards\chpw0ste-20.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

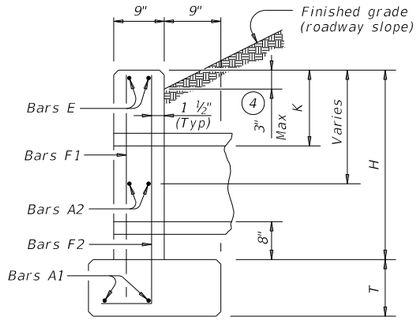
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



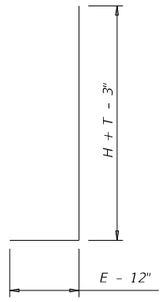
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

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

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

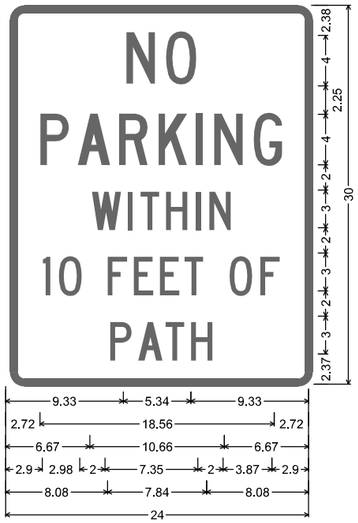
Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		104



R8-2T_24x30;
1.50" Radius, 0.63" Border, 0.38" Indent, Red on, White;
"NO", C; "PARKING", C; "WITHIN", C;
"10", C; "FEET", C; "OF", C; "PATH", C;

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

SIGN DETAILS

SCALE: NTS

SHEET 1 OF 1

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	105
CHECK JMT	CONTROL 0919	SECTION 19	JOB 087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\8. Traffic\US82T*SIGNDETS*01.dgn

DATE: 7/5/2023 5:45:23 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\8. Traffic\Standards\smdgen.dgn

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))

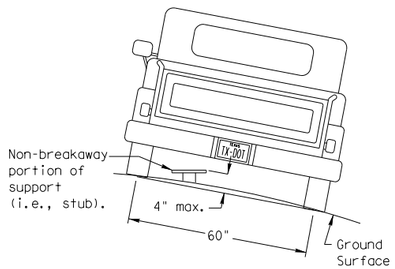
Number of Posts (1 or 2)

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-3))

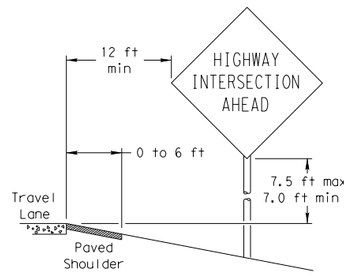
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

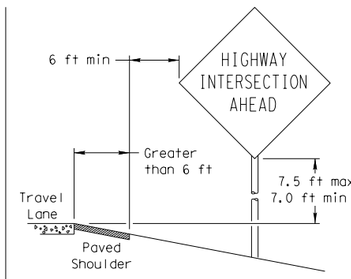
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

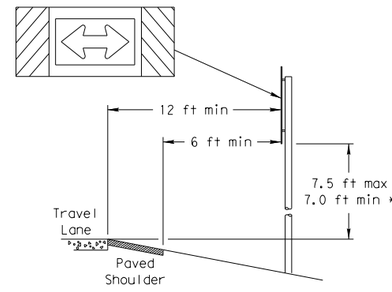
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



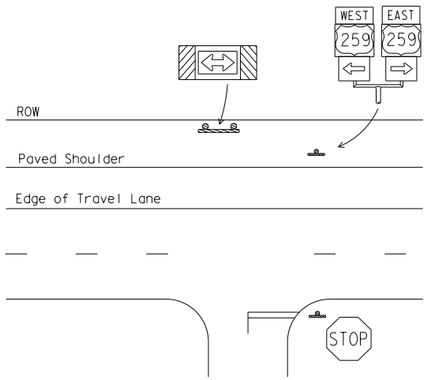
GREATER THAN 6 FT. WIDE

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.

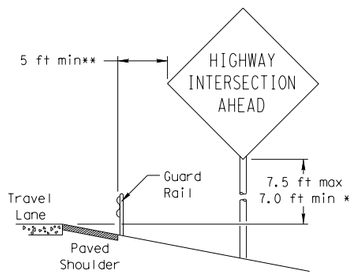
T-INTERSECTION



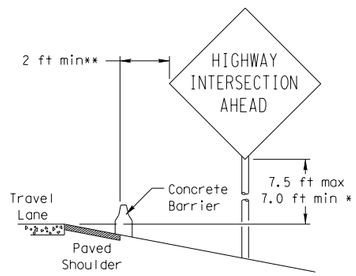
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



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

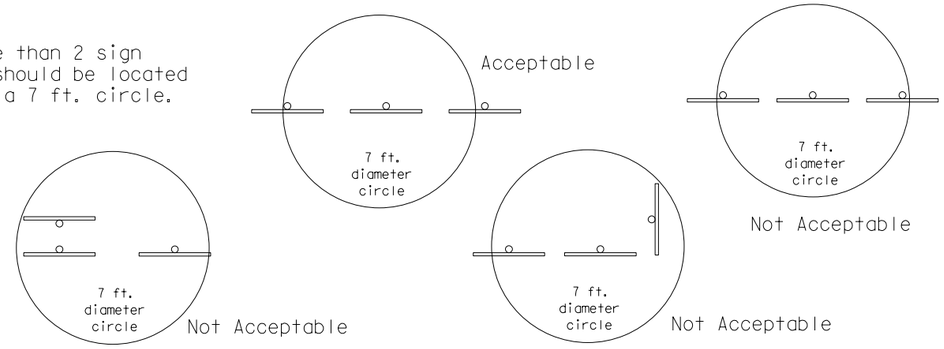
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

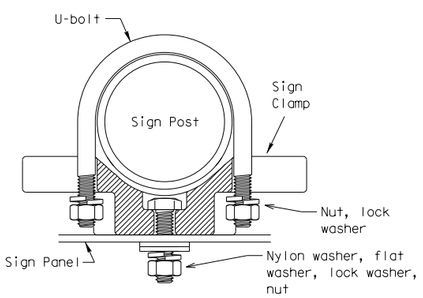
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

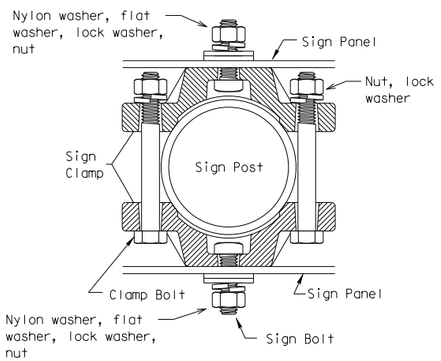


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

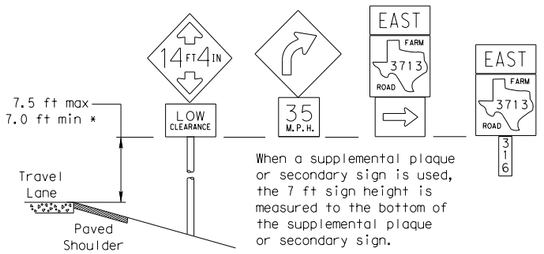
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



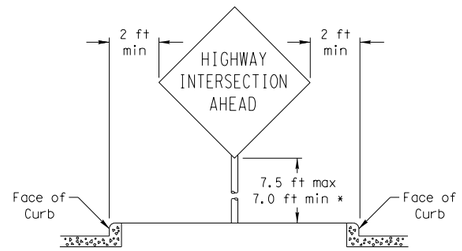
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



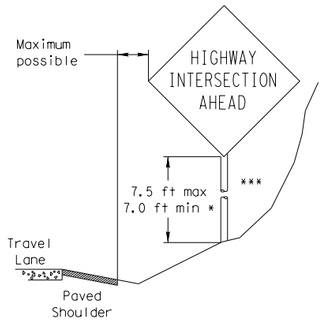
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

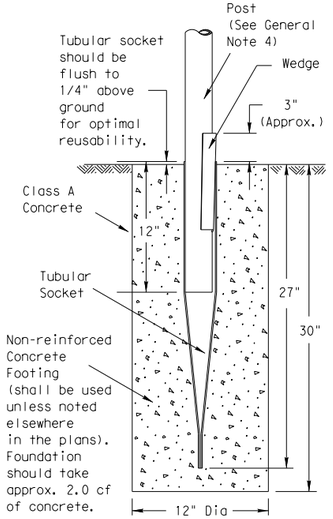
SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		106

26A

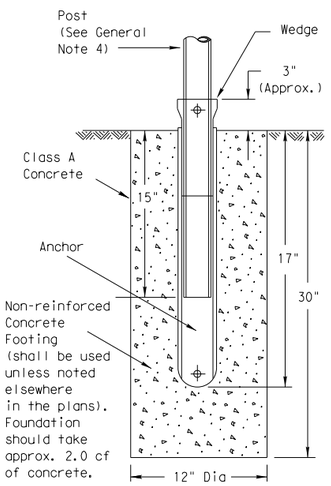
DATE: 7/5/2023 5:45:33 PM
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\8. Traffic\Standards\smdtwt.dgn

Wedge Anchor Steel System



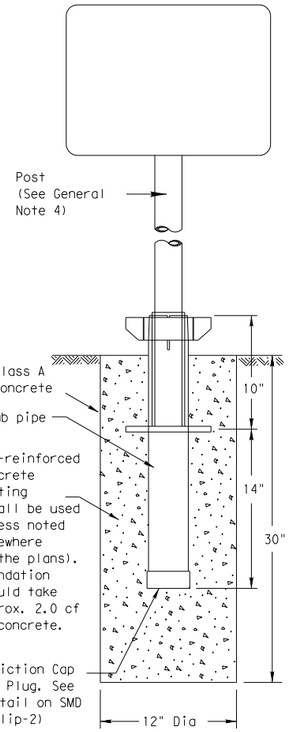
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

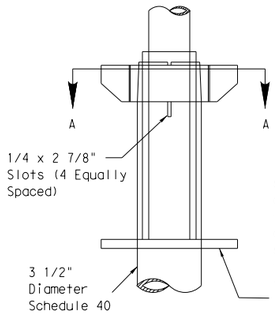


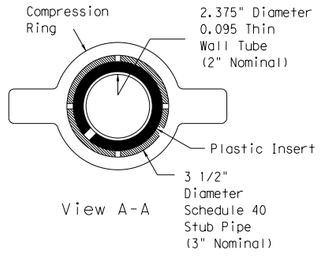
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



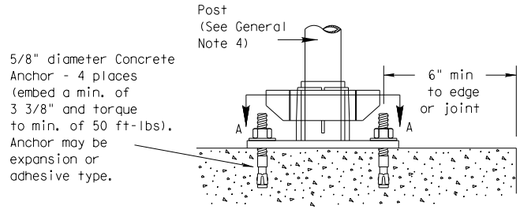
SM RD SGN ASSM TY TWT(X)UA(P)



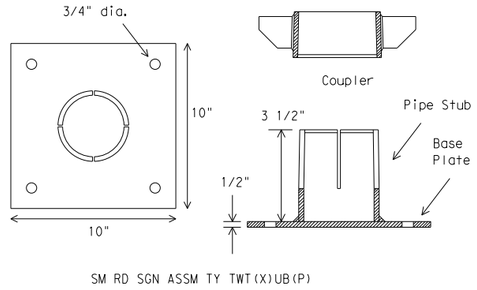


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

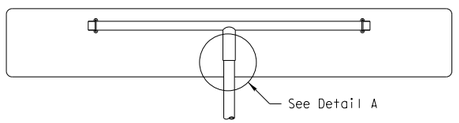


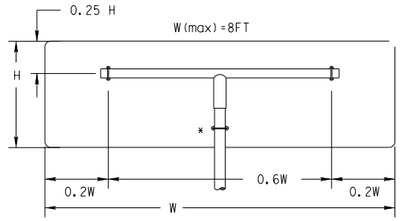
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



SM RD SGN ASSM TY TWT(X)UB(P)

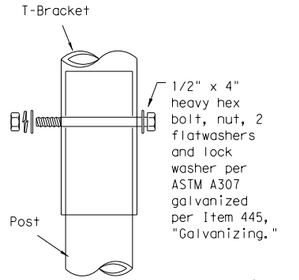
Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)

(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

9-08 REVISIONS

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

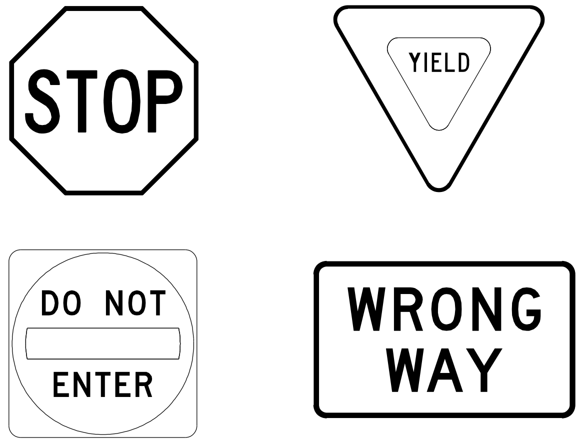
CONT	SECT	JOB	HIGHWAY
0919	19	087	VARIOUS

DIST	COUNTY	SHEET NO.
ATL	BOWIE	107

26E

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

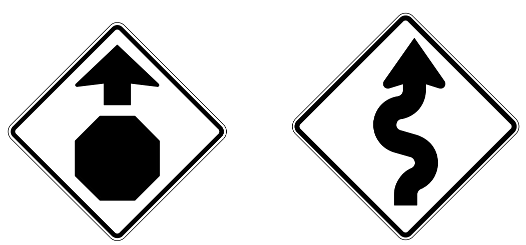
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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 12-03 7-13 9-08	0919	19	087	VARIOUS
	DIST		COUNTY	SHEET NO.
	ATL		BOWIE	108

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\epic.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit 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.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☒ No Action Required ☐ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☒ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☒ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☒ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☒ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

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 immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		109

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):
0919-19-087

1.2 PROJECT LIMITS:
From: CR 4105

To: SH 98

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 33°29′15.11"N ,(Long) 94°31′16.70"W

END: (Lat) 33°28′22.01"N ,(Long) 94°28′13.90"W

1.4 TOTAL PROJECT AREA (Acres): 21.38

1.5 TOTAL AREA TO BE DISTURBED (Acres): 21.38

1.6 NATURE OF CONSTRUCTION ACTIVITY:
CONSTRUCTION OF SHARED USE PATH CONSISTING OF GRADING, BASE, PAVEMENT, AND SIGNING.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Sawyer silt loam	0 to 3 percent slopes
Eylau very fine sandy loam	0 to 3 percent slopes
Blevins silt loam	1 to 3 percent slopes
Adaton-Muskogee complex	
Sardis silt loam	0 to 1 percent slopes, frequently flooded

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:

☐ 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.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☐ Remove existing pavement
☒ 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
☒ Install culverts, culvert extensions, SETs
☐ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☒ 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
Red Bayou	Lower Red River (0201)
Anderson Creek, Peters Branch, Austin Chapel Branch	Wright Patman Lake (0302)

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ 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)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		110
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	BOWIE	
CONT.	SECT.	JOB	HIGHWAY NO.
0919	19	087	VARIOUS

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\swp3b22.dgn

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
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☒ ☐ 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

- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ 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: _____

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
Wetland	996+25	999+45

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ 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:

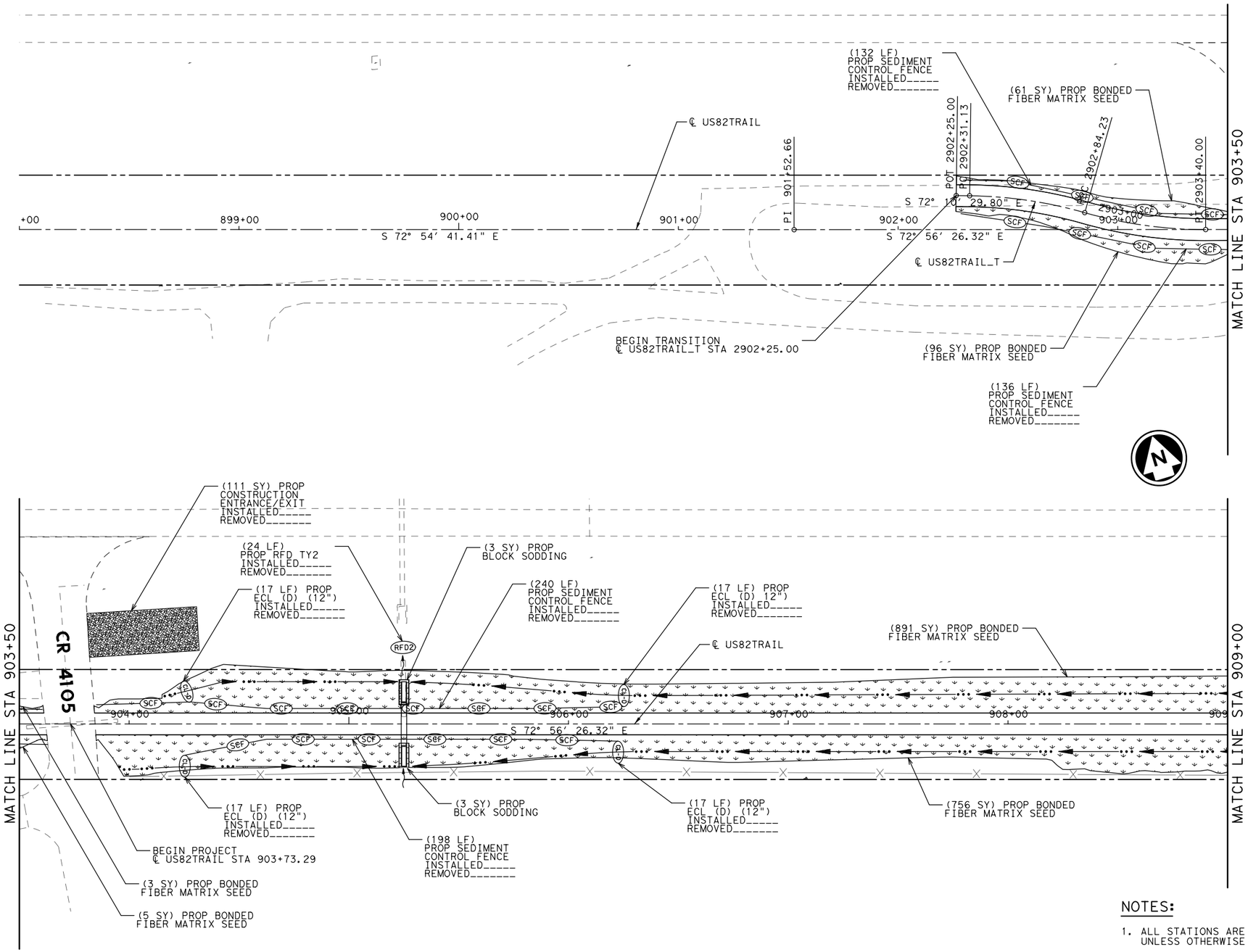
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being 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)

Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		111
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	BOWIE	
CONT.	SECT.	JOB	HIGHWAY NO.
0919	19	087	VARIOUS



0′ 25′ 50′

SCALE IN FEET

LEGEND

- SOIL RETENTION BLANKET
- BONDED FIBER MATRIX SEED
- BLOCK SODDING
- CONSTRUCTION ENTRANCE/EXIT
- STONE RIPRAP
- (SCF) SEDIMENT CONTROL FENCE
- (RFD1) ROCK FILTER DAM (TYP 1)
- (RFD2) ROCK FILTER DAM (TYP 2)
- (RFD3) ROCK FILTER DAM (TYP 3)
- (CL-D) EROSION CONTROL LOG DAM
- FLOW LINE
- PROP DITCH FLOW LINE
- EXISTING DITCH FLOW LINE
- ROW

NOTES:

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3. EROSION CONTROL QUANTITIES LISTED ARE APPROXIMATE AND MAY NEED TO BE VARIED TO MEET FIELD CONDITIONS OR AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
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TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

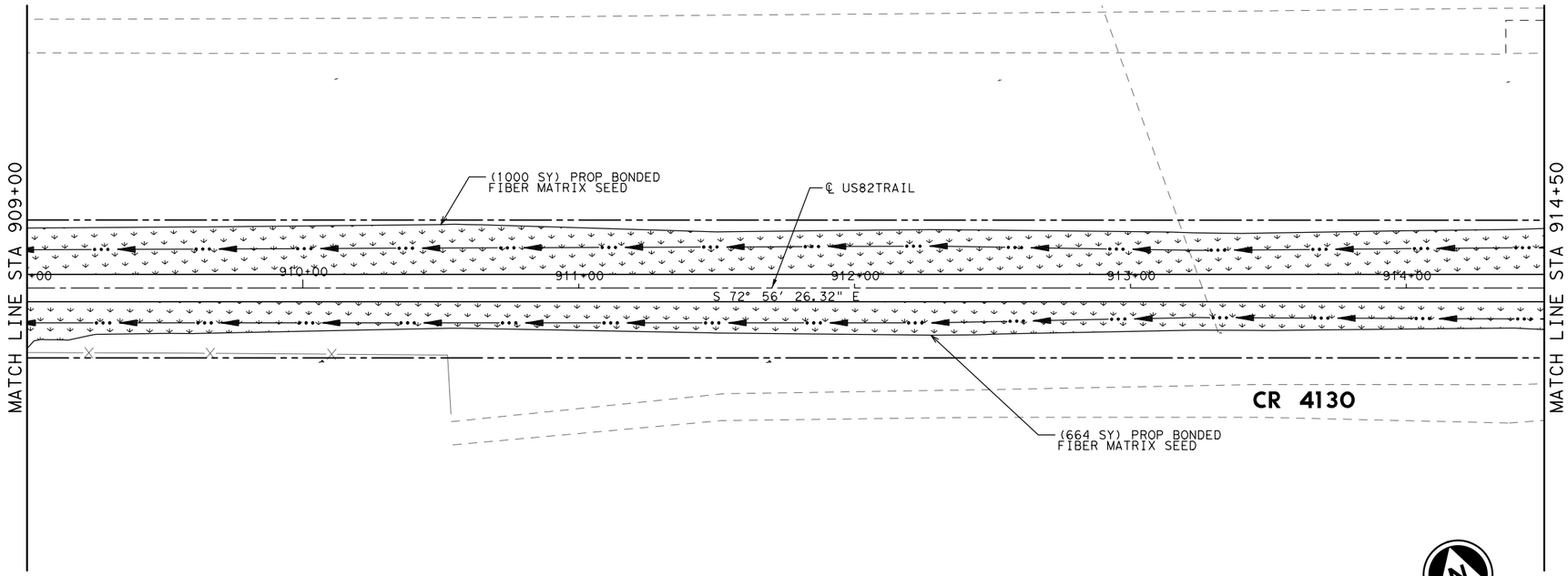
VARIOUS

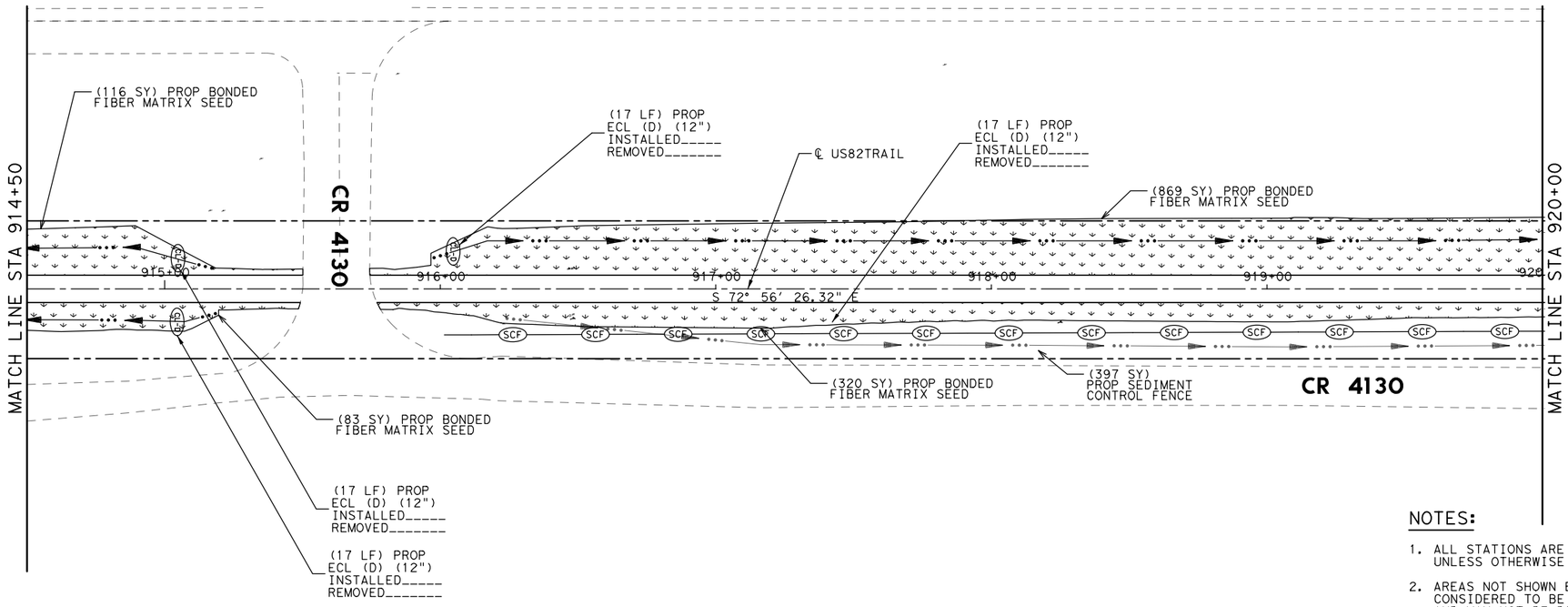
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
BEGIN TO STA 909+00

SCALE: 1" = 50′ SHEET 1 OF 16

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	112
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P3.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

- SOIL RETENTION BLANKET
- BONDED FIBER MATRIX SEED
- BLOCK SODDING
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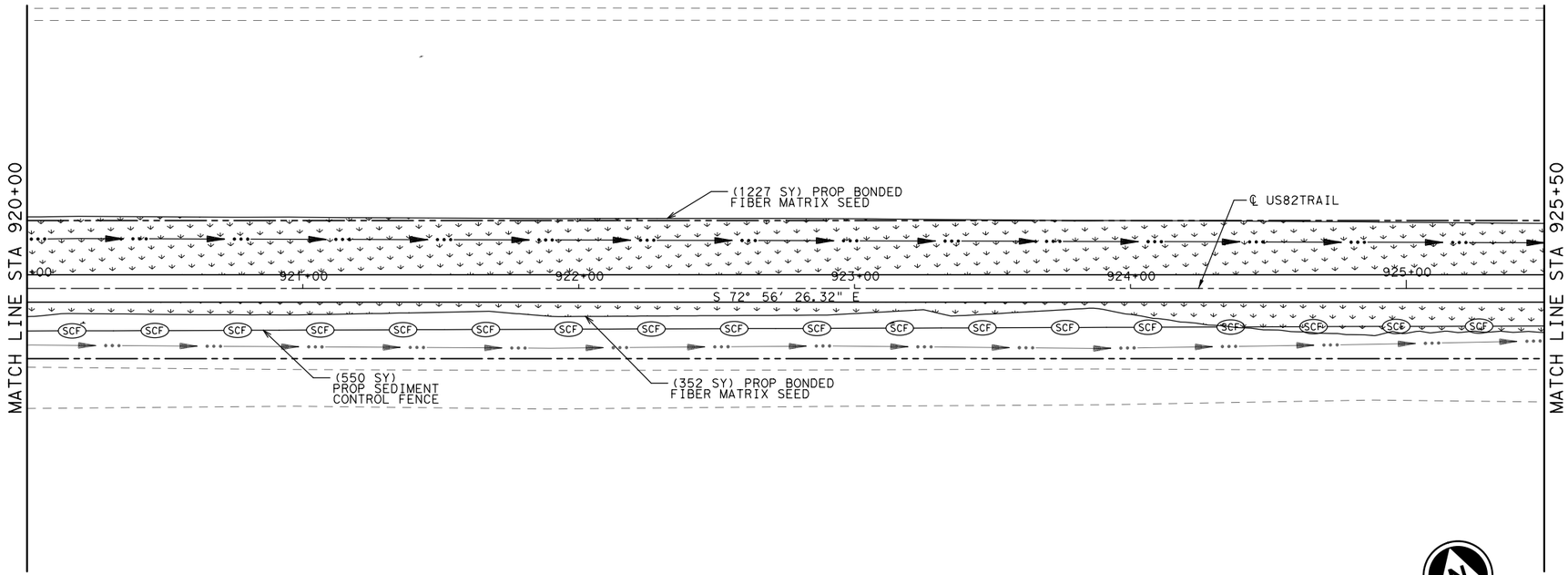
VARIOUS

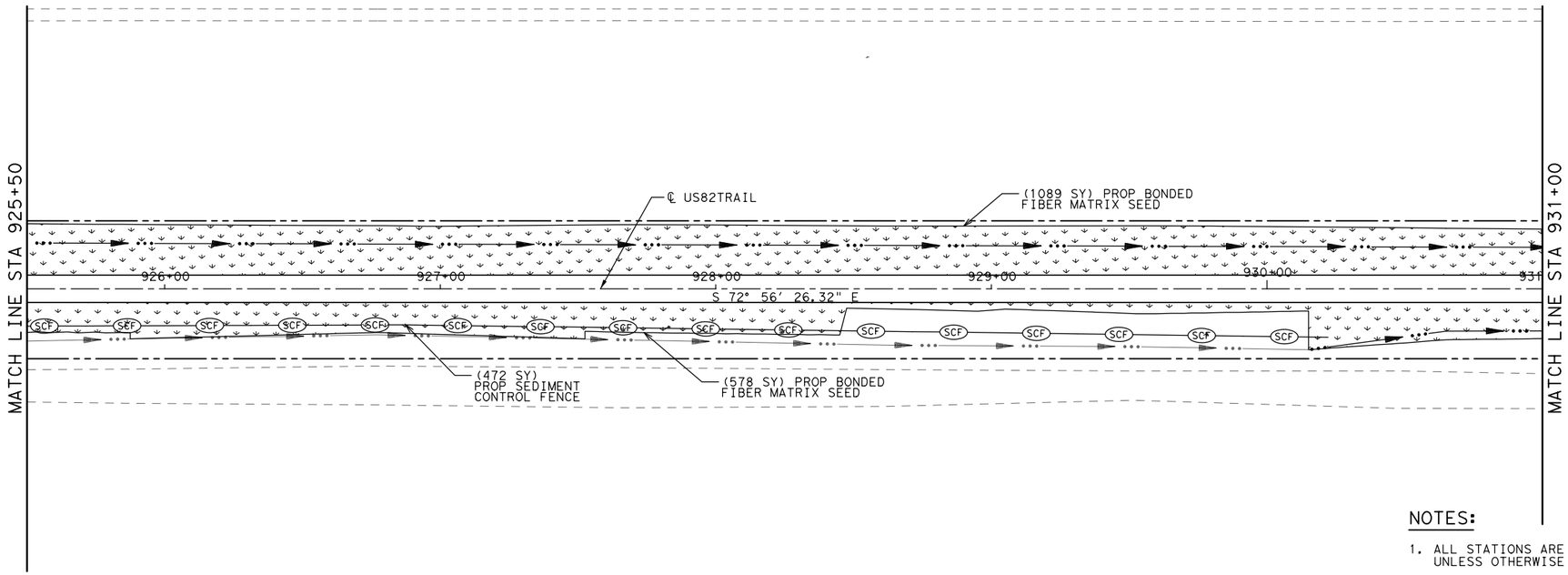
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 909+00 TO STA 920+00

SCALE: 1" = 50′ SHEET 2 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	113
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P3.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

- SOIL RETENTION BLANKET
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Texas Department of Transportation

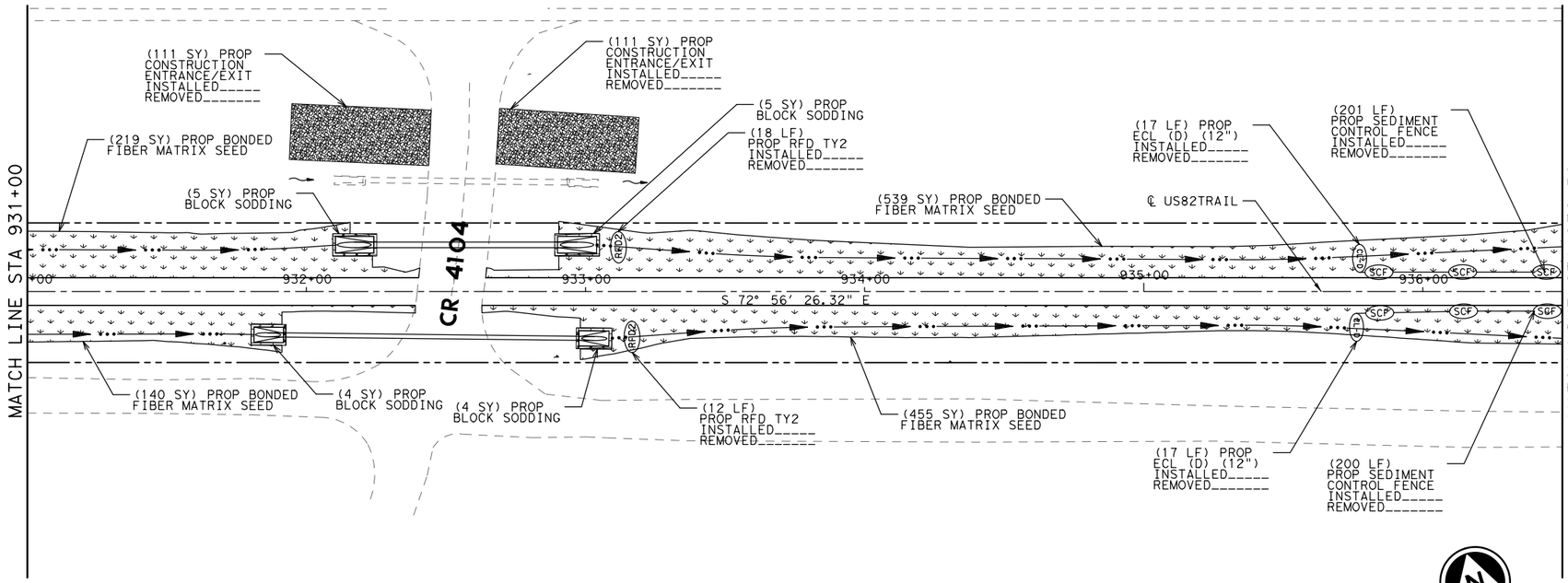
VARIOUS

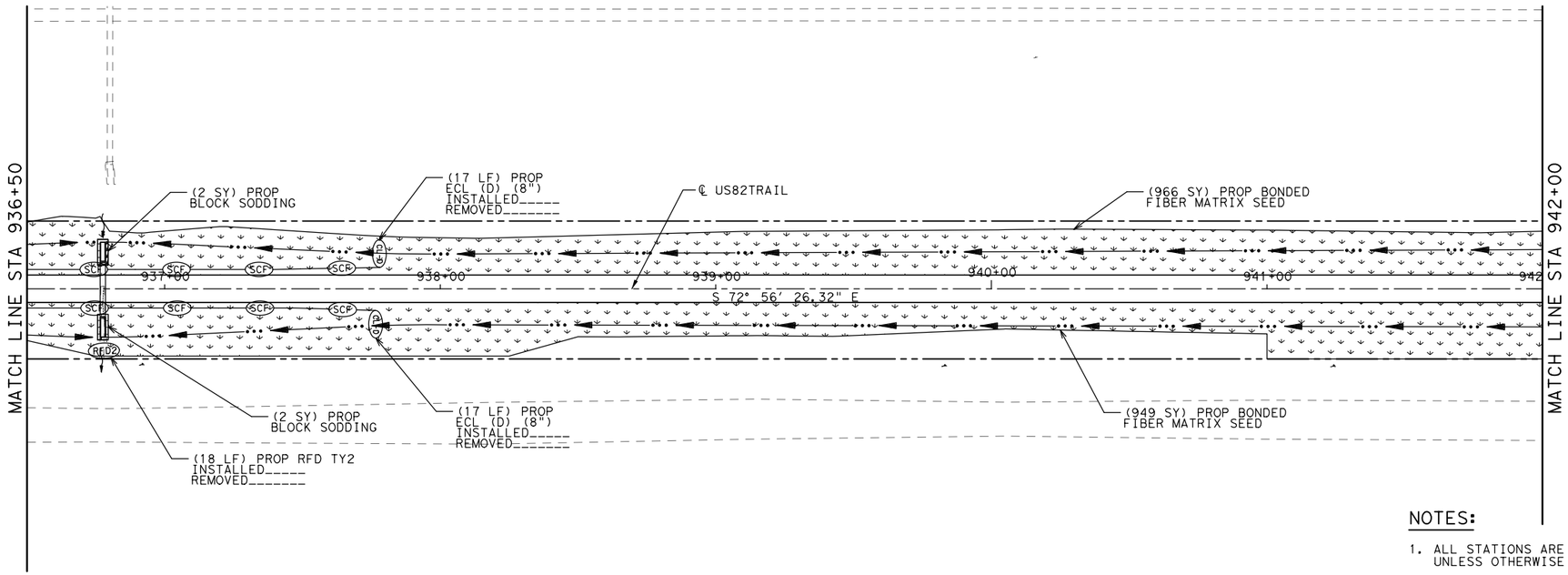
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 920+00 TO STA 931+00

SCALE: 1" = 50′ SHEET 3 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	114
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P3.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

- SOIL RETENTION BLANKET
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Texas Department of Transportation

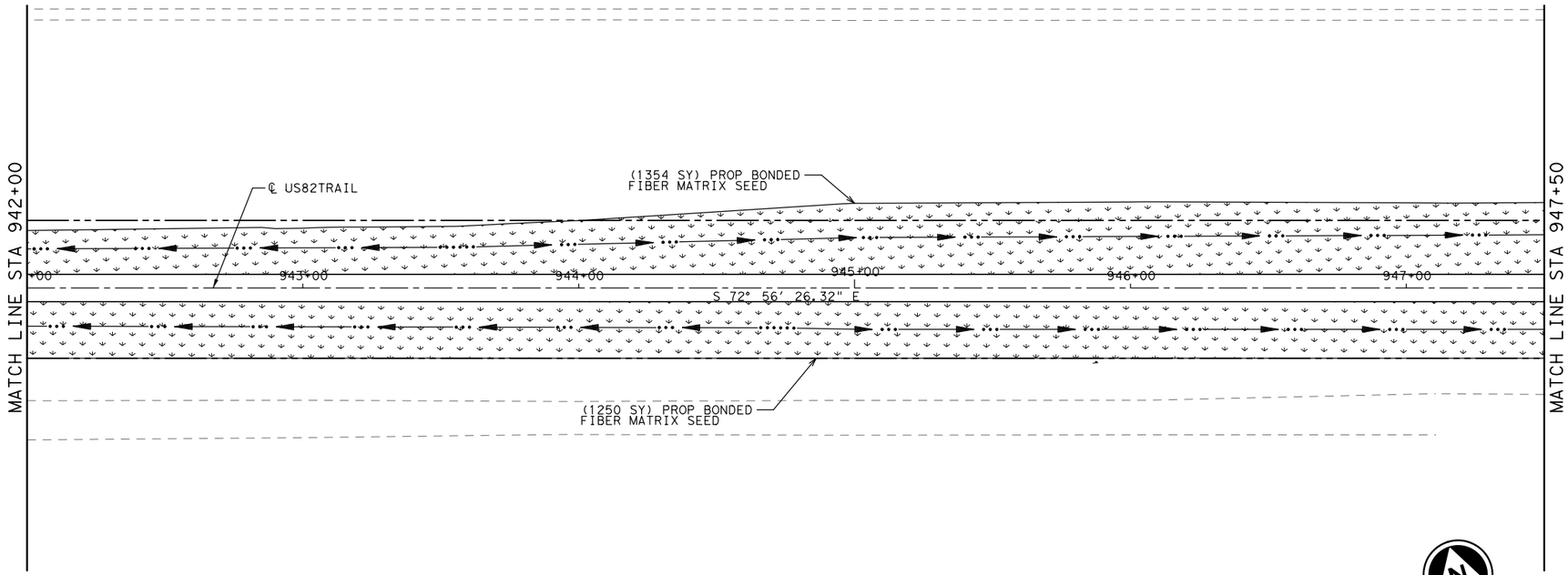
VARIOUS

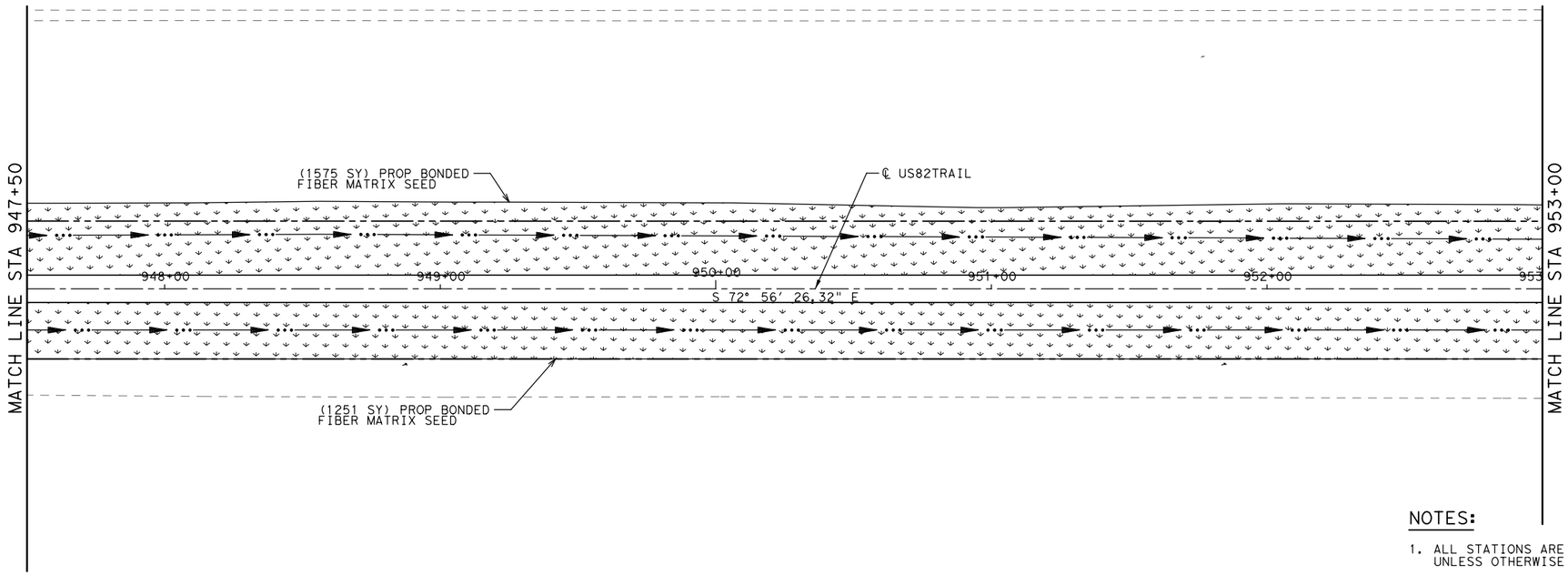
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 931+00 TO STA 942+00

SCALE: 1" = 50′ SHEET 4 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	115
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P3.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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Texas Department of Transportation

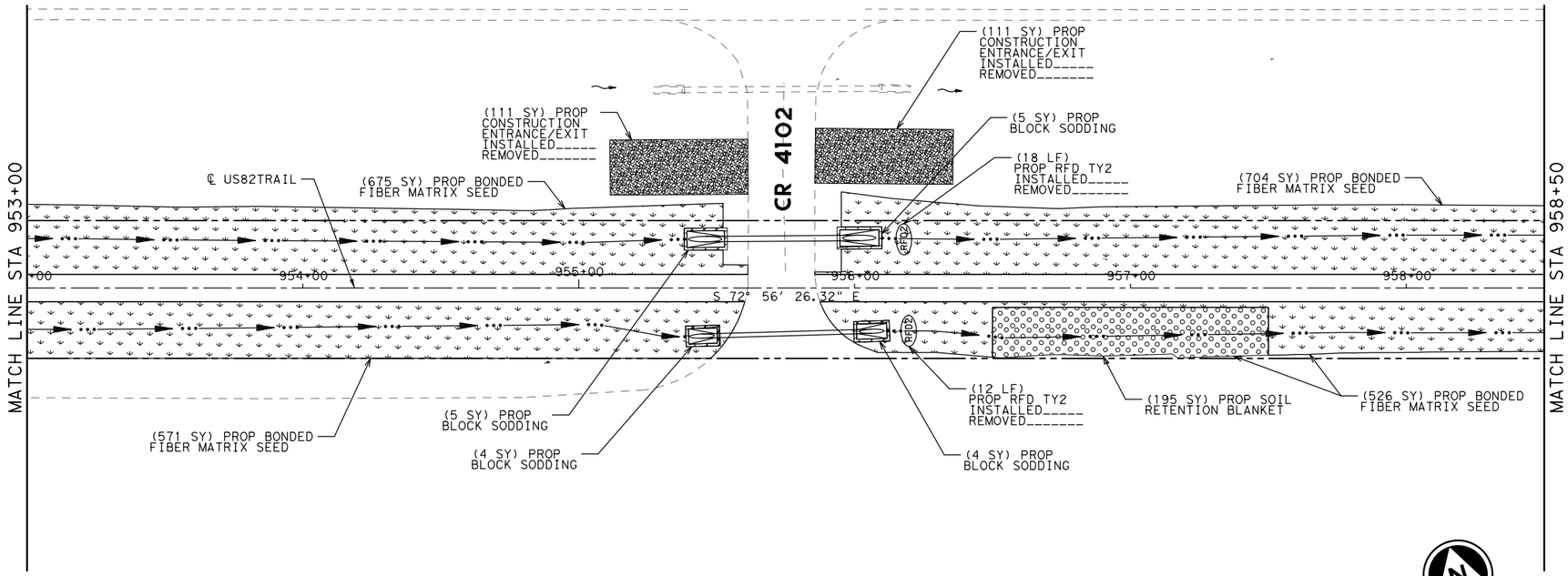
VARIOUS

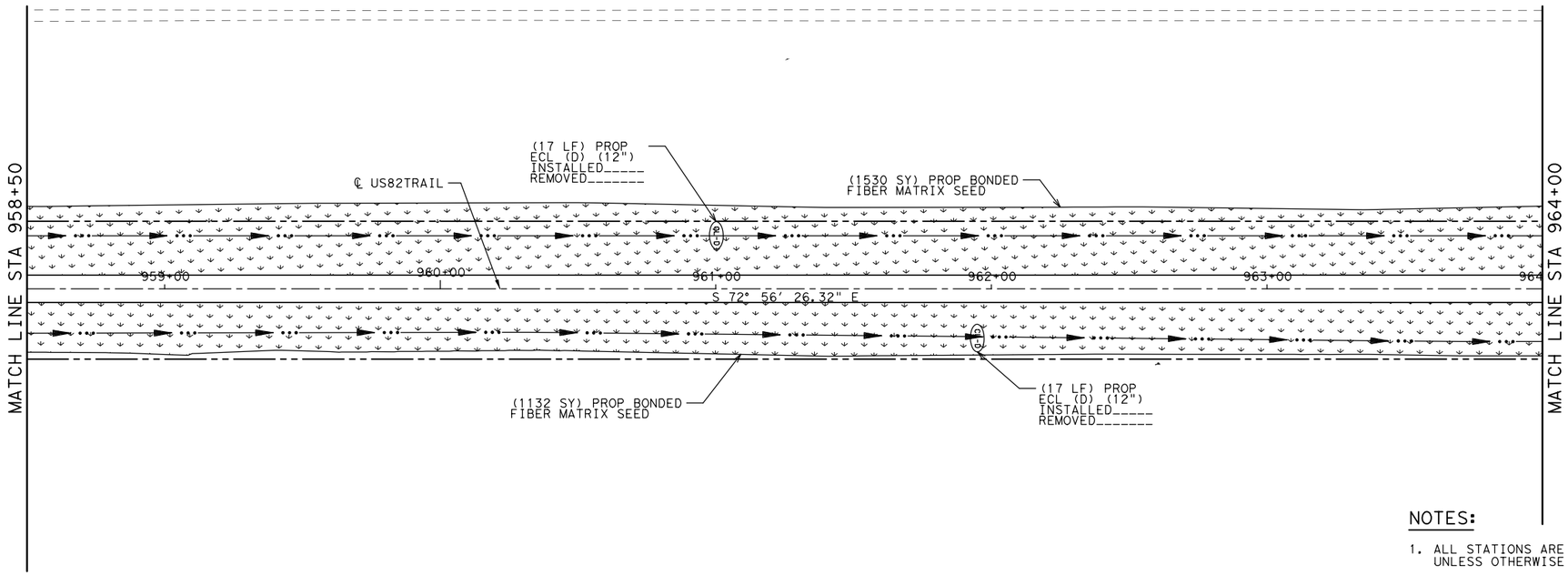
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 942+00 TO STA 953+00

SCALE: 1" = 50′ SHEET 5 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	116
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P3.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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Texas Department of Transportation

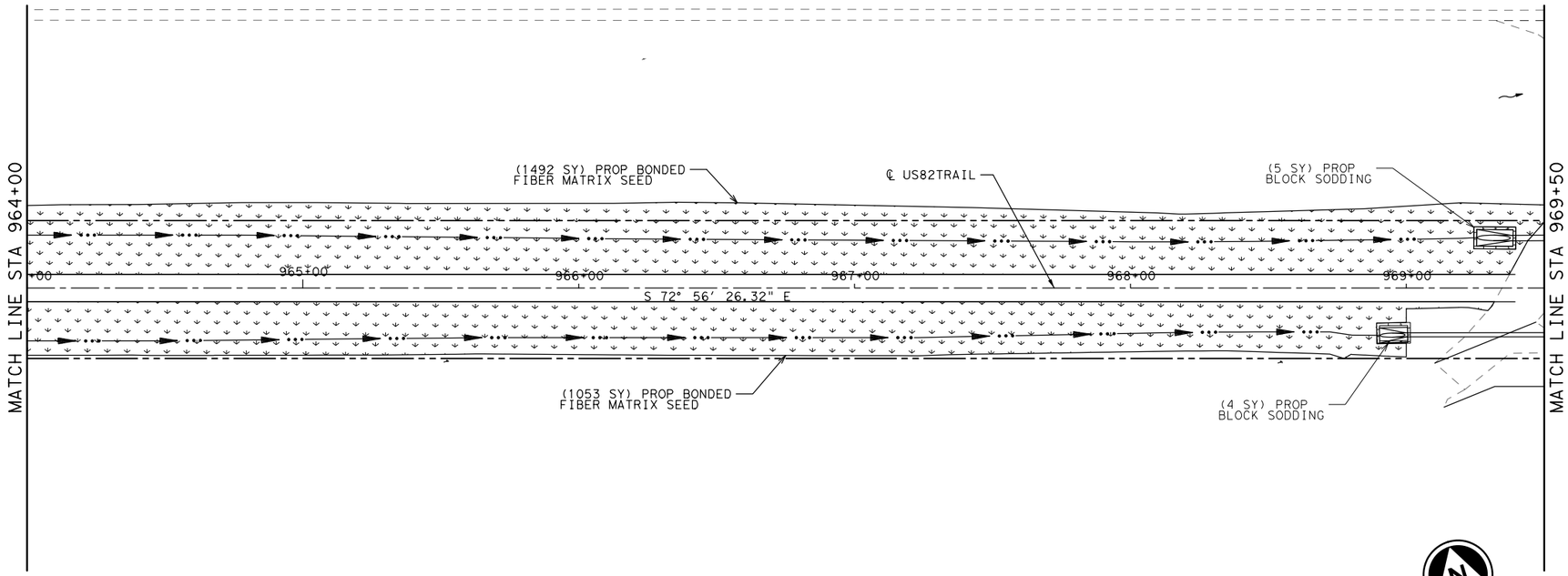
VARIOUS

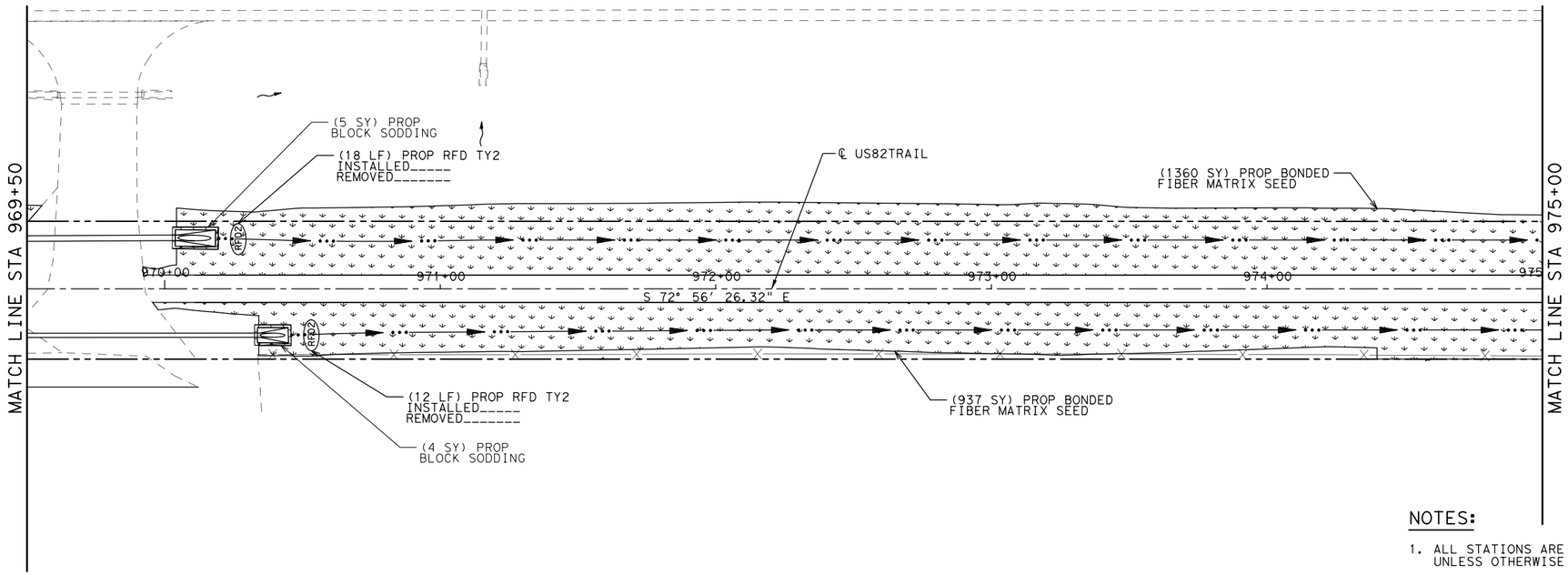
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 953+00 TO STA 964+00

SCALE: 1" = 50′ SHEET 6 OF 16

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	117
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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Texas Department of Transportation

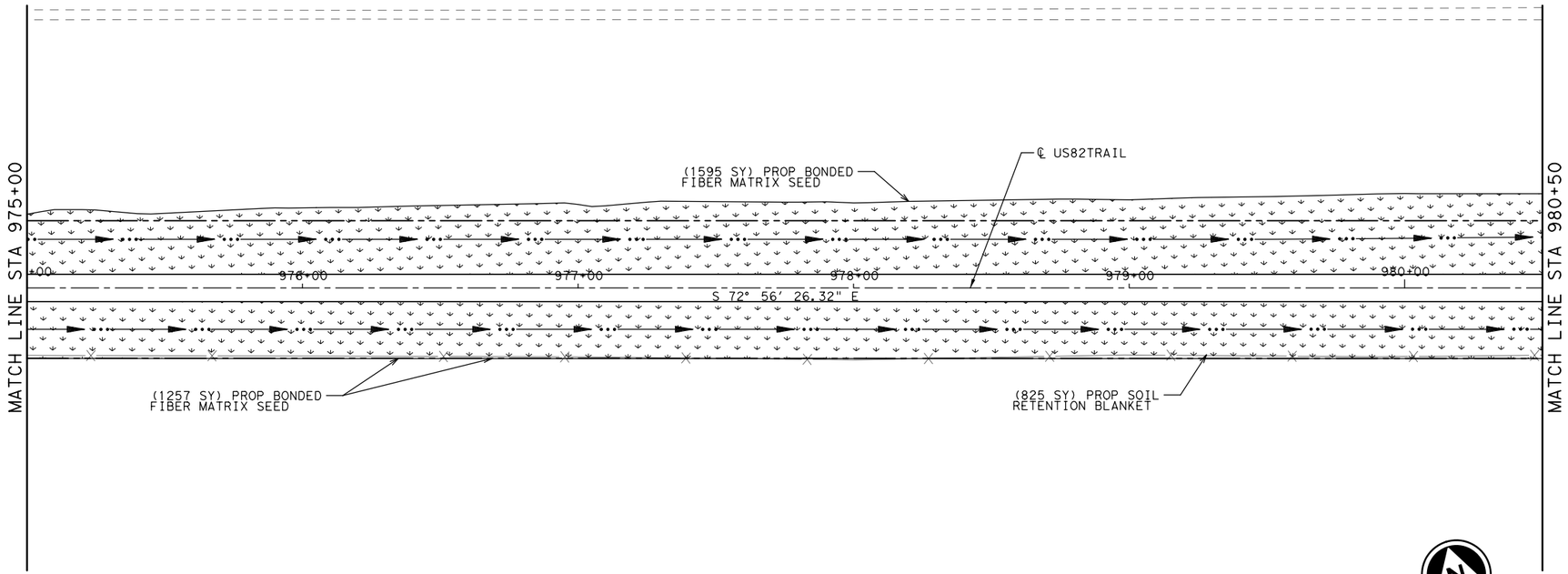
VARIOUS

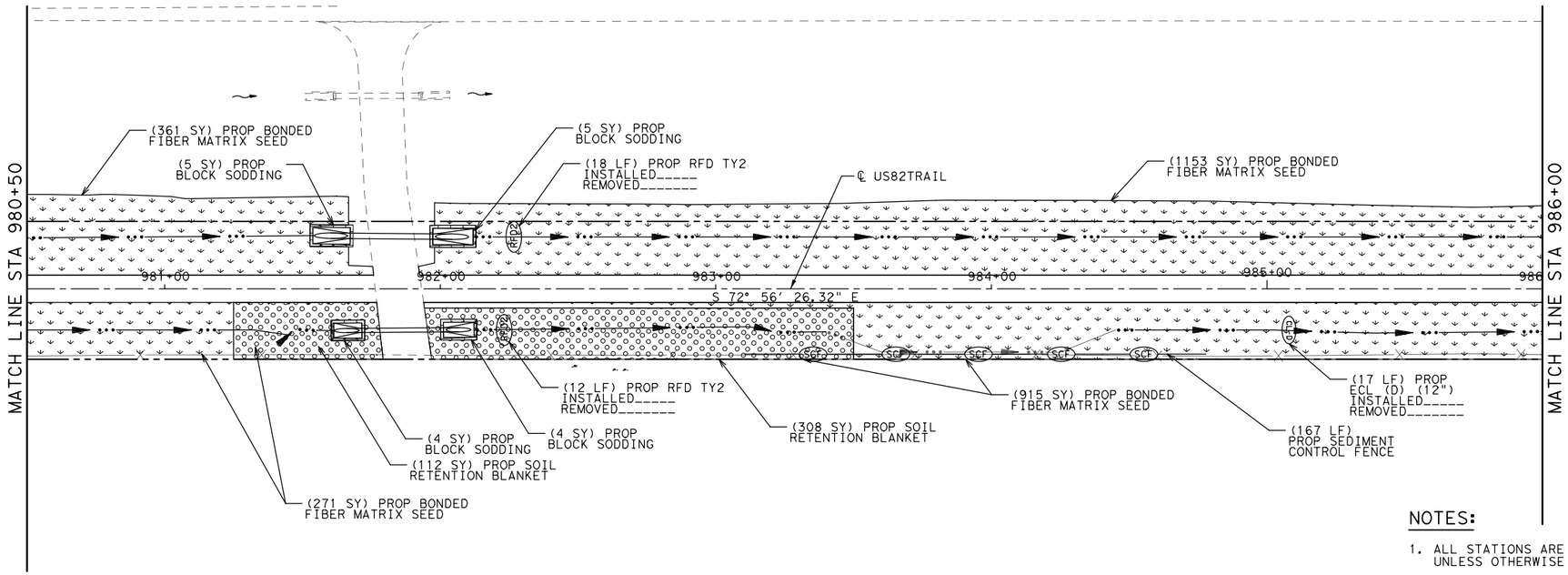
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 964+00 TO STA 975+00

SCALE: 1" = 50′ SHEET 7 OF 16

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	118
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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Texas Department of Transportation

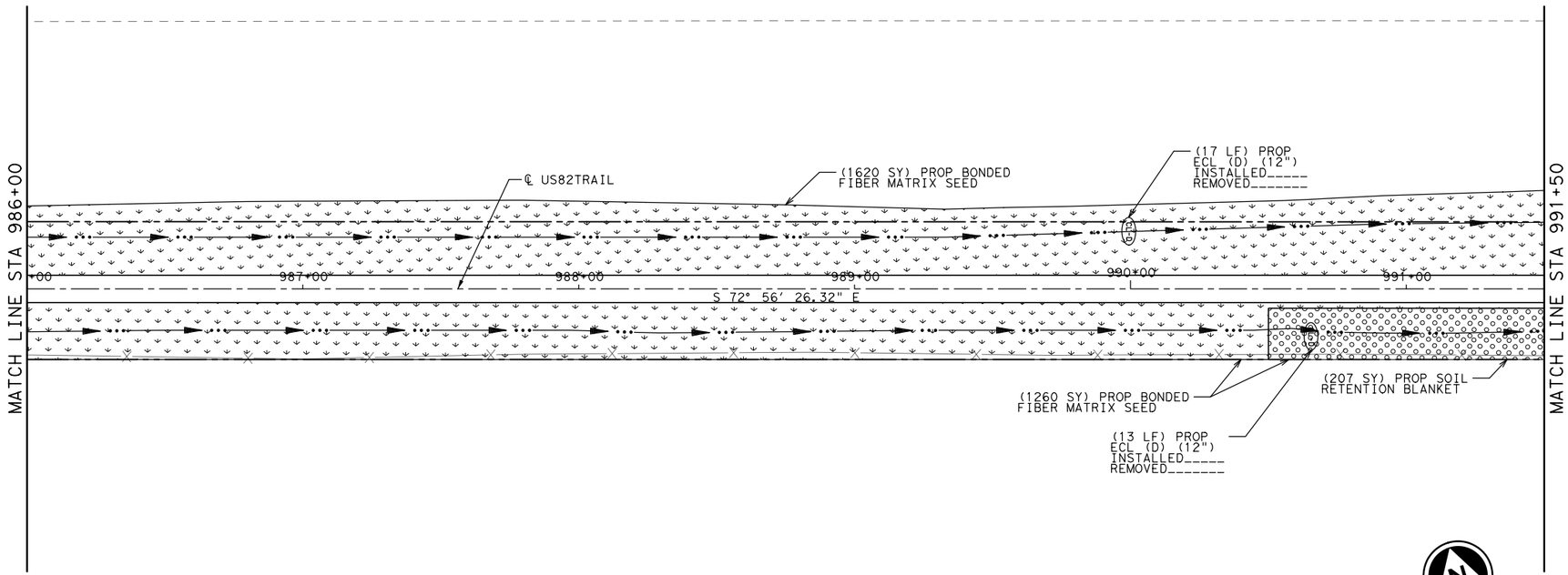
VARIOUS

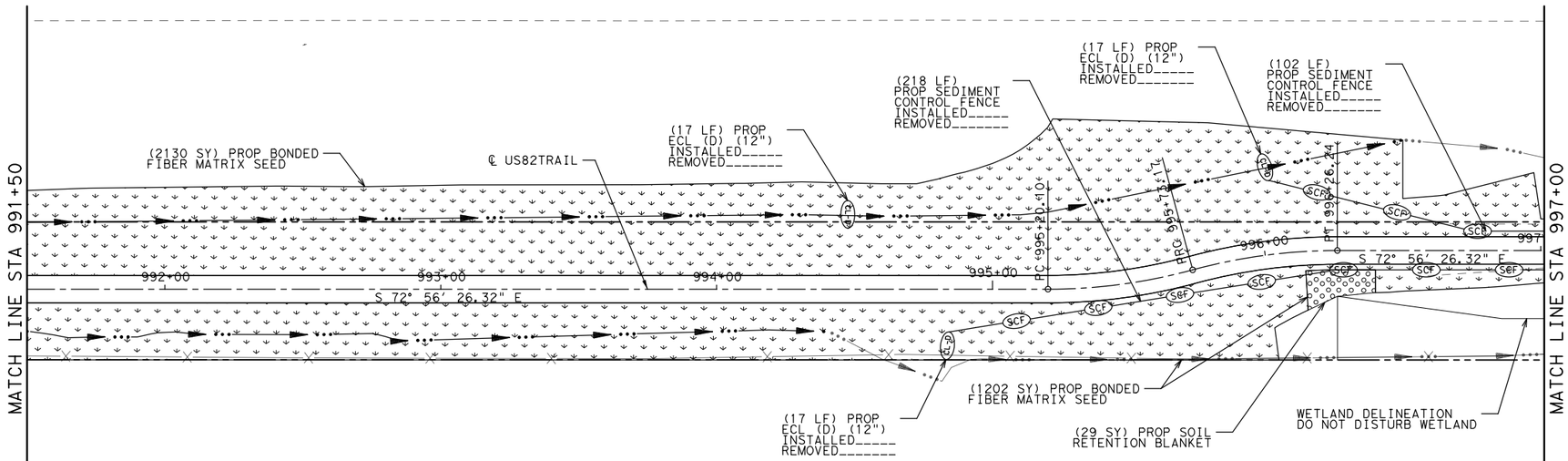
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 975+00 TO STA 986+00

SCALE: 1" = 50′ SHEET 8 OF 16

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	119
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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- CONSTRUCTION ENTRANCE/EXIT
- STONE RIPRAP
- SCF — SEDIMENT CONTROL FENCE
- RFD1 — ROCK FILTER DAM (TYP 1)
- RFD2 — ROCK FILTER DAM (TYP 2)
- RFD3 — ROCK FILTER DAM (TYP 3)
- CL-D — EROSION CONTROL LOG DAM
- FLOW LINE
- PROP DITCH FLOW LINE
- EXISTING DITCH FLOW LINE
- ROW

NOTES:

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STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

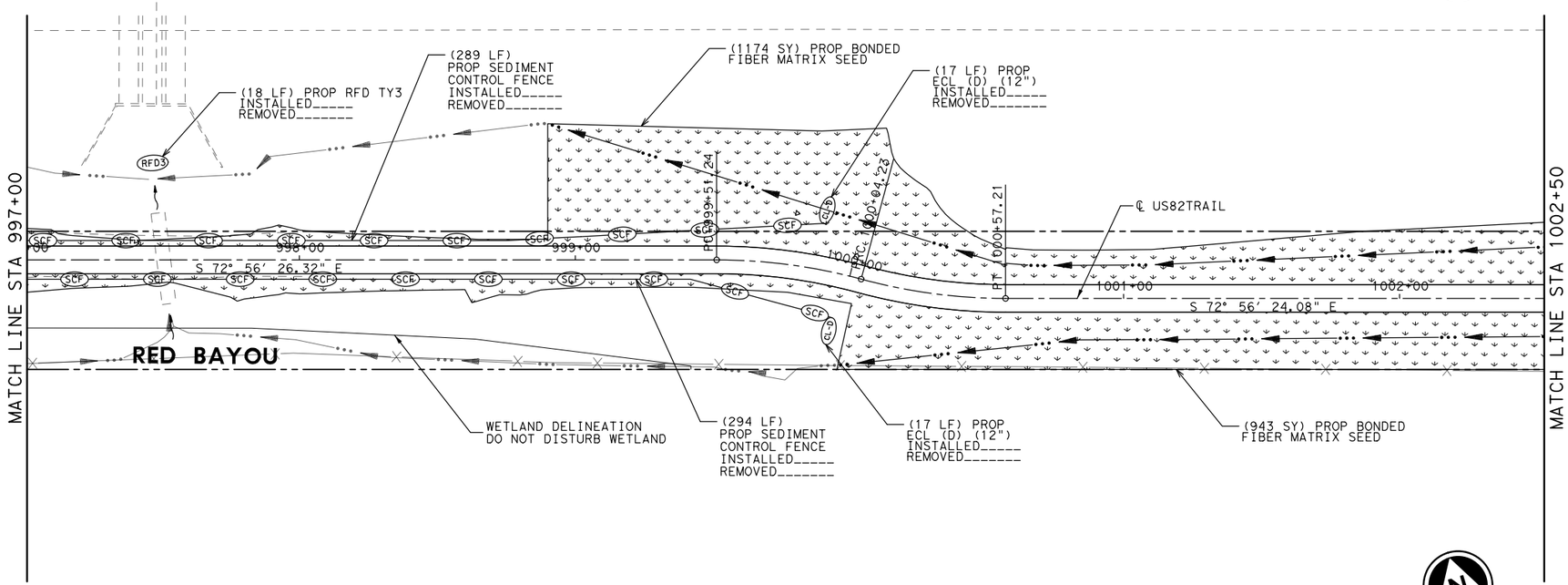
VARIOUS

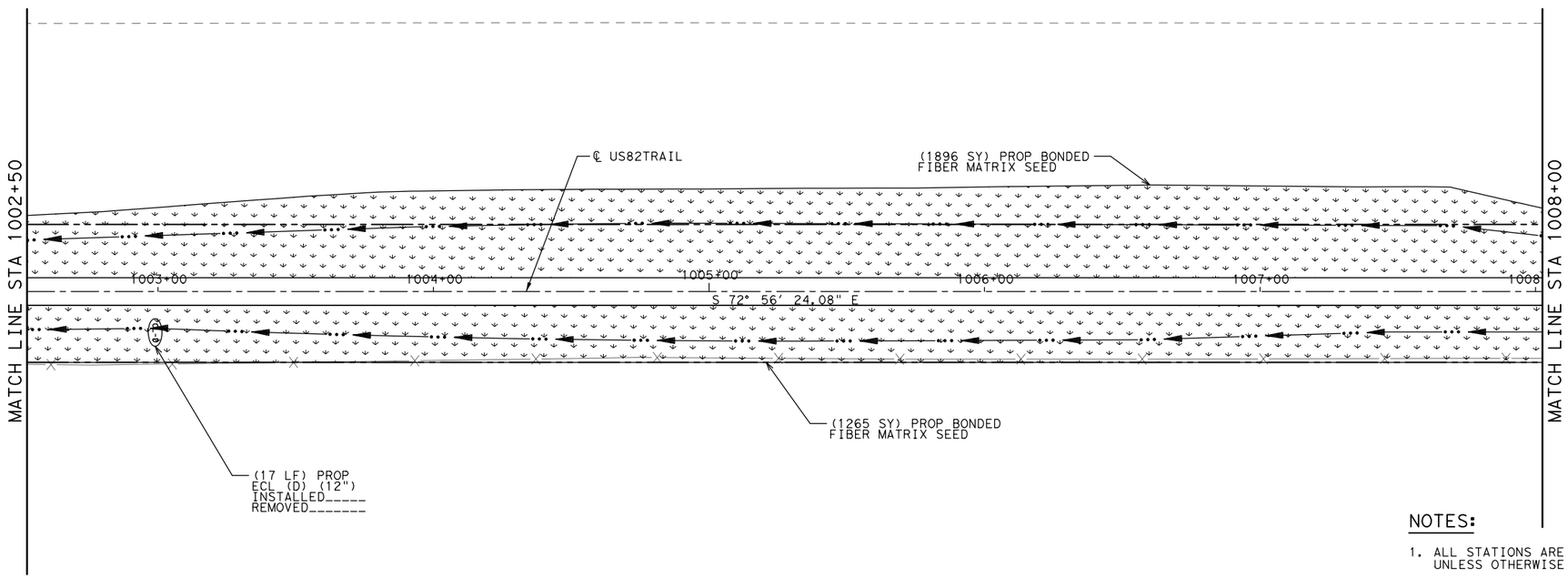
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 986+00 TO STA 997+00

SCALE: 1" = 50′ SHEET 9 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	120
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

- SOIL RETENTION BLANKET
- BONDED FIBER MATRIX SEED
- BLOCK SODDING
- CONSTRUCTION ENTRANCE/EXIT
- STONE RIPRAP
- SCF — SEDIMENT CONTROL FENCE
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JMT TBPE REGISTRATION NO. F-163341

Texas Department of Transportation

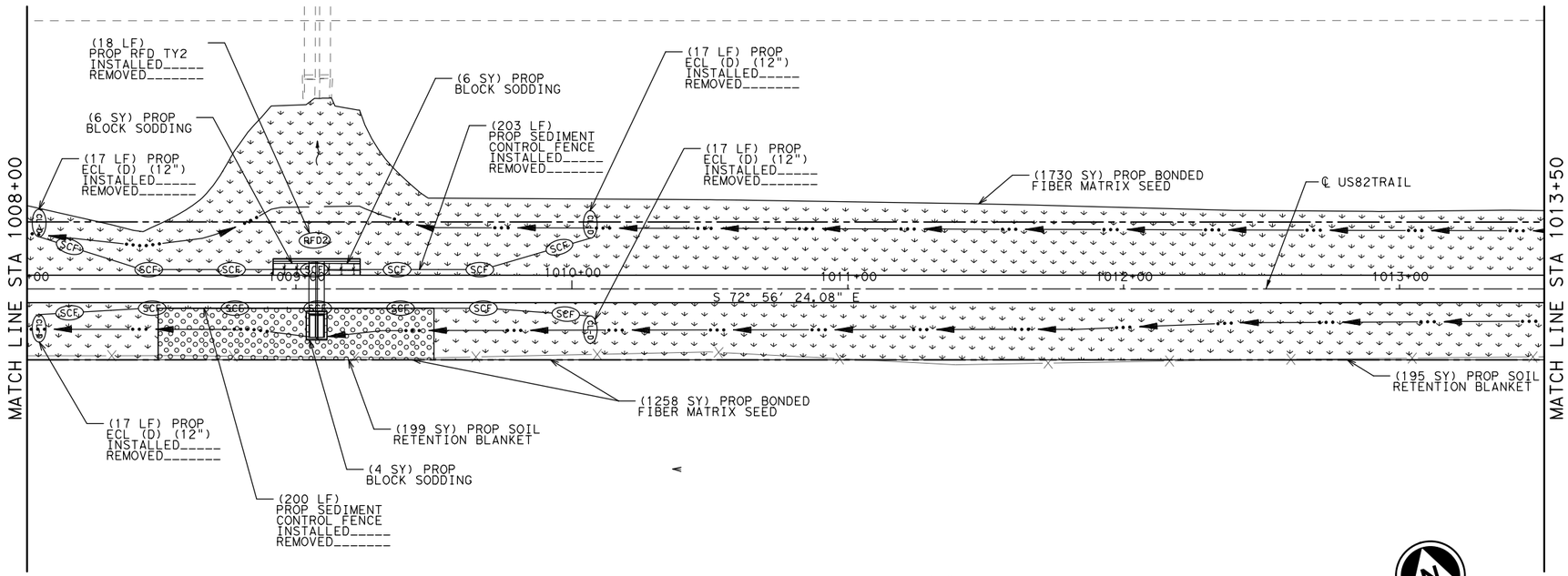
VARIOUS

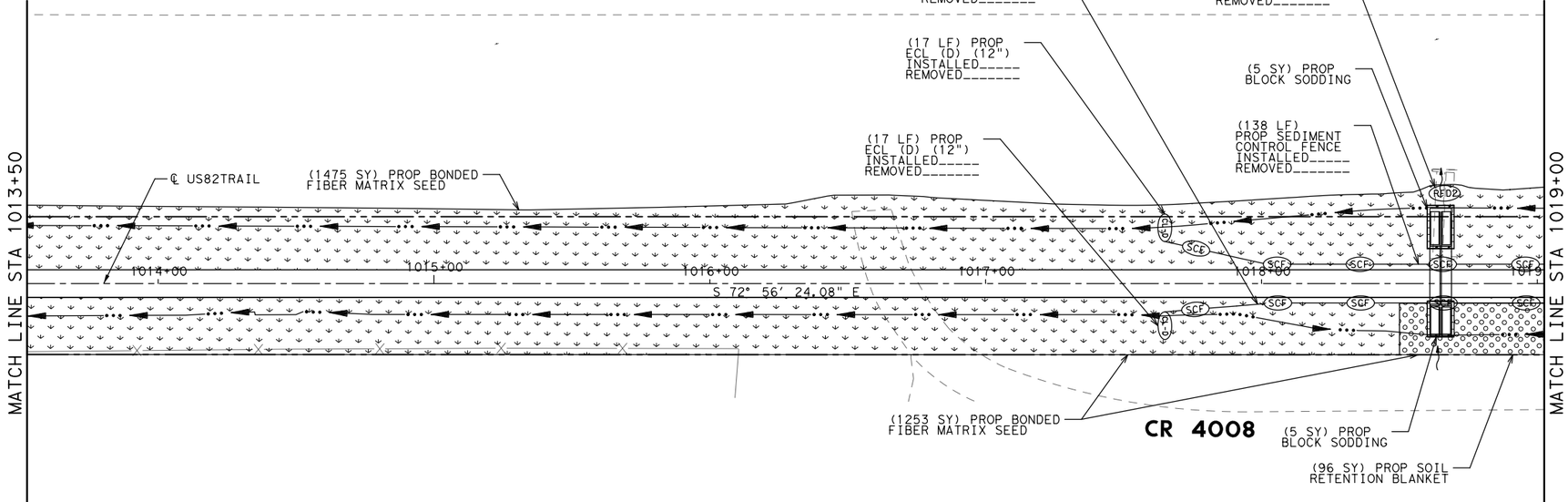
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 997+00 TO STA 1008+00

SCALE: 1" = 50′ SHEET 10 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	121
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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- BONDED FIBER MATRIX SEED
- BLOCK SODDING
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7/5/2023

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

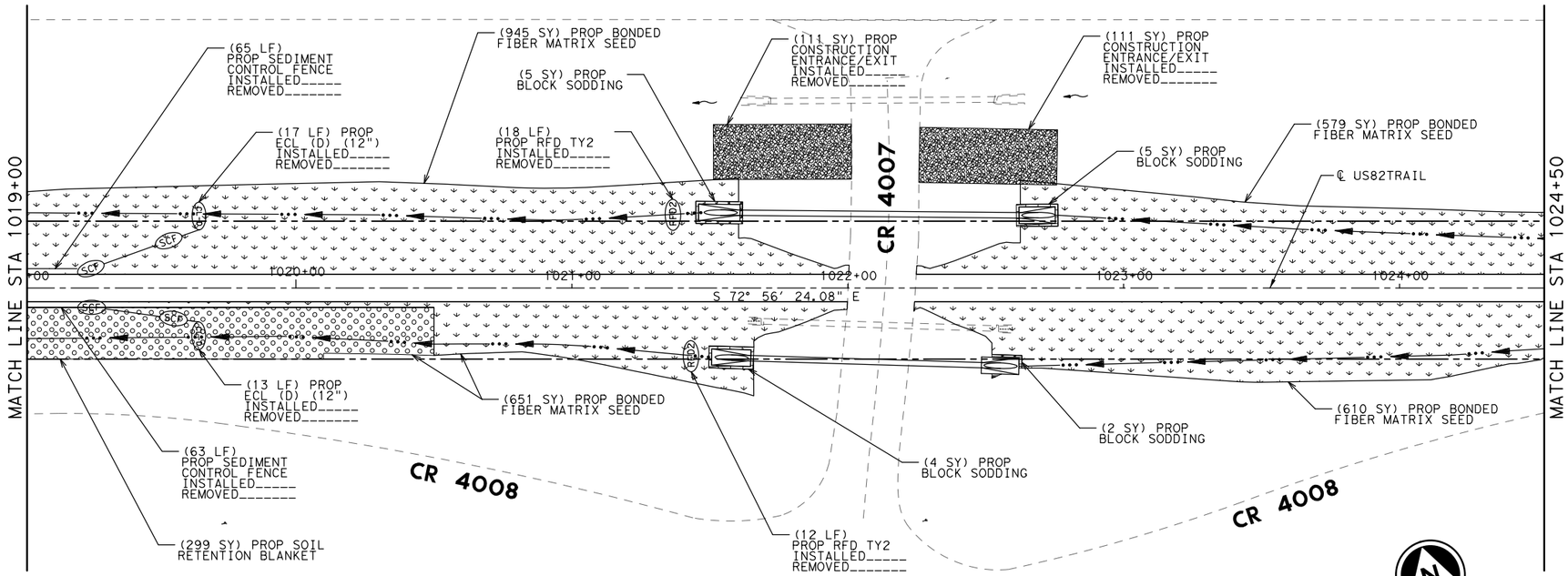
VARIOUS

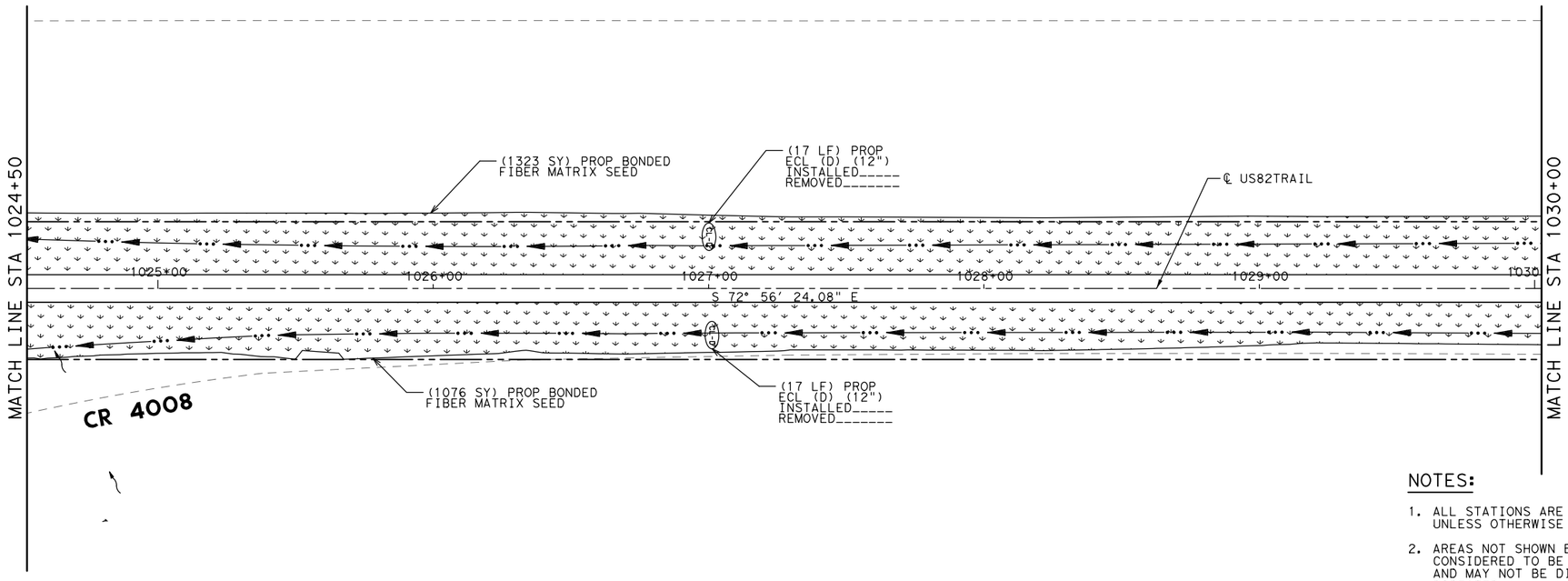
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1008+00 TO STA 1019+00

SCALE: 1" = 50′ SHEET 11 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	122
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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- BONDED FIBER MATRIX SEED
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4. AREA NORTH OF CR 4008 IS BOWIE COUNTY PROPERTY, NO RIGHT OF ENTRY REQUIRED.

STATE OF TEXAS
ROBERT J. RAMON
111661
LICENSED
PROFESSIONAL ENGINEER

7/5/2023

DocuSigned by:
3EF5D1603925484...

JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

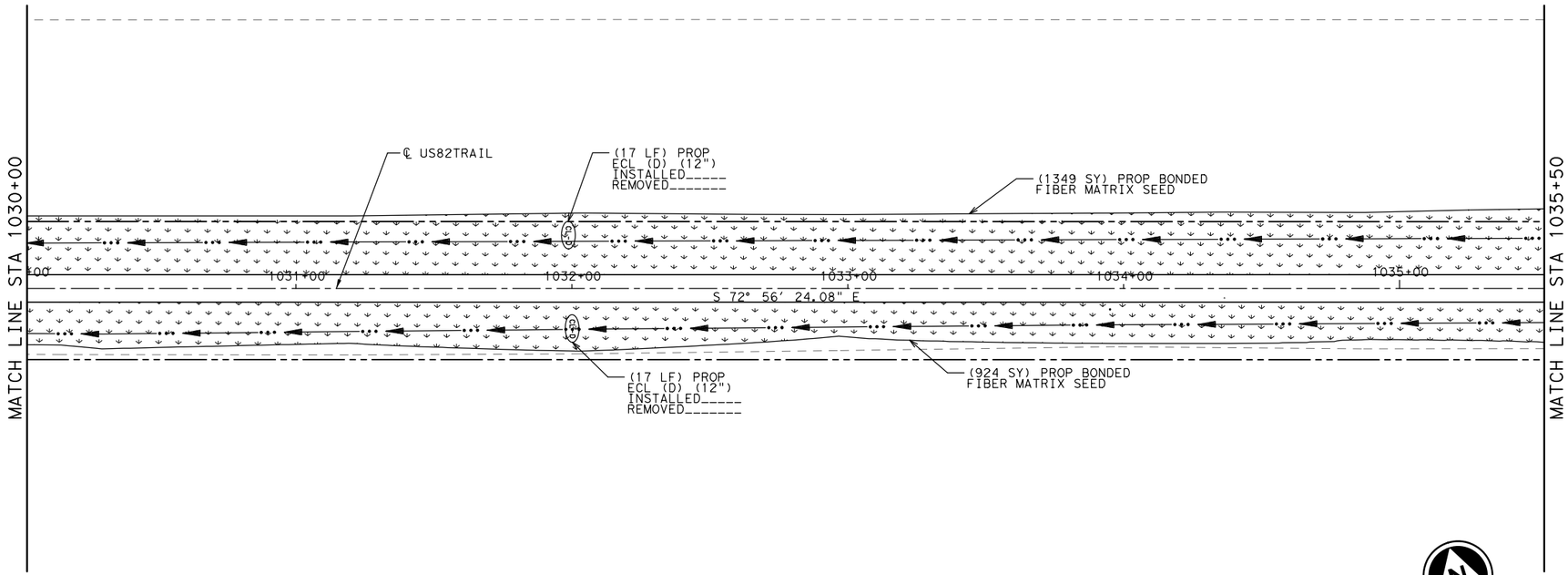
VARIOUS

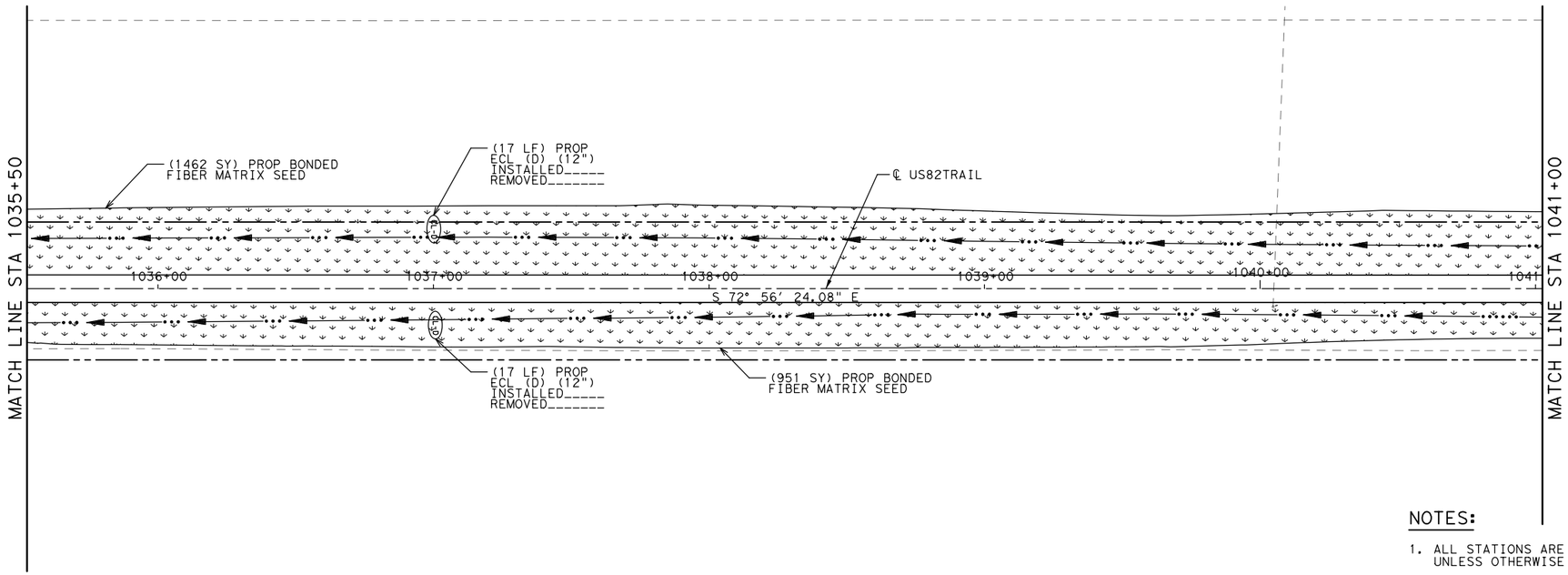
EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1019+00 TO STA 1030+00

SCALE: 1" = 50′ SHEET 12 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	123
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
FILE NAME: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn





0′ 25′ 50′

SCALE IN FEET

LEGEND

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JMT TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1030+00 TO STA 1041+00

SCALE: 1" = 50′ SHEET 13 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	124
CHECK JMT	CONTROL	SECTION	JOB	
	0919	19	087	

DATE: 7/5/2023
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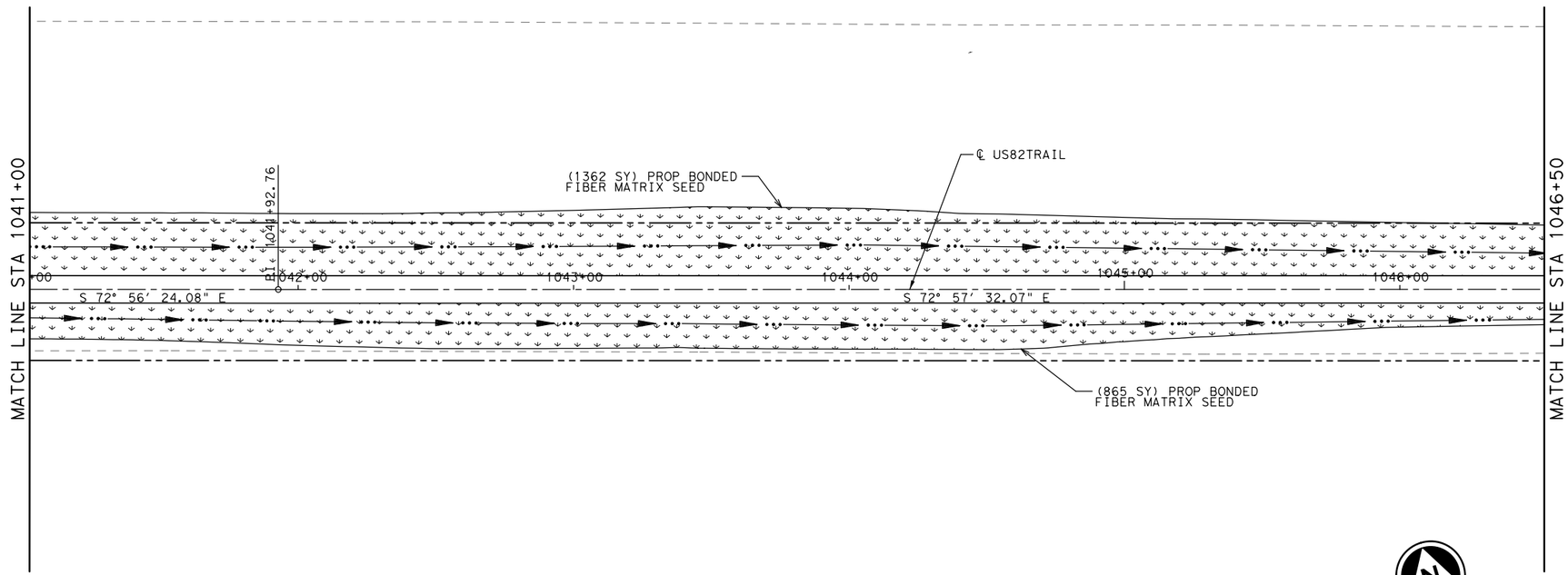

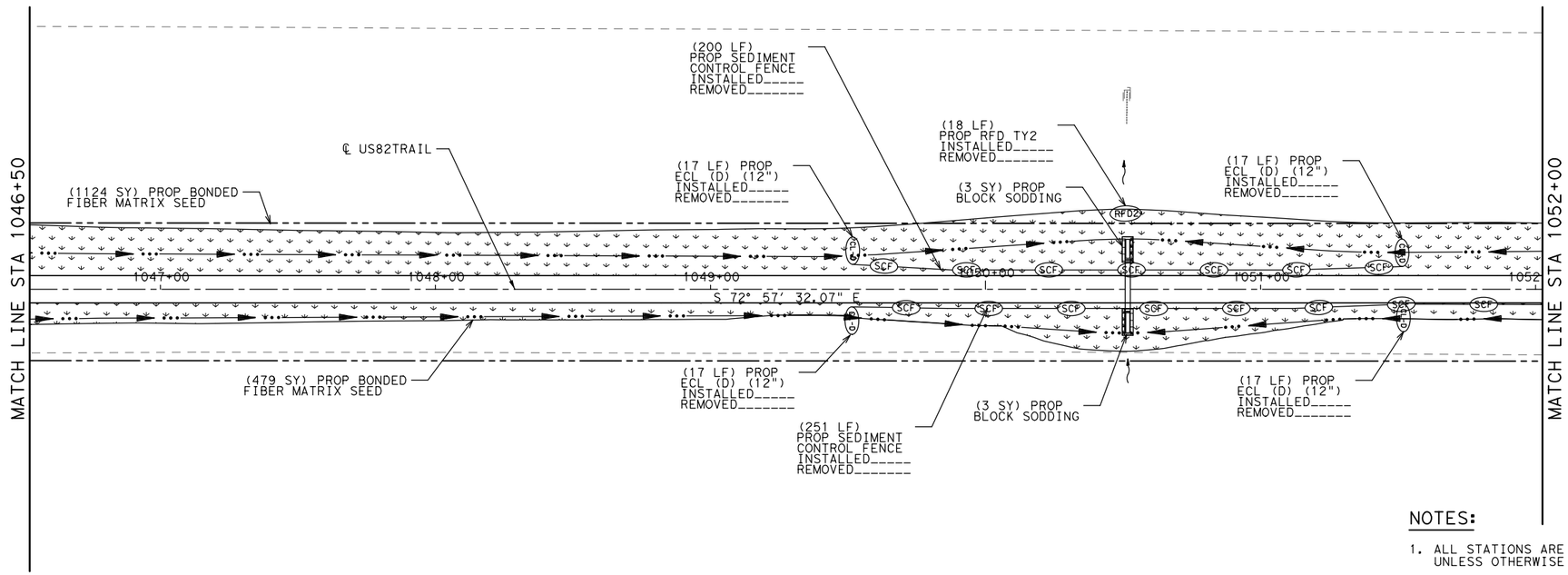

0′ 25′ 50′

SCALE IN FEET

LEGEND

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7/5/2023

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3EF5D1603925484...

TBPE REGISTRATION NO. F-16341

Texas Department of Transportation

VARIOUS

EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1041+00 TO STA STA 1052+00

SCALE: 1" = 50′ SHEET 14 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	125
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
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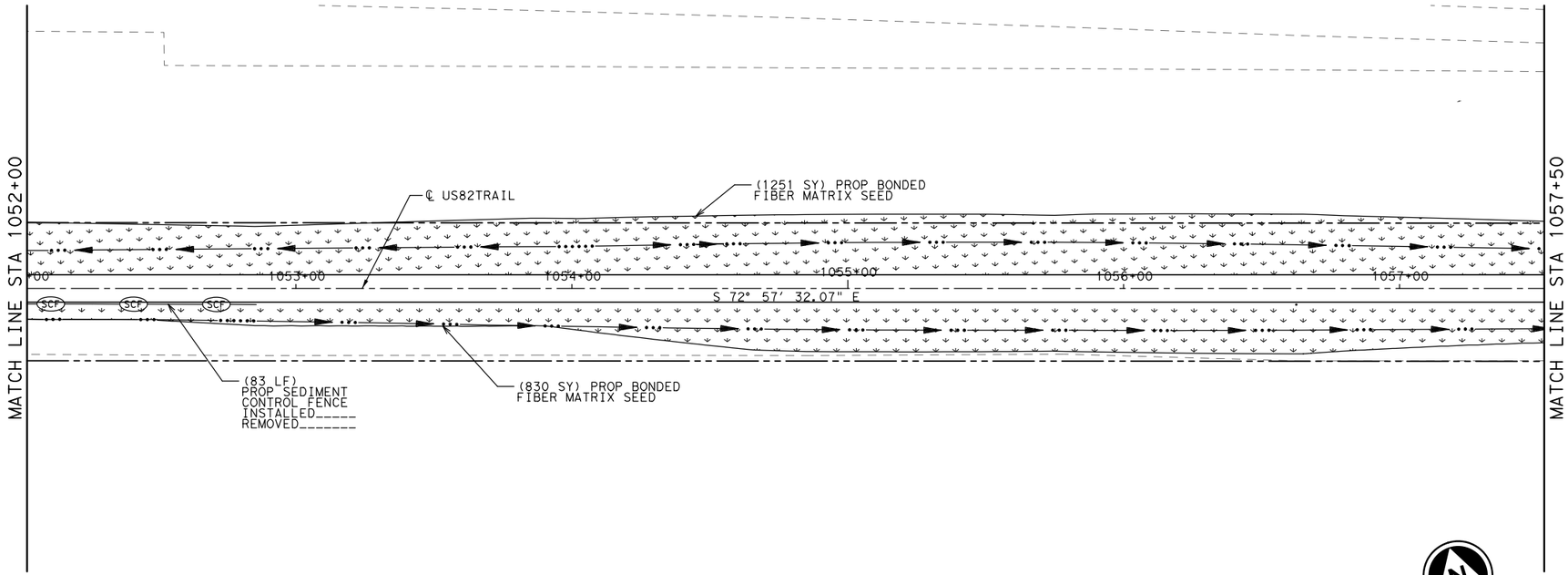

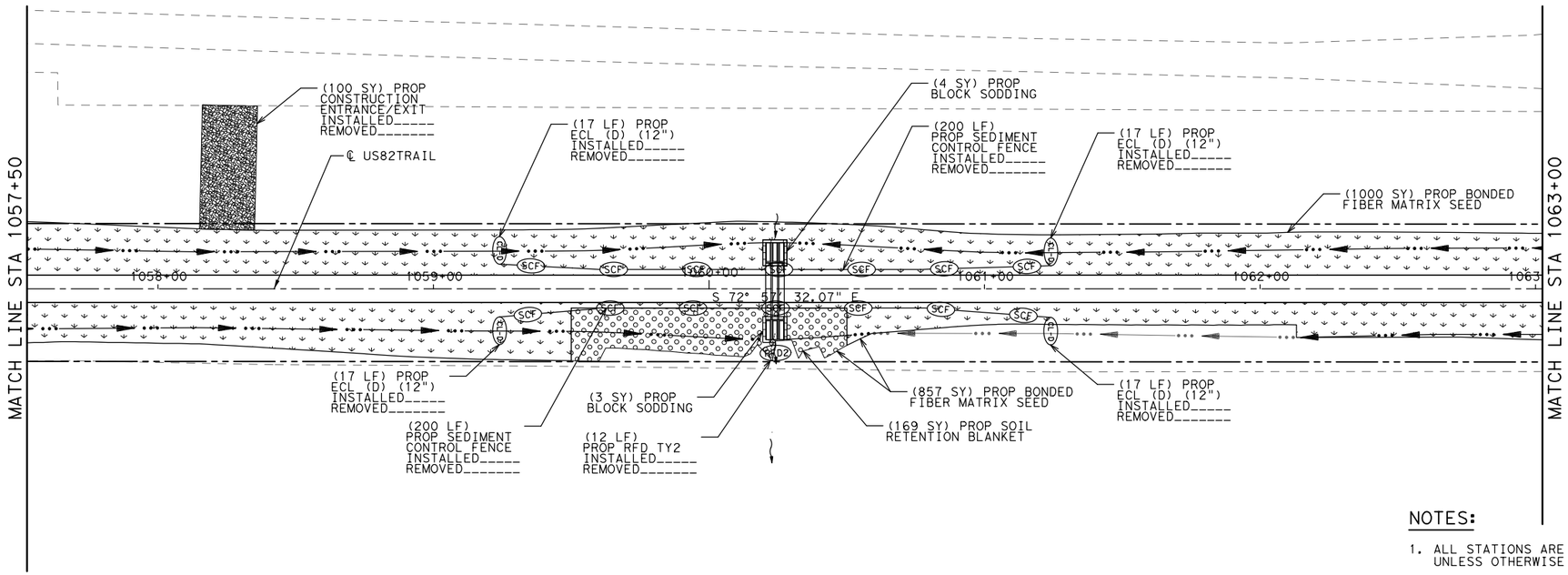

0′ 25′ 50′

SCALE IN FEET

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Texas Department of Transportation

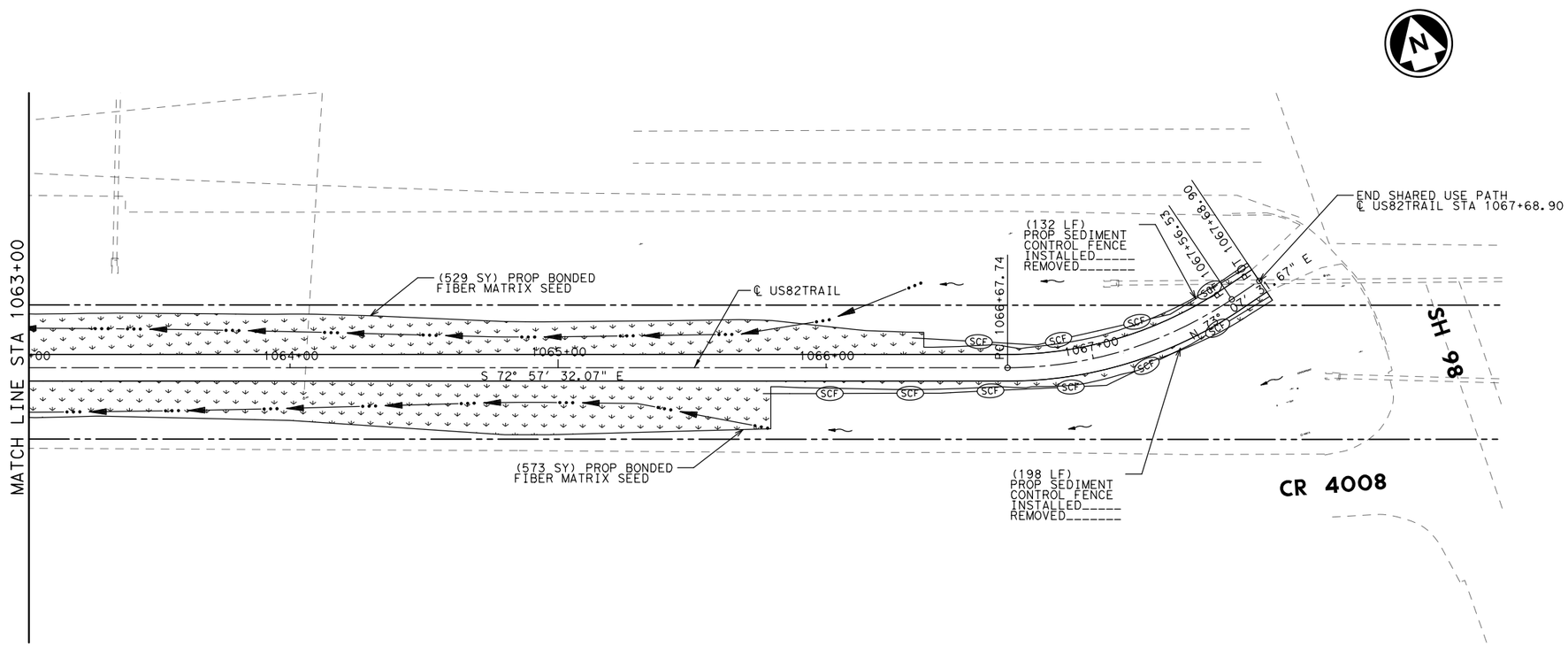
VARIOUS

EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1052+00 TO STA 1063+00

SCALE: 1" = 50′ SHEET 15 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JMT	TEXAS	ATL	BOWIE	126
CHECK	CONTROL	SECTION	JOB	
JMT	0919	19	087	
CHECK				
JMT				

DATE: 7/5/2023
FILE NAME: pw: \\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\SW3P Layout\US82T*S*SUP*SW3P4.dgn



0′ 25′ 50′

SCALE IN FEET

LEGEND

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Texas Department of Transportation

VARIOUS

EROSION CONTROL PLAN
SWP3 LAYOUT SHEETS
STA 1063+00 TO STA 1068+25

SCALE: 1" = 50′ SHEET 16 OF 16

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JMT	6	(SEE TITLE SHEET)		VARIOUS
GRAPHICS JMT	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK JMT	TEXAS	ATL	BOWIE	127
CHECK JMT	CONTROL 0919	SECTION 19	JOB 087	

DATE: 7/5/2023
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7/27/2023
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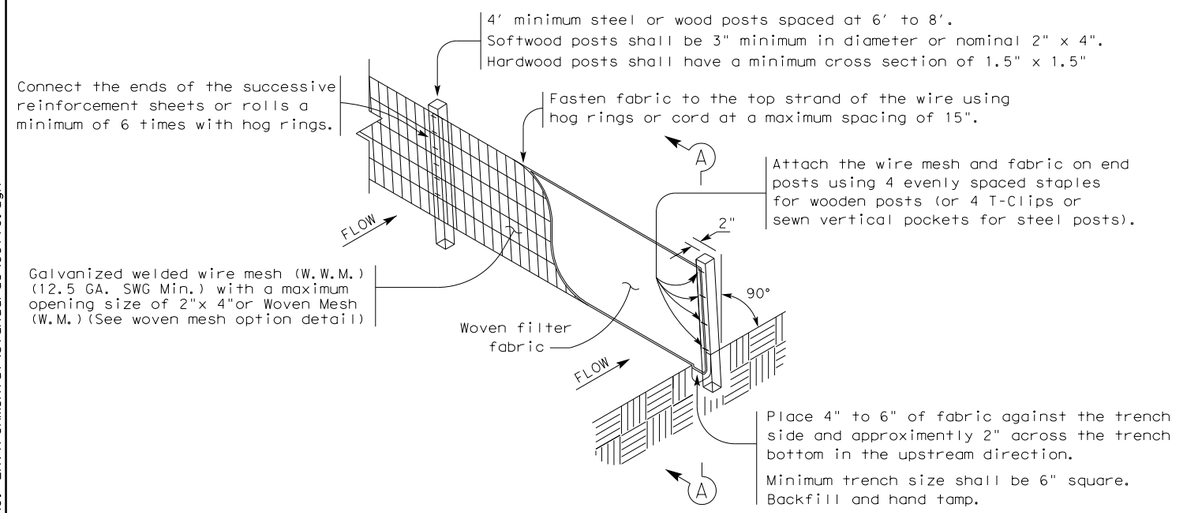
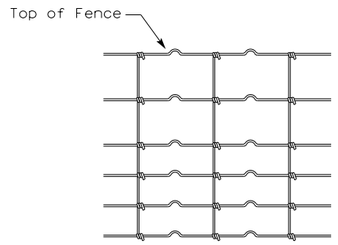
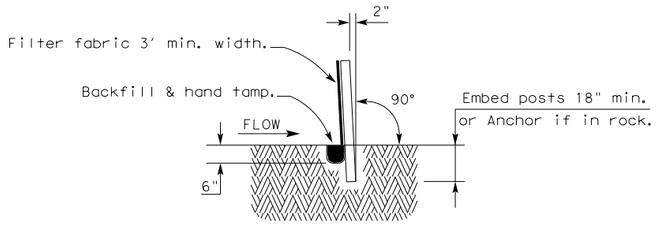


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

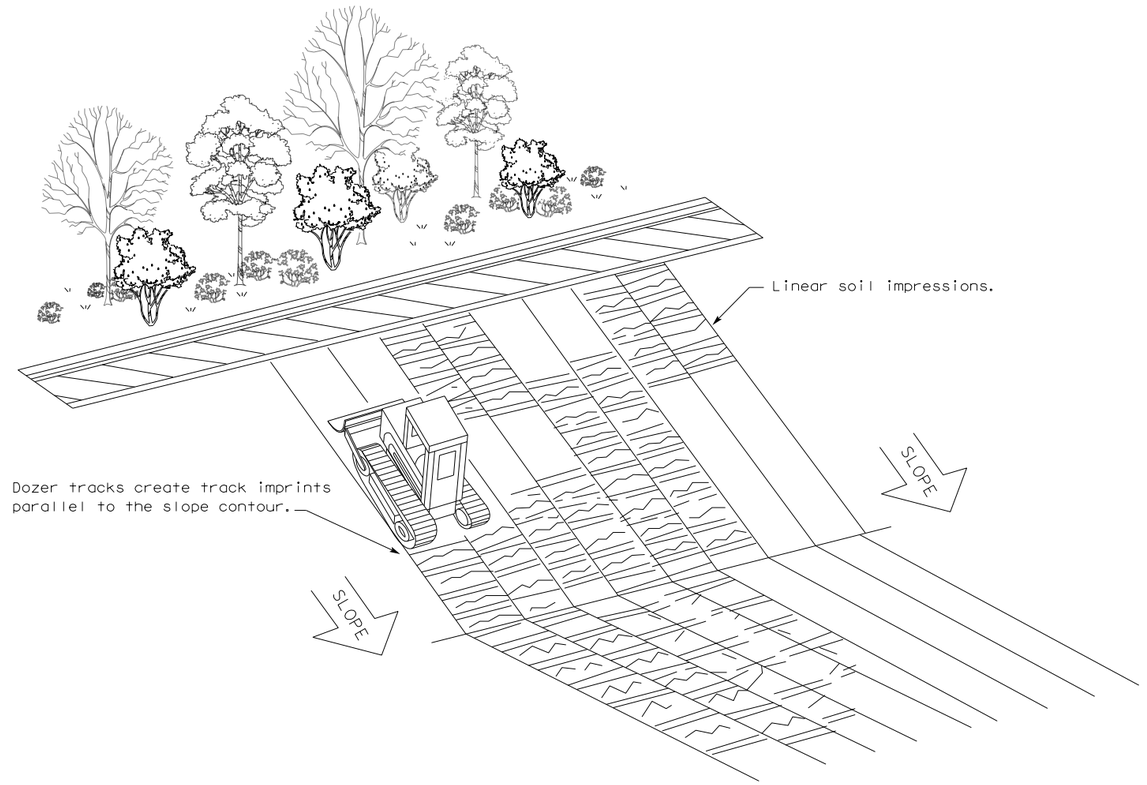
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

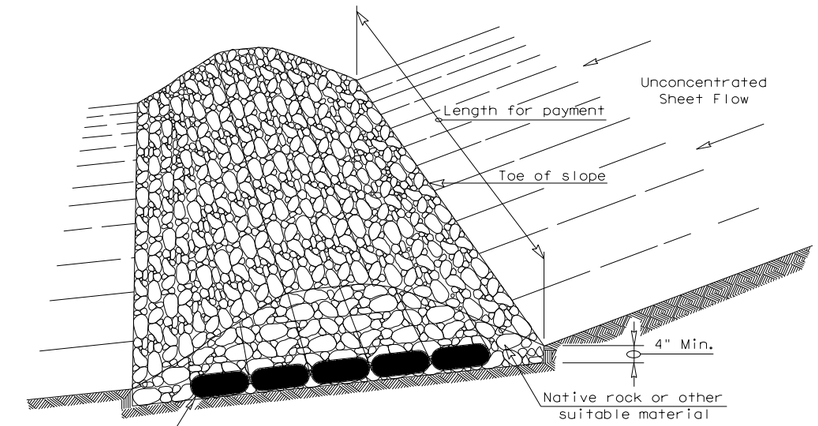
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

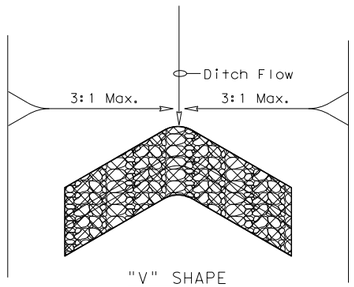
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		128

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\Standards\ec216.dgn

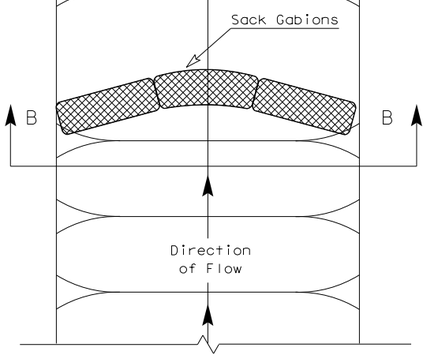


FILTER DAM AT TOE OF SLOPE

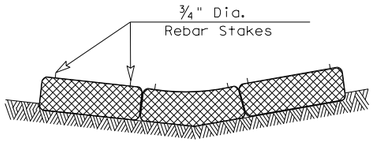
RFD1



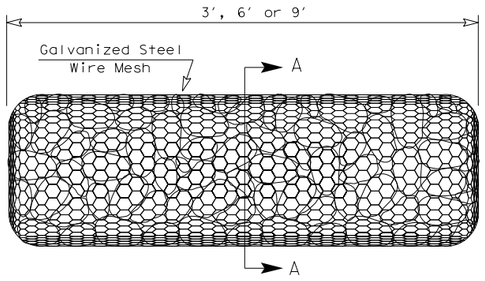
"V" SHAPE
PLAN VIEW



PLAN VIEW

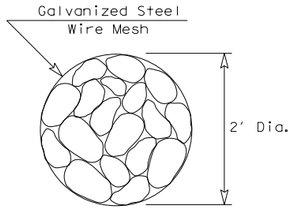


SECTION B-B

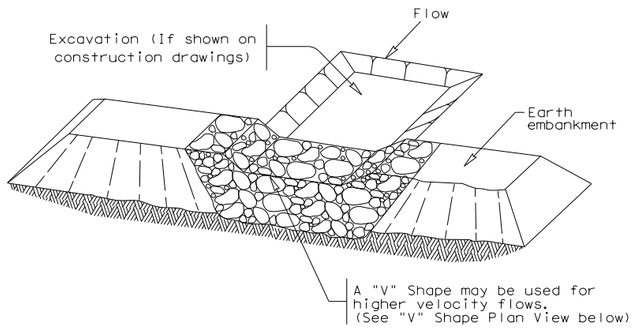


TYPE 4 (SACK GABIONS)

RFD4

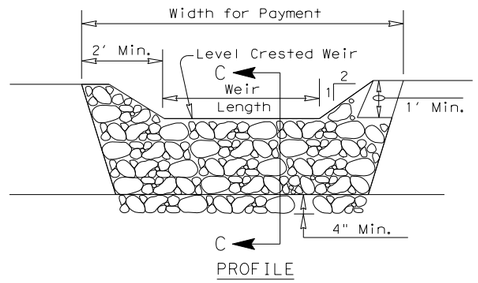


SECTION A-A

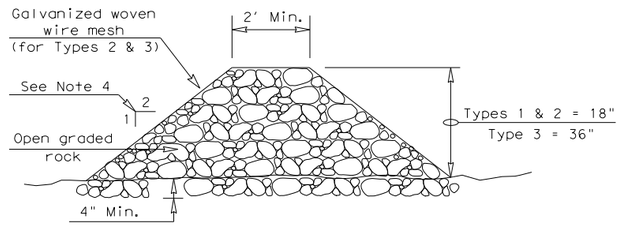


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

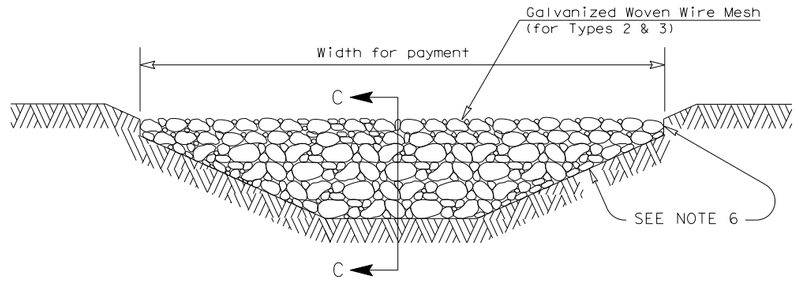
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

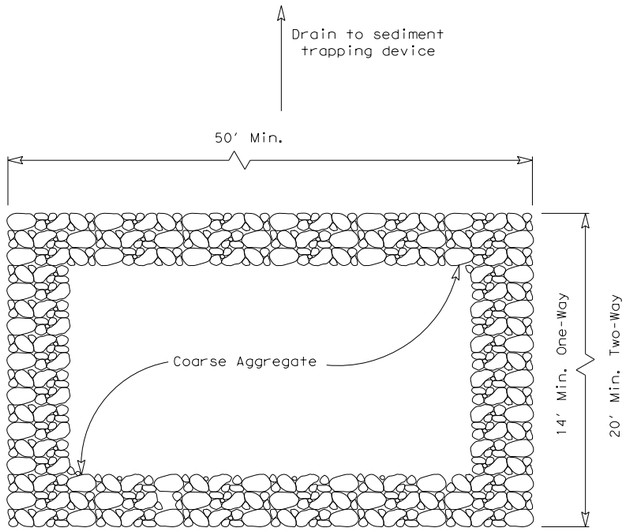
Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

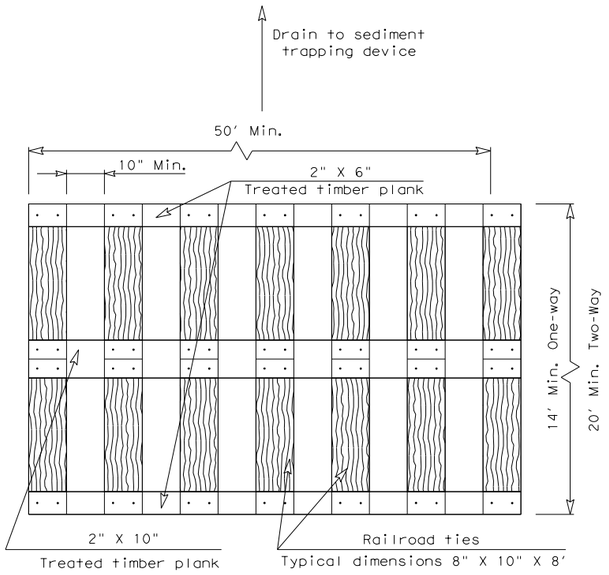
ROCK FILTER DAMS

EC(2)-16

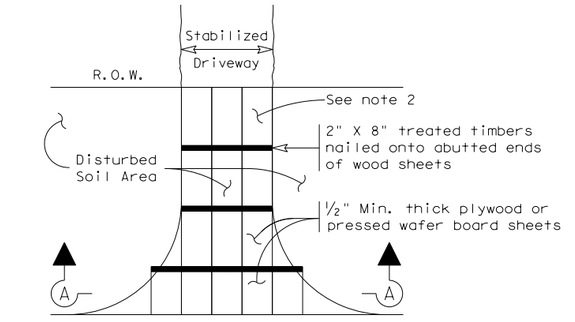
FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		129



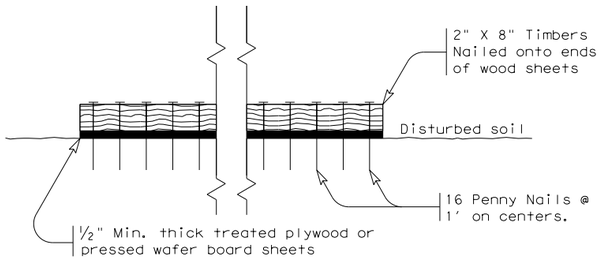
PLAN VIEW



PLAN VIEW



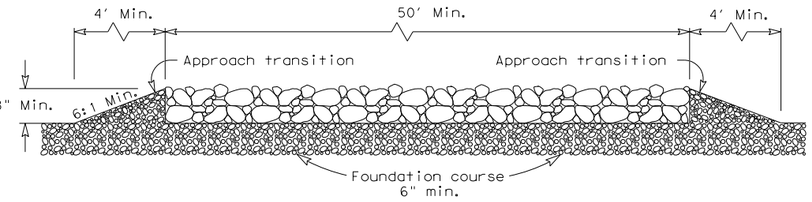
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



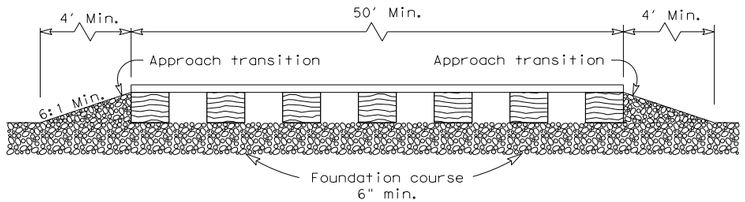
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0919	19	087	VARIOUS
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		130

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\Standards\ec316.dgn

DATE: 7/5/2023
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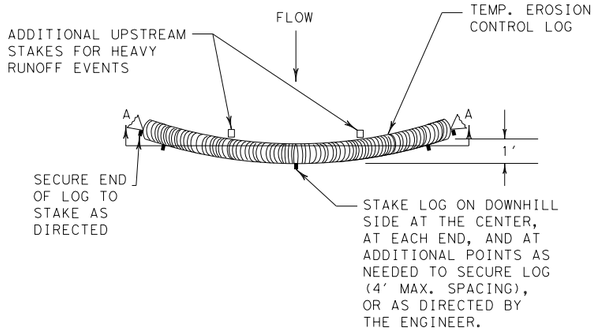
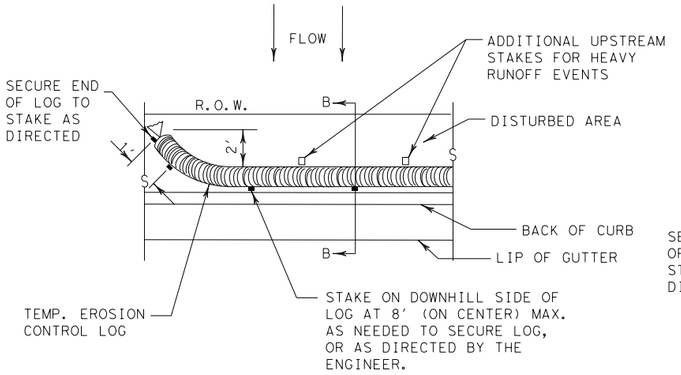
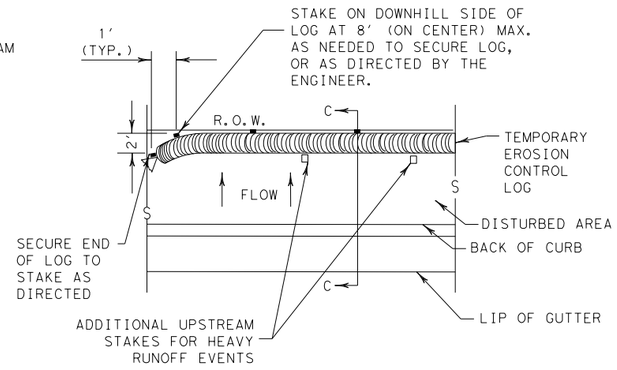


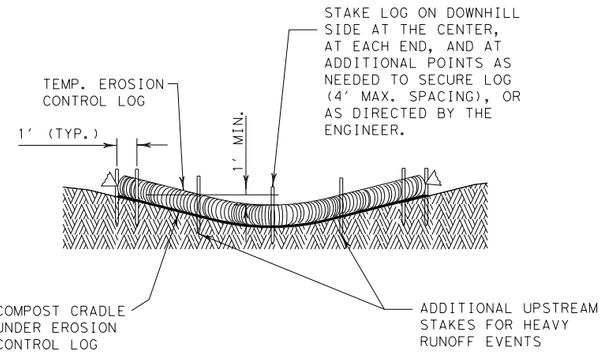
PLAN VIEW



PLAN VIEW



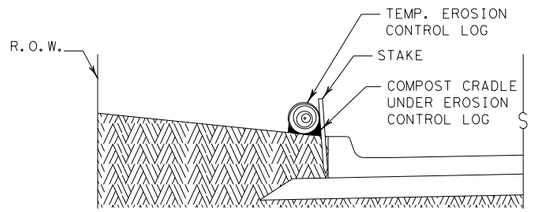
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

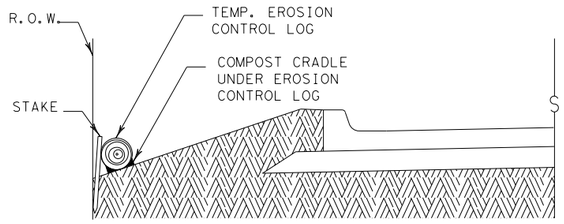
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



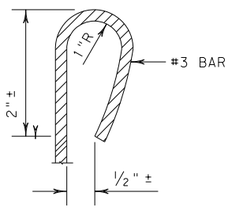
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW

LEGEND

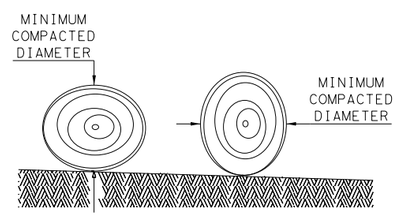
- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

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.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

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.

Texas Department of Transportation

Design Division Standard

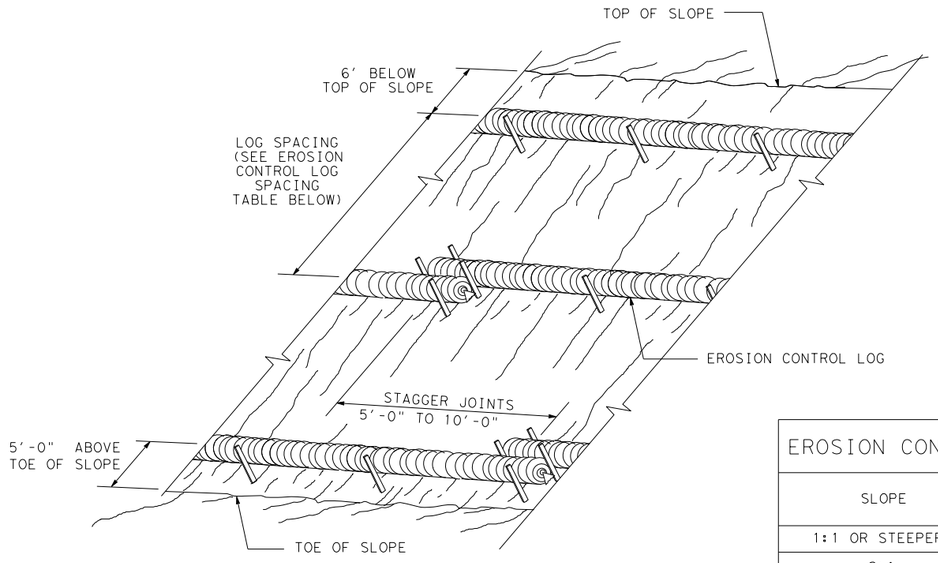
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

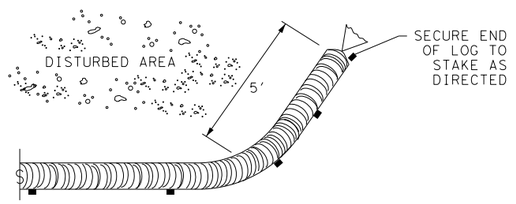
FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0919	19	087		VARIOUS		
	DIST	COUNTY				SHEET NO.	
	ATL	BOWIE				131	

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\Standards\ec916.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

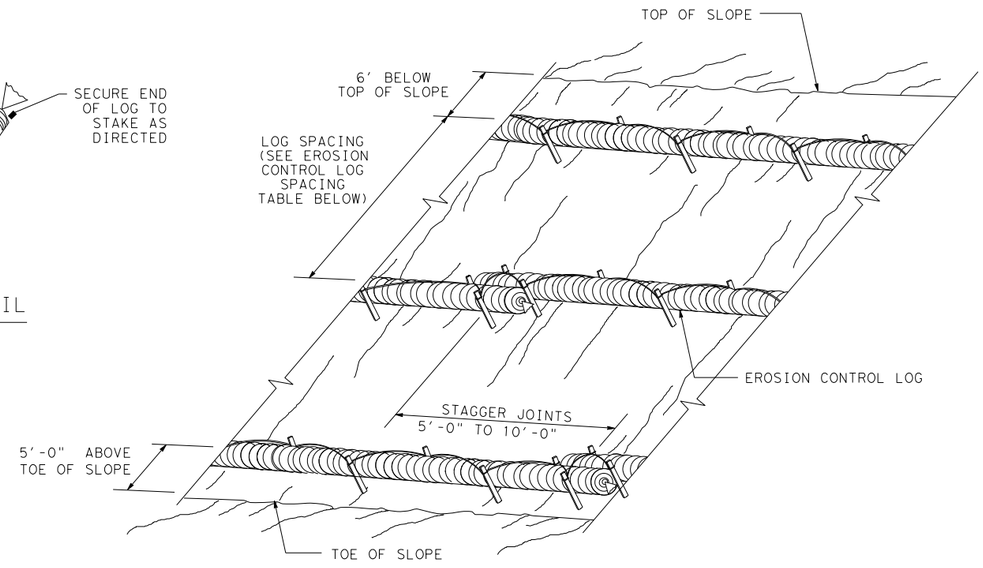
CL-SST



END SECTION RAP DETAIL

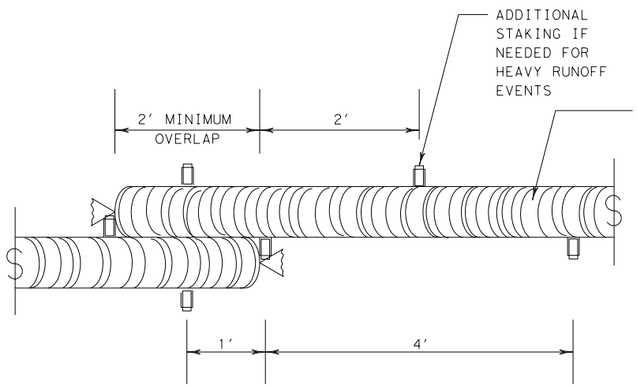
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

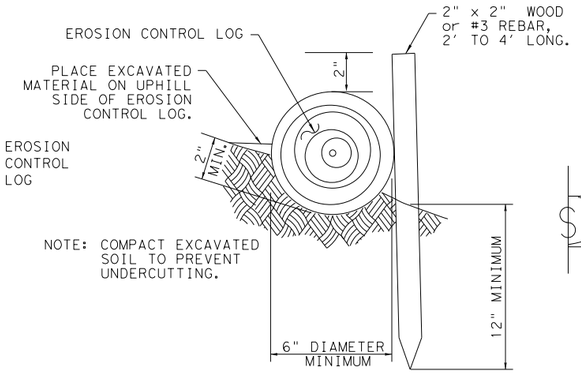
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

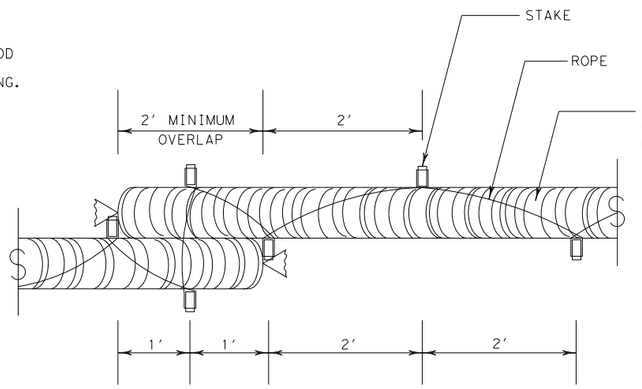


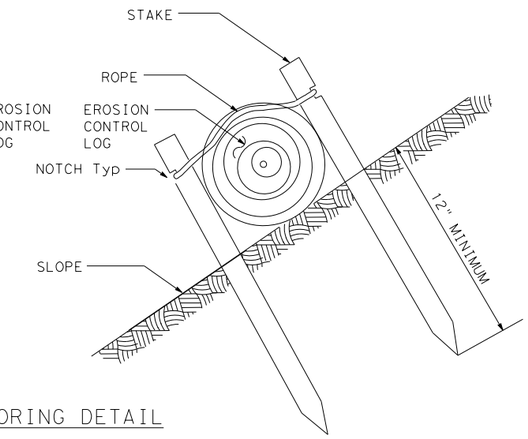


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

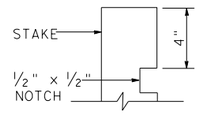
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

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
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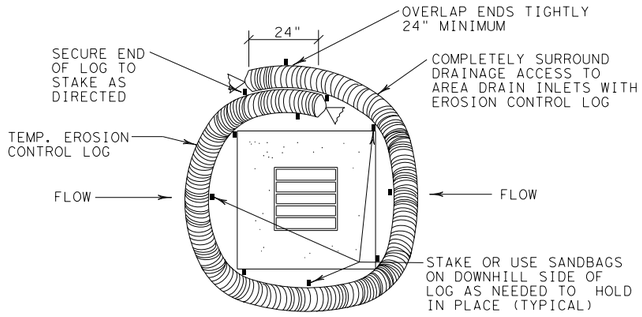
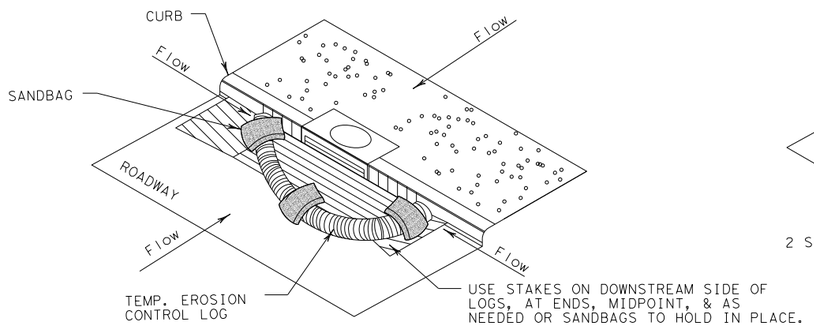
	DIST	COUNTY		SHEET NO.
	ATL	BOWIE		132

DATE: 7/5/2023
FILE: pw:\\jmt-pw.bentley.com:jmt-pw-01\Documents\Projects\2016\16-1179-004\Design-SUP\4 - Design\Plan Set (Malta to SH 98)\9. Environmental\Standards\ec916.dgn



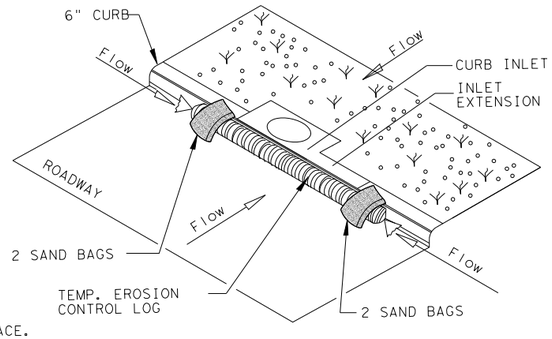
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

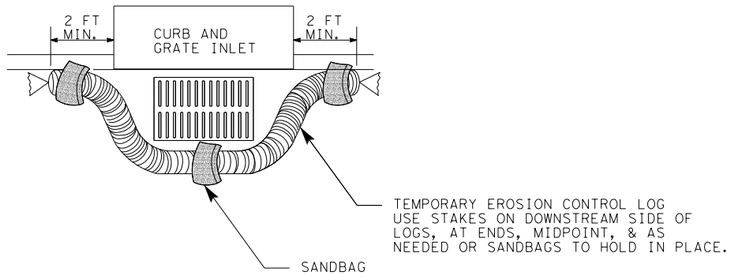
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

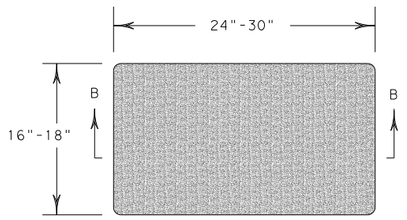
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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	0919	19	087	VARIOUS			
	DIST	COUNTY		SHEET NO.			
	ATL	BOWIE		133			

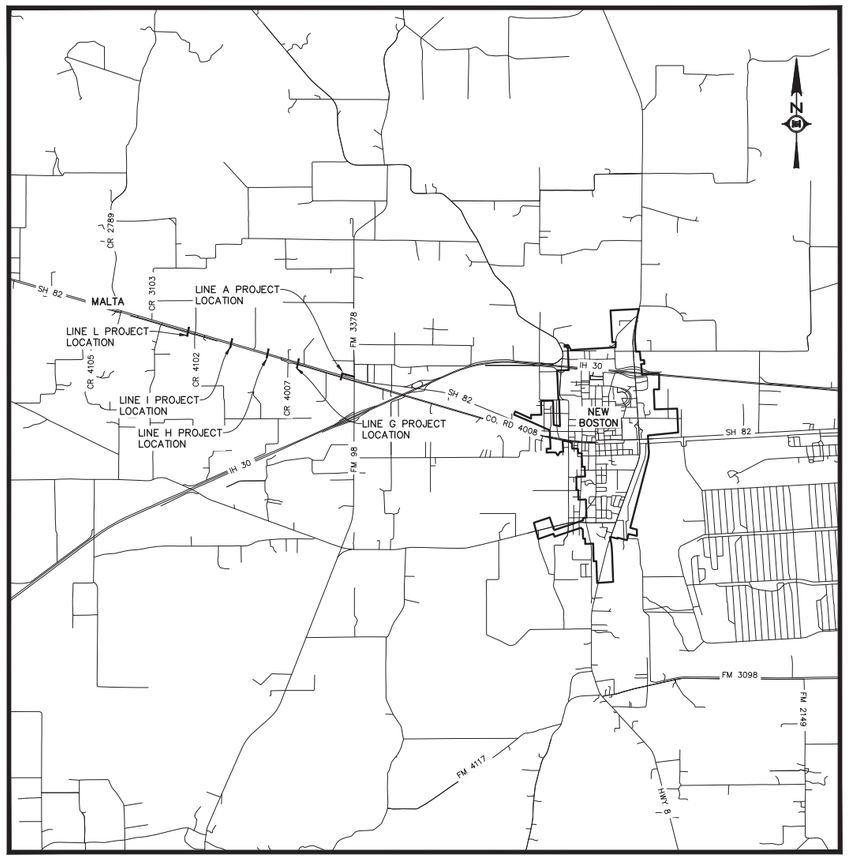
TXDOT US 82:
MALTA TO 98 UTILITY RELOCATION & HIGHWAY BORE
ROW CSJ#0919-19-094

CENTRAL BOWIE COUNTY WSC

BOWIE COUNTY, TEXAS

JUNE 2023

THIS PLAN SHEET HAS BEEN REDUCED TO HALF SCALE FOR INCLUSION IN THE PLAN SET. A COPY OF THE FULL SIZE PAGES ARE AVAILABLE AT THE ENGINEERS OFFICE FOR USE.



PROJECT LOCATION MAP
SCALE: N.T.S.

LEGEND

	MAILBOX
	SEWER CLEANOUT
	TRAFFIC SIGN
S	SEWER MANHOLE
12"	TREE WITH SIZE
	SHRUBS OR BRUSH
	POWER POLE WITH GUY WIRE
	WATER METER
6"W	WATER MAIN & SIZE
	FIRE HYDRANT
	WATER VALVE
	GAS METER
	GAS TESTER
	FIBER OPTIC PEDESTAL
G	GAS LINE
T	TELEPHONE CABLE
6"SS	WASTEWATER MAIN & SIZE
	CATV/TELEPHONE PEDESTAL
X X X X	WIRE FENCE
	WOOD FENCE
	CHAIN LINK FENCE
BE	BURIED ELECTRIC

PROPOSED WATER

6"W	WATER LINE & SIZE
	WATER VALVE
	5 1/4" FLUSH POINT ASSEMBLY
W	EXISTING SERVICE TRANSFER
	5 1/4" FLUSH POINT
	2" FLUSH POINT
	1" FLUSH POINT
EX. TxDOT R.O.W.	EXISTING TxDOT R.O.W.
EX. COUNTY R.O.W.	EXISTING COUNTY R.O.W.
PROPOSED EASEMENT	PROPOSED EASEMENT
1000+00	TxDOT HIGHWAY STATIONING

ISSUED FOR BIDDING AND CONSTRUCTION PURPOSES

HAYTER ENGINEERING
Practical Infrastructure Solutions
TxEng F-315 | TxSurv F-10028600 | OSBPE/LS #603 | ASBPE #2521 | LA #EF629
www.haytereng.com

STATE OF TEXAS
KEVIN R. VANHOOZIER
127925
LICENSED PROFESSIONAL ENGINEER
6/21/2023

THIS SEAL IS AUTHORIZED TO APPEAR ON SHEETS 1-8 OF HAYTER ENGINEERING PROJECT #Y2--065006--20.05(8) "TXDOT US 82: MALTA TO 98 UTILITY RELOCATION & HIGHWAY BORE"

PAGE INDEX	
PAGE NO.	**DESCRIPTION**
134	TITLE PAGE
135	GENERAL NOTES & TECHNICAL SPECIFICATIONS
136	SUMMARY OF UTILITY RELOCATIONS
137	LINE A
138	LINE G & LINE H
139	LINE I
140	LINE L
141-143	CONSTRUCTION STANDARDS

GENERAL NOTES:

1. LOCATE ALL TIE-IN POINTS AND VERIFY THE O.D.'S AND TYPES OF ALL LINES TO BE CONNECTED PRIOR TO LAYING ANY LINE SEGMENTS.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION OF EXISTING SERVICES. A NEW SERVICE IS REQUIRED FROM THE NEW WATER MAIN TO THE EXISTING METER.

3. DELIVER ALL ABANDONED VALVES AND FIRE HYDRANTS TO THE CBCWSC BARN.

4. CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING BURIED UTILITIES IN PROJECT AREA.

5. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING OVERHEAD UTILITY OWNER TO ENSURE PROTECTION OF EXISTING OVERHEAD UTILITIES. ANY COST INVOLVED IN SAID PROTECTION SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.

6. REMOVE AND REINSTALL MAILBOXES, STREET SIGNS, AND CULVERTS AS NECESSARY FOR CONSTRUCTION. THESE ARE NOT SEPARATE PAY ITEMS.

7. IN LIEU OF TRENCHING AND OPEN CUTTING, DRIVEWAY, AND STREETS, CAN BE DIRECTIONAL DRILLED. NO PAYMENT MODIFICATIONS IF THIS OPTION IS SELECTED.

8. NO TREES SHOULD BE REMOVED UNLESS NOTED ON PLANS OR UPON SPECIFIC APPROVAL FROM OWNER/ENGINEER.

9. ALL WORK INVOLVING SERVICE LINES SHALL BE PERFORMED BY, OR UNDER THE SUPERVISION OF A LICENSED PLUMBER.

10. VERIFY SERVICE TRANSFER WITH CBCWSC BEFORE PERFORMING TRANSFER.

11. CONTRACTOR SHALL IMPLEMENT TRAFFIC CONTROL PLAN TO MEET WITH TxDOT REQUIREMENTS.

TECHNICAL SPECIFICATIONS
FOR
Central Bowie County Water Supply Corporation

FOR
Malta to SH 98 Utility Relocation & Highway Bore
ROW CSJ#0919-19-094

June 2023

HEI #065006

6-21-23

HAYTER ENGINEERING

4445 SE LOOP 286
PARIS, TEXAS 75460
(903) 785-0303

Practical Infrastructure Solutions
TxEng F-315 I TxSurv F-10028600 I OSBPE/LS #603 I ASBPE #2521 I LA #EF6529
Texas I Oklahoma I Arkansas I Louisiana

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Soil Tackifier

Cellulose	1.4 lbs.
Wood	1.5 lbs.

From September 15 to November 1, add 3 pounds per 1000 square feet of winter rye with a PLS = 0.83 to above mixture, and 1/2 lb. unhulled Bermuda. Preferably the seeding should be accomplished in early spring - no seeding will be allowed from November 1, to February 28, without specific approval of the ENGINEER.

Straw mulch shall be spread uniformly over the area indicated or as designated by the ENGINEER at the rate of 2 to 2-1/2 tons of straw per acre. The actual rate of application will be designated by the ENGINEER. Straw may be hand or machine placed and shall be adequately secured.

Cellulose and wood fiber mulch shall be spread uniformly over the area indicated or as designated by the ENGINEER at the rate of 45 to 80 lbs. per 1000 square feet.

It shall be the CONTRACTOR's responsibility to maintain the initial shape and contour of the entire seeded/sprigged area, irrespective of the project's 12-month maintenance period, until such time as a 75% average grass coverage has been obtained.

<u>Cellular Grout</u>

I – SCOPE OF WORK

This work consists of providing a non-pervious, Low Density Cellular Concrete (LDCC) to fill abandoned pipes or other structures at the location shown in the plans in accordance with the details in the plans and these specifications.

II – MATERIALS

A. Portland cement shall comply with ASTM C150 (Type I, II or III).
B. Fly ash shall be Class C or Class F and compatible with foaming agent.
C. Water shall be free from deleterious substances.
D. Foaming agent shall conform to ASTM C796.
E. Admixtures for water reducing, retarding, accelerating, and other specific properties may be used when recommended by the manufacturer of the foaming agent.
F. LDCC shall have the following properties:

Range of Cast Density, PCF 24-30
Minimum Compressive Strength (28 Days), PSI 40
Flow Consistency per ASTM D6107 Greater than 7”

III – SUBMITTALS

A. Mix design for LDCC, including materials to be used and their sources.
B. Resume of CONTRACTOR showing experience as specified below, including qualifications of CONTRACTOR’s superintendent and/or foreman.

C. Description of equipment and placement methods to verify compliance with specifications.

IV – PRODUCTION

A. Foam generating equipment shall be used to produce a predetermined quantity of pre-formed foam which shall be mixed and blended with cementitious slurry. Equipment shall be calibrated to produce consistent foam with stable, uniform cellular structure.
B. LDCC shall be produced utilizing specialized automated proportioning, mixing, and foam producing equipment, which is capable of meeting the specified properties.
C. Avoid excessive handling of the material. After sufficient mixing of the foam with slurry, the material shall be conveyed promptly in its final location.
D. All equipment used must be approved by the foam manufacturer.

V – INSTALLATION

A. CONTRACTOR shall fill the existing abandonment as indicated in the plans or as directed by project engineer.
B. LDCC shall be pumped through injection ports located at bulkhead to allow abandonment to be completely filled.
C. All bulkheads and injection ports installed shall be capable of withstanding a minimum of 30 PSI or the allowable maximum pressure, whichever is greater and shall be water-tight.
D. Injection and vent ports and pipes must be securely installed and be able to receive a minimum 3” male threaded NPT.
E. Space injection points at intervals that allow material to be forced from one injection point to the next at pressures below maximum allowable pressure.
F. All water and other residual materials must be removed from pipe prior to initiating filling procedure. If required, dewatering shall be continuous during installation.
G. LDCC shall be placed in a manner so as not to cause collapsing of material, which may require multiple lifts depending upon length and diameter of pipe being abandoned.

VI – QUALITY CONTROL AND QUALITY ASSURANCE

A. CONTRACTOR shall have a record of experience and quality of work placing foam concrete that is satisfactory to the Engineer. Including the following:

1. Shall be capable of developing a mix design, batching, mixing, handling, and placing LDCC.
2. Shall be regularly engaged in the production and pumping of LDCC for filling abandoned pipes or other structures.
3. Workers included the CONTRACTOR’s superintendent and /or foreman, shall be fully qualified to perform the work and have had previous experience in production and pumping of LDCC under similar conditions.

B. TESTING

1. Testing to be performed by the OWNER or approved agency.
2. A minimum of four (4) 3”x 6” cylinders shall be molded for each shift of operation.

3. LDCC to be tested at any age after three (3) days for compressive strength. At least two (2) specimens from each set should be tested at 28 days in accordance with ASTM C-495 unless otherwise approved by engineer.
4. CONTRACTOR shall record and measure wet cast densities at the point of placement regularly. Mix shall be adjusted as required to obtain the specified cast density at the point of placement.
5. CONTRACTOR shall record and measure flow consistency regularly in accordance with ASTM D6107.

Coordination of Testing and Sterilization with Installation

The practice of "installing only", and delaying testing, sterilization, operation, and appurtenances until after completion will not be permitted and will cause items which are installed only to be disallowed on monthly partial payment estimates.

Preconstruction Video Documentation

A video recording of the site shall be done by the CONTRACTOR before beginning any construction. This requirement will be done to document pre-existing conditions prior to construction. One “thumb-drive” copy of the recording will be given to the ENGINEER prior to the beginning of construction.

Buy American Accommodations

Iron and steel products used on this project shall comply with TxDOT’s requirements for BUY AMERICA. Information is provided on the next page that outlines the BUY AMERICA requirements.

TECHNICAL SPECIFICATIONS

GENERAL

WATER PIPING

BORES

VALVES

FLOW METERS

CONCRETE

MISCELLANEOUS

TECHNICAL SPECIFICATIONS

GENERAL

Intent

It is the intent of these specifications to ensure that this CONTRACTOR will provide the OWNER with all material, labor, equipment, supervision, and administration of construction to complete an operative project as shown on the drawings and/or described herein.

All work required to affect these improvements is to be provided by this CONTRACTOR and no item of work or material will be furnished by the OWNER unless specifically set forth herein.

Standard Reference Specifications

These contract documents contain references to standard specifications as adopted by the American Waterworks Association (AWWA), the American Society of Testing Material (ASTM), the American Association of State Highway and Transportation Officials (AASHTO), the Texas Department of Transportation (TxDOT), and the American National Standards Institute (ANSI). All such references shall be construed to refer to the designated standard and the latest revision thereof, regardless of the specification date shown herein.

Mobilization

"Mobilization" shall consist of the mobilization of personnel, equipment and supplies at the project site and preparation for beginning work on other contract items. Mobilization shall include, but is not limited to, the movement of equipment, personnel, materials, supplies, etc. to the project site, the establishment of office and other facilities necessary prior to beginning the work, bonds, insurance, and similar preparatory costs.

Mobilization shall be considered a lump sum item. Partial payments for mobilization will be as follows: The "adjusted contract amount" for construction items as used below is defined as the total contract amount less the lump sum bid for mobilization.

1. When 5% of the adjusted contract amount for construction items is earned, 75% of the mobilization lump sum bid or 5% of the total contract amount, whichever is less, (in either case, less the retainage specified elsewhere in the contract) may be paid.

2. When 15% of the adjusted contract amount for construction items is earned, the remainder of the mobilization lump sum bid not paid under (1) above or 10% of the total contract amount, whichever is less, (in either case less the retainage specified elsewhere in the contract) may be paid.

3. Any remainder of this bid item not paid under (1) or (2) will be paid upon completion.

The intention of allowing a bid item for mobilization is to give the CONTRACTOR the opportunity to recoup his "up front" costs in the event the OWNER decides to reduce or increase the scope of the project.

Preconstruction Conference

A preconstruction conference will be held prior to the beginning of any construction. This meeting will be attended by the CONTRACTOR, the OWNER, the ENGINEER, all subcontractors, and any governmental agencies involved in administration of the project. The meeting date will be established by the ENGINEER after the project has been awarded. The successful bidder shall furnish to the ENGINEER a project schedule at this meeting, showing the major items or work to be constructed and the anticipated completion dates.

Schedule and Sequence of Construction

Prior to beginning work, the CONTRACTOR shall prepare and submit a proposed schedule and sequence of construction to the ENGINEER for his review.

The CONTRACTOR shall construct the segments in a general order of West to East, starting with Line L, continuing with Line I, etc. until Line A. Depending on material acquisition, the CONTRACTOR may start multiple lines at once or start on eastern lines ahead of others, but priority shall be given to western lines to keep ahead of the trail construction.

In the case of pipelines, any segment or system, once started, shall be worked on continuously until it is completed and placed in service. The practice of installing all or most of the pipe before placing any of the system into service, shall be avoided. The CONTRACTOR'S compliance with this condition shall be a prime consideration in determining unit quantities allowed on partial payment estimates.

Where the OWNER provides water and sewer service, it is imperative to continue the operation of the existing facilities. It will be mandatory that this CONTRACTOR so arrange his work as to cause the absolute minimum inconvenience to the existing users.

Shop Drawings and Submittals

Submit catalog data on the following (5 copies):

No.	Description	Date Submitted	Date Approved	Log No.
1	PVC Pipe			
2	Ductile Iron Fittings			
3	Mechanical Joint Thrust Restraints			
4	Gate Valves			
6	Tapping Sleeve & Valve			
7	Valve Boxes			
8	Tracer Wire			
9	Encasement Pipe (Steel & PVC)			
10	Casing Spacers			
11	Concrete Mix Design			
12	Cellular Grout			
13	HDPE Tubing			
14	Service Saddle			
15	Curb Stop			
16	Corp Stop			
17	Foster Adaptor			

Review of shop drawings and submittals will be performed only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Modifications or comments made on the shop drawings during the review do not relieve the CONTRACTOR from compliance with the plans and specifications. CONTRACTOR is responsible for confirming and correlation of dimensions; information that pertains solely to the fabrication process or to the means, methods, techniques, sequences, and procedures of construction; coordination of the work of all trades; and for performing all work in a safe and satisfactory manner.

Shop drawings and submittals provided that are not list above are not required and will not be reviewed or returned. The CONTRACTOR's level of responsibility is the same for all materials and equipment, irrespective of shop drawing submittal or review.

Construction Water

This CONTRACTOR shall pay for all construction and testing water. He will pay the bill directly to the supplier.

Construction Electricity

This CONTRACTOR shall pay for all construction and testing electricity. The construction meter shall be in the CONTRACTOR'S name, and he shall pay the power company directly.

Material and Workmanship

All equipment, materials, and articles incorporated into the work shall be new, and of a quality equal to, or better than, specified herein. If not specified herein, the quality shall be satisfactory to the ENGINEER. All workmanship shall be of acceptable quality as determined by the ENGINEER, and the OWNER may require the CONTRACTOR to dismiss from the work any employee or employees the OWNER may deem incompetent, unqualified, unreliable, careless, or insubordinate.

Payment for Incidental Items

For unit price contracts, the payment for all labor, materials, equipment, supervision, overhead, and associated costs to complete the project contemplated by the drawings and/or specifications shall be according to the unit items set forth in the Bid Schedule. Payment for items required, but

not set forth in the Bid Schedule as separate pay items, shall be considered as incidental and shall be included in the various items provided for in the Bid Schedule.

For lump sum contracts, the lump sum specified in the Bid Schedule shall include all necessary labor, materials, equipment, supervision, overhead and associated costs to complete the project contemplated by the drawings and/or these specifications, whether specifically listed on the Bid Schedule, or not.

Coordination with Existing Utilities

The location of existing buried utilities, where shown, are approximate only. There may exist utilities, which are not shown. This CONTRACTOR shall be responsible for locating and protecting all buried utilities. The existence of utilities not shown shall not be grounds for additional compensation.

The CONTRACTOR shall contact each utility company ahead of performing the work and request the utility to locate its lines. Failure of the utility to locate, or improper location by the utility, shall not result in additional cost to the OWNER.

All OWNER'S utilities damaged by the CONTRACTOR shall be repaired by the CONTRACTOR at his expense. Materials used in repair of utilities shall conform to these specifications. The CONTRACTOR shall notify any utility customer in advance of shutting-off his utility service. Existing water and sewer lines damaged shall be repaired within 4 hours on the day damaged. OWNER shall operate his existing water valves in his system. However, he does not guarantee 100% shut-off of existing water lines.

Where existing facilities of the OWNER or its customers are specifically designated to be connected to the facilities constructed herein, this CONTRACTOR shall do so under the OWNER'S supervision. If required by the OWNER, these connections will have to be made during the period from midnight to 6:00 a.m.

Appurtenances

Appurtenances shall be constructed as soon as the line of which they are a part is constructed to their locations. The construction of appurtenances in advance of the construction of the line will not be permitted, except:

1. Tapping sleeves and valves
2. Boring and encasement

Should the CONTRACTOR elect to install the bore and encasement prior to installing the adjacent pipeline, adjustments to grade or location of the bore/encasement required to properly accommodate the pipeline shall be at the CONTRACTOR'S expense.

Facilities On and/or Across Highway Rights-of-Way

The OWNER has obtained permits from the District Engineer of the Texas Department of Transportation authorizing the installation of the facilities covered by the project plans. The CONTRACTOR may obtain a copy of such permits from either the OWNER or the ENGINEER. No facilities, other than the specifically authorized facilities, shall be placed on or across any highway right-of-way or any part thereof.

The CONTRACTOR shall hold harmless the Texas Department of Transportation and its duly appointed agents and employees, against any action for personal injury or damage to property sustained by reason of the exercise of the privileges granted by these permits.

During the construction of the authorized work the CONTRACTOR shall exercise all diligence in observing the following rules and safety precautions:

1. TxDOT reserves the right to have a representative present during installation of the authorized work and to inspect such installation during construction and upon completion thereof. Therefore, the CONTRACTOR shall notify the appropriate area Engineer at least forty-eight (48) hours prior to commencing any construction work on highway rights-of-way.

2. The authorized facilities shall be installed in accordance with the project plans. The location of the authorized facilities shall be changed only with the approval of TxDOT. Longitudinal pipelines shall be located on a uniform alignment and as near as practicable to the right-of-way line. Pipelines crossing a highway shall be approximately perpendicular to the highway roadway.

3. Authorized pipelines crossing the paved portion of the highways shall be put in place only by TxDOT approved methods. Water jetting methods shall not be allowed. Location of bore pits shall be approved by TxDOT.

4. Authorized pipelines crossing the paved portion of the highways shall be encased as shown by the appropriate permit.

5. Authorized pipelines laid in open cut trenches on highway rights-of-way shall have a #14 bare, solid copper wire installed concurrently with the pipe for pipe detection purposes. The wire shall terminate where an authorized line crosses a highway right-of-way line. At this point, the wire shall be fastened to the 1" x 1" x 1/8" galvanized angle iron that supports the "Pipeline" marker described below as shown by the project plans. The tracer wire shall be continuous with not splices.

6. The CONTRACTOR shall place a "Pipeline" marker at every point where an authorized line crosses a highway right-of-way line. Where new lines parallel the edge of the right-of-way line, the marker shall be placed as close as possible to the fence or edge of right-of-way.

7. The CONTRACTOR shall be responsible for locating and protecting any and all existing buried facilities along, across or near the locations of the authorized facilities and for arranging with TxDOT for any adjustment of the plan location of the authorized facilities necessary to protect such existing facilities. The decision of the TxDOT representative, as to the location of the authorized facilities, shall be final.
8. The CONTRACTOR shall adequately mark all points of potential hazard to traffic, resulting in any manner from the construction of the authorized facilities, with barricades and signs.

9. The CONTRACTOR shall not, at any time, block a roadway traffic lane without first having the proper barricades and signs in place and providing a flagman or police protection or both if considered necessary by TxDOT.

10. The CONTRACTOR shall take all precautions necessary to require all workers to park vehicles, including CONTRACTOR'S equipment, well off the paved portion of the highways, including shoulders, and shall always keep all excavated material off the pavements.

11. The CONTRACTOR shall compact the backfill, in all open cut trenches on highway rights-of-way, to densities equal to the densities of surrounding undisturbed areas.

12. All above-ground appurtenances (valve boxes, manholes, etc.) on highway rights-of-way, shall be located flush with the finished grade.

13. From time to time, during construction of the authorized facilities the CONTRACTOR shall remove, and keep removed, surplus materials and debris from highway rights-of-way, to the satisfaction of the TxDOT representative. Upon completion of the authorized lines, all highway rights-of-way shall be promptly and thoroughly cleaned up and left in a condition at least equal to their condition prior to commencement of construction of the authorized lines.

Easements and Sites

The CONTRACTOR shall be solely liable for any damage to property or improvements because of the construction of this work. This CONTRACTOR will cause to be protected all improvements on or off the right-of-way, such as fences, buildings, signs, poles, utilities, trees, shrubs, etc., unless designated for removal, and should such improvements be damaged, he shall make restitution to the satisfaction of their OWNER. The CONTRACTOR shall be responsible for such improvements that must be relocated or temporarily moved and shall do such work at his cost.

Public and Private Access

This CONTRACTOR shall maintain vehicular access to all private property.

All private driveways not located within state right-of-way will be open-cut and repaired as set forth herein. No driveway will be closed overnight.

All county roads or streets will be open-cut and repaired as set forth herein. No street shall be closed for a period of more than four hours.

No federal or state highways, or railroads shall be closed. All such crossings shall be bored, jacked, pushed, or otherwise crossed in strict accordance with the OWNER'S permits.

CONTRACTOR shall notify appropriate law enforcement and emergency medical services agencies, and local school district, of all road closings.

Storm Water Pollution Prevention Plan: (SWP3)

The CONTRACTOR shall be responsible for preparing and implementing the Storm Water Pollution Prevention Plan (SWP3). Construction projects located in the State of Texas that disturb one acre or more of land and are subject to storm water discharges require a Storm Water Pollution Prevention Plan (SWP3) under the conditions of TPDES General Permit No. TXR150000, “General Permit to Discharge Waste under provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code”.

If the disturbed site area is greater than 5 acres, the CONTRACTOR shall file a Notice of Intent (NOI) using the online e-permitting system (STEERS - https://www3.tceq.texas.gov/steers/) before starting construction work and a Notice of Termination (NOT) using the same online e-permitting system (STEERS - https://www3.tceq.texas.gov/steers/) upon completion of the project and final stabilization of the construction site. Filing the NOI will require the payment of a $100 fee by the CONTRACTOR. The NOI shall be posted on site. If the disturbed site is larger than 1 acre, but less than 5 acres, the CONTRACTOR shall post the required notice on site, in accordance with the conditions of TPDES General Permit TXR 150000.

As part of the SWP3 the CONTRACTOR shall be named as the “Operator with Responsibility” for the SWP3. The “Operator with Responsibility” has day-to-day operational control over the activities at the construction site necessary to ensure compliance with the SWP3 and other conditions of TPDES General Permit TXR 150000. As the defined “Operator with Responsibility”, the CONTRACTOR shall comply with all conditions of TPDES General Permit No. TXR150000.

The CONTRACTOR shall begin re-grassing or site stabilization within fourteen (14) days after the construction activity in that portion of the site has permanently ceased.

The CONTRACTOR shall begin re-grassing or site stabilization within fourteen (14) days after the construction activity in that portion of the site has temporarily ceased, unless construction activity on a portion of the site is temporarily ceased and earth disturbing activities will be resumed within twenty-one (21) days.

The silt fences shown on the drawings are a method the CONTRACTOR may use to comply with the requirements of TPDES Permit No. TXR 150000. The CONTRACTOR shall amend the SWP3 as necessary to comply with the requirements of TPDES Permit No. TXR 150000 as they pertain

to this construction site. All amendments to the SWP3 must be consistent with the requirements of TPDES General Permit TXR 150000.

Construction Stakes – Water Lines

The alignment is shown on the drawings.

The CONTRACTOR shall cause construction alignment stakes to be set, at his expense, at intervals not greater than 300 feet. These are to be set after all clearing, grubbing and rough grading is complete. The CONTRACTOR shall preserve these marks and if they are lost or damaged, he shall reset them at his own expense. All other construction stakes, both line and grade of every nature, shall be furnished by the CONTRACTOR at his expense. The CONTRACTOR shall furnish, at any time, to the OWNER'S representative a surveyor's transit and one laborer, should the OWNER'S representative desire to check line or grade. Such checking shall not relieve the CONTRACTOR of his responsibility to construct every item in accordance with the drawings and specifications.

Reuse of Material

No used material, or material which has been used by the CONTRACTOR for any temporary purpose whatever is to be incorporated in the permanent structure.

Barricades, Signs, and Lighting

The CONTRACTOR shall furnish, erect, and maintain adequate warning devices and lighting to protect the public from all construction hazards arising from the building of this project. He shall be totally responsible and solely liable for their adequacy and for any claims or accidents resulting from his failure to provide and maintain them properly.

All traffic control signs or devices used for protection of construction workers shall conform to Part VI of the Manual of Uniform Traffic Control Devices, 1988 Edition, Revision 3, September 3, 1993, FHWA-SA-94-027 or Part VI of the manual on Uniform Traffic Control Devices, Millennium Edition, December 2000, FHWA, which are incorporated by reference (OSHA 29 CFR Part 1926).

Sanitation

Necessary sanitation conveniences for the use of laborers on the work site shall be furnished and maintained by the CONTRACTOR in acceptable locations properly secluded from the public, and their use shall be enforced.

Clean-Up

At the conclusion of the work, and prior to final payment, all tools, temporary structures, and materials belonging to the CONTRACTOR shall be promptly removed. All rubbish and other foreign substances shall be removed from the project site and satisfactorily disposed of. All job

sites including streets, easements, rights-of-way, roads, and areas used by the CONTRACTOR shall be left in a clean, neat condition satisfactory to their owner. The OWNER'S representative may also require clean-up of the job site or easements and rights-of-way periodically during the progress of the work.

Burning of brush on the work sites will not be permitted without the landowner's permission, and then only in strict compliance with local, state, and federal laws. Any surplus excavated earth not designated for reuse shall be disposed of at approved locations secured by the CONTRACTOR at his expense, and rough leveled to the landowner's satisfaction.

Any regressing, sodding, or reseeding required shall be in accordance with landscape requirements elsewhere herein.

Record Drawings

During progress of the job, the CONTRACTOR shall mark up a set of the drawings, including dimensions, to indicate any deviations from the contract drawings. After completion of the job, this set of record drawings is to be furnished to the ENGINEER for review, including sufficiency of information, clarity, and readability.

The ENGINEER will periodically check with the CONTRACTOR to verify compliance with this requirement. Failure to comply will result in delay of monthly progress payments.

Lead-Free Requirements

All metallic components in contact with raw or potable water shall conform to NSF-61 and NSF/ANSI 372 (“lead free” requirement of the Reduction of Lead in Drinking Water Act).

Construction Office

The CONTRACTOR shall furnish and maintain, during construction of the improvements embraced in this contract, an adequate temporary field office on the project site, or adjacent thereto, for the use of his representatives and personnel. He shall not be required to provide space for the ENGINEER or the OWNER'S on-site representative.

The CONTRACTOR shall maintain in this office a complete set of construction drawings, shop drawings, equipment details, specifications, working record drawings, change orders, etc.

Upon completion of the improvements, or as directed by the ENGINEER, the CONTRACTOR shall remove all such temporary structures and facilities from the site, they shall become the CONTRACTOR'S property, and he shall leave the site of the work in the condition required by the contract.

WATER PIPING

Reinforcement of Adjacent Existing Utilities

Existing cast iron, or pressurized PVC utilities approximately at right angles to this CONTRACTOR'S trench, will not require additional support or protection, other than the exercise of care in placing new facilities adjacent to same, and in placing backfill, except when the unsupported span is over six feet (6'), in which case the existing pipe shall be supported by concrete piers at no added cost to the OWNER.

Vitrified clay, concrete pipe, and/or gravity PVC utilities, approximately at right angles to the ditch, will be removed to firm undisturbed ground on each side of the trench and the removed section replaced with epoxy-lined ductile iron pipe or pressure-type PVC pipe without additional compensation. Note that for sewer lines crossing potable water mains, more restrictive requirements are stated elsewhere herein.

Concrete, PVC, ductile iron, cast iron, steel, asbestos cement, and clay utilities parallel to and in the edge of the trench, shall be adequately supported without additional compensation.

Trench Excavation for Sanitary Sewer and Potable Water Mains

The CONTRACTOR shall perform all necessary trench excavation. Unless otherwise specified herein, trench excavation will comply with the Trench Excavation section of ASTM D-2321. There shall be no separate classification of excavation.

In general, all pipeline excavation shall be made by open cut from the surface of the ground and shall be no greater in width or depth than is necessary to permit the proper construction of the work. The sides of the trench shall be cut and maintained as nearly vertical as is feasible to a point at least 12 inches above the top of the pipeline. If the trench walls are to be sloped for trench safety purposes (where other forms of trench safety are not required), then sloping may begin at this point.

The entire foundation area in the bottom of the excavation shall be firm, stable and of uniform density. A soil is stable if it provides dependable support for the pipe and undergoes only slight volumetric change with variation in its moisture content.

Unstable soil conditions in trench bottoms shall be stabilized before laying the pipe. As a minimum, this is accomplished by over-excavating the trench bottom to remove the unstable material and bringing it back to grade with appropriate bedding material. Additional stabilization may be required, including French Drains, well points, concrete backfill, or other to be agreed upon by the ENGINEER. No additional compensation is allowed for stabilization.

Materials shall not be disturbed below grade, except soft, wet, disintegrated, or other unsuitable materials which shall be removed to a depth below grade as is directed by the ENGINEER. Any rock or other extremely hard materials under the foundation area shall be removed to a depth not less than 6" below grade.

Excavate trenches to ensure that sides will be stable under all working conditions. Slope trench walls or provide supports in conformance with all state and national standards for safety. Open only as much trench as can be safely maintained by available equipment. Backfill all trenches as soon as practicable, but not later than the end of each working day.

Do not lay or embed pipe in standing or running water. At all times prevent flows from sewers, storm drains, runoff, and surface water from entering the trench. The providing of a proper foundation will be at the CONTRACTOR'S expense. Embedment for pipe, structure foundations, or the pipeline itself shall not be laid or poured in standing or running water, or on unstable foundations.

When standing or running water from any source is present in the work areas, dewater to maintain stability of in-situ and imported materials. Maintain water level below pipe bedding and foundation to provide a stable trench bottom. Use, as appropriate, sump pumps, well points, deep wells, geofabrics, perforated underdrains, or stone blankets of enough thickness to remove and control water in the trench. Dewatering shall be considered as incidental work and will not be paid for as separate items. When excavating while depressing groundwater, ensure the groundwater is always below the bottom of cut to prevent washout from behind sheeting or sloughing of exposed trench walls. Maintain control of water in the trench before, during, and after pipe installation, and until embedment is installed and enough backfill has been placed to prevent floatation of the pipe. To preclude loss of soil support, employ dewatering methods that minimize removal of fines and the creation of voids in in-situ materials.

Control running water emanating from drainage of surface or groundwater to preclude undermining of the trench bottom or walls, the foundation, or other zones of embedment. Provide dams, cutoffs, or other barriers periodically along the installation to preclude transport of water along the trench bottom. Backfill all trenches after the pipe is installed to prevent disturbance of pipe and embedment.

Use suitably graded materials in foundation or bedding layers or as drainage blankets for transport of running water to sump pits or other drains. Use well graded materials, along with perforated underdrains, to enhance transport of running water, as required. Select the gradation of the drainage materials to minimize migration of fines from surrounding materials.

Where trench walls are stable or supported, provide a width enough, but no greater than necessary, to ensure working room to properly and safely place and compact hauching and other embedment materials. The space between the pipe and trench wall must be wider than the compaction equipment used in the pipe zone. Maximum trench widths shall be as shown on the drawings. In addition to safety considerations, trench width in unsupported, unstable soils will depend on the size and stiffness of the pipe, stiffness of the embedment and in-situ soil, and depth of cover. Specially designed equipment may enable the satisfactory installation and embedment of pipe in trenches narrower than specified above. If it is determined that the use of such equipment provides an installation consistent with the requirements of this standard, minimum trench widths may be reduced, as approved by the ENGINEER.

When supports such as trench sheeting, trench jacks, trench shields or boxes are used, ensure that support of the pipe and its embedment is maintained throughout installation. Ensure that wall sheeting is sufficiently tight to prevent washing out of the trench wall from behind the sheeting. Provide tight support of trench walls below viaducts, existing utilities, or other obstruction that restrict driving of sheeting.

Unless otherwise directed by the ENGINEER, sheeting shall not be placed in or below the pipe zone to preclude loss of support of foundation and embedment materials. When specifically allowed by the ENGINEER, sheeting may be placed in or below the pipe zone, with the top of sheeting to be cut off 1.5 feet or more above the crown of the pipe. Leave rangers, whalers, and braces in place as required to support cutoff sheeting and the trench wall in the vicinity of the pipe zone. Timber sheeting to be left in place is considered a permanent structural member and should be treated against biological degradation (for example, attack by insects or other biological forms) as necessary, and against decay if above groundwater.

Do not disturb the installed pipe and its embedment when using movable trench boxes and shields. Movable supports should not be used below the top of the pipe zone unless approved methods are used for maintaining the integrity of embedment material. Before moving supports, place, and compact embedment to enough depths to ensure protection of the pipe. As supports are moved, finish placing and compacting embedment.

If the ENGINEER permits the use of sheeting or other trench wall supports below the pipe zone, ensure that pipe and foundation and embedment materials are not disturbed by support removal. Fill voids left on removal of supports and compact all materials to required densities.

If ledge rock, hard pan, shale, or other unyielding material, cobbles, rubble or debris, boulders, or stones larger than 1.5 in. (40 mm) are encountered in the trench bottom, excavate a minimum depth of 6 in. (150 mm) below the pipe bottom and replace with proper embedment material.

The CONTRACTOR shall be responsible for the satisfactory disposal of excess and unsuitable materials of any sort, and shall be responsible for backfilling, tamping, compacting, and refilling after settlement, of all excavated areas and other land, private and public, damaged or occupied by the CONTRACTOR in the performance of the contract, to as good condition as they were prior to the beginning of the work. It shall be his further responsibility to remove all surface obstruction to his work on easements or sites. He shall protect all pipes, conduits, signs, utility poles, wire, fences, building, and other public or private property improvements adjacent to or in the line of the work.

Trench backfilling as it relates to pavement repair subbase:

- Due to the varying depths of trenching and the varying types of native soils, the backfill under trenched areas that will receive pavement repair will conform to the requirements shown in the detail drawings.
- All backfill beneath trenched areas that are to receive pavement repair will be uniformly mechanically compacted in maximum 8” loose lifts to a minimum of 95% standard Proctor density at -1 to +3% of optimum moisture. The backfill material will be as shown in the detail drawings. Hand-operated pneumatic or gasoline-powered equipment will be required for adequate compaction around valve stacks, manholes, cleanouts, etc.
- In all trenched areas that are to receive pavement repair, the pipe will be installed in trenches with near-vertical walls employing OSHA-approved trench-safety methods (hydraulic wall jacks, trench boxes, etc.). Sloping the sides of the trench will not be allowed so that pavement repair at the top of the trench is minimized.

Installation and Backfill of Buried Pipe

CONTRACTOR shall comply with the "Materials", "Installation", and "Inspection, Handling and Storage" sections of ASTM D-2321, except as modified herein.

Excavation shall be as described elsewhere in these specifications and as shown on the drawings.

Install foundation and bedding as shown in the drawings and as specified herein, according to conditions in the trench bottom. Provide a firm, stable, and uniform bedding for the pipe barrel and any protruding features of its joint. Provide a minimum 4-inch thickness of bedding unless a greater thickness is specified.

When rock or unyielding material is present in the trench bottom, increase the thickness of bedding material to 6 inches minimum.

Where the trench bottom is unstable or shows a "quick" tendency, excavate all unstable material as a minimum, and replace with a foundation of material per Table I. Place and compact this foundation material in accordance with the drawings. Control of quick and unstable trench bottom conditions may also be accomplished with the use of appropriate geofabrics applied to the satisfaction of the ENGINEER and in strict accordance with the manufacturer's recommendations. For severe conditions, the ENGINEER may require a special foundation such as piles, sheeting, or concrete mats. Correction of unstable trench bottom shall not result in increased cost to OWNER.

Minimize localized loadings and differential settlement wherever the pipe crosses other utilities or subsurface structures. Provide a cushion of bedding material between the pipe and any such point of localized loading.

If the trench bottom is excavated below intended grade, fill the over-excavation with compatible foundation or bedding material and compact to a density not less than the minimum densities given in the drawings.

If trench sidewalls slough off during any part of excavating or installing the pipe, remove all sloughed and loose material from the trench.

All pipeline excavation made in one day shall have the pipe installed and backfilled the same day. Excavation of trench days ahead of pipe laying will not be permitted.

Excavations for pipeline appurtenances shall be backfilled as soon as is feasible.

Place pipe and fittings in the trench with the invert conforming to the required elevations, slopes, and alignment. Ensure uniform pipe support. In special cases where the pipe is to be installed to a curved alignment, maintain angular joint deflection or pipe bending radius, or both, as indicated in the drawings.

Adjustment in grade shall be made by scraping away or filling in along the full length of the pipe with approved bedding material, properly compacted, and not by wedging, blocking up the conduit, or supporting the conduit on mounds of earth.

The width of trench excavation is set forth in the drawings and shall not be exceeded in the area from the bottom of the trench to a point 12" above the top of the pipe.

Pipe shall be laid with the bell pointing away from the last joint. Pipe sockets and barrels shall always be clean and free from dirt.

Comply with manufacturer's recommendations for assembly of joint components, lubrication, and making of joints. When pipe laying is interrupted, secure piping against movement and seal open ends to prevent the entrance of water, mud, or foreign material.

Mark, or verify that pipe ends are marked, to indicate insertion stop position, and ensure that pipe is inserted into pipe or fitting bells to this mark. Push spigot into bell using methods recommended by the manufacturer, keeping pipe true to line and grade. Protect the end of the pipe during homing and do not use excessive force that may result in over-assembled joints or dislodged gaskets. If full entry is not achieved, disassemble, and clean the joint and reassemble. Use only lubricant supplied or recommended for use by the pipe manufacturer.

When making solvent cement joints, follow recommendations of both the pipe and solvent cement manufacturer. If full entry is not achieved, disassemble, or remove and replace the joint. Allow freshly made joints to set for the recommended time before moving, burying, or otherwise disturbing the pipe.

When the pipe joint has been checked for line and grade, the bedding material shall be applied to the springline of the pipe or as set forth in the drawings, and compacted by hand tamps or hand-held mechanical tamps, taking care not to damage or displace the pipe.

On pressure lines, all gasket joint or mechanical joint dead ends, fittings, flush valves, fire hydrants and offsets shall have Class D concrete thrust reaction blocking placed to provide for pressure reaction, as set forth in the drawings.

Where specifically called for on the drawings, additional joint restraints shall be provided.

All pipe shall then be further embedded and backfilled as set forth in the drawings and/or as described herein.

On highway right-of-way, backfill methods shall conform to the OWNER'S permits or as set forth herein and in the drawings, whichever is more restrictive.

All embedment material shall be per Table I. It shall not be the "grassed-off" overburden stripped from the site, but may be trench "tailings", provided these meet the requirements of Table I.

Where suitable embedment material, and/or suitable material for backfilling does not exist on the job site, the CONTRACTOR shall furnish such material from off the job site at his expense, and also dispose of the unsuitable material removed from the trench off of the job site, at his expense.

Place embedment materials by methods that will not disturb or damage the pipe. Work in and tamp the haunching material in the area between the bedding and the underside of the pipe before placing and compacting the remainder of the embedment in the pipe zone. Follow compaction requirements in the drawings for density requirements. Do not permit compaction equipment to contact and damage the pipe. Use compaction equipment and techniques that are compatible with materials used and location in the trench. Before using heavy compaction or construction equipment directly over the pipe, place enough backfill to prevent damage, excessive deflections, or other disturbance of the pipe. See minimum cover requirements elsewhere herein. Pipe embedment shall be compacted in maximum 8" loose lifts.

All excavations shall be backfilled to finished grades, shapes, and configurations as shown on the drawings. Finish backfill, after consolidation, shall not have a variance of over one inch in ten feet when measured with a straight edge perpendicular to the slope. Any subsequent settlement of finished areas shall be brought back to the final grade and configuration with additional material as required, so that upon the completion of the construction of the project, and for the twelve-month maintenance period, all areas shall have their final grade and shape. The CONTRACTOR, during the life of this contract, shall be responsible for so maintaining the trench and trench backfill as to permit safe passage for vehicles and pedestrians over the same. During inclement weather, he shall be responsible for removing any vehicle or livestock which may become stuck, stalled, or stranded in a trench, or in trench backfill, and shall utilize every available means to keep trenches and trench backfill across public thoroughfares and driveways safe and passable at all times.

Initial backfill, i.e., that backfill material used to a point at least 6 inches above the top of the pipe, shall be the same material as the embedment material. Unless otherwise noted on the drawings, the final backfill may be the native material removed from the trench, except that rock removed from the trench must be reduced to a size no larger than 3" maximum dimension before reuse. Broken concrete larger than 3" in maximum dimension, trees, or other lumpy materials, or materials frozen, or of a perishable, spongy, or otherwise improper nature shall never be used in the backfill.

Consolidation of cohesionless material by watering (jetting or puddling) shall only be used under controlled conditions when approved by the ENGINEER. At all times, conform to the lift thicknesses and minimum density requirements in the drawings.

To preclude damage to the pipe and disturbance to pipe embedment, a minimum depth of backfill above the pipe should be maintained before allowing vehicles or heavy construction equipment to traverse the pipe trench. For embedment materials installed to the minimum densities required in the drawings, provide cover (that is, depth of backfill above top of pipe) of at least 30 in. (0.8 m)

or one pipe diameter (whichever is larger) before allowing vehicles or construction equipment to traverse the trench surface.

All pressure conduits shall have a minimum cover as follows: 3" diameter and smaller - 30"; 4" thru 8" - 36"; and 10" and larger - 42", as measured from the natural ground surface to the top of the pipe. Pressure pipe buried in unstratified rock may be raised 6" upon authorization from the ENGINEER. Notwithstanding the above, all pipe must be buried a minimum of 36" below all highway and railroad borrow ditches.

Changes in depth of cut for pressure lines, necessitated by conflicting existing underground utilities will not be a basis for additional compensation, but will be considered as incidental work. Such changes shall not reduce the specified pipe cover.

All pressure conduit crossing creeks shall be installed by directional drilling. The minimum cover shall be 48" and the maximum shall be 60".

All gravity pipelines shall have the depth of bury specified in the detail drawings.

Provide support for vertical risers as commonly found at sewer service connections, cleanouts, and drop manholes to preclude vertical or lateral movement. Prevent the direct transfer of thrust due to surface loads and settlement and ensure adequate support at points of connection to main lines.

When excavating for a service line connection, excavate material from above the top of the existing pipe before removing material from the sides of the pipe. Materials and density of service line embedment should conform to the specifications for the existing line, or with this specification, whichever is more stringent.

Secure caps and plugs to the pipe to prevent movement and resulting leakage under test and service pressures.

Use flexible water stops, resilient connectors, or other flexible systems approved by the ENGINEER to make watertight connections to manholes and other structures.

Pipe shall be protected during handling against impact shock and free fall. No cracked or damaged pipe or joint shall be installed in the line. Handle and store pipe and fittings in accordance with recommendations of the manufacturer.

If faults, caverns, or subsidence are discovered during construction, all work shall halt, and the ENGINEER will be contacted to inspect.

TABLE I
EMBEDMENT MATERIAL REQUIREMENTS

Gravity Sewer Mains Particle Size Limitations	
Sieve Size	**% Passing**
1 ½”	100
#4	90-100
#200	0-10
Plasticity Index (P.I.) less than 12	
Pressure Mains Smaller Than 6” Particle Size Limitations	
Sieve Size	**% Passing**
1 ½”	100
#4	50-100
#200	5-50
Plasticity Index (P.I.) less than 25	
Pressure Mains 6” and Larger Particle Size Limitations	
Sieve Size	**% Passing**
1 ½”	100
#4	10-100
#200	0-10
Plasticity Index (P.I.) less than 12	
Foundation Material (When Required) Particle Size Limitations	
Sieve Size	% Passing
1 ½”	100
#4	10-50
#200	0-5
Plasticity Index (P.I.) less than 9	

Mechanically Tamped Backfill

Where specifically called for in these specifications or on the drawings, the material used in the backfill process shall be uniformly, mechanically tamped, with hand-operated pneumatic or gasoline tools in 6" to 8" loose lifts, to 95% of standard Proctor density (ASTM 698) at slightly above optimum moisture. Mechanical compaction shall extend to the finished ground surface.

Polyvinyl Chloride (PVC) Pipe for Potable Water Mains and Wastewater Force Mains

Plastic pipe shall be manufactured from material meeting the requirements of ASTM D-1784, 12454B compounds. The finished pipe shall conform to ASTM D-2241, the gasket joint to ASTM D-3139 and the gaskets to ASTM F-477. Each joint shall bear the seal of approval of NSF, indicating that the pipe is suitable for conveying potable water. The pipe shall bear markings on each joint showing the pressure rating, type, grade and manufacturer's run or lot. Manufacturer's certificate of test and compliance shall be furnished on all PVC pipe.

Any plastic pipe field inspected and found not to conform as to wall thickness or diameter shall be rejected, and all pipe of the same run or lot number shall be rejected and replaced with acceptable pipe at the CONTRACTOR'S expense. Field tests will be made on random samples of pipe.

14" through 36" PVC shall conform to Unibell PVC Pipe Association specification Uni-B-11 and shall have the pressure rating and DR specified on the drawings and/or bid schedule. Pipe shall have cast iron O.D. and rubber gasket joints.

6" through 12" PVC shall be either Class 160 SDR 26 gasket-joint, Class 200 SDR 21 gasket joint, or AWWA C-900 DR 18 or DR 25, whichever is specified in the drawings and/or the Bid Schedule. Where AWWA C-900 pipe is specified, it shall have cast iron equivalent O.D., and be listed by Underwriters Laboratories as well as NSF. It shall be furnished in 20' lengths, with rubber gasket joints.

3" and 4" PVC shall be Class 200 SDR 21, as shown on the drawings and/or bid schedule and shall be gasket joint. 2-1/2" and smaller PVC shall be Class 200, rubber-ring gasket joint, SDR 21, with integral bell.

All physical and chemical tests shall be made at 73 degrees Fahrenheit. These tests shall include, but are not limited to, quick burst test, sustained pressure test, acetone immersion test, vice test, and drop impact test as set forth in applicable ASTM and NSF Standards.

Plastic pipe delivered to the project well in advance of its installation shall be protected from excessive warpage, discoloration, and heat deformation. Pipe shall not be strung for laying more than thirty days in advance of the laying time. Ends of plastic pipe shall be protected so that same shall not be scratched or abraded prior to installation. Any damaged ends shall be removed prior to installation.

Pipe may be cut by using a medium tooth saw and miter box. Fine emery cloth or sandpaper shall be used to remove burrs.

No male threaded PVC pipe will be allowed. Solvent-weld pipe shall be adequately snaked to allow for expansion or contraction.

High Density Polyethylene Pipe

High density polyethylene (HDPE) pipe and fittings shall be a PE 3408 high density, extra molecular weight polyethylene pipe, specified by ASTM D3350 as having a cell classification of PE 345434C. Dimensions and workmanship are specified by ASTM F714. The finished pipe shall conform to AWWA C-906.

HDPE pipe shall have all joints welded by mans of butt-fusion providing a continuous non-gasketed pipeline, capable of hydrostatic pressure testing to 12 times its designed pressure rating.

Diameter and Standard Dimension Ratio (SDR) shall be as shown on the drawings.

Anchoring system shall be as shown on the drawings.

HDPE pipe shall be Driscopipe 1000 as manufactured by Phillips Driscopipe, Inc. or approved equal.

Fittings and Blocking

All 6" and larger cast iron, ductile iron, asbestos cement pressure and gravity pipe, and PVC pressure pipe, shall have ductile iron (not gray iron) fittings. These fittings shall conform to the American National Standard for Ductile-Iron and Gray-Iron Fittings, 3" through 48", for Water and Other Liquids, AWWA Standard C110, or the American National Standard for Ductile Iron Compact Fittings 3" through 24" for water service, AWWA C153. Ductile iron fittings shall be "Tyler", "U.S. Pipe", "American Pipe", “Sigma” or approved equal, and shall be manufactured in the USA. Each fitting shall have cast on its exterior the appropriate AWWA designation.

MJ fittings are required and shall be rated for 350 psi working pressure. Flange fittings will be rated for 250 psi minimum working pressure, and will have ANSI Class 125 flanges, unless otherwise specified.

The ductile iron fittings shall have a 1/16 inch cement-lining and asphaltic seal coat all meeting AWWA C-104.

For gravity service, the ductile fittings shall be rated for a minimum of 125 psi working pressure.

Bolts and nuts for mechanical joints or flanged ends shall be of high-strength, zinc-plated carbon steel, and shall conform to ASTM Designation A 307 (Grade B).

All buried ductile iron fittings shall be mechanical joint. All pressure fittings above ground, inside of structures, or on disturbed foundations shall be flanged.

All mechanical joint fittings shall be blocked with concrete (as shown in the detail drawings), then wrapped with polyethylene. Concrete blocking shall be placed at the time the fitting is installed.

SDR 35 PVC gravity sewer pipe shall have SDR 35 PVC gasketed push-on fittings. PVC fittings shall conform to ASTM resin specification D-1784, the dimensions shall conform to ASTM D-3034, the gasket shall conform to ASTM D-3212 and the joint material shall meet the requirements of ASTM F-477.

SDR 26 PVC pressure rated pipe (ASTM D-2241) used for gravity service shall use SDR 26 PVC gasketed fittings.

Where fittings are specified in the bid schedule to be paid by weight, payment will be based on the weight of the fitting only, exclusive of gaskets, bolts, nuts, glands, blocking and so forth. Where fittings are not specifically itemized on the bid schedule, they are considered incidental to the other items of construction shown.

The weight of fittings listed in the bid schedule is based on “compact” fittings unless “full body” fittings are specified.

Hydrostatic Testing - Water and Wastewater Pressure Mains

After backfilling mains and before pavement repairs, each section of pressure line constructed shall be tested with a hydraulic test pressure of not less than 150 psi over a continuous period of not less than four hours. The CONTRACTOR shall furnish adequate equipment to make these tests. The test pressure shall not be allowed to fall below 140 psi, at which pressure the pump will be started and the line loss measured directly by tank measurement or read off a totalizing meter. Re-pressurizing shall be done each hour, or sooner, as may be required to maintain the test pressure within the prescribed limits. The final re-pressurizing will be made at the end of the final hour of the test. Total water used will be the sum of the quantities required to re-pressurize the line to the original test pressure. 100% of the pressure mains laid will be tested. New meter service lines will be tested. Where existing service lines are reused and transferred to the new main, the connection of the corporation stop into the new main will be done before the pressure test, but the existing service line shall not be tested.

During the filling of the mains, and before applying the test pressure, all air shall be expelled from the mains.

If the test indicates a leakage more than a rate equal to 10 gallons per inch of diameter of the pipe per mile over a 24-hour period, then the CONTRACTOR shall be required to find the leaks and eliminate same. All known leaks shall be stopped, regardless of allowable leakage.

Tests may be combined with sterilization and shall be observed by representatives of the interested parties.

Sterilization of Potable Water Mains

All newly constructed or existing repaired water lines and appurtenances shall be sterilized for 24 hours at 50 ppm available chlorine as per AWWA C-651-99, by this CONTRACTOR before the lines are placed into service. After completion of the pipelines, or any valved section thereof, the main shall be flushed and then chlorinated. Any of the following methods of procedure (arranged in the order of preference) shall be followed, subject to the approval of the ENGINEER:

Chlorine Gas-Water Mixture
Sodium Hypochlorite and Water Mixture
Calcium Hypochlorite and Water Mixture

The use of dry calcium hypochlorite in the pipe is not allowed. Upon completion of sterilization, all lines shall again be flushed, until the chlorine residual at the sterilized section terminus is less than 2 ppm. One bacteriological sample per 1000 feet of new pipe shall be collected by the CONTRACTOR who shall arrange and pay for their testing at an acceptable laboratory. Written test results shall be supplied to the ENGINEER.

The following table provides an estimate of chlorine required to produce a 50 ppm concentration, per 100 feet of pipe. It is provided for field reference only, and adherence thereto does not relieve the CONTRACTOR of full responsibility for a successful test:

Pipe Size (Inches)	100% Chlorine (Pounds)	1% Chlorine Solution (Gallons)
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

Mechanical Joint Thrust Restraint

Thrust restraint mechanical joint follower glands shall be used to restrain plain end pipe in all ductile iron mechanical joint fittings. These glands shall meet the following requirements:

The mechanical joint restraint shall be designed to fit standard mechanical joint bells with standard T-head bolts conforming to ANSI/AWWA C-111/A21.11 and ANSI/AWWA C21.53 of latest revision.

Glands shall be manufactured of ductile iron conforming to ASTM A536 grade 65-45-12. Setscrews shall be of hardened ductile iron and require the same torque in all sizes. Steel setscrews are not permitted.

Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.

Mechanical joint restraint shall be incorporated in the design of the follower gland. $3^{o} - 5^{o}$ deflection is required for 6" through 12" MJ joints. The restraint mechanism shall consist of a plurality of individually activated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile-iron conforming to ASTM A536-80. The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153 of latest revision. Twist-off nuts, sized same as tee-head bolts, shall be used to insure proper actuating of restraining devices. The restraining glands shall have a pressure rating equal to that of the pipe on which it is used.

Only uncut solid pipe shall be used between fittings if the distance is less than 18 feet laying length.

Mechanical joint thrust restraint glands are required on all mechanical joint connections in addition to concrete thrust blocking described elsewhere herein.

These devices shall have the stated pressure rating with a minimum safety factor of 2:1 and shall be EBAA IRON, Inc. Megalug Series 1100 for ductile iron pipe or Series 2000 PV for PVC pipe or approved equal.

Polyethylene Encasement of Ductile-Iron Piping and Appurtenances

The CONTRACTOR shall install polyethylene encasement around underground installations of ductile-iron pipe, ductile iron fittings, valves, and other ductile iron appurtenances.

Polyethylene film shall be manufactured of virgin polyethylene material conforming to ASTM Standard Specification D-1248-78.

Polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely airtight and watertight enclosure. Overlaps shall be secured by using adhesive tape, plastic string, or any other material capable of holding the polyethylene encasement in place until backfilling operations are completed.

Use the same backfill material as that specified for pipe without polyethylene wrapping, exercising care to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage polyethylene.

Corrosion Protection of Buried Threaded Components

After buried fittings have been installed, but prior to backfilling, the CONTRACTOR shall thoroughly coat nuts and bolts of all components with Rubber-In-A-Can.

Rubber-In-A-Can shall be manufactured by Share Corporation, P.O. Box 245013, Milwaukee, WI 53224, 800-776-7192, www.sharecorpo.com.

A thorough coating of Rubber-In-A-Can shall prevent contact between the nuts and bolt and the surrounding backfill and bedding material.

It is not intended to be cover the fitting, valve, or appurtenance body—the polyethylene wrap specified elsewhere herein is required for that purpose. The poly wrap is to protect the body of the component from corrosion, while the Rubber-In-A-Can is required for protection of the threaded components.

Use the same backfill material as that specified for pipe without this coating, exercising care to prevent damage to the Rubber-In-A-Can coating material when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage the coating.

Existing Water Service Transfers (New Main to Meter)

After the new mains covered by this contract have been installed, (including new corporation stops, service saddles, one-piece service lines, and locking curb stops for existing services), tested, sterilized and placed into service, this CONTRACTOR shall transfer existing water services where shown on the drawings to be transferred, from the new main to the existing meter.

The CONTRACTOR shall arrange the transfers at the customer's convenience. He shall uncover the existing service at the meter box, turn the existing meter stop off, and disconnect the existing service line from the meter. The existing meter and meter box will be reused unless otherwise shown on the drawings. All ends of existing service lines with curb stops at the meters shall be removed from the meter box, and buried outside meter box.

Meter and box shall be reused, but shall be relocated at a spot designated by the owner. All work on private property shall be conducted or supervised by a licensed plumber.

The bid item for this work includes the corporation stop, service saddle, curb stop, and service line from the new main to the existing meter, and any pavement repair required.

Floatation of Structures or Pipelines

This CONTRACTOR shall exercise the greatest of care to prevent the displacement of any structure or pipeline by external water pressure. All such displacement shall be corrected by this CONTRACTOR at his expense, and, if necessary, in the ENGINEER'S opinion, the displaced structure or pipe shall be removed and replaced at the CONTRACTOR'S expense.

Every concrete structure shall be provided with an adequate opening (properly water-stopped) to permit entrance of groundwater during construction, or an approved relief valve.

Upon completion of the structure's backfill, and before placing the unit in service, these anti-floatation openings shall be properly plugged, if directed by the ENGINEER.

All pipelines shall be immediately "blinded-in", and at least partially backfilled, to prevent floatation.

Existing Line Abandonment

After the new lines covered by this contract have been installed, tested, sterilized and placed into service, and required customer services have been transferred from existing parallel lines to the new mains, certain existing lines, where shown on the drawings, will be cut, capped, and taken out of service. Lines 2” and smaller shall be capped using PVC solvent welded caps and lines larger than 2” shall use mechanical joint caps. The abandonment of these lines is outlined on the construction drawings insofar as the piping arrangement of the existing system is known, but the existing piping arrangement is not guaranteed.

Where noted on drawings, pipe shall be abandoned by filling with flowable fill.

Brass Goods

All brass goods shall meet AWWA current requirements and shall be that material commonly referred to as waterworks brass. They shall be screwed or flared connections and shall meet AWWA Standard C-800.

Furthermore, all brass goods shall comply with NSF-61, as well as NSF/ANSI 372 ("lead free" requirement of the Reduction of Lead in Drinking Water Act).

Galvanized Iron Pipe

Galvanized steel pipe shall be Schedule 40 with screwed connections. All fittings shall be malleable iron, hot-dipped-galvanized after fabrication. Threaded joints shall be doped.

Solid Sleeves

Solid sleeves shall be used to join two plain-end pieces of pipe. The sleeves shall be ductile-iron pipe with mechanical joints connections on each end. Solids sleeves shall allow the pipe to be inserted beyond the depth of the socket that contains the gasket.

Solid sleeves shall be installed with restrained joint retainer glands, as defined elsewhere herein.

Solid sleeves shall be connected to single pieces of pipe between mechanical joint fittings to prevent separation of the pipe-to-pipe connection – unless that connection is also restrained.

Solid sleeves shall be protected from corrosion by a double wrap of polyethylene, as described elsewhere herein.

BORES

Encasement Pipe

Where lines are shown on the drawings to be installed in bores and encased, the drawings set forth a bore and encasement pipe size for each carrier pipe.

Encasement pipe shall be steel, of the configuration and wall thickness shown on the drawings, or in the OWNER'S permits. Joints shall be securely welded, and the encasement shall be installed to the straightest alignment feasible.

The exterior of the pipe shall be protected from corrosion with a bituminous coating.

End seals constructed of minimum ¼" Neoprene sheets and stainless steel circle clamps (applied to connect the Neoprene sheets to the pipe and to the casing) shall be used to prevent soil from washing into the annual space between the pipe and the casing. Install on both ends of casing. End seals shall not be installed if any water is in the casing.

Bores

No State or Federal highway, or railroad, shall be open cut. All crossings of these facilities, and any others so shown on the drawings, shall only be by methods approved by TxDOT, without damage to them, or disturbing their use. Such methods shall be done in strict compliance with the terms and conditions of Highway and/or Railroad Permits issued to the OWNER.

The OWNER shall furnish copies of the permits to the CONTRACTOR and it shall be this CONTRACTOR'S responsibility to place each bore at the location specified by the OWNER'S permit. Any permit revisions caused by bore mis-location will be at the CONTRACTOR'S expense.

Bores shall be for the length of the crossings as shown by the OWNER'S permits.

Bores shall not be made without adequate advance notification (minimum 48 hours) to the respective permitted facility owner's representative.

Bore diameters shall not be more than 3" greater than the encasement pipe O.D. or, 3" greater than the carrier pipe joint O.D. where the permit does not require encasement.

All bores under state or federal roadways shall be “dry” bores with encasement as shown in the drawings. Driveway bores within state right-of-way may be “wet” bores without encasement.

The Texas Department of Transportation and/or respective railroad may impose additional requirements, which will be outlined in the OWNER'S permits and are considered a portion of this contract.

Carrier Pipe in Bores

The carrier pipe installed inside the encasement pipe shall be of the same material as the main line, unless noted otherwise on the drawings.

On bell-and-spigot carrier pipes, the carrier pipe bells shall not rest on the encasement pipe flow line. Casing spacers, as per the detail drawings, shall be provided to properly position the pipe in the casings, protect the bells, and prevent carrier pipe floatation. The lengths of main line pipe joints may be adjusted to cause the minimum number of carrier pipe joints to occur inside the encasement pipe.

Casing Spacers

Casing spacers shall be used to install the carrier pipe inside the encasement pipe. Casing spacers shall fasten tightly onto the carrier pipe so that when the carrier pipe is being installed the spacers will not move along the pipeline. Casing spacers shall be doubled on each end of the encasement.

Each casing spacer shall be capable of providing support for the carrier pipe in service at a maximum spacing of 10'. Calculations shall be provided to the ENGINEER by the casing spacer manufacturer showing that the casing spacer will support the service load at the recommended spacing, including a factor of safety of two (2). Casing spacers used under this specification shall meet or exceed the specifications described herein as projection-type casing spacers.

Projection-type casing spacers shall be constructed of preformed sections of high density polyethylene. The flexible sections shall be joined around the pipe to provide a minimum of 16

plastic projections per spacer section. Projection-type casing spacers shall be "RACI" Type F/G spacers, manufactured by Recon Pipe Corporation of Vernon, British Columbia, telephone (604) 545-2227, or equivalent.

VALVES

Gate Valves

Valve size and location shall be as shown on the drawings. Valves inside of structures or above grade shall have hand wheels. Buried valves shall be equipped with valve boxes as described elsewhere herein. Valves inside of structures or above grade shall be flanged; buried valves 2" and larger shall be mechanical joint. Buried valves smaller than 2" shall have threaded ends with brass pipe nipples in each end. All valves furnished under these specifications shall comply in all respects to AWWA specifications.
All buried valves shall be anchored in Class B concrete as per the detail drawings, so that no stress or strain, because of operating the valve, will be transferred to the pipe.

This CONTRACTOR shall furnish to the OWNER a valve operating wrench for each type of valve.

a. 2" and Larger

2" and larger valves furnished under this specification shall comply in all respects to AWWA C-509 or C-515 for resilient seated gate valves. The valves shall be non-rising stem with 2" nut operator (unless handwheel is shown - handwheels to be ductile iron, if specified) and mechanical joint connections. Valve body, bonnet, stuffing box and operating nut shall be ductile iron. Wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber, except for guide and wedge nut areas. The valve shall be designed for a minimum 200 psi working pressure, 400 psi test pressure. The design shall allow 0-ring seals to be changed while the valve is in service. Valve body and bonnet shall be covered inside and out (ferrous parts only) with asphalt varnish or a fusion-bonded epoxy acceptable for use in potable water. Valve shall open to the left (counterclockwise).

b. 1-1/2" and Smaller

1-1/2" and smaller valves shall be ASTM B-62 brass, of the plug type, and manufactured from materials, which meet the various ASTM specifications applying to materials for use in waterworks service. The bronze body and bronze plug shall comply strictly with ASTM B-62 material specifications, commonly referred to as waterworks brass. The valves furnished under these specifications shall be manufactured and tested to AWWA C-800 standards. 1-1/2" and smaller valves shall be fastened to mains with all brass service saddles and brass threaded nipples, as per the detail drawings. Valve shall open to the left (counterclockwise). The handwheel shall be epoxy-coated ductile iron to prevent corrosion.

Valve Boxes

All buried valves shall have screw-type, three-piece, 5" minimum diameter, C.I. valve boxes. The three pieces shall include an upper female-threaded section with drop-in top; a male-threaded barrel bottom section; and a flared base section with minimum inside dimension at the base of 14 inches. Tyler 6860 Series with #6 base or approved equal. The CONTRACTOR shall determine the depth of bury of the water main and the assembled box extension required. Valve boxes shall be set to not transfer surface impact loads to the pipe or the valve. Boxes shall be plumb, with the operating nut set in the center of the box. Each top shall be set 1" above finished grade when the surface is earthen, or flush with the surface when in pavement.

Only in the case of buried butterfly valves with a buried gearbox will the 14" base not be required. Provide a standard 8" bottom non-slotted valve box base in this situation. The weight of the box shall be transferred to compacted backfill around the valve instead of onto the valve itself.

Gray Iron Castings

Gray (cast or ductile) iron castings shall conform to ASTM A-48, and shall be free of blowholes, cracks, warping, and burnt-on sand, and shall be reasonably smooth. Covers shall fit properly into frames and shall seat uniformly. Angles shall be filleted, and risers shall be sharp and true.

Additional specific requirements for gray iron valve boxes, fittings, valves, manhole and cleanout covers, and similar appurtenances, may also be included under other sections herein.

Tapping Sleeves and Valves

Tapping sleeves and valves shall be used where shown on the drawings, and the sleeve and valve are considered one unit for payment purposes.

Tapping valves shall meet AWWA specifications and requirements outlined for gate valves elsewhere herein, except that they shall be especially designed for use with tapping sleeve. They shall be complete with valve box and marker, and concrete blocking. Valves shall be flange by MJ, unless otherwise noted.

The tapping sleeve shall be of cast iron or ductile iron body, with corrosion-resistant steel alloy bolts. Ends shall be mechanical joint. The outlet shall be flanged, for connection to the valve. Small and large O.D. range gaskets shall be provided. The sleeve shall be designed for a minimum of 150 psi operating pressure and 250 psi test pressure. It shall be provided in two sections, which bolt together to surround the pipe circumference, with the outlet cast as an integral portion of the sleeve.

Tapping sleeves which consist of two half-circle fabricated sections of steel, gasket lined and longitudinally crimped to allow deformation by tightening the bolts and thus provide built-in range over a variety of pipe O.D.'s may also be used, providing that the main body, neck, and bolts are constructed of Type 304 stainless steel, and designed to withstand a minimum of 150 psi working pressure and 250 psi test pressure.

The tapped plug removed from the line shall be delivered to the ENGINEER.

All metallic components shall be poly-wrapped to reduce corrosion.

FLOW METERS

Water Meter Boxes

Existing meter boxes shall be reused unless otherwise shown on the drawings.

The meter box shall be set on firm ground so that the top of the meter box is 1/2" above the ground surface, and the box is level and plumb. The ground shall be carefully backfilled and tamped around the meter box so as to leave a neat appearance.

CONCRETE

Concrete

This specification includes structural concrete, for walls, floors, roof, beams, footings and all other portions of buildings, tanks and structures, and for pavements and any other flatwork. Where not specifically indicated herein, the latest versions of the requirements of ACI 301 – "Specifications for Structural Concrete for Buildings," ACI 302 – "Guide for Concrete Floor and Slab Construction," ACI 316R – "Recommendations for Construction of Concrete Pavements and Concrete Bases," or ACI 350R – "Environmental Engineering Concrete Structures," as appropriate, shall govern.

(a) Cement – Cement for concrete shall be Type 1 Portland cement, which shall conform to the requirements of the current specifications for Portland cement, ASTM designation C150. The CONTRACTOR shall furnish, in advance of construction, a certified analysis and a statement from the manufacturer that it meets the C150 specification.

(b) Water – Water for use in mixing and curing concrete shall be reasonably clean and shall be free from injurious amounts of oil, acid, alkali, salts, organic or vegetable matter, or other deleterious substances.

When comparative tests are made with distilled water, any indication of unsoundness, marked change in time of setting, or a reduction of more than 10 percent mortar strength shall be sufficient cause for rejection of the water under test. If the CONTRACTOR desires to use any water source for concrete mixing other than the normal, local, potable water supply, it shall be his sole responsibility to have all tests performed and to bear the cost of the testing. The testing laboratory and tests shall be approved by the ENGINEER.

(c) Concrete Admixtures – All Class A (structural) concrete may contain a chloride-free liquid admixture for reducing water requirements and retarding the set of the concrete. The admixture shall meet ASTM C-494. An admixture to entrain 4% to 6% air meeting ASTM

C-260, shall be required in exposed concrete or concrete for tank walls and floors. It shall be added in strict accordance with the manufacturer's recommendation. Other admixtures must be submitted to the ENGINEER in advance, for approval.

(d) Concrete Aggregates – General – The handling and storage of aggregates shall be in such a manner as to prevent intrusion of foreign materials and segregation of sizes.

If stored on the ground, the sites of the stockpiles shall be grubbed, cleaned of all vegetation and leveled off. The bottom six inch layer of aggregate stock pile shall not be disturbed and shall not be used in the work.

At the time of use, the aggregates shall be free from frozen material and all foreign material such as grass, wood, sticks, burlap, paper, or dirt, which may have become mixed with the aggregates in stockpiles or in handling.

Aggregate scales shall be tested and certified correct at least annually, and at such other times as the ENGINEER may direct.

(e) Coarse Aggregate for Concrete – The coarse aggregate shall be well graded in size from coarse to fine and when tested by laboratory methods shall meet the requirements for percentage by weight of ASTM C33, #57, as follows:

Nominal Size:	1 Inch	
Retained on	1 ½ inch sieve	0%
Retained on	1 inch sieve	0 to 5%
Retained on	½ inch sieve	40 to 75%
Retained on	#4 inch sieve	90 to 100%
Retained on	#8 sieve	95 to 100%

- ASTM C33 gradation #57 is also equivalent to TxDOT Item 421 aggregate grade #4.

Where coarse aggregate is delivered to the job in two or more sizes or types, each size or type shall be separately and accurately measured by volume or weighed separately in such proportions as the ENGINEER may direct and shall not be mixed prior to batching.

The maximum size of aggregate shall be reduced in size to meet the following conditions:

1. One-fifth of the least dimension between forms of that part of the structure in which the concrete is being placed, and

2. One-third of the thickness of slabs, and

3. Three-fourths of the clear space between reinforcement, and

4. The maximum size aggregate is defined as the clear space between the sides (not diagonal) of the smallest square openings through which 95% of the weight of the aggregate can be passed.

Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, or a combination of these.

Gravel, crushed gravel, and crushed stone shall consist of clean, hard durable particles, free from adherent coatings, thin, or elongated pieces, soft or disintegrated particles, dirt, organic or injurious matter.

When subjected to the sodium sulfate or magnesium sulfate soundness test (5 cycle), in accordance with TxDOT method 411-A, the loss will not exceed 12% (sodium) and 18% (magnesium sulfate).

Deleterious substances shall not exceed the following percentages by weight:

Material removed by decantation	1.0%
Shale, slate or other similar materials	1.0%
Clay lumps	0.25%
Soft Fragments	3.0%
Other deleterious substances, including friable, thin, elongated or laminated pieces	3.0%
The sum of all deleterious substances, exclusive of material removed by decantation, shall not exceed by weight	5.0%

The aggregate shall be free from a harmful excess of salt, alkali, vegetable matter, or other objectionable matter occurring either free or as adherent coatings.

(f) Fine Aggregate for Concrete – Fine aggregate shall consist of a sand or mixture of sands with or without a mineral filler. The sand or mixture of sands in fine aggregate shall consist of clean, hard, durable, uncoated grains, free from lumps.

When tested according to TxDOT test method TEX-612-J, the acid insoluble residue of the fine aggregate shall be not less than 28% by weight. When the fine aggregate is tested by method TEX-317-D, it shall have a mortar tensile strength equal to or greater than the Ottawa sand mortar.

The fine aggregate shall be free from a harmful excess of salt or alkali. It shall not contain more than 0.5% by weight of clay lumps.

When subjected to the color test for organic impurities (ASTM C-40) the sand or mixture of sand shall not show a color darker than the standard color.

The sand or mixture of sands shall be well-graded from coarse to fine, and when tested by laboratory methods (TEX-401-A), shall meet the following requirements for percentage by weight:

Retained on 3/8 inch sieve	0%
Retained on No. 4 sieve	0% to 5%
Retained on No. 8 sieve	0% to 20%
Retained on No. 16 sieve	15% to 50%
Retained on No. 30 sieve	35% to 75%
Retained on No. 50 sieve	65% to 90%
Retained on No. 100 sieve	90% to 100%
Retained on No. 200 sieve	97% to 100%

If it is economical to use two sands of different gradations which when combined will meet these specifications, each sand shall be separately and accurately measured in such proportions as the ENGINEER may direct and shall not be mixed prior to batching.

The mineral filler, if required, shall be stone dust or crushed sand with a minimum of 95% passing the #30 sieve. It shall not exceed 5% by weight of the total quantity of fine aggregates.

(g) Mixing and Placing Concrete – The CONTRACTOR shall furnish the ENGINEER laboratory tests as follows:

1) Coarse Aggregates
2) Fine Aggregate
3) Cement
4) Concrete design mix

All equipment, tools, and machinery used for hauling, storing, and mixing and placing concrete shall be approved by the ENGINEER and shall be maintained in a condition to insure the completion of the work without excessive delays for repairs and replacements. All equipment necessary for the construction of the work shall be on the project and shall be acceptable to the ENGINEER as to condition before the CONTRACTOR will be permitted to begin construction.

All materials shall be separately and accurately measured by weight and volume.

Trucks shall be acceptable as to type and condition. They shall be provided with a closed watertight drum suitably mounted and shall be fitted with adequate blades capable of combining aggregates, cement and water into a thoroughly mixed and uniform mass of concrete, and to discharging the concrete without segregation.

Concrete shall be composed of cement, admixture, fine aggregate, mineral filler (if required), coarse aggregate and water, mixed in the proportions designated by the testing laboratory and in conformity with these specifications. The CONTRACTOR shall pay for

all laboratory investigations and for the design and testing of the mix and aggregate materials.

The concrete mix shall be designed, and acceptance or rejection of the completed structure will be based upon the specified compressive strength in pounds per square inch at 28 days. Control will be accomplished by meeting a compressive strength in pounds per square inch at the age of seven days, equal to or greater than the following:

Compression Testing: ASTM C-31

Compressive Strength Lbs Per Square Inch At 7 Days	28 Days	Concrete Class	Minimum Sacks Cement	Maximum Water/Cement Ratio (Gal/Sk)	Cement	Air Entrained (if required)
1300	2000	D	4	8	Portland Type 1	NA
2000	3000	B	5	6.5	Portland Type 1	4 – 6%
2500	3700	A	6	6.0	Portland Type 1	4 – 6%

Concrete Applications:

Type A- All structural work (foundation, piers, beams, floors, roof slabs, walls, bottoms, suspended walkways, manholes, boxes, inlets, water-holding floors, etc.): street pavement, curbs, and driveways.

Type B- All sidewalks, ramps and steps.

Type D- All pipe thrust-blocking, fence, bumper blocks, fills on structural concrete subgrade pipe encasement, etc.

The CONTRACTOR may substitute a stronger type for a weaker type. He shall not substitute in reverse order.

The concrete shall be uniform and workable. The quantity of water will be determined by the laboratory and will be such as to give the mixture the minimum amount of water consistent with the required workability. In general, the consistency of the concrete mixture shall be such that:

1. The mortar clings to the aggregates.
2. The concrete is not sufficiently fluid to segregate when transported to place of deposit.
3. The concrete, when dropped directly from the discharge chute of the mixer, will flatten out at the center of the pile, but the edges of the pile will stand up and not flow.
4. The mortar will show no free water when removed from the mixer.
5. The concrete will settle into place when deposited in the form. When transported in metal chutes at an angle of 30 degrees with the horizontal, it will slide and not flow into place.
6. The surface of the finished concrete will be free from "laitance" or a surface film

of water.

Any concrete failing to meet the above consistency requirements, although meeting the following slump requirements, will be unsatisfactory. The CONTRACTOR will change the mix to correct the unsatisfactory conditions.

Concrete shall contain no more water, within the slump limits specific for the various classes of the work, than is necessary to produce a concrete, which is workable and sufficiently plastic for the class of work intended. In general, the maximum slump in inches will be as follows:

Class of Work	Slump in Inches
Foundations and massive sections	4
Floors and unformed walls	4
Driveway, sidewalk, and pavements	5
Formed heavy walls, slabs, beams & columns	4
Formed thin walls	5

However, admixtures will be considered that allow the slump to increase – as long as the W/C ratio is not increased, or the strength is not decreased. All other requirements will still apply.

Tests for consistency of concrete shall conform to the current method of Slump Test for Consistency of Cement Concrete, ASTM Designation C-142.

During the progress of the work, the ENGINEER will cast test cylinders of the number and type he may desire for testing and maintaining a check on the compressive and strength of the concrete that is actually being placed.

The CONTRACTOR shall provide and maintain on site at his cost, facilities for the purpose of making and curing concrete test specimens. The cost of all materials used in test specimens shall be included in the contract unit price bid for the various items of the work and will not be paid for as a separate contract pay item. The cost of testing specimens shall be borne by the OWNER.

Concrete may be mixed in a central mixing plant or in a truck mixer, or it may be partially mixed at a central plant and the mixing completed in the truck mixer as herein set forth. Concrete so mixed shall be proportioned and batched as herein specified and shall meet all requirements specified for quality and strength.

The CONTRACTOR shall be responsible for producing a concrete that will have the required consistency and slump when delivered to the job. If the concrete as delivered to the job site is not of the required consistency or workability, the use of additional cement may be required. Concrete that is unsuitable, as delivered for placement, will be rejected.

Hand mixing of concrete will not be permitted except in case of emergency. Re-tempering

or remixing of concrete will not be permitted.

All concrete not placed as herein specified within 60 minutes after adding water, will be rejected.

Except upon specific written authorization by the ENGINEER concrete shall not be placed when the overnight temperature is below 35 degrees F., or at any time when the temperature is less than 40 degrees F. and falling. Upon request of the CONTRACTOR and when such written permission is granted by the ENGINEER the CONTRACTOR shall furnish an approved enclosure, such as canvas covered framework, to enclose and protect all concrete so placed, and shall maintain the air temperature surrounding the concrete at not less than 50 degrees F. for not less than five days.

During hot summer weather, the temperature of the concrete mix at time of placement shall not exceed 90 degrees F.

Neither salt nor chemical admixtures shall be added to the concrete to prevent freezing. The CONTRACTOR shall be responsible for the quality and strength of concrete placed, and all concrete damaged in any way, including spalling and surface damage, by freezing or rain, shall be removed and replaced by the CONTRACTOR at his own cost and expense.

Concrete shall not be placed before the time of sunrise nor be placed later than will permit all finishing operations during sufficient natural light, unless directed by the ENGINEER.

Ready-mixed concrete shall conform to the current specifications for Ready-Mixed Concrete, ASTM Designation C-94.

The CONTRACTOR shall furnish all machinery, equipment, and devices of an approved type or design necessary for proper placing of the concrete, using methods approved by the ENGINEER, and conforming to the requirements of these specifications. All equipment shall be mortar-tight, and shall be kept clean, free from hardened concrete, and in proper working order at all times.

Concrete shall not be placed unless an on-site representative is present. The forms, reinforcement, etc., shall be reviewed and approved before ordering delivery of the concrete (allow at least one day advance notice for review).

Concrete shall be mixed, transported, and placed in conformity with these specifications. Concrete shall be handled to the place of final deposit in such a manner to prevent segregation, separation, loss of the ingredients, or the displacement of the reinforcement. The arrangement and use of chutes, when necessary, shall extend as near as possible to the final place of deposit of the concrete. Depositing a large quantity of concrete at one point and flowing or working it along the forms will not be permitted. A "tremie" or "elephant trunk" shall be utilized when dropping the concrete a distance in excess of five feet.

Placing concrete shall be so regulated that undue pressure will not be exerted against the

forms. Care shall be taken to fill each part of the forms by depositing concrete directly as near its final location as practical, to work the coarse aggregates back from the surface, and to mechanically work the concrete under and around the reinforcement bars, joints, water-stops and embedded structural shapes and equipment without displacing them.

Joints, water-stops, dowels, inserts, etc., shall be placed at the locations shown on the drawings and concrete shall be poured in one continuous operation between or around such.

Where work is unavoidably suspended between regularly planned construction joint locations, a joint and/or water-stop located and formed in a manner satisfactory to the ENGINEER shall be placed. Keys of the depth and width shown on the drawings shall be formed in the soft concrete and removing them after the concrete has hardened. Construction joints, water-stops, inserts, dowels, and reinforcing steel shall be free of dirt, scum, laitance or other inert materials before pouring the next section. Joints shall be wetted immediately prior to placing fresh concrete.

Concrete shall not be placed in or under water. Forms and foundations must be free of standing water, mud, and debris.

All construction joints located beneath finish grade or water level shall be waterproofed with PVC water-stops.

All concrete shall be protected against loss of moisture for a period of not less than 120 hours, by either forms, curing compound, wet mats, wet straw/sand, water immersion, or spray.

All horizontal slabs and each horizontal layer deposited in formed walls, beams, columns, and similar structures, shall be mechanically vibrated. The vibrator should be extended slightly into the underlying layer to bond the two layers together. The vibrator shall not be used to move the concrete horizontally. Vibration will not be required for curbs or sloped concrete surfaces unless specifically called for on the drawings.

All snap ties shall be broken off to the haunch embedded in the concrete and the resulting void shall be caulked with concrete grout and rubbed to achieve an appearance acceptable to the ENGINEER.

(h) Placement Record – The project on-site representative shall be furnished one ticketed copy of each batch of concrete delivered to the project. This ticket shall show the volume, type material, and structure or use where placed. Test samples will be so noted.

(i) Concrete Test Samples – The ENGINEER shall select at random batches of concrete to be tested and shall make test cylinders from any batch so selected. The CONTRACTOR shall furnish the test cylinders free of charge. One cylinder shall be broken at the end of seven days. If it is acceptable, a second cylinder shall be broken at the end of 28 days. If it is acceptable, the third cylinder shall be discarded. Should either sample not show acceptable strength, the third sample shall be broken at that time. If this sample shows acceptable

strength, the unacceptable sample shall be deemed to have been in error. Any batch of concrete so sampled whose test fails to equal 90% of the specified strength, shall be cored on the site and tested at the CONTRACTOR'S expense.

If this coring bears out the test samples, then that portion of the structure shall be deemed to be in non-compliance with the intent of the contract documents and the CONTRACTOR, without any recourse to the OWNER or the ENGINEER, shall immediately remove and replace the concrete at his expense.

Should the concrete test results be less than specified, the ENGINEER, at his discretion, may request, and the CONTRACTOR shall provide, a revised mix design. No additional pours will be made until the revised design is submitted.

(j) Forms – All straight channels, the inside of all concrete structures, and the exposed surface plus twelve inches of the outside of the structures shall be formed of smooth new plywood or steel. All other portions of structures may be formed of used plywood or dressed lumber.

Form removal shall be carried out in such a manner to insure the complete safety of the structure. As a minimum, except for slabs on grade, forms shall remain in place for the various classes of work until the concrete has reached the minimum 7-day compressive strength specified herein for the class of concrete involved. The forms can be removed in 3 days if the CONTRACTOR can prove that the 7-day strength has already been achieved. (This testing will be paid for by the CONTRACTOR).

Forms for slabs on grade may be removed after 24 hours.

All exposed edges of concrete structures shall be chamfered ¾".

All forms shall be adequately and rigidly braced to prevent misalignment. Any form failure resulting in misalignment of that structural section or "bulging" of its wall shall cause the section to be rejected and such section shall be removed and replaced if, in the judgment of the ENGINEER, such misalignment or bulging would affect the structure's use, function or appearance.

Forms shall be set such that the lines and surfaces of the columns, piers and walls, as well as slabs, ceilings, lintels, sills, parapets and other conspicuous lines shall not vary from plumb, level or the grade specified by more than ¼" in any 20' of length. Sleeves, floor opening, wall openings, shall be located within ± ½" of the locations shown on the drawings and cross-sectional dimensions of columns and beams and the thickness dimensions of slabs and walls shall be to the dimensions shown on the drawings within a tolerance of – ¼" to + ½".

All forming shall be carried out in such a manner as to insure the safety of the work during form construction and placement of the concrete.

(k) Concrete Finishes – All concrete structures shall have the finish provided by the forms,

except:

1. Interior finished floor slabs of buildings and the interior walls of troughs carrying liquids shall be hard steel trowelled and sealed as described elsewhere herein.

2. Interior floor slabs of all boxes, manholes, and structures receiving concrete fill or equipment shall be wood float finished or as directed by the manufacturer of the equipment.

3. Structural base slabs, beams, and concrete fills below grade that are not exposed shall be wood float finish.

4. Walls exposed above grade, of tanks, boxes, flumes, inlet/outlet structures and similar structures (not including sewer manholes) shall be hand-rubbed, or coated with a cement-base aggregate type, heavy duty coating, especially designed for said purpose, to product a smooth, pleasing surface which is consistent in color and texture and free of imperfections left by the forms or by honeycombs or similar voids. ENGINEER shall be the judge of acceptability of the finished appearance.

5. Sidewalks, pavements, and steps, and any other items exposed but not mentioned above, shall be broom finished.

Where a cement base aggregate type coating is used as referred to above, it shall be heavy duty, designed for immersion service, and shall be "Thoro Systems" or equal, applied in strict accordance with the manufacturer's instructions. Manufacturer's literature shall be supplied the ENGINEER for product approval and the ENGINEER shall be the judge of acceptability of the finished appearance. Color shall be selected by the ENGINEER.

(l) Steel Reinforcement – Reinforcement is the metal embedded in concrete in such a manner that the reinforcement and concrete act together in resisting applied forces. This shall also include development tie bars.

Steel reinforcement shall be deformed bars of open-hearth, new-billet-steel, yield strength 60,000 psi, conforming to the current specifications for Billet-Steel Bars for Concrete Reinforcement, ASTM Designation A-615. All reinforcing steel shall have been tested inside of the U.S.A. for compliance with these specifications.

Wire for reinforcement shall be cold drawn from rods hot-rolled from open hearth billets, conforming to the current specifications for Cold Drawn Steel Wire for Concrete Reinforcement, ASTM Designation A-82. The welded wire fabric shall comply with ASTM A-185, Welded Steel Wire Fabric for Concrete Reinforcement. Fabric must be furnished flat-rolled fabric is not acceptable.

Reinforcement bars shall be bent cold to the shapes indicated on the drawings. All bending shall be done in the shop. Bends shall be true to the shapes indicated.

Reinforcement shall be stored above the ground surface upon skids, platforms or other supports, and shall be protected from mechanical injury and from surface deterioration by exposure to the weather. When placed in the work, the reinforcement shall be free from dirt, loose rust, scale, paint, oil or other foreign material.

Reinforcement bar laps shall be made as shown on the drawings and where not shown, they shall equal 40 times the bar diameter or the current CRSI standard, whichever is greater. Hooks and bends shall be made as shown on the drawings and where the dimension is not shown, the diameter of the hooks or bend shall equal eight times the bar diameter, with a straight length of bar at the end of hooks equal to four times the bar diameter, or the current CRSI standard, whichever is greater.

The reinforcement shall be supported on proper chairs and tied in place using approved methods so that it will not become displaced during the placing of concrete. The spacing of parallel bars shall not be less than three bar diameters center to center, with a minimum clearance between bars of 2". The distance from the center of bars to surface of concrete shall not be less than two bar diameters, with a minimum clear covering of three quarters inch, unless otherwise shown on the drawings. Bars in footings shall have a minimum clear cover above the soil of 3" unless otherwise shown on the drawings. The placing and securing of reinforcement in any section of the work shall be acceptable to the ENGINEER before any concrete is deposited in the section. In the event of any displacement of reinforcement from its proper setting, it shall be immediately replaced and secured to its original position.

Reinforcing steel shall be placed to the tolerances shown in the following table. Reinforcing steel shall not be heated for bending purposes.

Clear distance to formed surfaces……...± ¼
Minimum spacing between bars……...…- ¼
Clear distance from unformed surface to top reinforcement:
Members 8" deep or less……... .+ ¼
Members more than 8" deep but less than 24" deep…….……...…- ¼, + ½
Members 24" deep or greater……..…….- ¼ , + 1
Uniform spacing of bars, but the required number of
bars shall not be reduced……..± 2
Uniform spacing of stirrups and ties, but the required
Number of stirrups and ties shall not be reduced……...± 1
Longitudinal locations of bends and ends of reinforcement:
General…….……± 2
Discontinuous ends of members……..± ½
Length of bar laps……± 1- ½
Embedded length:
For bar sizes No. 3 through 11……...-1
For bar sizes No. 14 and 18……-2

Substitutions of sections, or modifications of details, or both, shall be made only when

approved by the ENGINEER.

Reinforcement may be rejected for failure to meet any of the requirements of the specifications, and specifically for the following:

1. Reinforcement exceeding the allowable variations.
2. Reinforcement not bent in accordance with the details.
3. Reinforcement with bends and kinks not shown on the details.

Dowels and tie bars shall be either straight or bent, smooth or deformed, as required, of ASTM A-615 materials.

(m) Water-Stops, Joint Fillers, Sealant

Waterstops shall be designed to stop water infiltration through cast-in-place concrete construction joints. It shall expand upon contact with water to form a positive seal against concrete. It shall consist of sodium bentonite to seal and fill voids and cracks in the concrete. The product shall be supplied in lightweight flexible coils and attached to existing concrete surfaces with an adhesive provided by the manufacturer, prior to the introduction of additional concrete. The product shall meet NSF-61 requirements for contact with potable water. Provide Volclay RX and Volclay WB-Adhesive.

Joint filler (expansion joint material) shall be a premolded, semi-rigid grade asphalt board (ASTM D-1751 or AASHTO M-213). It shall be 1" thick. The filler shall be held down ¾" from the surface of the concrete and extend full depth of the joint. It shall be held firmly in place while placing concrete. Any protruding material shall be neatly trimmed.

Sealants for pavement sidewalks, driveways, building floors, and similar will be a non-sag, self-leveling, or gun-grade synthetic joint sealant compound specifically recommended for adhesion and flexibility. It shall be capable of 100% elongation and installed in strict accordance with the manufacturer's directions. Use TREMCO Vulkam 45SSL, or equivalent.

Above finished floor for non-immersed locations, and all caulk and sealant shall be clear silicone compound or shall be butyl rubber compound in a color to match the surrounding material or painted.

For immersion service, concrete joint sealer shall be a two-component gun-grade synthetic rubber sealing compound, specifically recommended for continuous immersion services. It shall be Sonneborn "Sonolastic Two-Part," or equal, applied in strict accordance with the manufacturer's directions.

(n) Curing Materials – Materials for the curing of concrete shall conform to the following requirements.

1. Membrane-Forming Compounds – The membrane curing compound shall conform

to the requirements of Liquid Membrane-Forming Compounds for Curing Concrete, ASTM Designation C-309 for Type 2, white pigmented compound, unless otherwise specified or indicated. It shall be of such nature that it shall not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete.

The compound shall produce a firm, continuous uniform moisture-impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface at the specified rate of coverage, dry to touch in one hour and dry through in not more than four hours under normal conditions suitable for concrete operations. It shall adhere in a tenacious film without running off or appreciably sagging. It shall not disintegrate, check, peel or crack during the required curing period.

The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job site in the manufacturer's original containers only, which shall be clearly labeled with the manufacturer's name, the trade name of the material and a batch number or symbol with which test samples may be correlated.

When tested in accordance with Water Retention by Concrete Curing Materials, ASTM Designation C-156, the liquid membrane-forming compound shall restrict the loss of water present in the test specimen at the time of application of the curing compound to not more than 0.55 grams per square centimeter (0.01 oz per square inch) of surface.

2. Cotton Mats – Cotton mats are permissible providing the surface is covered completely and the mats are kept continuously damp.

3. Waterproof Paper – Waterproof paper is permissible consisting of two sheet of plain kraft paper cemented together with a bituminous material in which are imbedded cords or strands of fiber running both directions of the paper. The paper shall be light in color; shall be free of visible defects; and shall have a uniform appearance. It shall be sufficiently strong and tough to permit its use under the conditions existing on streets and structural work without tearing or otherwise becoming unfit for the use for which it is intended. The paper shall conform to specifications for Sheet Materials for Curing Concrete, ASTM Designation C-171.

Expansion Joints

Expansion joints shall be constructed at the locations shown on the drawings.

The expansion joint shall consist of smooth dowels, expansion material, support chairs, cap strip, and sealant.

Smooth dowels shall be grade 60, of the diameter and length shown on the drawings. Steel shall be free of rust and deleterious material – provide expansion caps on one end of each bar.

The expansion material shall be flexible foam sheet designed for horizontal expansion joint applications. It shall consist of isomeric polymer in a small, closed-cell structure which will compress easily and recover to at least 99%. The material shall be compatible with generally accepted cold-applied sealants. Thickness will be ½". The material may be provided pre-cut to a 4" width or furnished in sheets and field cut to a 4" width. Use W.R. Meadows "Ceramar" or equal (Lofland Company, 1-800-288-5250).

The expansion joint support basket shall be welded wire basket designed for ½" expansion material.

The cap strip will be ½" deep removable plastic strip designed to fit over the expansion material during the concrete pour, and later removed to provide a clean, sharp void for sealing. (Lofland Company or equal).

The expansion joint sealant shall be a non-sag, self-leveling, or gun-grade synthetic joint sealant compound specifically recommended for adhesion and flexibility. It shall be capable of 100% elongation and installed in strict accordance with the manufacturer's directions. Use TREMCO Vulkam 45SSL, or equivalent.

MISCELLANEOUS

Clearing and Grubbing

CONTRACTOR shall perform clearing and grubbing along rights-of-way and on project sites, as required to construct the project. In so doing, observe the following:

No trees over 6" in diameter shall be removed along rights-of-way or easements unless specifically designated for removal on the drawings, without prior approval of the OWNER. Pipeline alignment may, upon approval of the ENGINEER, vary within the easement from a straight line to avoid tree removal.

On sites, all trees under 6" in diameter, and all trees of any size within 15' of any proposed pipeline, structure, or cut/fill sections over 6 inches in depth, shall be removed, unless specifically noted otherwise on the drawings.

On sites, all tree and brush roots, stumps, and wood shall be removed to a point three feet below the natural ground, and any on-site material, reused as project fill, shall have all roots removed therefrom.

All cleared and grubbed material shall be disposed of off the sites, rights-of-way, and easements in accordance with the established guidelines of the Texas Commission on Environmental Quality, at a site to be secured by the CONTRACTOR, at no additional cost to the OWNER.

All trimmed tree limbs and branches 1" and larger in diameter shall be cut square and flush with tree trunk or limb.

Tracer Wire

Tracer tape shall be 14-gauge, solid core, with 30 mil HDPE insulation. Wire shall be terminated using 1" pipe and cap.

Wire shall be used with all pipe with the wire ending in an accessible location.

Pipeline, Valve, and Appurtenance Markers

All pipeline, valve and appurtenance markers shall conform to the detail drawings. They shall be on 16-gauge steel, fastened with two tamper-proof screws to a 1" x 1/8" galvanized angle. The marker coating shall be baked enamel, 4 mil dry film thickness, orange background with black markings. A valve marker shall be provided for each valve installed on this project.

A pipeline marker shall be installed on every fence where the pipeline crosses beneath same. The marker shall be 3" x 12" with a baked enamel finish on 16-gauge steel sheet, as per the drawings. The marker shall be fastened to the fence wire with galvanized wire, top and bottom, or nailed to the fence post.

An appurtenance marker shall be installed for each air release valve, flush valve, and control valve on this project.

In lieu of the above valve and/or pipeline markers, this CONTRACTOR may furnish and install flexible valve and pipeline marker posts, 2-1/2" x 60" long, with blue and white vinyl, factory-applied decals, labeled "CAUTION - Water Valve" or "CAUTION - Water Pipeline."

Posts shall be fabricated from glass fiber, marble and thermo-setting polymers for flexibility and resistance to deterioration. Marker posts shall be equivalent to Model No. CUM-375, (with appropriate decal), as manufactured by Carsonite Composites, LLC (800) 648-7916.

Markers shall not be a separate pay item.

Fencing Repairs

Existing fences intersected by pipelines constructed under this contract shall be crossed by digging under from each side, and not disturbing the fence, where possible. When this procedure is not feasible, and the CONTRACTOR deems it necessary to cut or remove a fence across or adjacent to the pipeline, he shall notify the fence owner, and shall be responsible for preventing any pets or livestock contained therein from escaping.

For barbed wire fencing the CONTRACTOR will remove the fence at a corner or brace post and shall protect the existing posts and wire. Any post or wire lost or damaged as a result of this project

shall be replaced with similar material, new, and of an equal or superior quality, at the CONTRACTOR'S expense.

Upon replacing the fence, it shall be stretched tight and shall be true to line, with wires parallel or fabric smooth, and with all usual appurtenances included. Posts shall be plumb and firmly embedded.

For chain link fencing, repairs shall be per technical specifications and construction standard.

Removing and replacing the fence, and all associated materials and work, are the responsibility of this CONTRACTOR and shall not be separate pay item.

Pavement Repairs

a. All city streets and private driveways, open cut by this CONTRACTOR, shall be repaired by this CONTRACTOR. Prior to repair, this CONTRACTOR shall maintain the access over such open cuts in a passable condition to vehicular traffic, regardless of weather conditions.

   The trench shall be backfilled in accordance with Installation and Backfill of Buried Pipe, as described elsewhere herein.

   The finished pavement surface shall conform to the shape and sections shown on the drawings and to adjacent undisturbed surfaces.

All workmanship and materials shall be in strict accordance with the latest version of the standard specifications for "Construction of Highways, Streets, and Bridges" as published by the Texas Department of Transportation.

The pavement wearing surface shall not vary more than 1/4 inch when measured with a 10-foot straightedge laid on the surface in a direction parallel to the crown.

All adjacent structures and painted surface shall be protected from asphalt spray and drift by covering with paper or in a manner acceptable to the ENGINEER. No liquid asphalt will be allowed to mar the appearance of finished concrete structures.

This CONTRACTOR shall be responsible, during the contract maintenance period, to correct any holes, blemishes, depressions, and surface irregularities in the pavement surfaces caused by his faulty workmanship, materials, or heavy equipment, or earth settlement.

Where pavement repairs are itemized in the bid schedule, the payment limits are determined by the dimensions shown in the detail drawings. Where pavement repairs are not itemized in the bid schedule, they are considered incidental to other work and are not a separate pay item.

b. Gravel base, crushed aggregate base, or iron ore - Gravel, crushed aggregate, or iron ore surfaces shall be repaired to the existing thickness, but not less than 6". They shall be compacted to minimum 95% standard Proctor ASTM D-698 at -1 to +3% optimum moisture. The CONTRACTOR shall match the existing material type. Crushed aggregate base shall be TxDOT Type "A", Grade 1, or Grade 2 crushed or broken aggregate.

c. Asphalt Pavement Repairs - Asphalt pavement shall be repaired with like base material of a thickness equal to that existing, but in no case less than 6" compacted thickness. The crushed rock base shall meet all applicable requirements of Texas Department Transportation, Item 247 Type A, Grade 1 or 2. The asphalt wearing surface shall be Item 340, Type D, hot-mixed, hot-laid and shall have a compacted minimum thickness of 2". The flexible base shall be tack coated prior to the asphalt overlay with 0.20 gallon per square yard of MC-30. The asphaltic wearing surface shall be rolled with a flat steel wheel roller.

d. Concrete pavement and driveway repairs - Concrete pavement walks, and drives shall be repaired immediately. The repair width shall be the width of the trench plus 12" on either side thereof. The line along which the pavement is removed shall be sawed a minimum of 1-1/2" deep before pavement is broken out. The thickness shall be not less than that existing, but in no case less than 5" for streets, 4" for driveway approaches and sidewalks. Any existing reinforcement steel shall be cut and bent back for concrete removal and then rebent and tied into place prior to concrete placement. All cut reinforcement shall be spliced with equal size bars of a length equal to 30 diameters, or wire mesh.

Existing concrete work that is non-reinforced shall be replaced as non-reinforced. Concrete for street and driveway pavement and curb and gutter shall be Class A. For sidewalks it shall be Class B.

e. Oil pavement repairs - Oil pavement shall have a repaired thickness equal to that existing, but in no case less than 3" compacted thickness.

Oil base pavement shall be composed of native sand and road oil. The sand and road oil will be mixed in proportion to one cubic yard (1 CY) of sand material per eleven (11) gallons of road oil. Materials shall be mixed by mechanical means until a homogenous mix is obtained. The installed mixture shall be thoroughly compacted.

f. Unimproved street surface repairs - Unimproved streets shall be repaired by standard backfill operations as specified herein, with mechanical compaction to minimum 95% standard proctor compaction at -1 to +3% of optimum moisture. However, care shall be taken to insure the finished backfill is of similar type material to that of the existing unimproved road, i.e. sandy topsoil should have a similar backfill surface and not clay, shale, etc.

Fine Grading

Fine grade all exposed earthen areas affected by construction, and elsewhere or as shown on the drawings. The finished surface shall be uniform and shall slope away from all structures. No slope shall be steeper than 4H:1V, unless specifically shown on the drawings.

Grade all sites, rights-of-way, and easements to prevent ponding of surface water, and to drain in a like direction as prior to construction, unless otherwise shown.

Areas to be seeded, sodded, or sprigged shall be fine graded and compacted, then disked a depth of two inches immediately prior to the placing of the grass. The top 2" of soil shall be available on-site material, unless specified otherwise.

Areas designated to re-grass themselves naturally shall be fine-graded, and disked.

Settlement or erosion, which affects the fine grading, shall be repaired as required until completion of the project and the warranty period.

Project Guarantee

Neither the final payment, nor any provision in the Contract, nor partial or entire use of the improvements embraced in this Contract by the OWNER or the public, shall constitute an acceptance of work not done in accordance with the Contract or relieve the CONTRACTOR of liability for faulty materials or workmanship.

This CONTRACTOR shall guarantee for a period of twelve calendar months from the date contained in the substantial completion certificate that all equipment and products are free from defects in their design, material, manufacture, and workmanship. Separate or individual warranties and guarantees by the suppliers of various equipment and products in lieu of the single source responsibility will not be acceptable. In the event any item is found defective during this twelve-month period, this CONTRACTOR shall provide all labor, replacement parts, supervision, and materials necessary to correct the defects at the project site without cost to the OWNER.

Any component so repaired shall be guaranteed by the CONTRACTOR to be defect-free for the ensuing twelve-month period, even if that period goes beyond the end of the original twelve-month period.

Manufacturer or supplier standard guarantees, which exceed the above twelve-month period shall be furnished to the OWNER; however, this in no way relieves this CONTRACTOR of his warranty period.

Each manufacturer and product supplier by furnishing his merchandise on this project, unconditionally warrants that, when said article or product is used as set forth herein, and operated and maintained within the said supplier's recommendations, the article will perform the services herein required of it.

The CONTRACTOR and his suppliers shall not be responsible for the project design concept.

Silt Fence

The silt fence used in this project shall be 36" wide and shall be non-biodegradable and resistant so most soil chemicals, acids, and alkali with a pH range of 3 to 12. The silt fence shall adhere, at a minimum, to the values listed below in the table.

Property	Test Method	Minimum Avg. Roll Value
Grab Tensile	**ASTM D4632**	**80 lb**
Elongation	**ASTM D4632**	**15%**
Mullen Burst	**ASTM D3786**	**180 psi**
Puncture	**ASTM D4833**	**35 lb**
Trap Tear	**ASTM D4533**	**35 lb**
AOS	**ASTM D4751**	**30 Sieve**
Permittivity	**ASTM D4491**	**0.05 sec^{-1}**

The CONTRACTOR shall install, maintain, and remove the silt fence as part of this project.

Re-grassing

CONTRACTOR shall furnish all labor, supervision, equipment, bedding materials, grass seed, sprigs, fertilizer and other items that may be necessary as follows:

a. Bermuda Grass - CONTRACTOR shall reseed all areas disturbed by his construction operations.

All seed must meet the requirements of the Texas Seed Law including the labeling requirements for showing pure live seed (PLS) name and type of seed. Seed furnished shall be of the previous season's crop and the date of analysis shown on each bag shall be within nine months of the time of delivery to the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety of seed shall be furnished for analysis and testing when directed by the ENGINEER. The amount of seed planted per acre shall be of the type specified below.

Water shall be clean and free of industrial wastes and other substances harmful to the growth of grass or the area irrigated.
Topsoil shall be native soils salvaged from the top 6" of disturbed area and stockpiled.

Fertilizer shall have an analysis of 15-15-15, or as indicated on the plans.

Straw mulch shall be oat, wheat or rice-straw, Prairie Grass, Bermuda Grass, other straw or hay approved by the ENGINEER.

Cellulose fiber mulch shall be natural cellulose fiber mulch produced from grinding clean whole wood chips. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizers and other additives. The mulch shall be such, that when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder.

Wood Fiber mulch shall be produced from ground newsprint with a labeled ash content not to exceed 7 percent. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizers and other additives. The mulch shall be such, that when applied, the material shall form a strong, moisture-retaining mat without the need for an asphalt binder.

After the designated areas have been rough graded to the lines, grades and typical sections indicated or as provided for in other items of this contract and any other soil area disturbed by the construction, likewise prepared, suitable seed bed shall be prepared. The seed bed shall consist of either 4" of approved topsoil or 4" of approved salvaged topsoil cultivated and rolled sufficiently to a state of good tilth. The optimum depth for seeding shall be 1/4". Water shall be applied as required to prepare the seed bed. Seeding shall be performed in accordance with the requirements hereinafter described.

Broadcast and straw mulch seeded areas shall immediately be watered with a minimum of 5 gallons of water per square yard or as needed and in the manner and quantity as directed by the ENGINEER.

Hydraulic seeded areas shall be watered commencing after the tackifier has dried with a minimum of 5 gallons of water per square yard or as needed to keep the seed bed in a wet condition favorable for the growth of grass.

Watering applications shall be constantly maintained the seed bed in a wet condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall of 1/2" or greater but shall be resumed before the soil dries out.
The seed bed shall be prepared as specified above and hydraulic planting equipment, which can place all material in a single operation, shall be used.

From March 1, to September 15, the hydraulic planting mixture and minimum rate of application per 1000 square feet shall be:

Hulled Bermuda Seed (PLS-0.83)	1 lb.
Water Soluble Fertilizer	13 lbs.
Fiber Mulch	
Cellulose	45.9 lbs.
Wood	57.4 lbs.

Soil Tackifier

Cellulose	1.4 lbs.
Wood	1.5 lbs.

From September 15 to November 1, add 3 pounds per 1000 square feet of winter rye with a PLS = 0.83 to above mixture, and 1/2 lb. unhulled Bermuda. Preferably the seeding should be accomplished in early spring - no seeding will be allowed from November 1, to February 28, without specific approval of the ENGINEER.

Straw mulch shall be spread uniformly over the area indicated or as designated by the ENGINEER at the rate of 2 to 2-1/2 tons of straw per acre. The actual rate of application will be designated by the ENGINEER. Straw may be hand or machine placed and shall be adequately secured.

Cellulose and wood fiber mulch shall be spread uniformly over the area indicated or as designated by the ENGINEER at the rate of 45 to 80 lbs. per 1000 square feet.

It shall be the CONTRACTOR's responsibility to maintain the initial shape and contour of the entire seeded/sprigged area, irrespective of the project's 12-month maintenance period, until such time as a 75% average grass coverage has been obtained.

<u>Cellular Grout</u>

I – SCOPE OF WORK

This work consists of providing a non-pervious, Low Density Cellular Concrete (LDCC) to fill abandoned pipes or other structures at the location shown in the plans in accordance with the details in the plans and these specifications.

II – MATERIALS

A. Portland cement shall comply with ASTM C150 (Type I, II or III).
B. Fly ash shall be Class C or Class F and compatible with foaming agent.
C. Water shall be free from deleterious substances.
D. Foaming agent shall conform to ASTM C796.
E. Admixtures for water reducing, retarding, accelerating, and other specific properties may be used when recommended by the manufacturer of the foaming agent.
F. LDCC shall have the following properties:

Range of Cast Density, PCF	24-30
Minimum Compressive Strength (28 Days), PSI	40
Flow Consistency per ASTM D6107	Greater than 7”

III – SUBMITTALS

A. Mix design for LDCC, including materials to be used and their sources.
B. Resume of CONTRACTOR showing experience as specified below, including qualifications of CONTRACTOR’s superintendent and/or foreman.

C. Description of equipment and placement methods to verify compliance with specifications.

IV – PRODUCTION

A. Foam generating equipment shall be used to produce a predetermined quantity of pre-formed foam which shall be mixed and blended with cementitious slurry. Equipment shall be calibrated to produce consistent foam with stable, uniform cellular structure.
B. LDCC shall be produced utilizing specialized automated proportioning, mixing, and foam producing equipment, which is capable of meeting the specified properties.
C. Avoid excessive handling of the material. After sufficient mixing of the foam with slurry, the material shall be conveyed promptly in its final location.
D. All equipment used must be approved by the foam manufacturer.

V – INSTALLATION

A. CONTRACTOR shall fill the existing abandonment as indicated in the plans or as directed by project engineer.
B. LDCC shall be pumped through injection ports located at bulkhead to allow abandonment to be completely filled.
C. All bulkheads and injection ports installed shall be capable of withstanding a minimum of 30 PSI or the allowable maximum pressure, whichever is greater and shall be water-tight.
D. Injection and vent ports and pipes must be securely installed and be able to receive a minimum 3” male threaded NPT.
E. Space injection points at intervals that allow material to be forced from one injection point to the next at pressures below maximum allowable pressure.
F. All water and other residual materials must be removed from pipe prior to initiating filling procedure. If required, dewatering shall be continuous during installation.
G. LDCC shall be placed in a manner so as not to cause collapsing of material, which may require multiple lifts depending upon length and diameter of pipe being abandoned.

VI – QUALITY CONTROL AND QUALITY ASSURANCE

A. CONTRACTOR shall have a record of experience and quality of work placing foam concrete that is satisfactory to the Engineer. Including the following:

1. Shall be capable of developing a mix design, batching, mixing, handling, and placing LDCC.
2. Shall be regularly engaged in the production and pumping of LDCC for filling abandoned pipes or other structures.
3. Workers included the CONTRACTOR’s superintendent and /or foreman, shall be fully qualified to perform the work and have had previous experience in production and pumping of LDCC under similar conditions.

B. TESTING

1. Testing to be performed by the OWNER or approved agency.
2. A minimum of four (4) 3”x 6” cylinders shall be molded for each shift of operation.

3. LDCC to be tested at any age after three (3) days for compressive strength. At least two (2) specimens from each set should be tested at 28 days in accordance with ASTM C-495 unless otherwise approved by engineer.
4. CONTRACTOR shall record and measure wet cast densities at the point of placement regularly. Mix shall be adjusted as required to obtain the specified cast density at the point of placement.
5. CONTRACTOR shall record and measure flow consistency regularly in accordance with ASTM D6107.

Coordination of Testing and Sterilization with Installation

The practice of "installing only", and delaying testing, sterilization, operation, and appurtenances until after completion will not be permitted and will cause items which are installed only to be disallowed on monthly partial payment estimates.

Preconstruction Video Documentation

A video recording of the site shall be done by the CONTRACTOR before beginning any construction. This requirement will be done to document pre-existing conditions prior to construction. One “thumb-drive” copy of the recording will be given to the ENGINEER prior to the beginning of construction.

Buy American Accommodations

Iron and steel products used on this project shall comply with TxDOT’s requirements for BUY AMERICA. Information is provided on the next page that outlines the BUY AMERICA requirements.

SUMMARY OF UTILITY RELOCATION

		7332-6002	7332-6008	7332-6009	7332-6014	7332-6015	7332-6018	7332-6019	7332-6020	7332-6021	7332-6024	7332-6025	7332-6029	7332-6033	7332-6036	7332-6037	7332-6042	7332-6043	7332-6044	7332-6046	7332-6048
SHEET NO.	LINE	1.5" C901 DR 9 Polyethelene Tubing	8" C900 DR 18 PVC	8" RJ C900 DR 18 PVC	Concrete encasement of pipe	6" Tapping sleeve and valve	Testing/flushing location	Ductile iron fittings	Customer service transfer and relocation of meter	Connect to lines 3" and smaller	Testing/flushing location	Reseeding disturbed areas	3" RJ SDR 21 CL 200 PVC	8" Directional drill	6" Steel encasement	6" Dry Bore	14" Steel encasement	14" Dry Bore	Sand embedment	Abandon existing 6" waterline with cellular grout.	Abandon existing 2" waterline with cellular grout.
		LF	LF	LF	LF	EA	EA	TON	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF
ROW CSJ#0919-19-094																					
137	LINE A	-	653	340	-	1	-	0.47	1	-	1	-	-	73	-	-	251	249	-	975	-
138	LINE G	-	-	-	114	-	-	-	-	-	-	114	-	-	-	-	-	-	114	-	-
138	LINE H	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
139	LINE I	-	-	-	-	-	1	0.31	-	1	-	-	236	-	220	220	-	-	-	150	75
140	LINE L	-	-	-	120	-	-	-	-	-	-	120	-	-	-	-	-	-	120	-	-
PROJECT TOTALS		**115**	**653**	**340**	**234**	**1**	**1**	**0.78**	**1**	**1**	**1**	**234**	**236**	**73**	**220**	**220**	**251**	**249**	**234**	**1125**	**75**

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TXDOT US 82: MALTA TO 98
UTILITY RELOCATION & HIGHWAY BORE
CENTRAL BOWIE COUNTY WSC

SUMMARY OF UTILITY RELOCATION

HAYTER ENGINEERING
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TxEng F-315 | TxSurv F-10028600 | OSBPE/LS #603 | ASBPE #2521 | LA #EF629
www.haytereng.com

KEVIN R. VANHOOZIER 127925

6/21/2023

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SCALE: AS SHOWN
PAGE: 136

Y2-065006-20.05(8)

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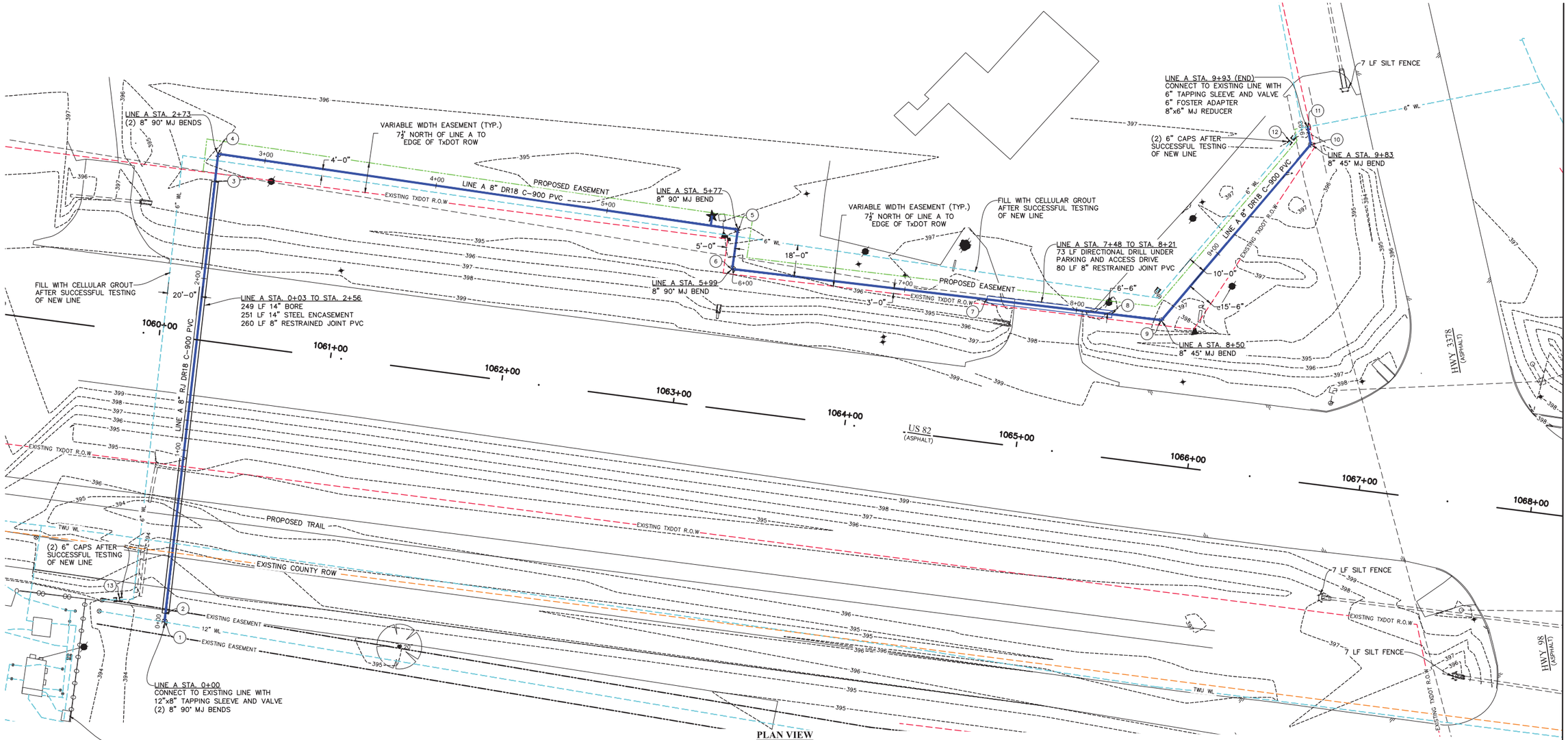
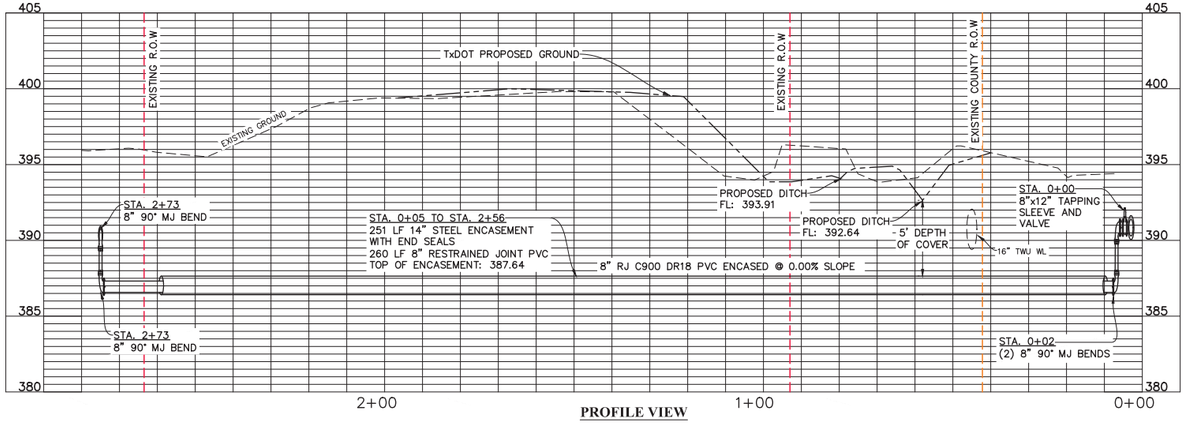


PLAN VIEW



PROFILE VIEW

LINE A COORDINATE TABLE			
Point #	Description	Latitude	Longitude
1	STATION 0+00 TAPPING SLEEVE & VALVE	33.4731687	-94.4728663
2	START OF BORE	33.4731817	-94.4728611
3	END OF BORE	33.4738365	-94.4725993
4	STATION 2+73 8" MJ 90 BEND	33.4738791	-94.4725823
5	STATION 5+77 8" 90 BEND	33.4735898	-94.4716475
6	STATION 5+99 8" 90 BEND	33.4735305	-94.4716737
7	START OF DIRECTIONAL DRILL	33.4733992	-94.4712126
8	END OF DIRECTIONAL DRILL	33.4733348	-94.4709865
9	STATION 8+50 8" MJ 45 BEND	33.4733094	-94.4708972
10	STATION 9+83 8" MJ 45 BEND	33.4735333	-94.4705509
11	STATION 9+93 TAPPING SLEEVE & VALVE	33.4735617	-94.4705496
12	CAP OF 6" WL TO BE ABANDONED	33.4735432	-94.4705865
13	CAP OF 6" WL TO BE ABANDONED	33.4732188	-94.4729405

SCALE: 1"=20'
BAR SCALE

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LINE A

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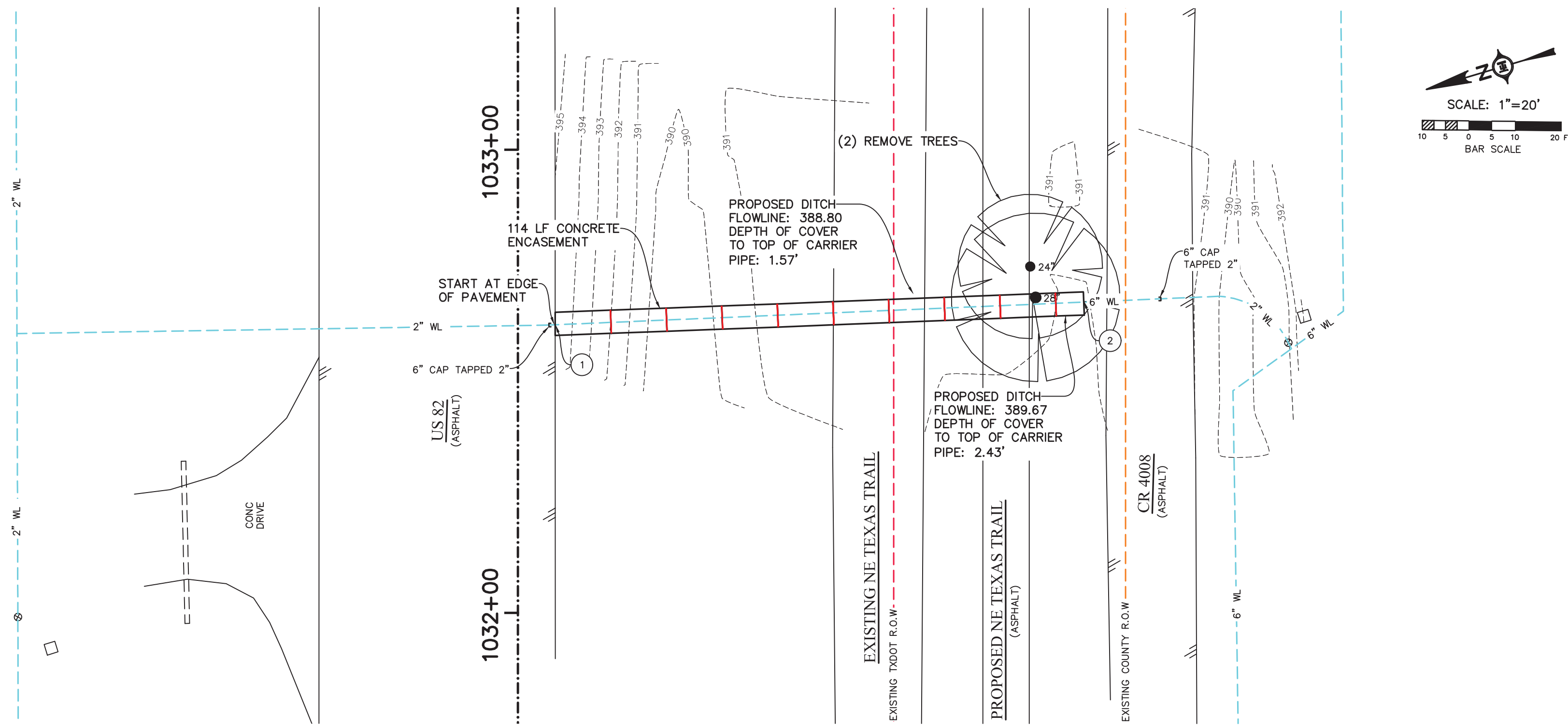
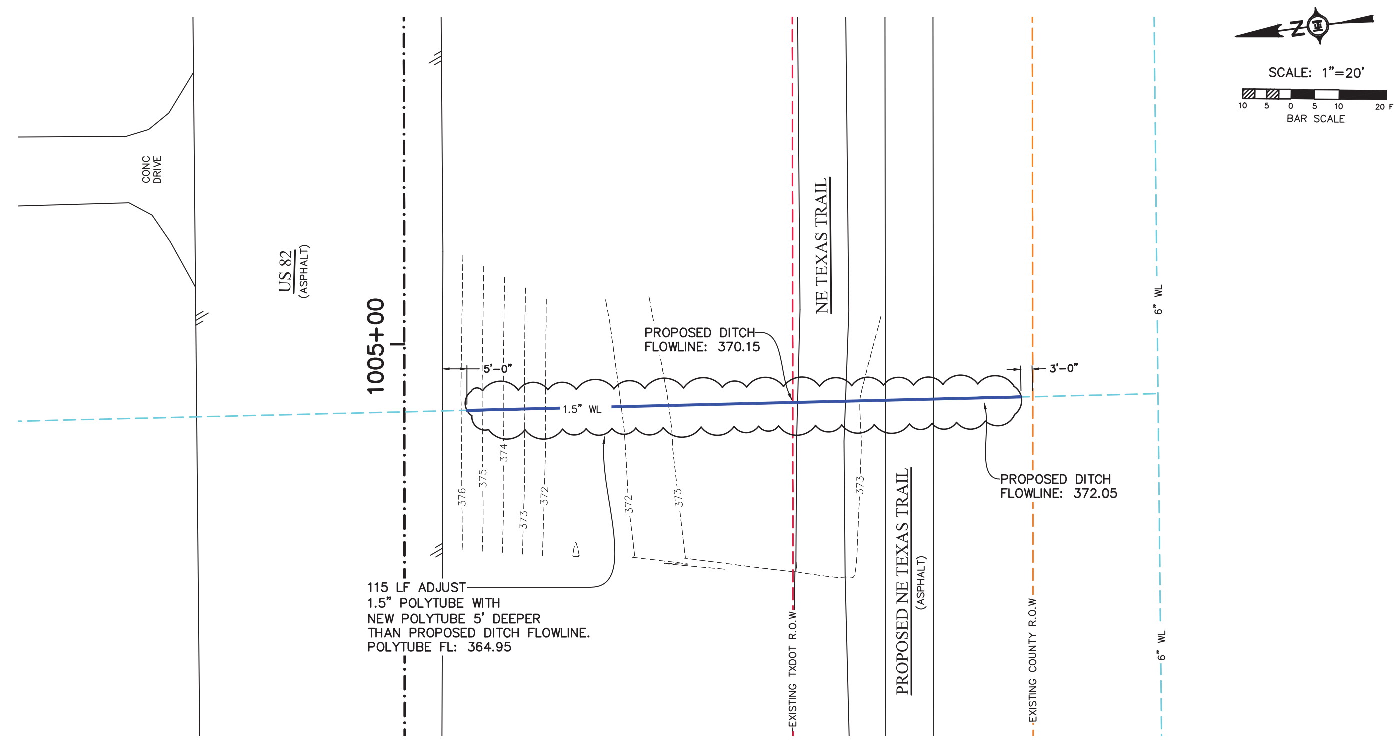


LINE G COORDINATE TABLE

Point #	Description	Latitude	Longitude
1	START OF CONCRETE ENCASEMENT	33.4760957	-94.4812398
2	END OF CONCRETE ENCASEMENT	33.4757960	-94.4813493

LINE G PLAN VIEW



LINE H PLAN VIEW

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LINE G & LINE H

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Y2-065006-20.05(8)

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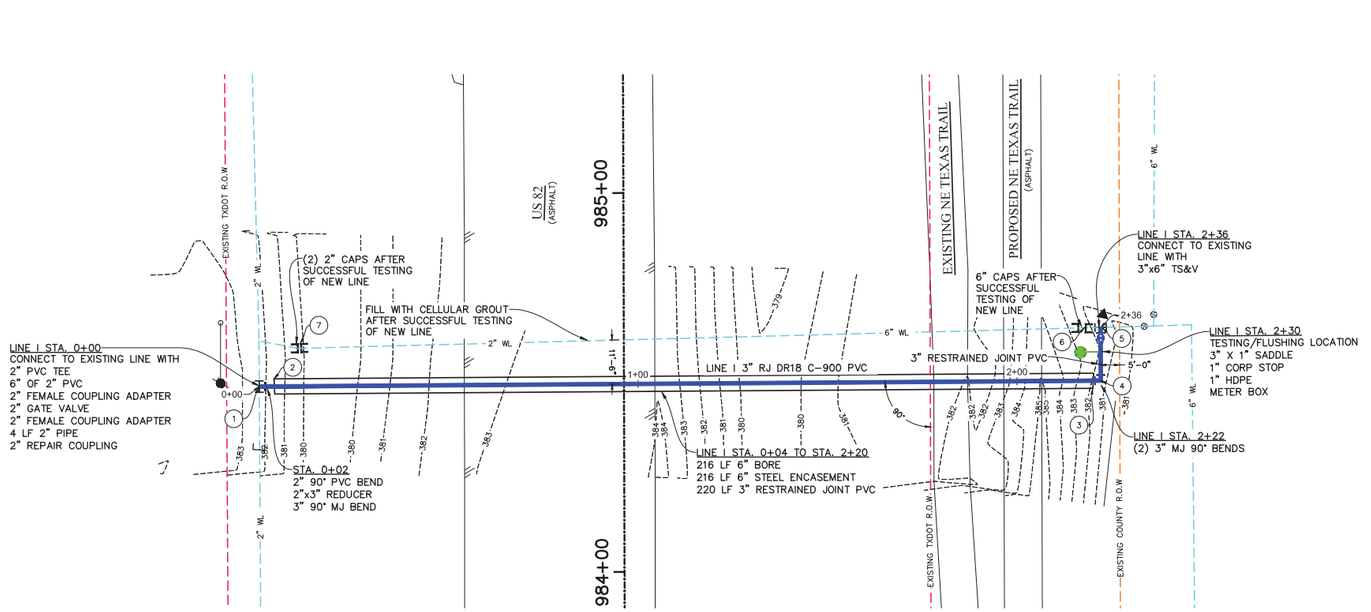
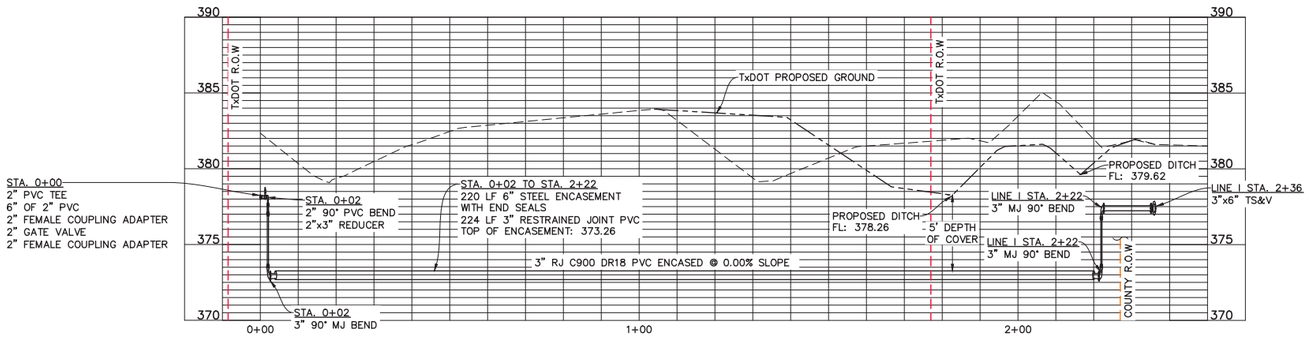
LINE I COORDINATE TABLE			
Point #	Description	Latitude	Longitude
1	STATION 0+00 2" TEE	33.4807270	-94.4960303
2	START OF BORE	33.4807166	-94.4960345
3	END OF BORE	33.4801551	-94.4962656
4	STATION 2+22 3" 90 BEND	33.4801499	-94.4962678
5	STATION 2+36 6" TS&V	33.4801371	-94.4962242
6	CAP OF 6" WL TO BE ABANDONED	33.4801475	-94.4962205
7	CAP OF 2" WL TO BE ABANDONED	33.4805792	-94.4960160

NOTE: TO INSTALL STATION 0+00 TEE, CLOSE EXISTING VALVE ON SOUTHERN SIDE OF HIGHWAY. THIS DISRUPTION OF SERVICE SHALL BE AS MINIMAL AS POSSIBLE.



LINE I PLAN VIEW



PROFILE VIEW

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SCALE: 1"=20'

BAR SCALE 10 5 0 5 10 20 FT

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LINE I

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Y2-065006-20.05(8)

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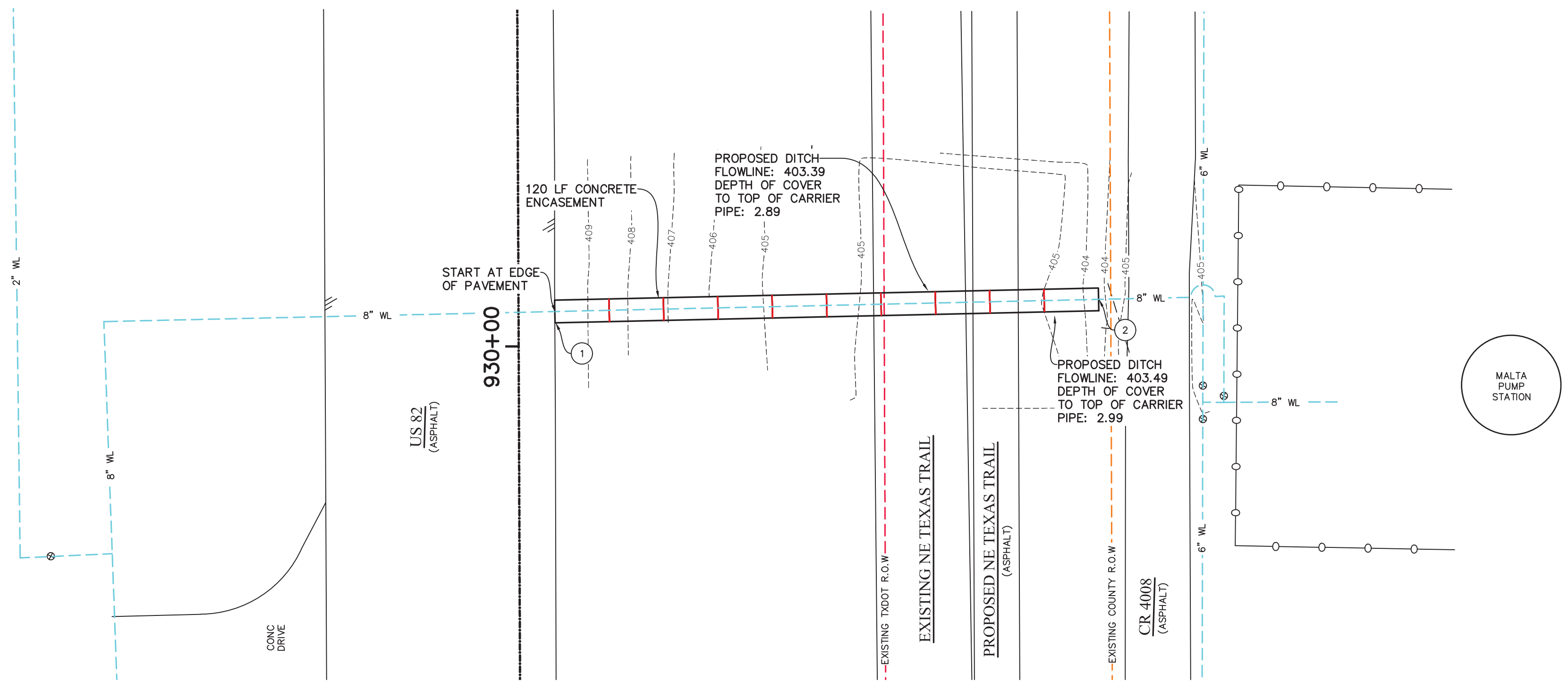
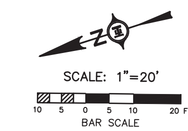


LINE L PLAN VIEW



LINE L COORDINATE TABLE			
Point #	Description	Latitude	Longitude
1	START OF CONCRETE ENCASEMENT	33.4853843	-94.5129938
2	END OF CONCRETE ENCASEMENT	33.4850710	-94.5131166

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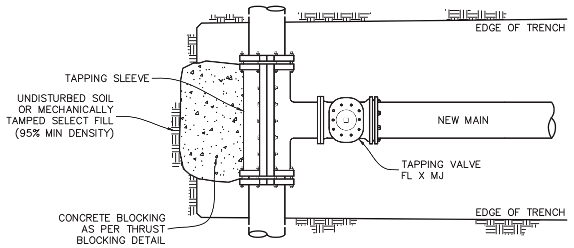
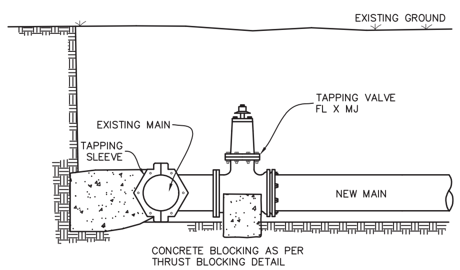
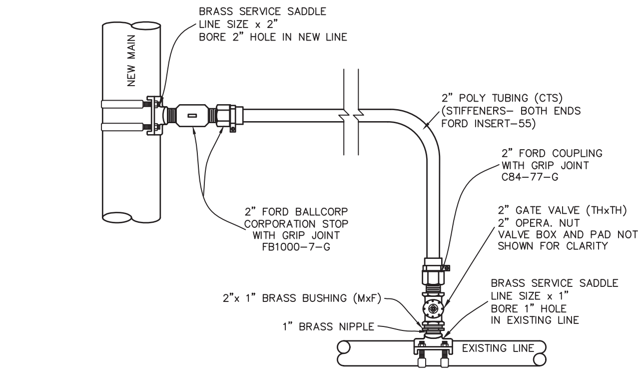




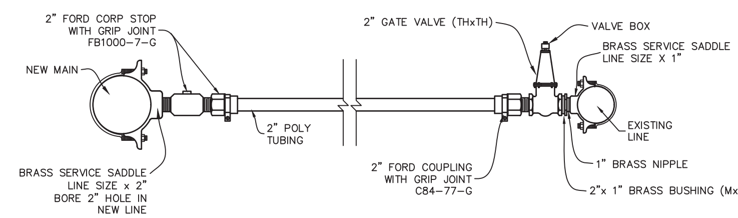
BOTH VALVE AND SLEEVE (INCLUDING NUTS, BOLTS, AND FLANGES) SHALL BE WRAPPED WITH MINIMUM 3 MIL POLY WRAP, OR SEALED WITH RUBBER-IN-A-CAN PRIOR TO THRUST BLOCK PLACEMENT OR BACKFILL. PIPE WALL REMOVED FROM MAIN BY TAPPING SHALL BE PROVIDED TO ENGINEER.

TAPPING SLEEVE & VALVE

SCALE: N.T.S.



PLAN VIEW

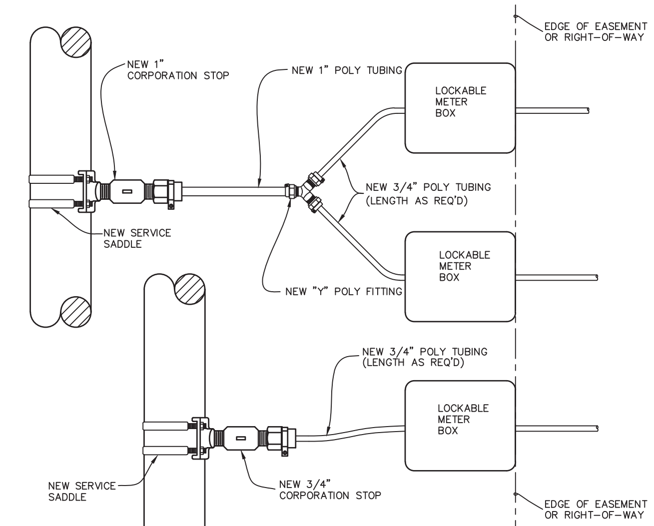


ILLUSTRATIVE SECTION VIEW

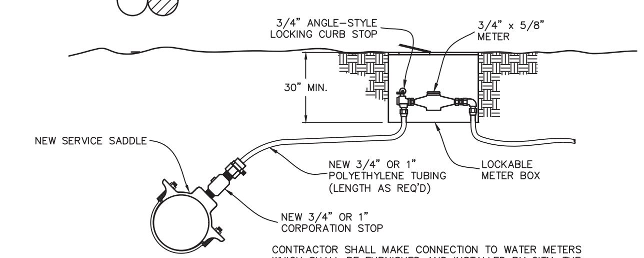
NOTE: FOR EXISTING MAINS, CUT IN A LINE SIZE TEE IN PLACE OF THE SERVICE SADDLE. ADAPT BRANCH OF NEW TEE TO VALVE (NO PVC MALE ADAPTERS.)

CONNECTION OF NEW MAIN TO 3" AND SMALLER EXISTING MAINS

SCALE: N.T.S.



PLAN VIEW



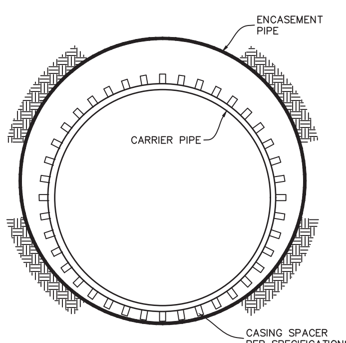
CONTRACTOR SHALL MAKE CONNECTION TO WATER METERS WHICH SHALL BE FURNISHED AND INSTALLED BY CITY. THE CONTRACTOR SHALL PROVIDE NO LESS THAN TWO DAYS NOTICE TO THE SYSTEM OWNER PRIOR TO WATER METER CONNECTION. LOCATIONS OF PROPOSED CONNECTIONS SHALL BE AS DETERMINED IN THE FIELD BY THE SYSTEM OWNER.

ALL SERVICE LINE TUBING SHALL BE POLYETHYLENE TUBING PER TECHNICAL SPECIFICATIONS.

PROFILE VIEW

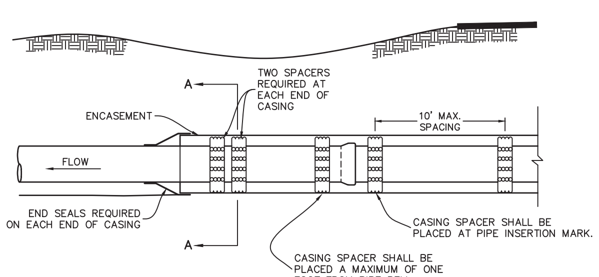
WATER SERVICE CONNECTION

SCALE: N.T.S.



SECTION A-A

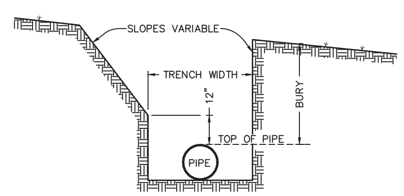
PROJECTION-TYPE CASING SPACER



HWY/RR ENCASEMENT DATA						
PIPE DESCRIPTION	CASING NOMINAL SIZE	"RACI: CASING SPACER		CASING REQ'D	WALL THICKNESS	CASING COATING
		PROJECTION REQ'D	TYPE REQ'D			
4" C900 DR 18 PVC	8	0.98	F,G	CERTA-LOK YELOMINE	0.410	NONE
4" C900 DR 18 PVC	8	0.98	F,G	STEEL	0.322	ASPHALT
6" C900 DR 18 PVC	10	0.98	F,G	CERTA-LOK YELOMINE	0.511	NONE
6" C900 DR 18 PVC	10	0.98	F,G/M,N	STEEL	0.365	ASPHALT
8" C900 DR 18 PVC	14	1.42	A,B/M,N	STEEL	0.375	ASPHALT

INSTALLATION IN ENCASEMENT PIPE

SCALE: N.T.S.



PIPE		TRENCH WIDTH		MINIMUM
USED FOR	SIZE	MINIMUM	MAXIMUM	BURY (1)
WATER SERVICES	3/4"-1-1/4"	6"	12"	30"
WATER SERVICES	1 1/2"-2-1/2"	6"	12"	30"
WATER MAINS	1"	6"	12"	30"
WATER MAINS	1-1/4"	6"	12"	30"
WATER MAINS	1-1/2"	6"	12"	30"
WATER MAINS	2"	6"	12"	30"
WATER MAINS	2-1/2"	6"	12"	30"
WATER MAINS	3"	6"	18"	30"
WATER AND SEWER MAINS	4"	20"	24"	36"
WATER AND SEWER MAINS	6"	22"	30"	36"
WATER AND SEWER MAINS	8"	24"	30"	36"
WATER AND SEWER MAINS	10"	26"	30"	42"
WATER AND SEWER MAINS	12"	28"	36"	42"
SEWER MAINS	15"	31"	42"	42"
WATER MAINS	16"	31"	42"	42"
WATER AND SEWER MAINS	18"	35"	42"	42"

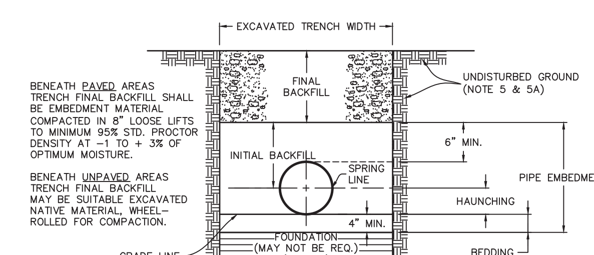
(1) THESE BURIES ARE APPLICABLE TO GRAVITY PIPELINE WHERE NO DEPTH IS SPECIFIED IN THE PLAN/PROFILE DRAWINGS, AND TO PRESSURE PIPELINES. IN ADDITION, NO PRESSURE LINE SHALL BE LESS THAN 36" DEEP UNDER BORROW DITCHES OR CREEK BOTTOMS. WHERE SPECIFIED ELEVATIONS ARE SHOWN ELSEWHERE FOR GRAVITY LINES, SUCH AS IN PLAN/PROFILE DRAWINGS, THOSE GRADES SHALL GOVERN.

TRENCH WIDTH AND BURY GRAVITY AND/OR PRESSURE LINES

SCALE: N.T.S.

BENEATH PAVED AREAS TRENCH FINAL BACKFILL SHALL BE EMBEDMENT MATERIAL COMPACTED IN 8" LOOSE LIFTS TO MINIMUM 95% STD. PROCTOR DENSITY AT -1 TO +3% OF OPTIMUM MOISTURE.

BENEATH UNPAVED AREAS TRENCH FINAL BACKFILL MAY BE SUITABLE EXCAVATED NATIVE MATERIAL, WHEEL-ROLLED FOR COMPACTION.



ALL FOUNDATION MATERIAL AND PIPE EMBEDMENT SHALL MEET REQUIREMENTS OF THE INSTALLATION AND BACKFILL OF BURIED PIPE-TABLE 1 TECHNICAL SPECIFICATION, COMPACTED TO MIN. 95% STD. PROCTOR DENSITY. AT -1 TO +3% OF OPTIMUM MOISTURE.

BACKFILL NOTES:

1. ON HIGHWAY RIGHT-OF-WAY, BACKFILL METHODS SHALL CONFORM TO THE OWNER'S PERMIT IF MORE RESTRICTIVE THAN NOTED ABOVE.

2. SEE "STREET, DRIVEWAY, AND SIDEWALK REPAIRS" STANDARD FOR WEARING SURFACE, BASE AND SUBBASE REQUIREMENTS FOR TRENCHES BENEATH SURFACED OR PAVED AREAS.

3. TRENCHES BENEATH STRUCTURES SHALL BE BACKFILLED SAME AS UNDER SURFACED AREAS.

4. PIPE SHALL NOT BE LAID ON UNSTABLE FOUNDATION. THE CONTRACTOR SHALL REMOVE SUCH UNSUITABLE MATERIAL AND REPLACE IT WITH ACCEPTABLE MATERIAL.

5. FOR TRENCHING IN UNPAVED AREAS, IN THE AREA 12" OR MORE ABOVE THE TOP OF THE PIPE, THE EXCAVATED TRENCH WIDTH AND BACKSLOPE MAY VARY TO COMPLY WITH APPROPRIATE SAFETY PRACTICES AND REGULATIONS.

5A. IN ALL TRENCHED AREAS THAT ARE TO RECEIVE PAVEMENT REPAIR, THE PIPE WILL BE INSTALLED IN TRENCHES WITH NEAR VERTICAL WALLS EMPLOYING OSHA-APPROVED TRENCH SAFETY METHODS (WALL JACKS, TRENCH BOXES, ETC). SLOPING THE SIDES OF THE TRENCH WILL NOT BE ALLOWED SO THAT PAVEMENT REPAIR AT THE TOP OF THE TRENCH WILL BE MINIMIZED.

BACKFILL FOR SANITARY SEWER (GRAVITY AND AND PRESSURE) AND FOR 6" OR LARGER POTABLE WATER MAINS

SCALE: N.T.S.

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CONSTRUCTION STANDARDS

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THIS SEAL IS AUTHORIZED TO APPEAR ON SHEETS 1-8 OF HAYTER ENGINEERING PROJECT #Y2-065006-20.05(8) "TXDOT US 82: MALTA TO 98 UTILITY RELOCATION & HIGHWAY BORE"

STATE OF TEXAS
KEVIN R. VANHOOZIER
127925
LICENSED PROFESSIONAL ENGINEER

6/21/2023

DRAWN BY: CK
DATE: JUNE 2023
SCALE: AS SHOWN

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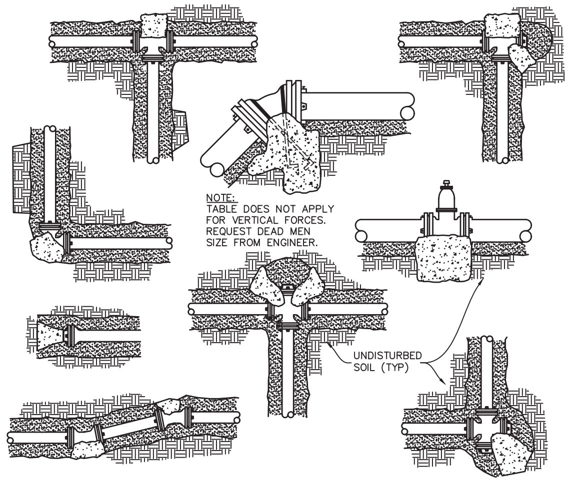


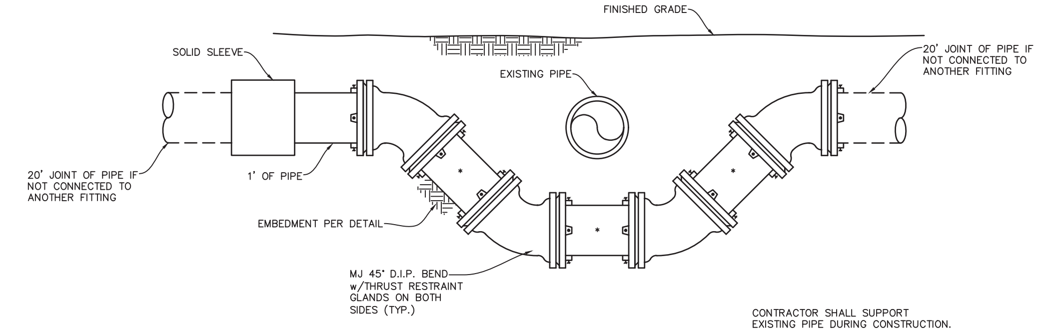
MINIMUM SQ.FT. BEARING AREA REQUIRED AT 150 PSI.

PIPE	11-1/4°	22-1/2°	45°	90°	VALVES,TEES & DEAD ENDS
2"	0.2	0.2	0.5	0.8	0.6
4"	0.5	0.8	1.7	2.7	2.8
6"	0.9	1.5	3.0	6.0	4.0
8"	1.4	2.9	6.0	10.0	8.5
10"	2.0	4.5	9.0	16.2	12.0
12"	3.0	6.8	12.0	21.0	16.0
18"	6.2	14.0	23.0	50.0	30.0
20"	11	21	42.2	78	55

1. AREA IS BASED ON 1000 PSF ALLOWABLE BEARING PRESSURE.
2. WHEN SOFT CLAY IS ENCOUNTERED THE BEARING AREAS SHALL BE DOUBLED.
3. USE CONCRETE FORMS TO KEEP CONCRETE CLEAR OF ALL BOLTS AND FLANGES.
4. TABLE IS BASED ON AWWA NO. 23, PVC PIPE DESIGN MANUAL.
5. ALL FITTINGS (INCLUDING NUTS AND BOLTS) TO BE DOUBLE WRAPPED WITH MINIMUM 3 MIL POLY WRAP.
6. THRUST RESTRAINT GLANDS ARE REQUIRED ON ALL MJ CONNECTIONS IN ADDITION TO CONCRETE THRUST BLOCKING

CONCRETE THRUST BLOCKING SCHEDULE

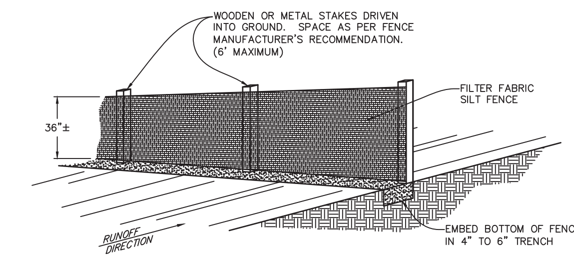
SCALE: N.T.S.



AVOIDING CONFLICTING UTILITY LINES

SCALE: N.T.S.

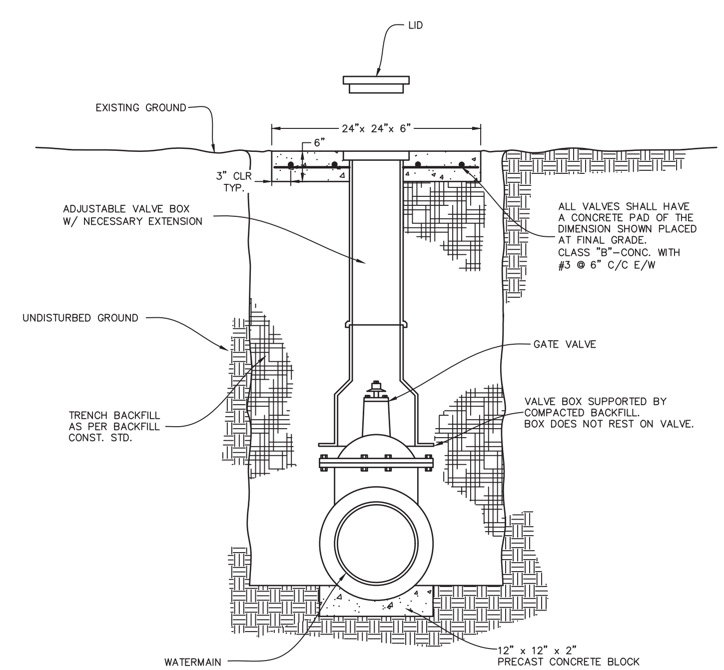
* ONLY SINGLE JOINTS OF PIPE SHALL BE USED BETWEEN FITTINGS.



TYPICAL SILT FENCE BARRIER

EROSION AND SEDIMENT CONTROL

SCALE: N.T.S.



WATER VALVE BURIED INSTALLATION

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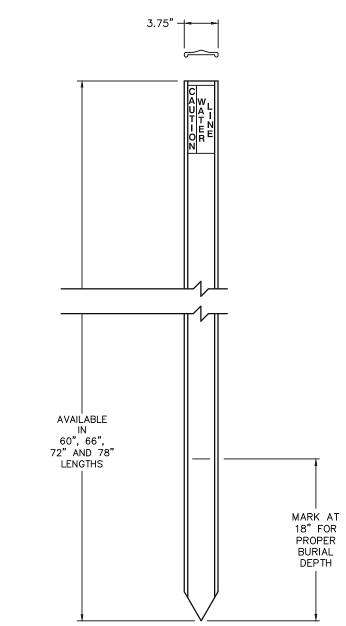

UTILITY MARKER

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NOTE: LOCATION OF EXISTING BURIED UTILITIES, WHERE SHOWN, IS APPROXIMATE ONLY. THERE MAY EXIST UTILITIES WHICH ARE NOT SHOWN. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTION OF ALL BURIED UTILITIES.

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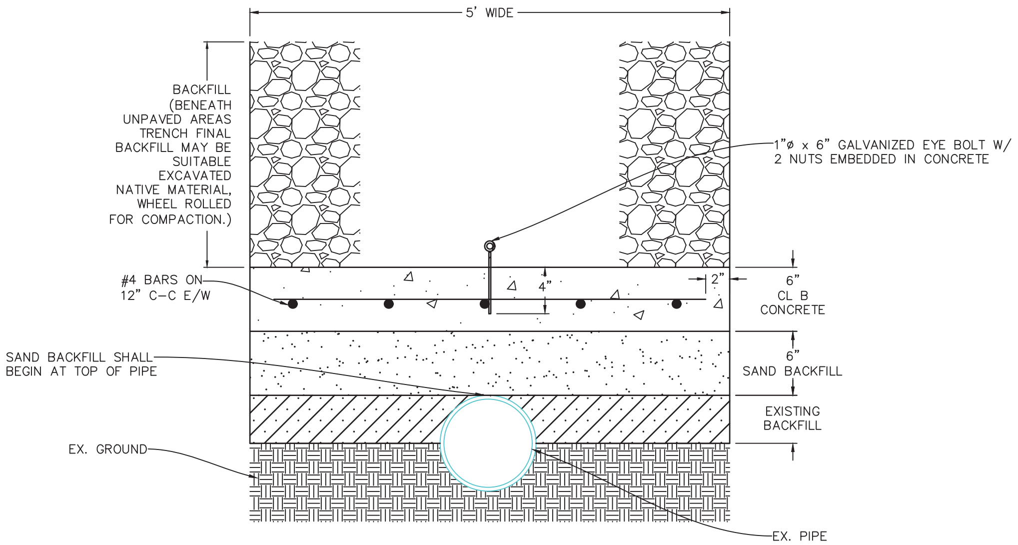

CONCRETE ENCASEMENT

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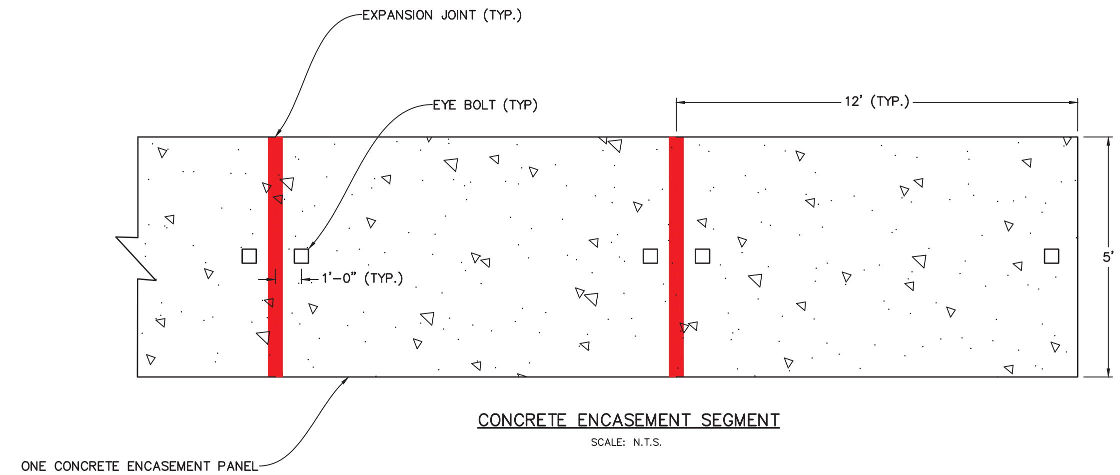

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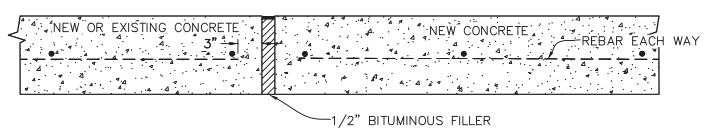
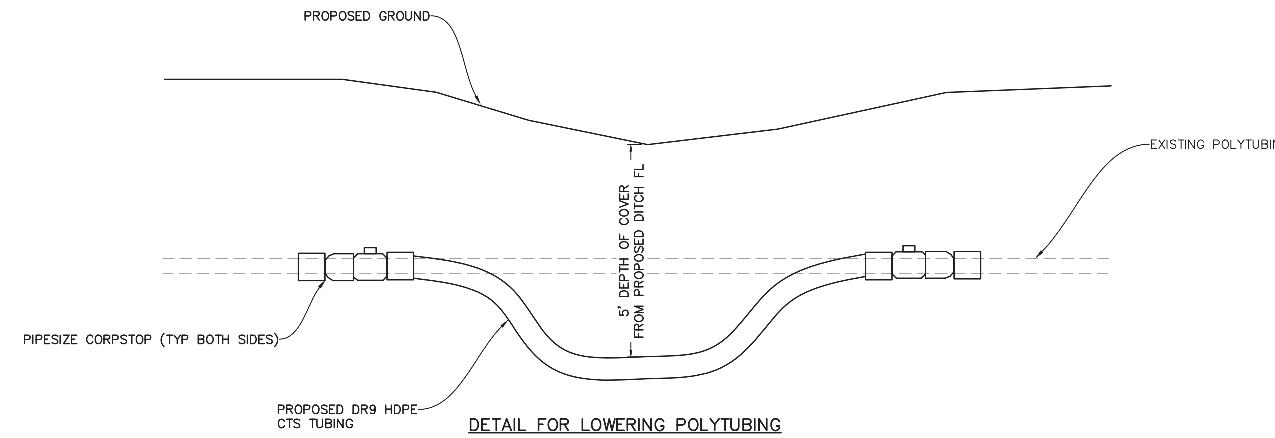


EXPANSION JOINT



DETAIL FOR LOWERING POLYTUBING

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KEVIN R. VANHOOZIER 127925 LICENSED PROFESSIONAL ENGINEER

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