FHWA TEXAS DIVISION	PROJECT NO.			SHEET NO.
	F 2021(845)			1
STATE	DISTRICT	COUNTY		
TEXAS	ABL	HOWARD		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0068	07	052, ETC	US 87	

DESIGN SPEED = (MAIN LANES) 70 mph
CURRENT A.D.T. (2019) = 5816 vpd
PROJECTED A.D.T. (2039) = 8026 vpd
FUNCTIONAL CLASS = PRINCIPAL ARTERIAL
EXISTING NBI# = N/A
PROPOSED NBI# = N/A

INDEX OF SHEETS

SEE SHEET 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

PROJECT NO. F 2021(845)

US 87
HOWARD COUNTY

LIMITS: *US 87 (CSJ:0068-07-052)*
FROM MARTIN COUNTY LINE
TO NORTH OF CR 50
LENGTH OF ROADWAY = 25,945.92 FT = 4.914 MI
LENGTH OF BRIDGE = 0.00 FT = 0.000 MI

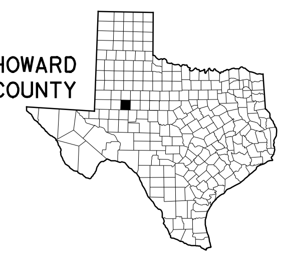
LIMITS: *US 87 (CSJ:0068-08-068)*
FROM NORTH OF CR 50
TO FM 2230
LENGTH OF ROADWAY = 55,210.28 FT = 9.699 MI
LENGTH OF BRIDGE = 0.00 FT = 0.000 MI

TOTAL LENGTH OF ROADWAY = 77,156.20 FT = 14.613 MI
TOTAL LENGTH OF BRIDGE = 0.00 FT = 0.000 MI
TOTAL LENGTH OF PROJECT = 77,156.20 FT = 14.613 MI

FOR THE CONSTRUCTION OF: *SAFETY IMPROVEMENT PROJECT*

CONSISTING OF: *INSTALL CABLE BARRIER, SAFETY LIGHTING, INTERSECTION IMPROVEMENTS*

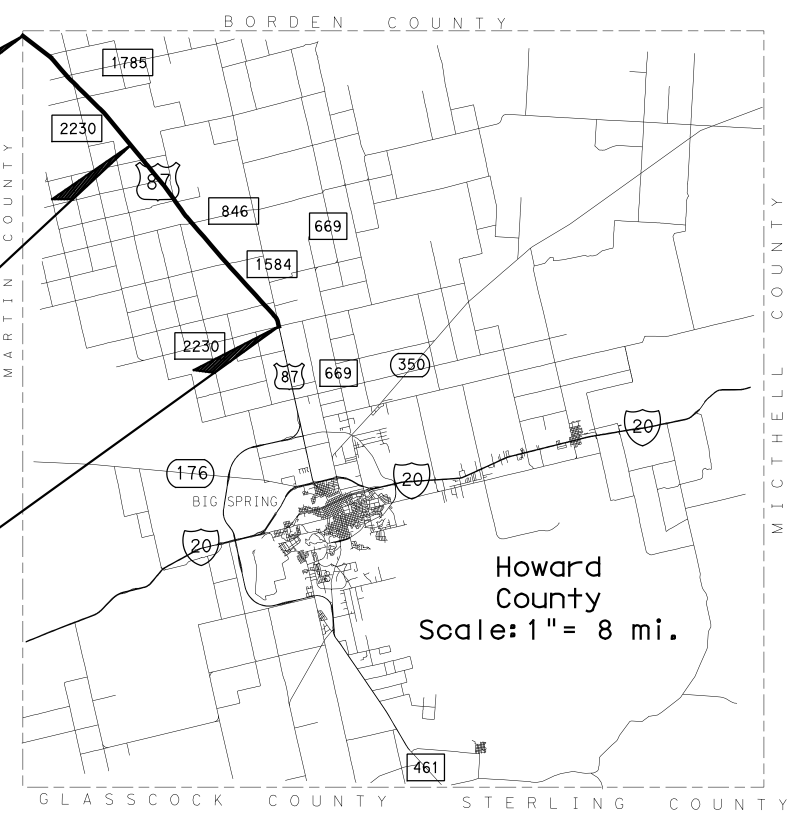
HOWARD COUNTY



END PROJECT
BEGIN CONTROL
CSJ: 0068-07-052
REF MRK: 354+1.388 mi.
STA: 1159+56.20

CSJ BREAK
END CSJ: 0068-07-052
BEGIN CSJ: 0068-08-068
REF MRK: 360+0.837 mi.
STA: 900+10.28

BEGIN PROJECT
END CONTROL
CSJ: 0068-08-068
REF MRK: 370+0.907 mi.
STA: 388+00.00



EXCEPTIONS: *N/A*
EQUATIONS: *N/A*
RAILROAD CROSSINGS: *N/A*

NOTE:
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION , NOVEMBER 1, 2014, AND THE CONTRACT PROVISIONS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 2012).

FINAL PLANS

LETTING DATE: AUGUST 2021
DATE CONTRACTOR BEGAN WORK: ____
DATE WORK WAS COMPLETED: ____
DATE WORK WAS ACCEPTED: ____
FINAL CONTRACT COST: $ ____
CONTRACTOR : ____

CERTIFICATION FOR FINAL PLANS

THIS PROJECT WAS BUILT ACCORDING TO THE PLANS AND SPECIFICATIONS. THESE FINAL PLANS REFLECT THE WORK DONE AND THE QUANTITIES SHOWN THEREON AND ON THE FINAL ESTIMATE ARE FINAL QUANTITIES.

AREA ENGINEER DATE

THE DISTRICT TRAFFIC SAFETY COMMITTEE HAS REVIEWED THE TRAFFIC CONTROL PLAN FOR THIS PROJECT AND IT IS IN COMPLIANCE WITH CURRENT TRAFFIC CONTROL STANDARDS.

DocuSigned by: Casey L. McGee, P.E. 5/27/2021
23FFE8857A804A6...
COMMITTEE CHAIRMAN DATE

Texas Department of Transportation

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED PROFESSIONAL ENGINEER
5/25/2021
Christopher Hartke

SUBMITTED FOR LETTING: 5/27/2021
DocuSigned by: Christopher Hartke
176D5097586894C...
CHRISTOPHER HARTKE, P.E.
TEAGUE NALL & PERKINS PROJECT MANAGER

RECOMMENDED FOR LETTING: 5/27/2021
DocuSigned by: Eric Welch
3CA29A463B0047A...
ERIC WELCH, P.E.
TxDOT PROJECT MANAGER

RECOMMENDED FOR LETTING: 5/27/2021
DocuSigned by: Neil Welch
F73FB89E3214468...
NEIL WELCH, P.E.
AREA ENGINEER

RECOMMENDED FOR LETTING: 5/31/2021
DocuSigned by: Michael Haithcock
5757E28879884FD...
MICHAEL A. HAITHCOCK, P.E.
DIRECTOR OF T P & D

APPROVED FOR LETTING: 6/1/2021
DocuSigned by: Thomas G. Allbritton, P.E.
0F6F7E0A37D430...
THOMAS G. ALLBRITTON, P.E.
DISTRICT ENGINEER

PENTABLE:
DATE: 5/25/2021 8:05:24 AM
FILE: ...\US 87\PROD_SHEETS\TITLE SHEET.dgn

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET WITH A "#" HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/25/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

INDEX OF SHEETS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR				2
GRPH CHECK	0068	07	052, ETC	
JKB				

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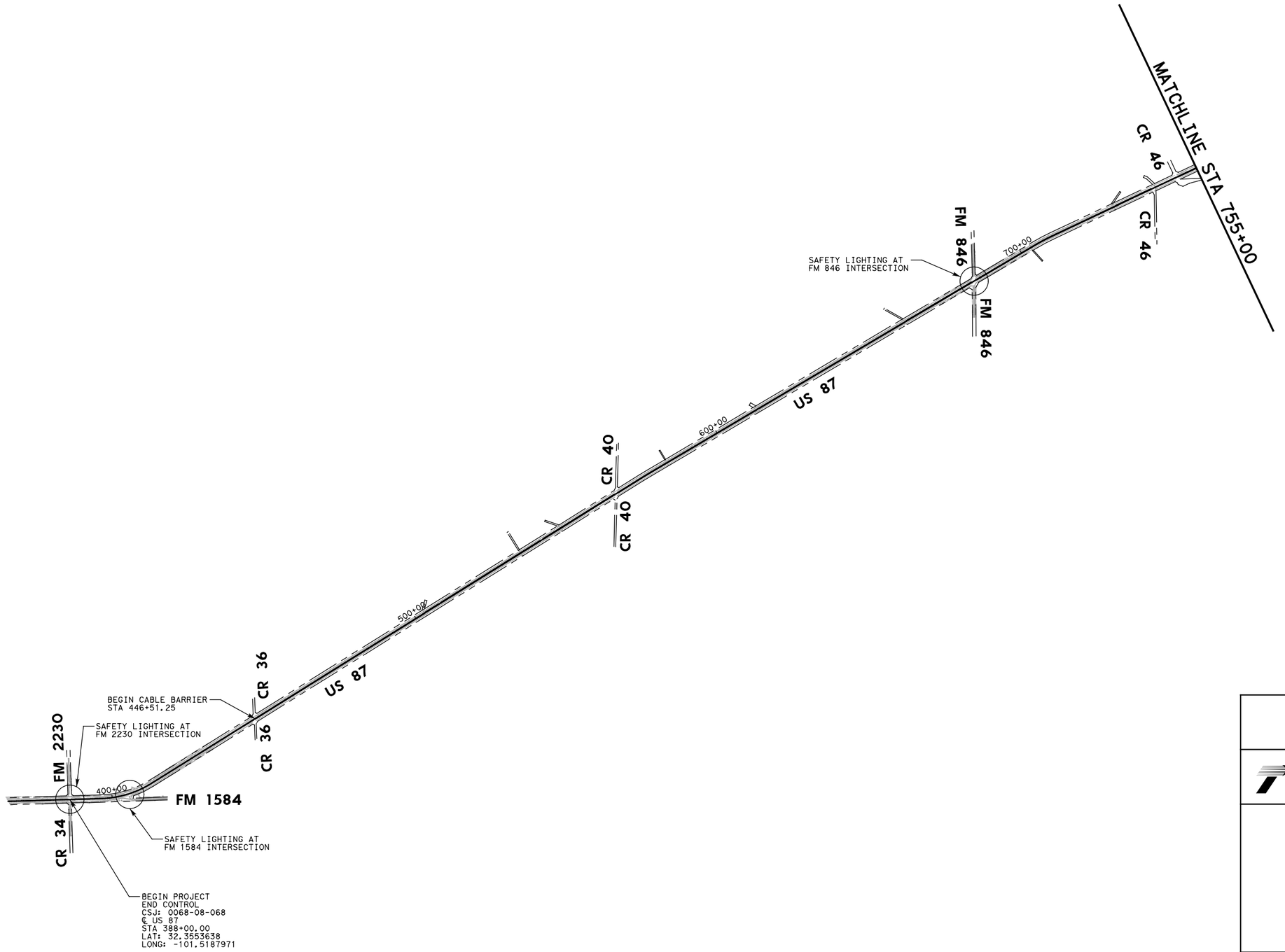

2000 1000 0 2000 4000

SCALE: 1" = 4000'

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

PROJECT LAYOUT

SHEET (1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	3
GRPH CHECK				
JKB				

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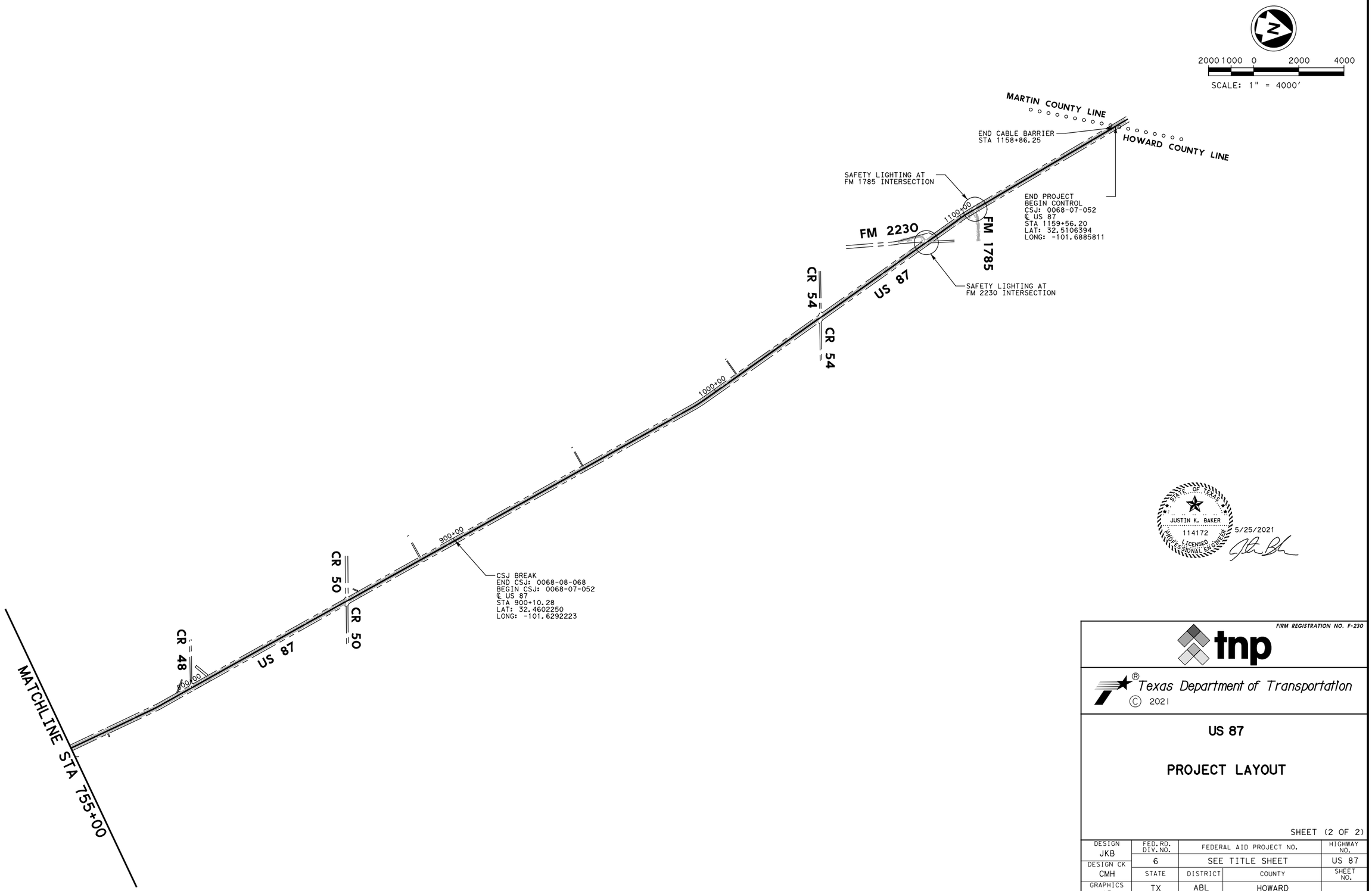

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

PROJECT LAYOUT

SHEET (2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR				4
GRPH CHECK	0068	07	052, ETC	
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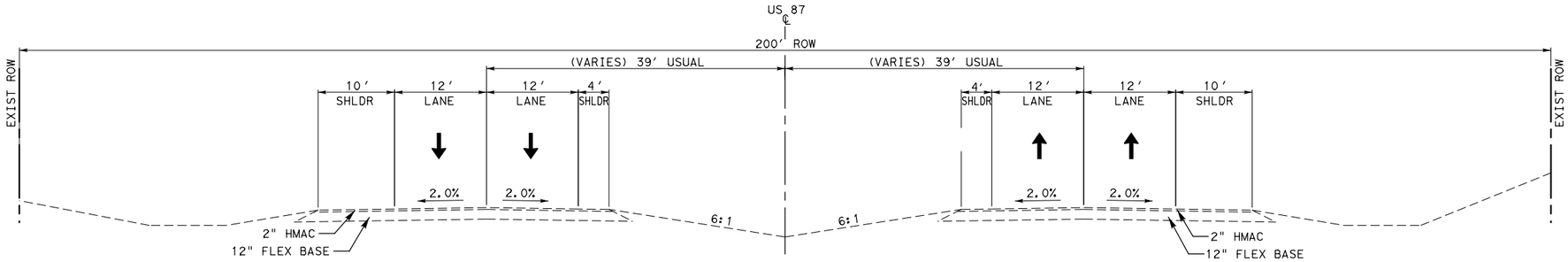
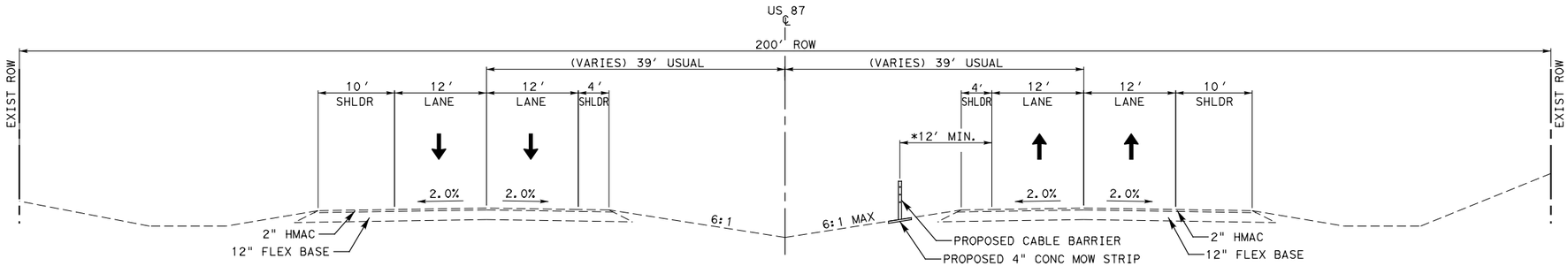
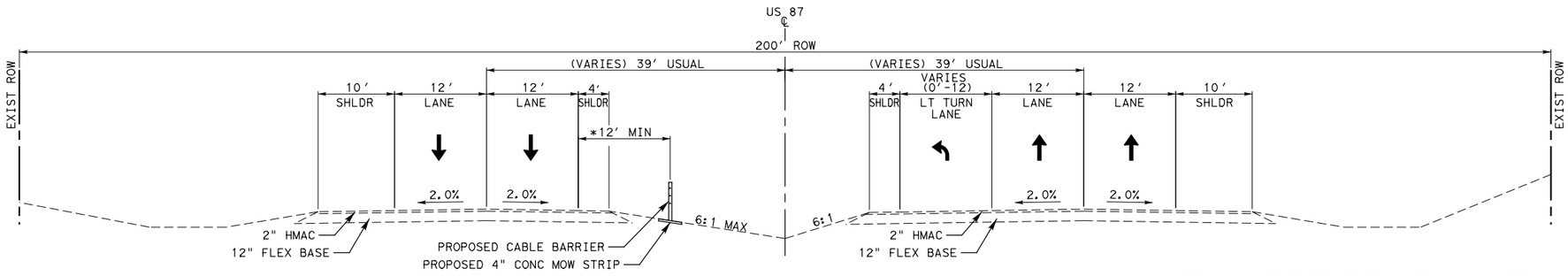


EXISTING US 87 TYPICAL SECTION
STA 420+06.56 TO STA 1159+56.20



PROPOSED US 87 TYPICAL SECTION
STA 420+06.56 TO STA 1159+56.20

* SEE PLAN LAYOUTS FOR EXACT LOCATION AND LIMITS



PROPOSED US 87 TYPICAL SECTION
STA 420+06.56 TO STA 1159+56.20

* SEE PLAN LAYOUTS FOR EXACT LOCATION AND LIMITS

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/25/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TYPICAL SECTIONS

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	5
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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DATE: 5/25/2021 7:50:47 AM jbaker

ABILENE DISTRICT GENERAL NOTES
2014 SPECIFICATIONS

General

Contractor questions on this project are to be addressed to the following individual(s):

Neil Welch, P.E.: Neil.Welch@txdot.gov
Ryan R. Sayles, P.E.: Ryan.Sayles@txdot.gov
(Big Spring Area Office)

Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

All questions submitted that generate a response will be posted through this site.
The site is organized by:
District
Project Type (Construction or Maintenance)
Letting Date
CCSJ/Project Name.

Failure to make necessary corrections to SW3P based on SW3P inspections will be cause for withholding the monthly estimate until such corrections have been made.

Failure to make necessary corrections to traffic control items based on barricade inspections will be cause for withholding the monthly estimate until such corrections have been made.

Provide ingress/egress to the adjacent properties in areas under construction. Phased construction of driveways and streets shall be required to provide uninterrupted access to adjacent properties. Coordinate work with the property owners before beginning any construction in the vicinity of the drive.

Environmental

Endangered and Protected Species

1. Migratory Birds
    a. Bird nesting season is typically 15Feb through 15Sep annually.
    b. The Contractor will avoid disturbing, destroying, removing, or relocating migratory birds and active nests found in trees, culverts, bridges, on the ground, or anywhere they are encountered.

Project Number: See Title Sheet
Control: 0068-07-052, ETC
County: Howard
Highway: US 87

    c. Perform all tree trimming and other vegetation clearing activities during the non-breeding season (typically 15Sep-15Feb annually). Perform any inactive nest removal and bird exclusion methods to prevent birds from establishing nests. Phasing of work during construction may be necessary to stay in compliance.
    d. When active nests are unexpectedly encountered on-site during construction, the Contractor will stop work and immediately notify the Engineer. Take measures to avoid disturbance of these birds, their occupied nest, eggs, and/or young, in accordance with the Migratory Bird Treaty Act, Texas Parks and Wildlife Code, and TxDOT policy.
    e. The Engineer will notify the Contractor when work may resume.
    f. The Contractor should be prepared to prevent migratory birds from building nests by utilizing nest prevention methods, such as bird-deterrent netting and bird-repelling sprays and/or gels, between 15Feb and 15Sep. The Contractor can discuss other preventative measures with the Engineer and/or District Environmental Staff.

Best Management Practices

1. Bird BMPs
    a. Not disturbing, destroying, or removing active nests, including ground nesting birds, during the nesting season;
    b. Avoiding the removal of unoccupied, inactive nests, as practicable;
    c. Preventing the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair;
    d. Not collecting, capturing, relocating, or transporting birds, eggs, young, or active nests without a permit.

Item 5, "Control of Work"

Use Method C for construction surveying.

All known utilities are identified in the plans, including the crossing of power lines. Use this information to identify potential issues with power poles and power lines prior to bidding. Make necessary arrangements with utility owners regarding temporary protections such as bracing power poles, and de-energizing power lines. The Department will not reimburse the cost of such temporary protections to the Contractor, unless the Engineer determines that inadequate information was available at the time the project was bid. **"Call Before You Dig" "Call 811"**

"Provide notification to the District Signal Shop by telephone at 325-676-6974 and by email at Juan.Salgado@txdot.gov when planning drilling or excavation work in areas where existing TxDOT underground utilities exist." Visual evidence of TxDOT underground utilities in the area include illumination poles, ground boxes, flashing beacons, traffic signals, etc. This notification must be provided 48 hours in advance of performing the work.

Drilled shaft locations or excavation areas must be staked prior to the notification so that the underground utilities can be located in relationship to the proposed work. Preserve and document the marked utility locations to prevent unnecessary secondary notifications. Notify the Engineer of conflicts between proposed work and underground utilities.

Obtain approval from the Engineer of staked locations for illumination foundations, pull boxes, and power source prior to construction.

Item 7, "Legal Relations and Responsibilities"
The total area disturbed for this project is 24.18 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, for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the government that operates a separate storm sewer system.

Provide one SW3P Notification Board for this project. Notification Boards are to be placed at locations within the right-of-way but outside the clear zone as directed by the Engineer. Consider this work to be subsidiary to the various bid items of the contract.

No significant traffic generator events identified.

Hard hats are required at all times during construction when construction personnel are in TxDOT Right-of-Way.

Item 8 "Prosecution and Progress"
Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process and/or execute all contracts at the same time.

The Contractor is hereby authorized to begin work prior to the expiration of the number of calendar days provided in the Special Provision to Item 8, Article 8.1. Notify the Engineer in writing of the date to begin work. Time charges will commence when work begins or on the expiration of the number of calendar days provided, whichever occurs first.

Maintain and submit a project schedule monthly. Submit to the Engineer the updated project schedule no later than the 25th calendar day of the following month.

Project Number: See Title Sheet
Control: 0068-07-052, ETC
County: Howard
Highway: US 87

Coordinate and update the work schedule with the project inspector daily. Give a minimum of 24 hours of notice to project inspector if work requiring inspection or testing is to be performed. Failure to do so may cause that work to be delayed or postponed if TxDOT personnel are not available. Work performed without suitable inspection, as determined by the Engineer, may be ordered removed and replaced at Contractor's expense.

Begin work 90 calendar days after the authorization date to begin work. Do not begin work before or after this period unless authorized in writing by the Engineer. The delay is needed to allow for purchasing ___Proposed Illumination Equipment___.

Item 9, "Measurement and Payment"
The progress payment period shall end on the 25th of each month, unless directed by the Area Office Engineer. Material on Hand (MOH) is due two business days before estimate cut off.

Item 164, "Seed for Erosion Control"
Quantities shown are approximate; limits of the temporary and permanent seeding will be determined during construction.

Temporary seeding will be required in several small areas as work progresses to comply with the storm water pollution prevention plan and may require multiple mobilizations of seeding crew.

Item 168, "Vegetation Watering"
Water rate for this project shall be ¼" of water per acre every two weeks for a 3-month period.

Item 416, "Drilled Shaft Foundations"
Place riprap around the illumination foundation as shown on Standard Sheet RID (2)-20. Riprap will be paid for under item 432.

All soil, water, and slurry removed from drilled shafts shall be captured and disposed of properly. No discharge of these materials into, or in close proximity to, the surrounding water will be allowed.

Item 432, "Riprap"
Provide tooled contraction joints at a maximum spacing of 25 feet and ½" fiber board every 150 feet when constructing cable median barrier mow strips. The depth for tooled joints shall be sufficient to ensure cracking at the joints. The depth for fiber board joints shall be the full depth of the mow strip.

Provide structural fiber reinforced or conventionally reinforced concrete for formed cable median barrier concrete mow strip.

Meet the following requirements when using structural fiber reinforcement:

- Use Class A Concrete.
- If slip forming, use an approved method that ensures adequate concrete consolidation. Sprinkle and consolidate the subgrade before the concrete is placed. Finish the surface with a wood float or broom finish as approved. Immediately after finishing operation, cure the riprap according to Item 420, "Concrete Structures".

When using conventional reinforcement, meet all requirements in accordance with Article 432.3.1. Concrete Riprap with exception that Class A Concrete is required.

Item 502, "Barricades, Signs and Traffic Handling"
Mobile traffic control in accordance with TCP 3 series will be required for placement of short duration, short term, intermediate term, and long-term traffic control.

Provide the Engineer with written notification seven (7) days in advance of major traffic changes. A major traffic change is defined as the temporary (greater than one day) or permanent relocation of traffic lanes typically in an urban setting. The notice will, at a minimum, include the expected date, time and scope of the traffic change. The Department will utilize the information provided to inform the traveling public of the changes. Failure to provide advance notice, or to provide accurate information, will result in delaying the work until such time that the public has been notified.

Additional signs, barricades and traffic handling may be necessary to complete the work shown herein and will be provided by the contractor as required and will be considered subsidiary to this item.

Relocate existing roadside signs to temporary supports as approved by the engineer.

All safety appurtenances such as signs, delineators, object markers and route markers will be in place prior to opening each phase of the construction to traffic, unless otherwise directed.

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 person responsible for TCP compliance must be available by local telephone and have a response time within 45 minutes.

Work will not be allowed on both sides of the roadbed at the same time.

Project Number: See Title Sheet
Control: 0068-07-052, ETC
County: Howard
Highway: US 87

Equip all work vehicles within 30 feet of the traveled way with a functioning amber strobe light or rotating beacon visible from all directions.

Repair barricades within the timeline shown on the barricade inspection report. Failure to comply will cease all work until barricades are repaired to the satisfaction of the Department.

Replace all damaged traffic control devices immediately. Remove any damaged traffic control devices from the project within 24 hours.

Conflicting guide signs shall be covered as approved by the Engineer.

Item 610, "Roadway Illumination Assemblies"
The Contractor is responsible for fixture testing costs; see Materials and Test Division test method TEX-1110.

Contractor should refer to the Texas Department of Transportation's Highway Illumination Manual, January 2018, Chapter 6, and Section 7 for additional information on lateral placement of illumination foundations as described in note 6 on RID (2)-20.
http://onlinemanuals.txdot.gov/txdotmanuals/hwi/index.htm

Fabricate steel roadway illumination poles in accordance with TxDOT standard RIP-19. Poles fabricated according to RIP-19 require no shop drawings.

Alternate designs to RIP-19 or the use of aluminum to fabricate poles will require the submission of shop drawings electronically.

For instructions on submitting shop drawings electronically go to TxDOT home page, Business with TxDOT, Bridge information, Shop drawings. File is titled: Guide to Electronic Shop Drawing Submittal

Place riprap around the illumination foundation as shown on Standard Sheet RID (2)-20.
Riprap will be paid for under item 432.

Item 618, "Conduit"
All conduit shall be SCH 80 PVC.

High density polyethylene (HDPE) may be substituted for schedule 80 PVC in bores.

High density polyethylene (HDPE) may be threaded and used with threaded PVC connectors or couplings.
Conduit elbows will be the long radius variety.
All couplings and connections shall be tight and waterproof. Each end of every PVC pipe connection and/or coupling shall be cleaned with PVC cleaner and glued thoroughly with PVC

sealer. Proposed and existing conduit shall be brought into a pull box and elbowed unless otherwise shown. Where a rigid metal conduit run terminates, a bushing shall be provided to protect the wire from abrasion.

The conduit shall be placed at a minimum depth of 2 feet unless otherwise shown on the plans or directed by the Engineer. If utility lines or other obstacles are at the 2-foot minimum depth then the conduit shall be routed under the utility or obstacle unless otherwise approved by the Engineer.

The conduit shall be placed on a 2-inch sand cushion and then backfilled with a minimum of 6 inches of sand fill. The remainder of the trench shall be backfilled with flexible base or soil as required by location of conduit on the project.
Flexible metal shall not be used on this project.

Use materials from prequalified material producers list as shown on the Texas department of Transportation (TxDOT) – Construction Division's (CST) material producer list. Category is "Roadway Illumination and Electrical Supplies".

Item 620, "Electrical Conductors"
A bare copper wire No. 8 AWG or larger will be installed in every conduit throughout the electrical system in accordance with Item 620, the electrical detail sheets, and the latest edition of the National Electric Code (NEC).

Grounding Conductors that share the same conduit, junction box, ground box or structure shall be bonded together at every accessible point in accordance with the current National Electrical Code.

Labeling conductors with label marker is acceptable.

Use ONLY certified persons to perform electrical work. See Item 7.18 "Electrical Requirements" for additional details.

For both transformer and shoe- base type illumination poles, provide double-pole breakaway fuse holder as shown on the Texas department of Transportation (TxDOT) – Construction Division's (CST) material producer list. Category is "Roadway Illumination and Electrical Supplies". Fuse holder is shown on the list under Items 610 and 620. Provide 10-amp time delay fuses.

Use breakaway connectors listed on materials from pre-qualified material producers list.

Project Number: See Title Sheet
Control: 0068-07-052, ETC
County: Howard
Highway: US 87

Item 628, "Electrical Service"
Coordinate setting up the electrical service with District Signal Shop@ 325-676-6984 to insure the meter is installed under the proper account name.

Provide 30 days prior notification for new service to be energized. Notify the District Signal Shop @ 325-676-6984.

Any service installed by others shall comply with all TxDOT Standards from weather head to fixtures.

Item 644, "Small Roadside Sign Supports and Assemblies"
Use the latest edition of the "Standard Highway Sign Designs for Texas" for Sign types for which design details are not shown on the plans.

Sign placement shall be in accordance with the latest edition of the TMUTCD & TxDOT's Sign Crew Field Book located at the following addresses.
TMUTCD - https://www.txdot.gov/business/resources/signage/tmutcd.html
TxDOT's Sign Crew Field Book - http://onlinemanuals.txdot.gov/txdotmanuals/sfb/index.htm

Before final sign installation, stake all sign locations for approval by the engineer.

All triangle slip base small sign mounts installed under this item shall utilize clamp type bases.

Item 6185, "Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)"

BASIS OF ESTIMATE FOR STATIONARY TMAs				
		TMA (Stationary)		
Phase	Standard	Required	Additional	TOTAL
1	TCP(2-1)-18	1	0	1
1	TCP(2-6)-18	1	0	1
1	TCP(5-1)-18	1	0	1
Basis of Estimate for Mobile TMAs				
		TMA (Mobile)		
Phase	Standard	Required	Additional	TOTAL
1	TCP(3-2)-13	2	1	3

Project Number: See Title Sheet
Control: 0068-07-052, ETC
County: Howard
Highway: US 87

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 TMAs needed for the project. The Contractor must get approval from the Engineer for any changes in the number of TMA as shown in the plans.

If a TMA is used for both mobile and stationary traffic control on the same day, it will be paid for as stationary for that day.

QUANTITY SHEET

CONTROLLING PROJECT ID 0068-07-052 **DISTRICT** Abilene **COUNTY** Howard
HIGHWAY US 87

			CONTROL SECTION JOB		**0068-07-052**		**0068-08-068**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00133731**		**A00133732**			
			COUNTY		**Howard**		**Howard**			
			HIGHWAY		**US 87**		**US 87**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)		CY			133.000		133.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)		SY	34,108.000		60,164.000		94,272.000	
	168-6001	VEGETATIVE WATERING		MG	286.500		505.500		792.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)		LF	112.000		216.000		328.000	
	432-6006	RIPRAP (CONC)(CL B)		CY	6.000		10.000		16.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	900.000		1,627.000		2,527.000	
	500-6001	MOBILIZATION		LS	100.00%				100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	4.000				4.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")		LF	185.000		740.000		925.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)		LF	185.000		740.000		925.000	
	543-6002	CABLE BARRIER SYSTEM (TL-4)		LF	22,960.000		42,000.000		64,960.000	
	543-6020	CABLE BARRIER TERMINAL SECTION (TL-4)		EA	25.000		35.000		60.000	
	610-6004	RELOCATE RD IL ASM (TRANS-BASE)		EA			1.000		1.000	
	610-6102	REPLACE LUMINAIRE W/LED (250W EQ)		EA			2.000		2.000	
	610-6258	IN RD IL (TY ST) 40T-12 (250W EQ) LED		EA	14.000		26.000		40.000	
	618-6046	CONDT (PVC) (SCH 80) (2")		LF	2,185.000		4,120.000		6,305.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)		LF	490.000		885.000		1,375.000	
	620-6004	ELEC CONDR (NO.12) INSULATED		LF	5,550.000		10,050.000		15,600.000	
	620-6007	ELEC CONDR (NO.8) BARE		LF	2,675.000		5,005.000		7,680.000	
	620-6008	ELEC CONDR (NO.8) INSULATED		LF			160.000		160.000	
	624-6002	GROUND BOX TY A (122311)W/APRON		EA	7.000		10.000		17.000	
	628-6002	REMOVE ELECTRICAL SERVICES		EA			1.000		1.000	
	628-6004	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)		EA	2.000		3.000		5.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA			4.000		4.000	
	690-6001	REMOVAL OF CONDUIT		LF			115.000		115.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN		EA	1.000		1.000		2.000	
	6027-6003	CONDUIT (PREPARE)		LF			385.000		385.000	
	6027-6008	GROUND BOX (PREPARE)		EA			5.000		5.000	
	6185-6002	TMA (STATIONARY)		DAY	34.000		70.000		104.000	
	6185-6005	TMA (MOBILE OPERATION)		DAY	3.000		9.000		12.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	

SUMMARY OF ROADWAY ITEMS

LOCATION	132 6005	432 6045	543 6002	543 6020	644 6001
	EMBANKMENT (FINAL)(ORD COMP)(TY C)	RIPRAP (MOW STRIP)(4 IN)	CABLE BARRIER SYSTEM (TL-4)	CABLE BARRIER TERMINAL SECTION (TL-4)	IN SM RD SN SUP&AM TY10BWG(1)SA(P)
	CY	CY	LF	EA	EA
CSJ 0068-08-068					
CABLE BARRIER LAYOUT - SHEET 1 OF 30		65	1697.5	1	
CABLE BARRIER LAYOUT - SHEET 2 OF 30	2	89	2400		1
CABLE BARRIER LAYOUT - SHEET 3 OF 30	16	84	2062.5	4	
CABLE BARRIER LAYOUT - SHEET 4 OF 30	1	89	2400		
CABLE BARRIER LAYOUT - SHEET 5 OF 30	10	86	2209	2	
CABLE BARRIER LAYOUT - SHEET 6 OF 30		84	2171	2	
CABLE BARRIER LAYOUT - SHEET 7 OF 30		86	2215	2	
CABLE BARRIER LAYOUT - SHEET 8 OF 30	3	87	2230	2	1
CABLE BARRIER LAYOUT - SHEET 9 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 10 OF 30	17	87	2234	2	1
CABLE BARRIER LAYOUT - SHEET 11 OF 30	3	84	2147	2	
CABLE BARRIER LAYOUT - SHEET 12 OF 30		89	2399		
CABLE BARRIER LAYOUT - SHEET 13 OF 30	28	81	1878	6	
CABLE BARRIER LAYOUT - SHEET 14 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 15 OF 30	43	82	2052	3	
CABLE BARRIER LAYOUT - SHEET 16 OF 30	2	86	2150	3	1
CABLE BARRIER LAYOUT - SHEET 17 OF 30	6	85	2195	2	
CABLE BARRIER LAYOUT - SHEET 18 OF 30	2	84	2155	2	
CABLE BARRIER LAYOUT - SHEET 19 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 20 OF 30		12	205	2	
CSJ 0068-08-068 TOTALS	133	1627	42000	35	4
CSJ 0068-07-052					
CABLE BARRIER LAYOUT - SHEET 20 OF 30		70	1785	2	
CABLE BARRIER LAYOUT - SHEET 21 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 22 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 23 OF 30		72	1734	4	
CABLE BARRIER LAYOUT - SHEET 24 OF 30		79	2036	2	
CABLE BARRIER LAYOUT - SHEET 25 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 26 OF 30		83	2145	2	
CABLE BARRIER LAYOUT - SHEET 27 OF 30		73	1545	8	
CABLE BARRIER LAYOUT - SHEET 28 OF 30		84	2045	4	
CABLE BARRIER LAYOUT - SHEET 29 OF 30		89	2400		
CABLE BARRIER LAYOUT - SHEET 30 OF 30		83	2070	3	
CSJ 0068-07-052 TOTALS	0	900	22960	25	0
PROJECT TOTALS	**133**	**2527**	**64960**	**60**	**4**

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	164 6001	168 6001	506 6041	506 6043
	BROADCAST SEED (PERM) (RURAL) (SANDY)	VEGETATIVE WATERING	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	MG	LF	LF
CSJ 0068-08-068				
CABLE BARRIER LAYOUT - SHEET 1 OF 30	2229	18.7		
CABLE BARRIER LAYOUT - SHEET 2 OF 30	3078	25.9	40	40
CABLE BARRIER LAYOUT - SHEET 3 OF 30	3010	25.3	60	60
CABLE BARRIER LAYOUT - SHEET 4 OF 30	3405	28.6	40	40
CABLE BARRIER LAYOUT - SHEET 5 OF 30	3716	31.2	40	40
CABLE BARRIER LAYOUT - SHEET 6 OF 30	3127	26.3	40	40
CABLE BARRIER LAYOUT - SHEET 7 OF 30	3129	26.3	20	20
CABLE BARRIER LAYOUT - SHEET 8 OF 30	3234	27.2	40	40
CABLE BARRIER LAYOUT - SHEET 9 OF 30	3330	28		
CABLE BARRIER LAYOUT - SHEET 10 OF 30	3121	26.2	20	20
CABLE BARRIER LAYOUT - SHEET 11 OF 30	3076	25.8	80	80
CABLE BARRIER LAYOUT - SHEET 12 OF 30	3002	25.2		
CABLE BARRIER LAYOUT - SHEET 13 OF 30	3031	25.5	80	80
CABLE BARRIER LAYOUT - SHEET 14 OF 30	3414	28.7	20	20
CABLE BARRIER LAYOUT - SHEET 15 OF 30	3282	27.6	40	40
CABLE BARRIER LAYOUT - SHEET 16 OF 30	3146	26.4	40	40
CABLE BARRIER LAYOUT - SHEET 17 OF 30	3183	26.7	40	40
CABLE BARRIER LAYOUT - SHEET 18 OF 30	3065	25.8	60	60
CABLE BARRIER LAYOUT - SHEET 19 OF 30	3122	26.2	60	60
CABLE BARRIER LAYOUT - SHEET 20 OF 30	464	3.9	20	20
CSJ 0068-08-068 TOTALS	60164	505.5	740	740
CSJ 0068-07-052				
CABLE BARRIER LAYOUT - SHEET 20 OF 30	2475	20.8	20	20
CABLE BARRIER LAYOUT - SHEET 21 OF 30	3163	26.6		
CABLE BARRIER LAYOUT - SHEET 22 OF 30	3249	27.3	20	20
CABLE BARRIER LAYOUT - SHEET 23 OF 30	2695	22.6		
CABLE BARRIER LAYOUT - SHEET 24 OF 30	3481	29.2	25	25
CABLE BARRIER LAYOUT - SHEET 25 OF 30	3355	28.2	35	35
CABLE BARRIER LAYOUT - SHEET 26 OF 30	2940	24.7		
CABLE BARRIER LAYOUT - SHEET 27 OF 30	2798	23.5	45	45
CABLE BARRIER LAYOUT - SHEET 28 OF 30	2994	25.2	20	20
CABLE BARRIER LAYOUT - SHEET 29 OF 30	3290	27.6		
CABLE BARRIER LAYOUT - SHEET 30 OF 30	3668	30.8	20	20
CSJ 0068-07-052 TOTALS	34108	286.5	185	185
PROJECT TOTALS	**94272**	**792**	**925**	**925**

SUMMARY OF ILLUMINATION ITEMS

LOCATION	416 6029	432 6006	610 6004	610 6102	610 6258	618 6046	618 6047	620 6004	620 6007	620 6008	624 6002	628 6002	628 6004	6027 6003	6027 6008	690 6001
	DRILL SHAFT (RDWY ILL POLE) (30 IN)	RIPRAP (CONC)(CLB)	RELOCATE RD IL ASM (TRANS-BASE)	REPLACE LUMINAIRE W/LED (250W EQ)	IN RD IL (TY ST) 40T-12 (250W EQ) LED	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	ELEC CONDR (NO.12) INSULATED	ELEC CONDR (NO.8) BARE	ELEC CONDR (NO.8) INSULATED	GROUND BOX TY A (122311)W/ APRON	REMOVE ELECTRICAL SERVICES	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	CONDUIT (PREPARE)	GROUND BOX (PREPARE)	REMOVAL OF CONDUIT
	LF	CY	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA	EA	LF	EA	LF
CSJ 0068-08-068																
FM 2230 (SOUTH)	64	3			8	1150	435	3210	1585		5		1			
FM 1584	96	4			12	1915	305	4540	2220		4		1			
FM 846	56	3	1	2	6	1055	145	2300	1200	160	1	1	1	385	5	115
CSJ 0068-08-068 TOTALS	216	10	1	2	26	4120	885	10050	5005	160	10	1	3	385	5	115
CSJ 0068-07-052																
FM 2230 (NORTH)	56	3			7	1150	245	2930	1395		4		1			
FM 1785	56	3			7	1035	245	2620	1280		3		1			
CSJ 0068-07-052 TOTALS	112	6	0	0	14	2185	490	5550	2675	0	7	0	2	0	0	0
PROJECT TOTALS	**328**	**16**	**1**	**2**	**40**	**6305**	**1375**	**15600**	**7680**	**160**	**17**	**1**	**5**	**385**	**5**	**115**

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	6001 6002	6185 6002	6185 6005
	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	EA	DAY	DAY
CSJ 0068-08-068	1	70	9
CSJ 0068-07-052	1	34	3
PROJECT TOTALS	**2**	**104**	**12**

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

QUANTITY SUMMARY

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR				12
GRPH CHECK	0068	07	052, ETC	
JKB				

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DATE: 5/25/2021 7:50:52 AM jbaker

SEQUENCE OF CONSTRUCTION

1. INSTALL ADVANCE WARNING SIGNS AND CHANNELIZING DEVICES PRIOR TO CONSTRUCTION IN ACCORDANCE WITH TXDOT BC STANDARDS AND TMUTCD.

2. USING DAYTIME CLOSURES, CLOSE INSIDE LANE ADJACENT TO CABLE BARRIER CONSTRUCTION USING TXDOT STANDARD TCP(2-6)-18 AND CLOSE INSIDE SHOULDER OPPOSITE OF CABLE BARRIER USING TXDOT STANDARD TCP(5-1)-18 WHILE INSTALLING CABLE BARRIER SYSTEM. LIMIT CLOSURES TO 2 MILE SEGMENTS.

3. INSTALL SAFETY LIGHTING AT FM 846, FM 1785 & FM 2230 INTERSECTIONS.

4. CLEAN UP AND REMOVE TRAFFIC CONTROL DEVICES.

TCP GENERAL NOTES

1. ALL EXISTING SIGNS ON OPEN ROADWAYS THAT ARE NOT IN CONFLICT WITH THE CONSTRUCTION AND TRAFFIC SHALL REMAIN IN PLACE UNLESS OTHERWISE DIRECTED TxDOT. SIGNS THAT ARE IN CONFLICT, SHALL BE COVERED OR REMOVED, STORED AND REPLACED IN FINAL LOCATION IF NOT BEING REPLACED.

2. CONTRACTOR SHALL ERECT REQUIRED CONSTRUCTION AND TRAFFIC CONTROL SIGNS PRIOR TO CONSTRUCTION.

3. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.

4. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTURBANCE IS EXPECTED TO OCCUR WITHIN TWO WEEKS.

5. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL BE REMOVED IN EACH AREA WITHIN TWO WEEKS OF VEGETATION ESTABLISHMENT OR AS APPROVED BY THE ENGINEER.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TRAFFIC CONTROL SEQUENCE OF CONSTRUCTION

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	13
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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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. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

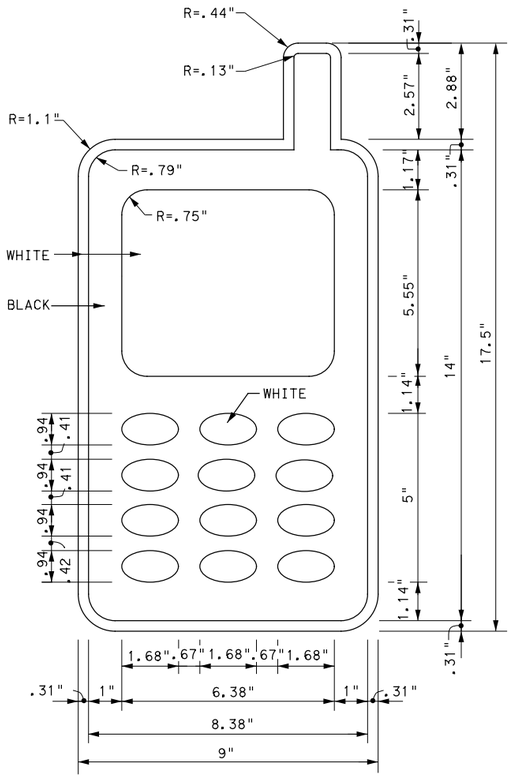
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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 APPAREL 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.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

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 Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	ABL	HOWARD		14

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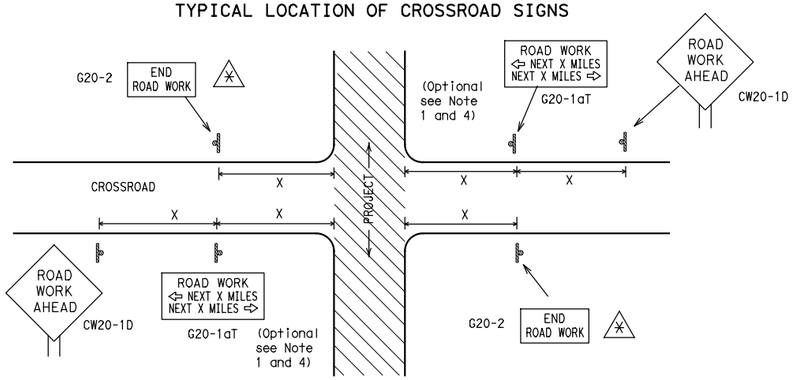
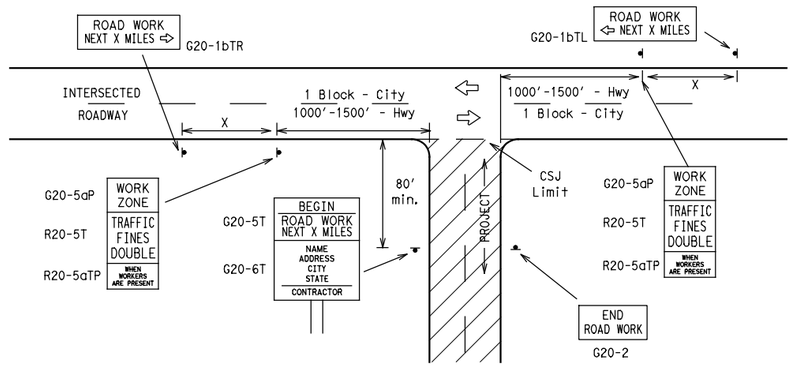
TYPICAL LOCATION OF CROSSROAD SIGNS



✳ 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. 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]

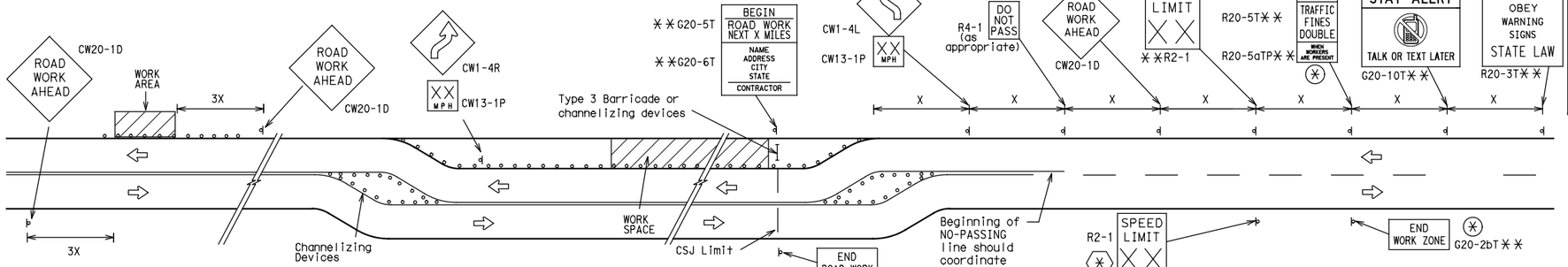
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

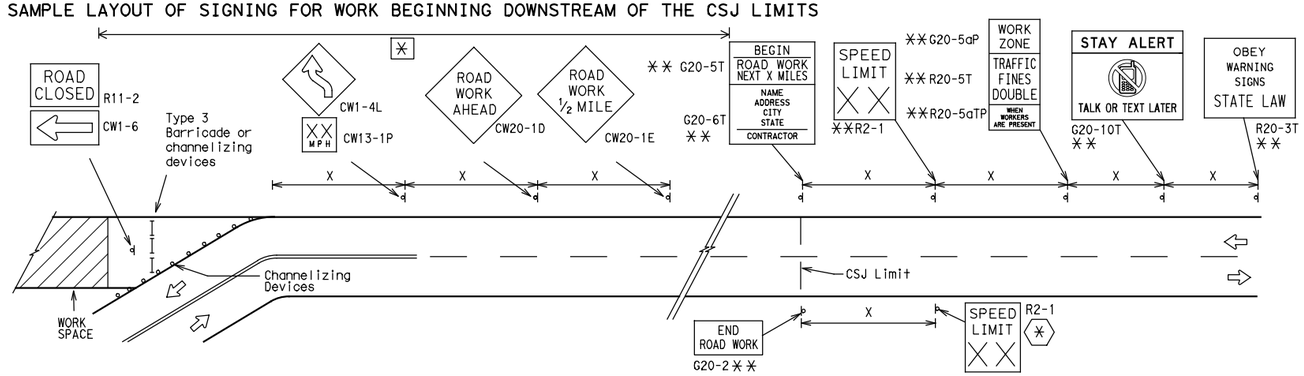
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

[✳] 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 Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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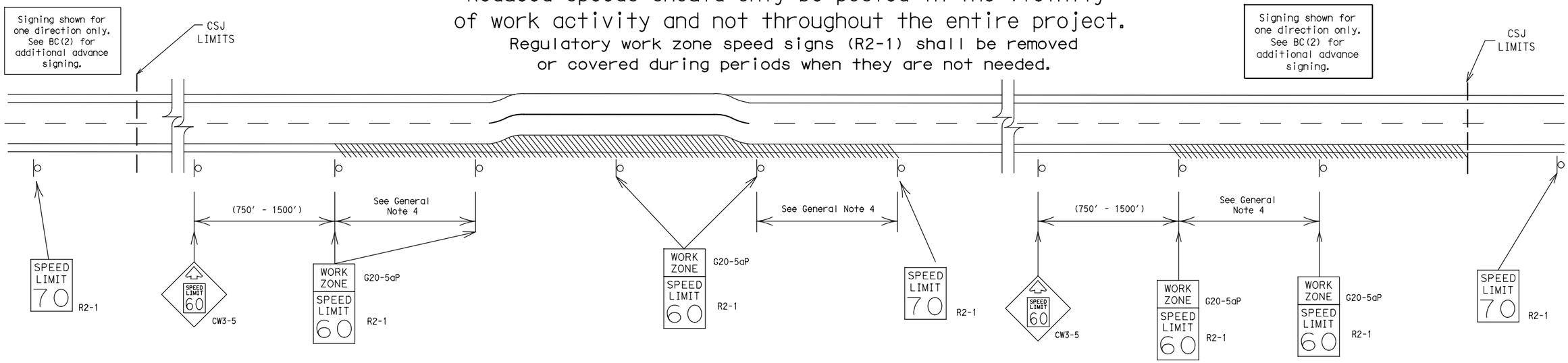
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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 travelled 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 Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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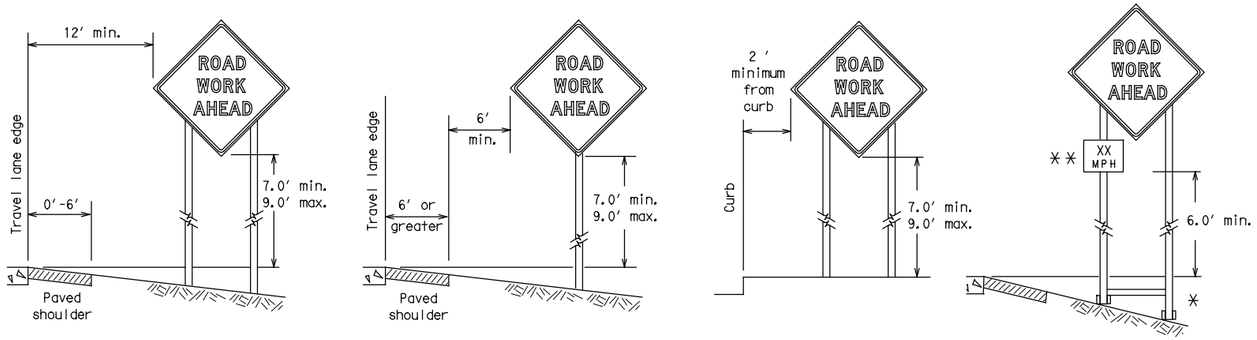
	ABL	HOWARD		16

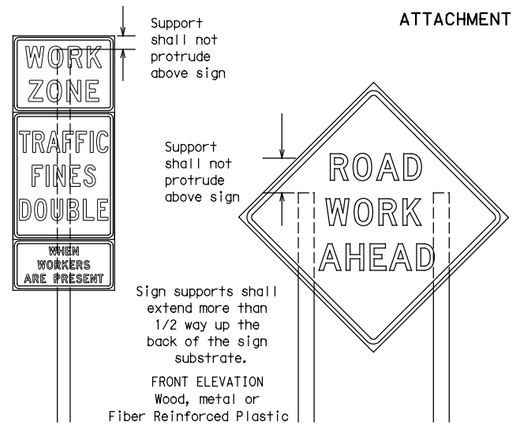
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



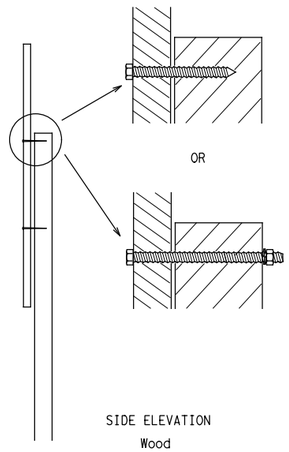
⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⚹⚹ 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



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.

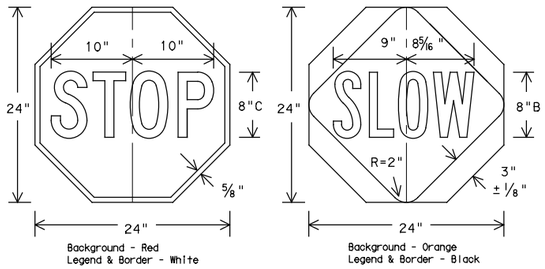


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

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" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
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.



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, 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.
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 sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards 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). 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 Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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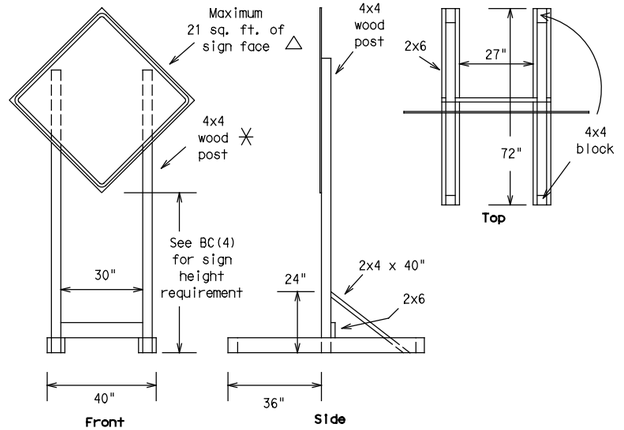
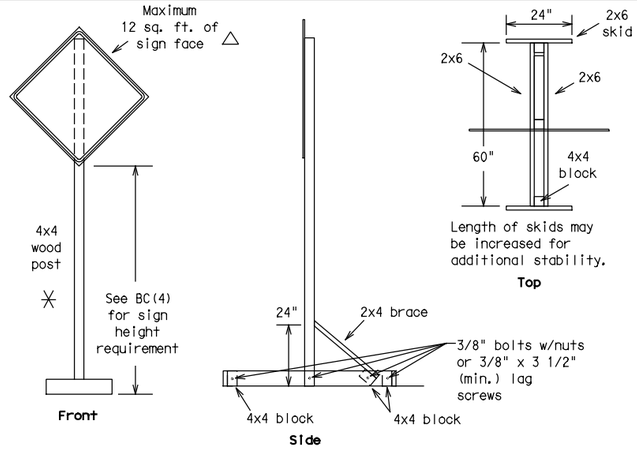
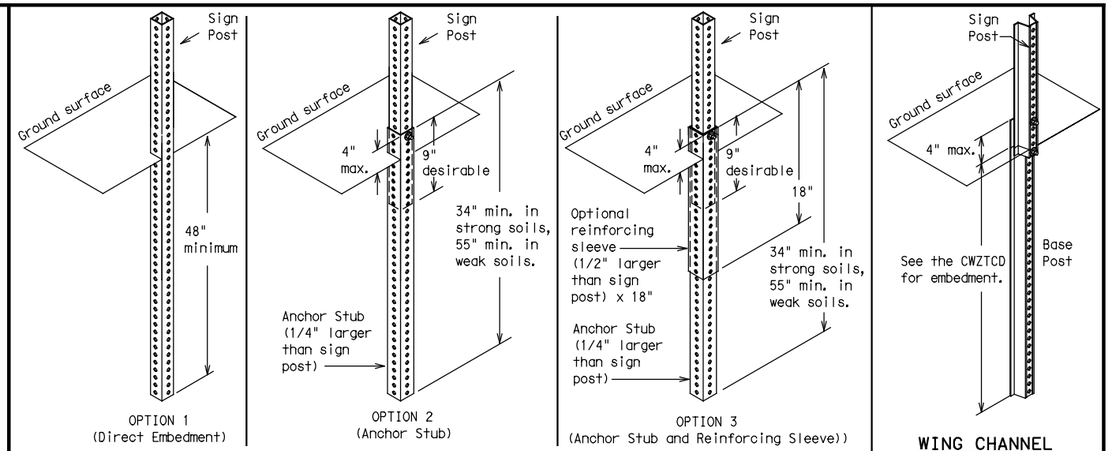




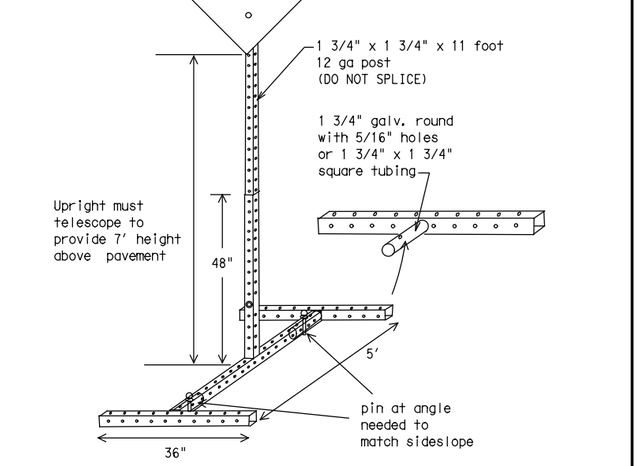
SKID MOUNTED WOOD SIGN SUPPORTS

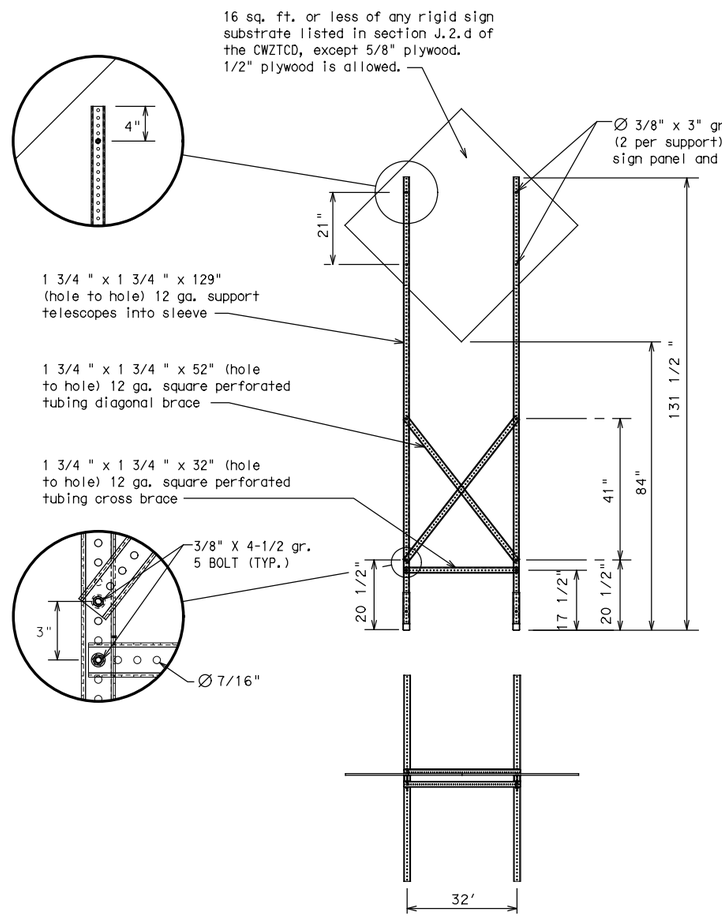
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS ☐

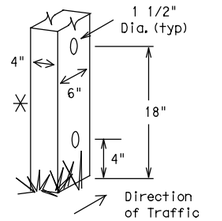


GROUND MOUNTED SIGN SUPPORTS

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.

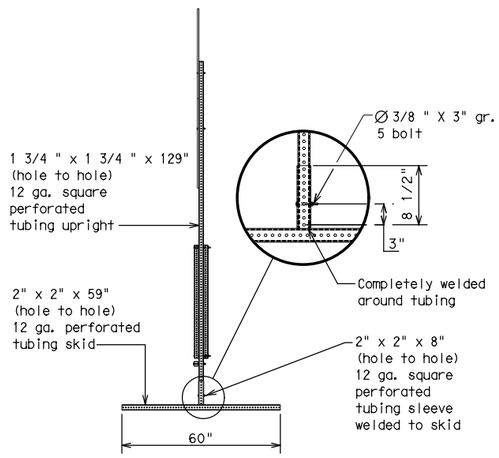






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND 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 Operations Division Standard

SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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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 Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ABL	HOWARD		19

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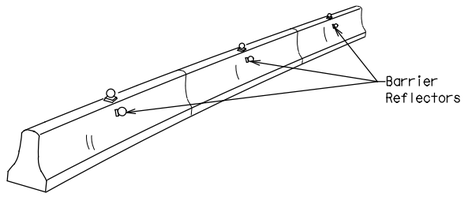
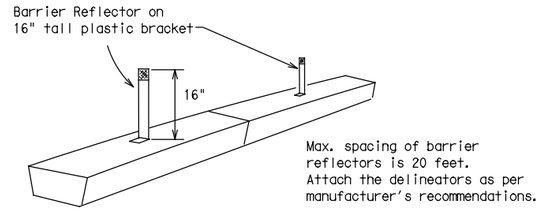
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

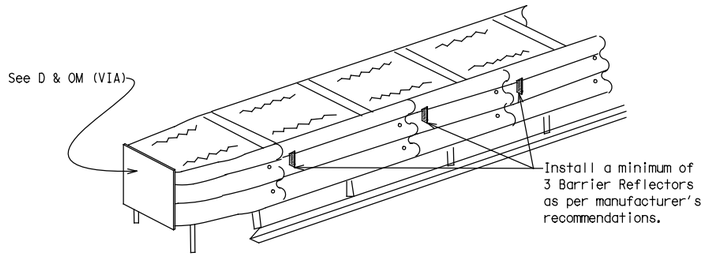


CONCRETE TRAFFIC BARRIER (CTB)

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.



LOW PROFILE CONCRETE BARRIER (LPCB)

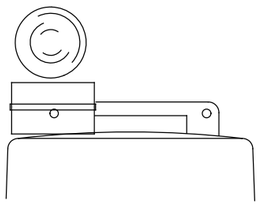


DELINEATION OF END TREATMENTS

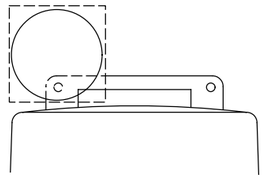
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

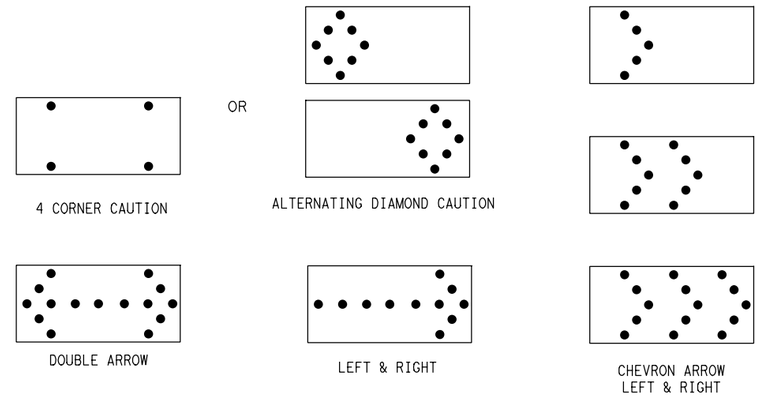
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or 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 Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ABL	HOWARD		20

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:

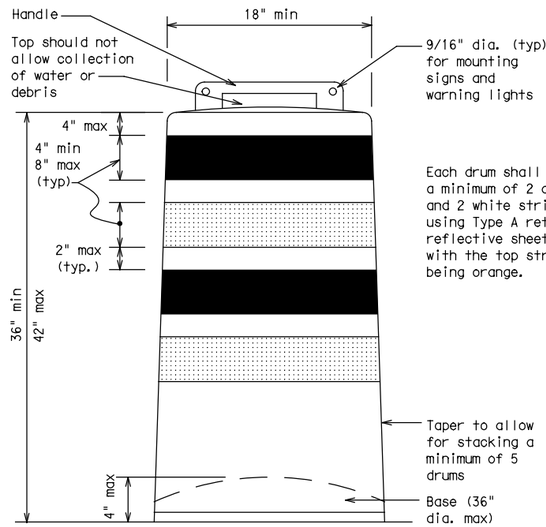
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

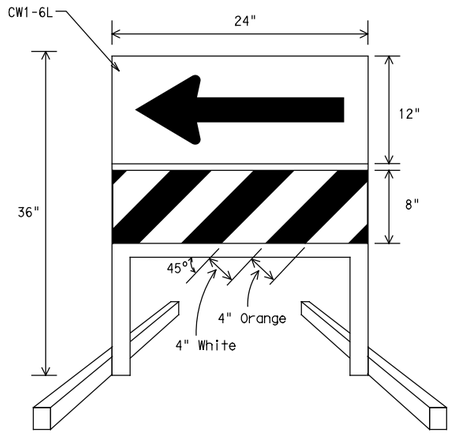
RETROREFLECTIVE SHEETING

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 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.

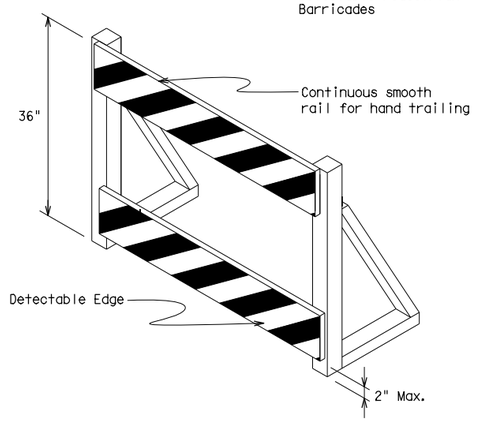




DIRECTION INDICATOR BARRICADE

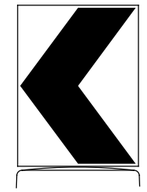
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

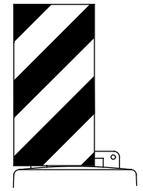


DETECTABLE PEDESTRIAN BARRICADES

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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
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 for Buildings and Facilities (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 may 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 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 Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ABL	HOWARD		21

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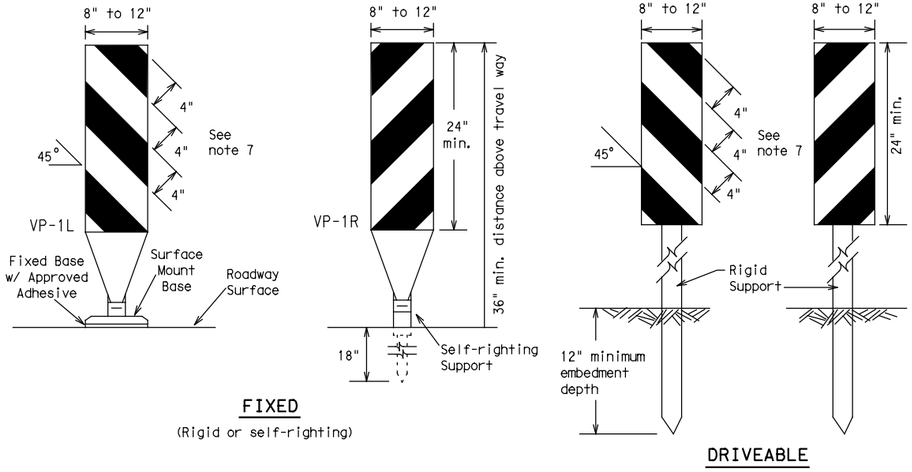
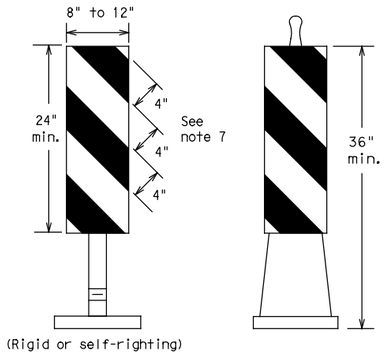


FIXED

(Rigid or self-righting)

DRIVEABLE

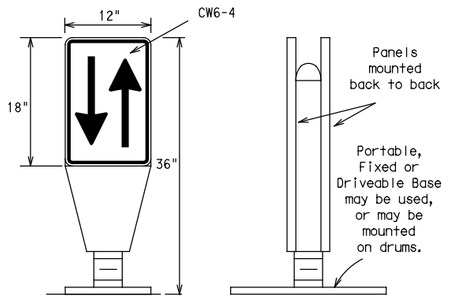


(Rigid or self-righting)

PORTABLE

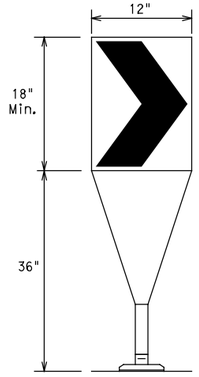
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of 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 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.

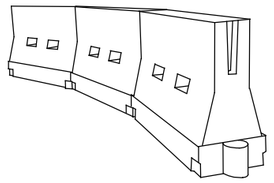
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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



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) placed 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 NCHRP 350 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

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.

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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	ABL	HOWARD		22

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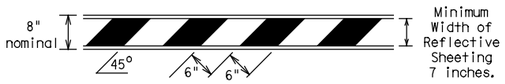
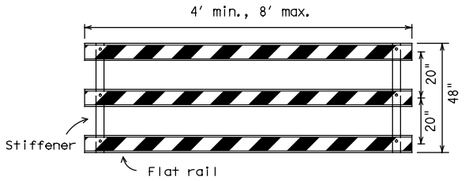
TYPE 3 BARRICADES

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 conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



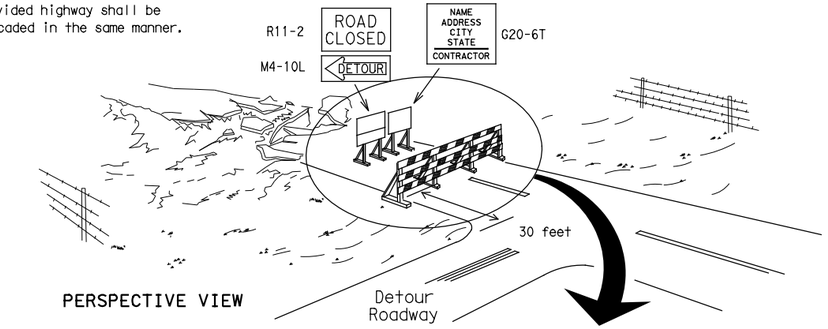
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

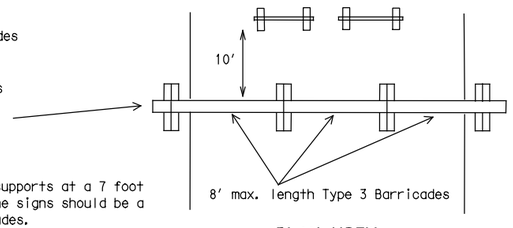
Each roadway of a divided highway shall be barricaded in the same manner.



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.

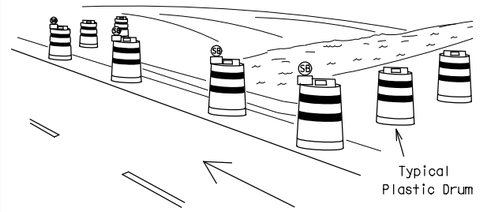
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

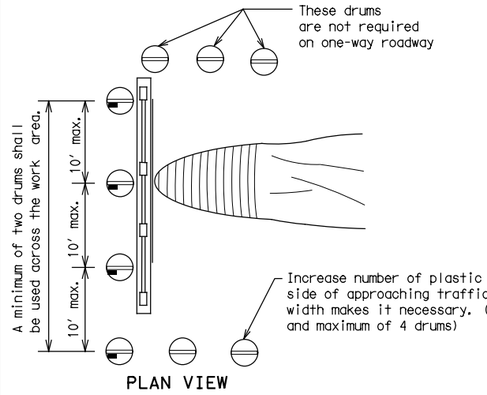
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

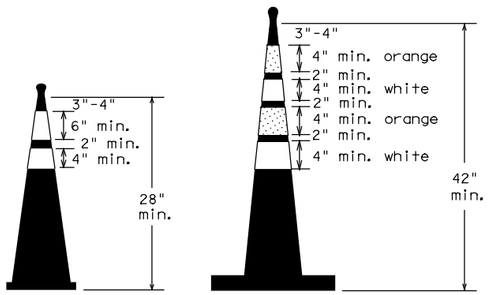
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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

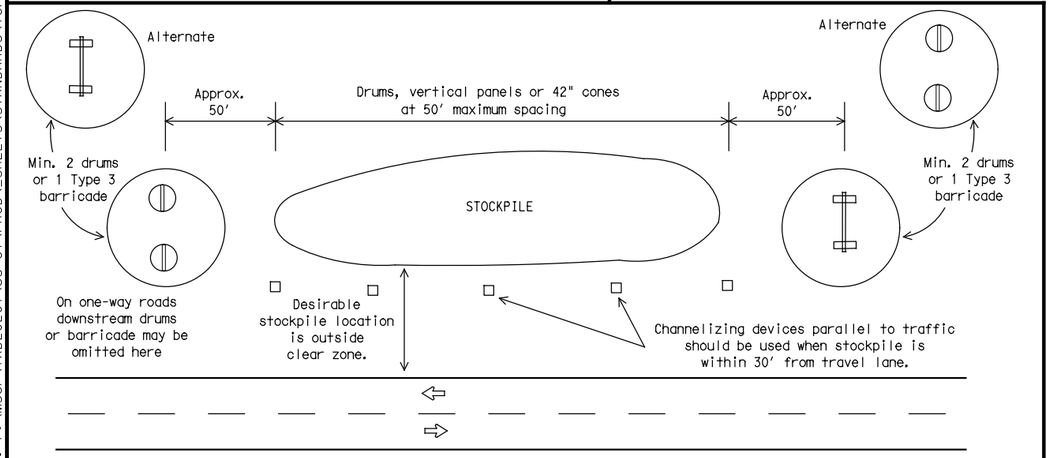
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

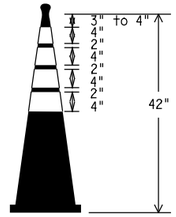
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night 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.
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

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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	ABL	HOWARD		23

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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.

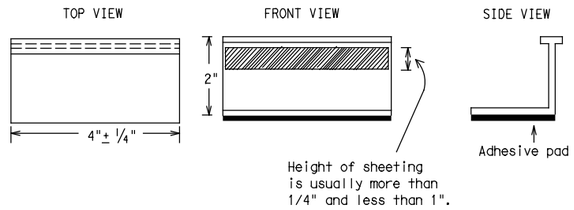
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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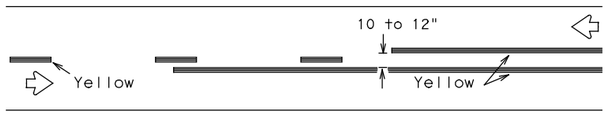
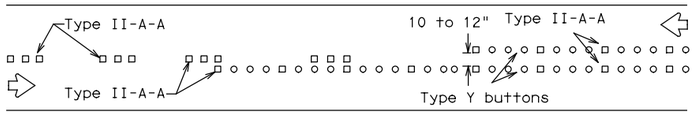
105

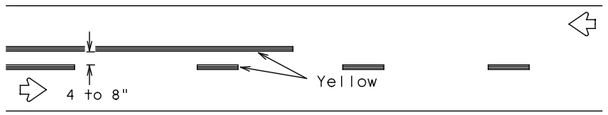
PAVEMENT MARKING PATTERNS



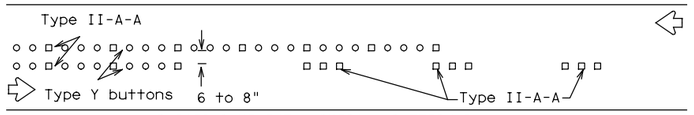
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



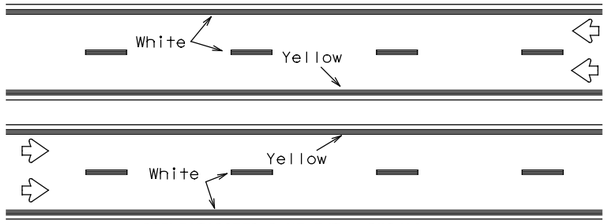
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



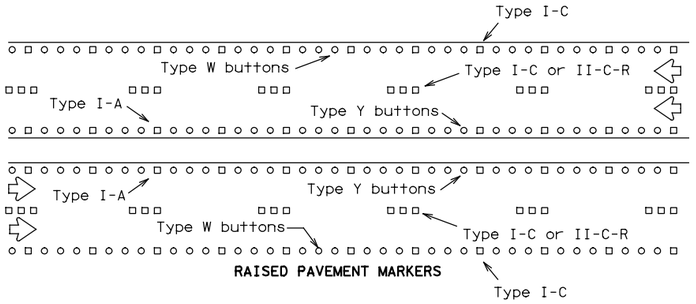
RAISED PAVEMENT MARKERS - PATTERN B

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

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



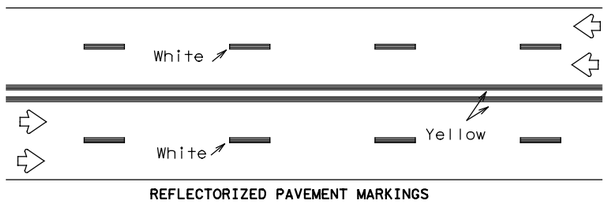
REFLECTORIZED PAVEMENT MARKINGS



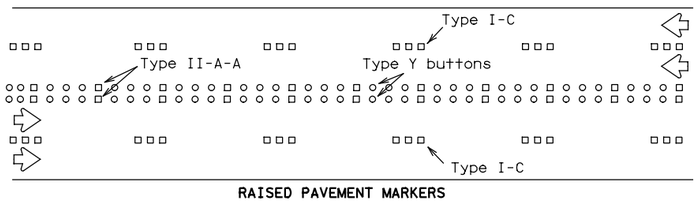
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



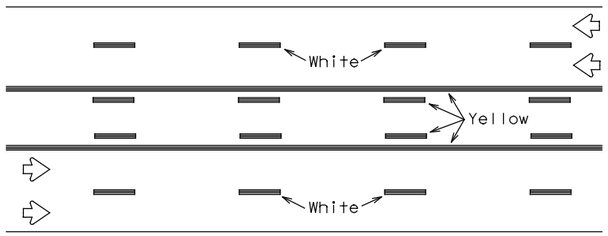
REFLECTORIZED PAVEMENT MARKINGS



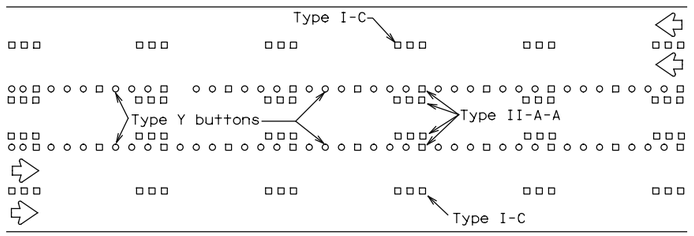
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

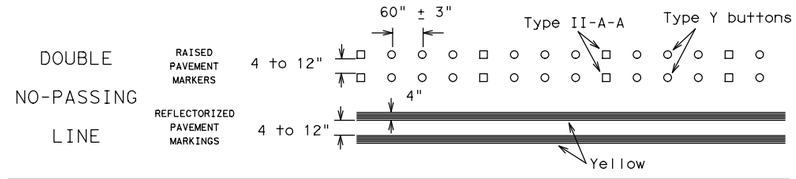
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

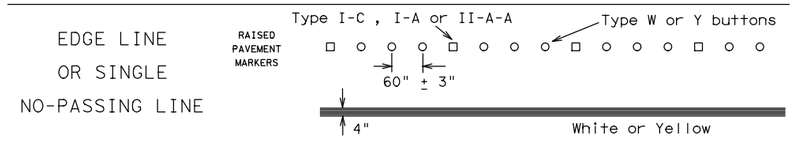
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

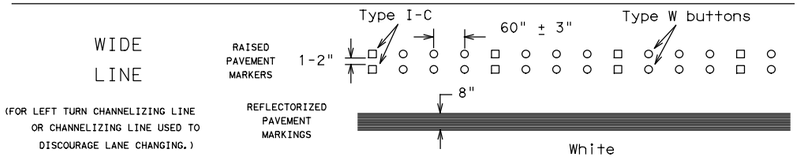


EDGE LINE OR SINGLE NO-PASSING LINE



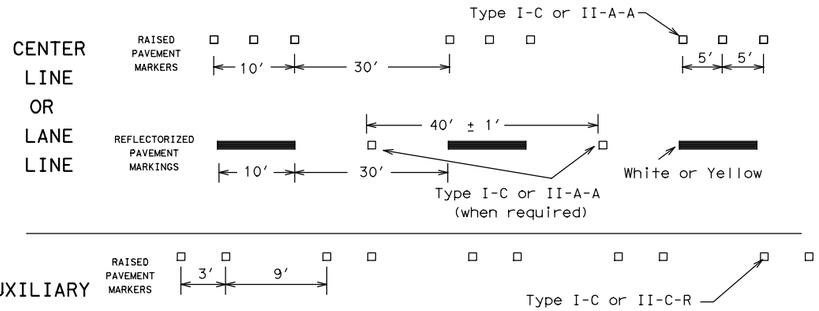
WIDE LINE

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

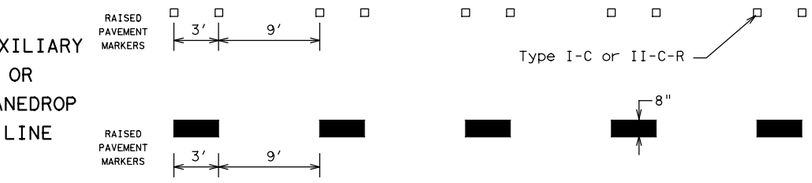


BROKEN LINES

CENTER LINE OR LANE LINE

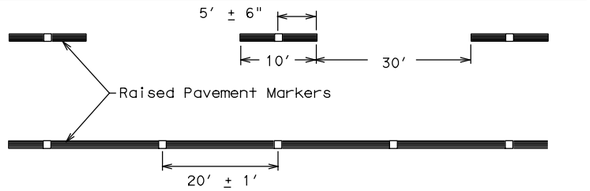


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	ABL	HOWARD		25
11-02 8-14				

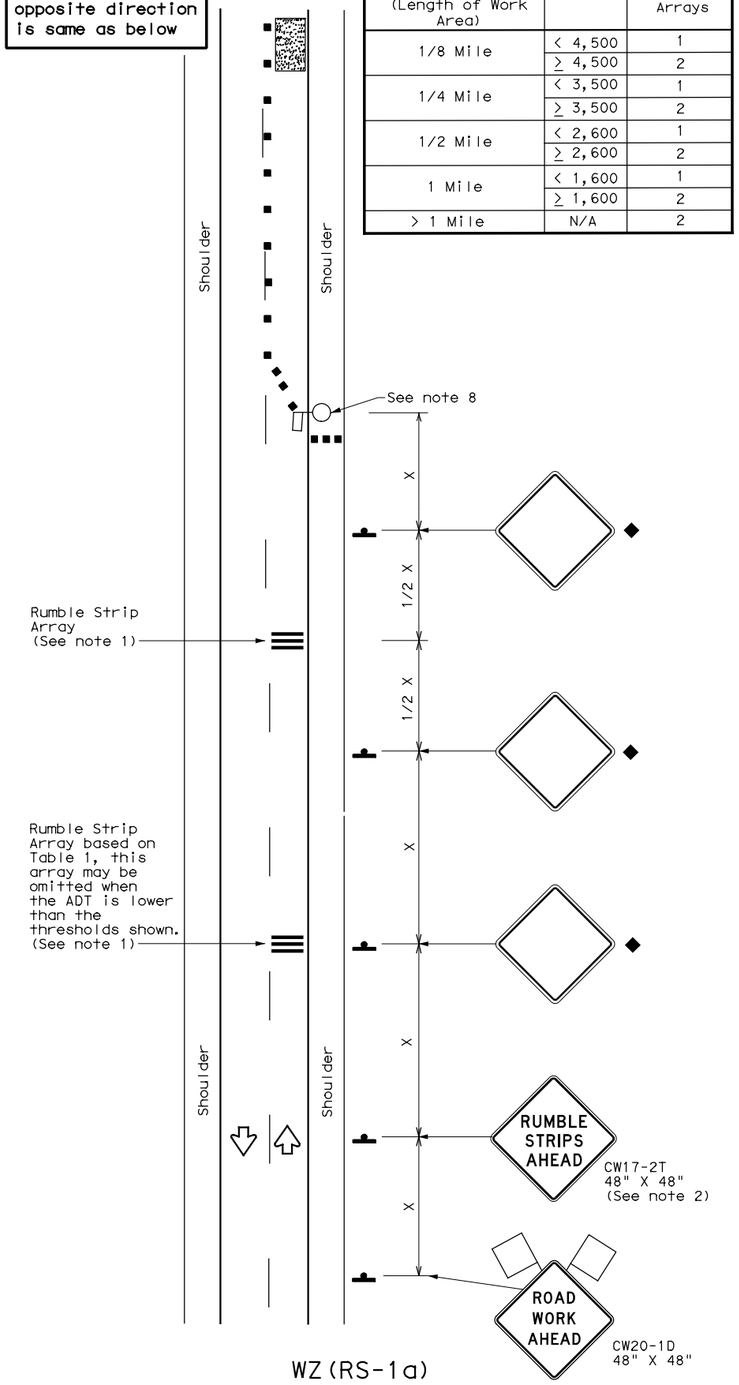
106

DATE: 5/25/2021 7:51:00 AM
FILE: P:\MSGP\TX020207\US 87\PROD_SHEETS\STANDARDS\TCP\bc-14.dgn

DATE: 5/25/2021 7:51:02 AM
FILE: P:\MSGPKTXD2020\TXUS 87\PROD_SHEETS\STANDARDS\TCP\wzrs16.dgn

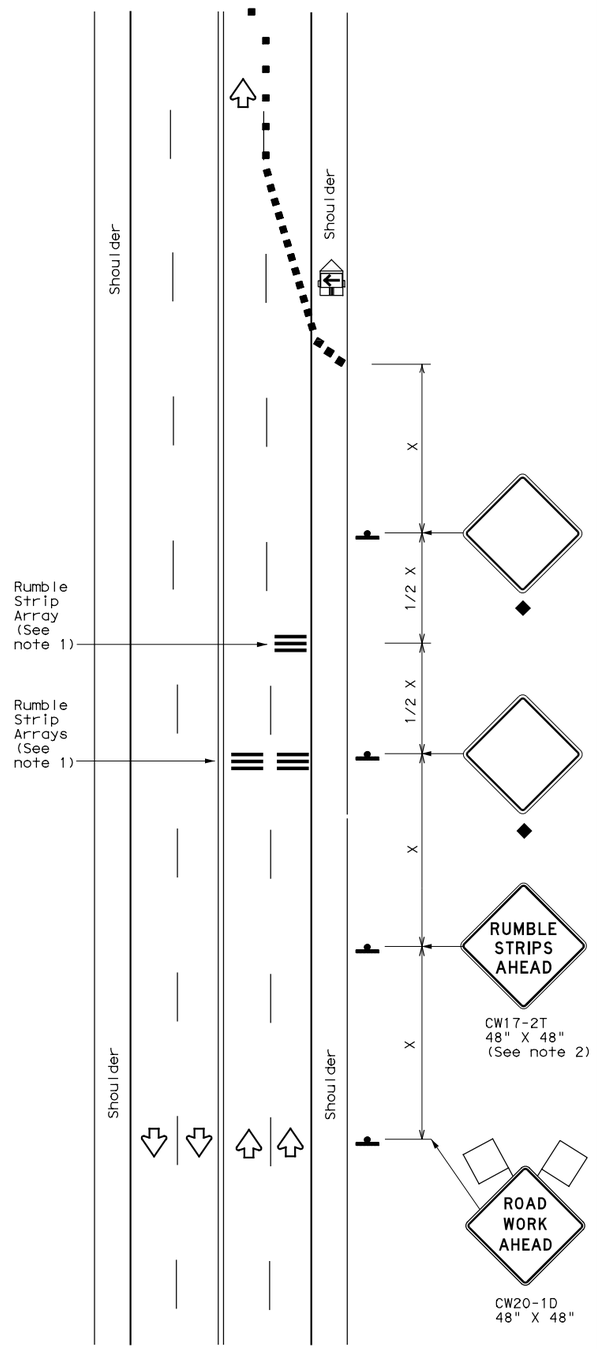
Warning sign and rumble strip sequence in opposite direction is same as below

TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel	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
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10′
> 40 MPH & ≤ 55 MPH	15′
> 55 MPH	20′

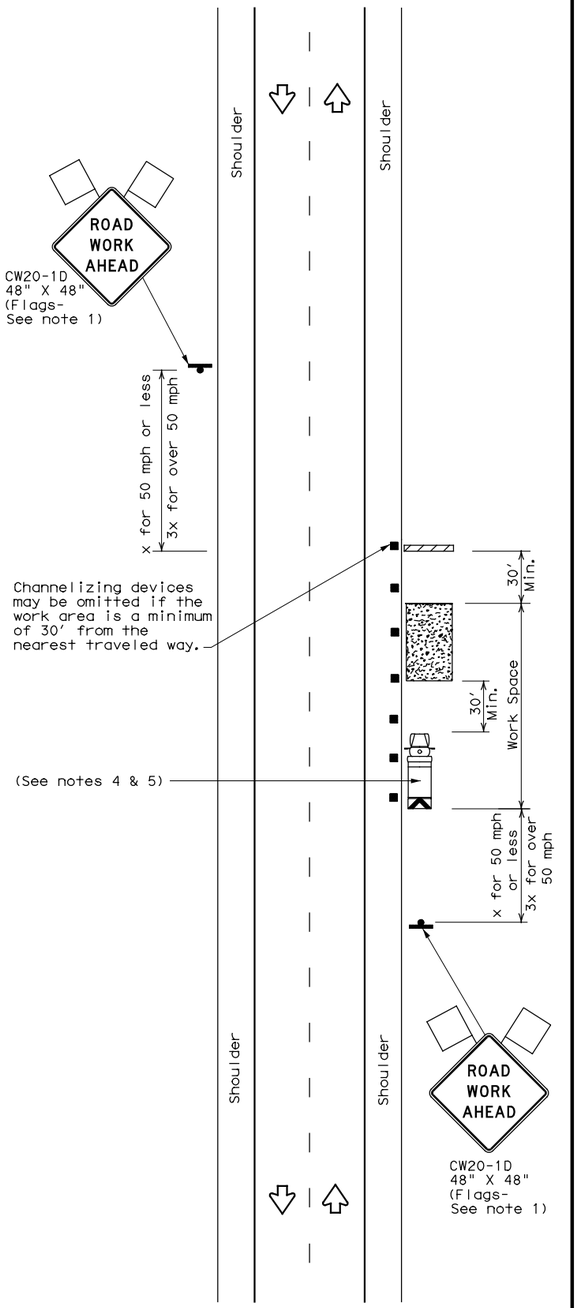
Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

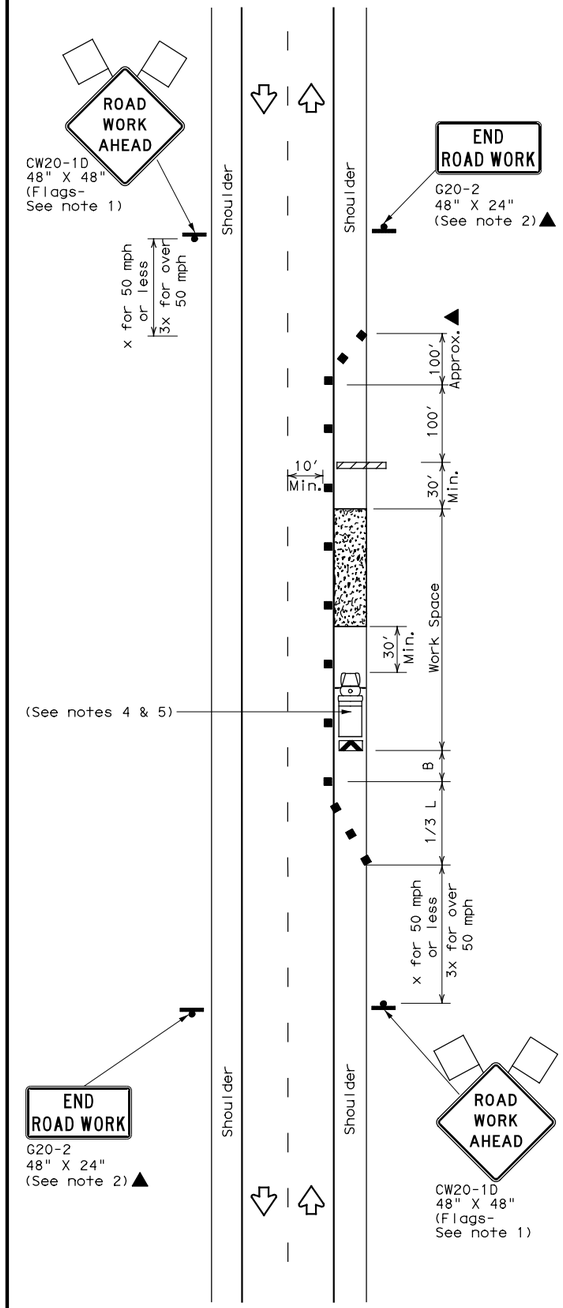
WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
2-14	DIST	COUNTY		SHEET NO.
4-16	ABL	HOWARD		26



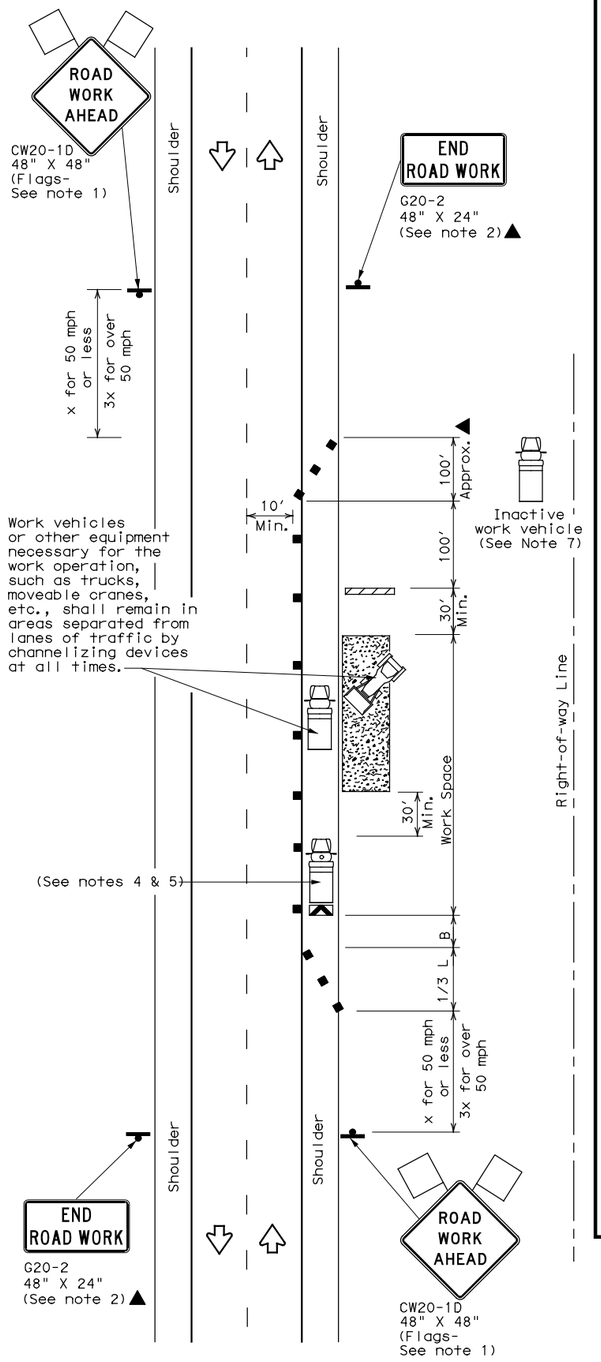
TCP (2-1a)

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	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ABL	HOWARD		27
1-97 2-18				

DATE: 5/25/2021 7:51:02 AM
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DATE: 5/25/2021 7:51:04 AM
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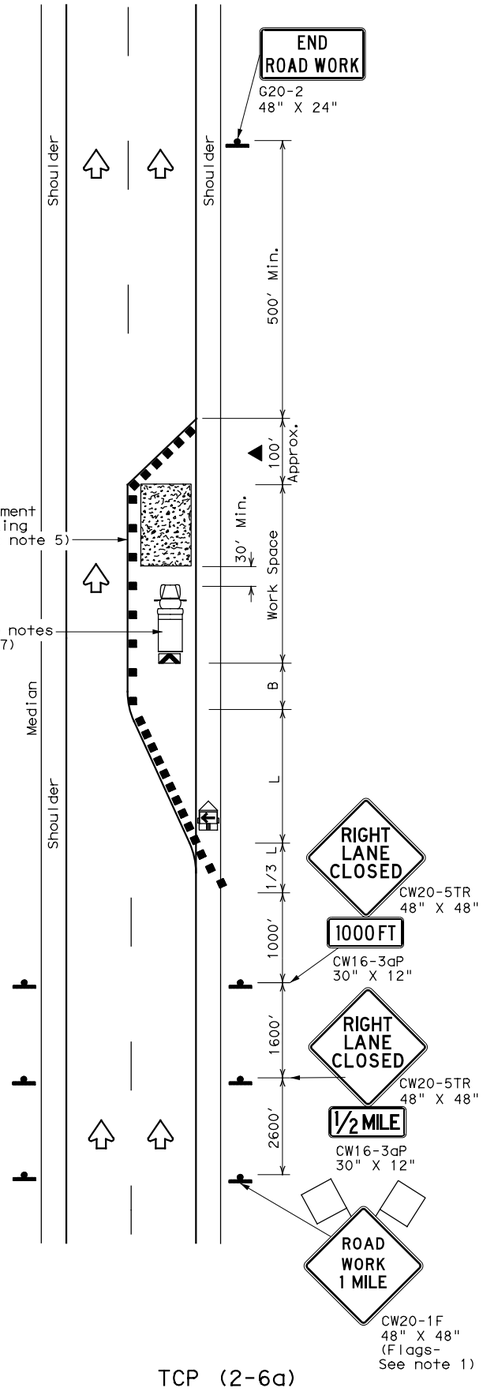
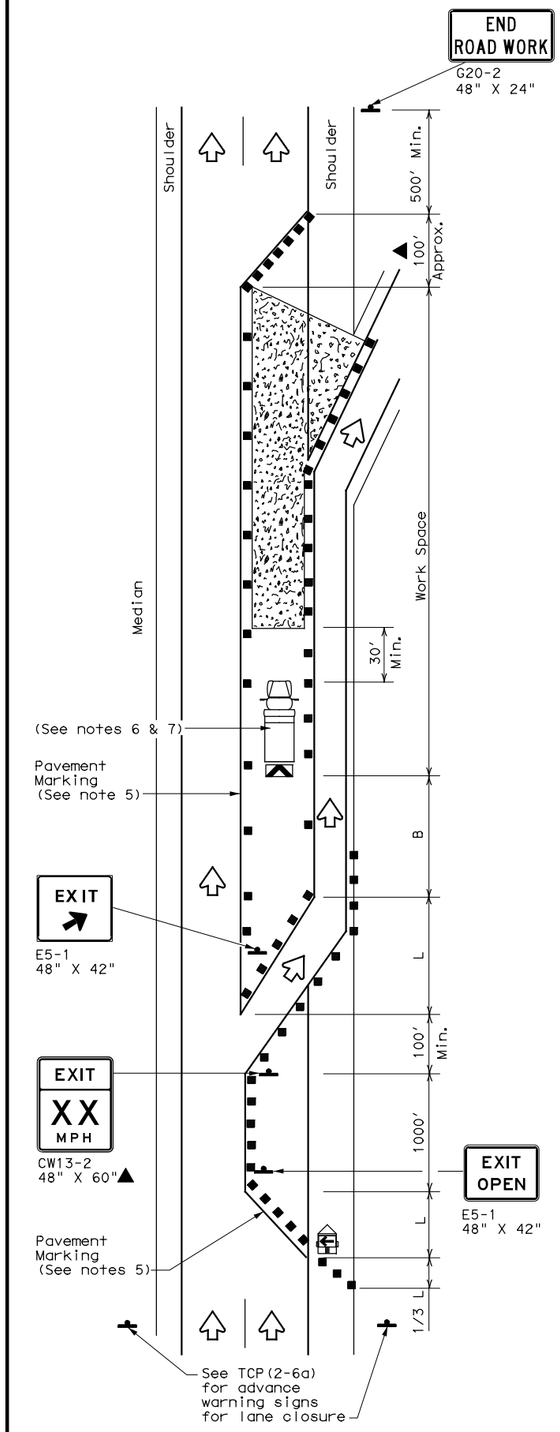


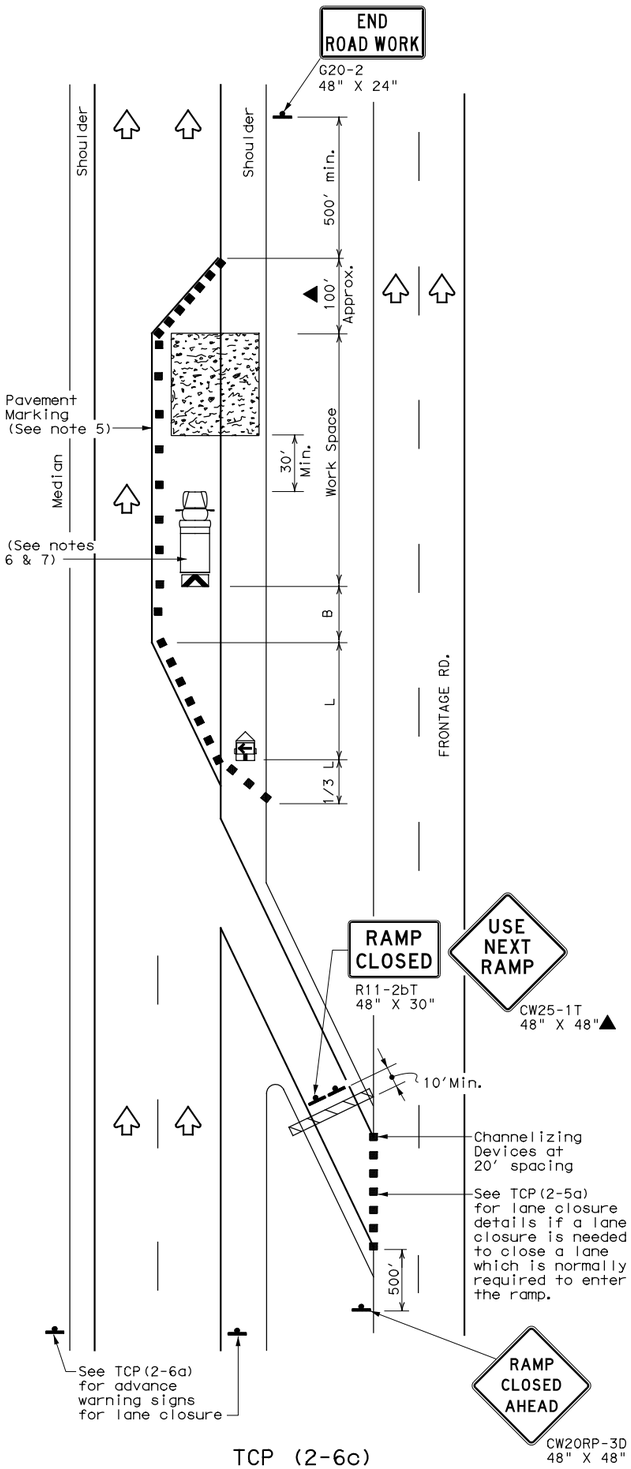
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. 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.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

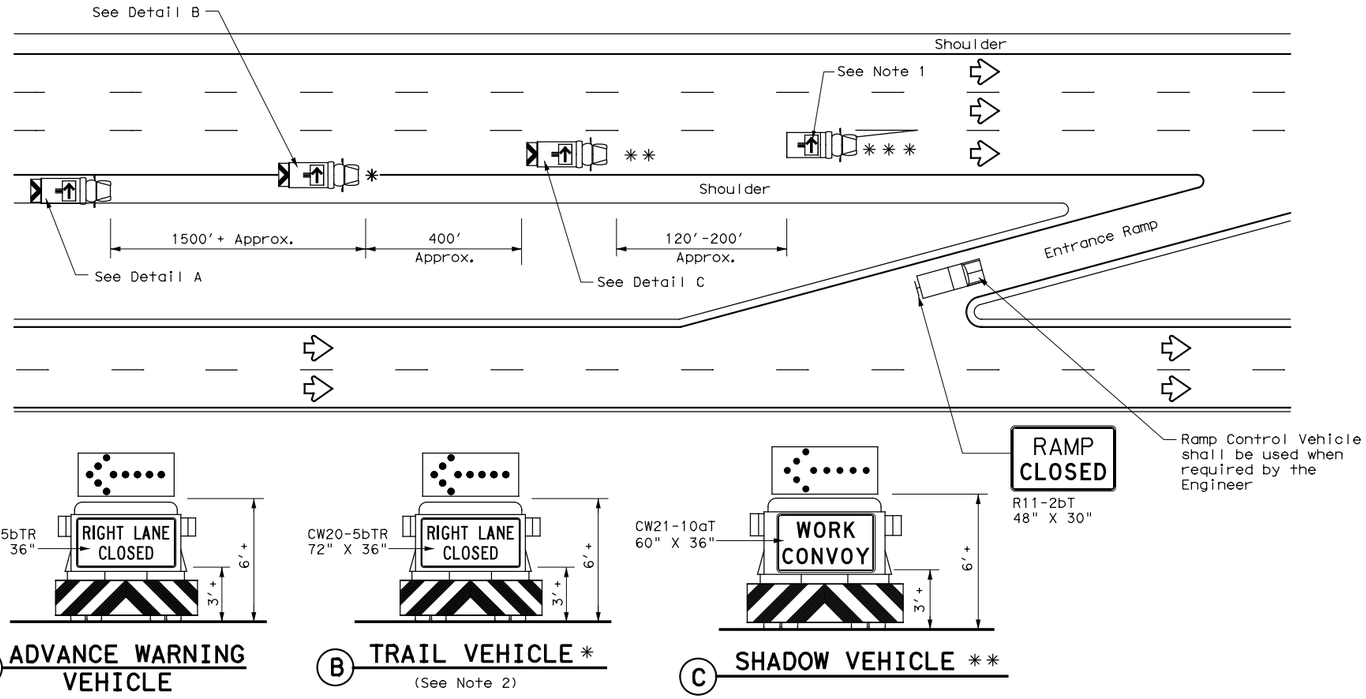
Texas Department of Transportation

Traffic Operations Division Standard

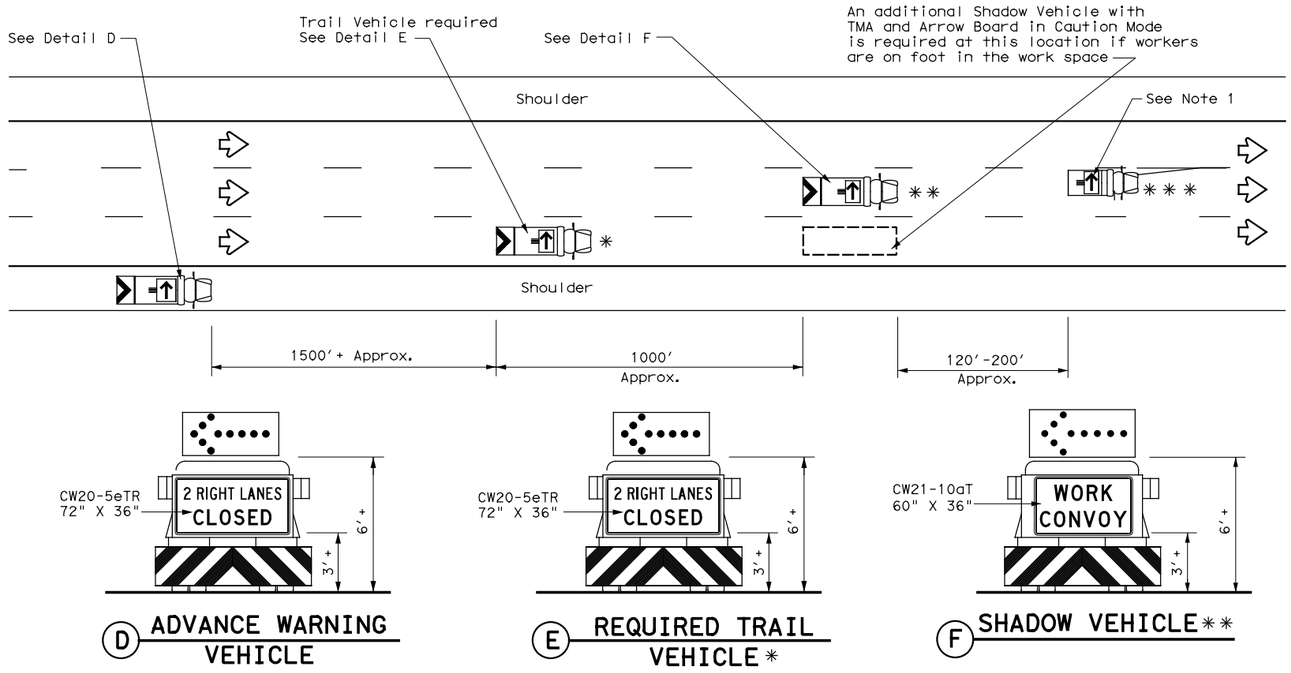
TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		28



RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



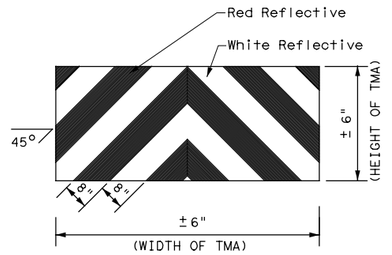
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

1. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		29

DATE: 5/25/2021 7:51:05 AM
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DATE: 5/25/2021 7:51:06 AM
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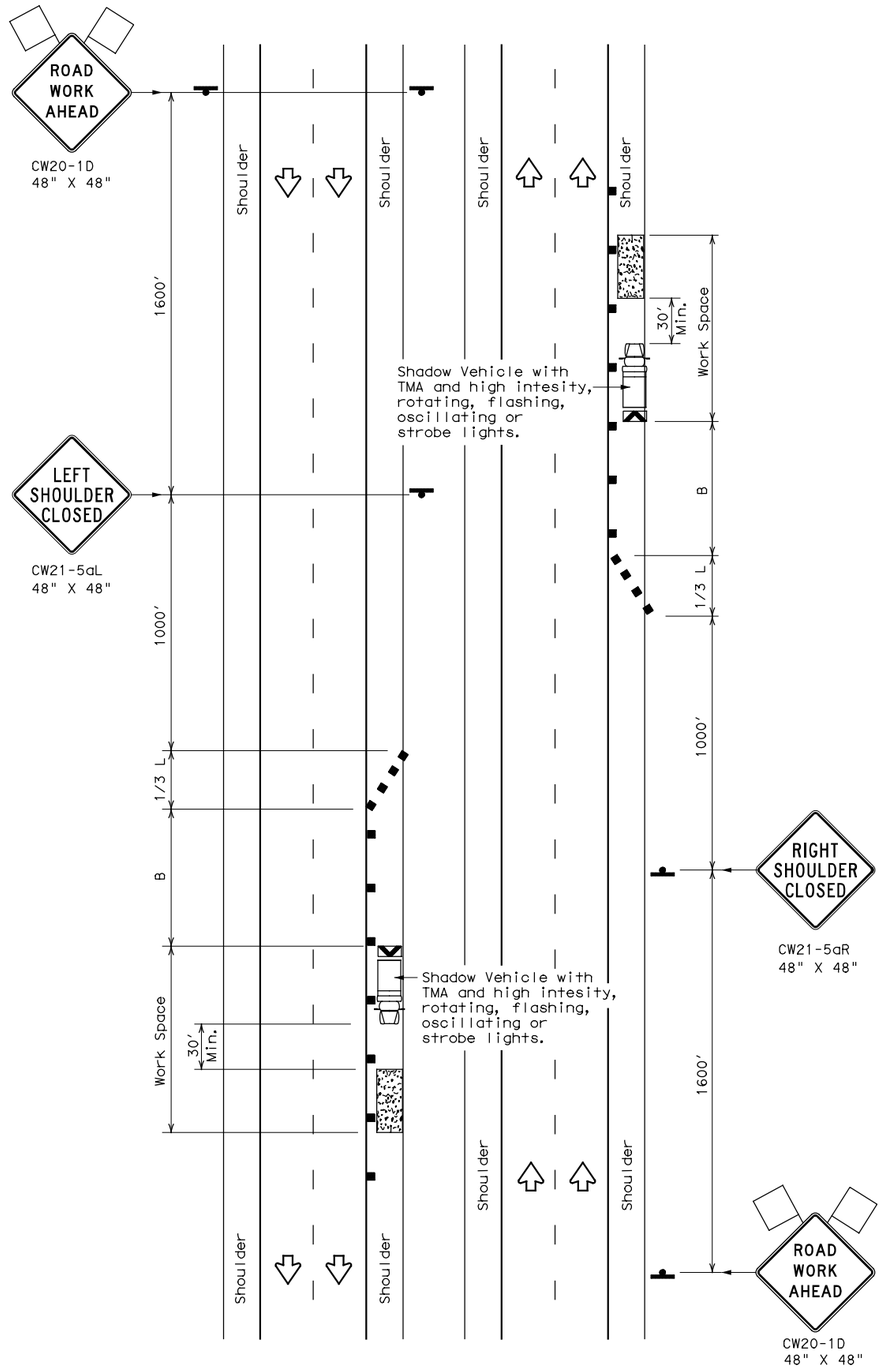
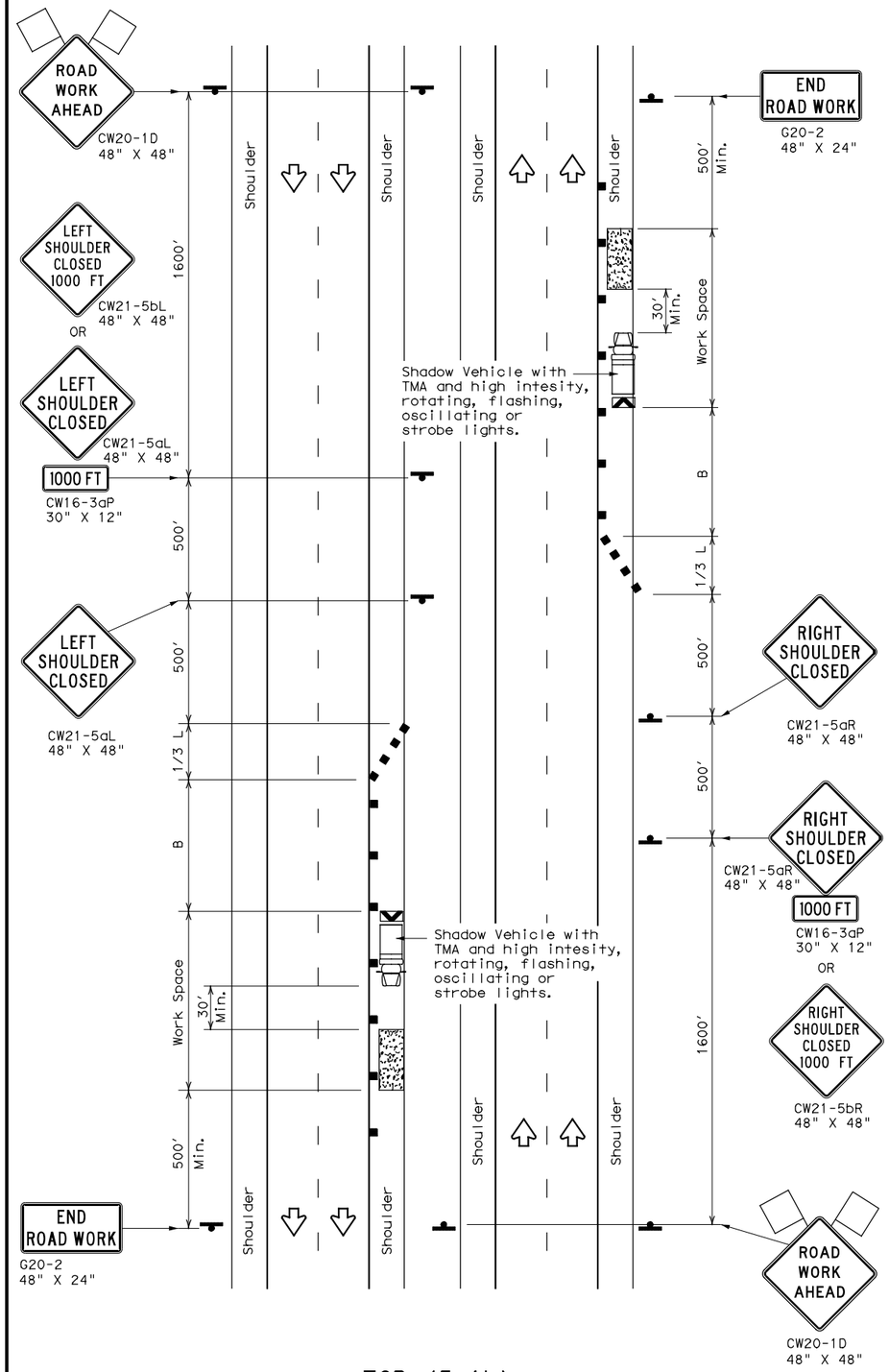


TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* 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
	TCP(5-1a)	TCP(5-1b)	TCP(5-1b)	

GENERAL NOTES

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely effecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

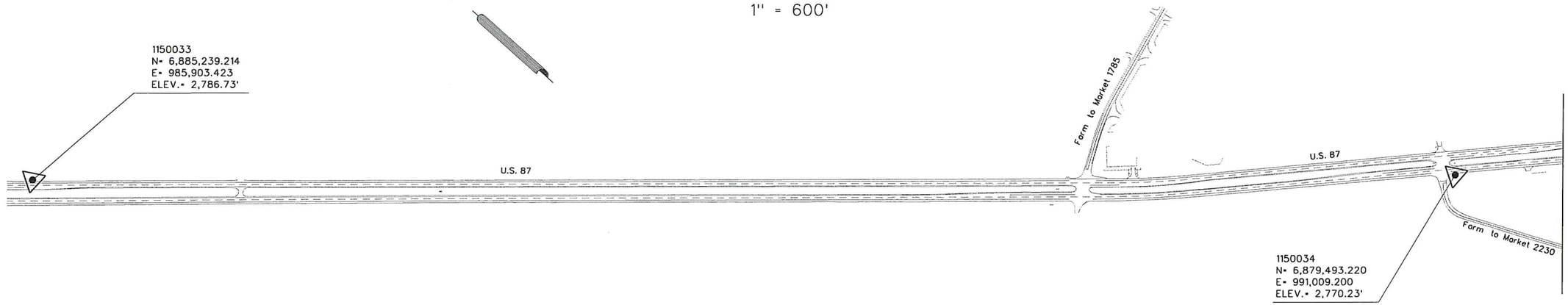
TCP(5-1)-18

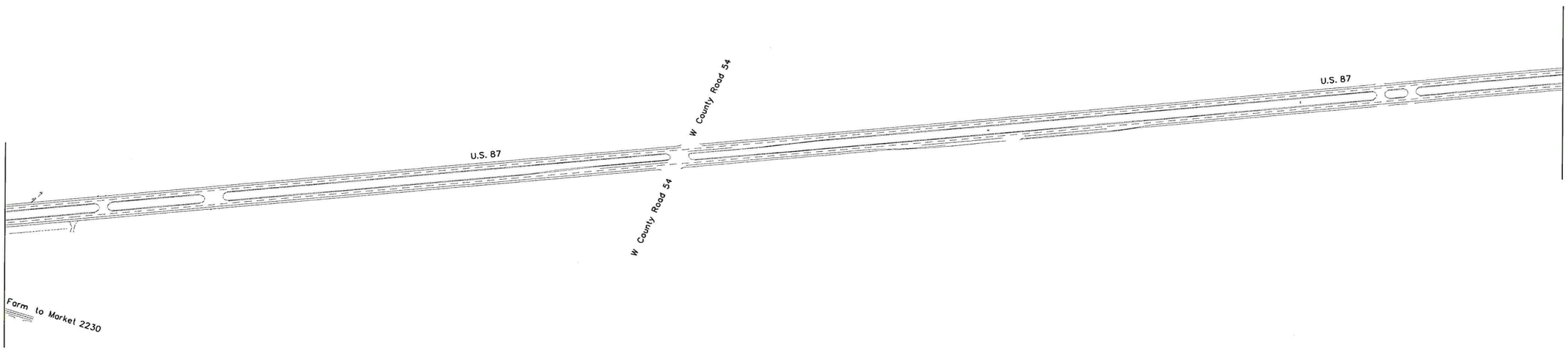
FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		30

GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'





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I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY DURING SEPTEMBER 2020 UTILIZING THE TXDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK, AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED
Timothy A. Frost
5316
PROFESSIONAL
LAND SURVEYOR

Timothy A. Frost 9/24/2021
Timothy A. Frost Date
Registered Professional Land Surveyor
No. 5316
TBPLS Firm No. 100116-01

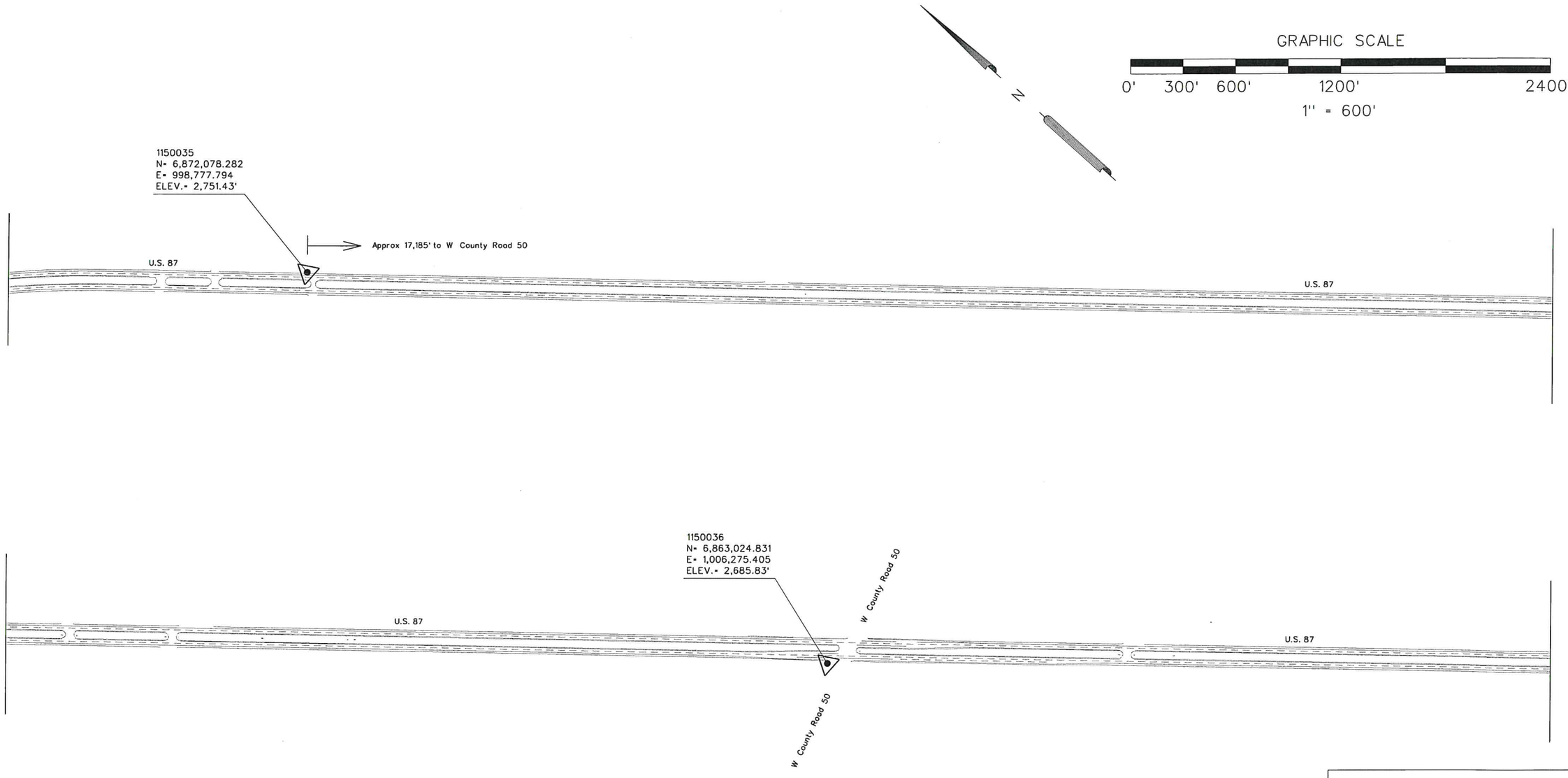
TEAGUE NALL & PERKINS
5237 N. RIVERSIDE DR., SUITE 100
FORT WORTH, TEXAS 76137

Texas Department of Transportation

US 87
SURVEY CONTROL INDEX SHEET

SHEET 1 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6	SEE TITLE SHEET		31
CHECK	STATE	DIST.	COUNTY	
DETAIL	TEXAS	ABILENE	HOWARD	
CHECK	CONT.	SECT.	JOB	HIGHWAY NO.
	0068	07	052, ETC	US 87



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Timothy A. Frost
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Timothy A. Frost 7/20/2021
Timothy A. Frost Date
Registered Professional Land Surveyor
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TBPLS Firm No. 100116-01

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Texas Department of Transportation

US 87
SURVEY CONTROL INDEX SHEET

SHEET 2 OF 4

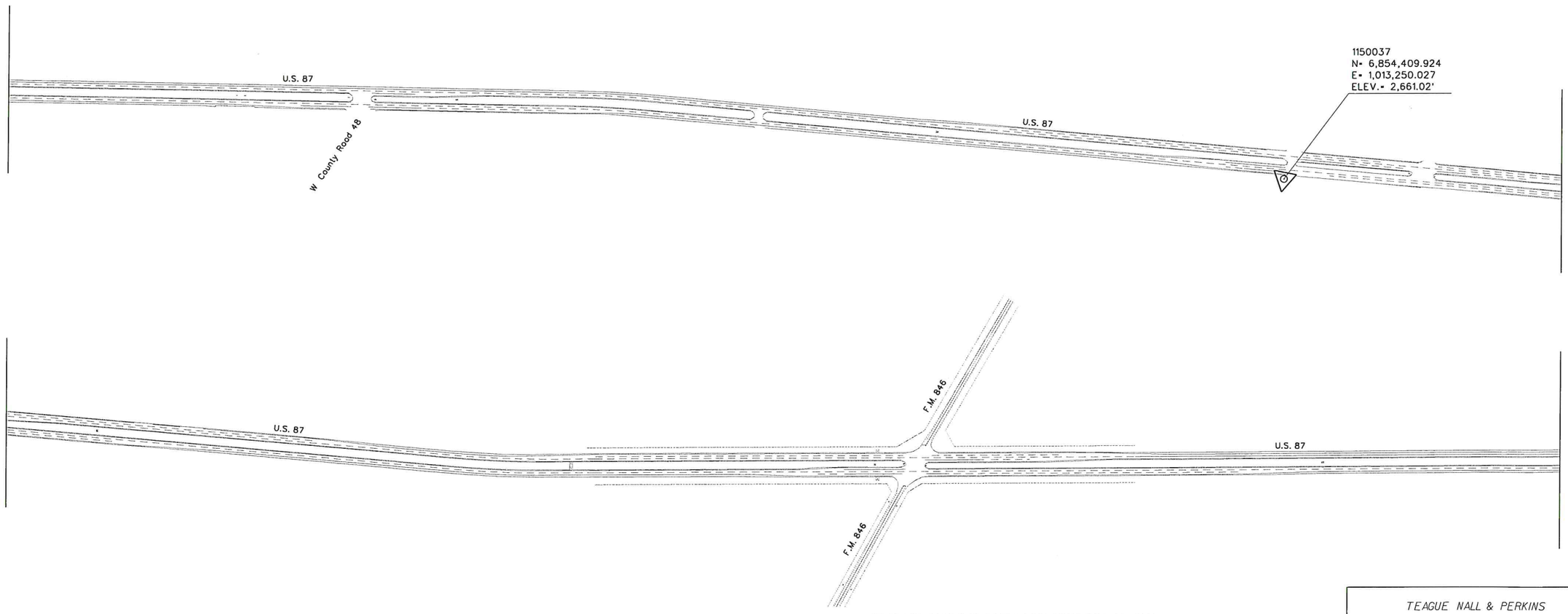
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CHECK	6	SEE TITLE SHEET		32
	STATE	DIST.	COUNTY	
DETAIL	TEXAS	ABILENE	HOWARD	
	CONT.	SECT.	JOB	HIGHWAY NO.
CHECK	0068	07	052, ETC	US 87

GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'

N



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Timothy A. Frost — 9/20/2021
Timothy A. Frost — Date
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Texas Department of Transportation

US 87
SURVEY CONTROL INDEX SHEET

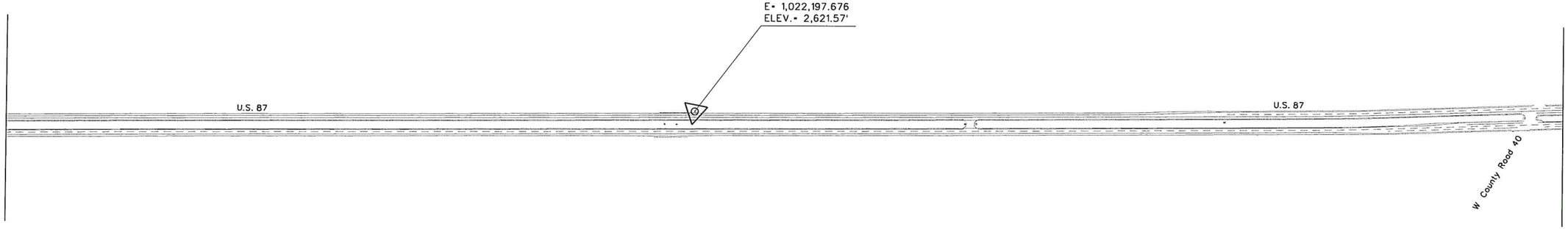
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CHECK	6	SEE TITLE SHEET		33
	STATE	DIST.	COUNTY	
DETAIL	TEXAS	ABILENE	HOWARD	
CHECK	CONT.	SECT.	JOB	HIGHWAY NO.
	0068	07	052, ETC	US 87

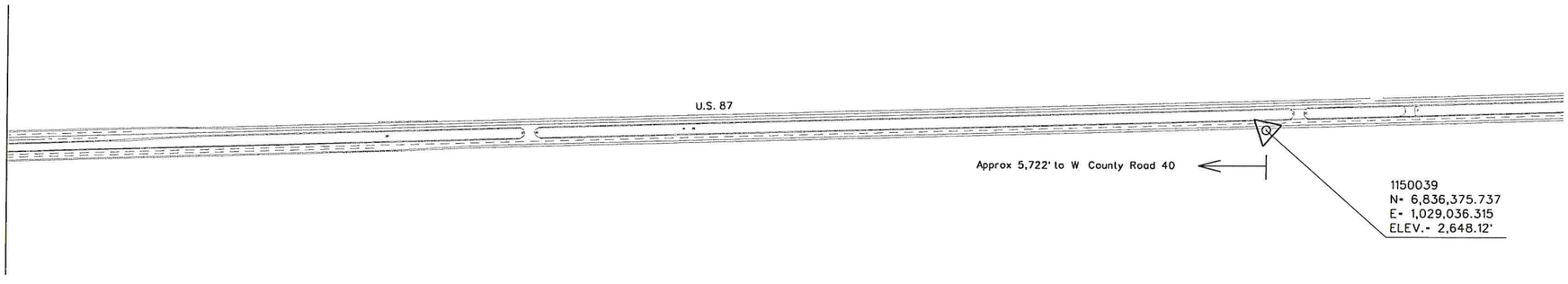
GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'

N





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STATE OF TEXAS
REGISTERED
Timothy A. Frost
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LAND SURVEYOR

Timothy A. Frost 9/22/2021
Timothy A. Frost *Date*
Registered Professional Land Surveyor
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TBPLS Firm No. 100116-01

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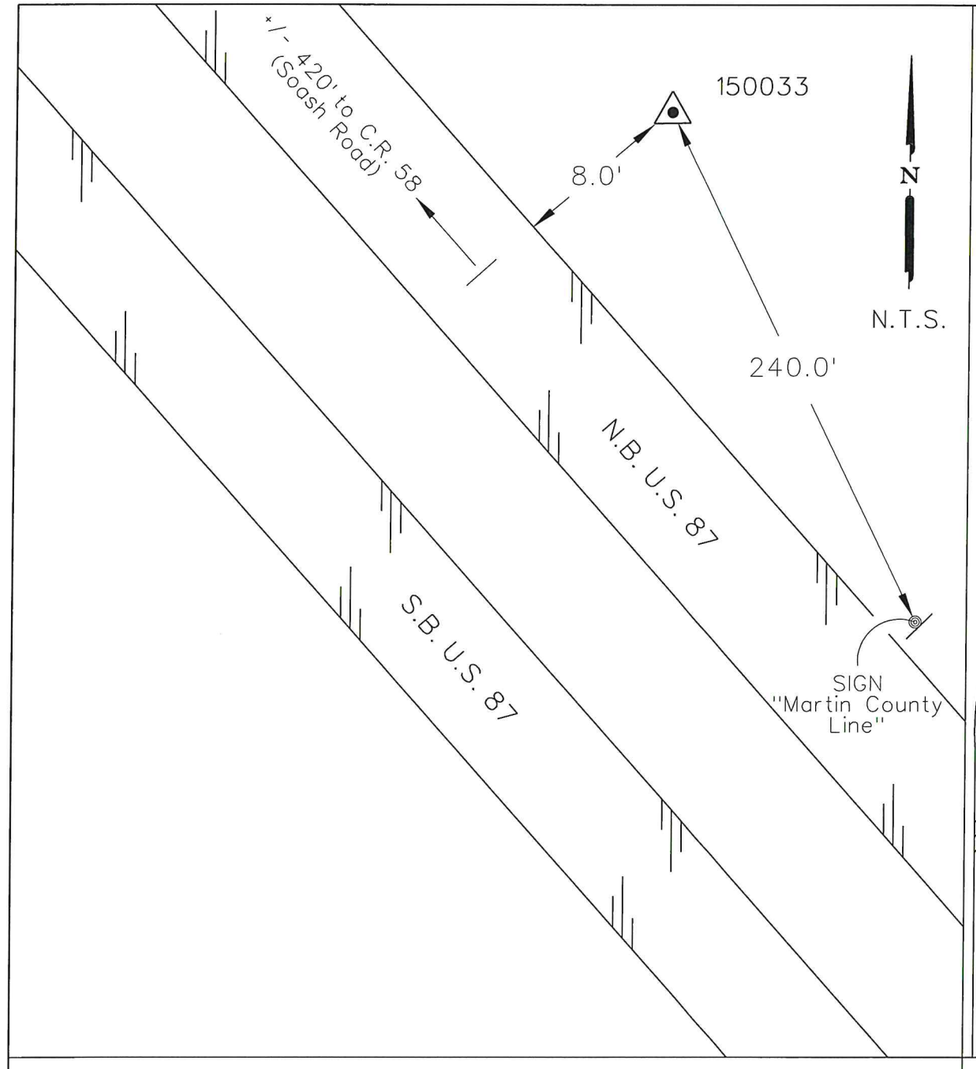
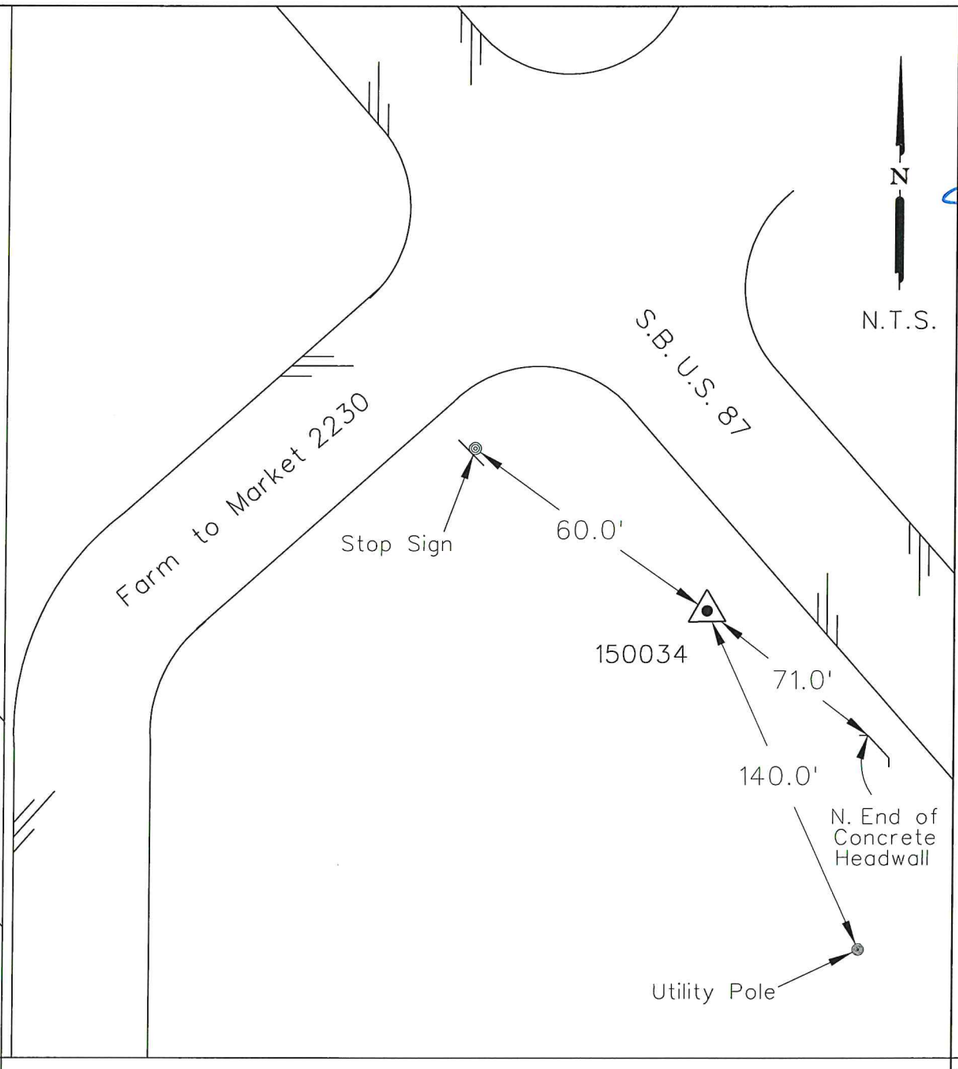
Texas Department of Transportation

US 87
SURVEY CONTROL INDEX SHEET

SHEET 4 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CHECK	6	SEE TITLE SHEET		34
	STATE	DIST.	COUNTY	
DETAIL	TEXAS	ABILENE	HOWARD	
	CONT.	SECT.	JOB	HIGHWAY NO.
CHECK	0068	07	052, ETC	US 87





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9/24/2020

Timothy A. Frost
Registered Professional Land Surveyor
No. 5316

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FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

STATE OF TEXAS
REGISTERED
Timothy A. Frost
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CONTROL POINT NO. 150033

150033, a Type II Aluminum Disk set in concrete, flush with ground, located in the north R.O.W of U.S. 87, approx. 420' S.E. of the intersection of U.S. 87 and C.R. 58 (Soash Road) also being +/- 8' N.E. of the north E.O.A. for N.B. U.S. 87 and +/- 240' N.W. of a sign located in the north R.O.W. for the Martin County line.

US SURVEY FEET
NAVD 88 ELEVATION = 2,786.73'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,885,239.214
SURFACE EAST: 985,903.423
GRID NORTHING: 6,883,793.617
GRID EAST: 985,696.427
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

CONTROL POINT NO. 150034

150034, a Type II Aluminum Disk set in concrete, flush with ground, located in the S.W. R.O.W of the intersection of S.B. U.S. 87 and F.M. 2230 also being +/- 60' S.E. of a stop sign for F.M. 2230, +/- 71' N.W. of the north end of a concrete headwall located in the south R.O.W of S.B. U.S. 87 and +/- 140' N.W of a utility pole.

US SURVEY FEET
NAVD 88 ELEVATION = 2,770.23'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,879,493.220
SURFACE EAST: 991,009.200
GRID NORTHING: 6,878,048.830
GRID EAST: 990,801.132
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

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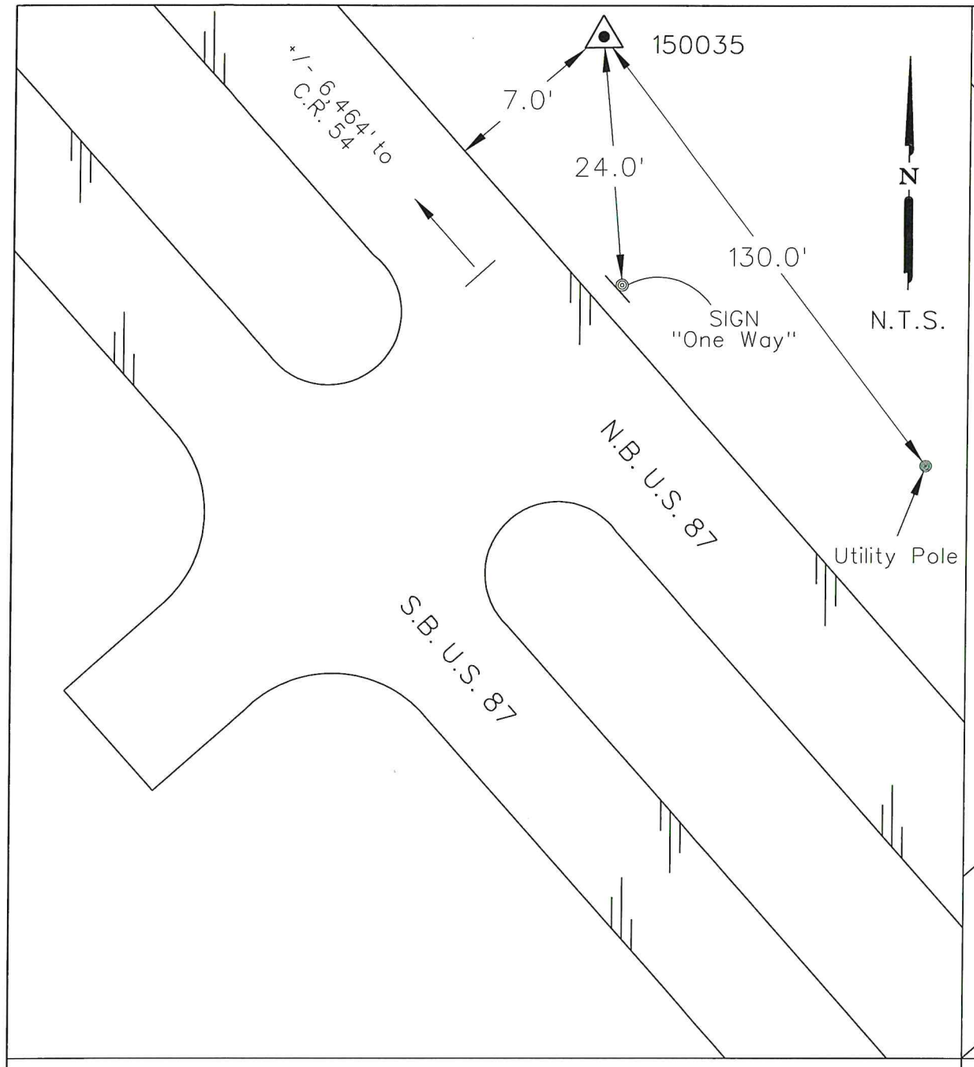
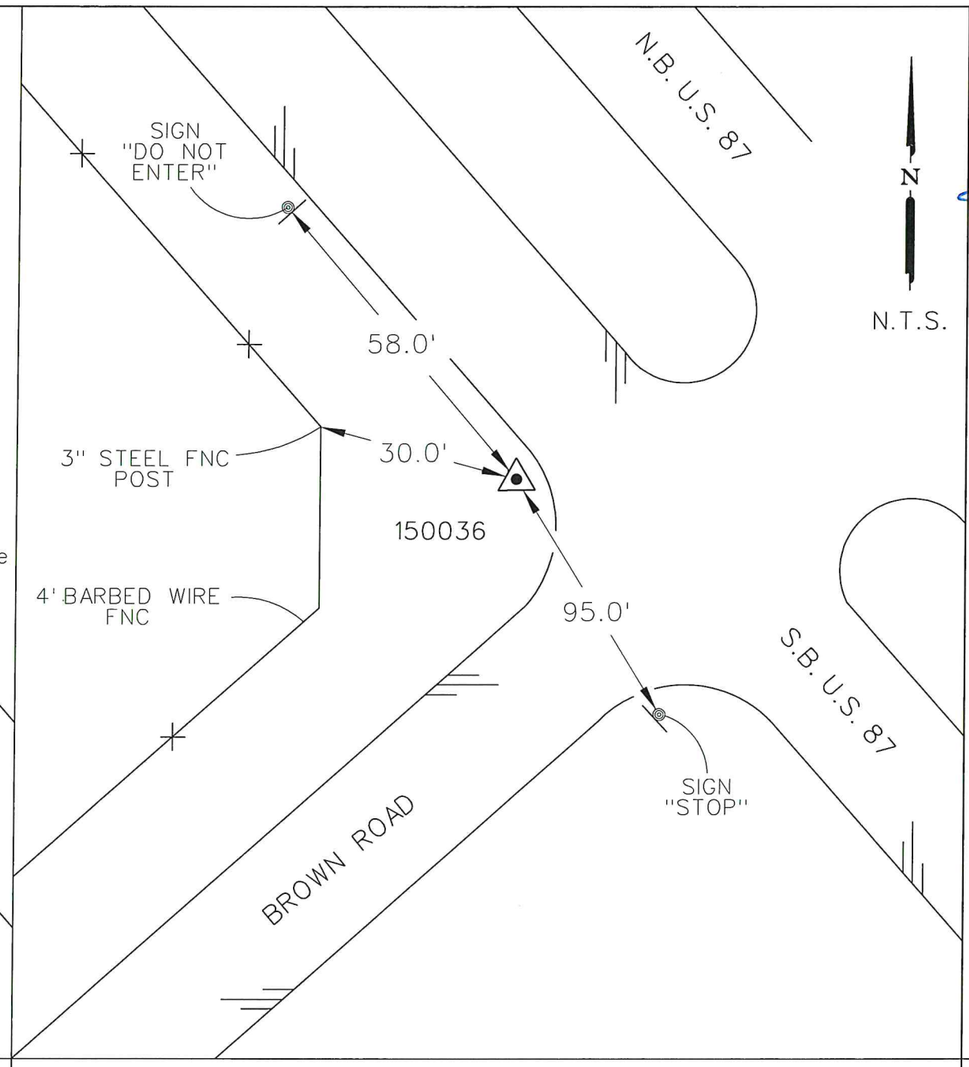
Texas Department of Transportation

SURVEY CONTROL

SCALE: N/A

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	35
CHECK	CONTROL	SECTION	JOB	
	0068	07	052, ETC	





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STATE OF TEXAS
REGISTERED
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CONTROL POINT NO. 150035

150035, a Type II Aluminum Disk set in concrete, flush with ground, located in the north R.O.W of U.S. 87, approx. 6,464' S.E. of the intersection of U.S. 87 and C.R. 54, also being +/- 7' N.E. of the north E.O.A. for N.B. U.S. 87, +/- 24.0' north of a "One Way" traffic sign and +/- 130.0' N.W. of a utility pole located along the north R.O.W. for U.S. 87.

US SURVEY FEET
NAVD 88 ELEVATION = 2,751.43'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,872,078.282
SURFACE EAST: 998,777.794
GRID NORTHING: 6,870,635.448
GRID EAST: 998,568.095
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

CONTROL POINT NO. 150036

150036, a Type II Aluminum Disk set in concrete, flush with ground, located in the N.W. R.O.W of the intersection of S.B. U.S. 87 and Brown Road, also being +/- 58' S.E. of a "Do Not Enter" sign, +/- 30' S.E. of 3" steel post set at the north end of a corner clip and +/- 95' N.W. of a "Stop" sign located in south R.O.W. for Brown Road.

US SURVEY FEET
NAVD 88 ELEVATION = 2,685.83'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00012
SURFACE NORTHING: 6,863,024.831
SURFACE EAST: 1,006,275.405
GRID NORTHING: 6,861,583.898
GRID EAST: 1,006,064.131
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

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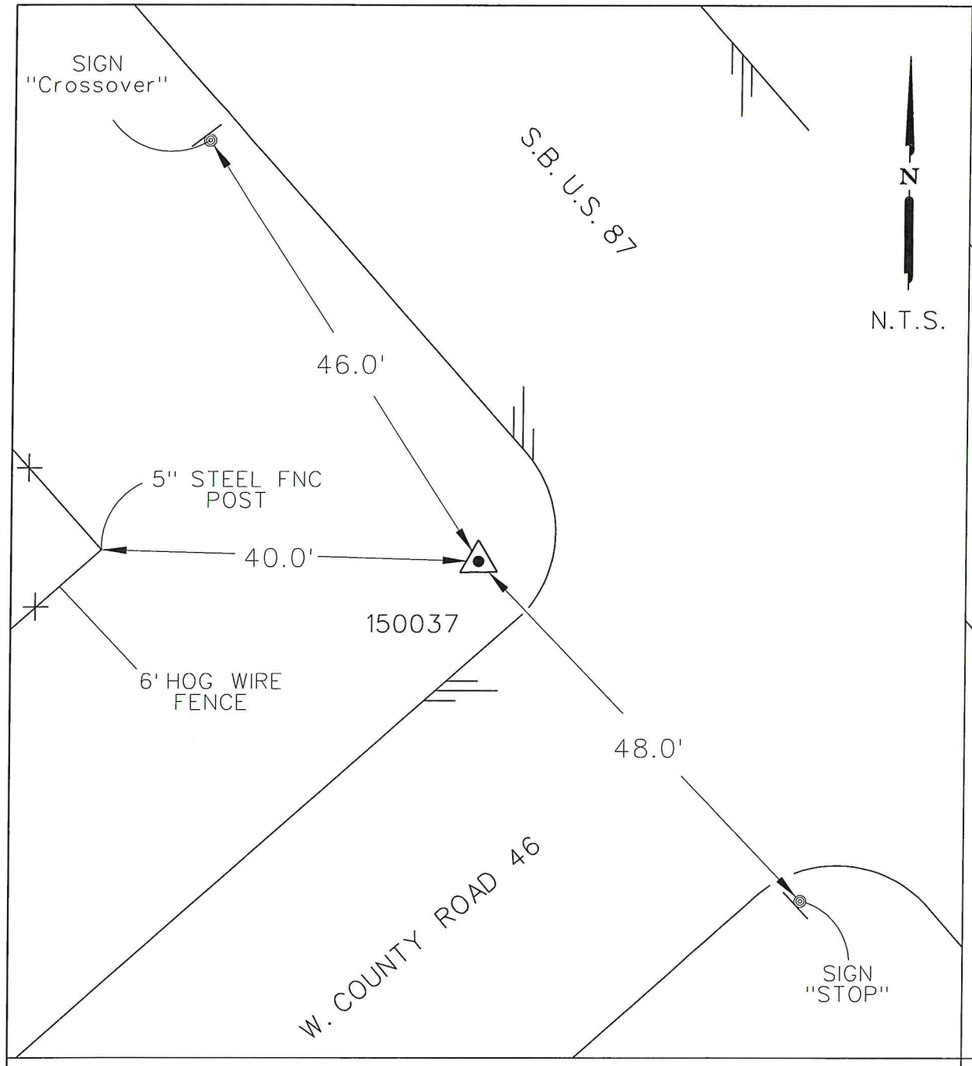
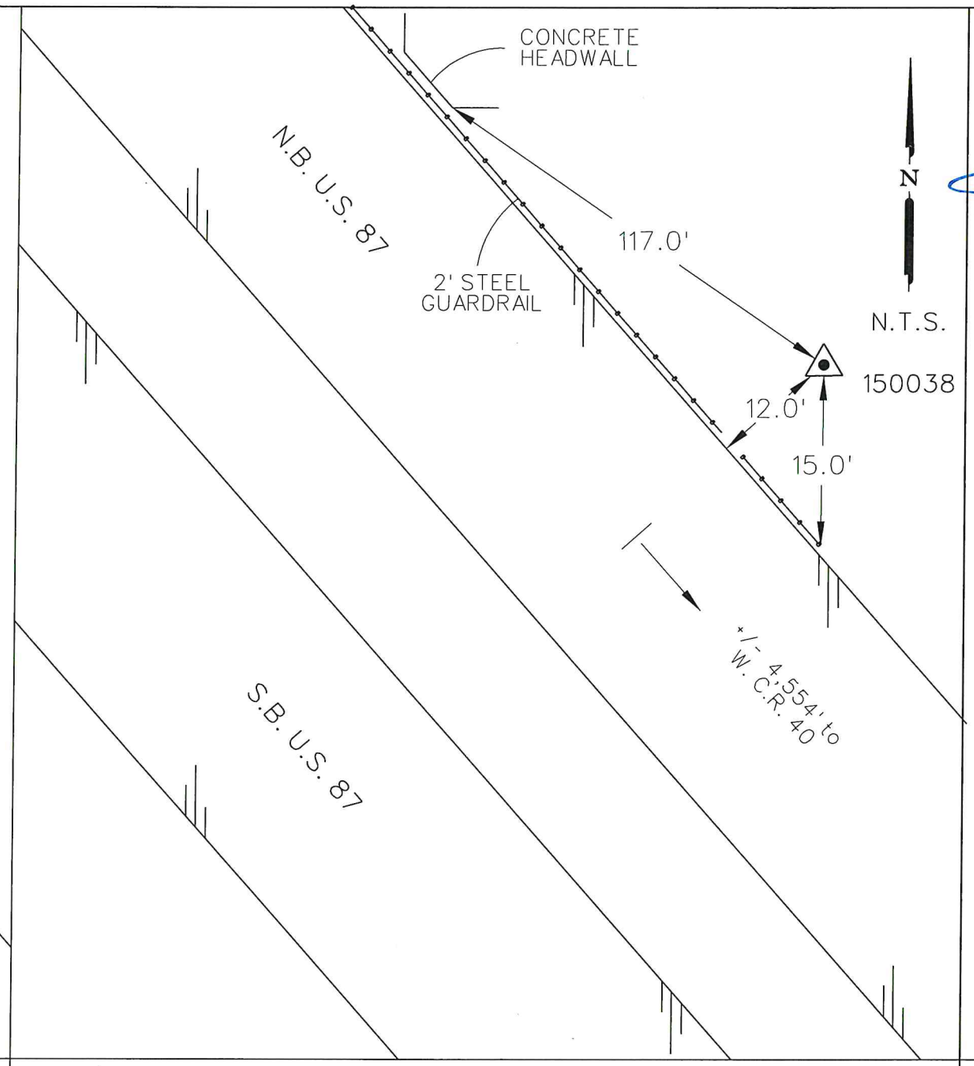
SURVEY CONTROL

SCALE: N/A

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	ABILENE	HOWARD	36
CHECK	CONTROL	SECTION	JOB	
	0068	07	052, ETC	





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No. 5316

TEAGUE NALL & PERKINS
5237 N. RIVERSIDE DR., SUITE 100
FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

STATE OF TEXAS
REGISTERED
Timothy A. Frost
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PROFESSIONAL
LAND SURVEYOR

CONTROL POINT NO. 150037

150037, a Type II Aluminum Disk set in concrete, flush with ground, located in the south R.O.W of U.S. 87 also being the north R.O.W. of W. County Road 46 approx. 46' S.E. of a "Crossover" sign, +/- 40' S.E. of a 5" steel fence post and +/- 48' N.W. of a "Stop" sign located in the south R.O.W. for W. County Road 46.

US SURVEY FEET
NAVD 88 ELEVATION = 2,661.02'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,854,409.924
SURFACE EAST: 1,013,250.027
GRID NORTHING: 6,852,970.800
GRID EAST: 1,013,037.289
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

CONTROL POINT NO. 150038

150038, a Type II Aluminum Disk set in concrete, flush with ground, located in the north R.O.W of U.S. 87, +/- 117' S.E. of the south end of a concrete headwall located in the north R.O.W. of U.S 87, +/- 12' north of the north E.O.A. of N.B. U.S. 87 and +/- 15' from the south end of a 2' tall steel guardrail.

US SURVEY FEET
NAVD 88 ELEVATION = 2,621.57'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,844,021.004
SURFACE EAST: 1,022,197.676
GRID NORTHING: 6,842,584.061
GRID EAST: 1,021,983.059
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

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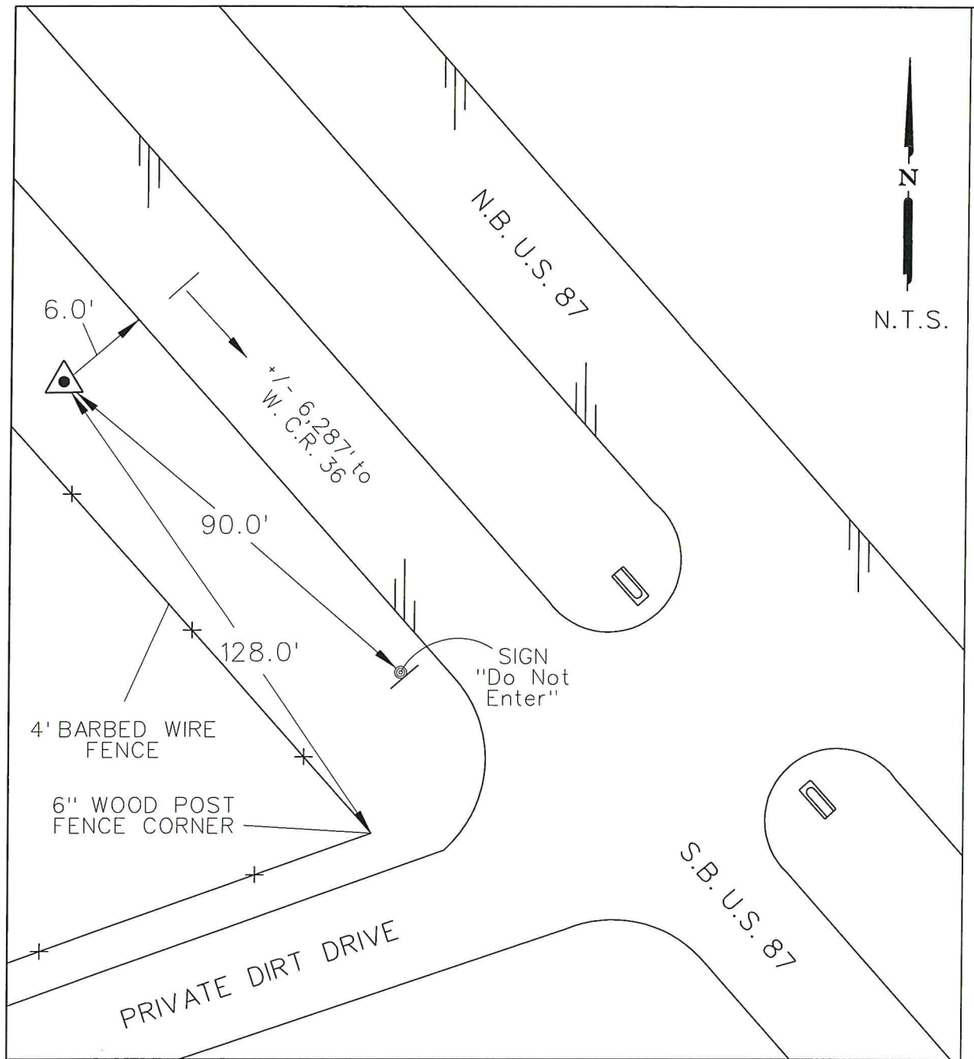
SURVEY CONTROL

SCALE: N/A

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	37
CHECK	CONTROL	SECTION	JOB	
	0068	07	052, ETC	



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9/20/2021

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FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

STATE OF TEXAS
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LAND SURVEYOR

CONTROL POINT NO. 150039

150039, a Type II Aluminum Disk set in concrete, flush with ground, located in the SOUTH R.O.W of U.S. 87, approx. 6,287' N.W. of the intersection of U.S. 87 and W. C.R. 36, +/- 6' south of the south E.O.A. for S.B. U.S. 87, +/- 90' N.W. of a "Do Not Enter" sign located in the south R.O.W. for S.B. U.S. 87 and +/- 128' N.W. of 6" wood post for a fence corner.

US SURVEY FEET
NAVD 88 ELEVATION = 2,648.12'
DATE SET: SEPTEMBER 17, 2020
MONUMENT: TYPE II

HOWARD COUNTY SCALE FACTOR: 1.00021
SURFACE NORTHING: 6,836,375.737
SURFACE EAST: 1,029,036.315
GRID NORTHING: 6,834,940.399
GRID EAST: 1,028,820.263
ELEVATION ARE NAVD 88 BASED UPON GEOID 12B
TxDOT VRS NETWORK

Coordinates shown hereon refer to the Texas Coordinate System of 1983 (North Central Zone; NAD83(2011) EPOCH 2010.00) as derived locally from TxDOT's VRS Network via Real Time Kinematic (RTK) methods. An average Combination Factor of 1.00021 was used to scale grid coordinates and distances to surface. All coordinates shown are surface.

The elevations shown are NAVD88 and were derived from the above RTK observations. Orthometric heights were calculated by applying the Geoid 12B model to the ellipsoid heights.

SURVEY CONTROL

SCALE: N/A

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	38
CHECK	CONTROL	SECTION	JOB	
	0068	07	052, ETC	

PROPOSED US 87 - HORIZONTAL ALIGNMENT

Beginning chain P_US87 description

Point 87001 N 6,807,808.3106 E 1,041,015.2337 Sta 190+00.00

Course from 87001 to 87002 N 12° 49′ 22.16" W Dist 266.9327

Point 87002 N 6,808,068.5863 E 1,040,955.9915 Sta 192+66.93

Course from 87002 to 87003 N 12° 50′ 22.16" W Dist 6,887.4048

Point 87003 N 6,814,783.7814 E 1,039,425.4688 Sta 261+54.34

Course from 87003 to 87004 N 12° 37′ 22.16" W Dist 6,248.8280

Point 87004 N 6,820,881.5739 E 1,038,059.9004 Sta 324+03.17

Course from 87004 to PC P_US871 N 12° 50′ 02.59" W Dist 7,279.8245

	Curve Data				
Curve P_US871					
P.I. Station	404+56.44	N	6,828,733.6574	E	1,036,271.0426
Delta =	30° 13′ 03.10"	(LT)			
Degree =	2° 00′ 00.00"				
Tangent =	773.4498				
Length =	1,510.8769				
Radius =	2,864.7900				
External =	102.5735				
Long Chord =	1,493.4275				
Mid. Ord. =	99.0278				
P.C. Station	396+82.99	N	6,827,979.5303	E	1,036,442.8474
P.T. Station	411+93.87	N	6,829,298.8477	E	1,035,743.0421
C.C.		N	6,827,343.1802	E	1,033,649.6270
Back = N	12° 50′ 02.59" W				
Ahead = N	43° 03′ 05.69" W				
Chord Bear = N	27° 56′ 34.14" W				

Course from PT P_US871 to PC P_US872 N 43° 03′ 05.69" W Dist 16,322.2087

	Curve Data				
Curve P_US872					
P.I. Station	576+49.97	N	6,841,323.9707	E	1,024,509.1774
Delta =	1° 20′ 19.95"	(RT)			
Degree =	0° 30′ 00.00"				
Tangent =	133.8935				
Length =	267.7749				
Radius =	11,459.1600				
External =	0.7822				
Long Chord =	267.7688				
Mid. Ord. =	0.7822				
P.C. Station	575+16.08	N	6,841,226.1294	E	1,024,600.5807
P.T. Station	577+83.85	N	6,841,423.9209	E	1,024,420.0852
C.C.		N	6,849,048.7991	E	1,032,974.2409
Back = N	43° 03′ 05.69" W				
Ahead = N	41° 42′ 45.74" W				
Chord Bear = N	42° 22′ 55.71" W				

Course from PT P_US872 to PC P_US873 N 41° 42′ 45.74" W Dist 12,664.7682

	Curve Data				
Curve P_US873					
P.I. Station	707+15.25	N	6,851,077.0931	E	1,015,815.5818
Delta =	5° 19′ 43.93"	(RT)			
Degree =	1° 00′ 00.00"				
Tangent =	266.6358				
Length =	532.8872				
Radius =	5,729.5800				
External =	6.2008				
Long Chord =	532.6952				
Mid. Ord. =	6.1941				
P.C. Station	704+48.62	N	6,850,878.0519	E	1,015,993.0002
P.T. Station	709+81.51	N	6,851,291.7512	E	1,015,657.4156
C.C.		N	6,854,690.4910	E	1,020,270.0781
Back = N	41° 42′ 45.74" W				
Ahead = N	36° 23′ 01.81" W				
Chord Bear = N	39° 02′ 53.77" W				

Course from PT P_US873 to 87005 N 36° 23′ 01.81" W Dist 6,183.6429

Point 87005 N 6,856,269.9621 E 1,011,989.3295 Sta 771+65.15

Course from 87005 to PC P_US874 N 36° 22′ 48.11" W Dist 1,230.4098

PROPOSED US 87 (CONT.)- HORIZIONTAL ALIGNMENT

	Curve Data				
Curve P_US874					
P.I. Station	785+94.25	N	6,857,420.5357	E	1,011,141.6723
Delta =	3° 58′ 20.36"	(LT)			
Degree =	1° 00′ 00.00"				
Tangent =	198.6957				
Length =	397.2323				
Radius =	5,729.5780				
External =	3.4442				
Long Chord =	397.1527				
Mid. Ord. =	3.4422				
P.C. Station	783+95.56	N	6,857,260.5657	E	1,011,259.5263
P.T. Station	787+92.79	N	6,857,571.9572	E	1,011,013.0195
C.C.		N	6,853,862.1335	E	1,006,646.6398
Back = N	36° 22′ 48.11" W				
Ahead = N	40° 21′ 08.47" W				
Chord Bear = N	38° 21′ 58.29" W				

Course from PT P_US874 to PC P_US875 N 40° 21′ 08.47" W Dist 20,195.7296

	Curve Data				
Curve P_US875					
P.I. Station	992+95.25	N	6,873,196.4139	E	997,737.9532
Delta =	6° 07′ 43.82"	(LT)			
Degree =	1° 00′ 00.00"				
Tangent =	306.7344				
Length =	612.8838				
Radius =	5,729.5780				
External =	8.2047				
Long Chord =	612.5916				
Mid. Ord. =	8.1929				
P.C. Station	989+88.52	N	6,872,962.6587	E	997,936.5596
P.T. Station	996+01.40	N	6,873,407.6290	E	997,515.5253
C.C.		N	6,869,252.8349	E	993,570.1799
Back = N	40° 21′ 08.47" W				
Ahead = N	46° 28′ 52.29" W				
Chord Bear = N	43° 25′ 00.38" W				

Course from PT P_US875 to PC P_US876 N 46° 28′ 52.29" W Dist 10,282.4850

	Curve Data				
Curve P_US876					
P.I. Station	1101+25.70	N	6,880,654.5842	E	989,883.8471
Delta =	4° 50′ 00.29"	(RT)			
Degree =	1° 00′ 00.00"				
Tangent =	241.8141				
Length =	483.3413				
Radius =	5,729.5780				
External =	5.1006				
Long Chord =	483.1980				
Mid. Ord. =	5.0960				
P.C. Station	1098+83.89	N	6,880,488.0728	E	990,059.1982
P.T. Station	1103+67.23	N	6,880,835.2783	E	989,723.1497
C.C.		N	6,884,642.8668	E	994,004.5436
Back = N	46° 28′ 52.29" W				
Ahead = N	41° 38′ 52.00" W				
Chord Bear = N	44° 03′ 52.14" W				

Course from PT P_US876 to 87006 N 41° 38′ 52.00" W Dist 6,047.5883

Point 87006 N 6,885,354.3036 E 985,704.2276 Sta 1164+14.82

Ending chain P_US87 description

STATE OF TEXAS
JUSTIN K. BAKER
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5/25/2021

FIRM REGISTRATION NO. F-230

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US 87

HORIZONTAL ALIGNMENT DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	39
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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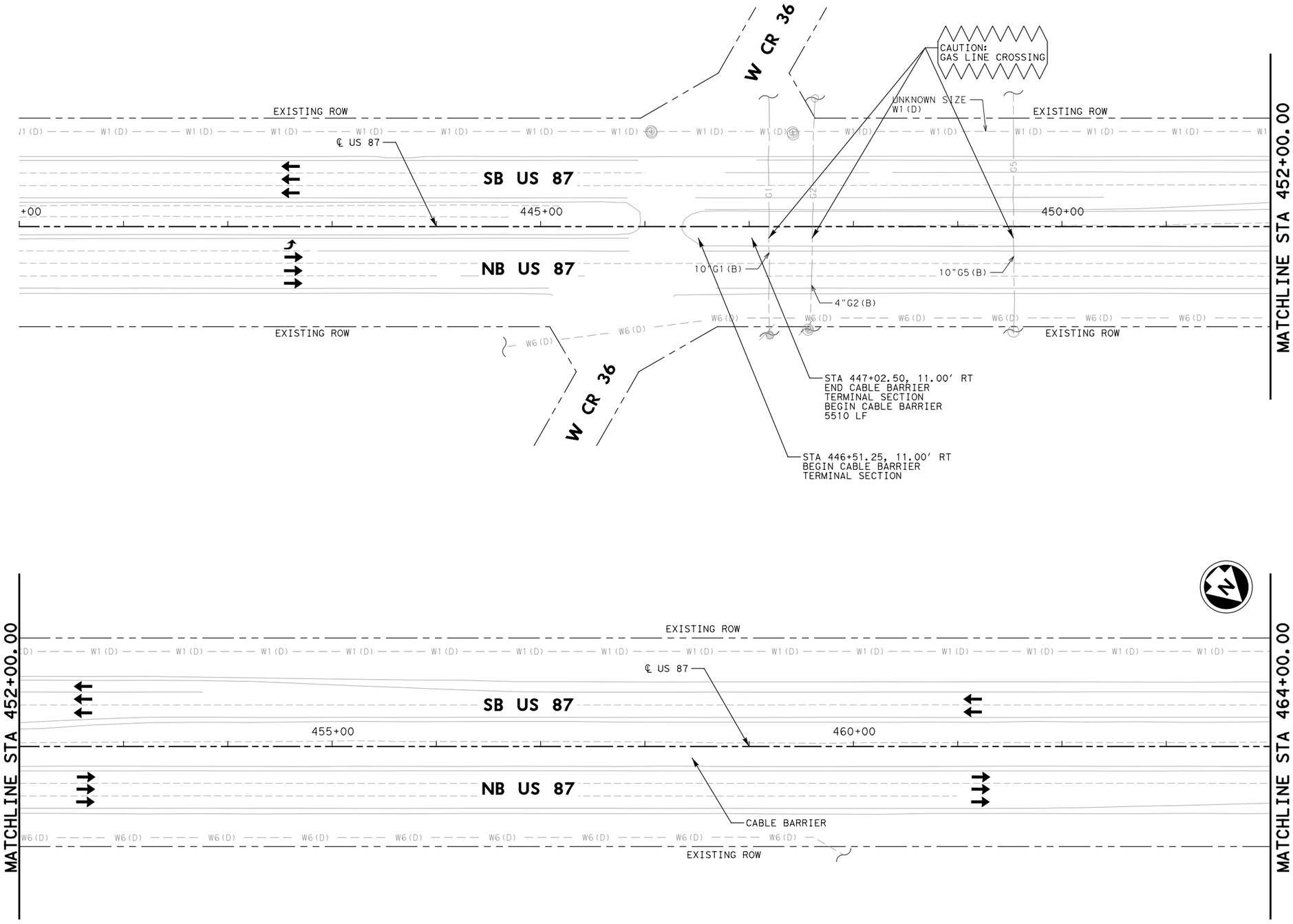

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

1. THE CONTRACTOR SHALL LOCATE ANY UTILITIES THAT CROSS THE CABLE BARRIER.
2. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.

STATE OF TEXAS
JUSTIN K. BAKER
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LICENSED
PROFESSIONAL ENGINEER
5/26/2021

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CABLE BARRIER PLAN LAYOUT

SHEET (1 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	40
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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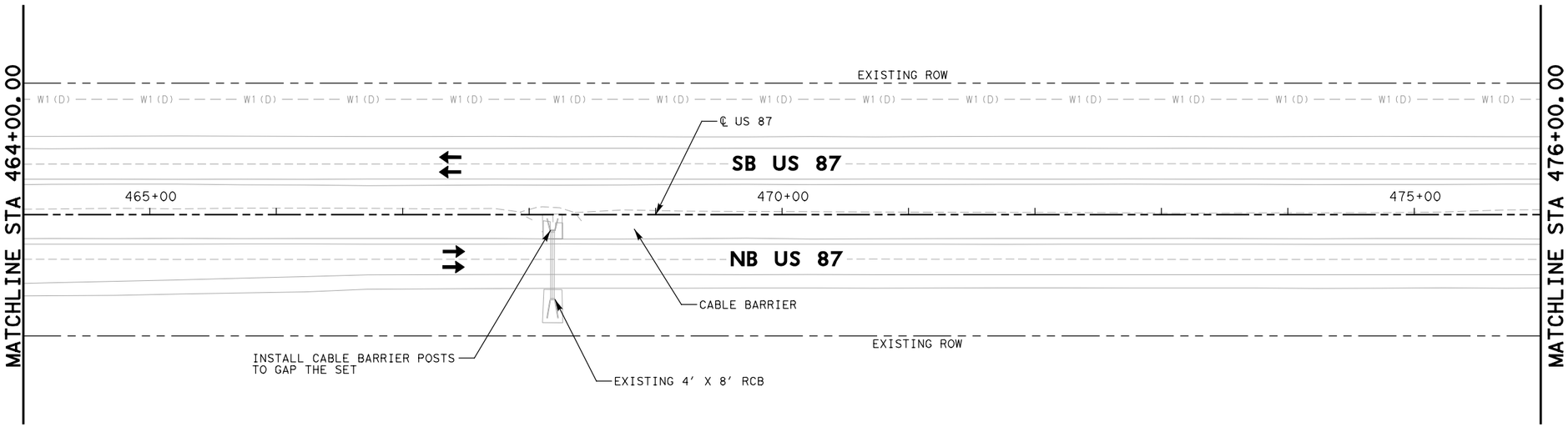

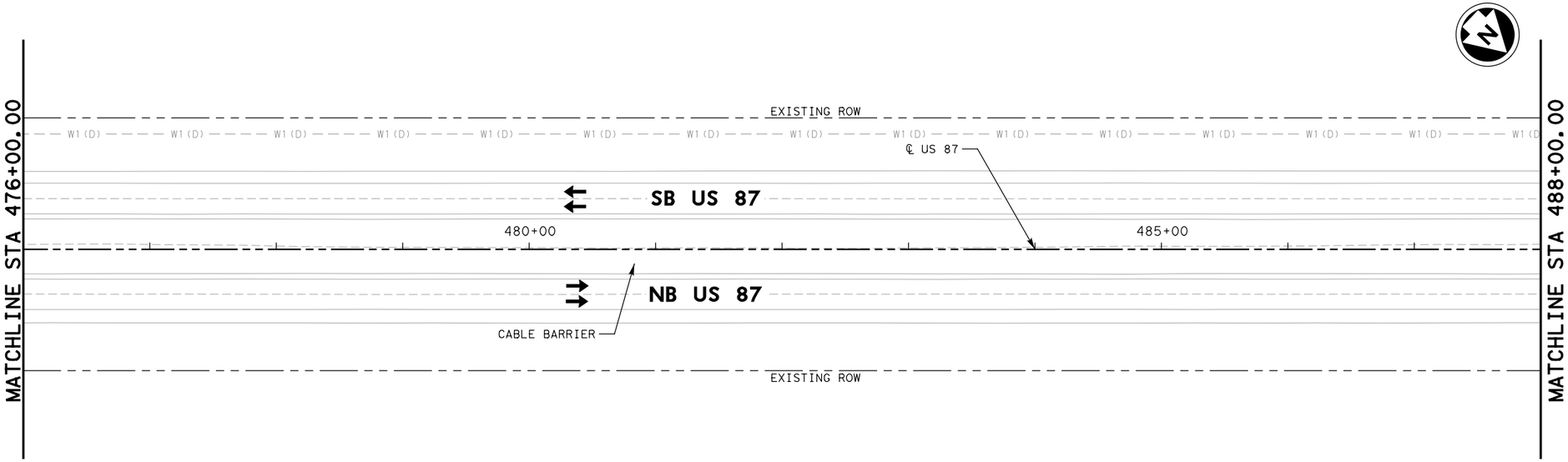

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SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (2 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	41
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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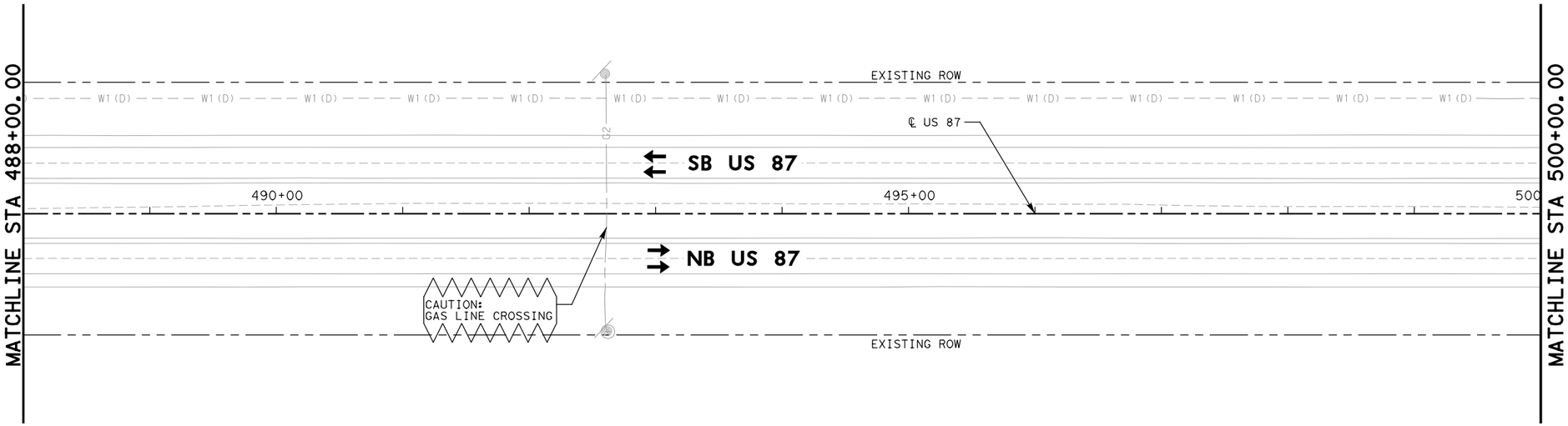

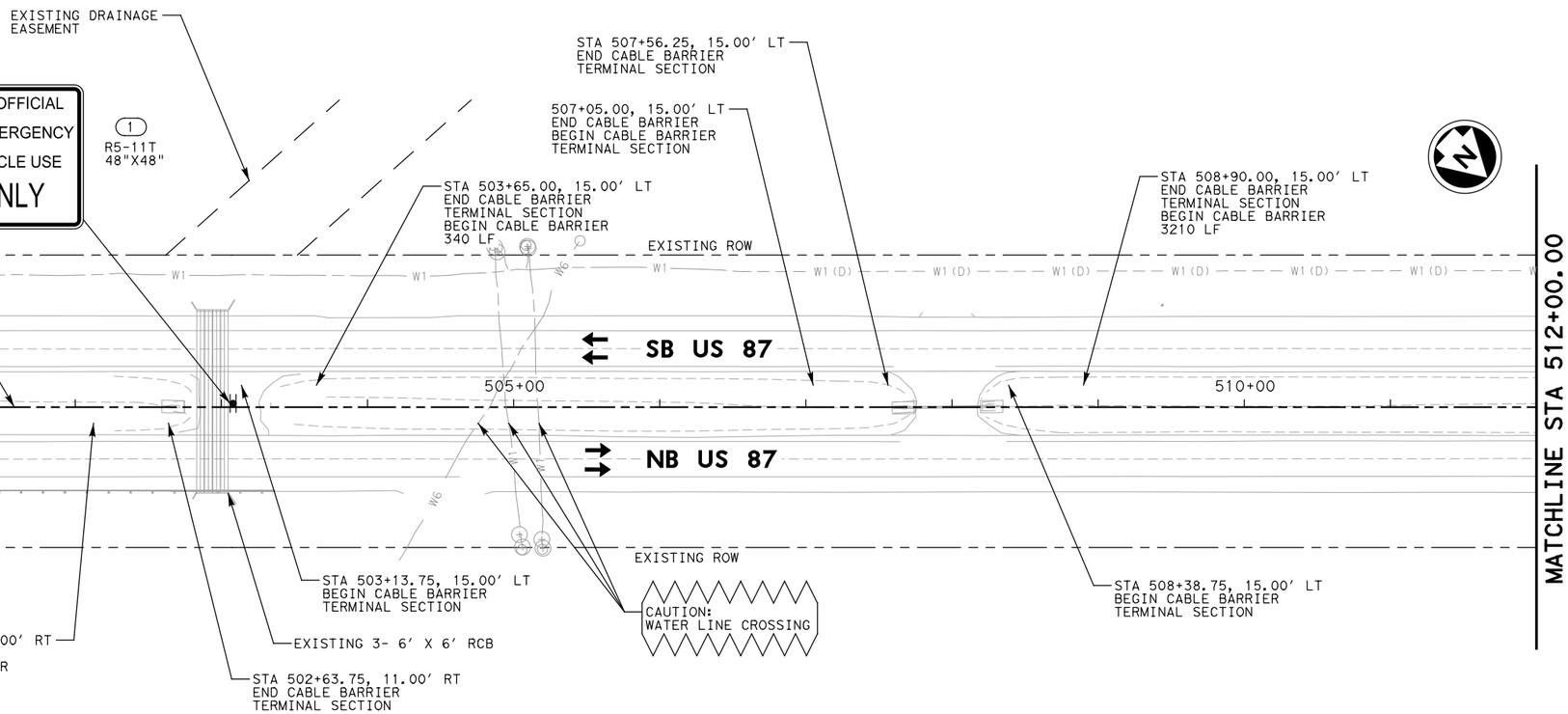

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (3 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	42
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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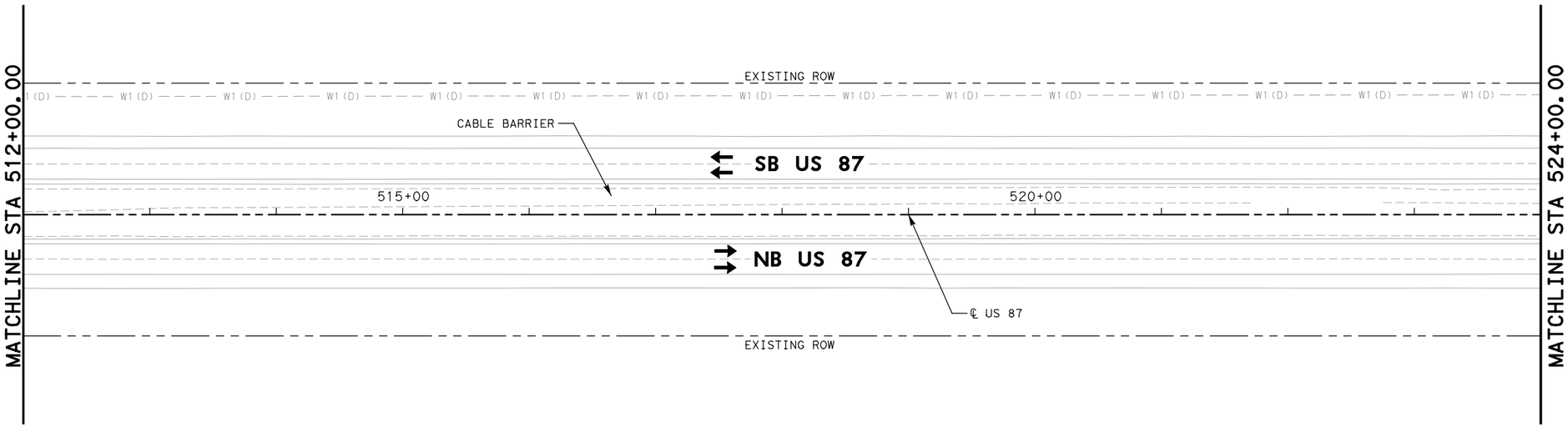

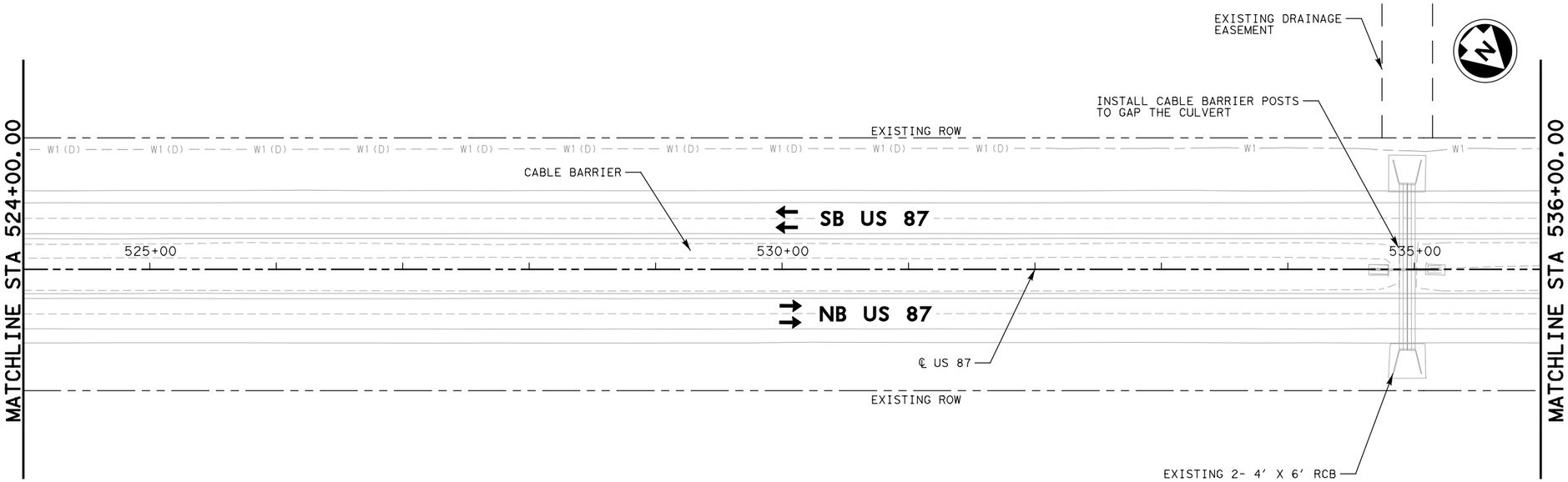

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (4 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	43
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
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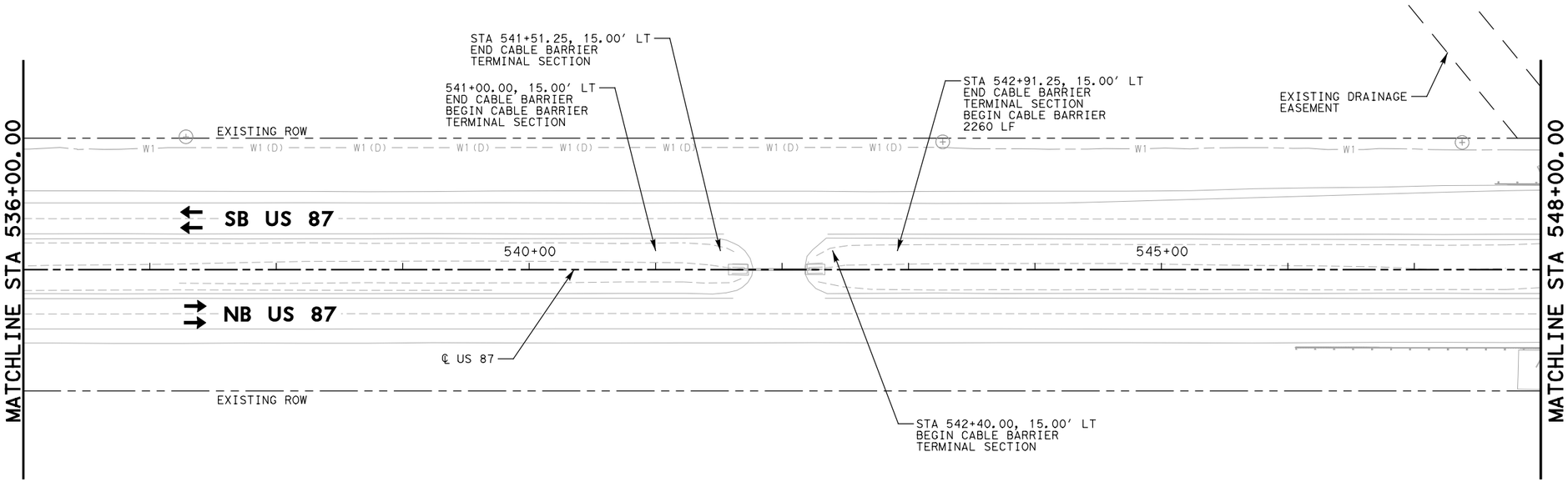

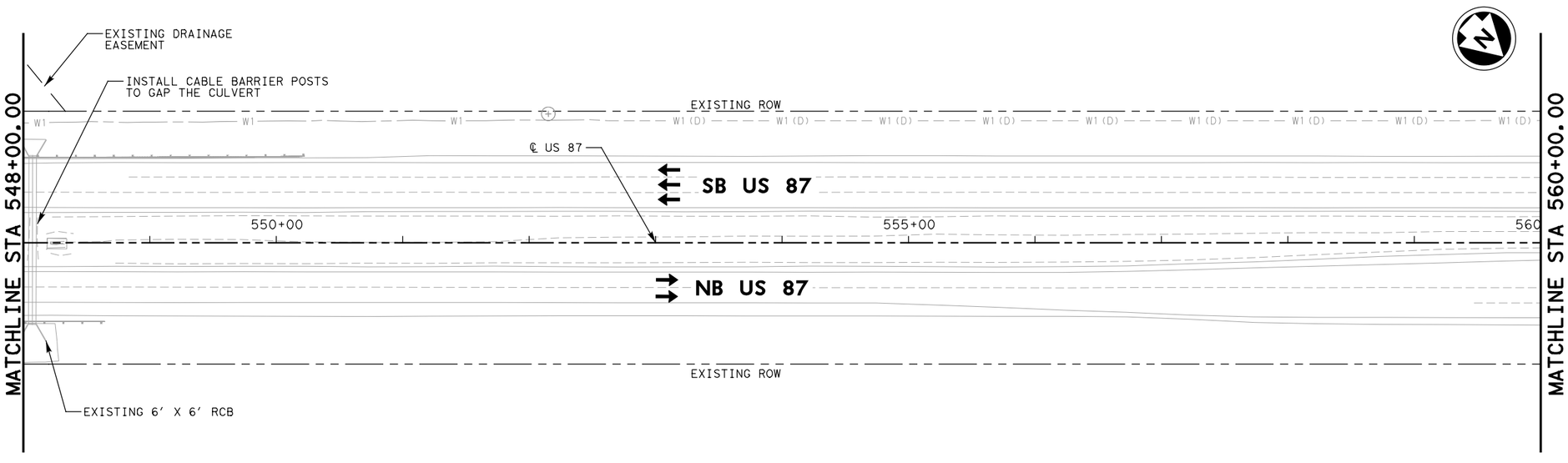

50 25 0 50 100

SCALE: 1" = 100′

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (5 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	44
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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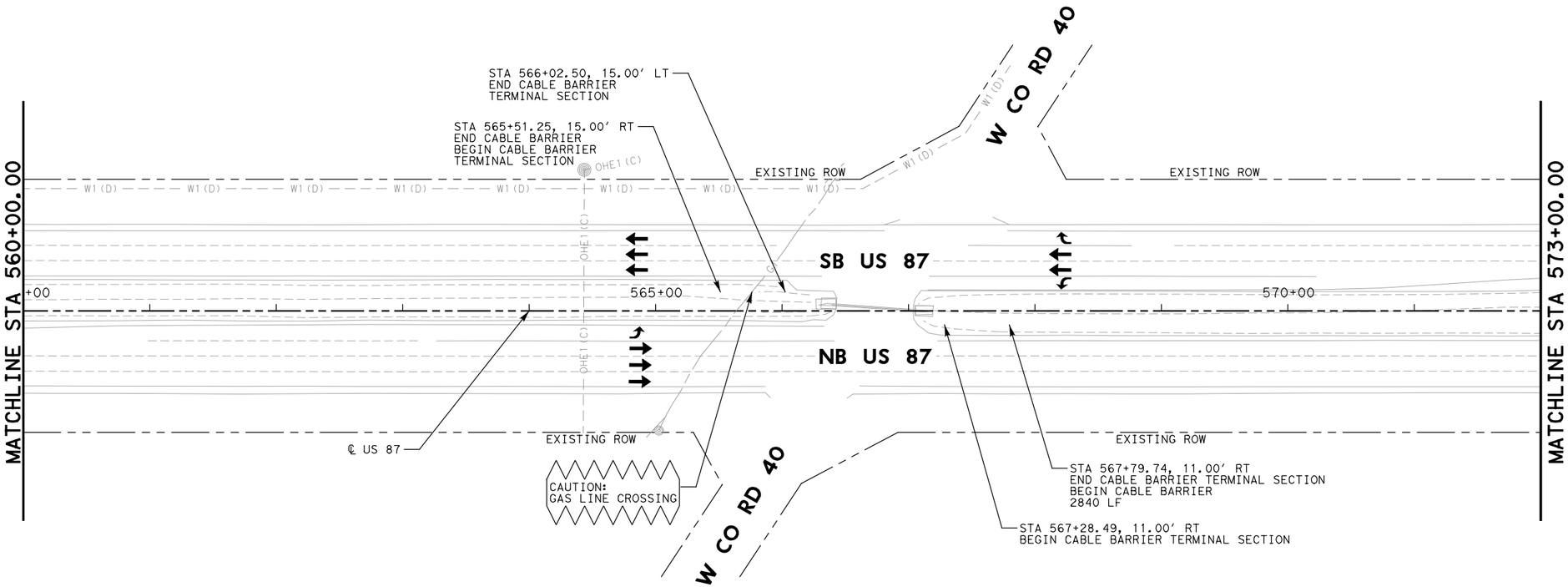

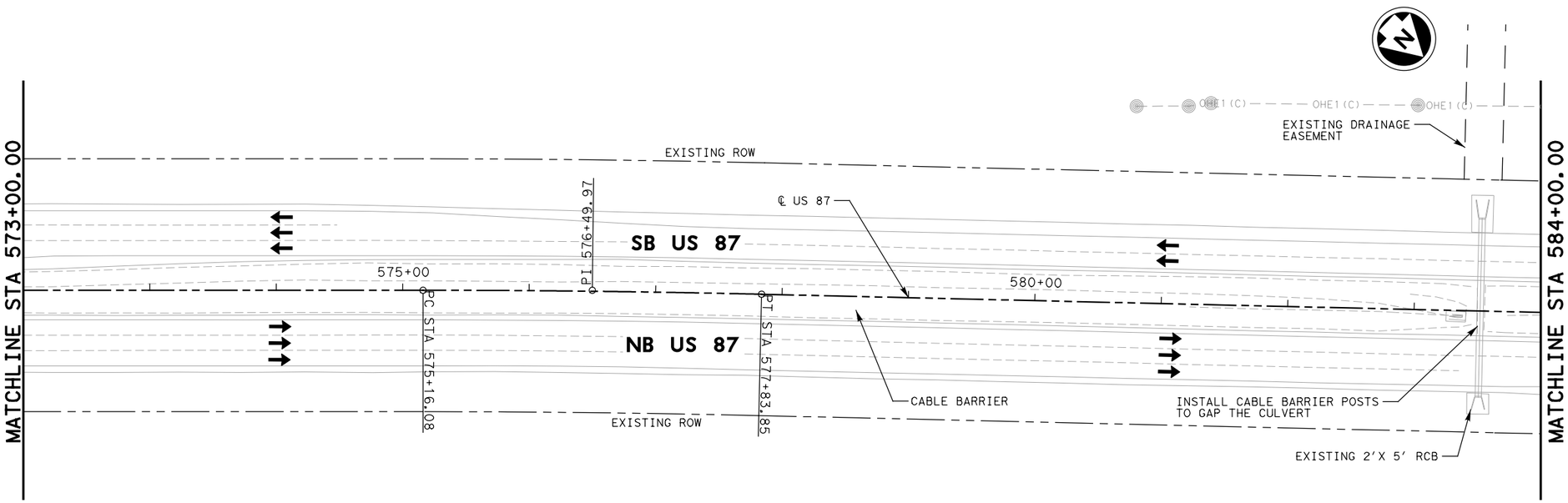

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (6 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	45
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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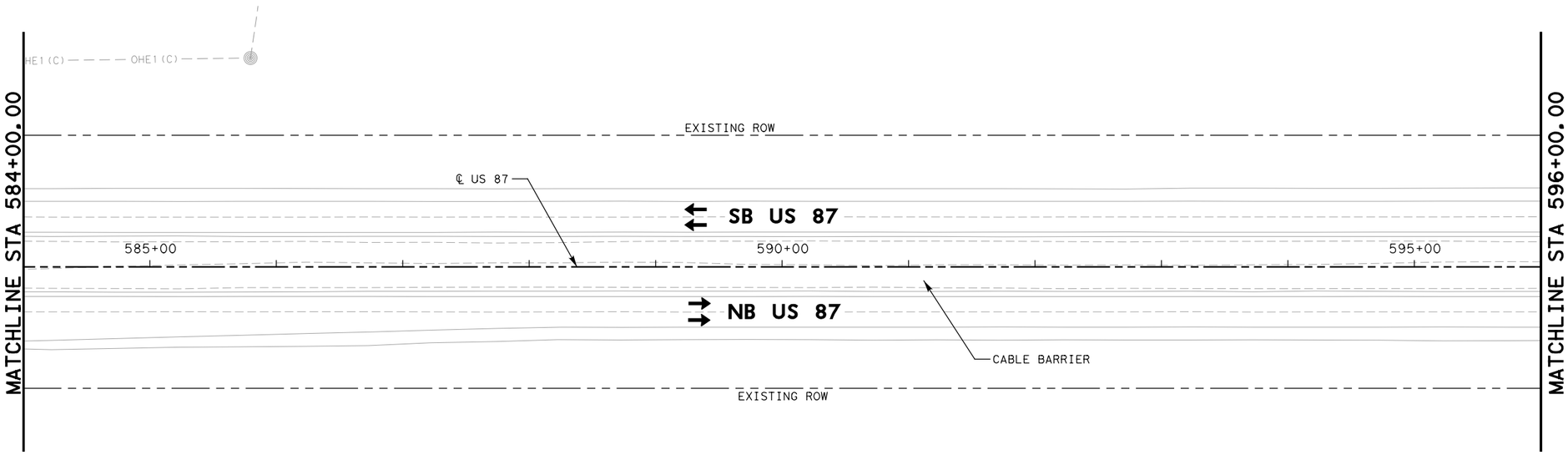

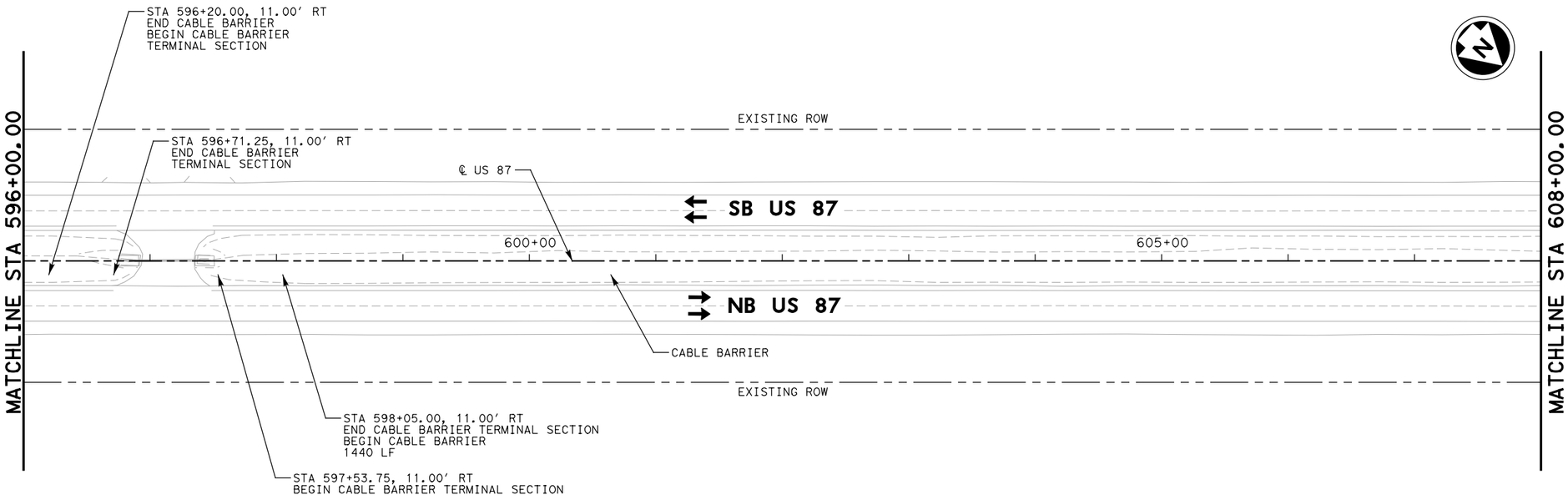

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

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STATE OF TEXAS
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5/26/2021

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US 87

CABLE BARRIER PLAN LAYOUT

SHEET (7 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	46
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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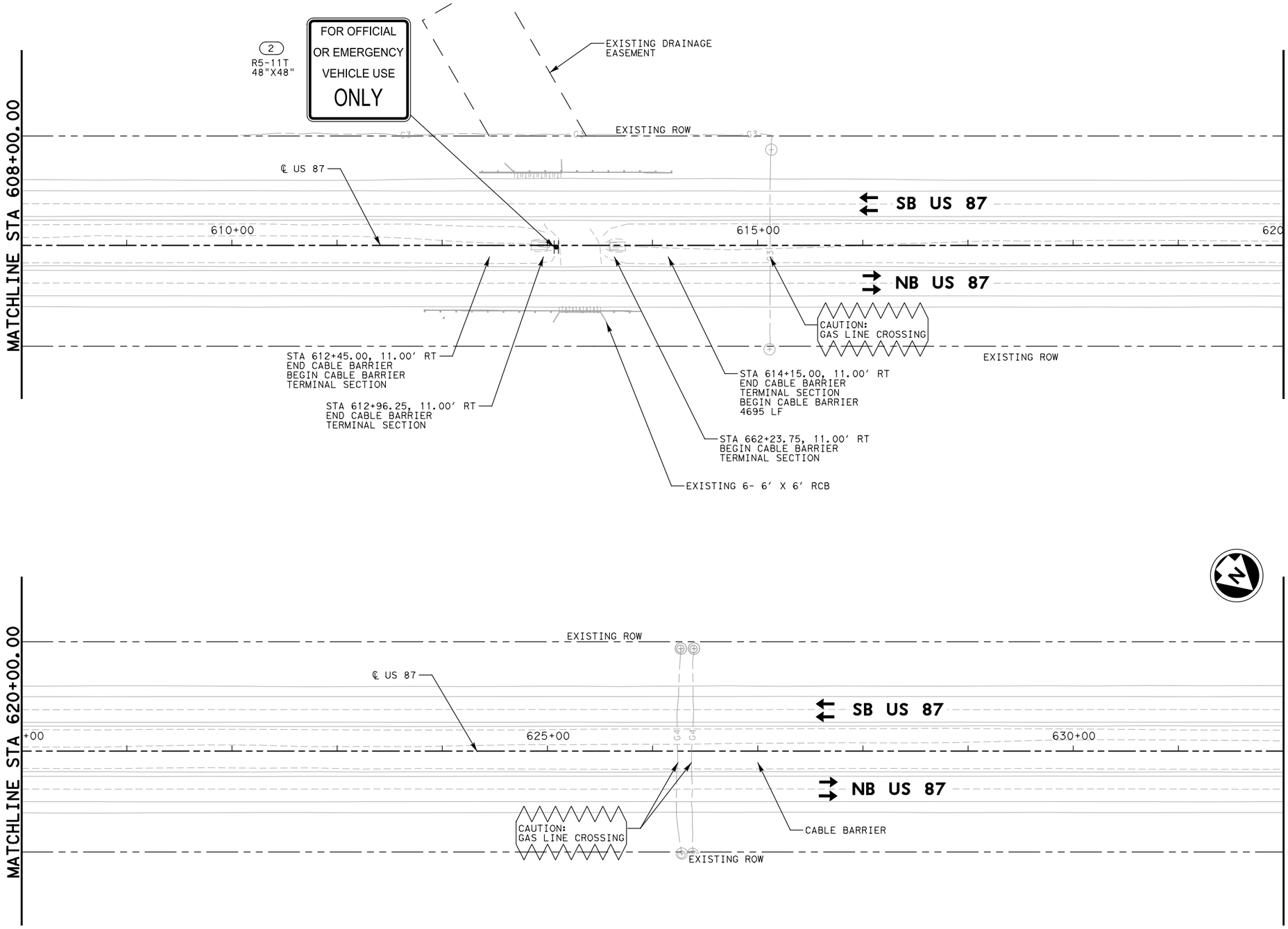

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

NOTES:

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STATE OF TEXAS
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CABLE BARRIER PLAN LAYOUT

SHEET (8 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	47
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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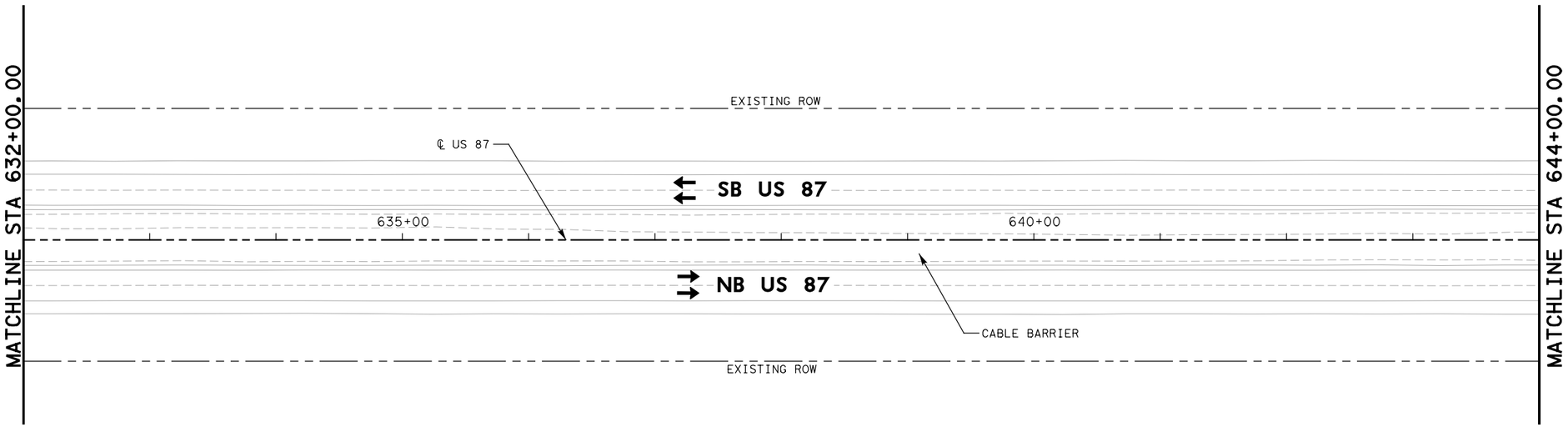
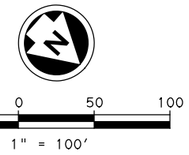
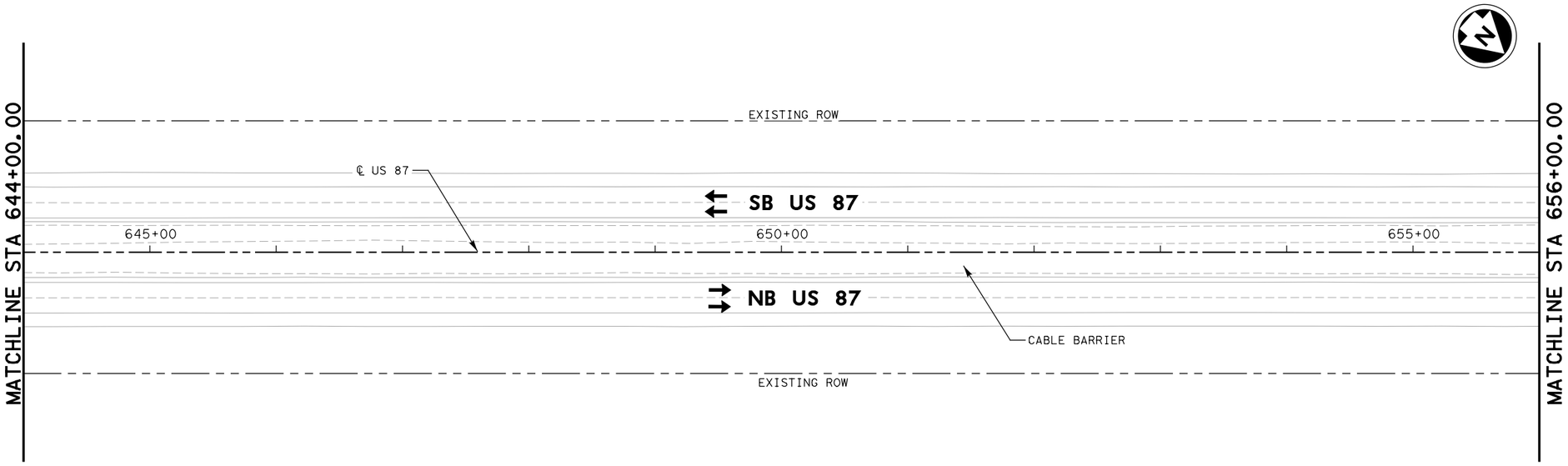




LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

1. THE CONTRACTOR SHALL LOCATE ANY UTILITIES THAT CROSS THE CABLE BARRIER.
2. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

CABLE BARRIER PLAN LAYOUT

SHEET (9 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	48
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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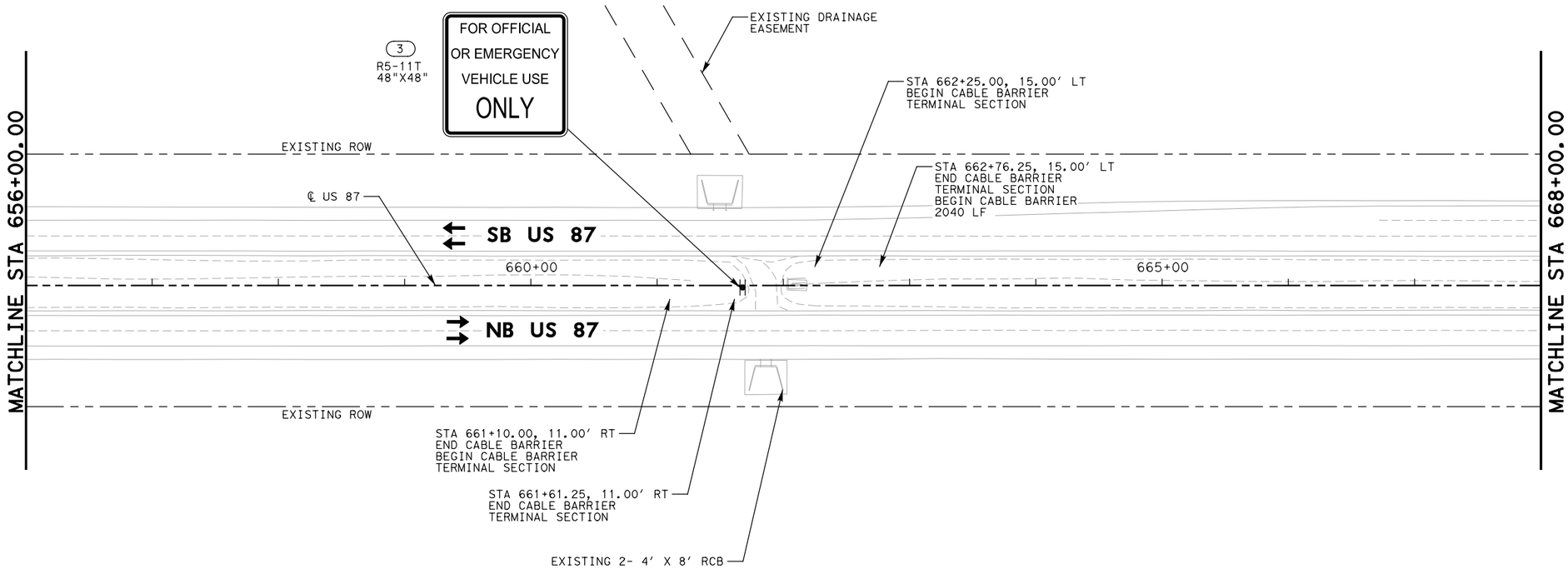

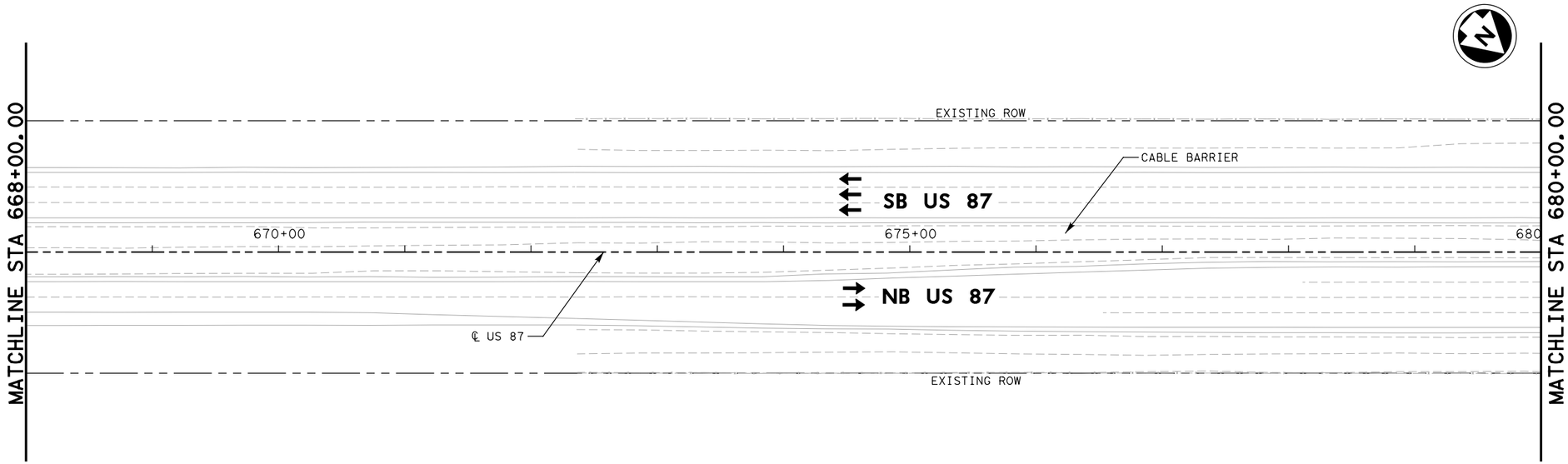

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

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STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED
PROFESSIONAL ENGINEER
5/26/2021

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US 87

CABLE BARRIER PLAN
LAYOUT

SHEET (10 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	49
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
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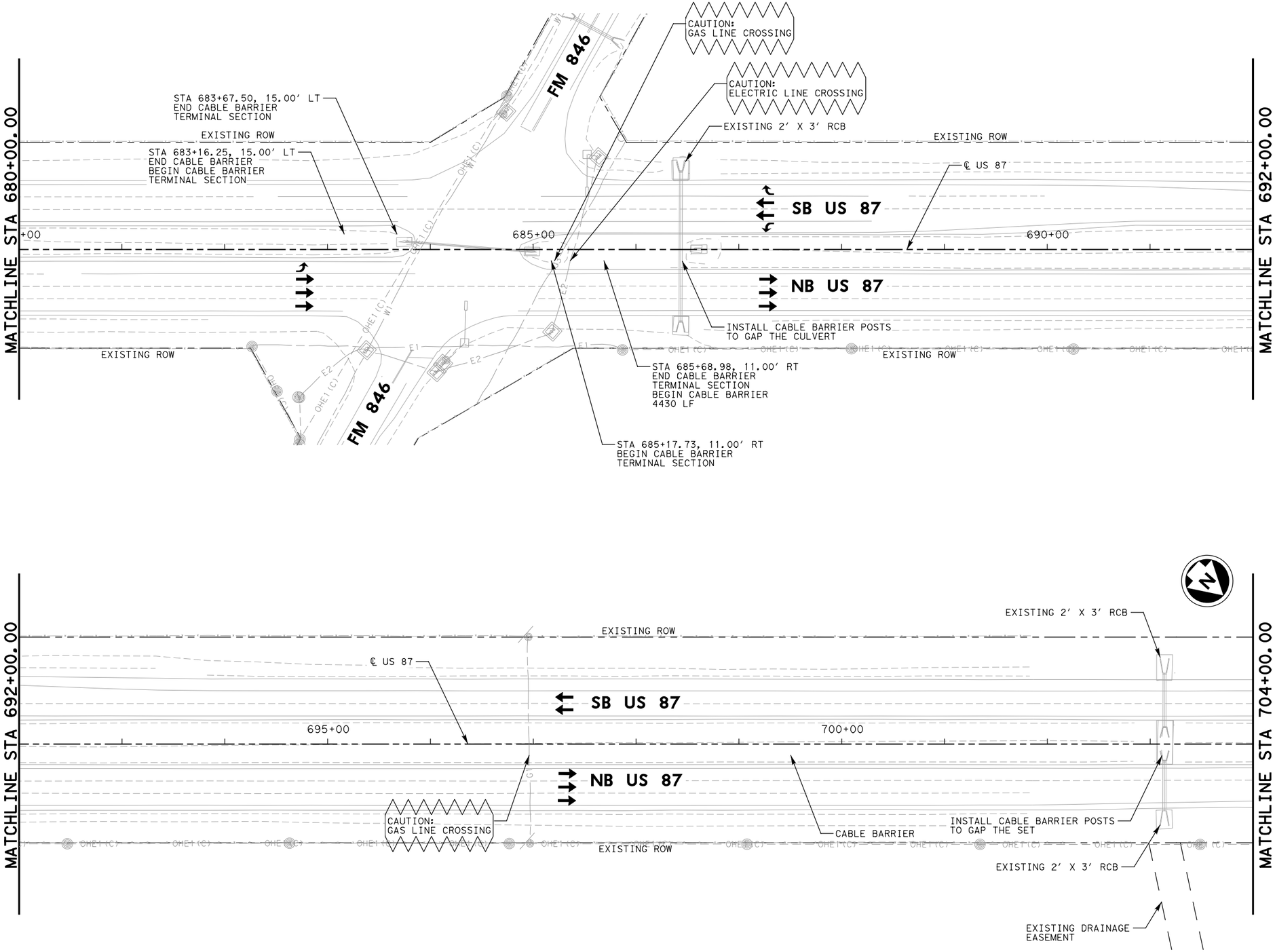

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (11 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	50
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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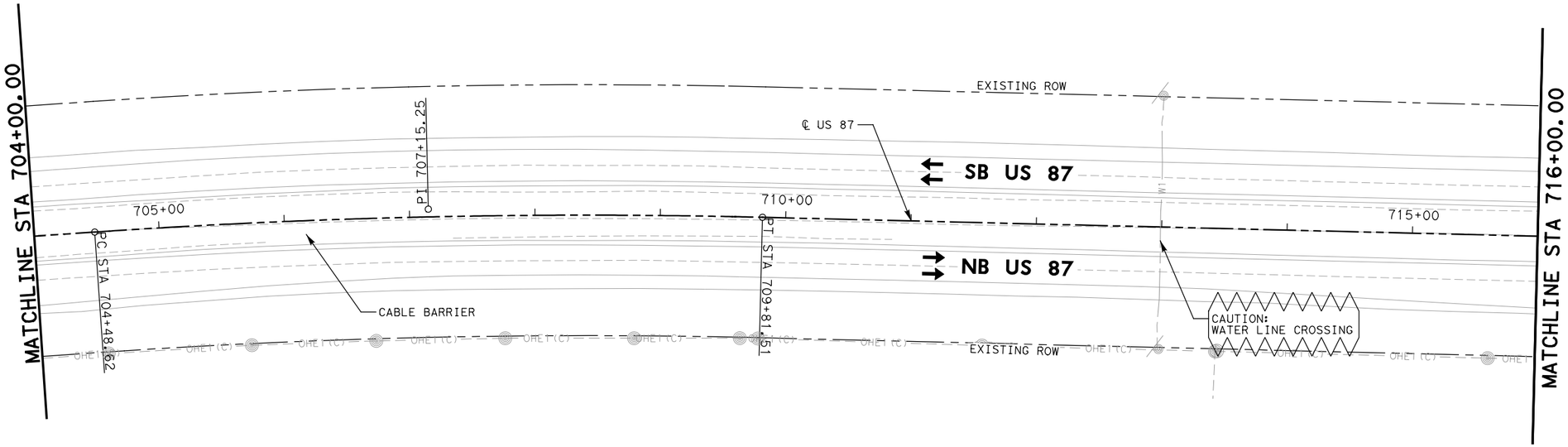

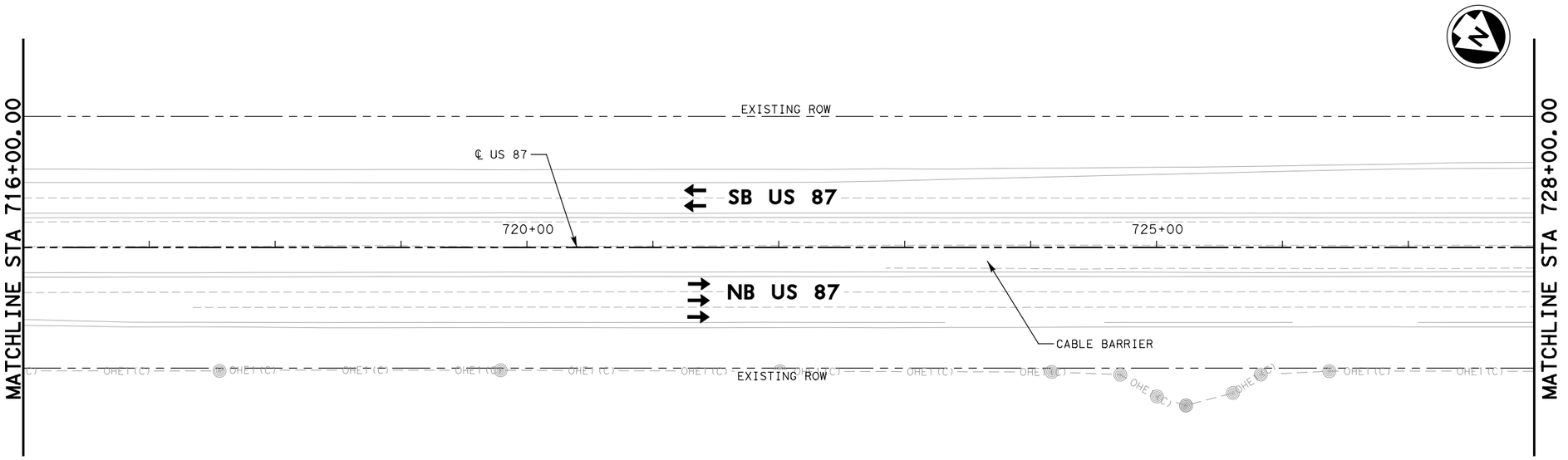

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (12 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	51
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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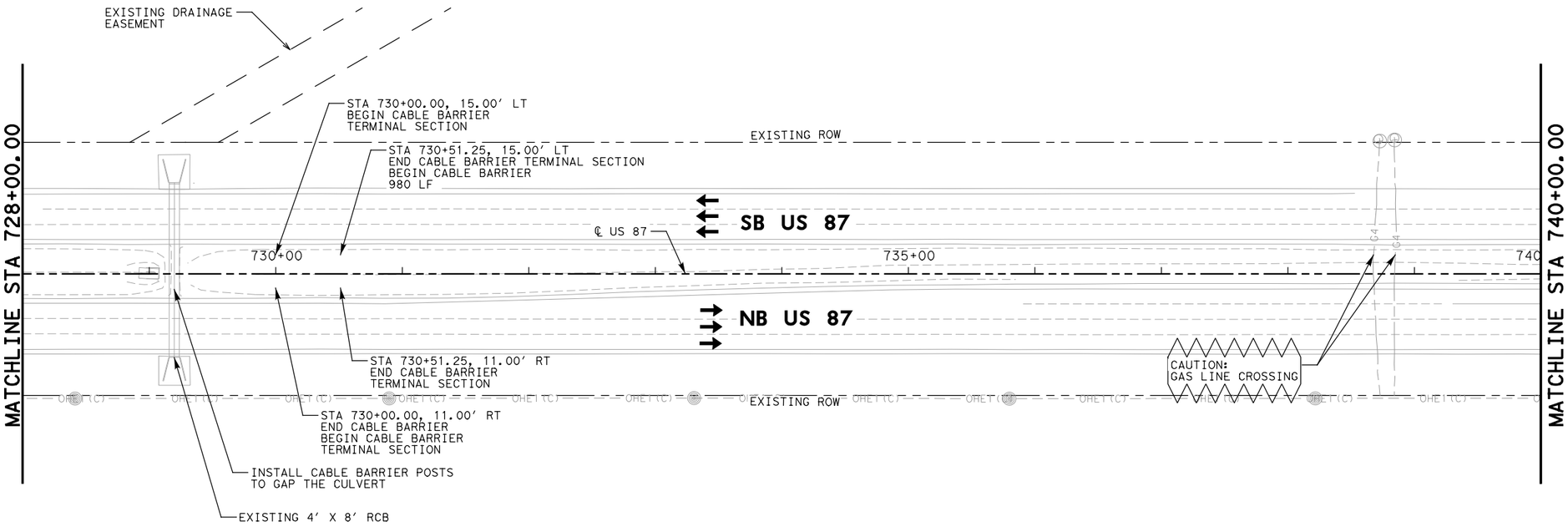

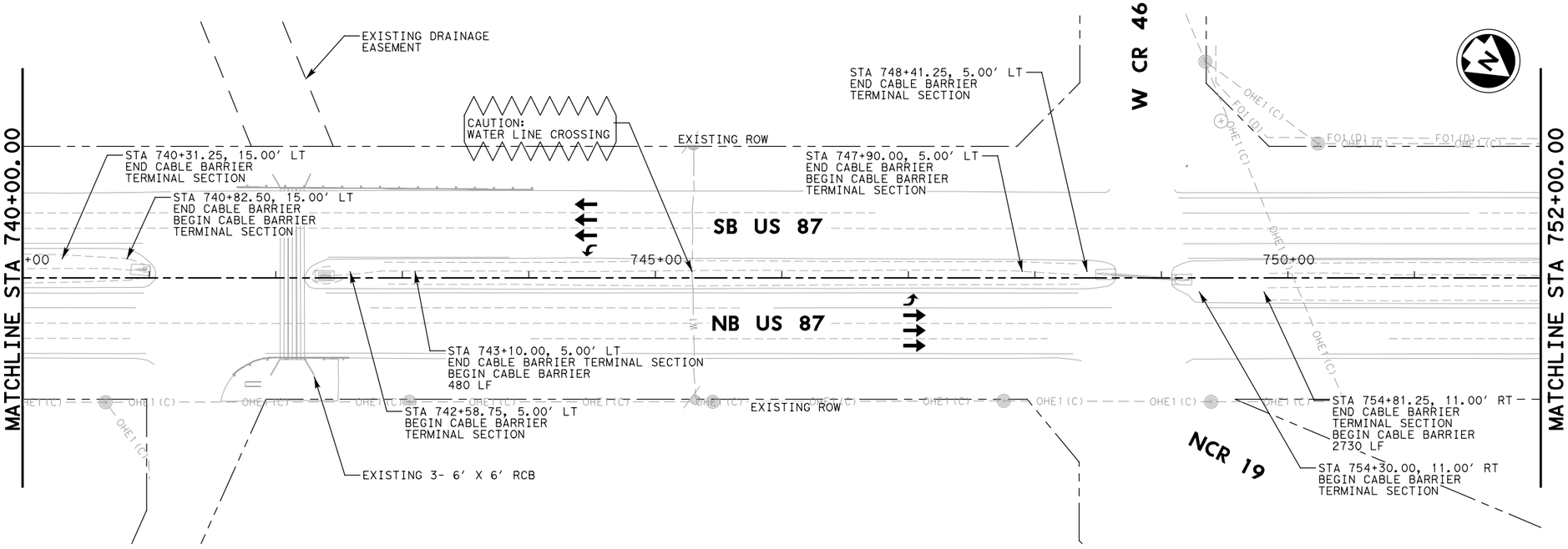

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

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SHEET (13 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	52
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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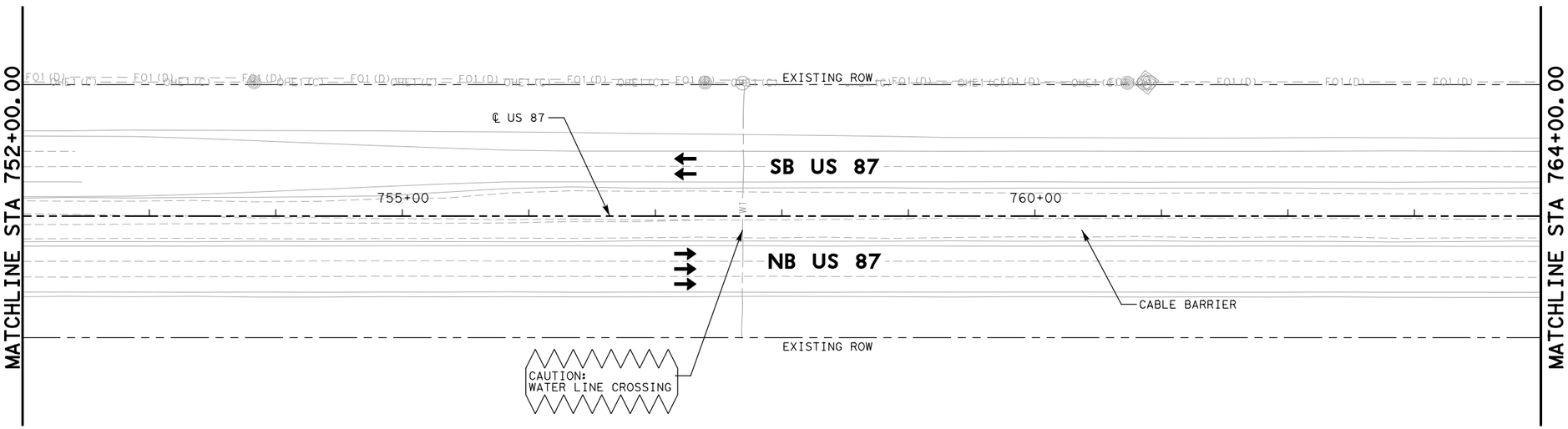

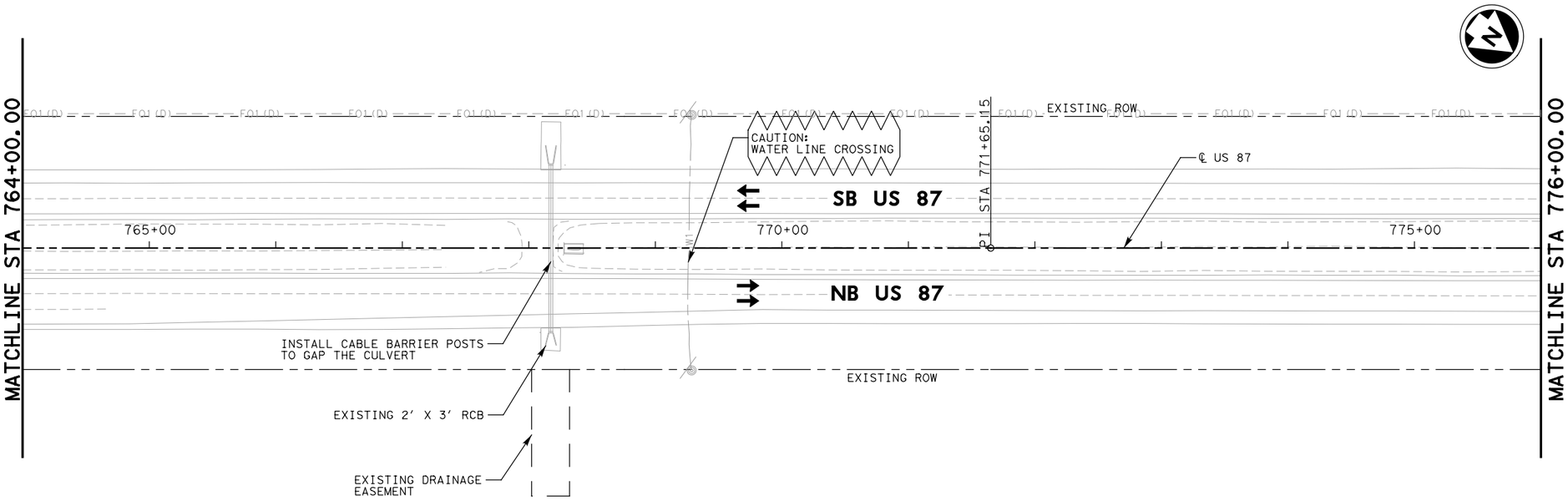

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (14 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	
AR	CONTROL	SECTION	JOB	53
GRPH CHECK				
JKB	0068	07	052, ETC	

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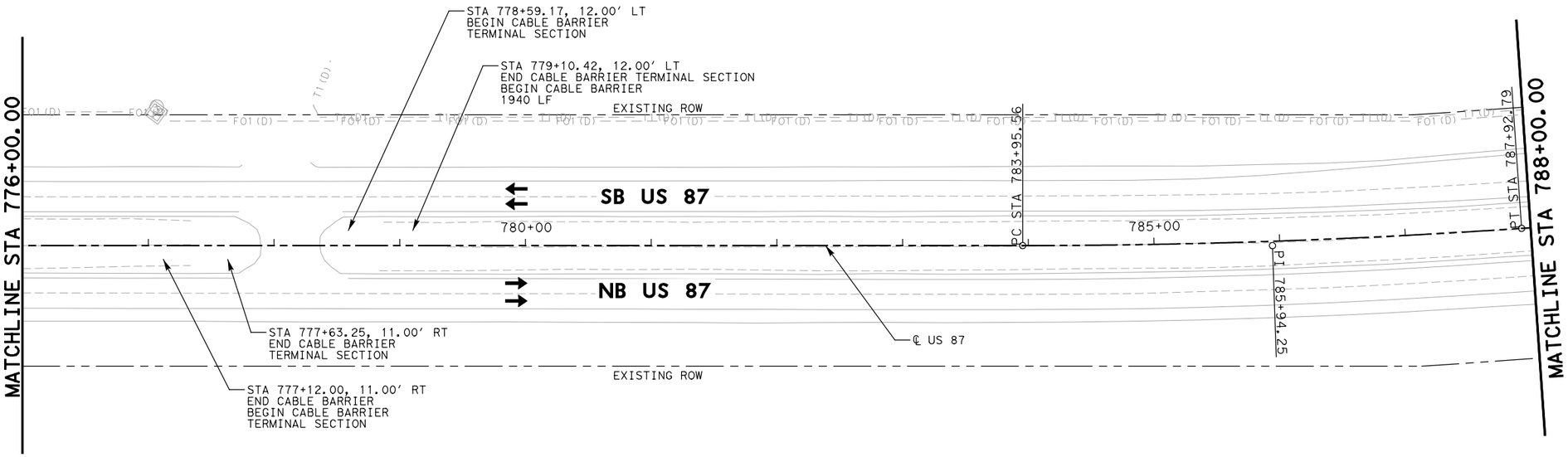

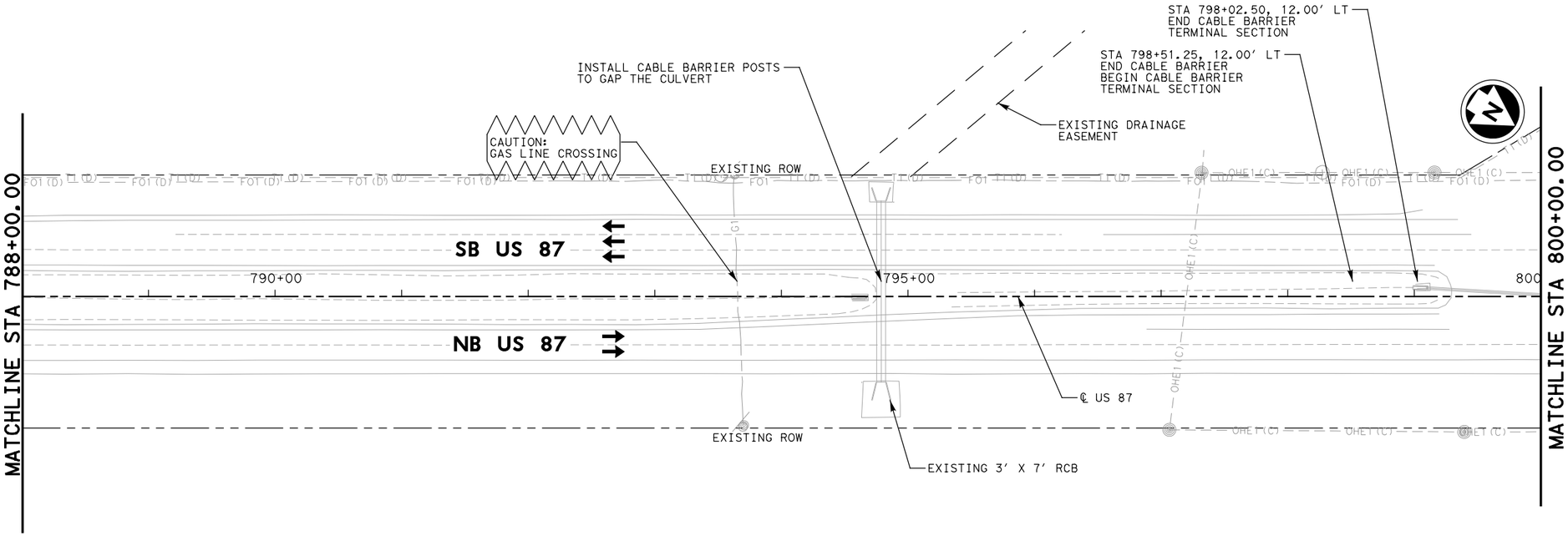

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (15 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	54
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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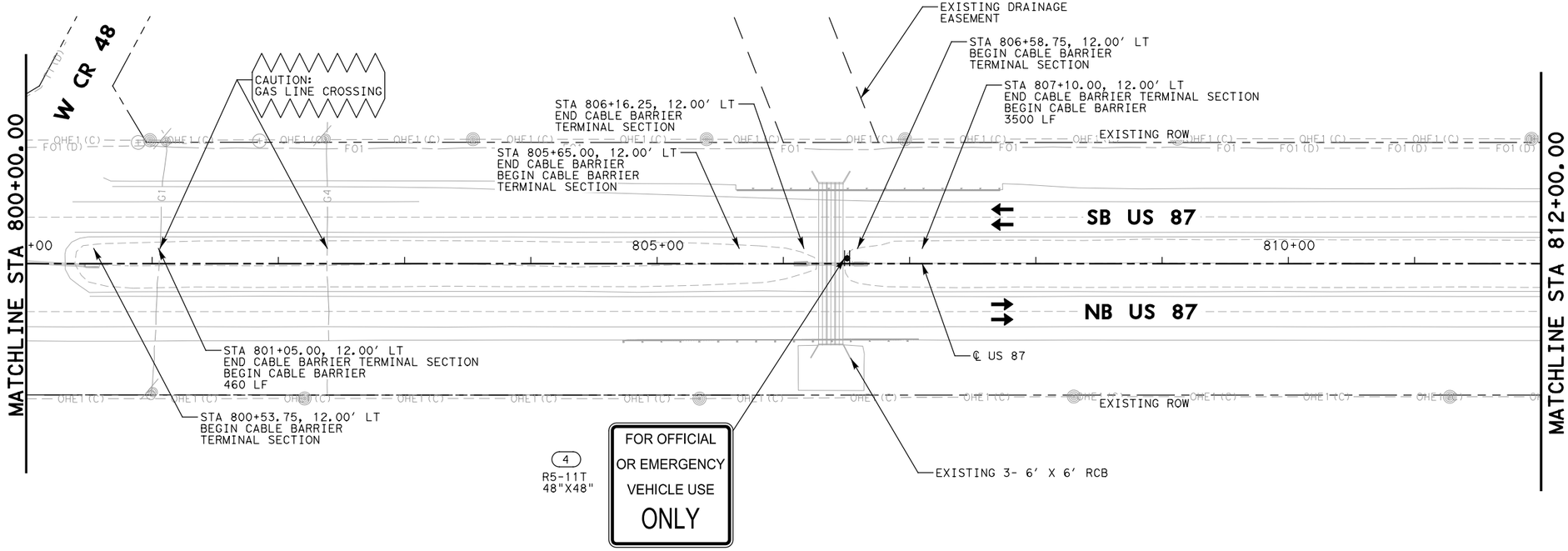

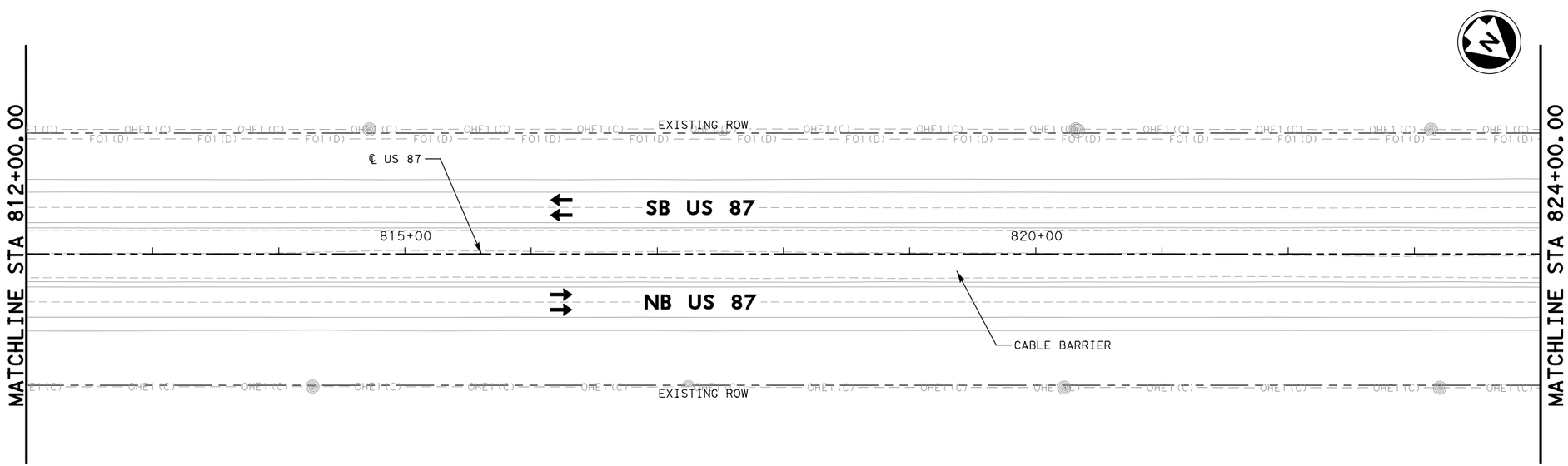

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (16 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	55
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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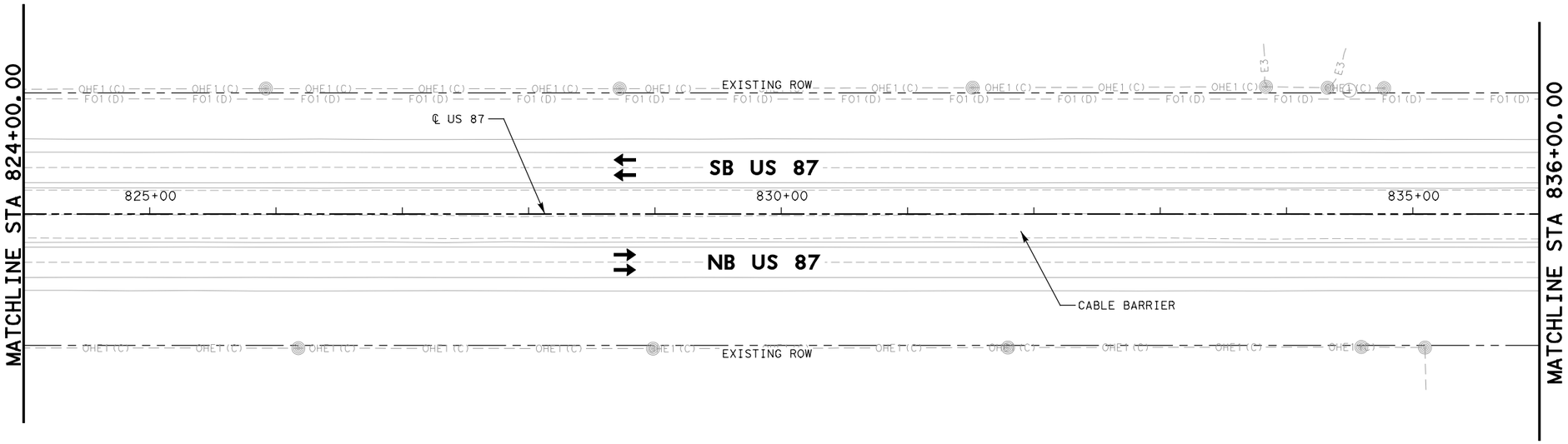

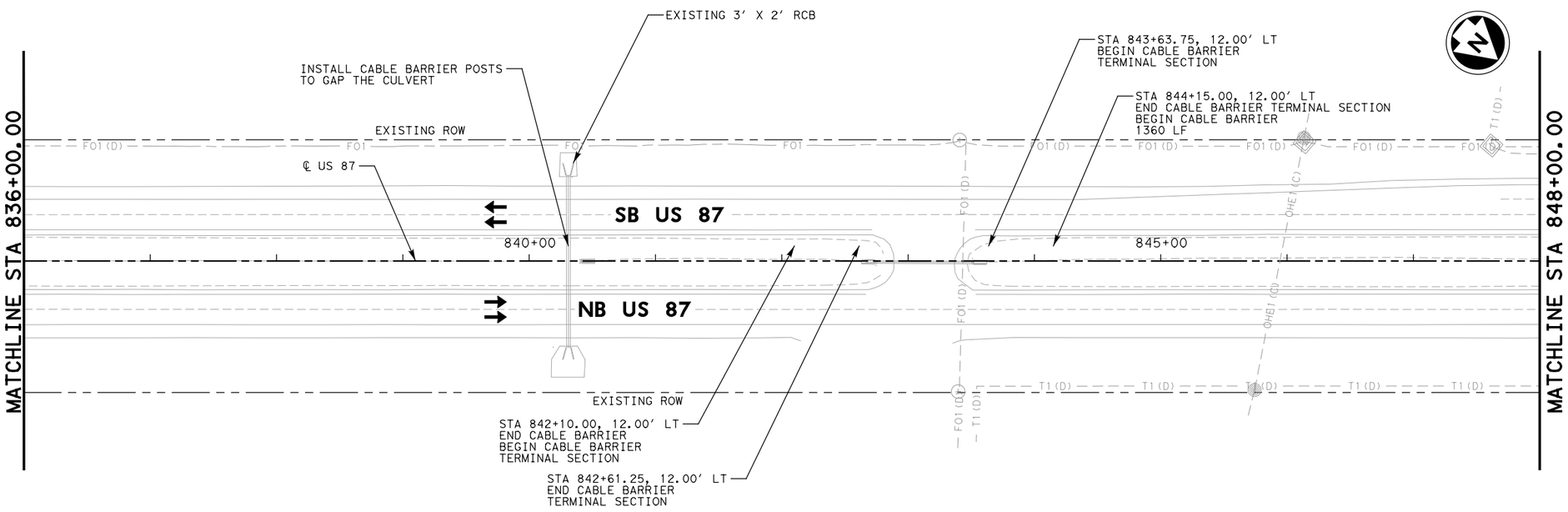

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (17 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	
AR				56
GRPH CHECK	CONTROL	SECTION	JOB	
JKB	0068	07	052, ETC	

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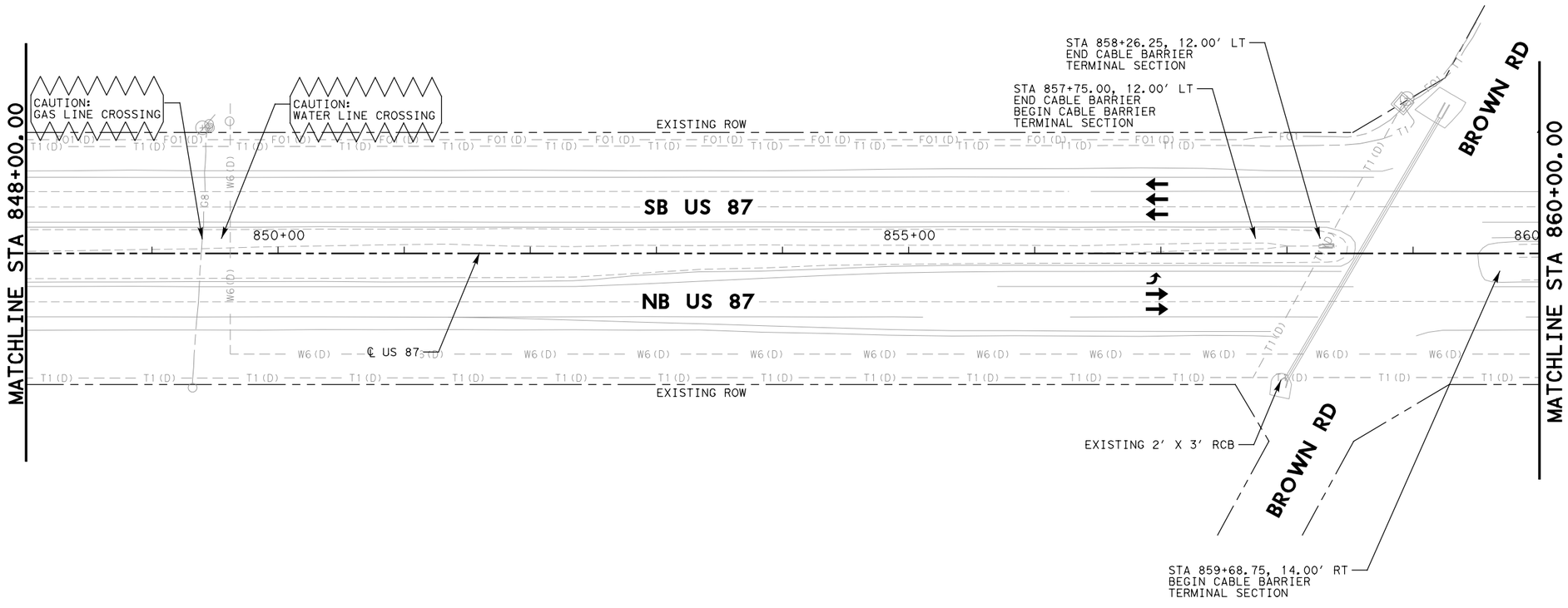

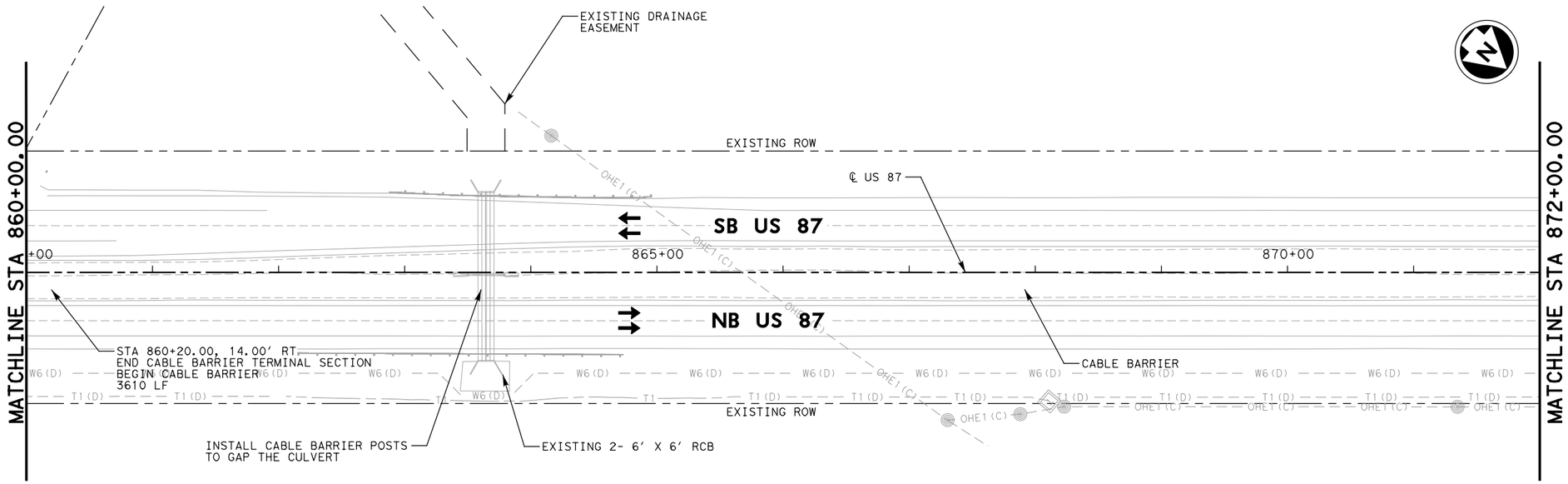

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (18 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	57
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
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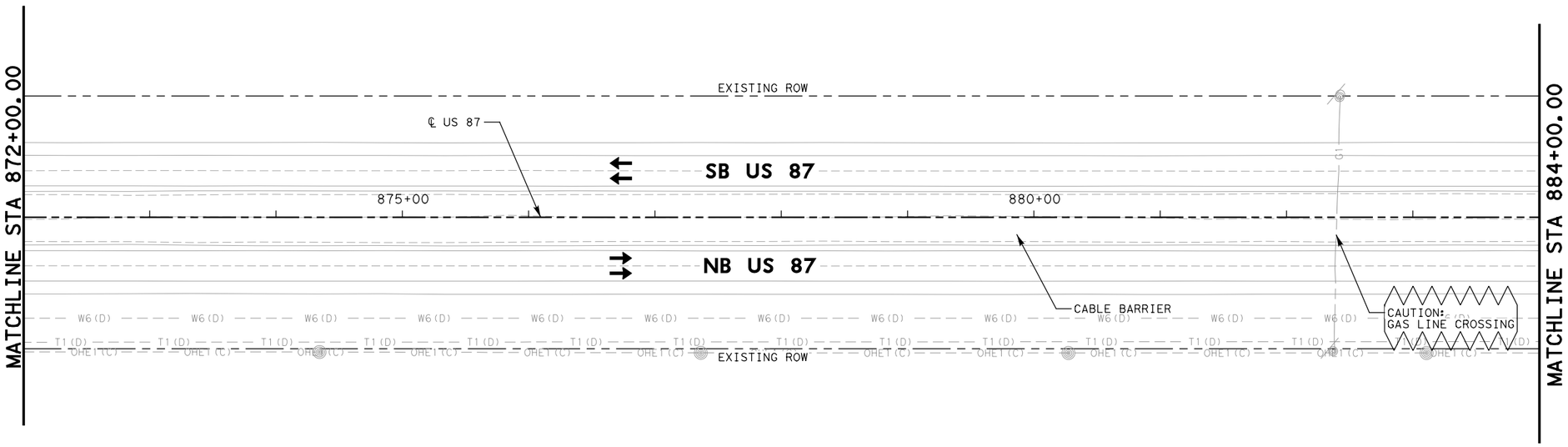

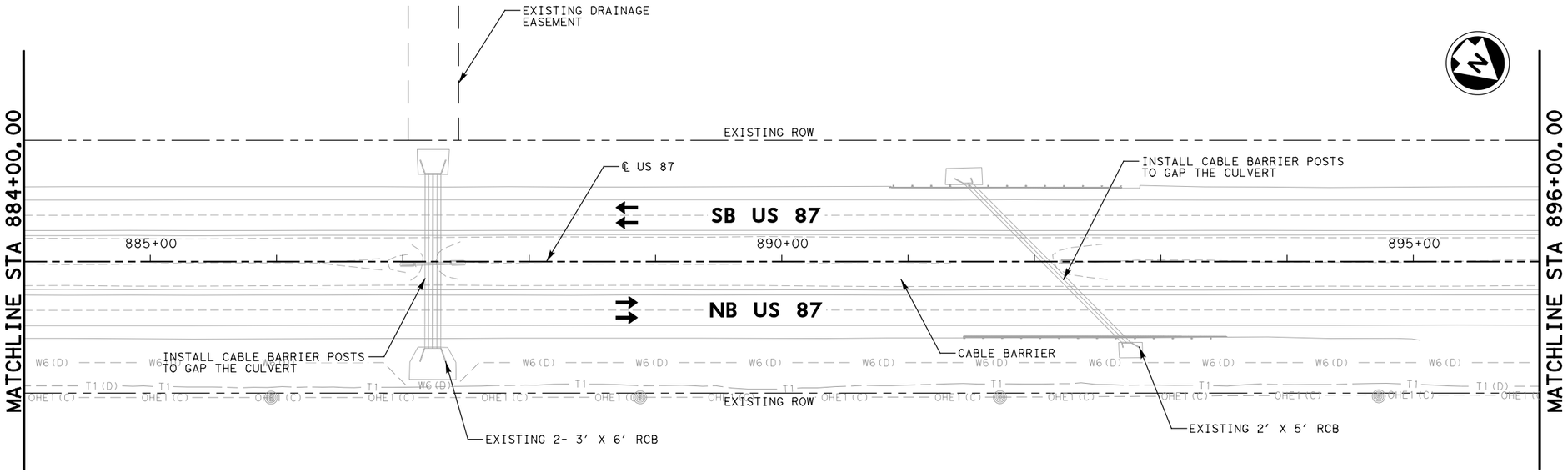

50 25 0 50 100

SCALE: 1" = 100′

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (19 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	58
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK				
JKB				

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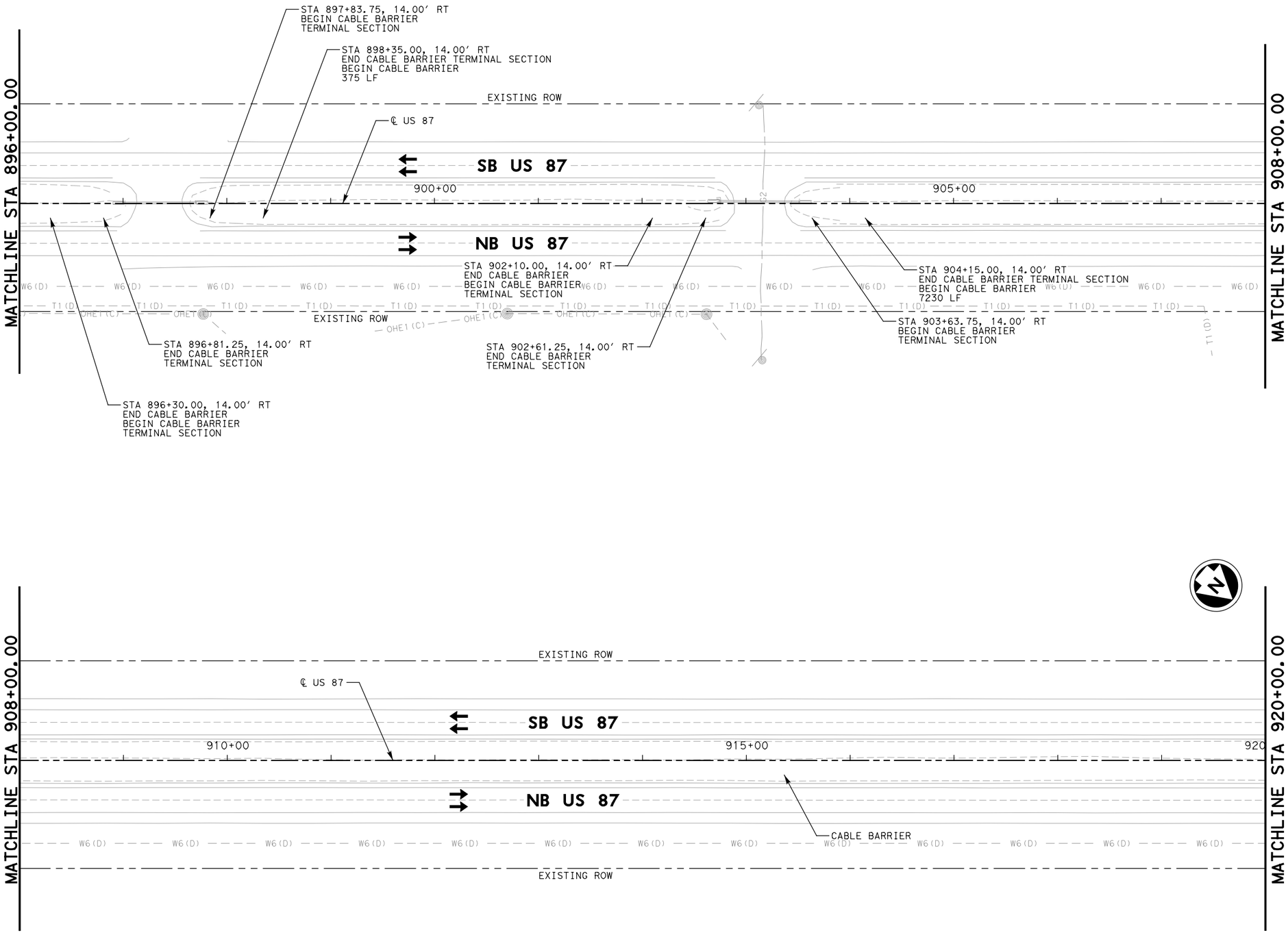

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (20 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	59
GRAPHICS	CONTROL	SECTION	JOB	
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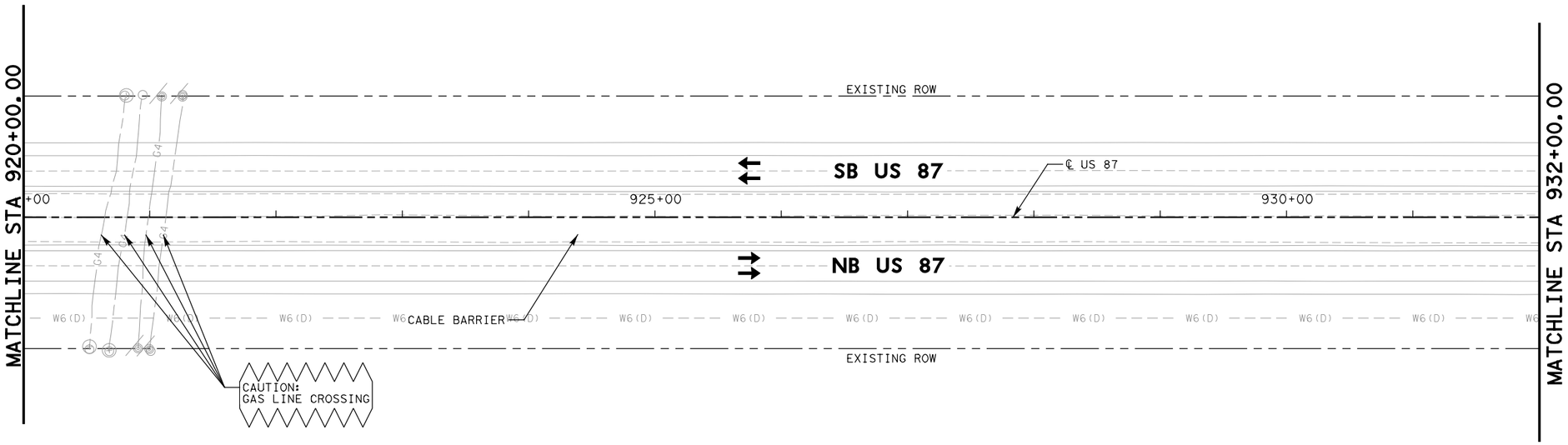

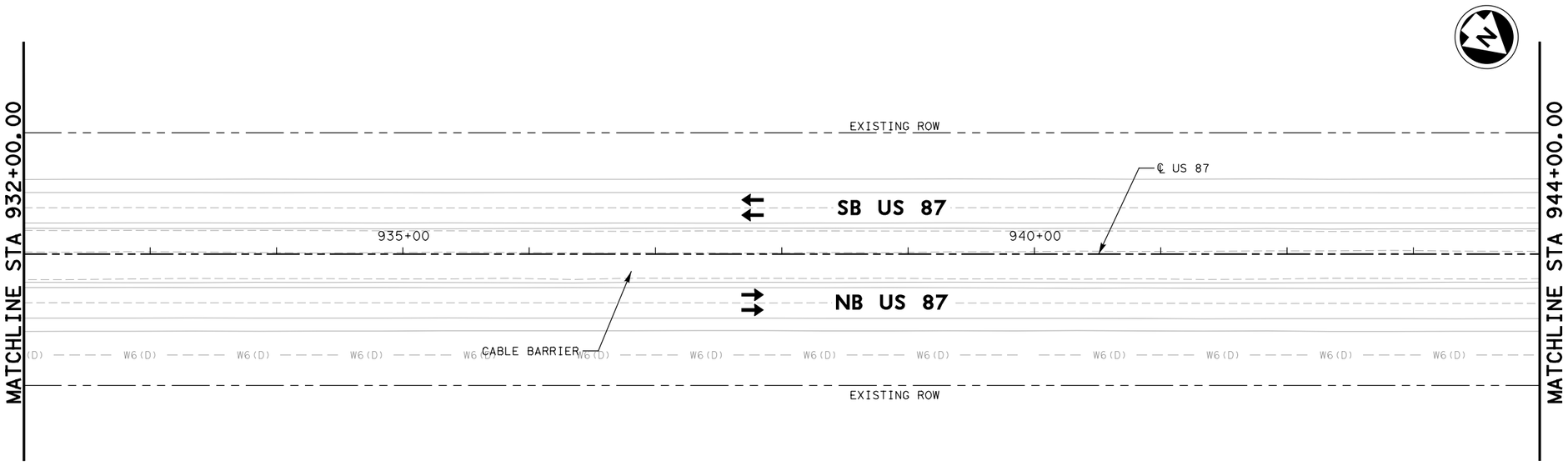

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

NOTES:

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CABLE BARRIER PLAN LAYOUT

SHEET (21 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	60
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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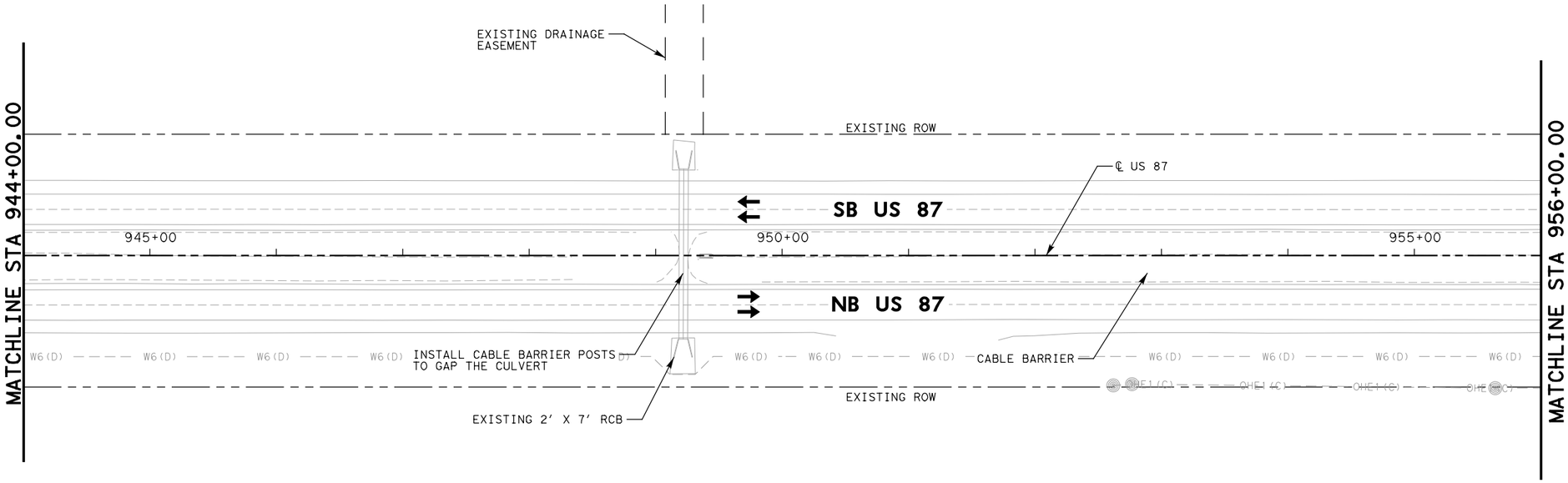

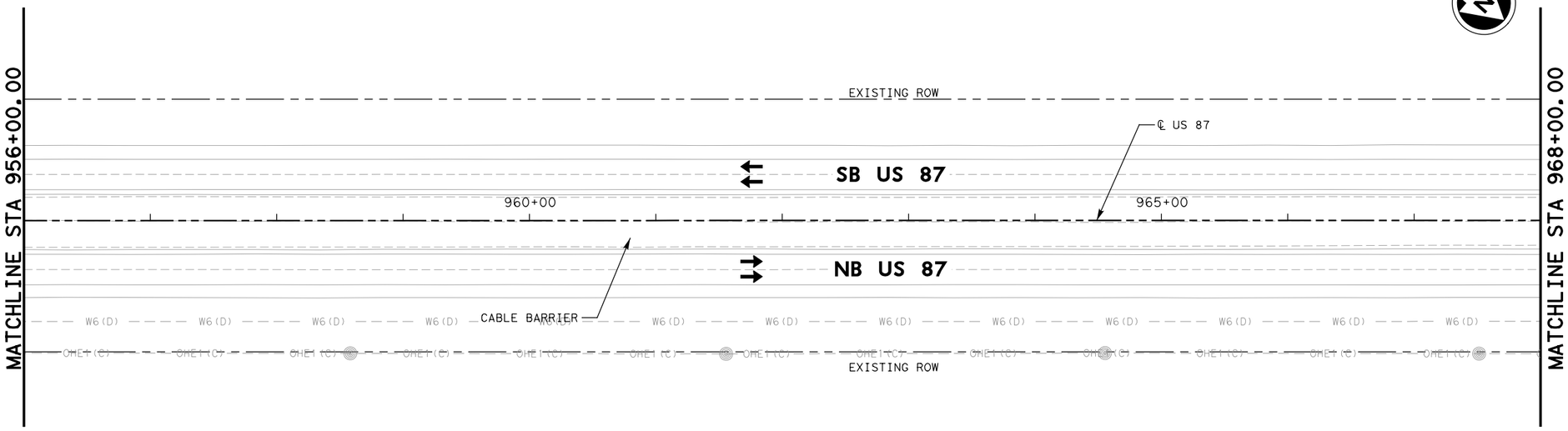

SCALE: 1" = 100'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

NOTES:

1. THE CONTRACTOR SHALL LOCATE ANY UTILITIES THAT CROSS THE CABLE BARRIER.
2. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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CABLE BARRIER PLAN LAYOUT

SHEET (22 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	61
GRAPHICS	CONTROL	SECTION	JOB	
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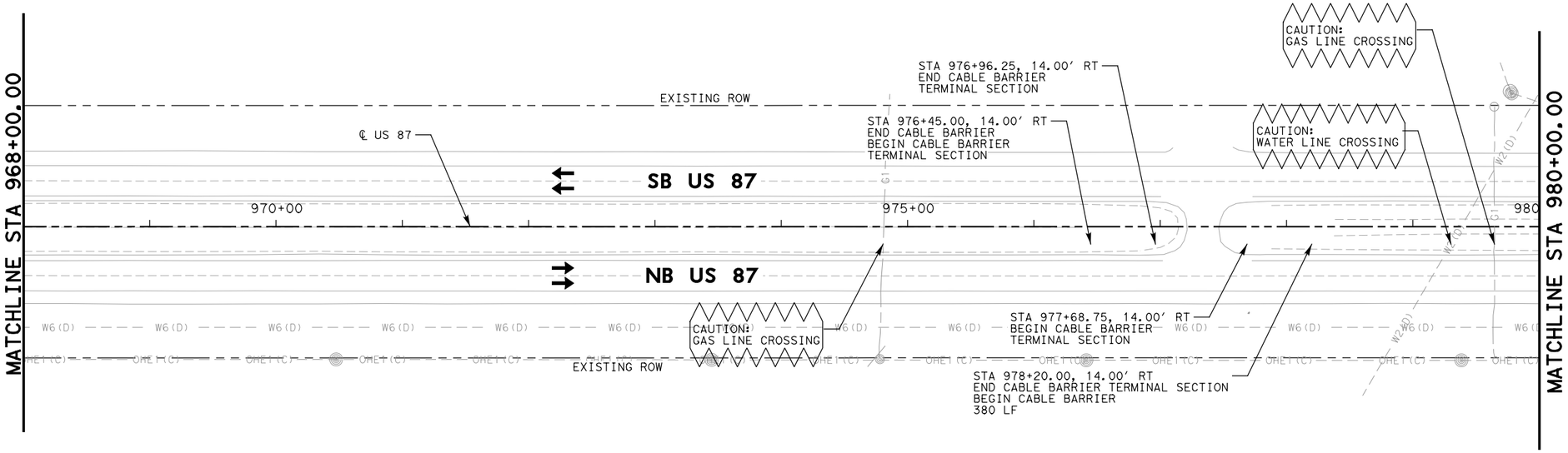

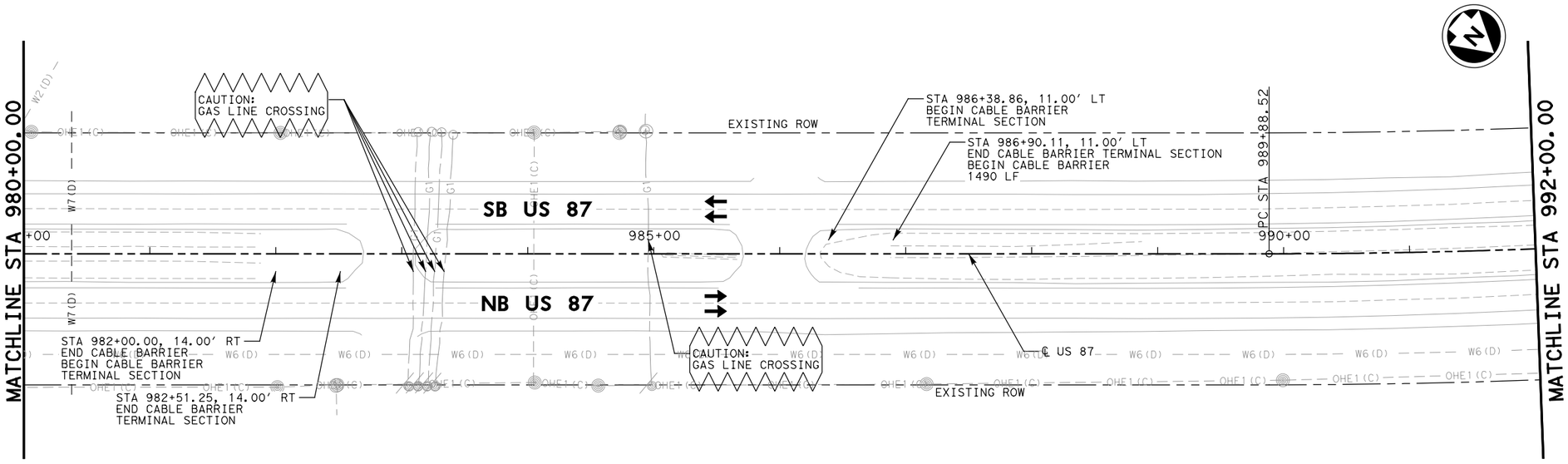

50 25 0 50 100

SCALE: 1" = 100′

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (23 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	62
GRAPHICS	CONTROL	SECTION	JOB	
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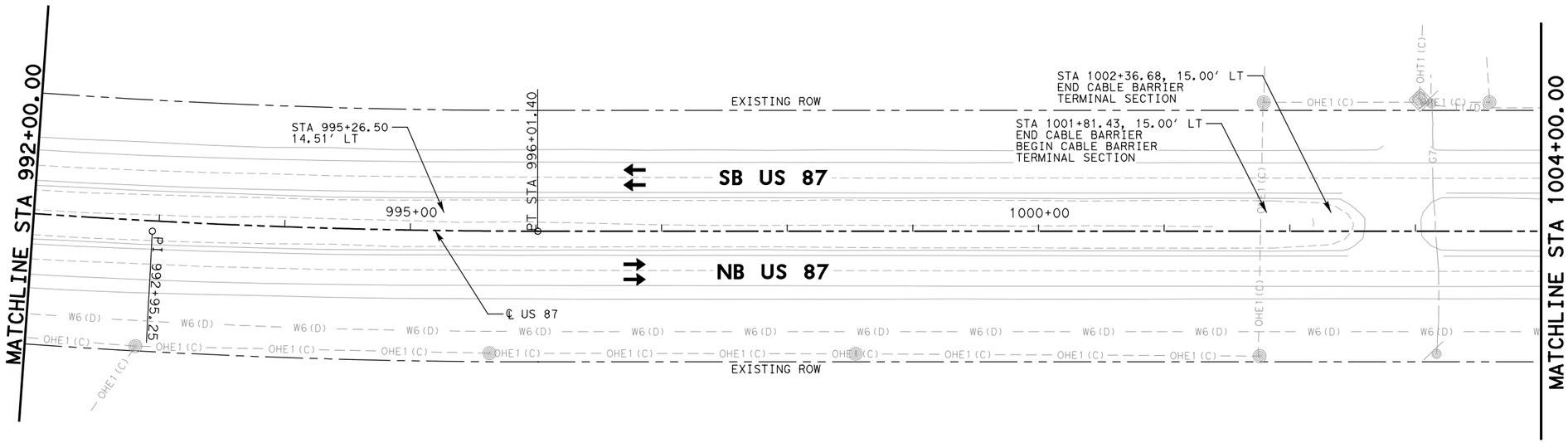

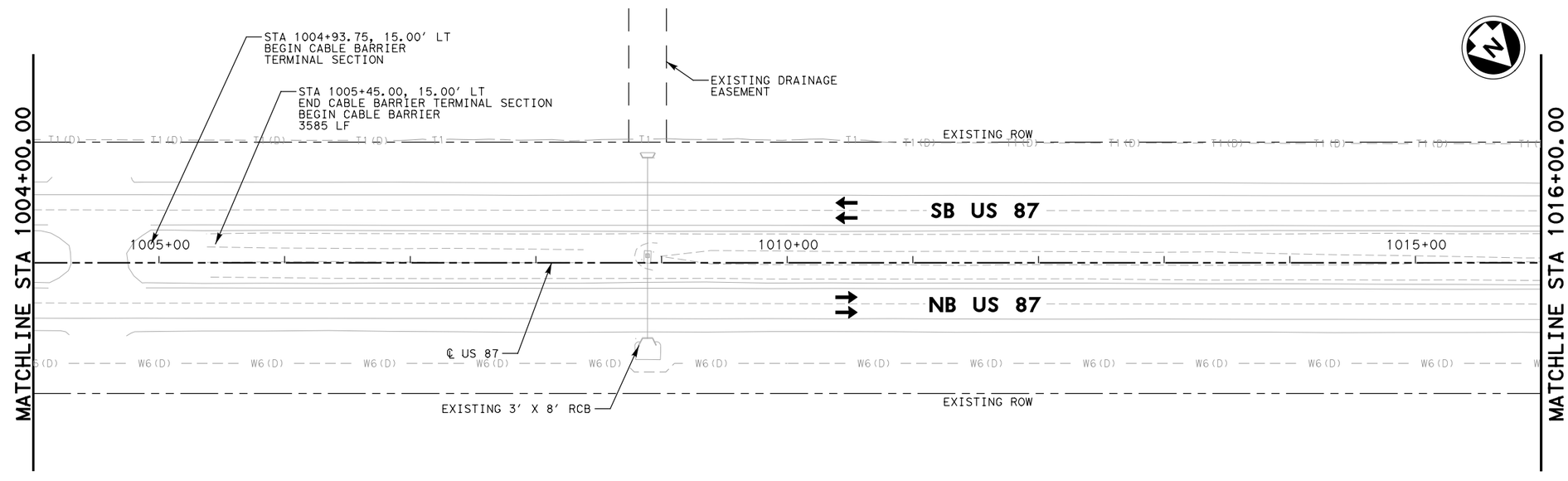

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (24 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	63
GRAPHICS	CONTROL	SECTION	JOB	
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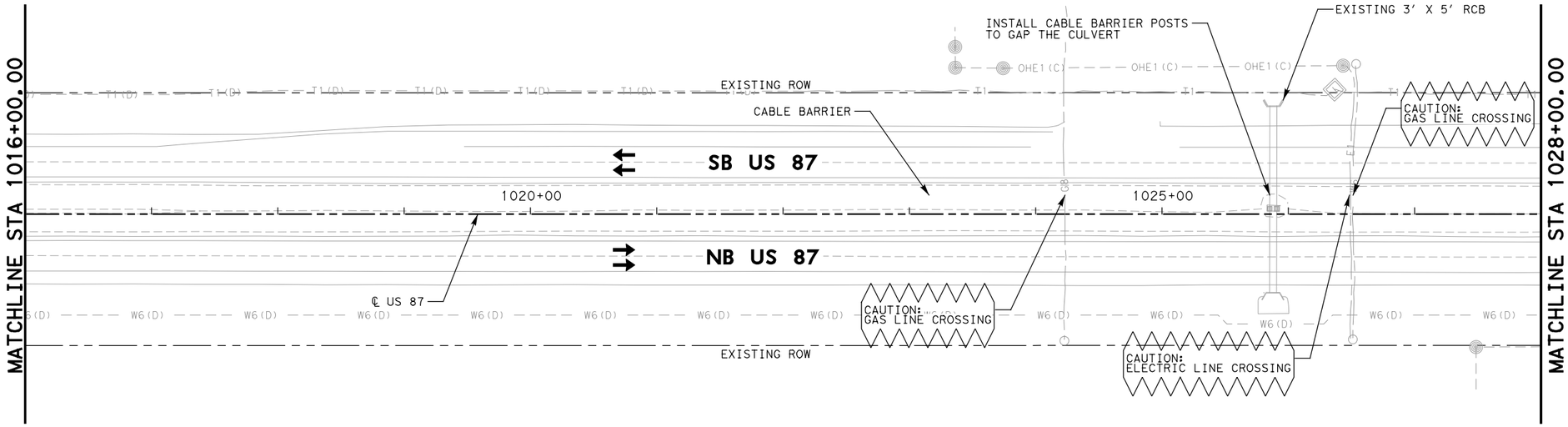

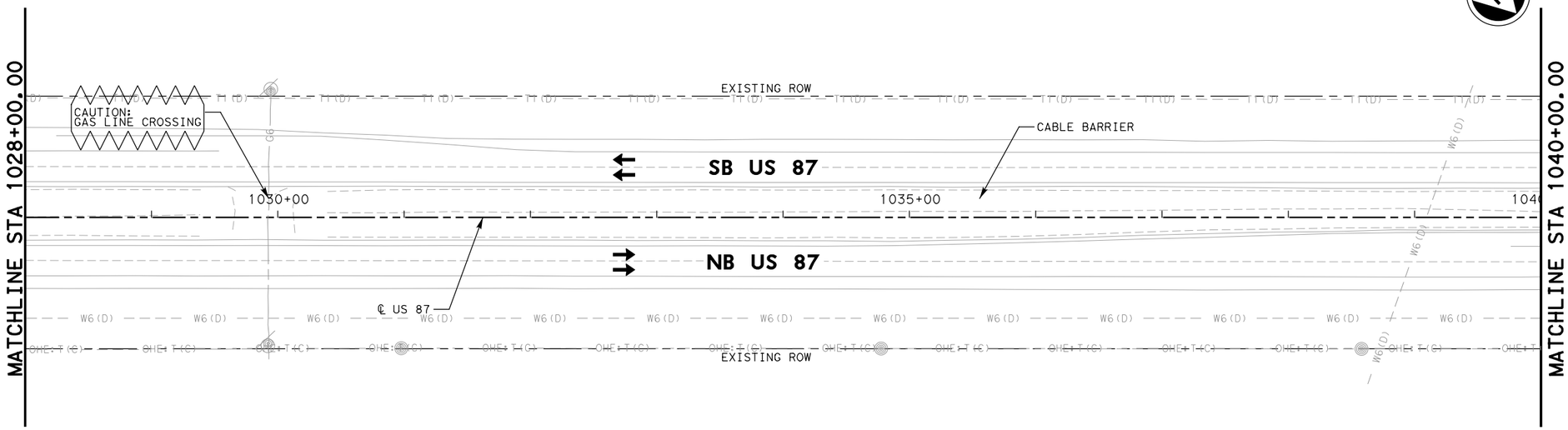

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (25 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	64
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
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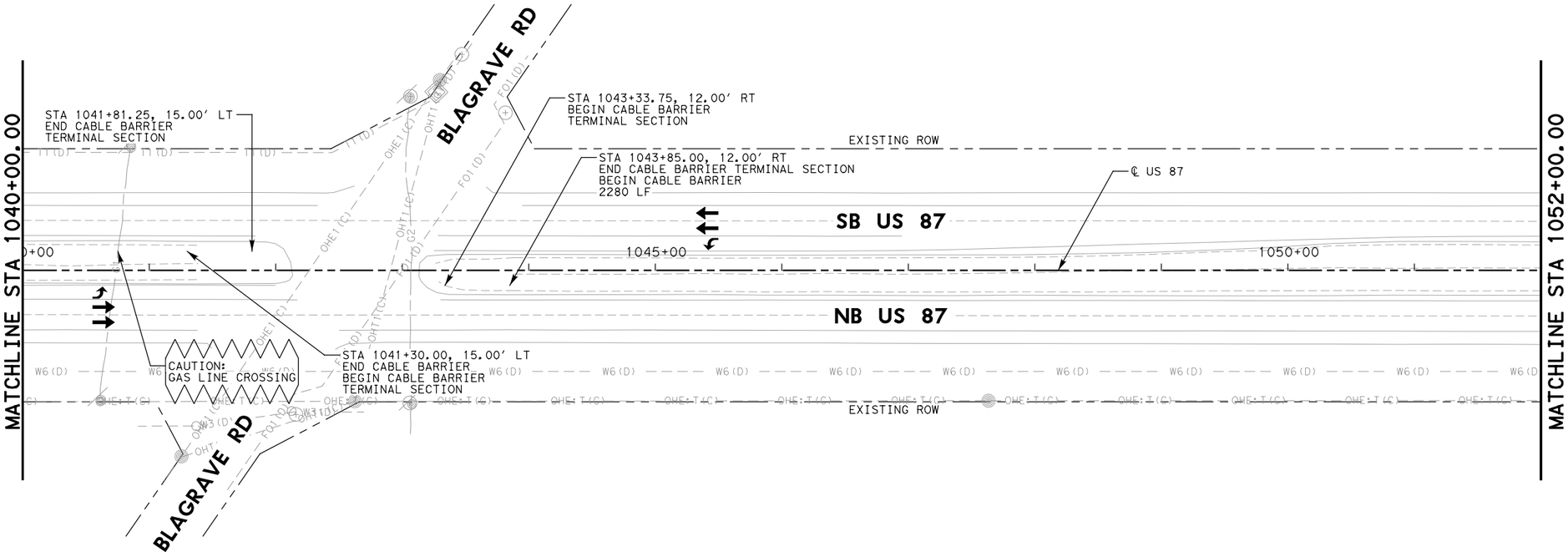

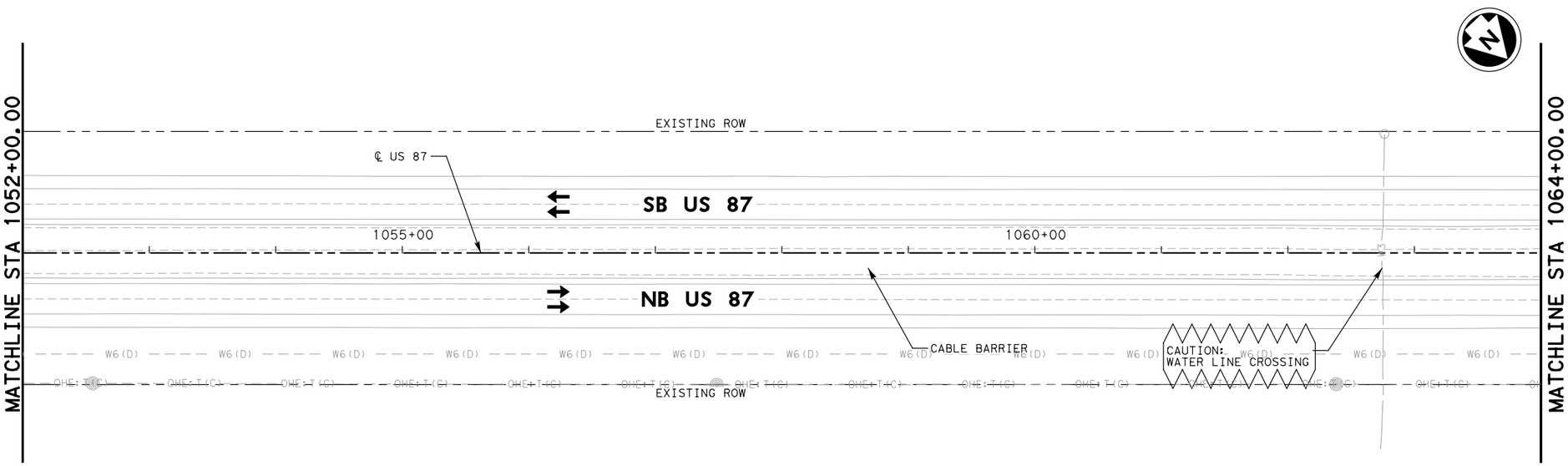

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (26 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	
AR	CONTROL	SECTION	JOB	65
GRPH CHECK				
JKB	0068	07	052, ETC	

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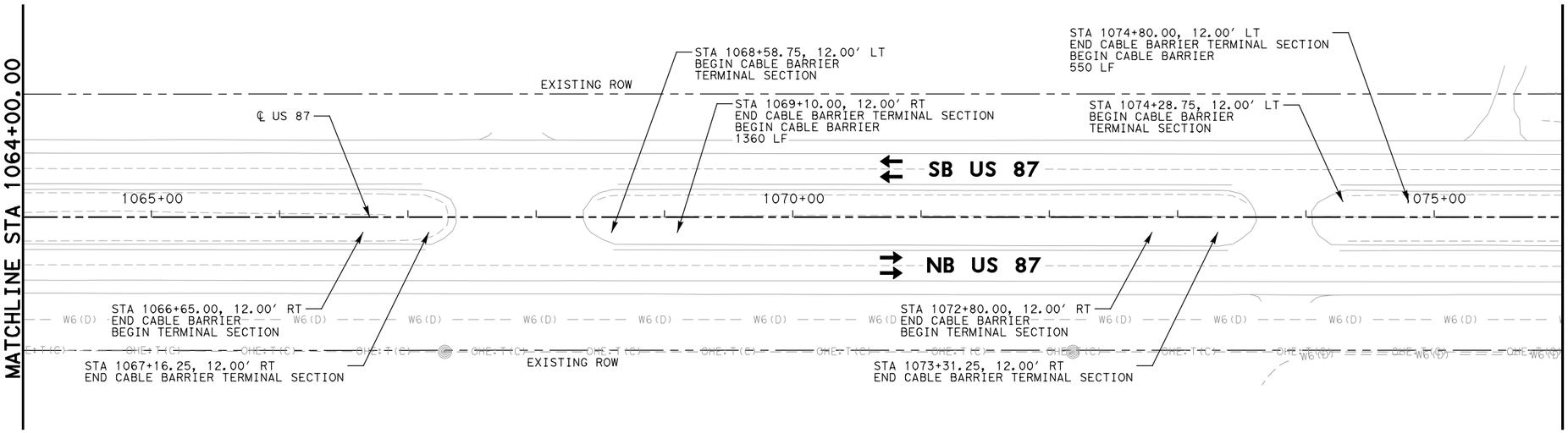

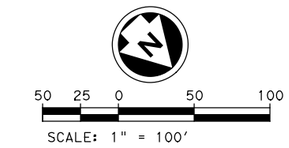

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

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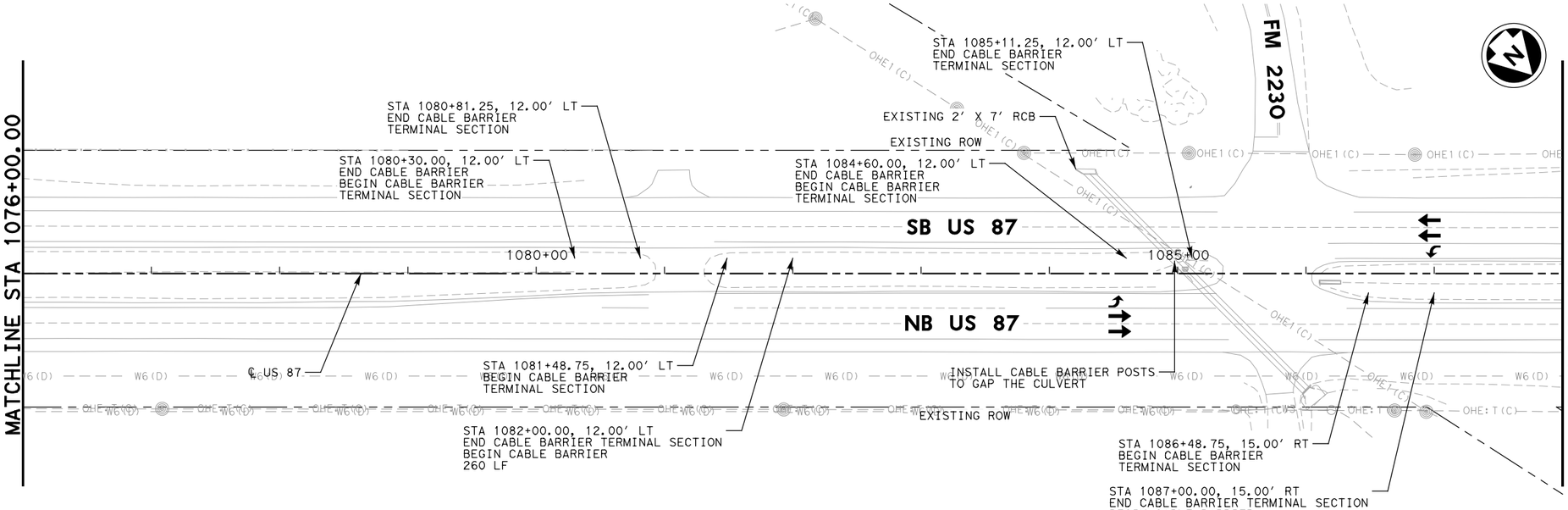

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CABLE BARRIER PLAN LAYOUT

SHEET (27 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	66
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK	0068	07	052, ETC	
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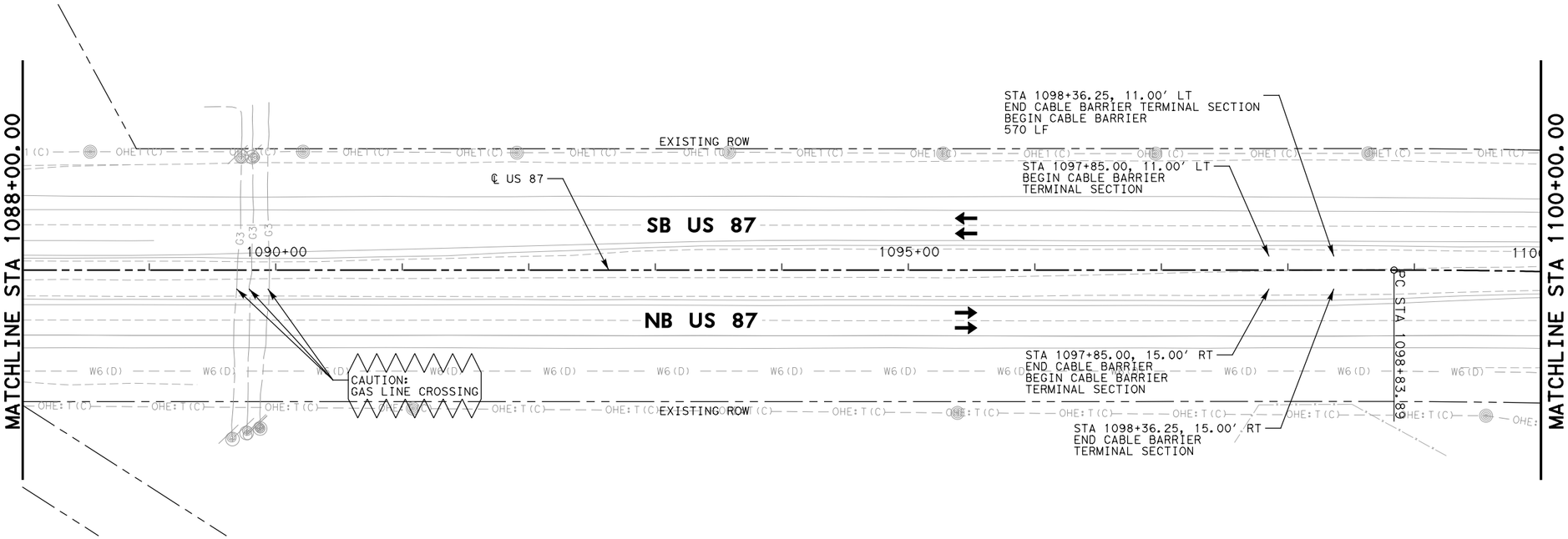

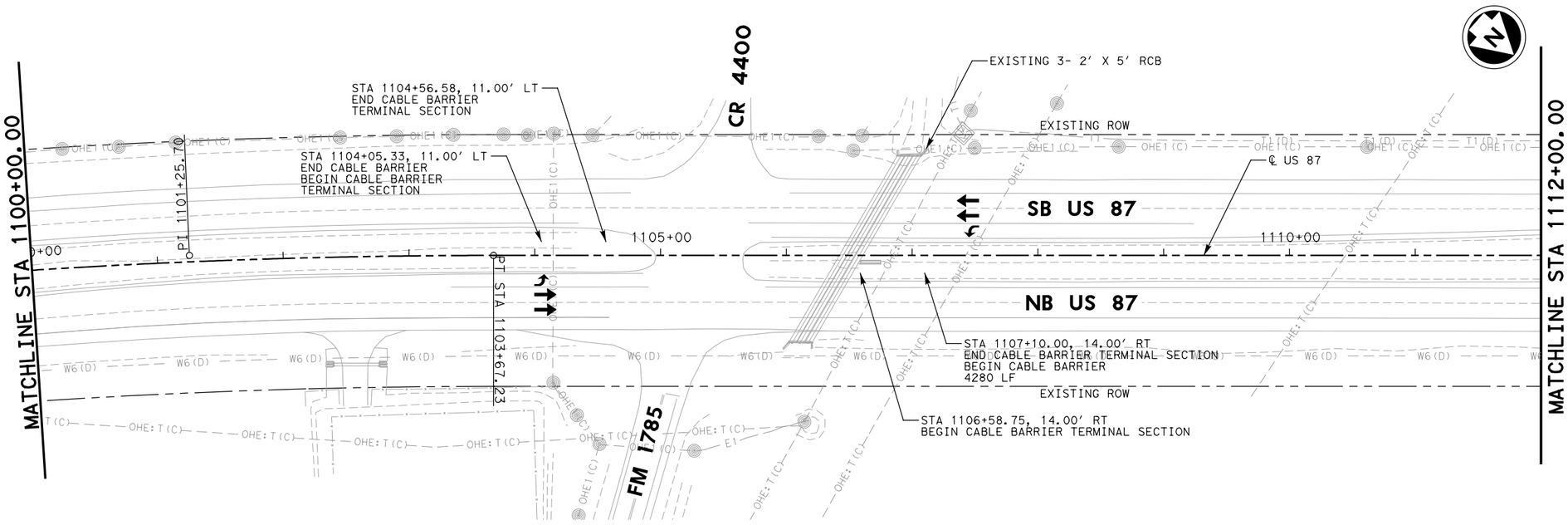

LEGEND
CABLE BARRIER
DIRECTION OF TRAFFIC
EXISTING ROW
EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (28 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	67
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK	0068	07	052, ETC	
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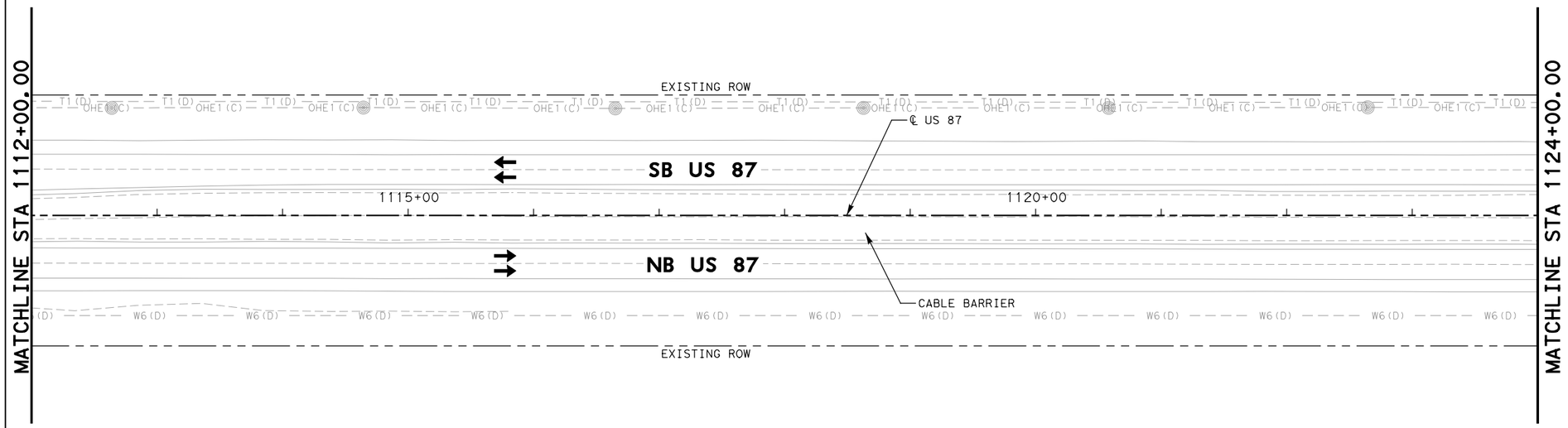

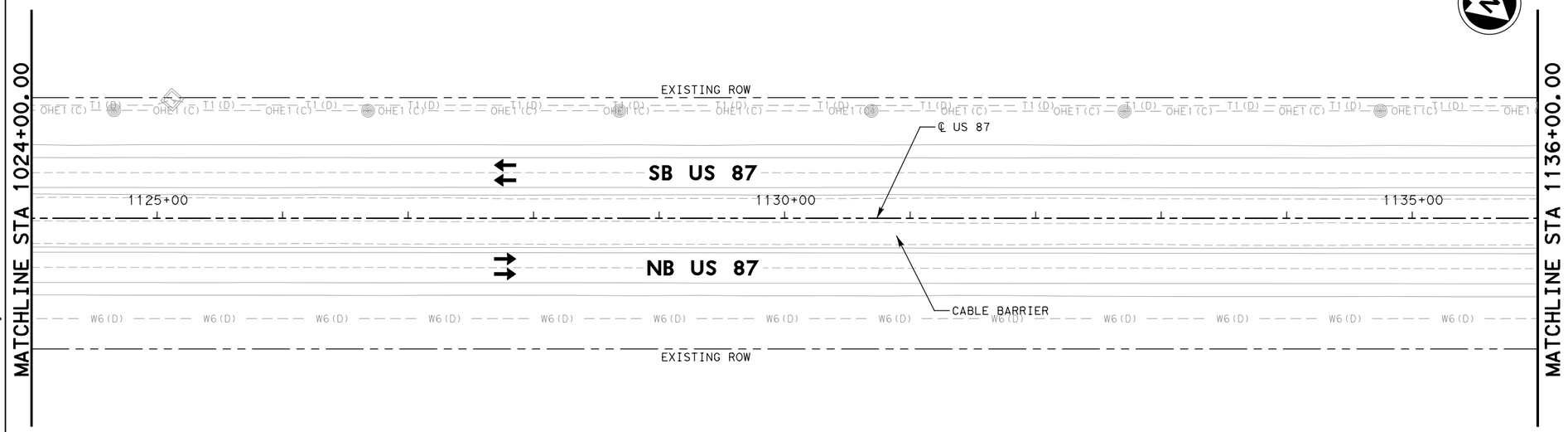

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
	CABLE BARRIER
	DIRECTION OF TRAFFIC
	EXISTING ROW
	EXISTING DRAINAGE EASEMENT

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CABLE BARRIER PLAN LAYOUT

SHEET (29 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	68
GRAPHICS	CONTROL	SECTION	JOB	
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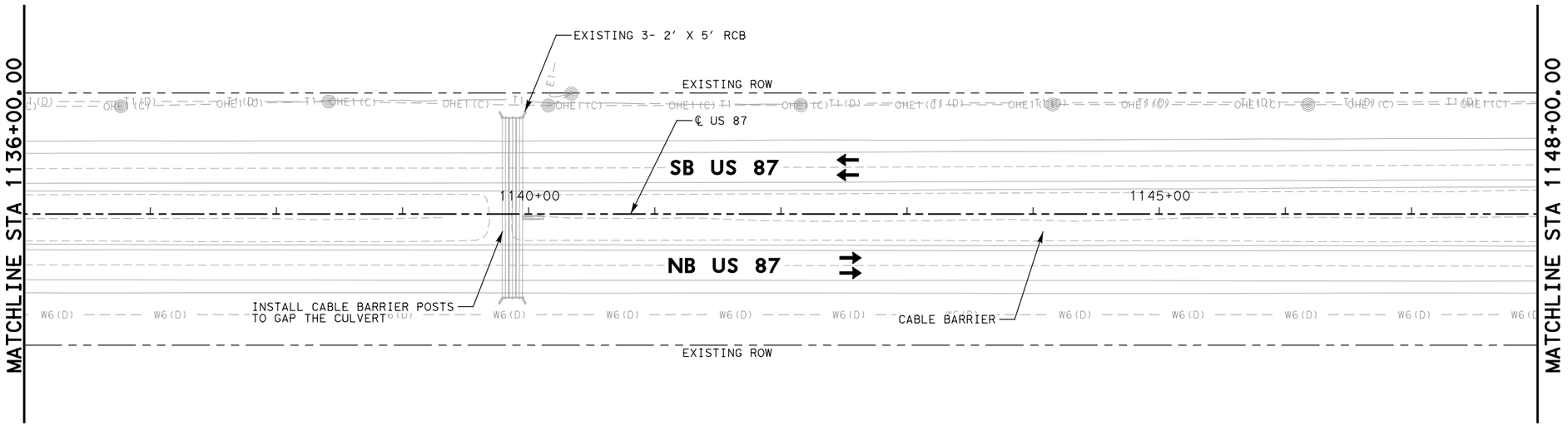

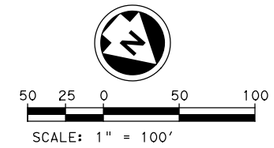

LEGEND

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- EXISTING ROW
- EXISTING DRAINAGE EASEMENT

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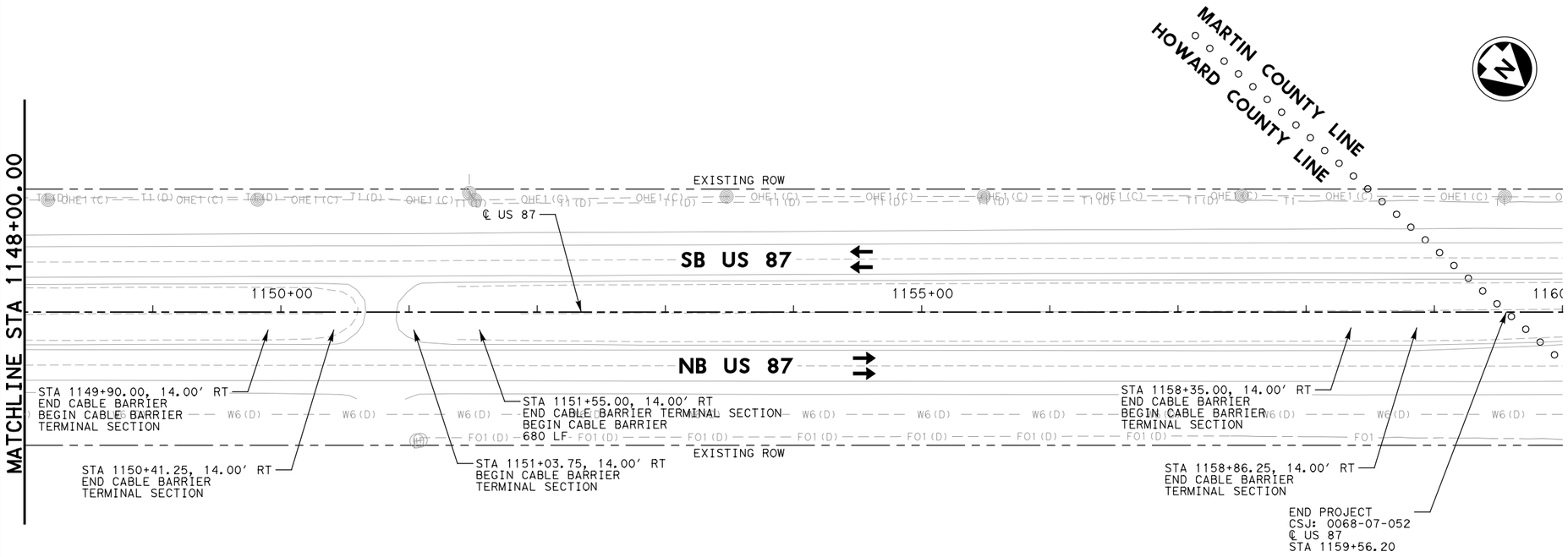

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CABLE BARRIER PLAN LAYOUT

SHEET (30 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	69
GRAPHICS	CONTROL	SECTION	JOB	
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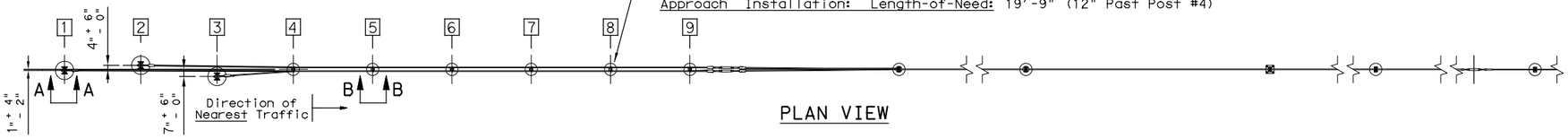
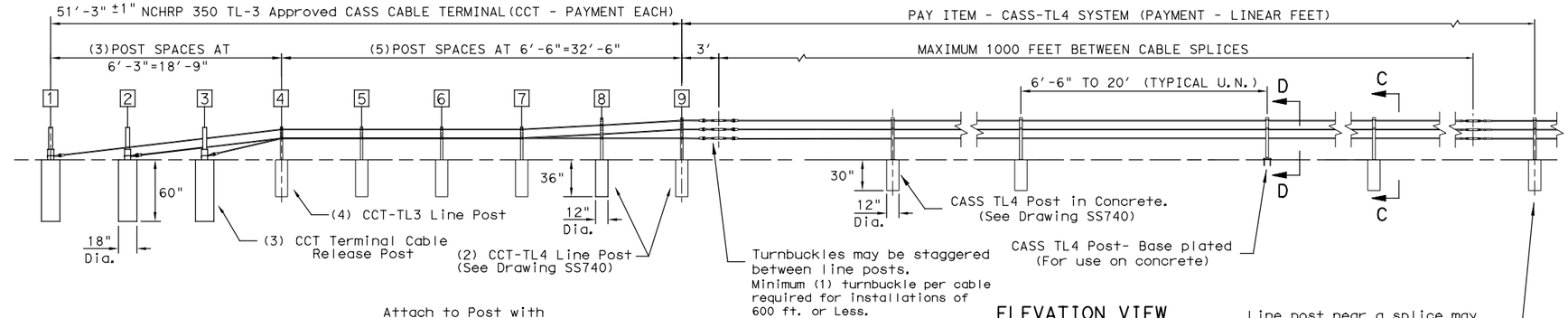
DATE: 5/25/2021 7:52:00 AM
FILE: P:\MSGPTXD2020?\US 87\PROD_SHEETS\STANDARDS\Roadway\cass1414.dgn

Preferred Installation: Locate post #2 away from nearest traffic.
System has been succesfully tested with opposite installation.

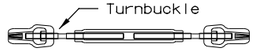
Length-of-Need Cass Cable Terminal (CCT):
Departure Installation: Length-of-Need: 44′-9" (At Post #8)
Approach Installation: Length-of-Need: 19′-9" (12" Past Post #4)



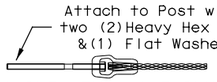
PLAN VIEW



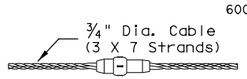
ELEVATION VIEW
(TYPICAL LAY-OUT)



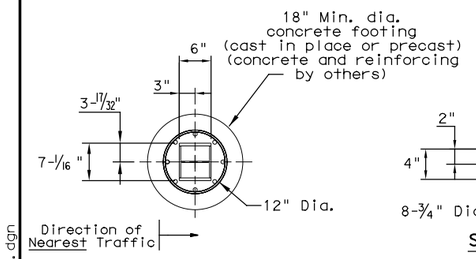
CABLE SPLICE WITH TURNBUCKLE
(OPEN BODY STYLE)



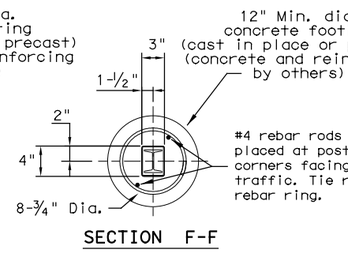
CABLE STUD ASSEMBLY



TORPEDO CABLE SPLICE



SECTION E-E



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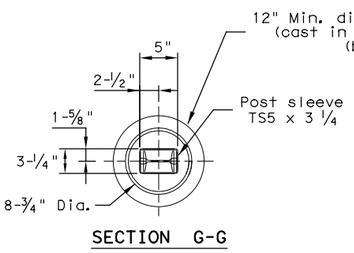
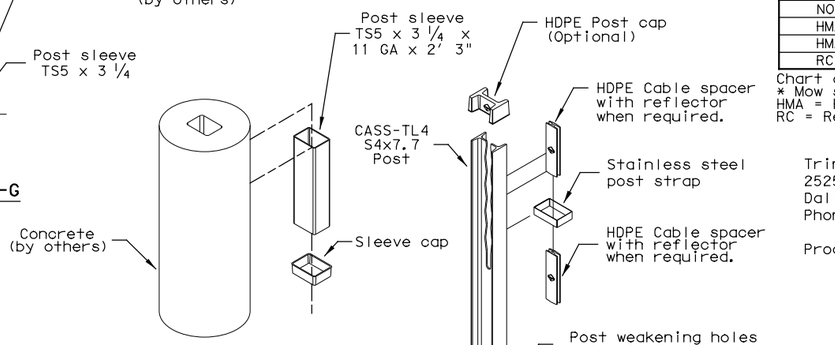
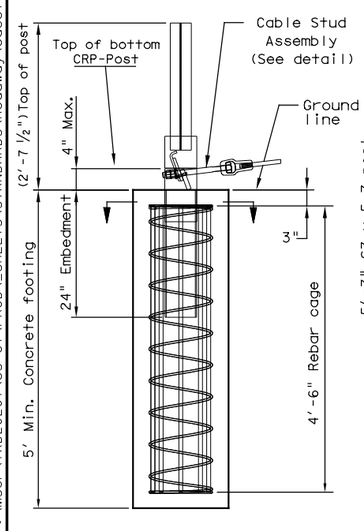


SECTION G-G

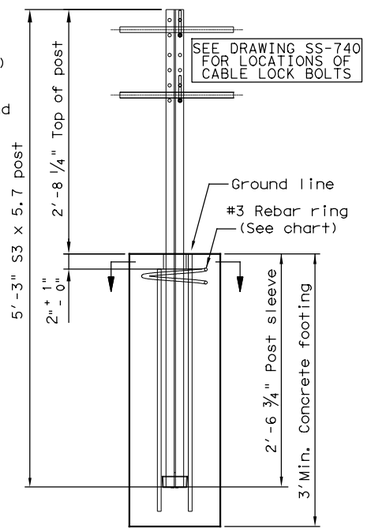


CONCRETE FOOTING
(IN QUALIFYING MOW STRIP SEE CHART)

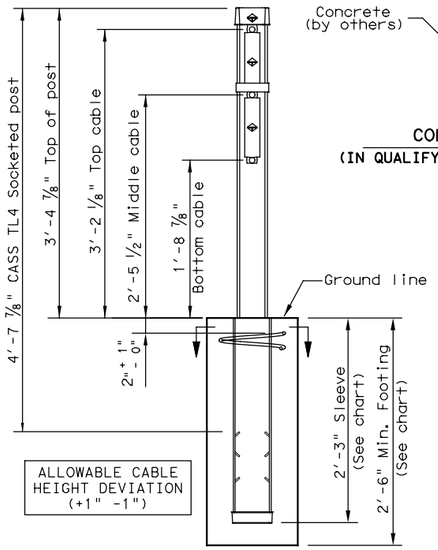
STANDARD POST & CONCRETE FOOTING
(SOCKETED POST)



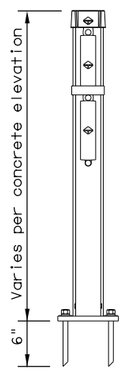
VIEW A-A
(CABLE RELEASE POST 1-3)



VIEW B-B
(TERMINAL LINE POST 4-7)



SECTION C-C
(SOCKETED POST)



SECTION D-D
(BASE PLATED POST)

GENERAL NOTES

1. This drawing is a general overview of CASS TL-4 Barrier System. See SS-740 (latest version) for specific details of CASS cable terminal (CCT) and cable safety system (CASS) requirements, proper installation, options and specification.
2. CASS is designed for bi-directional traffic flows and can be installed on either side of the median. Contact Trinity (800-527-6050) or consult the design, installation, or repair manual(s) for additional information.
3. All concrete for CASS footings shall be TxDOT class A. If class A or stronger concrete is utilized for the mowstrip, please see chart below for allowable footing depth and sleeve deviations.
4. All posts shall be socketed unless otherwise specified. All cables shall be pre-stretched unless otherwise specified.
5. For payment see Special Specification "Cable Barrier System".
6. CASS-TL4 shall be installed on shoulders or medians with slopes of 6:1 or flatter without obstructions, depressions, etc. That may significantly affect the stability of an errant vehicle. Grading of site and/or appropriate fill materials may be required. The designer/installer shall "Flatten" or "Round" various topographical inconsistencies that could interfere with the ability of the installer to consistently maintain the design height (in relation to the terrain) of the cables. Please consult manual(s) and / or TxDOT Memo(s) for installations in "Ditch Sections".
7. CASS TL-4 post spacing may be modified to avoid obstacles that conflict with the installation of cass-tl4 line posts or to reduce deflection on radiuses. No post space can exceed the maximum post TxDOT space limit of 20'. Reducing or increasing post spacing affects deflection. CASS TL-4 may be laterally transferred at a rate not to exceed 30:1.
8. Post foundations may be drilled through existing pavement. Please see line post foundation chart for minimum footing requirements in various applications.
9. For aesthetic purposes Trinity recommends all sleeves, driven posts, and lower cable release posts to be installed reasonably plumb (approximately 1/8" per foot).
10. CASS TL-4 shall be installed in well-drained, compacted, NCHRP Report 350 Standard soil. If soil does not meet this classification, if solid rock/concrete is encountered below grade or if soil is susceptable to severe freeze/thaw cycles, please contact Trinity about alternate footing design(s). Trinity suggests the use of "Mow strips" for erosion prevention and ease of maintenance / installation.
11. See the Texas MUTCD for proper "Barrier" Delineation.

MOW STRIP DETAIL*			CONCRETE FOOTING CHART		
MOW STRIP	DEPTH	WIDTH	FOOTING	TUBE SLEEVE	REBAR RING
NONE			30" Min.	27" Min.	YES
HMA	6" Min.	3′ Min.	27" Min.	15" Min.	NO
HMA	8" Min.	3′ Min.	24" Min.	15" Min.	NO
RC	3" Min.	3′ Min.	24" Min.	15" Min.	NO

Chart does not apply to Terminal Posts 1 thru 9.
* Mow strip or pavement.
HMA = Hot Mix Asphalt (Not Recycled Asphalt Pavement).
RC = Reinforced Concrete (TxDOT Class A Minimum).

CABLE TENSION CHART	
FAHRENHEIT	PRE-STRETCHED
DEGREES	LB / FORCE
-10	7300
0	7000
10	6600
20	6300
30	6000
40	5600
50	5300
60	5000
70	4600
80	4300
90	4000
100	3600
110	3300
120	3000
130	2700
140	2500
150	2300

Allowable deviation from chart in tangent sections: +800, -200 pounds/force. Cable tension readings are typically higher in curved cable sections.

Trinity Highway Products, LLC.
2525 Stemmons Freeway
Dallas, TX 75207
Phone: (800) 644-7976

Product.INFO@TRIN.NET

Texas Department of Transportation
Design Division Standard

TRINITY CABLE SAFETY SYSTEM (TL-4)

CASS(TL4)-14

FILE: cass1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
©TxDOT: March 2014	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		70

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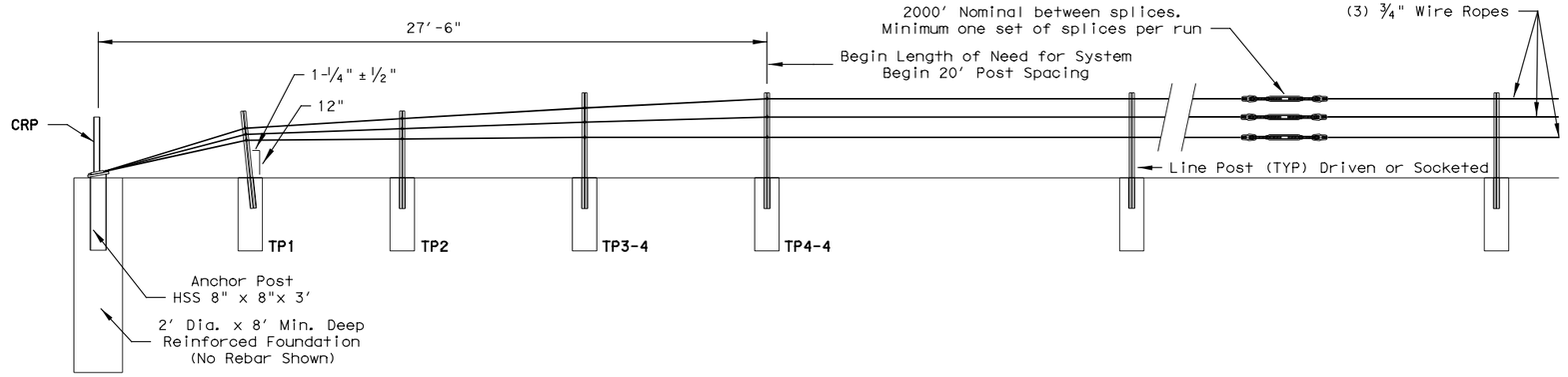
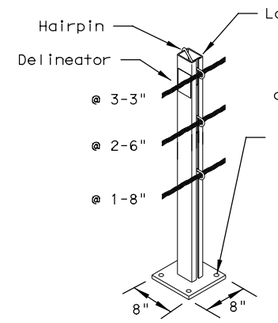
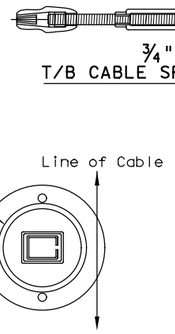
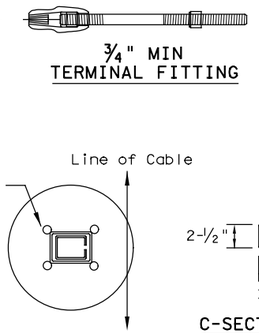




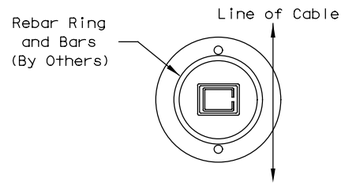
LINE POST
(BASE-PLATED OPTION)
Low-Fill Box Culvert Less than 15" Fill



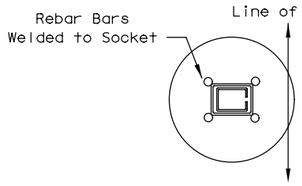
¾" MIN
T/B CABLE SPLICE FITTING



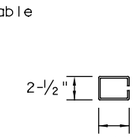
¾" MIN
TERMINAL FITTING



SECTION A



SECTION B



C-SECTION POST

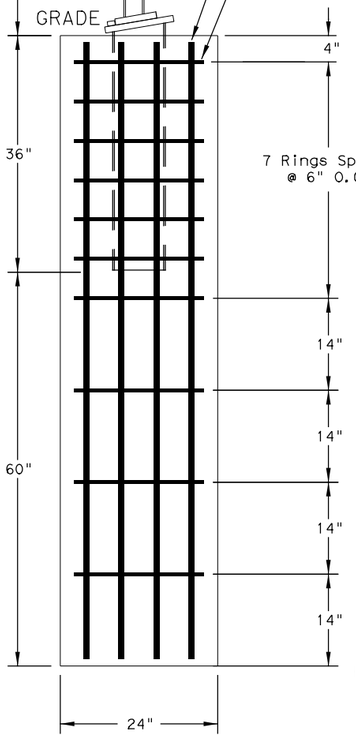
GENERAL NOTES

1. For additional information contact Gibraltar, Inc. at 1-800-495-8957, 830-798-5444, or see the manufacturer's product manual.
2. All concrete shall be CLASS A.
3. The Cable Barrier System shall be installed on shoulders or on medians with slopes of 6:1 or flatter. If installed on slopes steeper than 6:1 up to 4:1 the TL-4 system performs as a TL-3 and Gibraltar must be contacted for various guidelines related to placement.
4. The Cable Barrier System is accepted by the FHWA Test Level - 4.
5. See the Texas MUTCD for proper "Barrier" delineation.
6. Rock Clause: Where solid rock is encountered:
   A. For socketed post, continue digging 12" diameter, 15" deep into rock or the required plan depth, whichever comes first.
   B. For driven post, core drill a 4" diameter hole 18" deep into rock or the required plan depth, whichever comes first.
   C. For Anchor post, continue digging 24" diameter, 30" deep into rock or the required plan depth, whichever comes first.
7. Tolerances:
   * LP = 3" out of plumb, at top
   * Cable height = 1"
   * Anchor Post = 5" off of Cable Reference Line
8. The Gibraltar cable barrier system shall be installed in NCHRP Report 350 standard compacted soil. Soil must be well drained.
9. All non-welded rebar by others.
10. Minimum recommended line post foundation.
    A. Without mowstrip, 36" Deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long
    B. With 4" minimum depth hot mix asphalt, 30" deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long.
    C. With 3" minimum depth concrete mowstrip, 24" deep x 12" diameter foundations. (No rebar required)
    D. Direct drive post 42" deep.

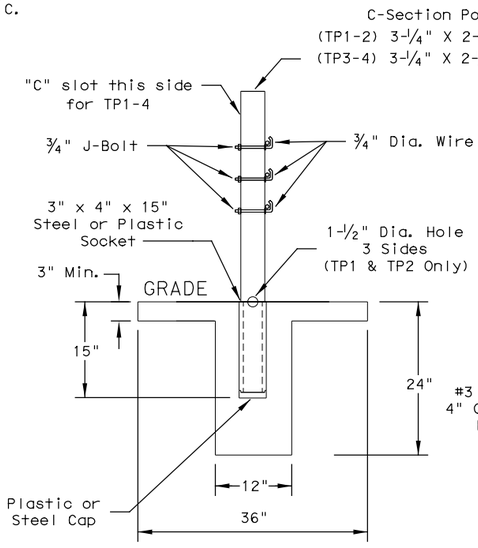
CABLE TENSION CHART*	
-10 °F	8000
0 °F	7600
10 °F	7200
20 °F	6800
30 °F	6400
40 °F	6000
50 °F	5600
60 °F	5200
70 °F	4800
80 °F	4400
90 °F	4000
100 °F	3600
110 °F	3200

DEFLECTION	
Deflection	Post Spacing
8'-0"	20 FT
7'-0"	12 FT
6'-8"	10 FT

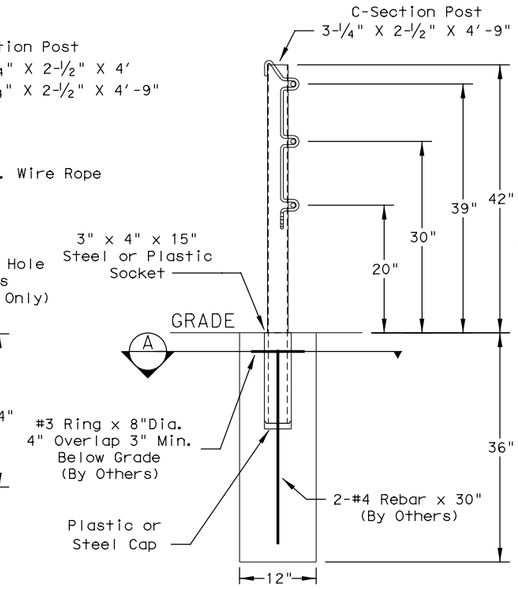
* Allowable Deviation from Chart +/- 10%



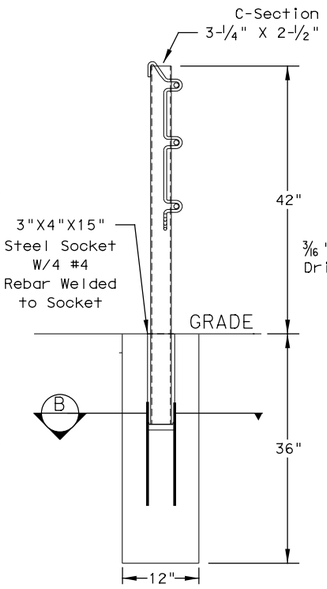
CABLE RELEASE AND ANCHOR POST



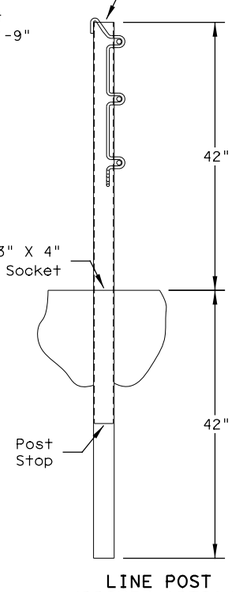
TERMINAL POST
(SHOWN WITH CONCRETE MOWSTRIP)
(Shown with Tube Plate Option)
(See Note 10)



LINE POST SOCKETED
(Shown with Rebar Ring/Bars Socket Option)
(See Note 9)



LINE POST SOCKETED
(Shown with Welded Rebar Socket Option)
(See Note 9)



LINE POST
(DRIVEN OPTION)
(Shown with Driven
Socket Option)
(See Note 9)

Texas Department of Transportation

Design Division Standard

GIBRALTAR CABLE BARRIER SYSTEM (TL-4)

GBRLTR(TL4)-14

FILE: gbrltrtl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
©TxDOT: March 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		71

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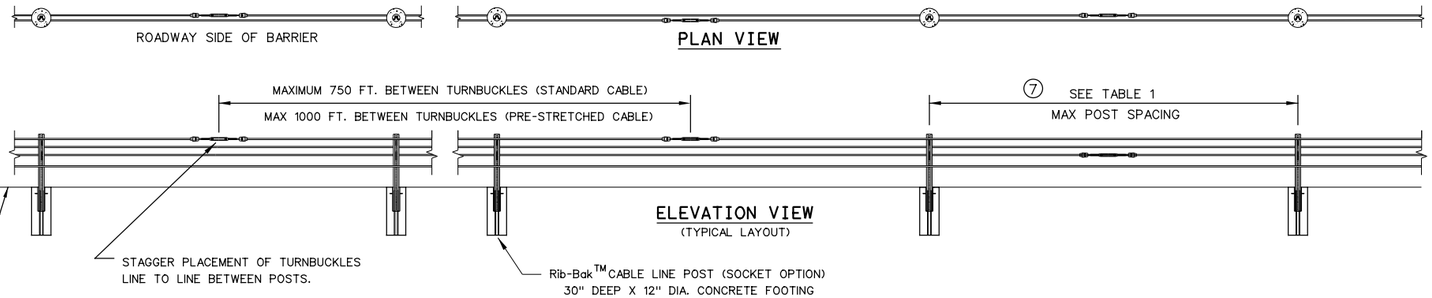
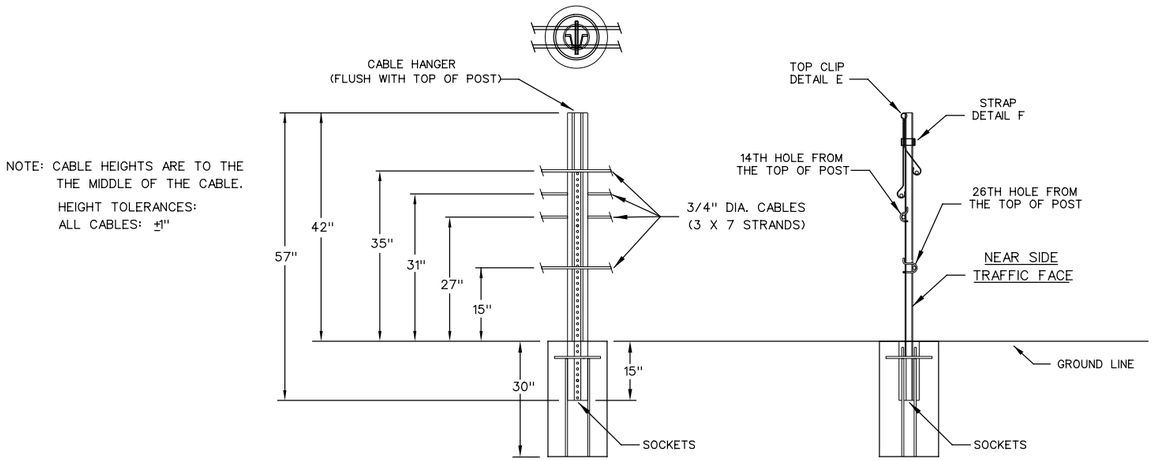
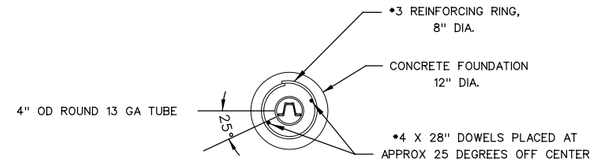
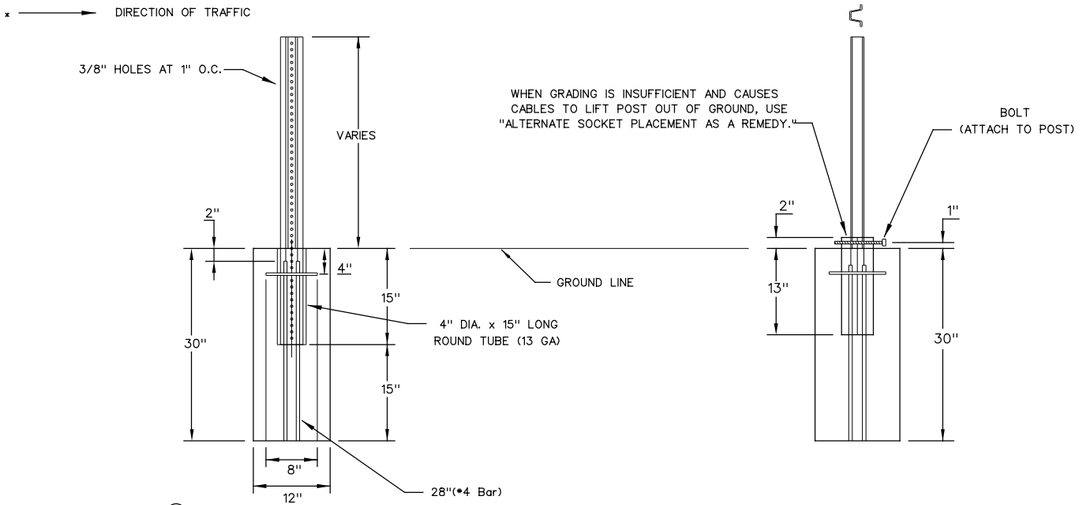




LENGTH OF NEED POSTS
MEDIAN CONFIGURATION

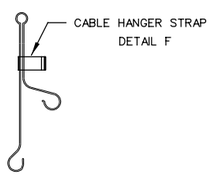
INSTALLATION DETAIL
4 CABLE 6:1



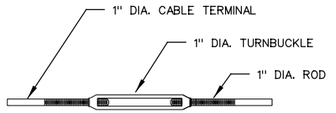


⑪ SOCKETED POST OPTION
(TYPE S POST)

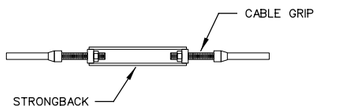
ALTERNATE SOCKET PLACEMENT
(TYPE S POST)



CABLE HANGER BRACKET
DETAIL E
(SUBJECT TO MANUFACTURER'S TOLERANCES)



WEDGED FITTING
TURNBUCKLE DETAIL
(TYPICAL)



STRONGBACK (SELF-SWAGING)
TURNBUCKLE DETAIL
(OPTIONAL)

GENERAL NOTES

1. FOR ADDITIONAL INFORMATION CONTACT YOUR DISTRIBUTOR OR NUCOR STEEL MARION, INC. AT (740) 383-4011.
2. FOR PAYMENT SEE SPECIAL SPECIFICATION "CABLE BARRIER SYSTEM".
3. FOR ADDITIONAL INFORMATION SEE THE MANUFACTURER'S PRODUCT MANUAL.
4. THE NU-CABLE SYSTEM IS DESIGNED FOR BI-DIRECTIONAL TRAFFIC FLOWS. SEE THE MANUFACTURER'S PRODUCT MANUAL FOR PLACEMENT ADJACENT TO GUARDRAIL END TREATMENTS.
5. THE NU-CABLE SYSTEM SHALL BE INSTALLED ON MEDIANS WITH SLOPES OF 6:1 OR FLATTER WITHOUT OBSTRUCTIONS, DEPRESSIONS, ETC; THAT MAY SIGNIFICANTLY AFFECT THE STABILITY OF AN ERRANT VEHICLE.
6. THE NU-CABLE SYSTEM MAY BE INSTALLED ON EITHER SIDE OF THE ROADWAY. Rib-Bak™ CABLE LINE POSTS MAY BE SOCKETED OR DRIVEN DESIGN.
7. THE TL-4 FOR 6:1 SLOPES CAN USE 4• / LF POST. SEE TABLE •1 FOR POST SIZE PER SPACING.
8. SEE (TABLE 2) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR INITIAL INSTALLATION.
9. SEE (TABLE 3) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR MAINTENANCE.
10. FOURTH (LOWEST) CABLE IS NOT OPTIONAL ON THE TL-4 SYSTEM.
11. CONSULT YOUR PROJECT PLAN SHEETS AND CABLE BARRIER SPECIFICATIONS FOR DESIRED SOCKET MATERIAL.
12. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGN IF SOIL TYPES DIFFER.

⑦ TABLE 1

POST SIZE TABLE	
POST SPACING	POST SIZE
0' - 17'-6"	4• / LF X 4' OR 6' POST
17'-6" - 20'	5• / LF X 4' POST

POST SPACING IS PER 8 FOOT DEFLECTION REQUIRMENTS.
CONSULT PRODUCT MANUAL IF GREATER DEFLECTION IS PERMISSIBLE.

⑧ TABLE 2

CABLE TENSION CHART	
INITIAL INSTALL	
F	LBF
120	4624
110	4986
100	5350
90	5713
80	6077
70	6440
60	7167
50	7894
40	8619
30	9346
20	10073
10	10800
0	11525
-10	12252
-20	12979
-30	13706

⑨ TABLE 3

CABLE TENSION CHART	
MAINTENANCE	
F	LBF
120	4021
110	4336
100	4652
90	4968
80	5284
70	5600
60	6232
50	6864
40	7495
30	8127
20	8759
10	9391
0	10022
-10	10654
-20	11286
-30	11918

Texas Department of Transportation
Design Division Standard

NU-CABLE BARRIER SYSTEM (TL-4) (4 CABLE)

NU-CABLE(TL4)-14

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REVISIONS	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		72

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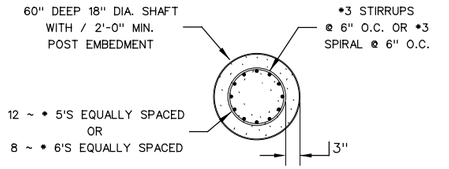
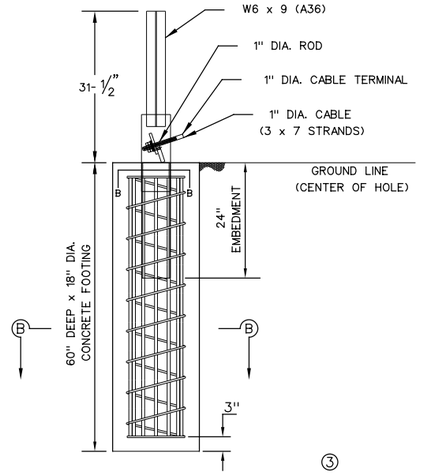
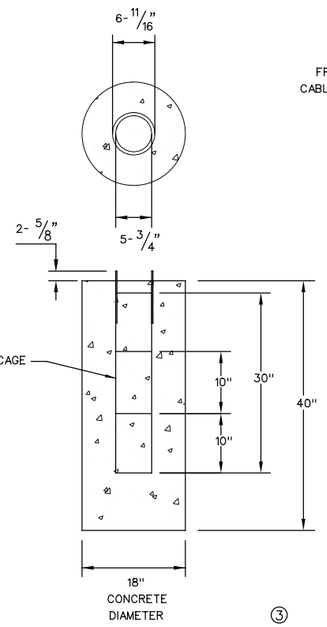


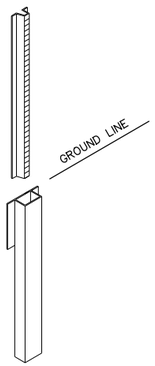
SECTION B-B
(CABLE RELEASE POST)



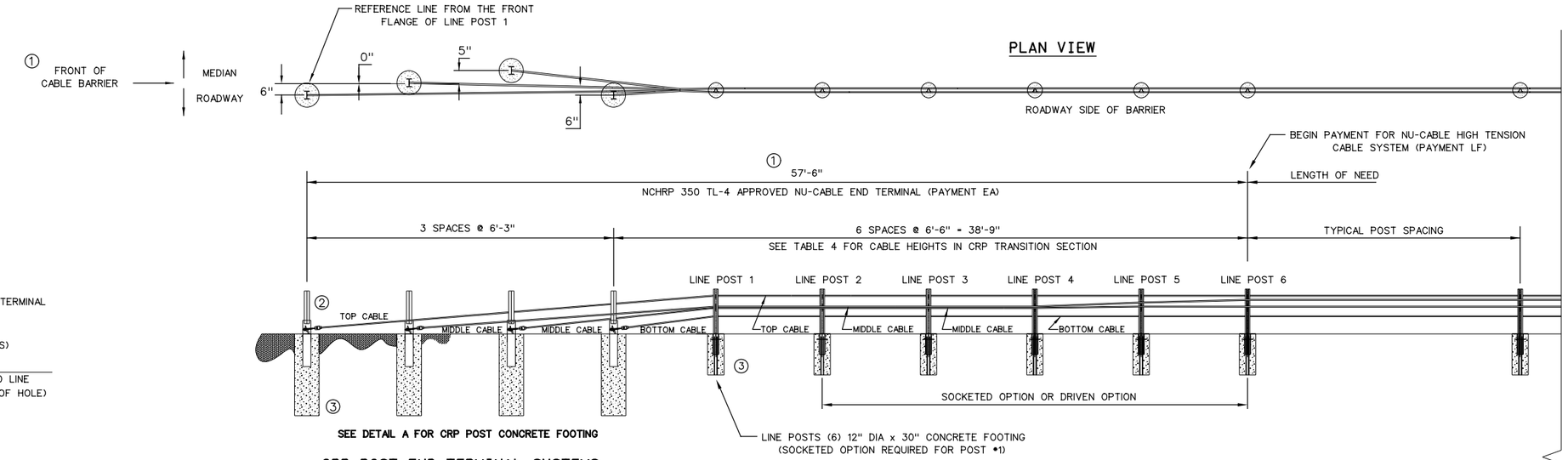
DETAIL A - CRP IN CONCRETE FOOTING
(3000 PSI MIN CONCRETE)



NU-TEN CONCRETE FOOTING DETAIL



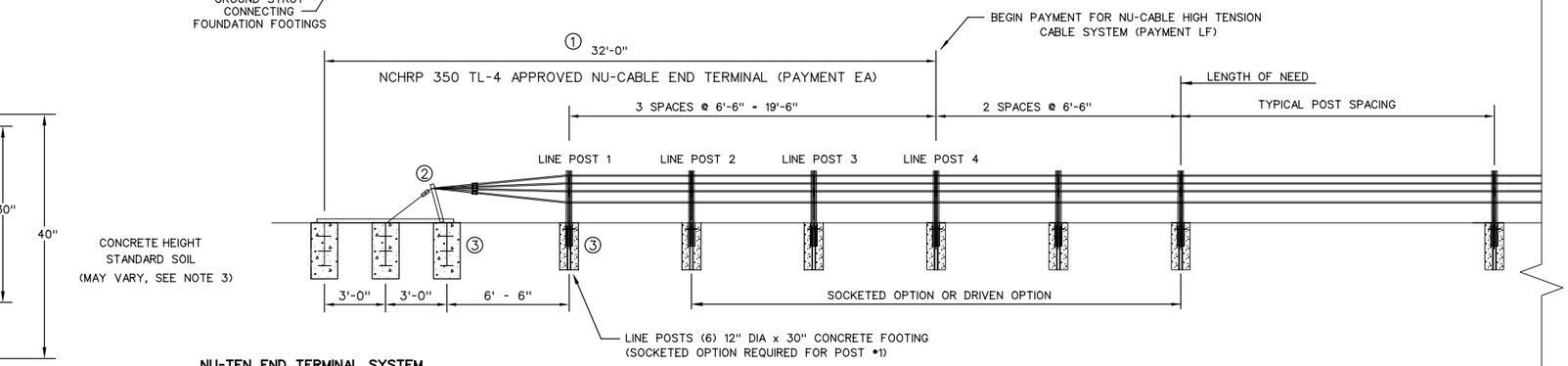
DRIVEN SOCKET OPTION



CRP POST END TERMINAL SYSTEMS

ELEVATION VIEW

① THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT.



NU-TEN END TERMINAL SYSTEM

ELEVATION VIEW

④ **TABLE 4**

CRP END TERMINAL CABLE HEIGHTS - TL-4						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	34"	34"	34"	34"	34"	34"
UPPER-MIDDLE CABLE	27"	27"	27"	27"	28"	31"
BOTTOM-MIDDLE CABLE	24"	24"	24"	24"	24"	24"
BOTTOM CABLE	15"	15"	15"	15"	15"	15"

NOTES

1. THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT. SYSTEM PAYMENT IS PER EACH (EA). REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL PAYMENT INFORMATION
2. REFER TO INSTALLATION MANUAL FOR CABLE END ASSEMBLY DETAIL.
3. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGNS IF SOIL TYPES DIFFER.
4. SEE TABLE 4 CABLE HEIGHTS IN CRP TRANSITION SECTION.

Texas Department of Transportation

Design Division Standard

NU-CABLE BARRIER SYSTEM (TL-4) (4 CABLE)

NU-CABLE(TL4)-14

FILE:	DN:	CK:	DW:	CK:
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	ABL	HOWARD		73

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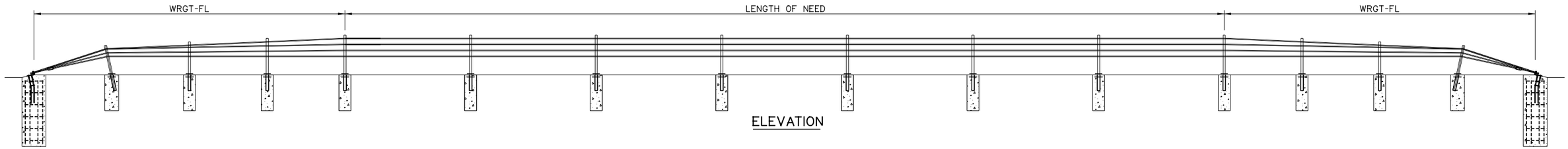
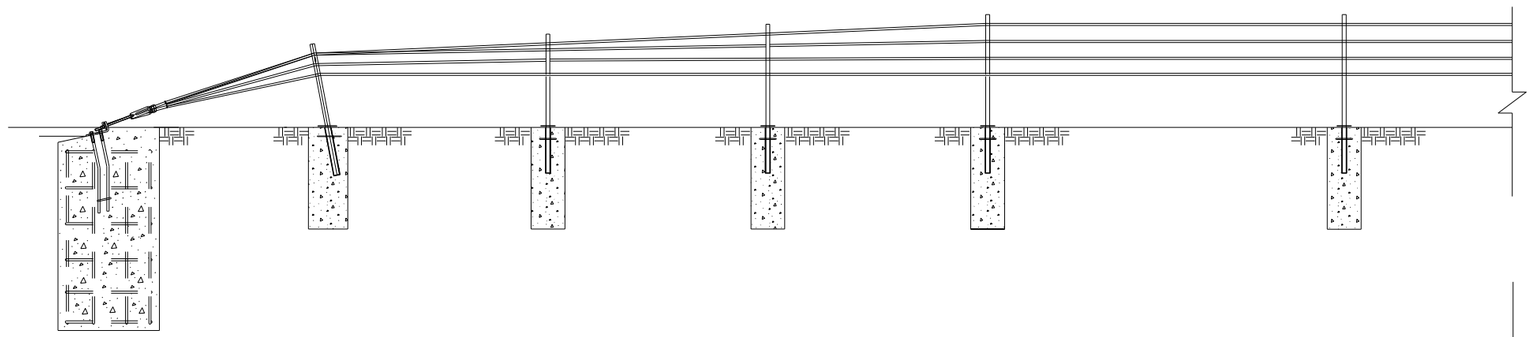
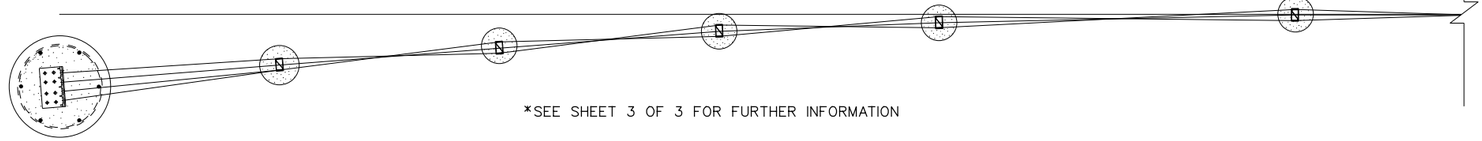


ELEVATION

PLAN

WRGT-FL END ANCHOR





*SEE SHEET 3 OF 3 FOR FURTHER INFORMATION

ROPE TENSION TABLE		
ROPE TEMP (°F)	TENSION (LBS)	TENSION (kN)
0	5700	25.4
5	5550	24.7
10	5400	24.0
15	5250	23.4
20	5100	22.7
25	4950	22.0
30	4800	21.4
35	4650	20.74
40	4500	20.0
45	4350	19.3
50	4200	18.7
55	4050	18.0
60	3900	17.3
65	3750	16.7
70	3600	16.0
75	3450	15.3
80	3300	14.7
85	3150	14.0
90	3000	13.3
95	2850	12.7
100	2700	12.0
105	2550	11.3
110	2400	10.7
115	2250	10.0
120	2100	9.3
125	1950	8.7
130	1800	8.0
135	1650	7.3
140	1500	6.7

*ROPE TENSION: ± 20% AFTER 2-WEEK INTERVAL

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.

2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.

3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".

4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACT MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.

5. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.

6. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.

7. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.

8. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.

9. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.

10. TAPER RATES FOR THE BRIFEN WRSF ARE AS FOLLOWS:
    HORIZONTAL: 25:1 MAXIMUM, 50:1 PREFERABLE
    VERTICAL: 25:1 MAXIMUM, 50:1 PREFERABLE

Texas Department of Transportation

Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
© TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		74

DATE: 5/25/2021 7:52:05 AM
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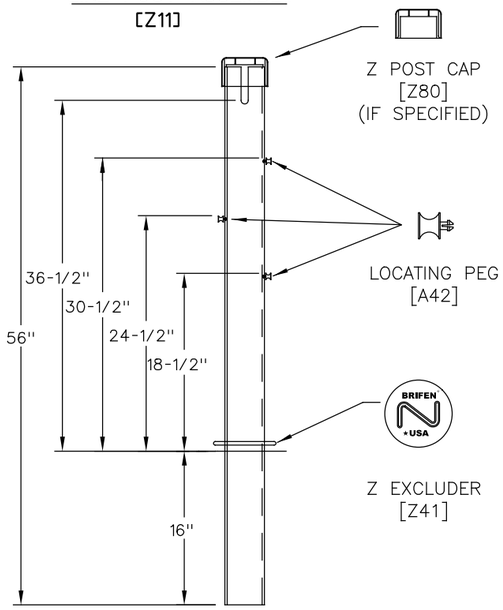
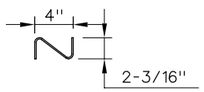
LINE POST ASSEMBLY
[Z11]



ELEVATION

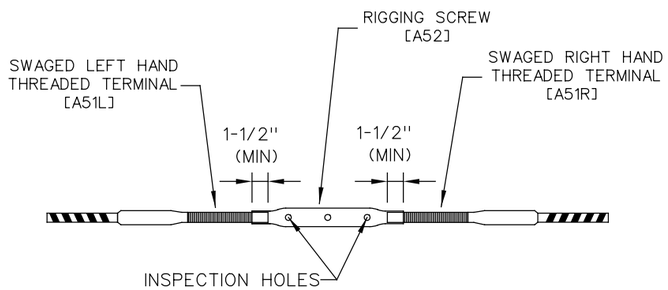


PLAN

NOTES SPECIFIC TO LINE POST ASSEMBLY

1. ROPE HEIGHTS SHALL BE ± 1" TO GROUND LINE.
2. POST SHALL BE ± 4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.

ROPE CONNECTION DETAIL

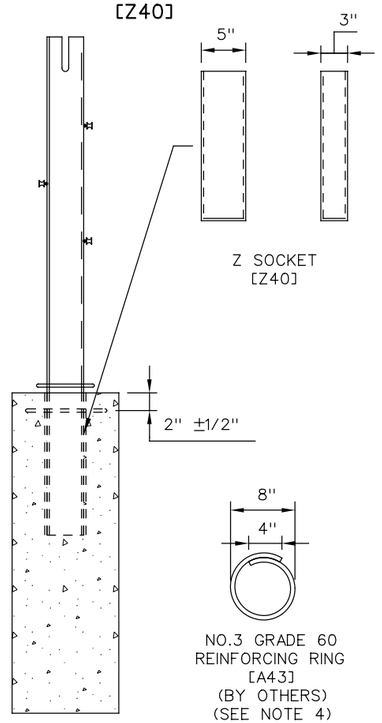


NOTES SPECIFIC TO ROPE CONNECTION DETAIL

1. THE WIRE ROPE TERMINALS SHALL BE THREADED A MINIMUM OF 1-1/2" INTO RIGGING SCREW.
2. AFTER FINAL TENSIONING, THE TERMINALS SHALL BE VISIBLE IN THE INSPECTION HOLES.

SOCKET ASSEMBLY

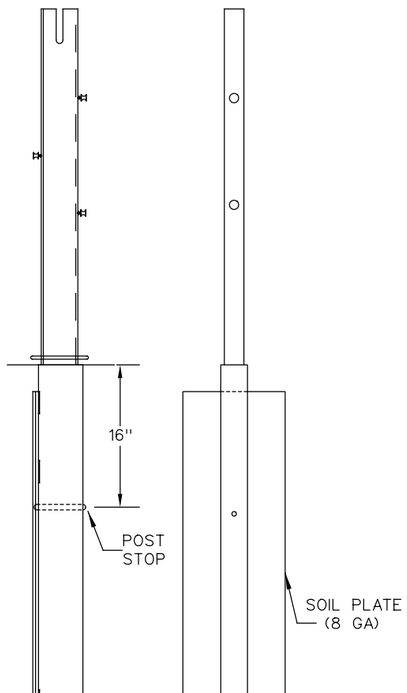
CONCRETE FOOTING
[Z40]



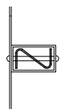
ELEVATION

PLAN

DRIVE SOCKET
[Z44]



ELEVATION SIDE



PLAN

NOTES SPECIFIC TO CONCRETE FOOTING

1. SIZE OF FOOTING WILL BE DETERMINED BY SOIL CONDITIONS, FOUNDATION TYPE AND PROJECT CONDITIONS.
2. CONCRETE BASED ON AGENCY SPECIFICATIONS.
3. CONCRETE BY OTHERS.
4. REINFORCING RING (BY OTHERS) WILL BE USED ACCORDING TO FOUNDATION SIZE AND TYPE. THE REINFORCEING RING MAY BE OMITTED IF THE FOOTING IS PLACED IN A CONTINOUS CONCRETE MOW STRIP.
5. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
6. SOCKET SHALL BE ± 2° OF VERTICAL PLUMB.

NOTES SPECIFIC TO DRIVE SOCKETS

1. SIZE OF SOIL PLATE WILL BE DETERMINED BY SOIL CONDITIONS AND PROJECT CONDITIONS.
2. THE SOIL PLATE SHALL BE PARALLEL TO ROADWAY AND CAN FACE TOWARD OR AWAY FROM THE TRAVEL LANE.
3. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
4. SOCKET SHALL BE ± 2° OF VERTICAL PLUM.
5. SOCKETS SHALL BE DRIVEN IN A MANNER TO NOT DISTORT OR DESTROY THE TOP OF SOCKET TO A DEGREE THAT PLACES THE SOCKET OR LINE POST OUT OF CONSTRUCTION TOLERANCES.

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACTION MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.

Texas Department of Transportation

Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:	
©TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0068	07	052, ETC	US 87	
	DIST	COUNTY		SHEET NO.	
	ABL	HOWARD		75	

DATE: 5/25/2021 7:52:05 AM
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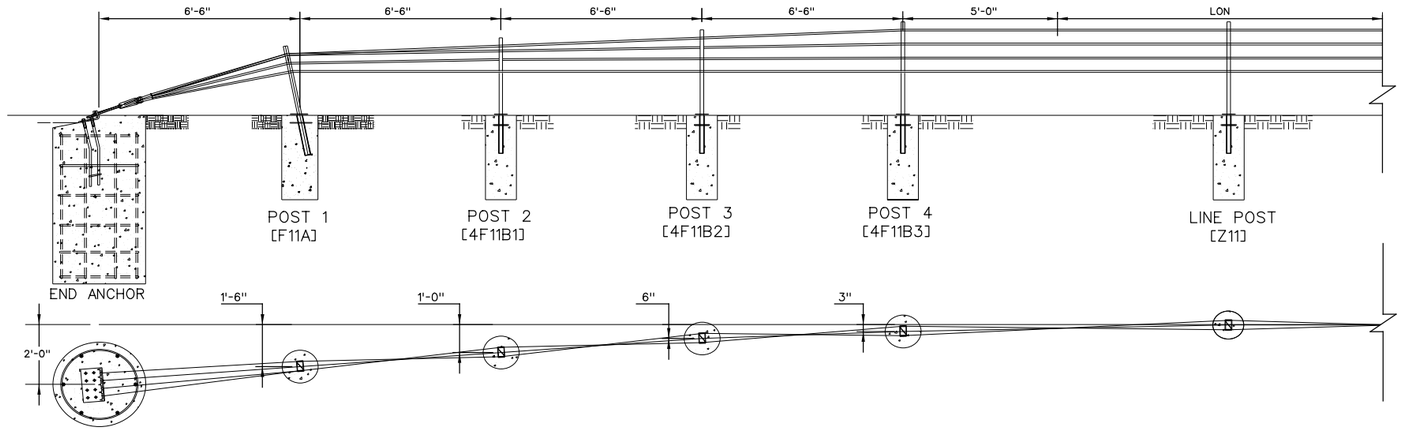
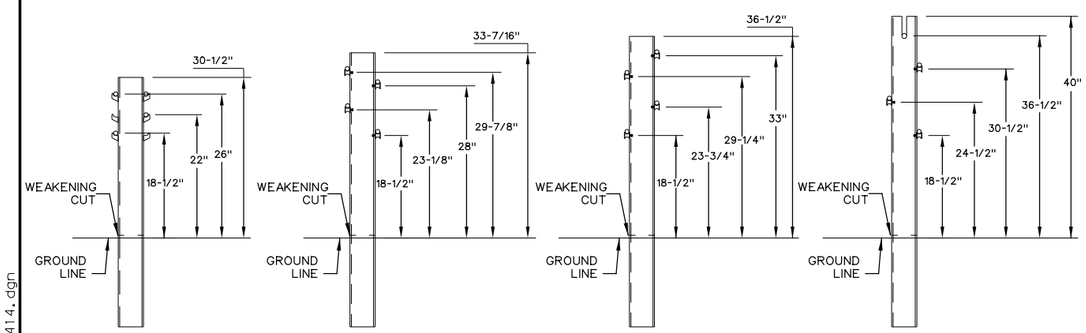
WRGT-FL END ANCHOR LAYOUT



GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
2. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
3. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
4. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
5. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
6. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.

WRGT-FL POST DETAILS

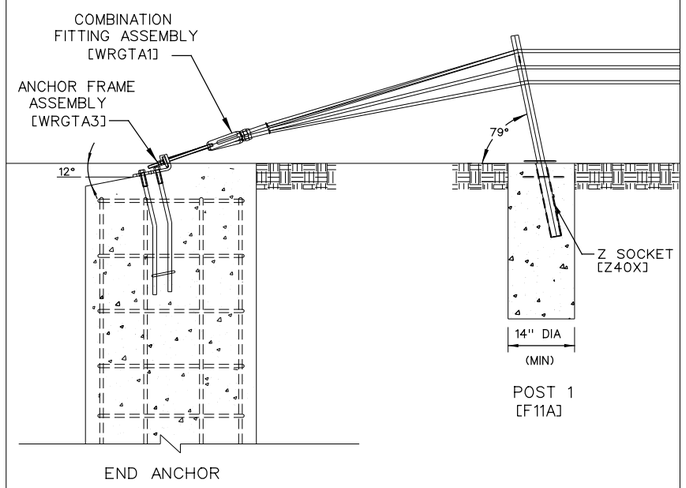


POST 1 [F11AL] | POST 2 [4F11B1L] | POST 3 [4F11B2L] | POST 4 [4F11B3L]

NOTES SPECIFIC TO WRGT-FL POST DETAIL

1. ROPE HEIGHTS SHALL BE ?1" TO GROUND LINE.
2. POST SHALL BE ?4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.
6. Z EXCLUDER (Z41) SHALL BE USED.
7. POST A & SOCKET SHALL BE PLACED 79? (?4?) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
8. POST A SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.
9. FOUNDATIONS FOR POST 2 THRU 4 SHALL BE THE SAME AS THE LINE POST ASSEMBLY'S FOR THE PROJECT.
10. WEAKENED CUTS SHALL FACE END ANCHOR.

END ANCHOR DETAILS

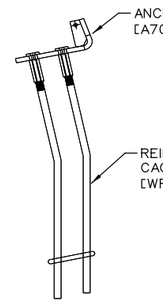


NOTES SPECIFIC TO END ANCHOR DETAIL

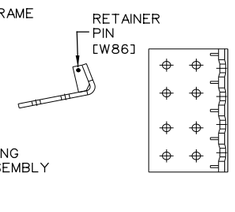
1. THE END ANCHOR ASSEMBLY SHALL BE PLACED 12? (+3?, -1?) BELOW HORIZONTAL PLANE.
2. POST 1 & SOCKET SHALL BE PLACED 79? (?4?) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
3. POST 1 SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.

END ANCHOR COMPONENTS

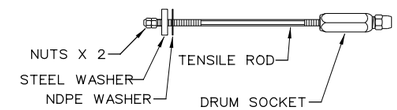
ANCHOR FRAME ASSEMBLY



ANCHOR FRAME [A70]



COMBINATION FITTING [WRGTA1]



SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE (TL-4)

BRIFEN(TL4)-14

FILE: brifent1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:	
©TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0068	07	052, ETC	US 87	
	DIST	COUNTY		SHEET NO.	
	ABL	HOWARD		76	

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
77-82	EXISTING UTILITY PLANS CONTROL INDEX SHEETS
83	EXISTING UTILITY PLANS GENERAL NOTES/ LEGENDS
84-166	EXISTING UTILITY PLANS

NOT INCLUDED IN THIS PLAN SET
INCLUDED IN THIS PLAN SET

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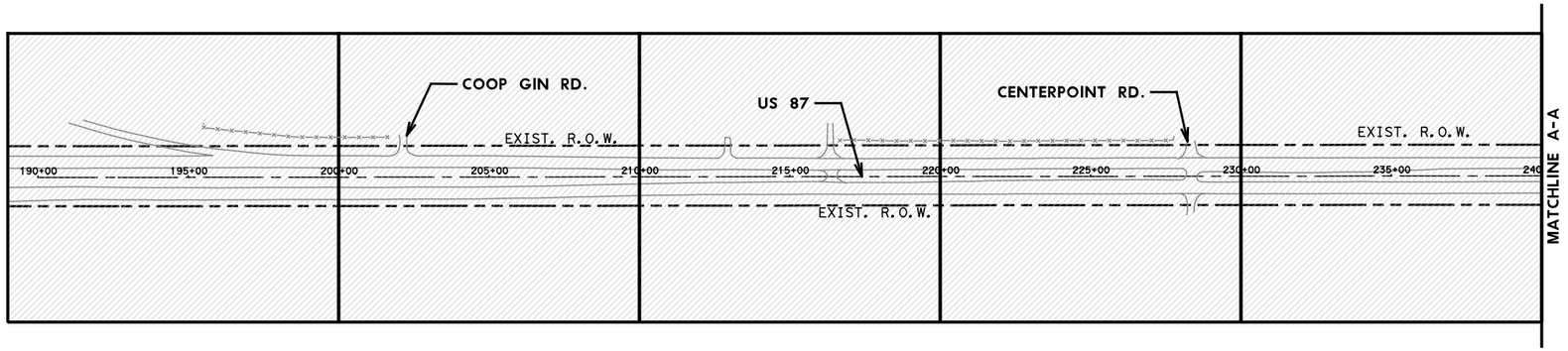

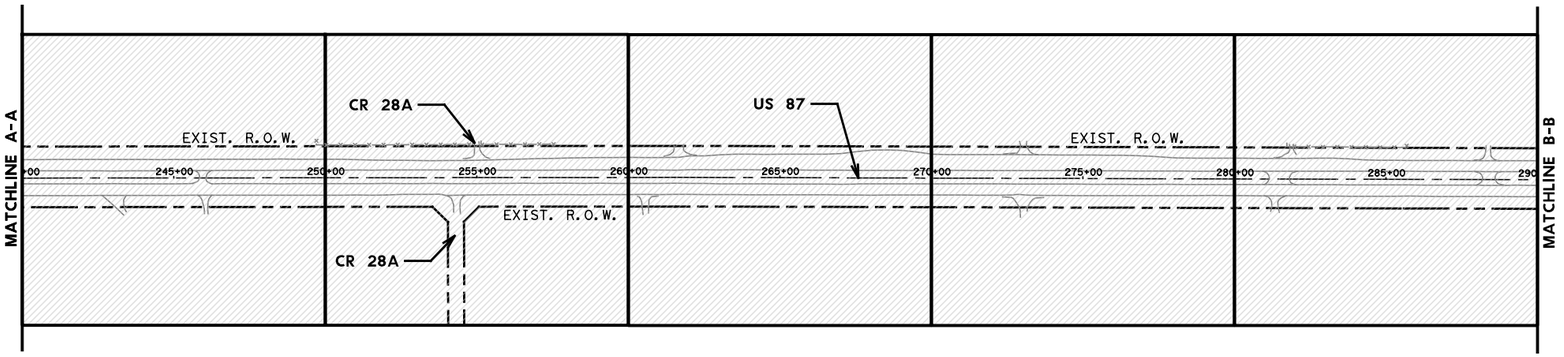

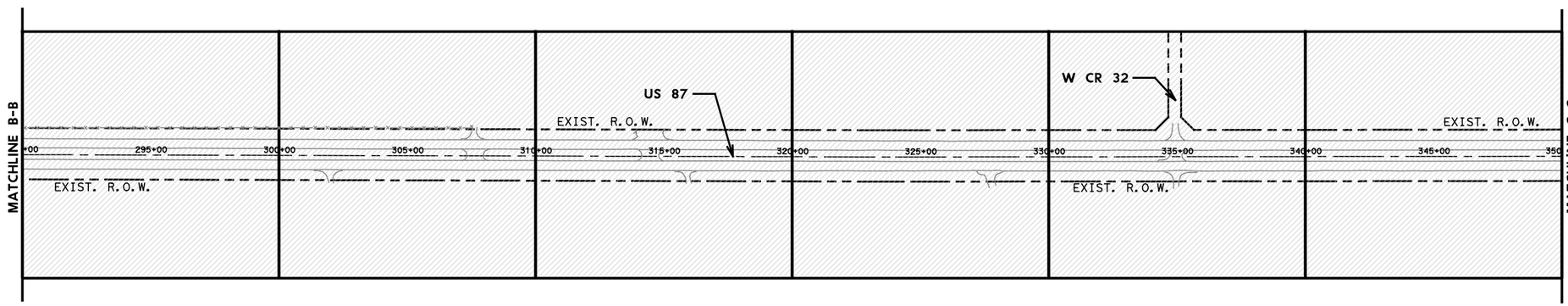

COORDINATES SHOWN HEREON REFER TO THE TEXAS COORDINATE SYSTEM OF 1983 (NORTH CENTRAL ZONE; NAD83(2011) EPOCH 2010.00) AS DERIVED LOCALLY FROM TXDOT'S VRS NETWORK VIA REAL TIME KINEMATIC (RTK) METHODS. AN AVERAGE COMBINATION FACTOR OF 1.00021 WAS USED TO SCALE GRID COORDINATES AND DISTANCES TO SURFACE. ALL COORDINATES SHOWN ARE SURFACE.

THE ELEVATIONS SHOWN ARE NAVD88 AND WERE DERIVED FROM THE ABOVE RTK OBSERVATIONS. ORTHOMETRIC HEIGHTS WERE CALCULATED BY APPLYING THE GEOID 12B MODEL TO THE ELLIPSOID HEIGHTS.

CONTROL POINT 1150033
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EASTING: 6885239.21
ELEVATION: 2786.73
FEATURE: MON

CONTROL POINT 1150034
NORTHING: 991009.20
EASTING: 6879493.22
ELEVATION: 2770.23
FEATURE: MON

CONTROL POINT 1150035
NORTHING: 998777.79
EASTING: 6872078.28
ELEVATION: 2751.43
FEATURE: MON

CONTROL POINT 1150036
NORTHING: 1006275.41
EASTING: 6863024.83
ELEVATION: 2685.83
FEATURE: MON

CONTROL POINT 1150037
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EASTING: 6854409.92
ELEVATION: 2661.02
FEATURE: MON

CONTROL POINT 1150038
NORTHING: 1022197.68
EASTING: 6844021.00
ELEVATION: 2621.57
FEATURE: MON

CONTROL POINT 1150039
NORTHING: 1029036.32
EASTING: 6836375.74
ELEVATION: 2648.12
FEATURE: MON

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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US 87
EXISTING UTILITY PLANS
CONTROL INDEX SHEET
(1 OF 6)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	77
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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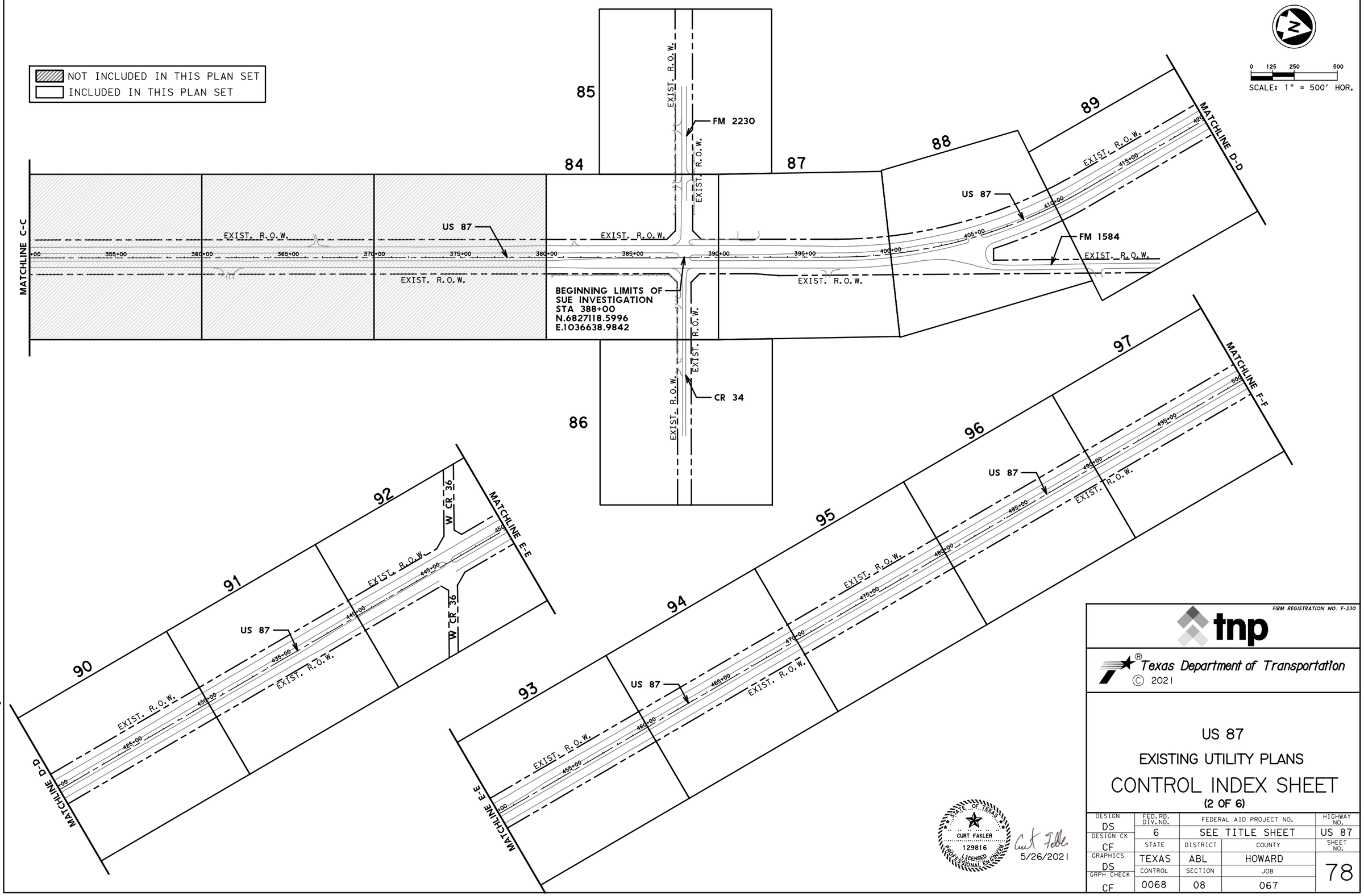

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US 87

EXISTING UTILITY PLANS

CONTROL INDEX SHEET

(2 OF 6)

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DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	78
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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5/26/2021

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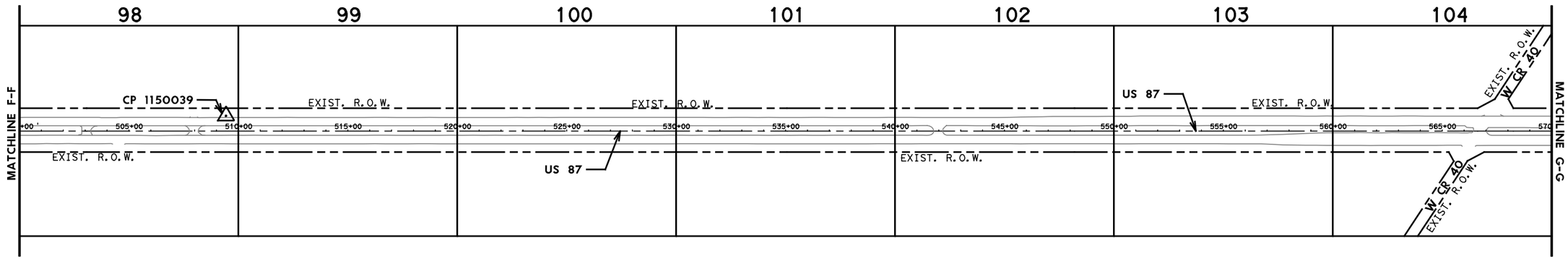

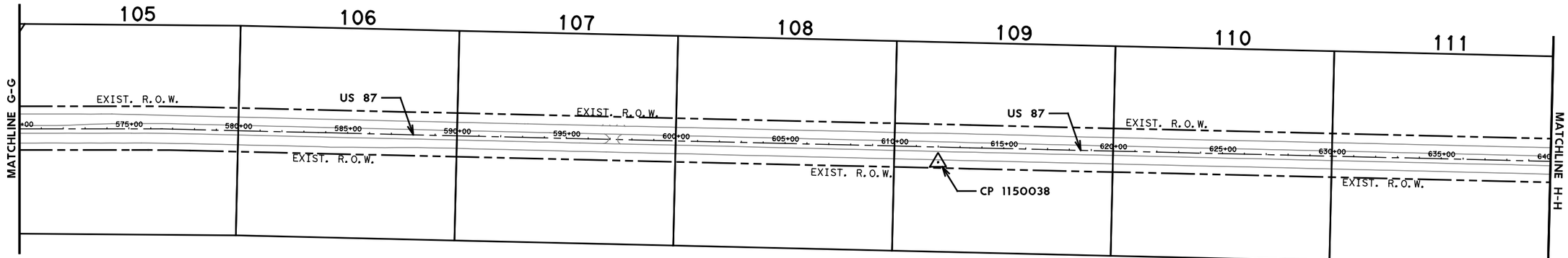

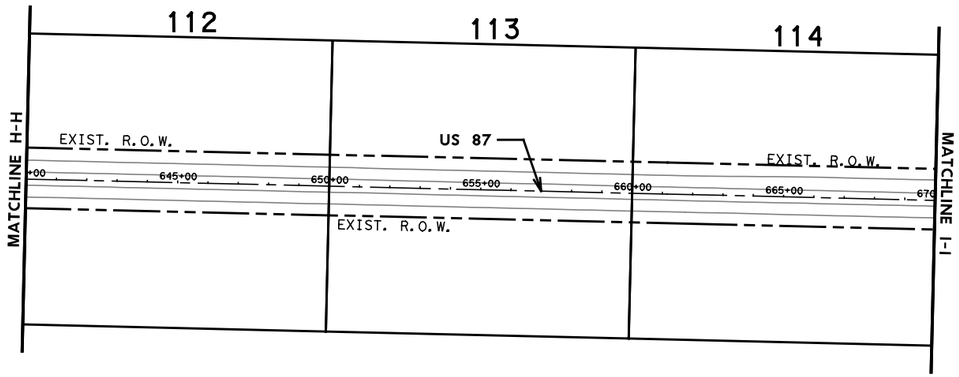

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US 87
EXISTING UTILITY PLANS
CONTROL INDEX SHEET
(3 OF 6)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	79
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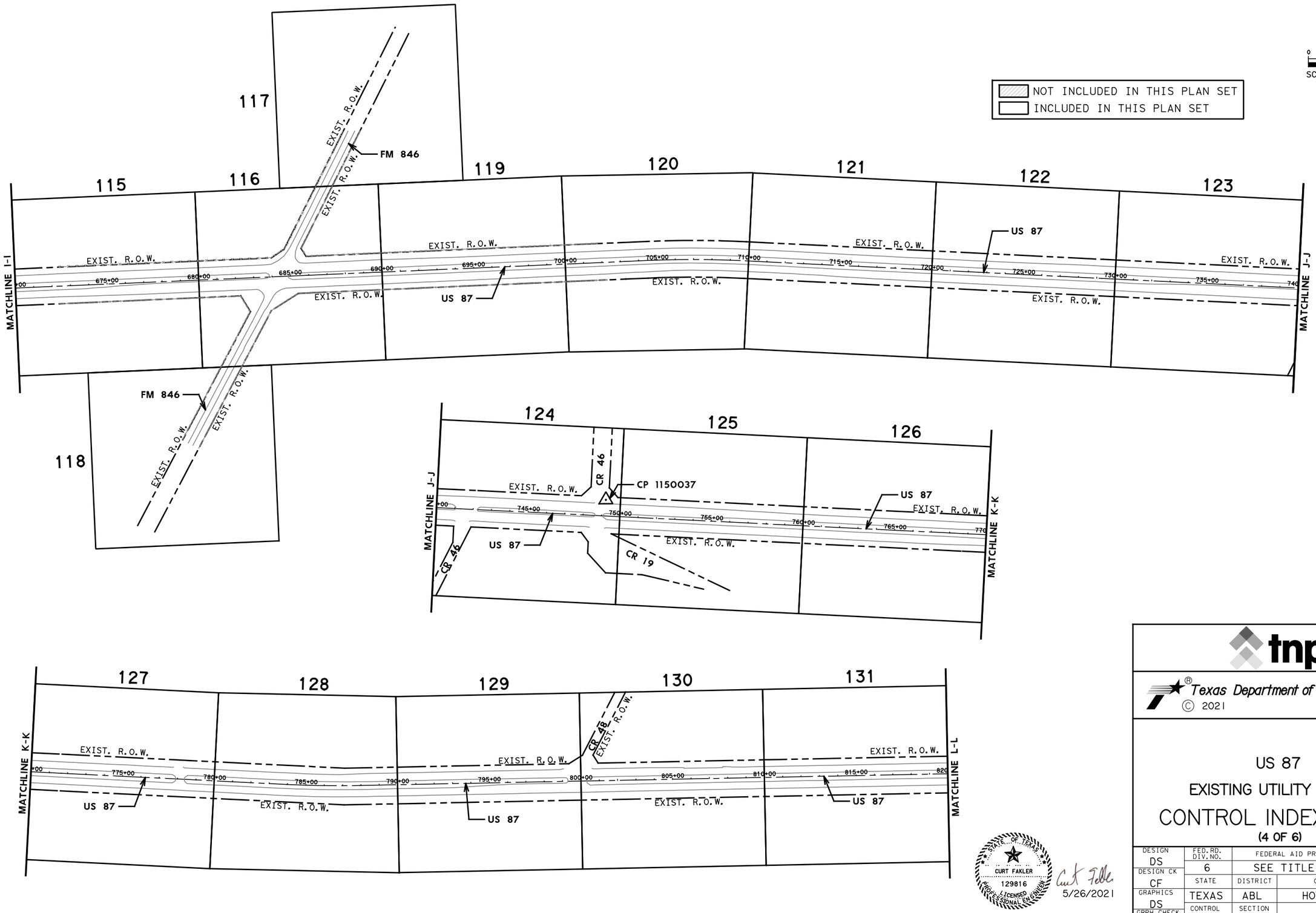

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US 87

EXISTING UTILITY PLANS

CONTROL INDEX SHEET

(4 OF 6)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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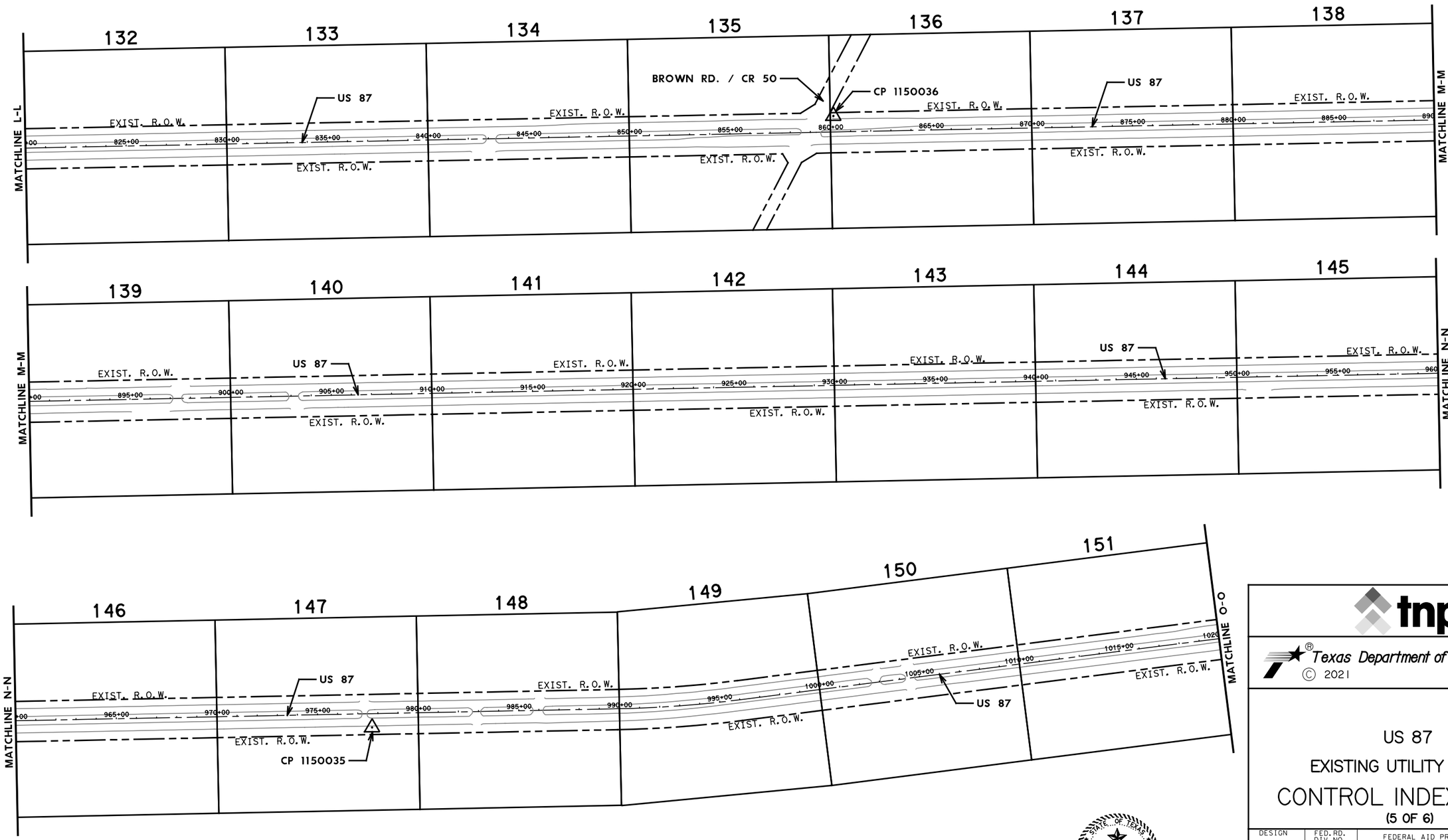

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US 87
EXISTING UTILITY PLANS
CONTROL INDEX SHEET
(5 OF 6)

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	81
GRAPHICS	CONTROL	SECTION	JOB	
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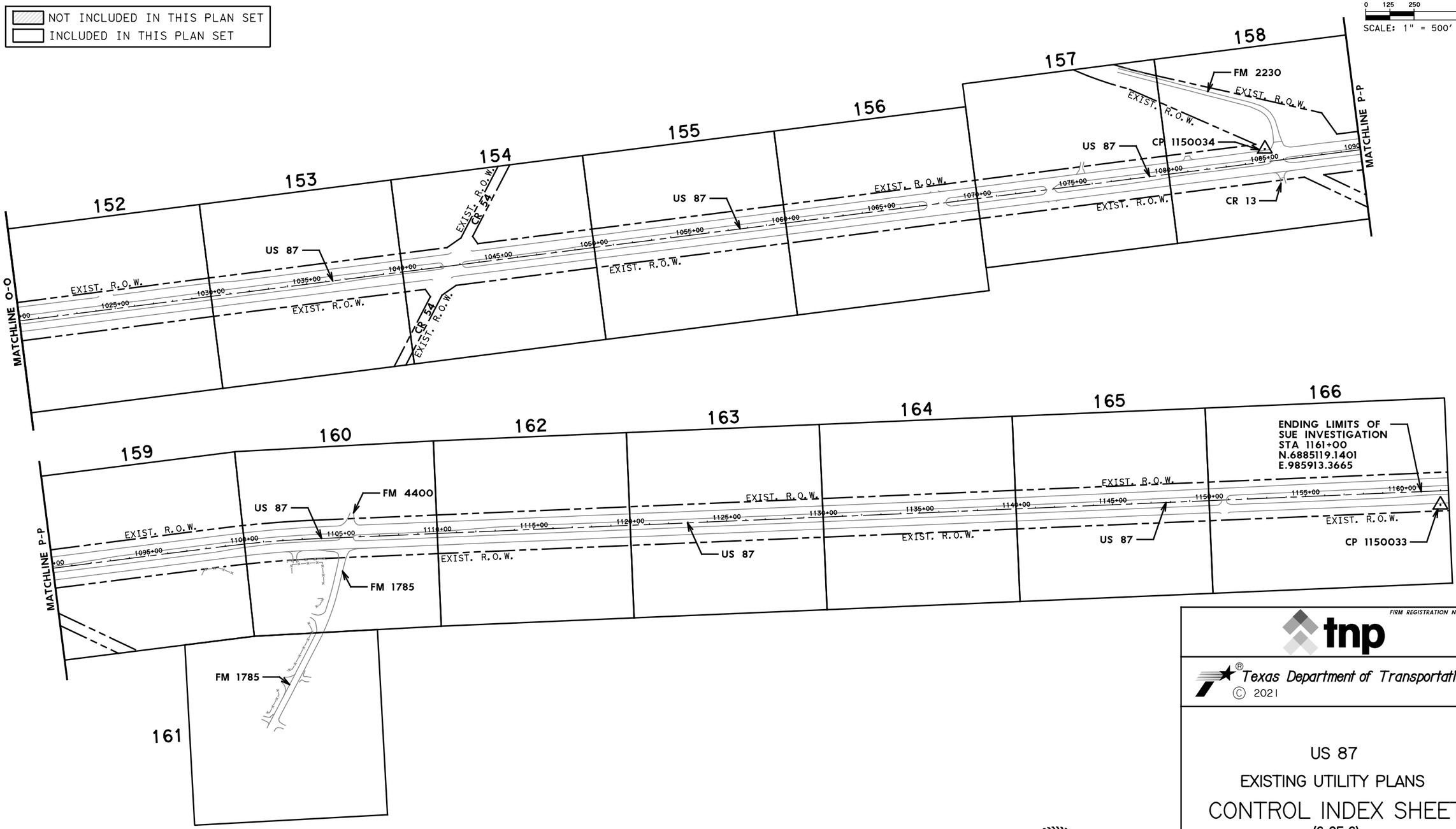

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US 87
EXISTING UTILITY PLANS
CONTROL INDEX SHEET
(6 OF 6)

STATE OF TEXAS
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5/26/2021

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\083 EXISTING UTILITY PLANS GENERAL NOTES LEGENDS.dgn
DATE: 5/26/2021 8:58:27 AM dsmyers

LINESTYLE LEGEND

- ELECTRIC — E1 — Oncor
- ELECTRIC — E1 (C) — Oncor
- ELECTRIC — E1 (D) — Oncor
- ELECTRIC — E2 — TxDOT
- ELECTRIC — E2 (C) — TxDOT
- ELECTRIC — E2 (D) — TxDOT
- ELECTRIC — E3 — Surge Energy
- ELECTRIC — E3 (C) — Surge Energy
- ELECTRIC — E3 (D) — Surge Energy
- ELECTRIC — E4 — Private
- ELECTRIC — E4 (C) — Private
- ELECTRIC — E4 (D) — Private
- ELECTRIC — E5 — SM Energy
- ELECTRIC — E5 (C) — SM Energy
- ELECTRIC — E5 (D) — SM Energy
- ELECTRIC — E6 — Ovintiv *
- ELECTRIC — E6 (C) — Ovintiv *
- ELECTRIC — E6 (D) — Ovintiv *
- OVERHEAD ELECTRIC — OHE1 (C) — Oncor
- OVERHEAD ELECTRIC — OHE2 (C) — NOT USED
- OVERHEAD ELECTRIC — OHE3 T (C) — Oncor - Transmission
- CABLE TV — CATV1 — NOT USED
- CABLE TV — CATV1 (C) — NOT USED
- CABLE TV — CATV1 (D) — NOT USED
- FIBER OPTIC — FO1 — Wes-Tex Telephone Coop.
- FIBER OPTIC — FO1 (C) — Wes-Tex Telephone Coop.
- FIBER OPTIC — FO1 (D) — Wes-Tex Telephone Coop.
- FIBER OPTIC — FO2 — AT&T *
- FIBER OPTIC — FO2 (C) — AT&T *
- FIBER OPTIC — FO2 (D) — AT&T *
- OVERHEAD CATV — OHCATV1 (C) — NOT USED
- OVERHEAD FIBER OPTIC — OHFO1 (C) — NOT USED
- OVERHEAD FIBER OPTIC — OHFO2 (C) — NOT USED
- OVERHEAD TELEPHONE — OHT1 (C) — Wes-Tex Telephone Coop.
- OVERHEAD TELEPHONE — OHT2 (C) — AT&T
- TELEPHONE — T1 — Wes-Tex Telephone Coop.
- TELEPHONE — T1 (C) — Wes-Tex Telephone Coop.
- TELEPHONE — T1 (D) — Wes-Tex Telephone Coop.
- TELEPHONE — T2 — AT&T
- TELEPHONE — T2 (C) — AT&T
- TELEPHONE — T2 (D) — AT&T
- GAS — G1 — WTG Gas
- GAS — G1 (C) — WTG Gas
- GAS — G1 (D) — WTG Gas
- GAS — G2 — Medallion Midstream
- GAS — G2 (C) — Medallion Midstream
- GAS — G2 (D) — Medallion Midstream
- GAS — G3 — NuStar Energy
- GAS — G3 (C) — NuStar Energy
- GAS — G3 (D) — NuStar Energy
- GAS — G4 — Targa Resources
- GAS — G4 (C) — Targa Resources
- GAS — G4 (D) — Targa Resources
- GAS — G5 — Navitas Midstream
- GAS — G5 (C) — Navitas Midstream
- GAS — G5 (D) — Navitas Midstream
- GAS — G6 — Enterprise Products
- GAS — G6 (C) — Enterprise Products
- GAS — G6 (D) — Enterprise Products
- GAS — G7 — Kinder Morgan
- GAS — G7 (C) — Kinder Morgan
- GAS — G7 (D) — Kinder Morgan
- GAS — G8 — Callon Petroleum
- GAS — G8 (C) — Callon Petroleum
- GAS — G8 (D) — Callon Petroleum
- GAS — G9 — DCP Midstream
- GAS — G9 (C) — DCP Midstream
- GAS — G9 (D) — DCP Midstream
- GAS — G10 — Atmos *
- GAS — G10 (C) — Atmos *
- GAS — G10 (D) — Atmos *
- GAS — G11 — NOT USED
- GAS — G11 (C) — NOT USED
- GAS — G11 (D) — NOT USED
- GAS — G12 — NOT USED
- GAS — G12 (C) — NOT USED
- GAS — G12 (D) — NOT USED
- GAS — G13 — NOT USED
- GAS — G13 (C) — NOT USED
- GAS — G13 (D) — NOT USED
- WATER — W1 — Surge Energy
- WATER — W1 (C) — Surge Energy
- WATER — W1 (D) — Surge Energy
- WATER — W2 — Diamonback Energy
- WATER — W2 (C) — Diamonback Energy
- WATER — W2 (D) — Diamonback Energy
- WATER — W3 — Unknown Owner
- WATER — W3 (C) — Unknown Owner
- WATER — W3 (D) — Unknown Owner
- WATER — W4 — H2O Midstream
- WATER — W4 (C) — H2O Midstream
- WATER — W4 (D) — H2O Midstream
- WATER — W5 — Alon USA *
- WATER — W5 (C) — Alon USA *
- WATER — W5 (D) — Alon USA *
- WATER — W6 — Callon Petroleum
- WATER — W6 (C) — Callon Petroleum
- WATER — W6 (D) — Callon Petroleum
- WATER — W7 — West Texas H2O
- WATER — W7 (C) — West Texas H2O
- WATER — W7 (D) — West Texas H2O
- WASTEWATER — WW1 — NOT USED
- WASTEWATER — WW1 (C) — NOT USED
- WASTEWATER — WW1 (D) — NOT USED
- STORM SEWER — STM1 — NOT USED
- STORM SEWER — STM1 (C) — NOT USED
- STORM SEWER — STM1 (D) — NOT USED

SYMBOL LEGEND

- TEST STATION W/ VENT PIPE
- FIRE HYDRANT
- WATER VALVE BOX
- CATHODIC PROTECTION
- PHOTO TAKEN HERE
- WASTEWATER MANHOLE
- SEWER CLEAN OUT
- STORM MANHOLE
- STORM SEWER INLET
- STORM CLEAN OUT
- GAS MANHOLE
- GAS METER
- GAS VALVE
- GAS TEST STATION
- CATV PEDESTAL
- CATV SERVICE BOX
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TELEPHONE POLE
- TELEPHONE HAND HOLE
- FIBER OPTIC HAND HOLE
- FIBER OPTIC MARKER POST
- FIBER OPTIC MANHOLE
- UTILITY MARKER POST
- RAILROAD SIGNAL
- WATER MANHOLE
- WATER METER
- WATER VALVE
- ELECTRIC PEDESTAL
- ELECTRIC MANHOLE
- ELECTRIC METER
- HIGH MAST LIGHTING TOWER
- ELECTRIC TRANSFORMER
- TRAFFIC CAMERA
- LUMINAIRE STANDARD
- SIGNAL CONTROL PANEL
- POWER POLE
- POWER POLE WITH RISER
- ILLUMINATION POLE
- GUY ANCHOR
- GUY POLE DEADMAN
- SOLAR PANEL
- TRAFFIC SIGNAL PEDESTAL
- TRAFFIC SIGNAL BOX
- SIGN
- TRAFFIC SIGNAL POLE
- GENERIC MANHOLE
- LEVEL 'A' TEST HOLE
- CONTROL POINT

GENERAL NOTES

SIZE INFORMATION SHOWN IS TAKEN FROM AVAILABLE UTILITY RECORDS.

UTILITY QUALITY LEVEL A:

PRECISE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES OBTAINED BY THE ACTUAL EXPOSURE
(OR VERIFICATION OF PREVIOUSLY EXPOSED AND SURVEYED UTILITIES) AND SUBSEQUENT MEASUREMENT OF SUBSURFACE UTILITIES, USUALLY AT A SPECIFIC POINT.

UTILITY QUALITY LEVEL B:

INFORMATION OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS
TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF SUBSURFACE UTILITIES.
QUALITY LEVEL B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR
DEPICTION. THIS INFORMATION IS SURVEYED TO APPLICABLE TOLERANCES DEFINED BY THE PROJECT
AND REDUCED ONTO PLAN DOCUMENTS.

UTILITY QUALITY LEVEL C:

INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE ABOVE-GROUND UTILITY FEATURES
AND BY USING PROFESSIONAL JUDGEMENT IN CORRELATING THIS INFORMATION TO
QUALITY LEVEL D INFORMATION

UTILITY QUALITY LEVEL D:

INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS.

QUALITY LEVEL LEGEND

- WW1 — QUALITY LEVEL B
- WW1 (C) — QUALITY LEVEL C
- WW1 (D) — QUALITY LEVEL D

CONTACT LIST

COMPANY	UTILITY COORDINATOR	PHONE	E-mail	ADDRESS
Atmos			Map.Requests@atmosenergy.com	
Alon USA	Robert Broussard	432-263-9514	Robert.Broussard@delekus.com	
AT&T	Ken Spencer		KS5595@att.com	
Callon Petroleum	Ryan Hastings	432-219-9560	rhastings@callon.com	6 Desta Dr. Suite 4000, Box 23 Midland, TX 79705
DCP Midstream	Dwayne Hillman		hillmad@dcpmidstream.com	
Diamondback Energy	Josh Baltzell	43-247-6244	JBaltzell@Diamondbackenergy.com	
Enterprise Products	Angela Sledge		Land_Encroachments@eprod.com	9420 West Sam Houston Parkway North ,Houston, TX 77064-6317
Ovintiv	Clabe Henson	432-221-6411	Clabe.Henson@ovintiv.com	
H2O Midstream	Evan Haight	713-401-9499 x117	evan.haight@h2omidstream.com	2925 Briarpark Drive, Suite 1050 Houston, Texas 77042
Kinder Morgan	Eric Swenson	713-420-5045	Eric_Swenson@kindermorgan.com	
Medallion Midstream	John Hill	432-413-7587	jhill@medallionmidstream.com	
Navitas Midstream	Gerardo Hernandez	832-463-4414	greyes@navitas-midstream.com	
NuStar Energy	Brett Walker	210-918-2264	Brett.walker@nustarenergy.com	
Oncor - Distribution	Matt Myrick	817-215-6565	DistributionGIS@oncor.com	115 W 7th Street, Suite 1017 Fort Worth, Texas 76102
Oncor - Transmission	Chris Reily	214-486-4717	QTRANSM1@oncor.com	1616 Woodall Rodgers Freeway Suite 6A-012 Dallas, Texas 75202
SM Energy	Callie Harris	903-681-2127	rockridgelinelocate@sm-energy.com	
Surge Energy	Rene Rivas	575-659-9767	RRivas@SurgeEnergyA.com	
Targa Resources	LeAnne Hodges	940-229-4294	lhodges@targaresources.com	
Wes-Tex Telephone Coop	David White	432-271-2706	dwhite@westex.coop	711 Scurry Big Spring, TX 79720
West Texas H20	Brennan Tharaldson	833-234-4889	Brennan.Tharaldson@gvty.com	3300 N A Street, Building 4, Suite 100, Midland, TX 79705
WTG Gas	Ben Best	432-682-6311	bbest@wtggas.com	

* DOES NOT APPEAR IN THIS PLAN SET.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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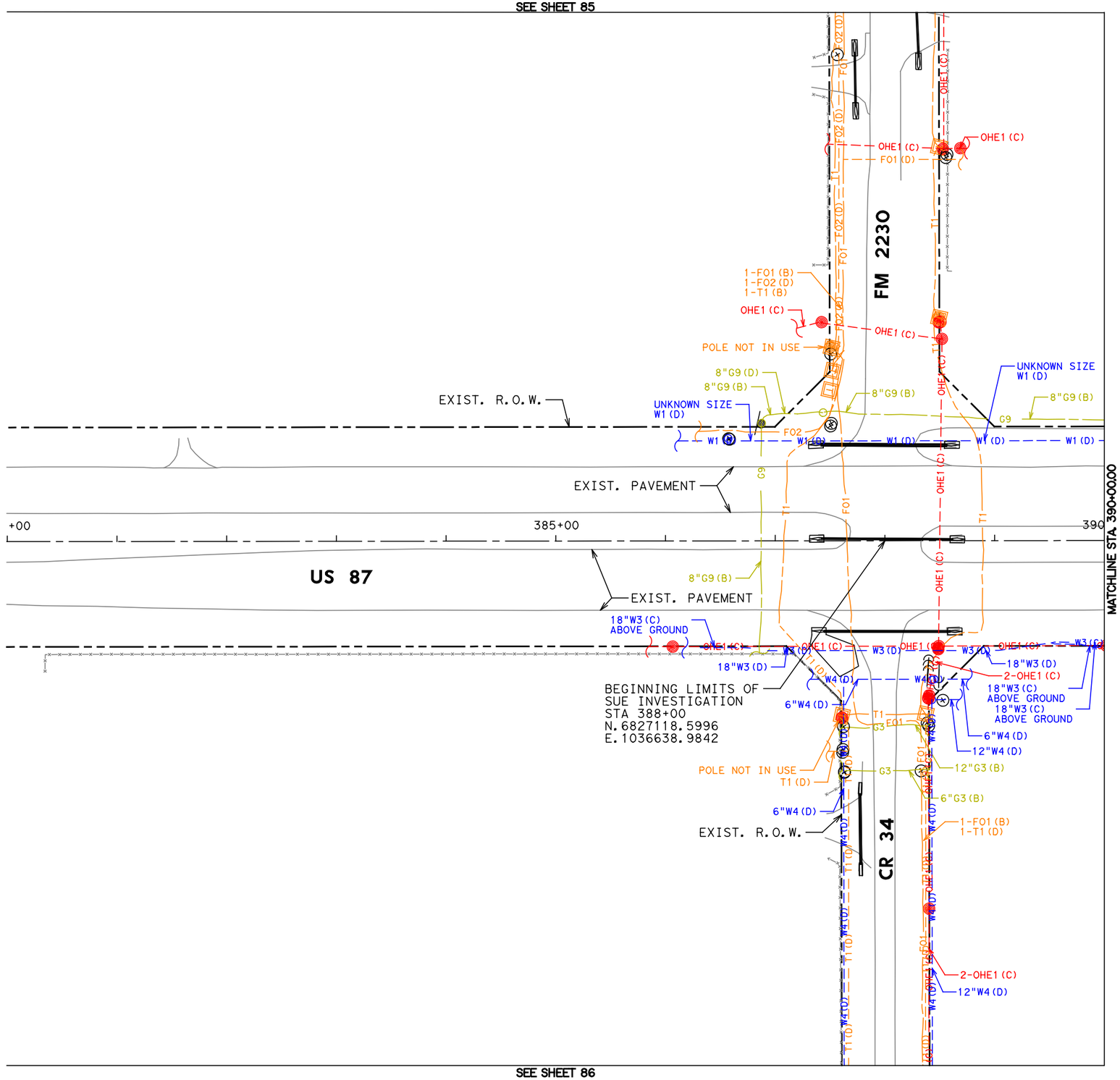
US 87
EXISTING UTILITY PLANS
GENERAL NOTES/LEGENDS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	83
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				



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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM BEGINNING TO STA. 390+00

SHEET 01 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	84
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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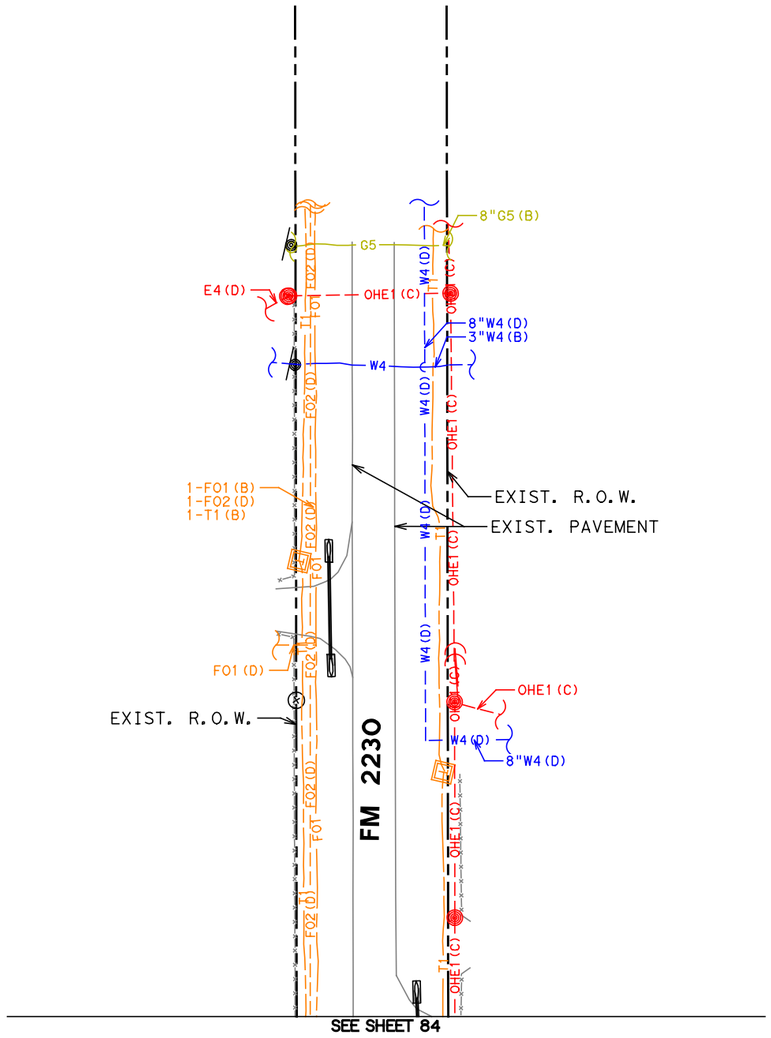

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SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FM 2230 WEST OF US 87
SHEET 02 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	85
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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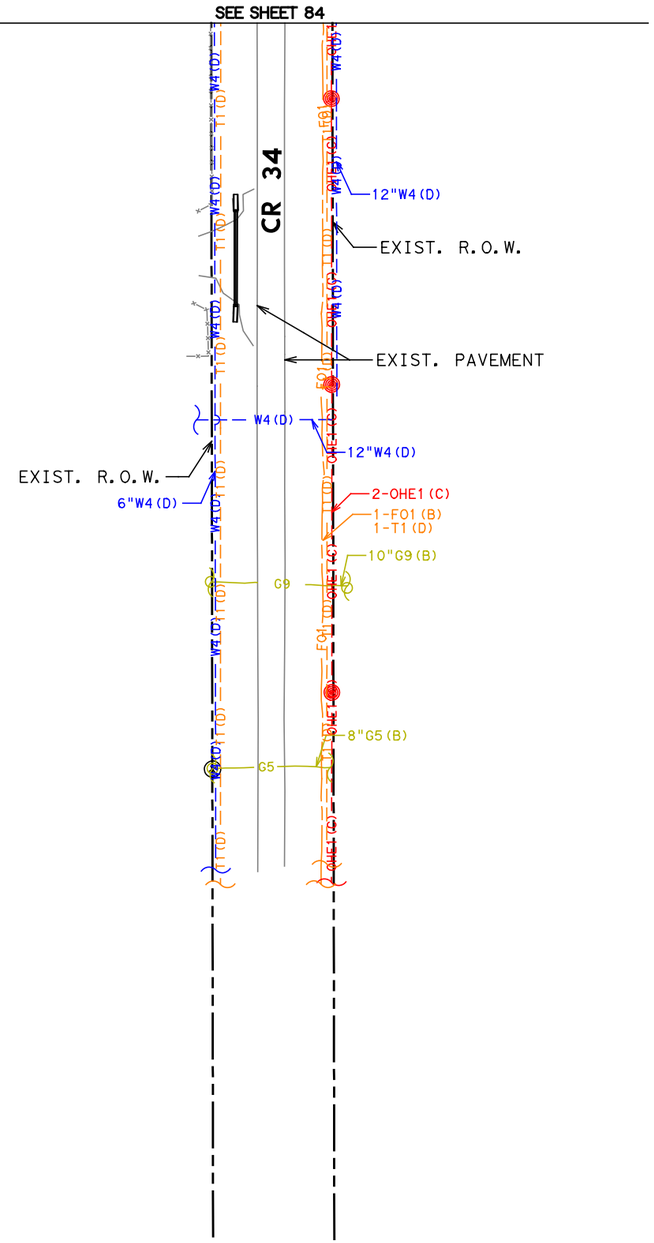

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
CR 34 EAST OF US 87
SHEET 03 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	86
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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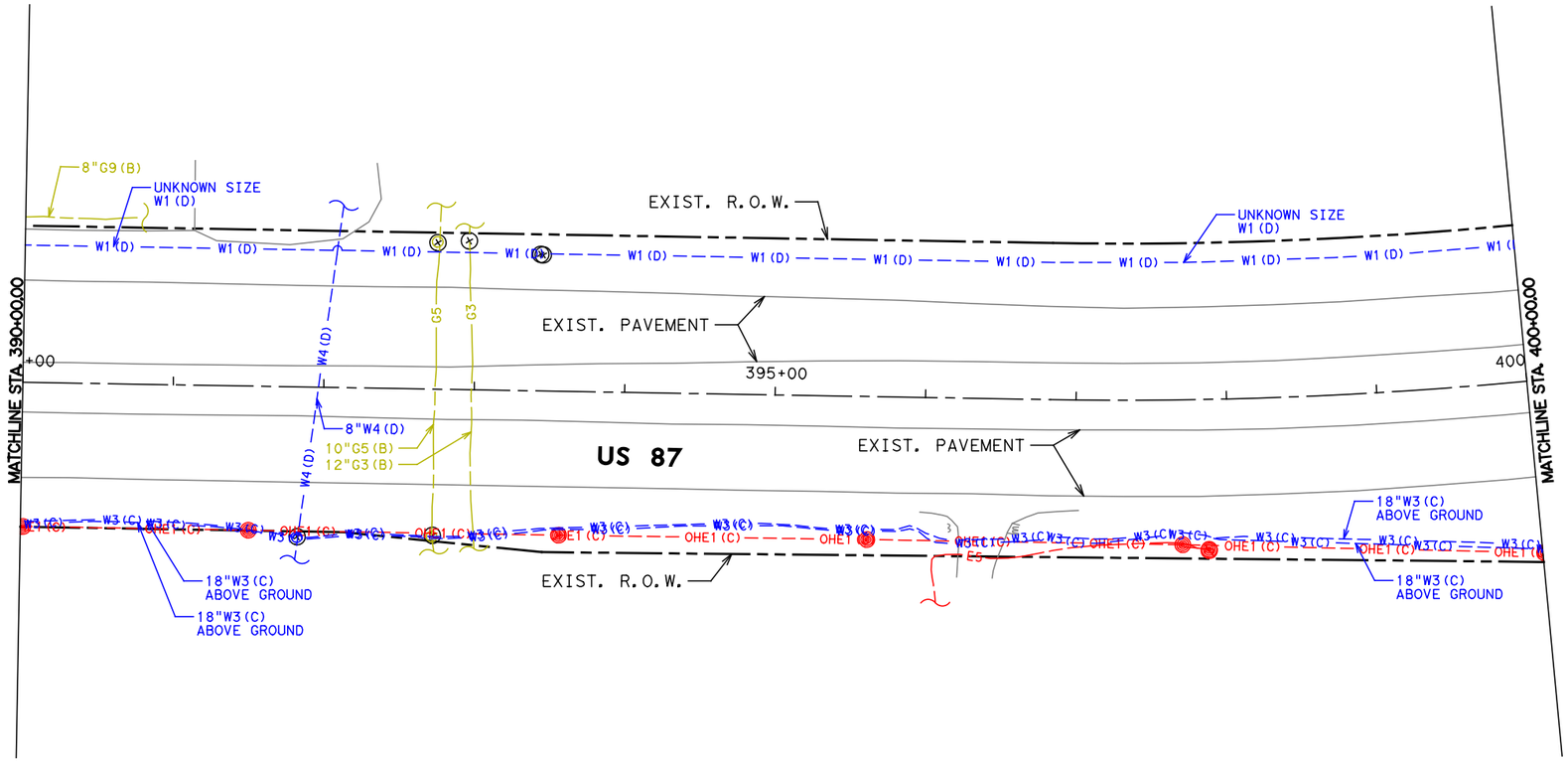

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SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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129816
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 390+00 TO STA. 400+00

SHEET 04 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	87
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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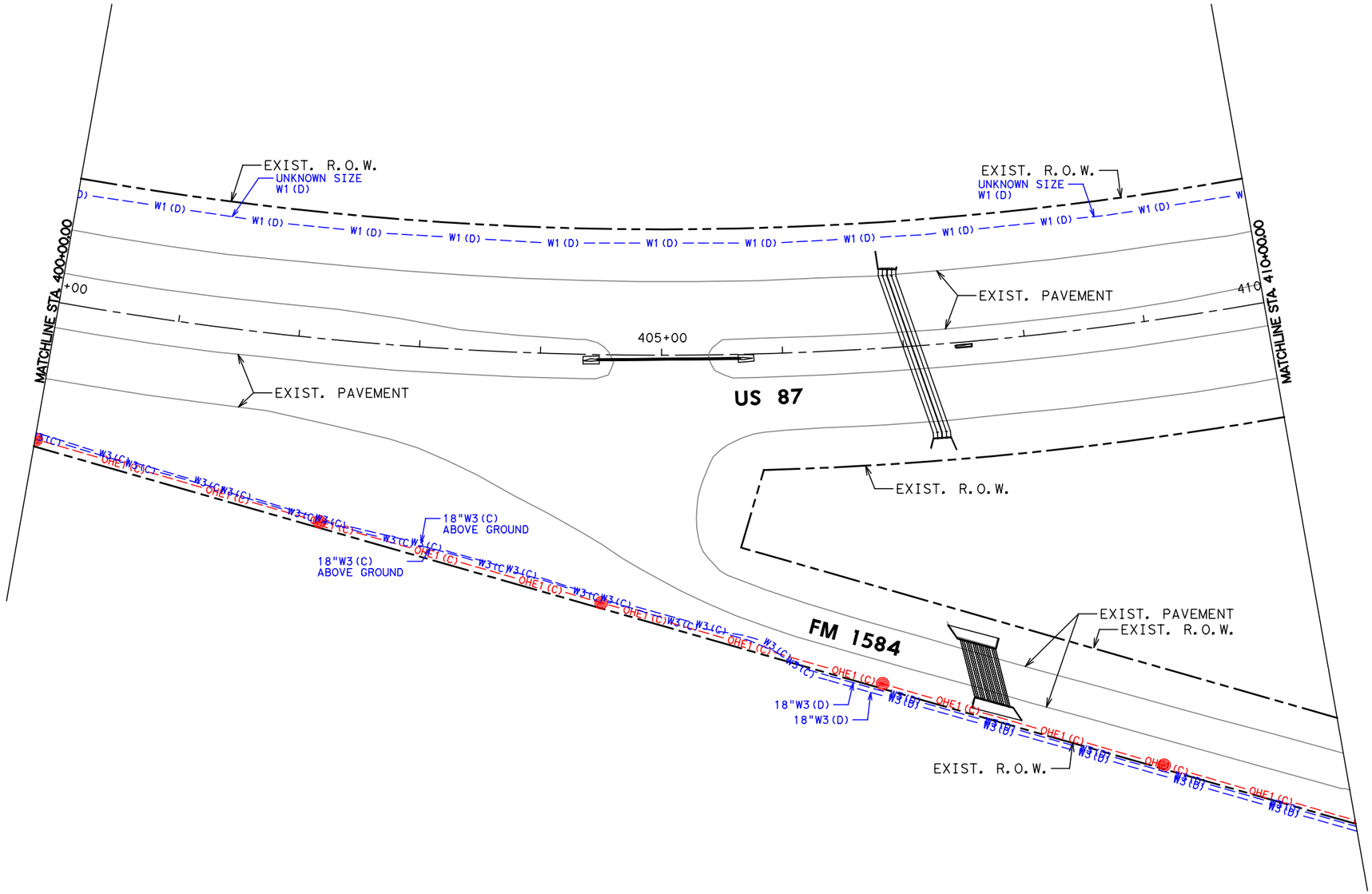

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SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 400+00 TO STA. 410+00
SHEET 05 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	88
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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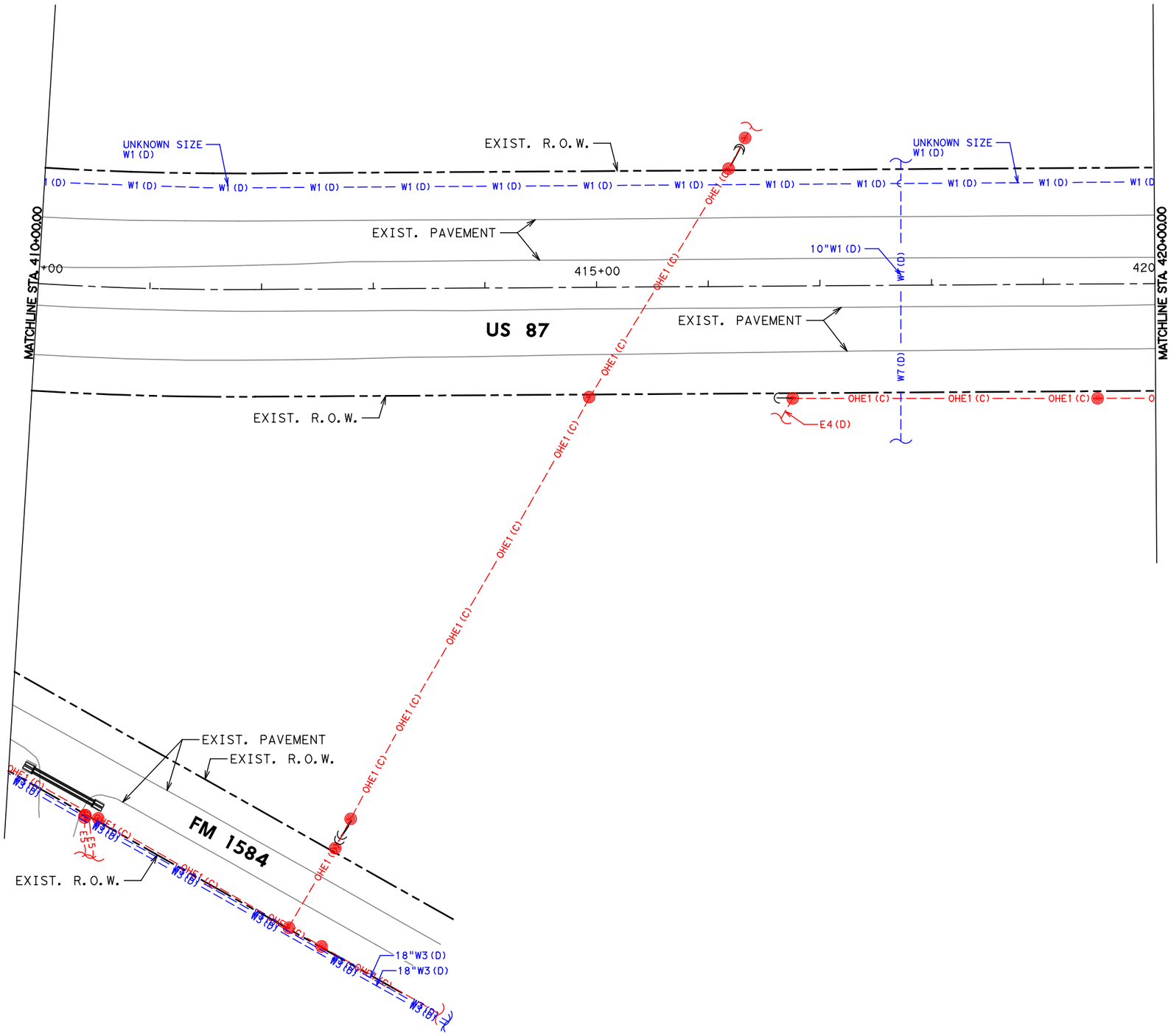

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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 410+00 TO STA. 420+00
SHEET 06 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	89
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
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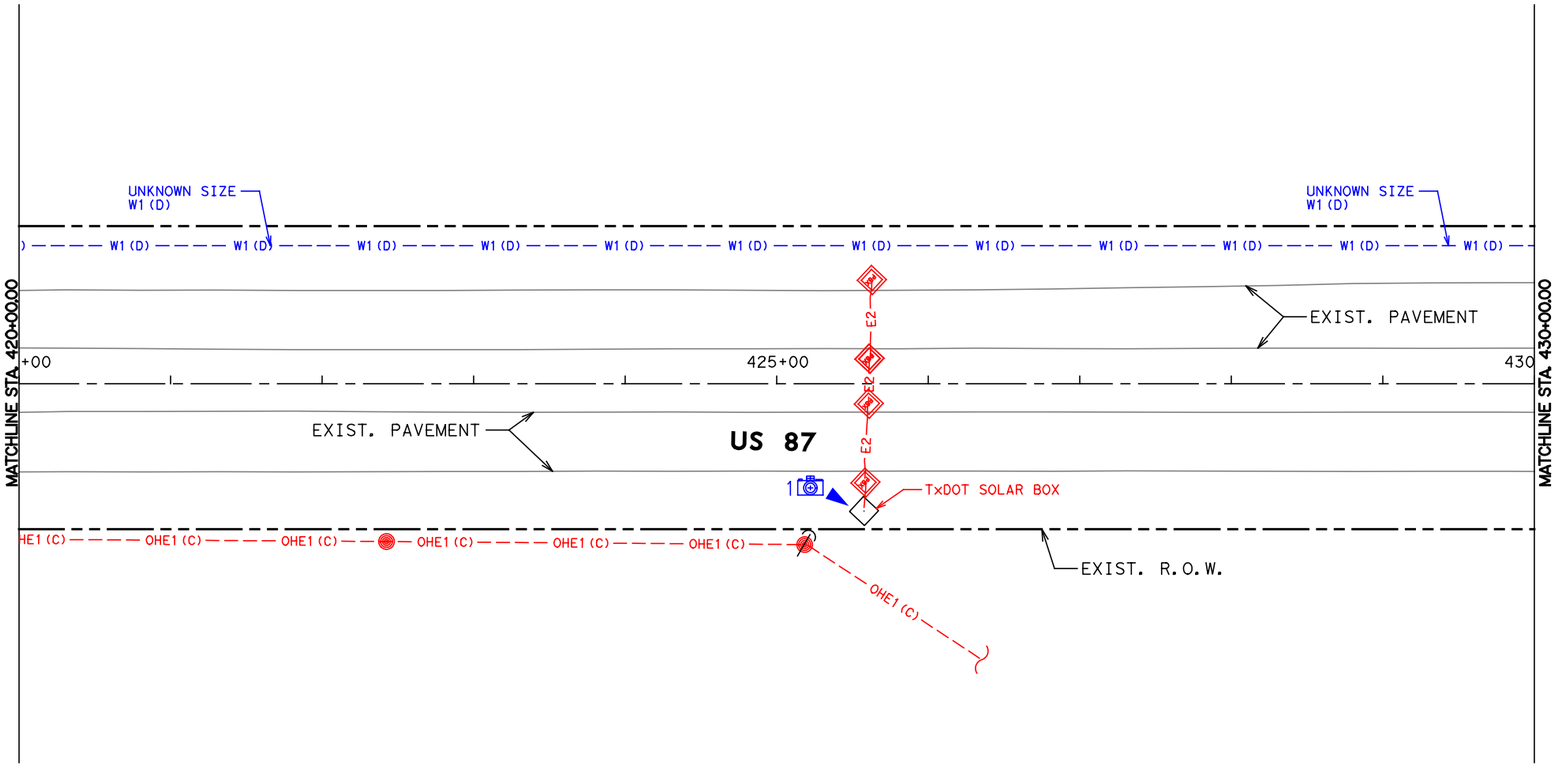

PHOTO 1

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SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87

EXISTING UTILITY PLANS

FROM STA. 420+00 TO STA. 430+00

SHEET 07 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	90
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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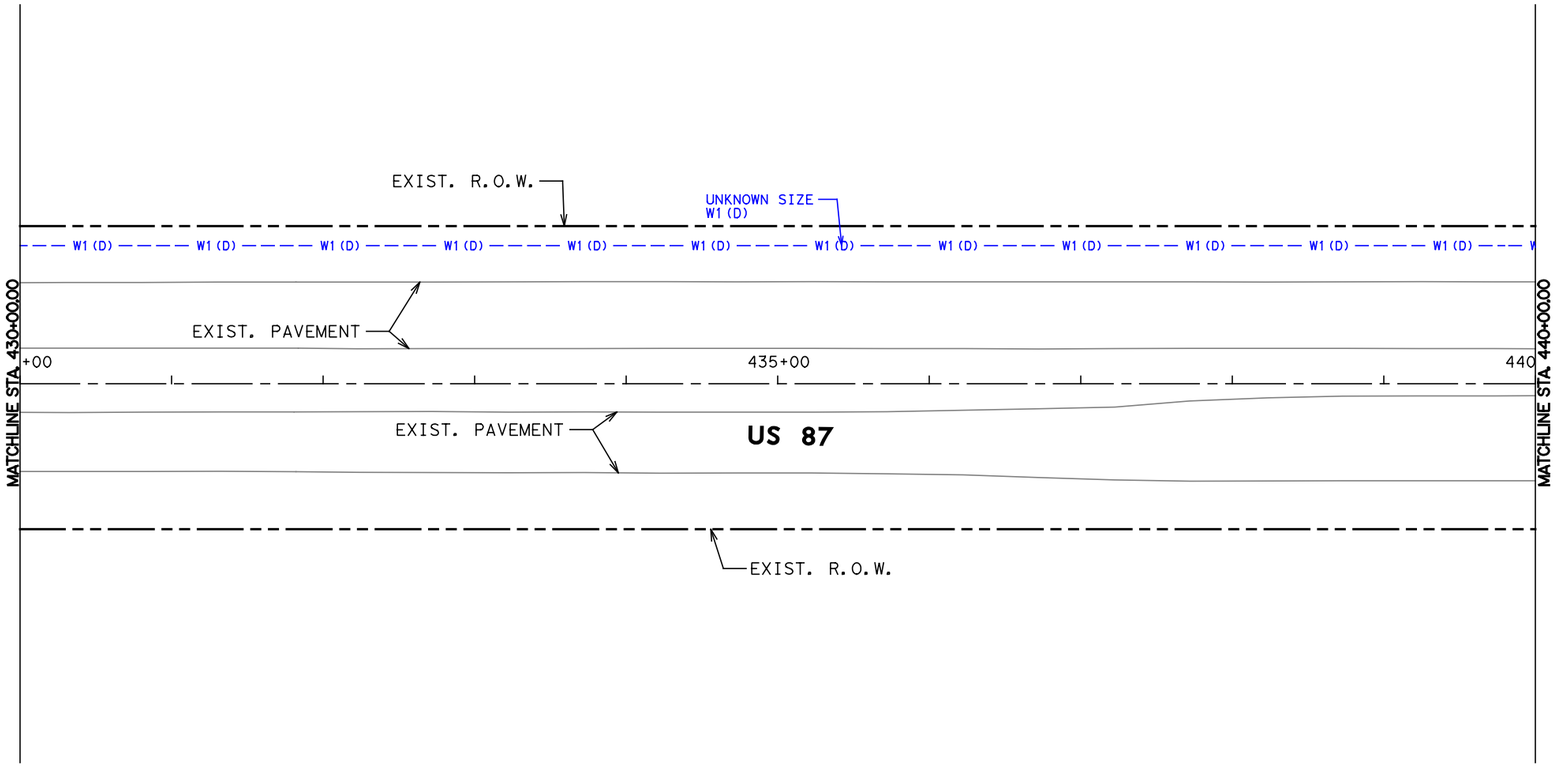

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SCALE: 1" = 100' HOR.

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US 87
EXISTING UTILITY PLANS
FROM STA. 430+00 TO STA. 440+00

SHEET 08 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	91
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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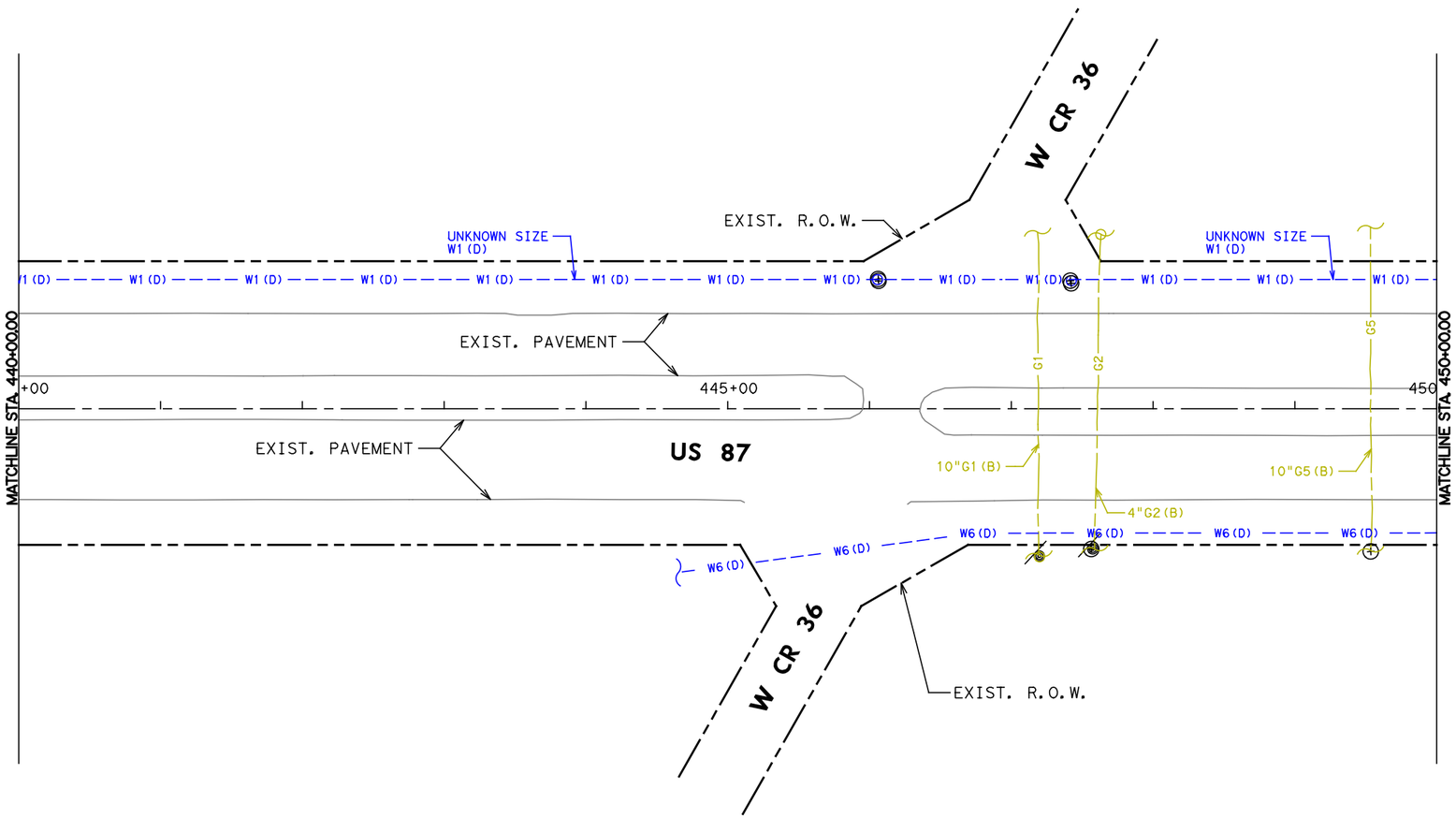

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SCALE: 1" = 100' HOR.

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US 87
EXISTING UTILITY PLANS
FROM STA. 440+00 TO 450+00
SHEET 09 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	92
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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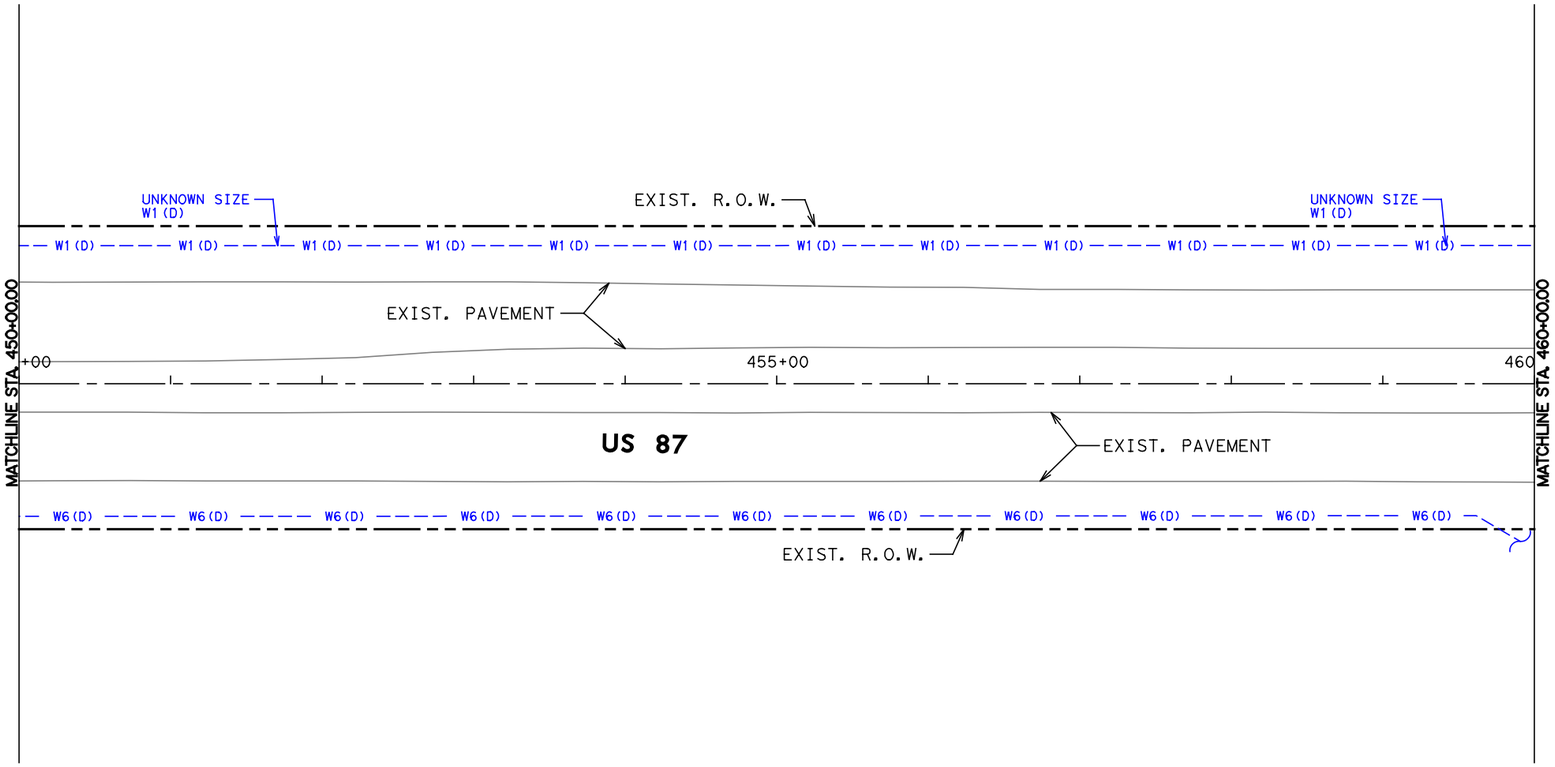

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 450+00 TO STA. 460+00

SHEET 10 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	93
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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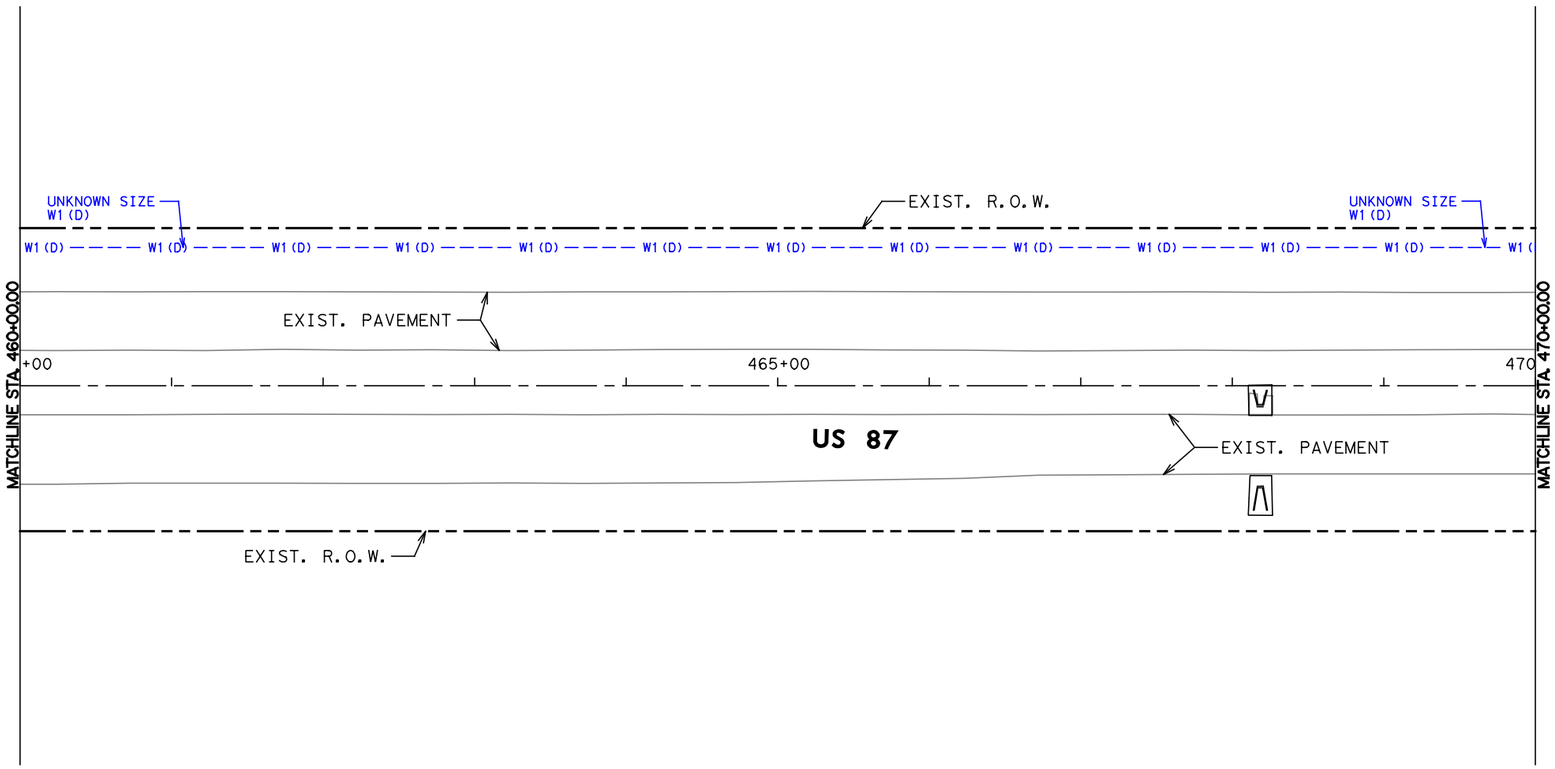

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 460+00 TO STA. 470+00

SHEET 11 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	94
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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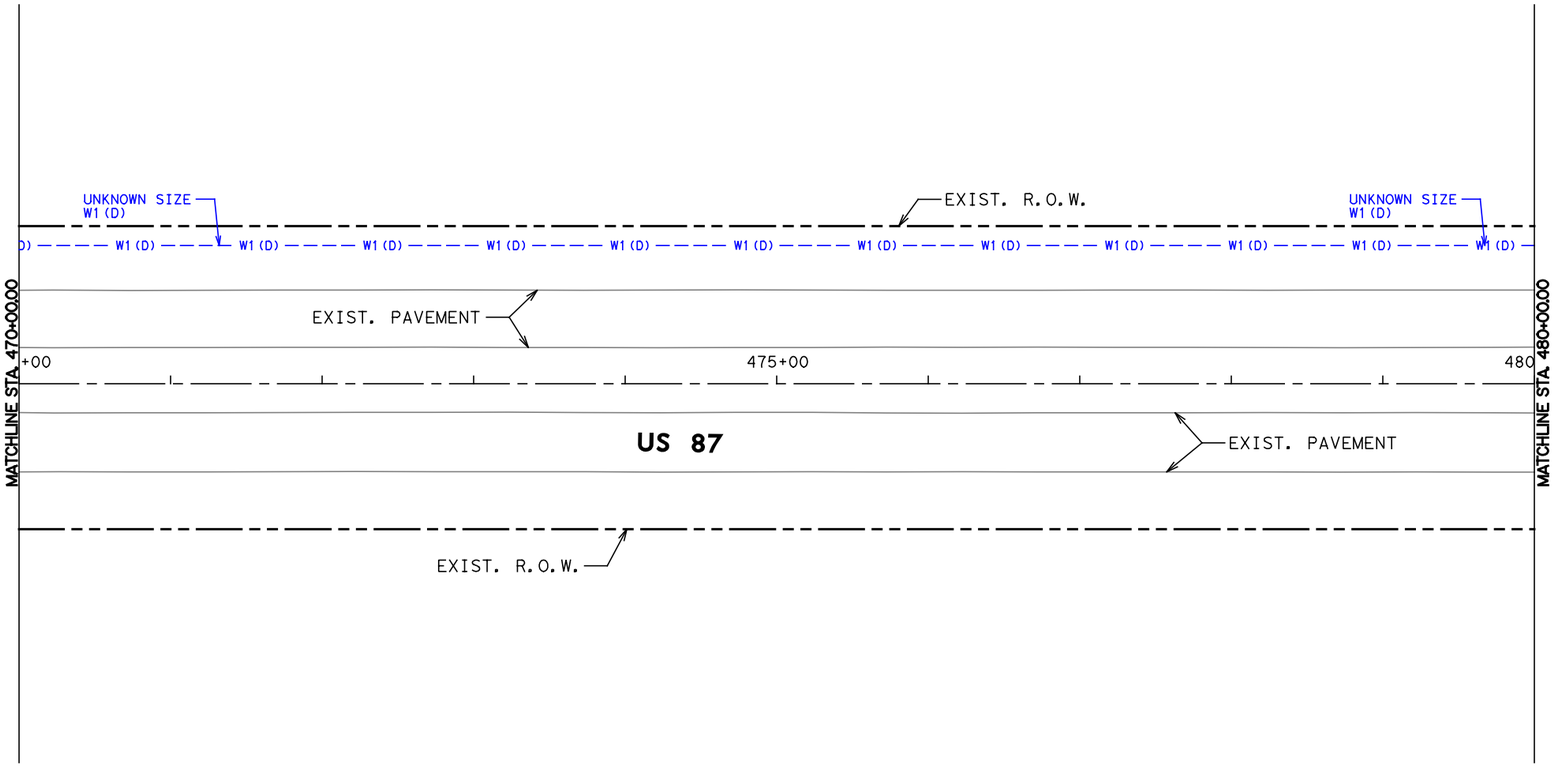

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 470+00 TO STA. 480+00

SHEET 12 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	95
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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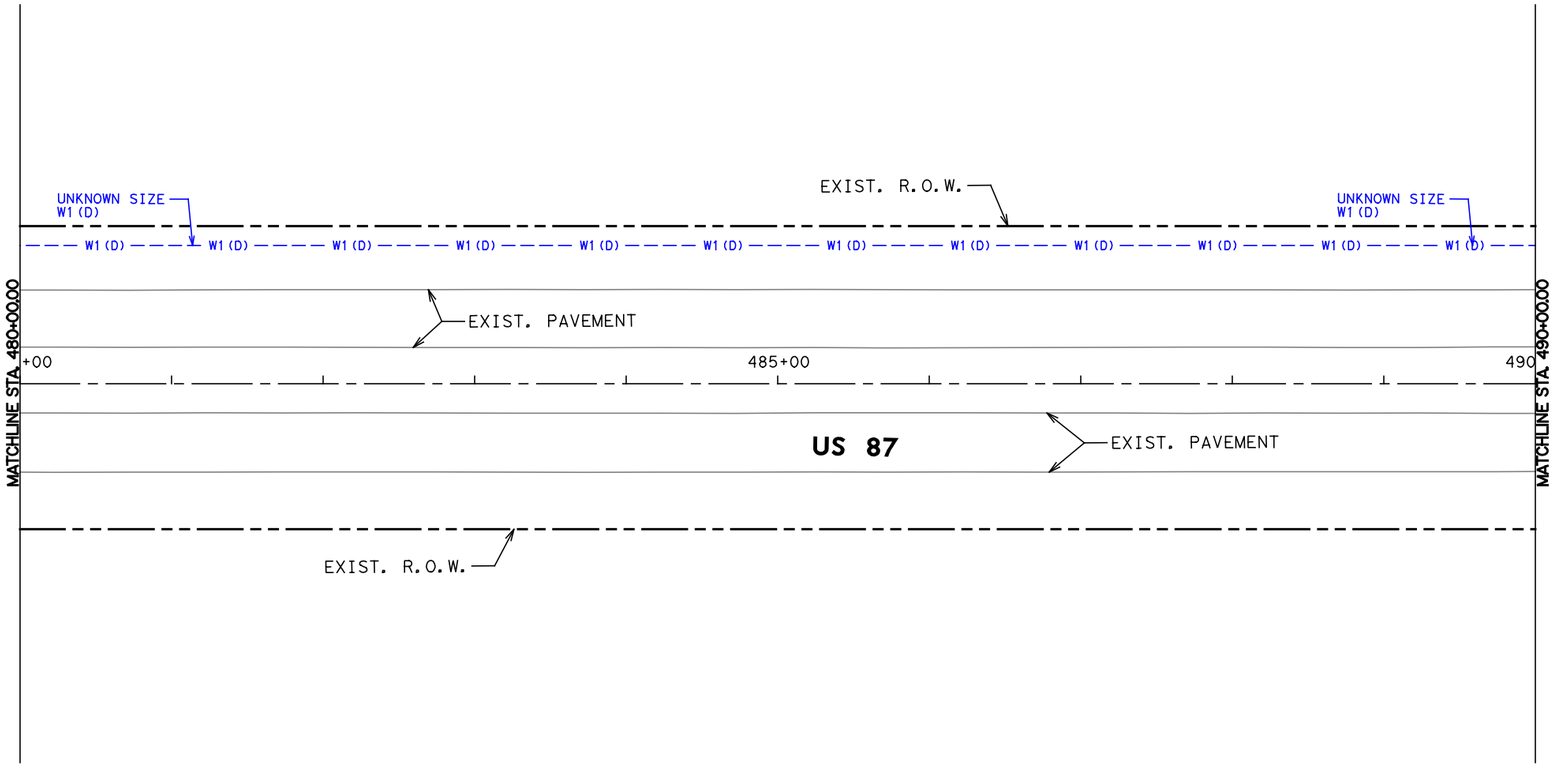

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 480+00 TO STA. 490+00

SHEET 13 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	96
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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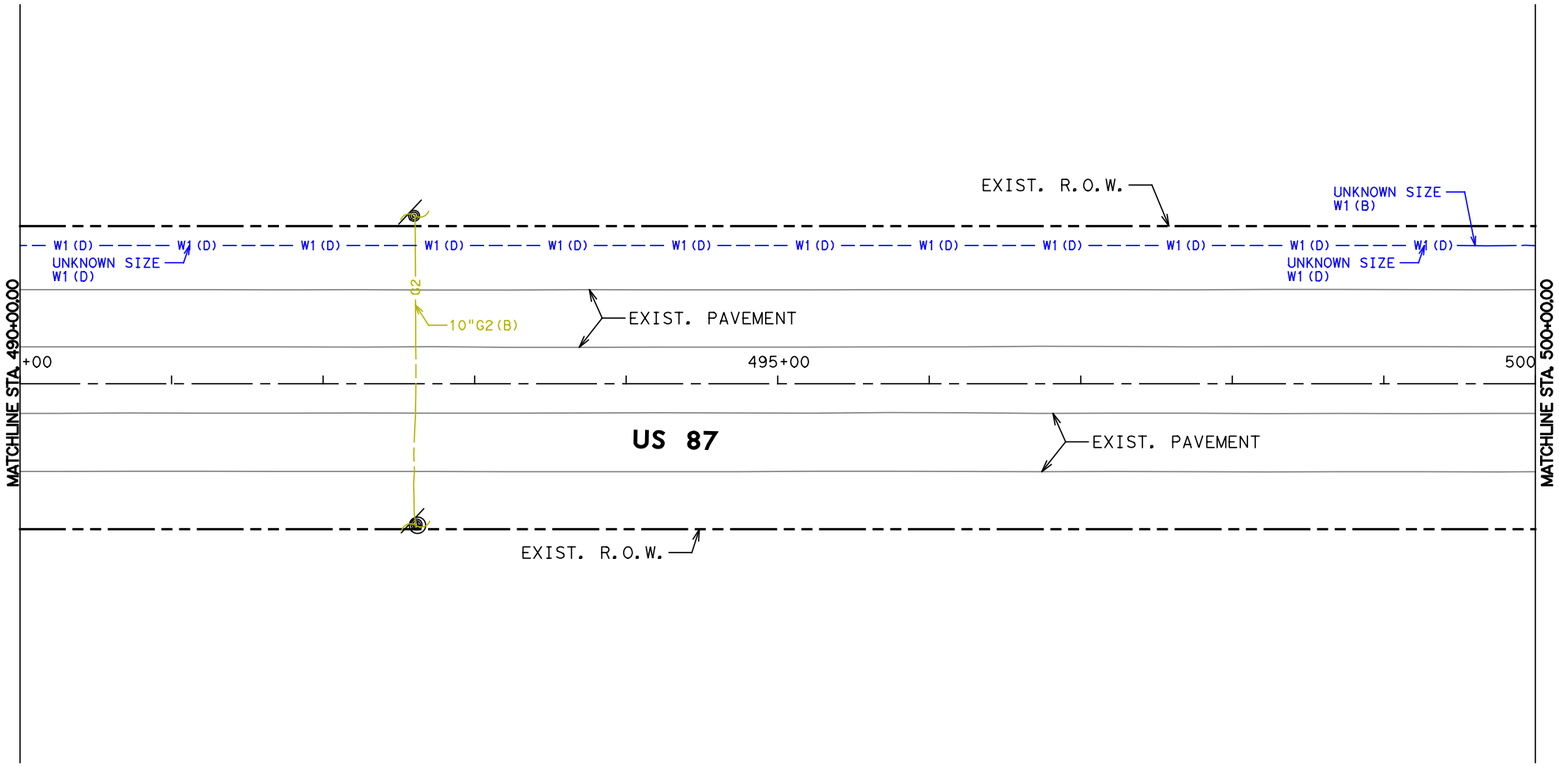

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 490+00 TO STA. 500+00

SHEET 14 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	97
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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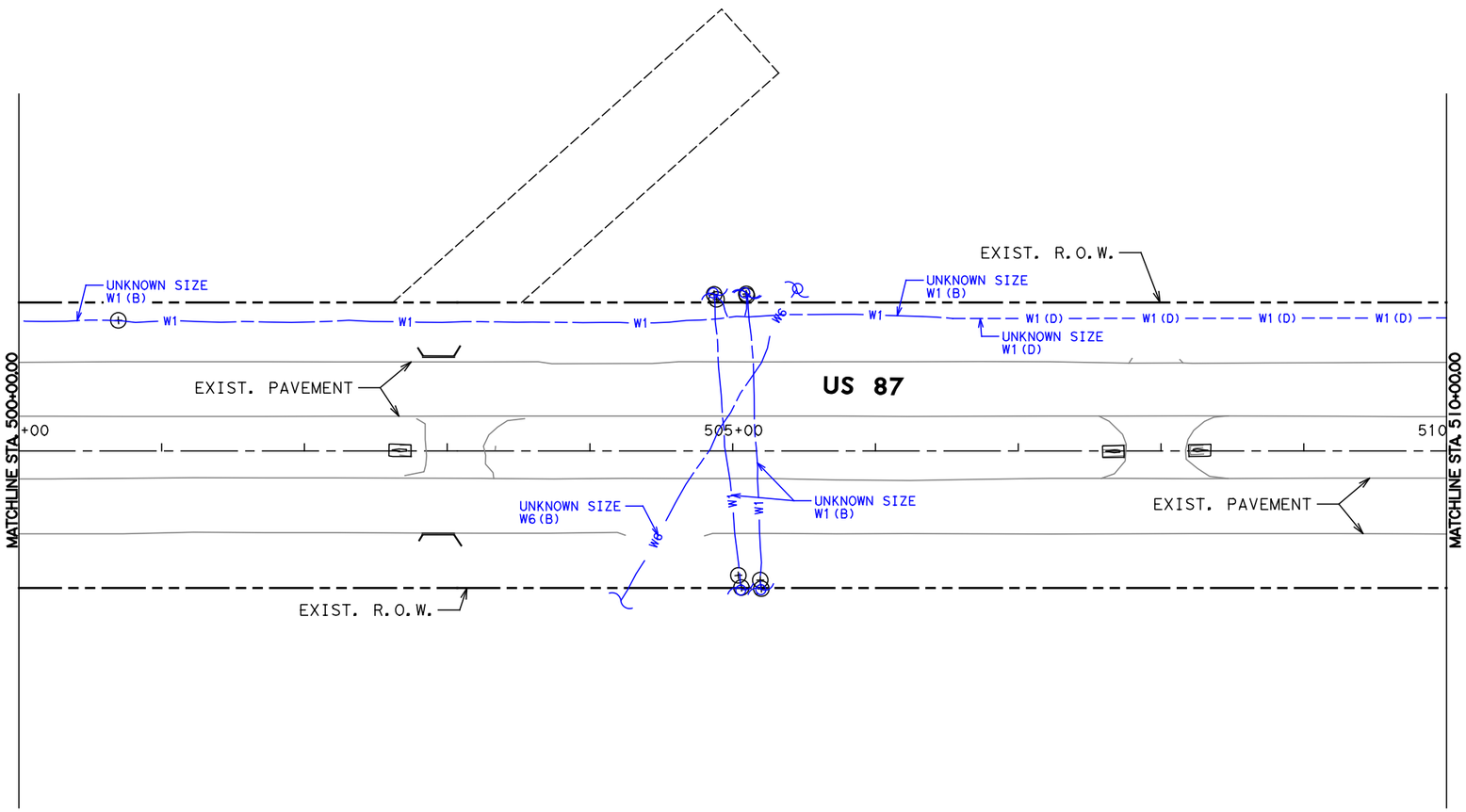

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 500+00 TO STA. 510+00

SHEET 15 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	98
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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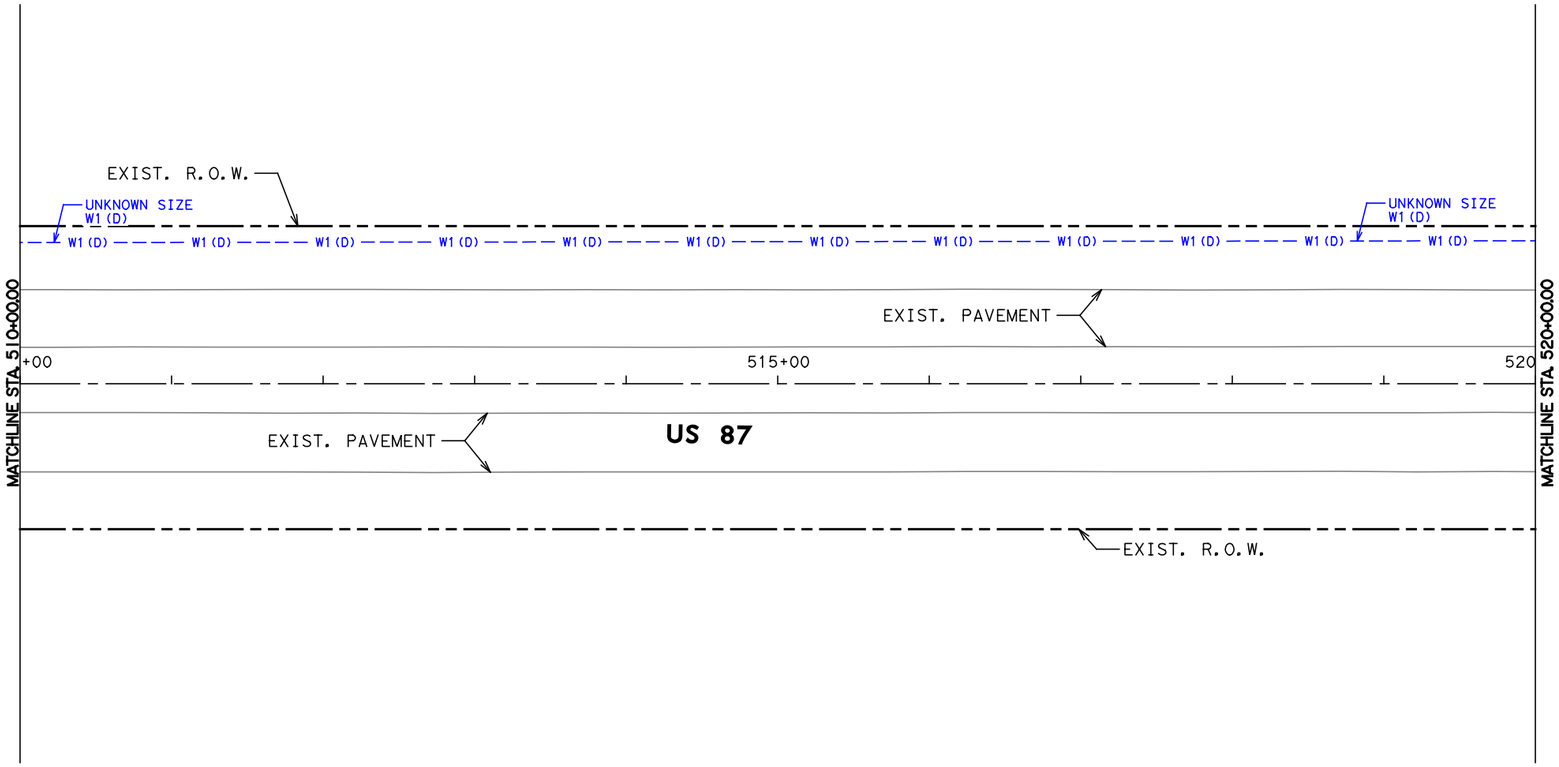

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 510+00 TO STA. 520+00

SHEET 16 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	99
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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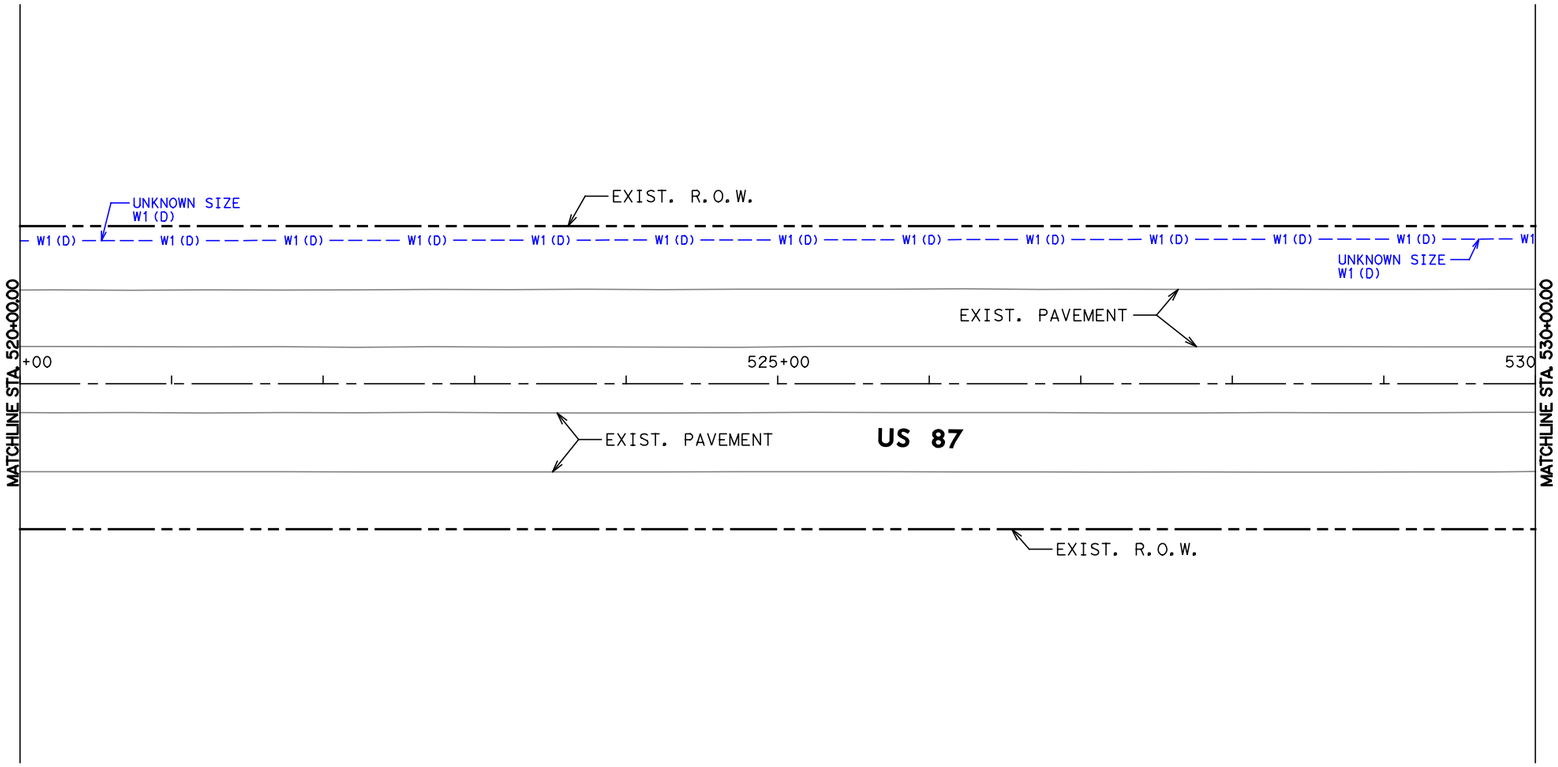

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 520+00 TO STA. 530+00
SHEET 17 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	100
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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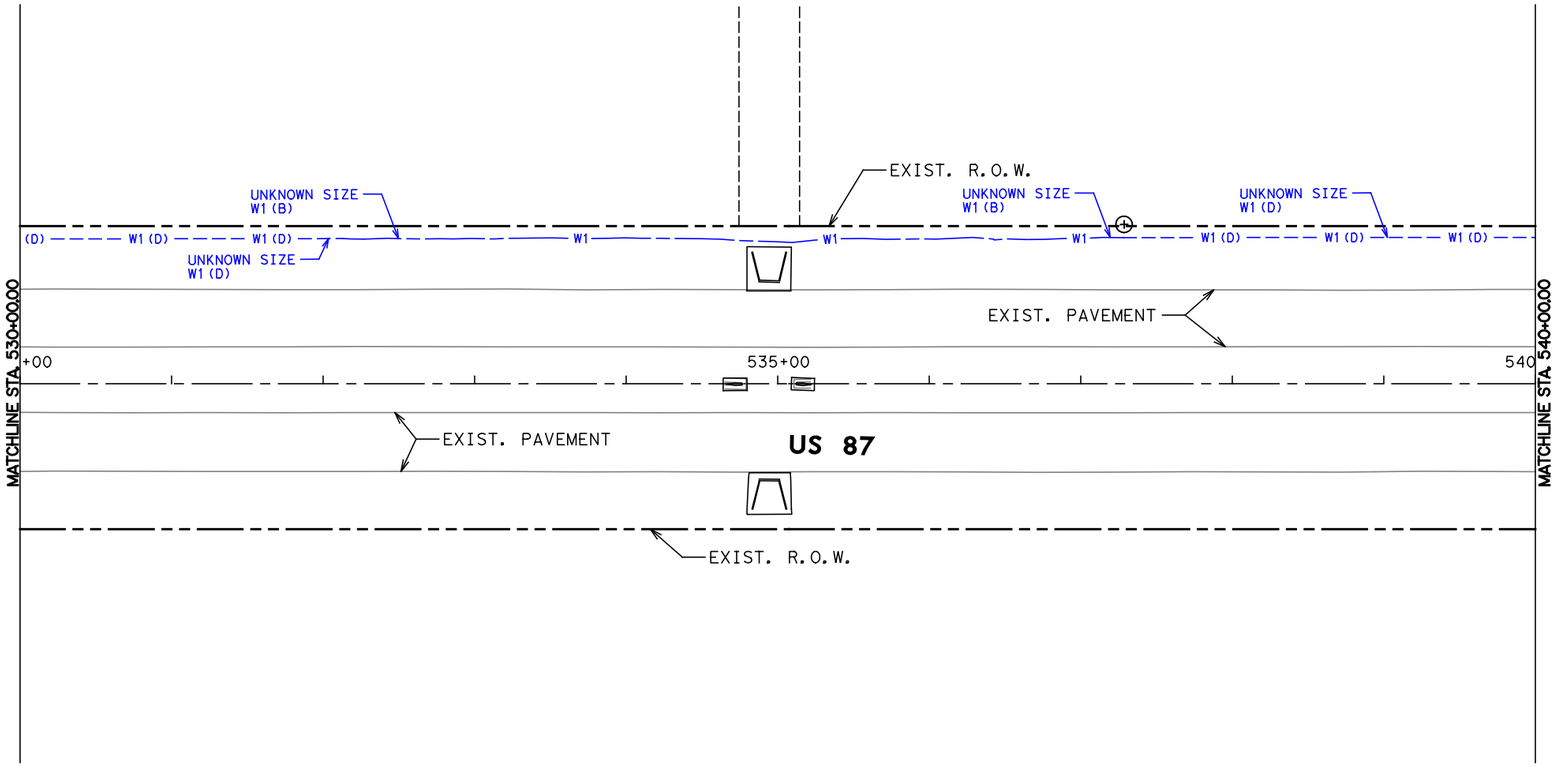

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 530+00 TO STA. 540+00
SHEET 18 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	101
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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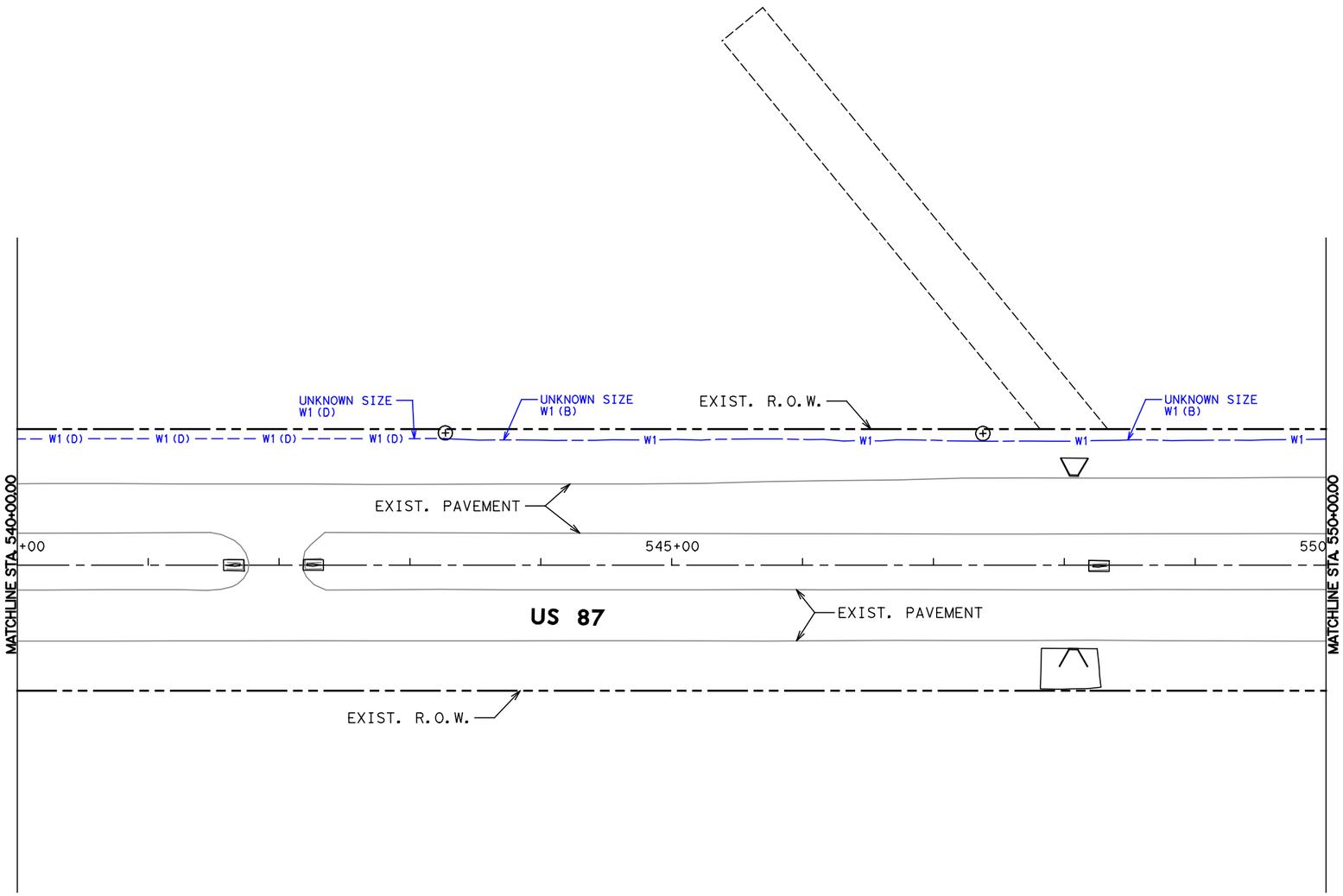

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 540+00 TO STA. 550+00
SHEET 19 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	102
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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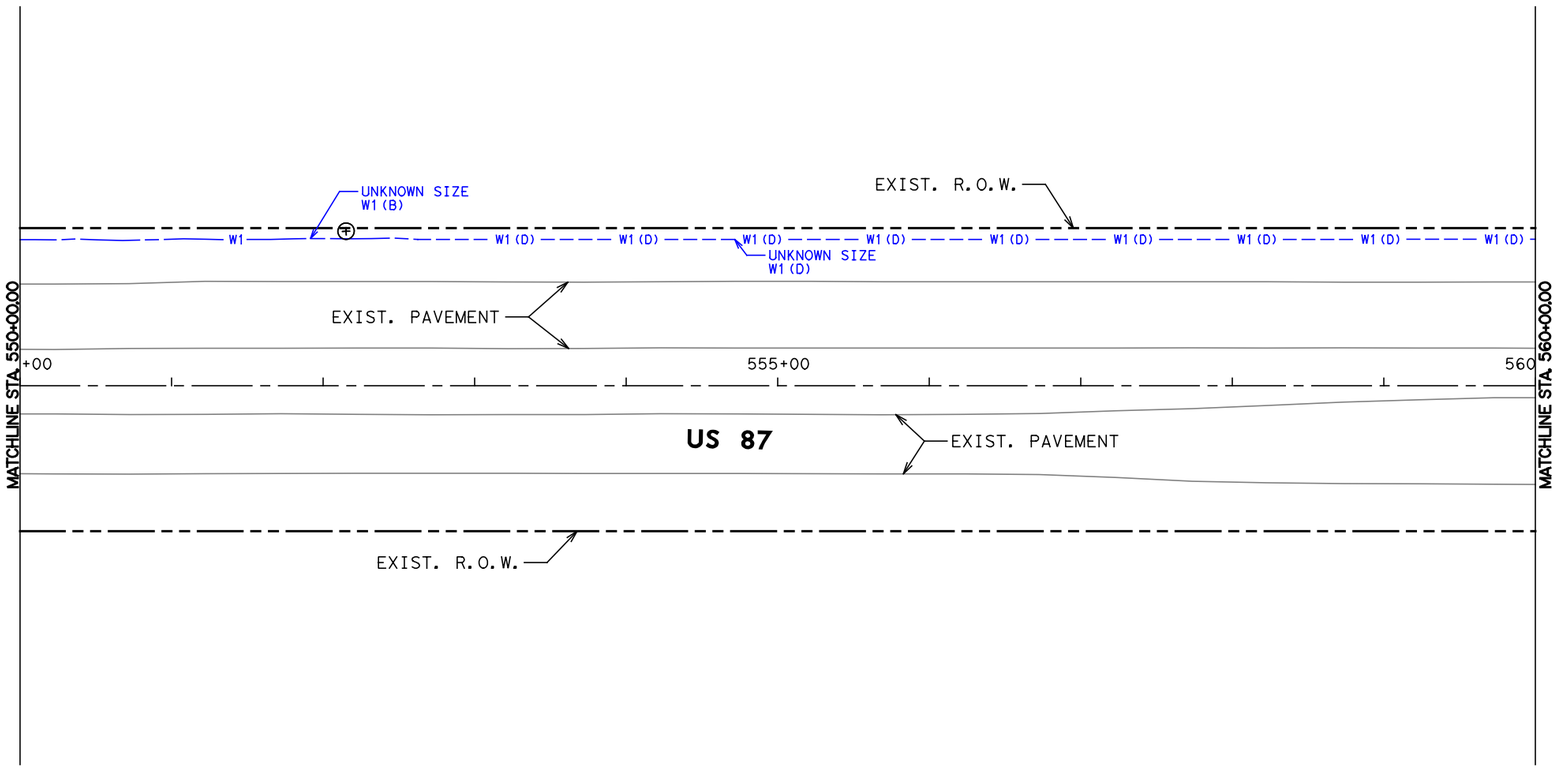

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SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 550+00 TO STA. 560+00
SHEET 20 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	103
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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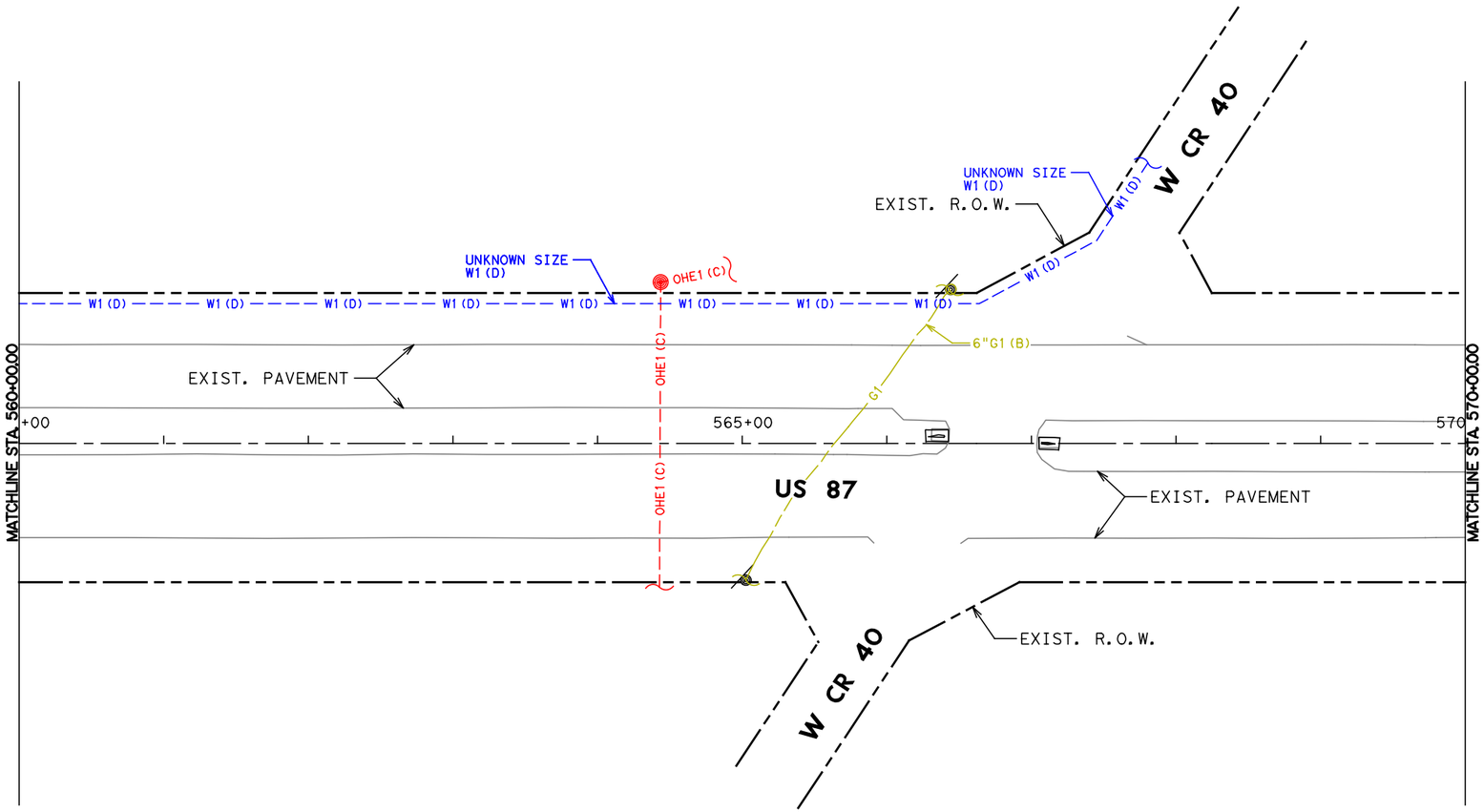

0 25 50 100
SCALE: 1" = 100' HOR.

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STATE OF TEXAS
CURT FAKLER
129816
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 560+00 TO STA. 570+00

SHEET 21 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	104
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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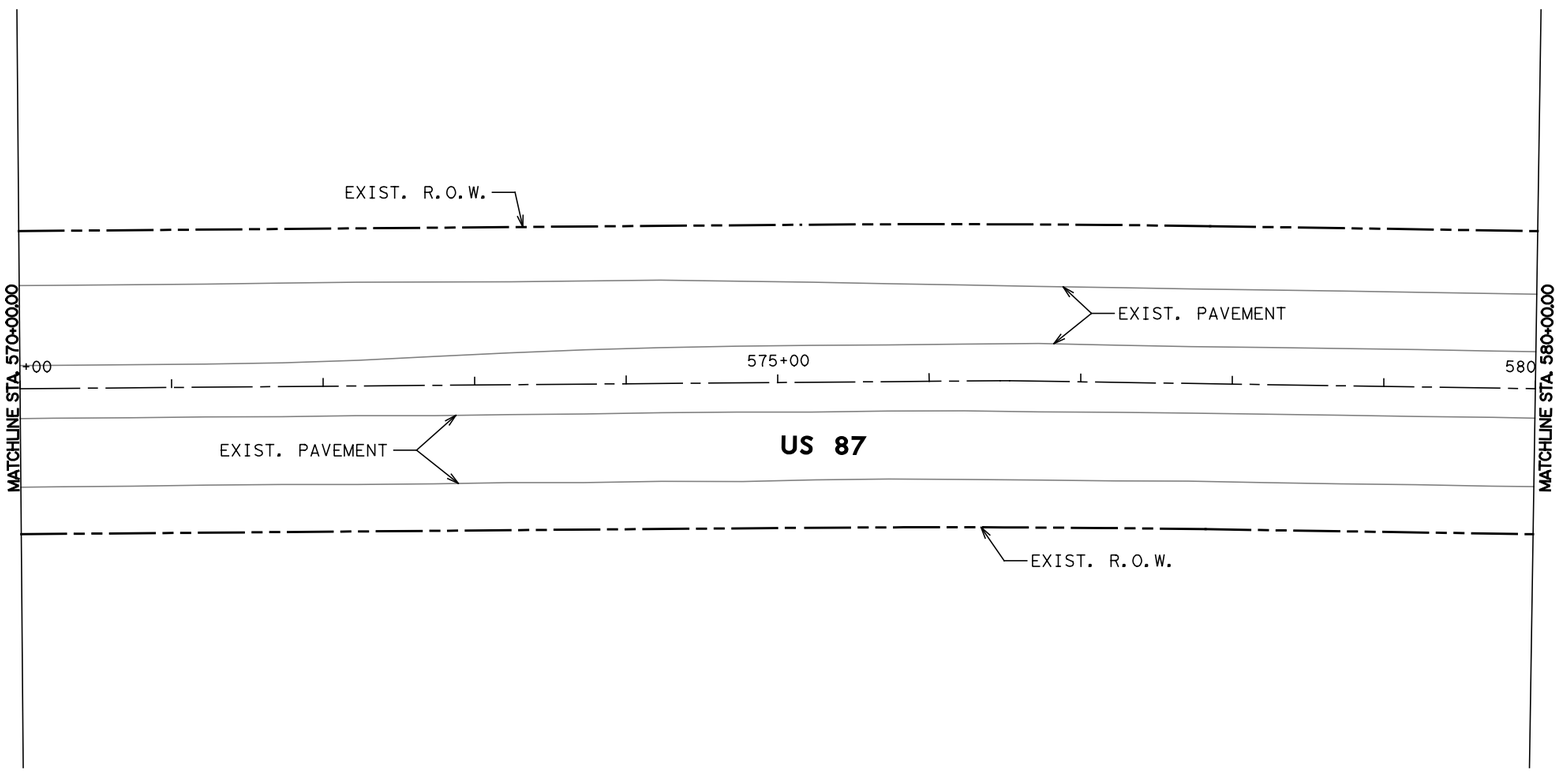

0 25 50 100
SCALE: 1" = 100' HOR.

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STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 570+00 TO STA. 580+00
SHEET 22 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	105
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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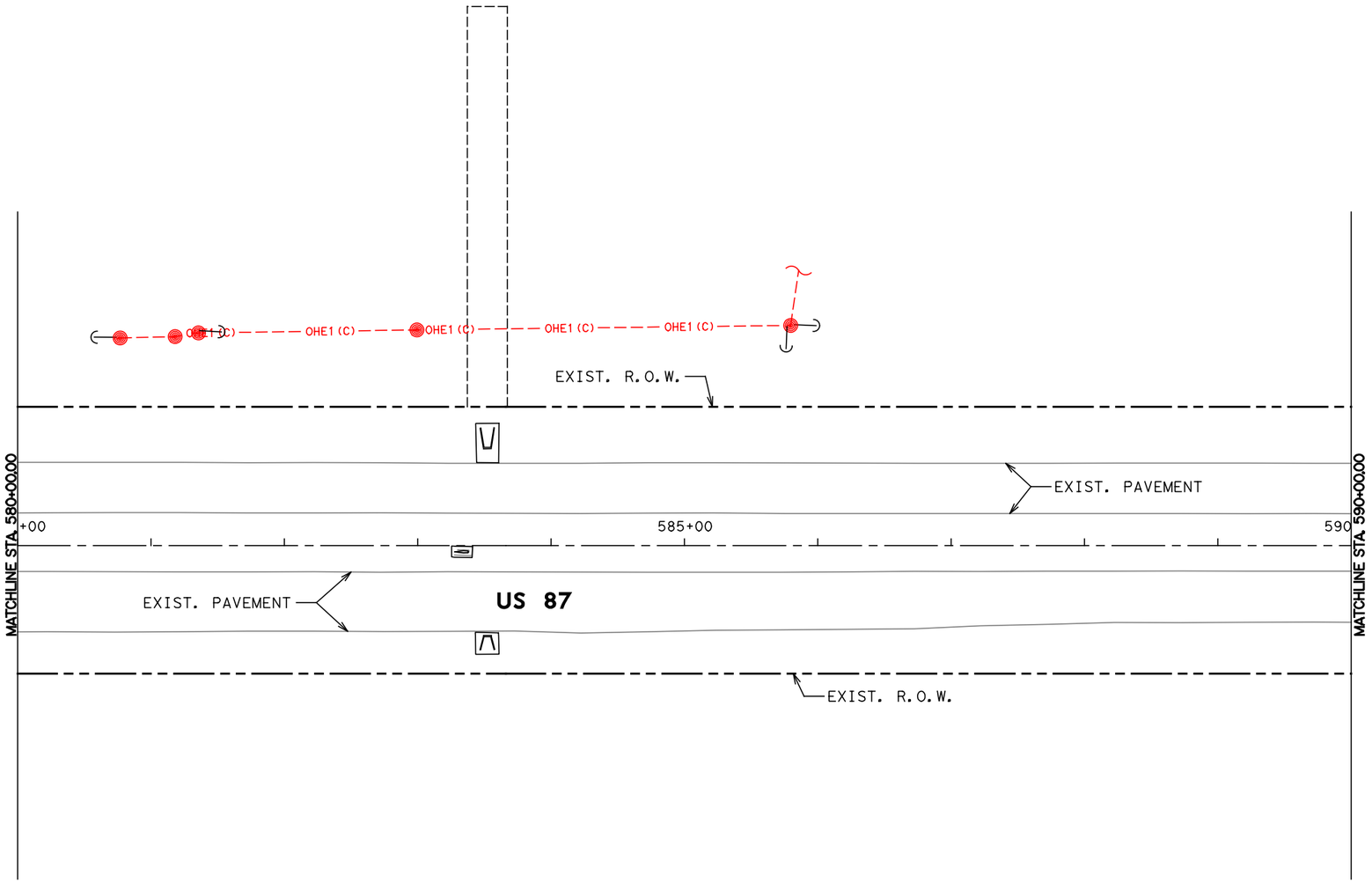

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 580+00 TO STA. 590+00

SHEET 23 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	106
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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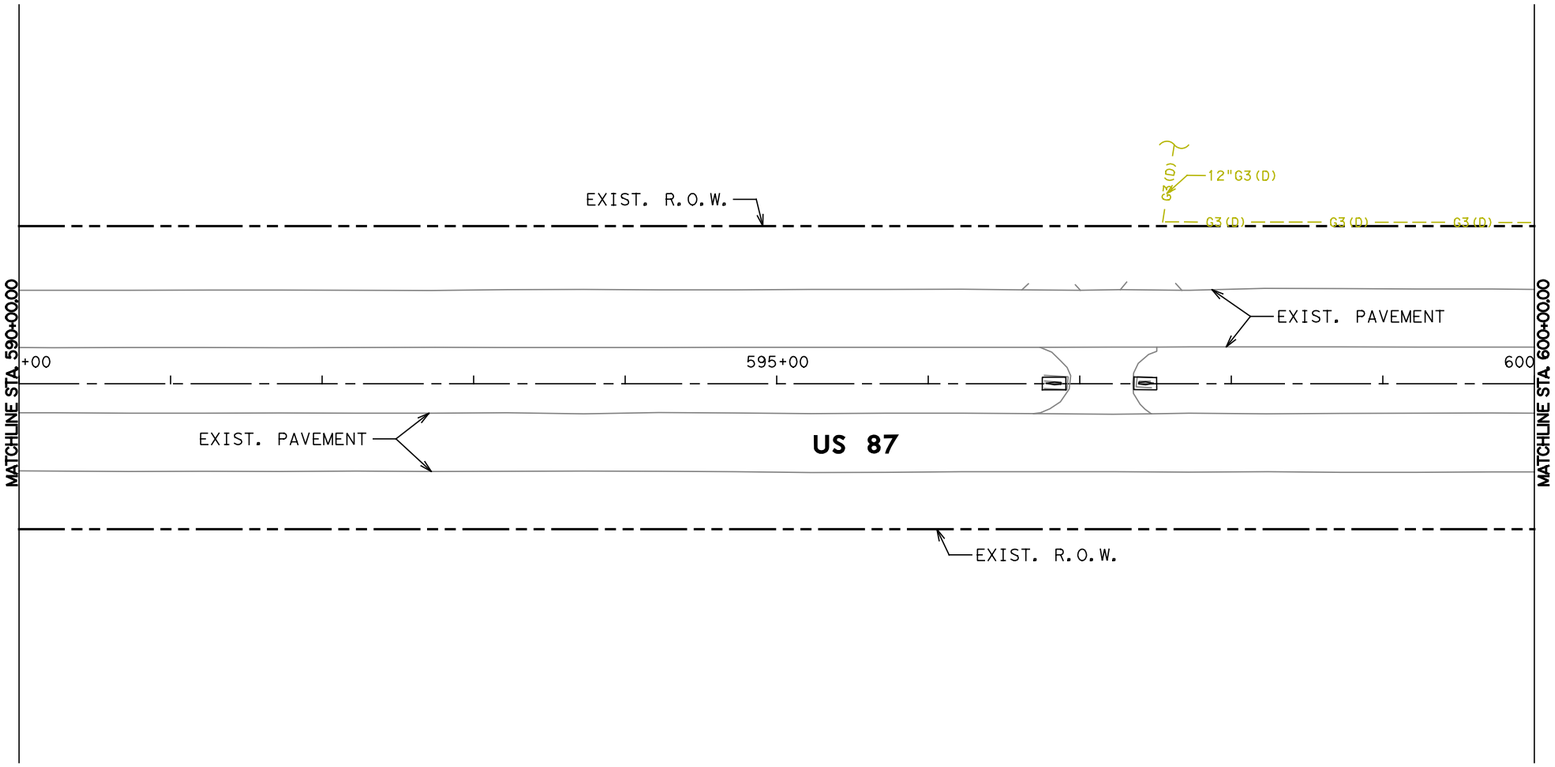

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation
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US 87
EXISTING UTILITY PLANS
FROM STA. 590+00 TO STA. 600+00
SHEET 24 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	107
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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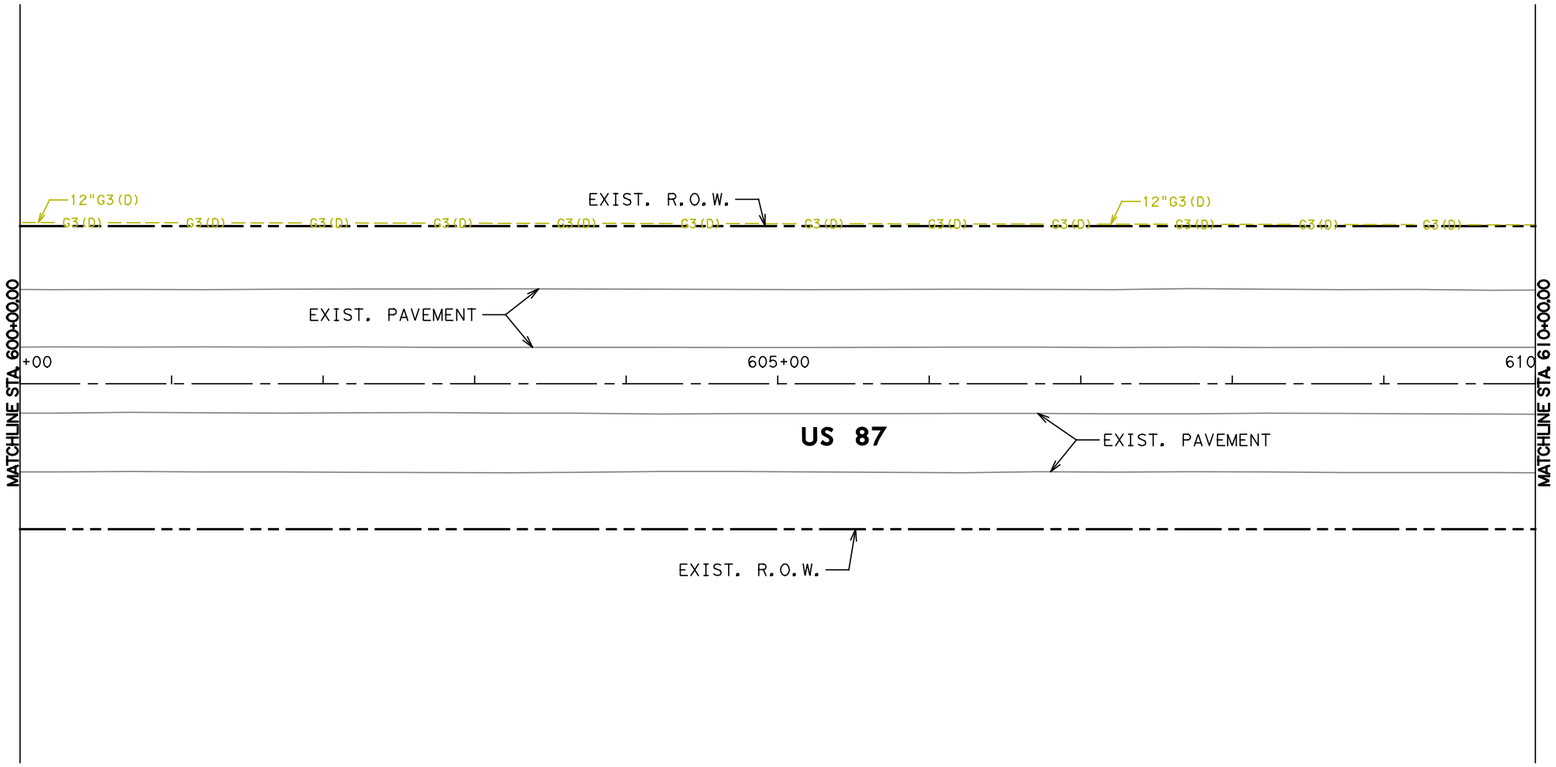

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 600+00 TO STA. 610+00
SHEET 25 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	108
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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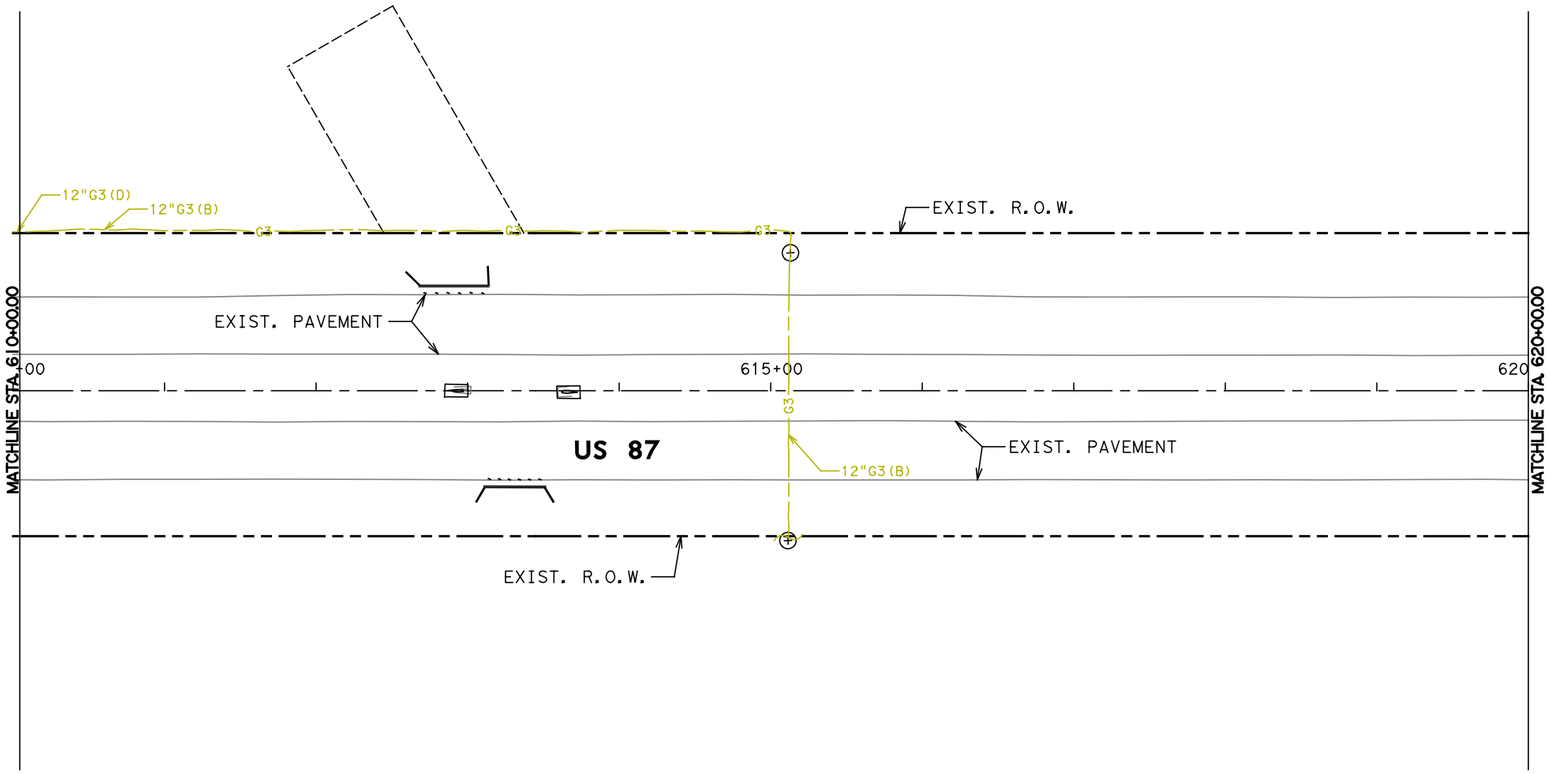

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
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5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 610+00 TO STA. 620+00

SHEET 26 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	109
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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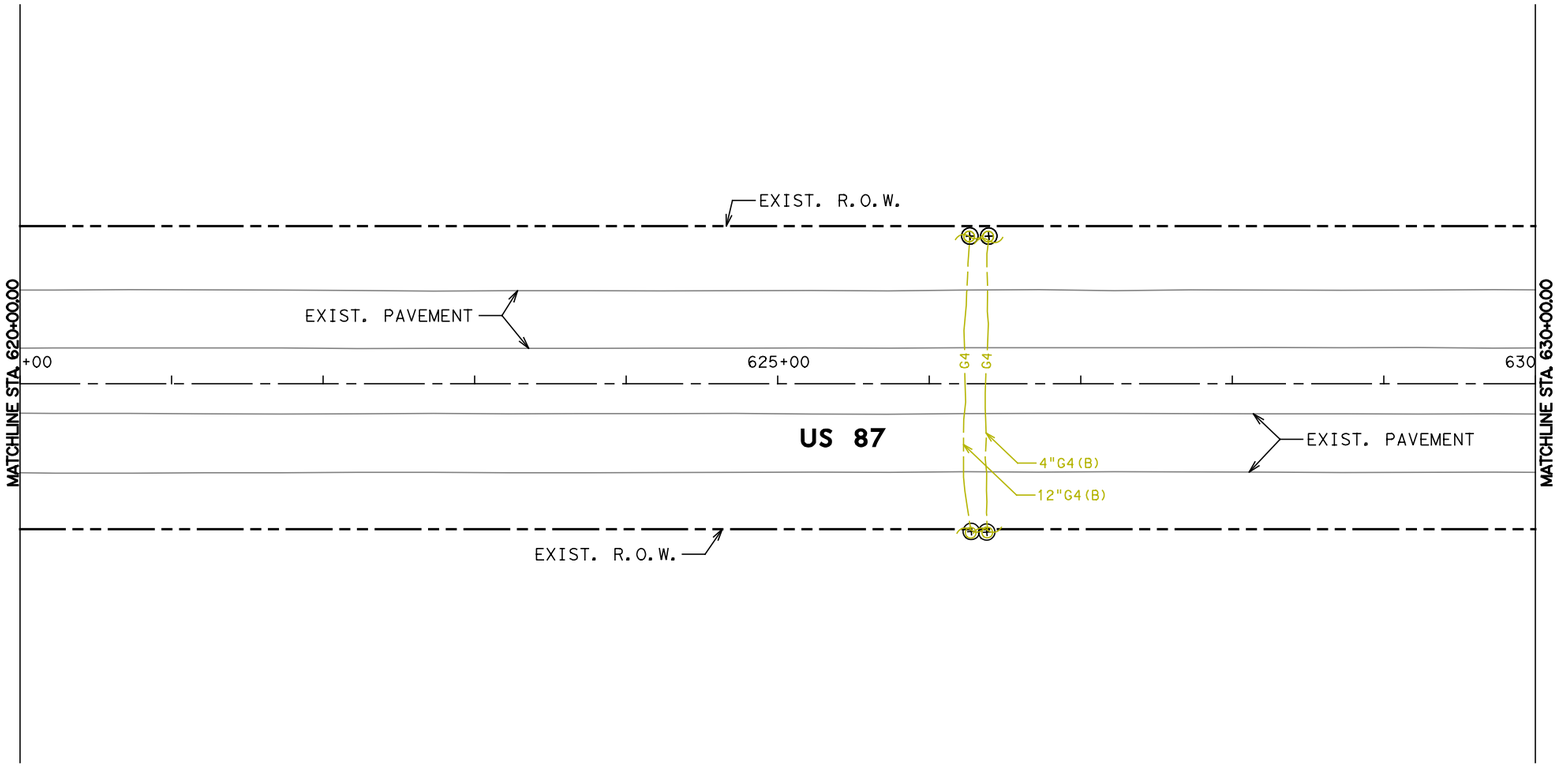

0 25 50 100

SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

EXISTING UTILITY PLANS

FROM STA. 620+00 TO STA. 630+00

SHEET 27 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	110
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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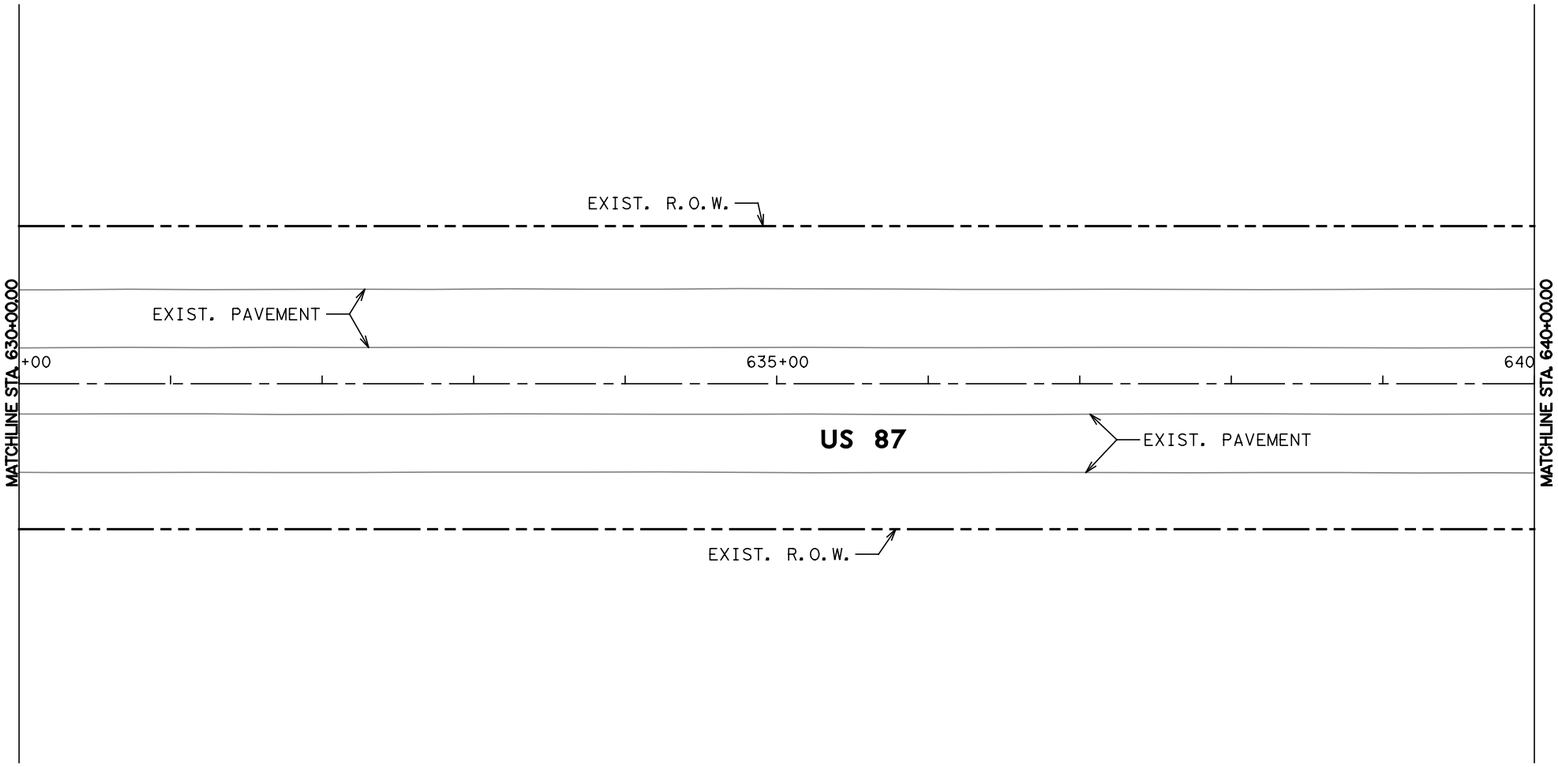

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 630+00 TO STA. 640+00
SHEET 28 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	111
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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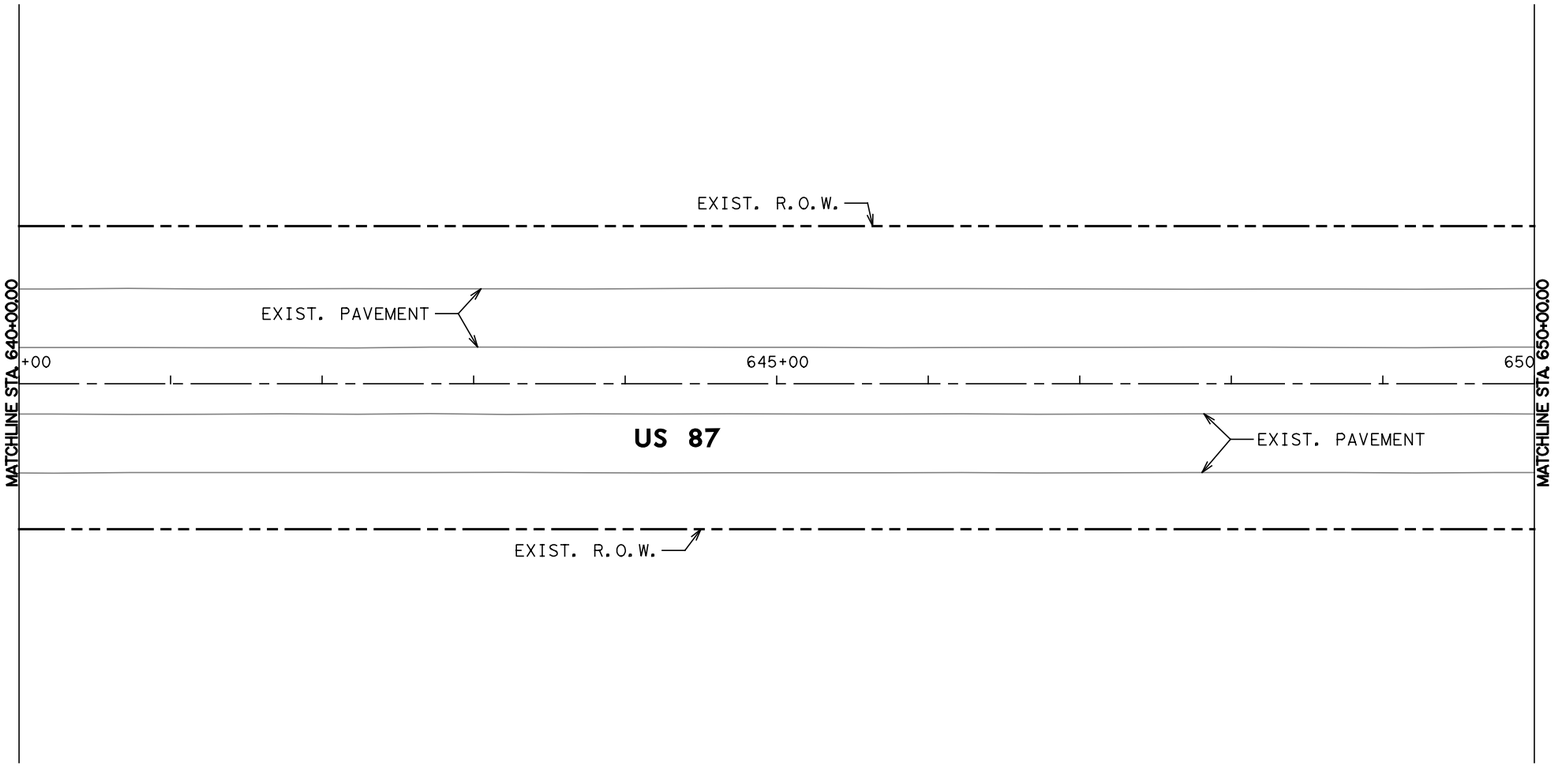

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 640+00 TO STA. 650+00
SHEET 29 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	112
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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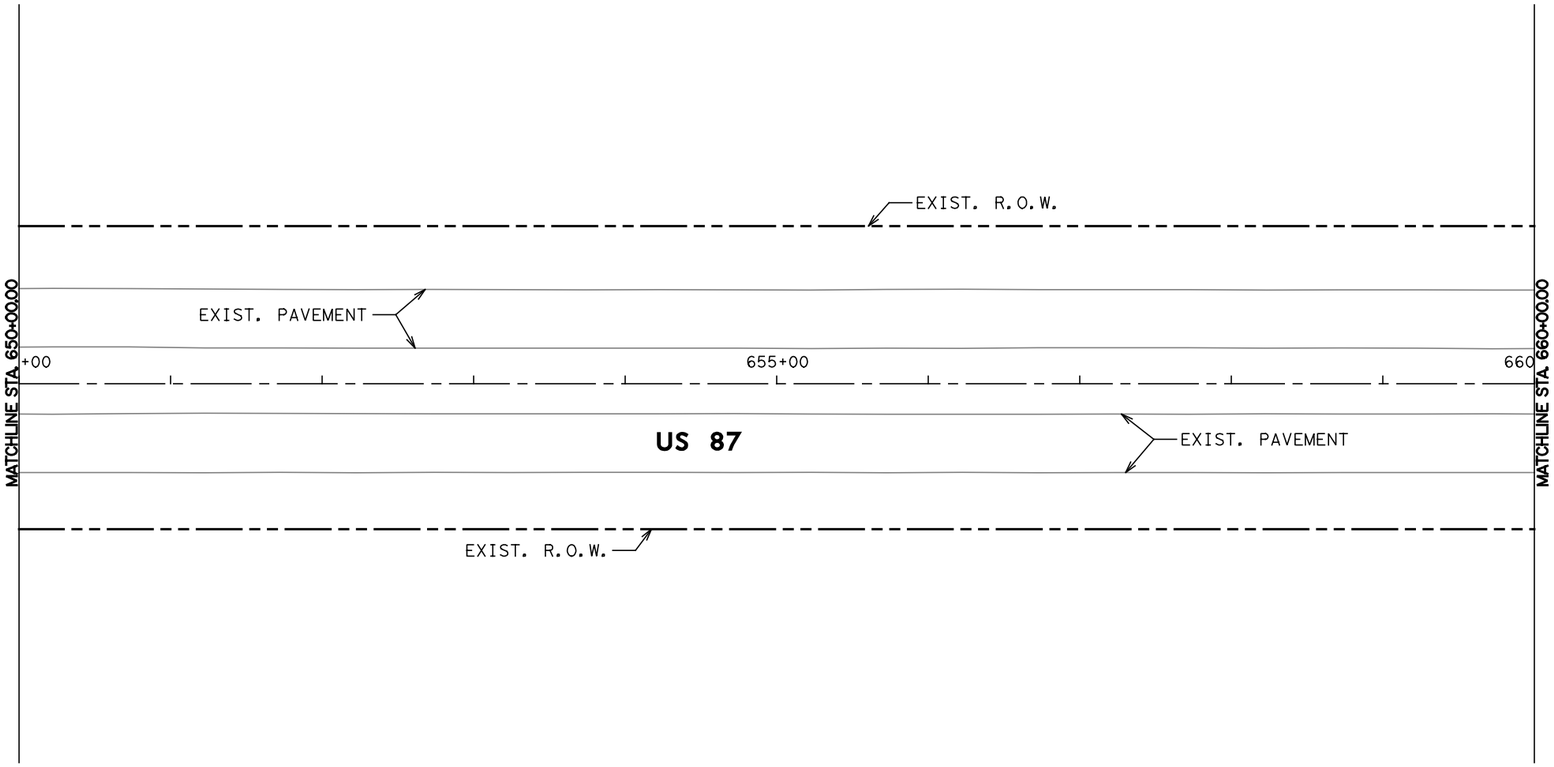

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 650+00 TO STA. 660+00
SHEET 30 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	113
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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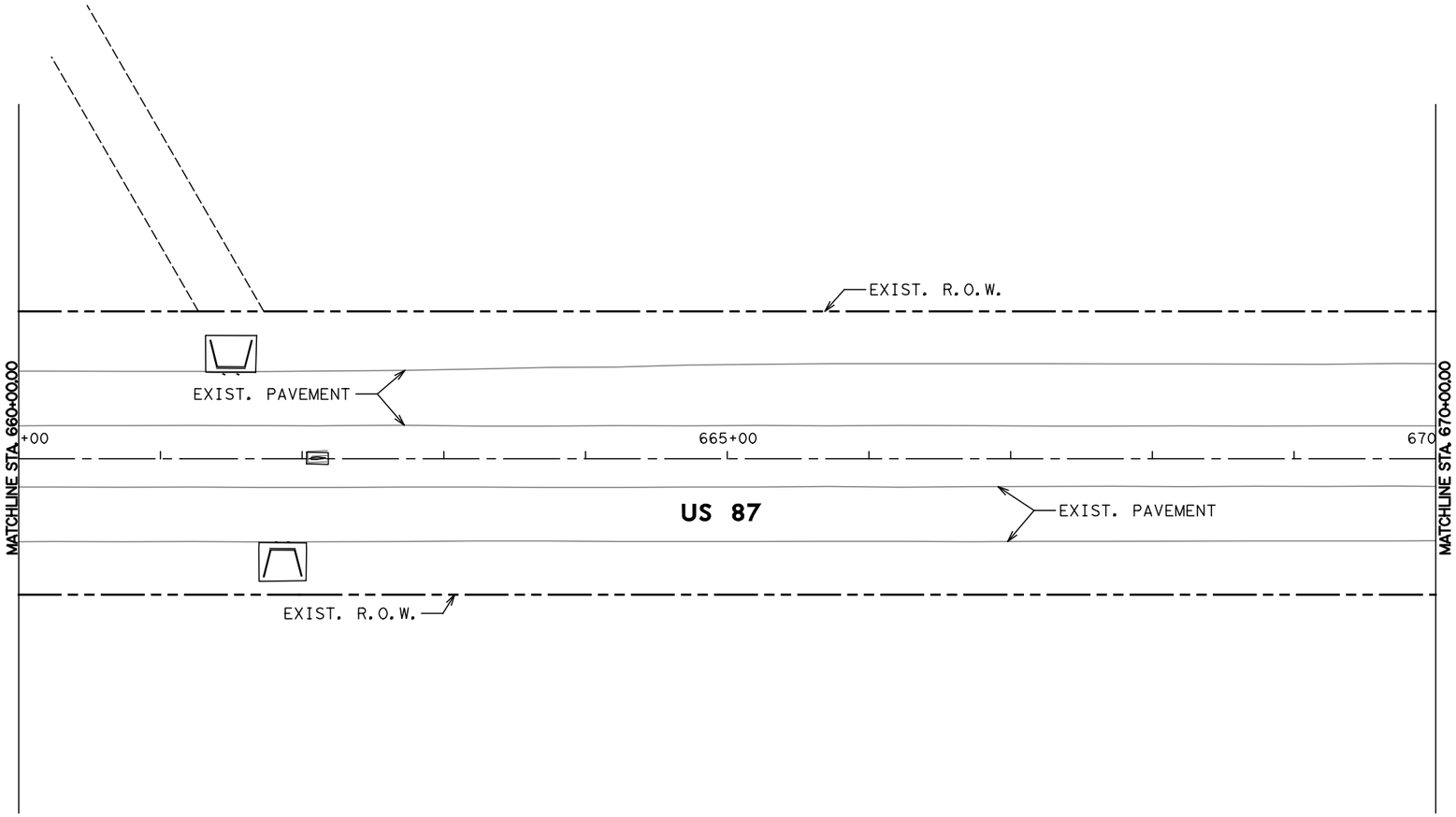

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 660+00 TO STA. 670+00
SHEET 31 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	114
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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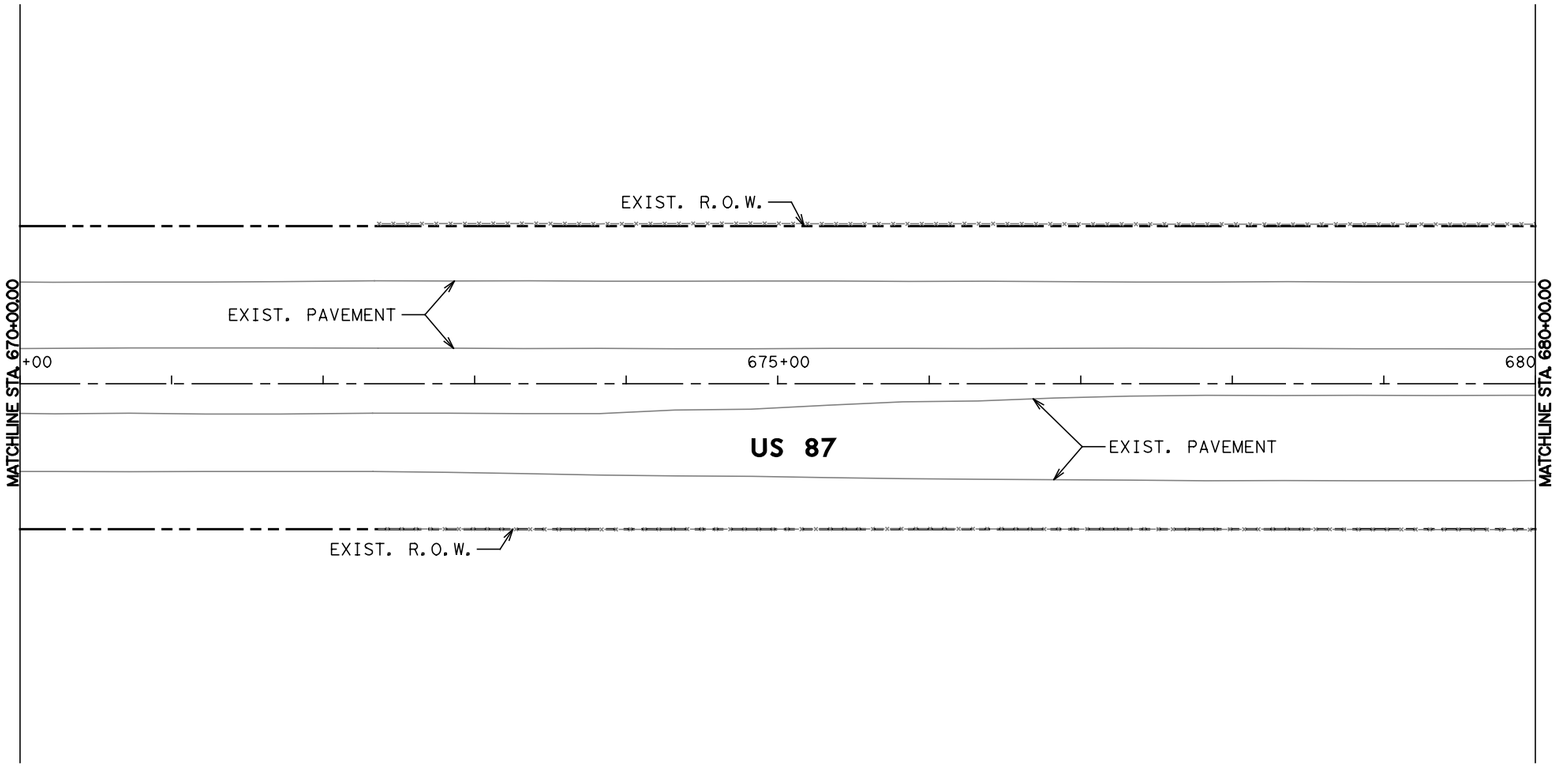

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 670+00 TO STA. 680+00

SHEET 32 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	115
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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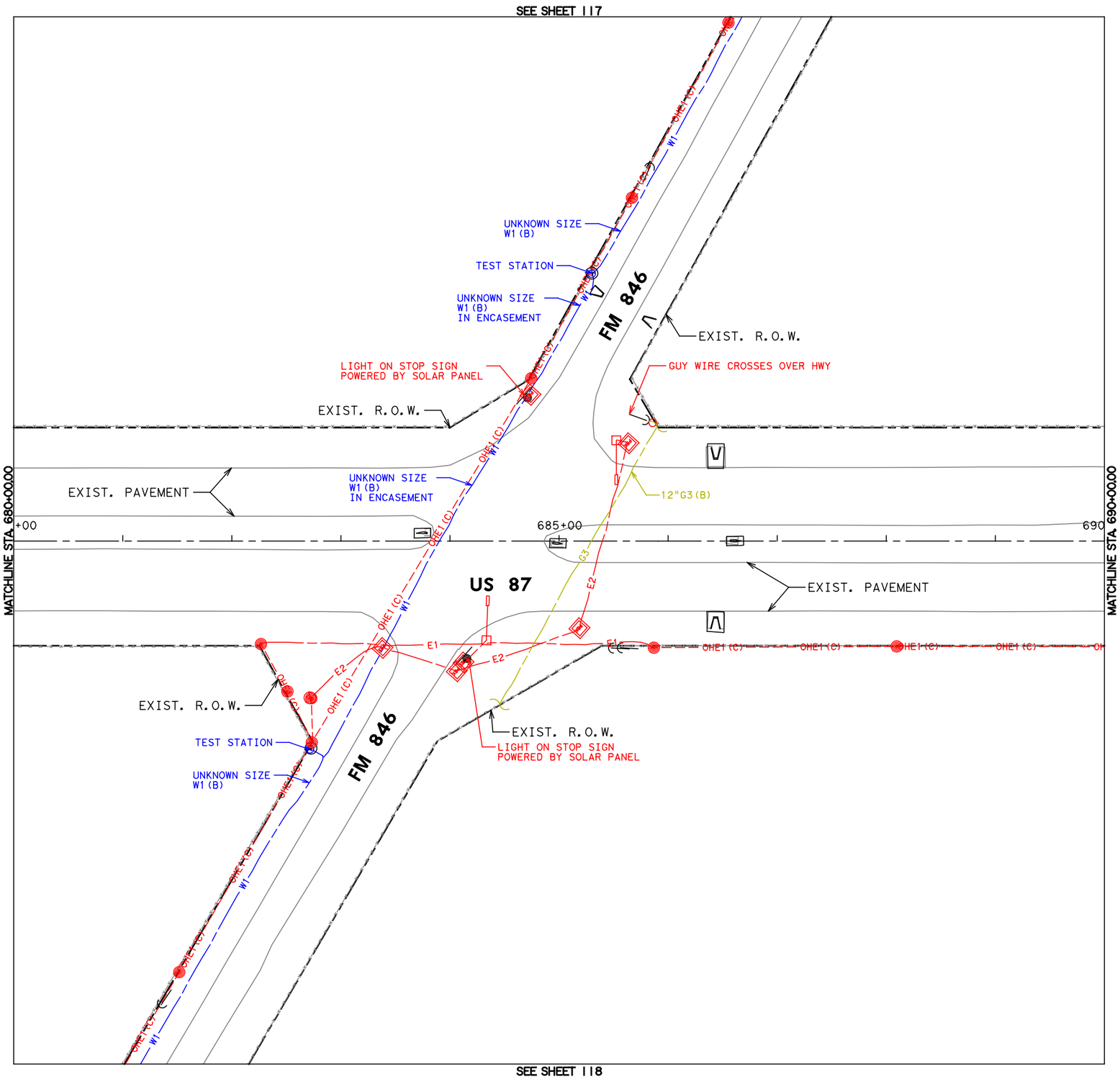

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 680+00 TO STA. 690+00
SHEET 33 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	116
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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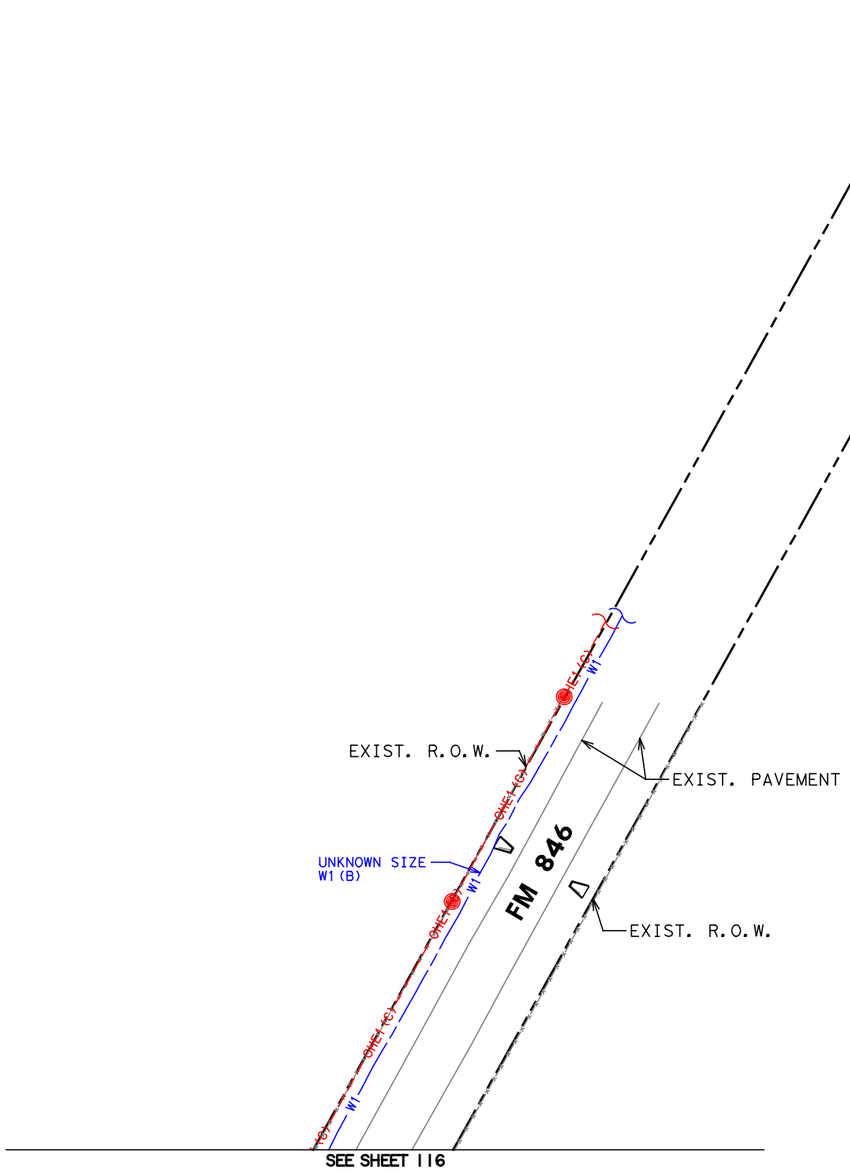

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FM 846 WEST OF US 87
SHEET 34 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	117
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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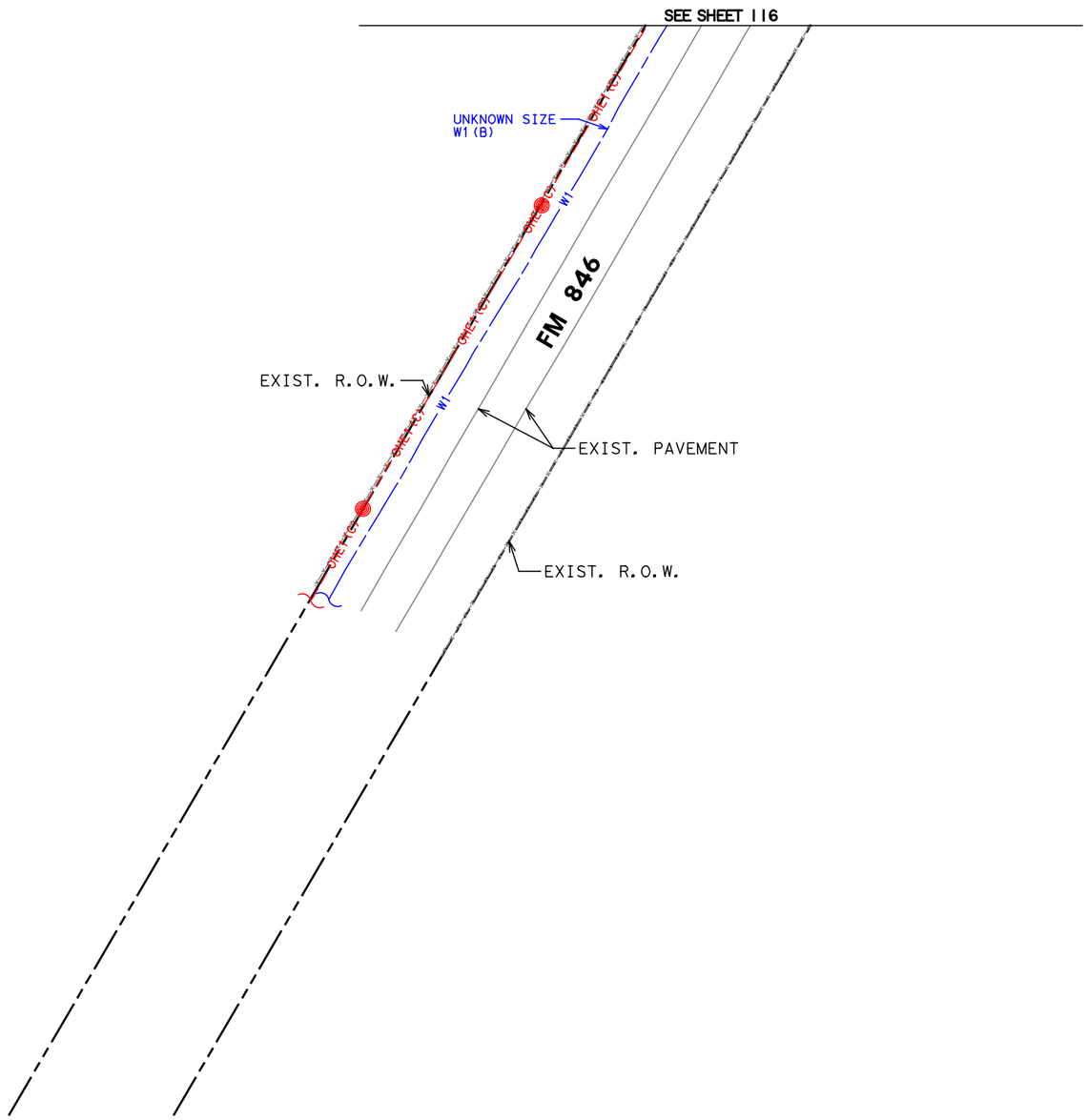

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FM 846 EAST OF US 87
SHEET 35 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	118
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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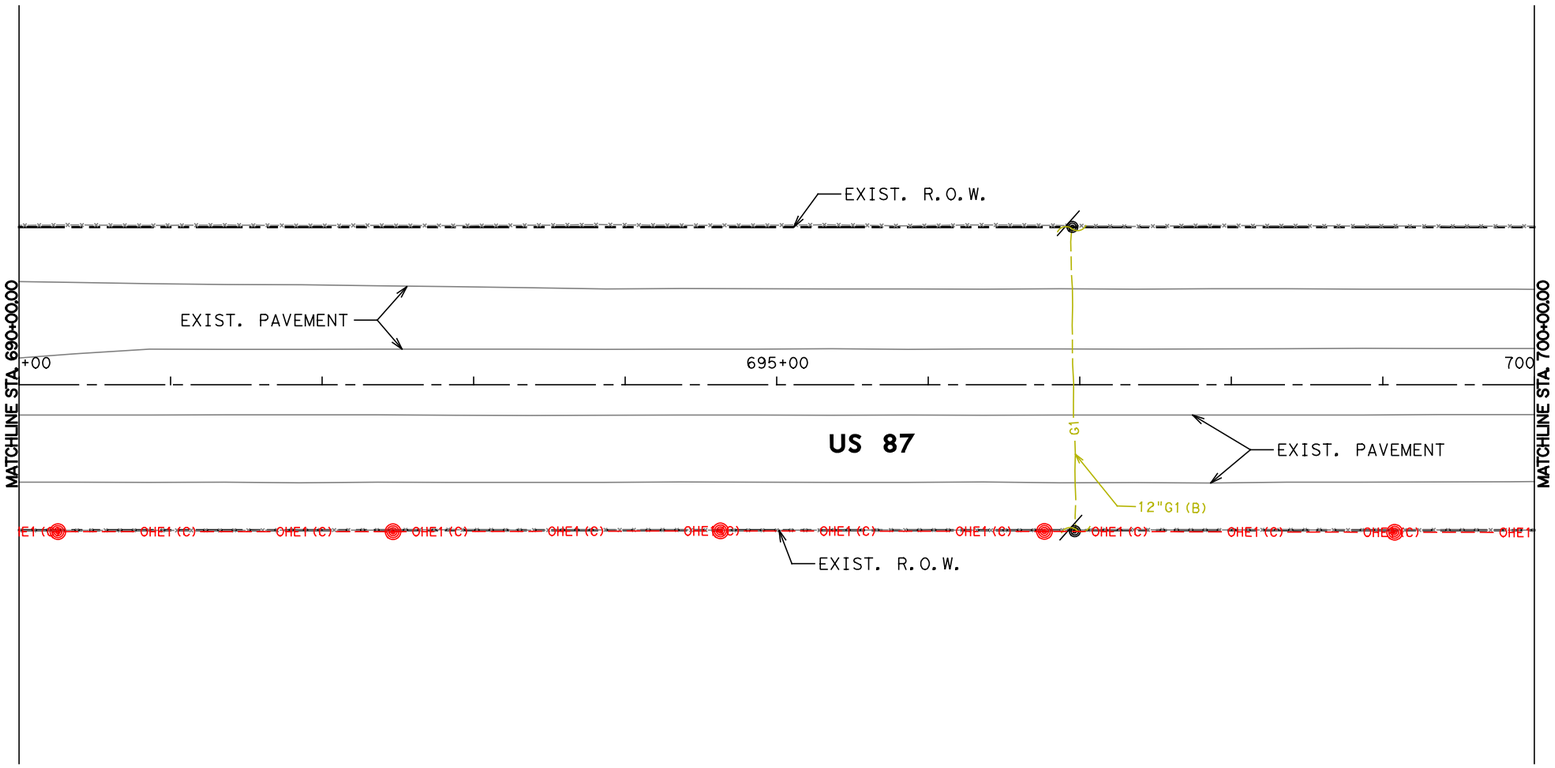

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 690+00 TO STA. 700+00
SHEET 36 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	119
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\119 EXISTING UTILITY PLANS.dgn
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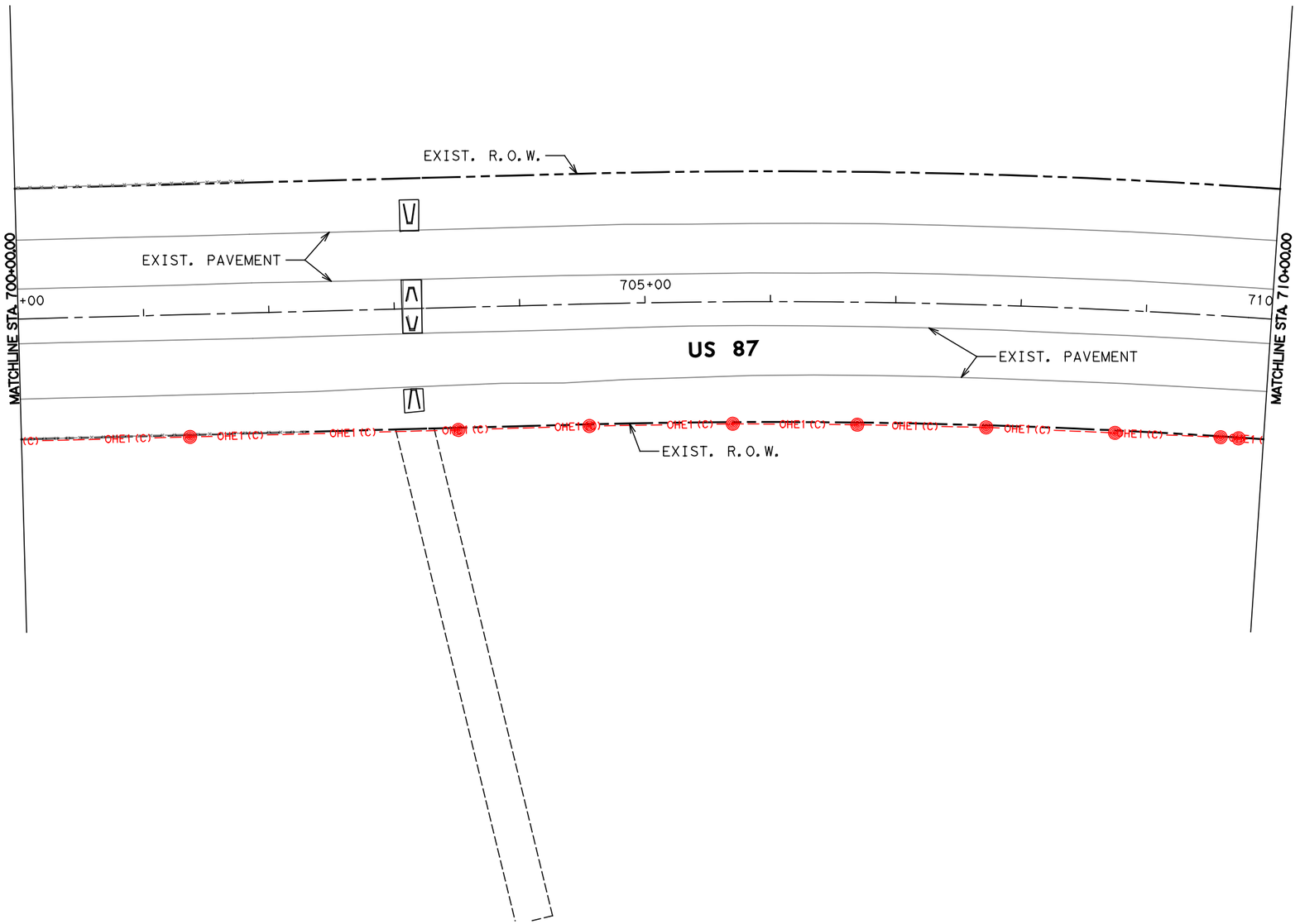

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 700+00 TO STA. 710+00
SHEET 37 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	120
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\120 EXISTING UTILITY PLANS.dgn
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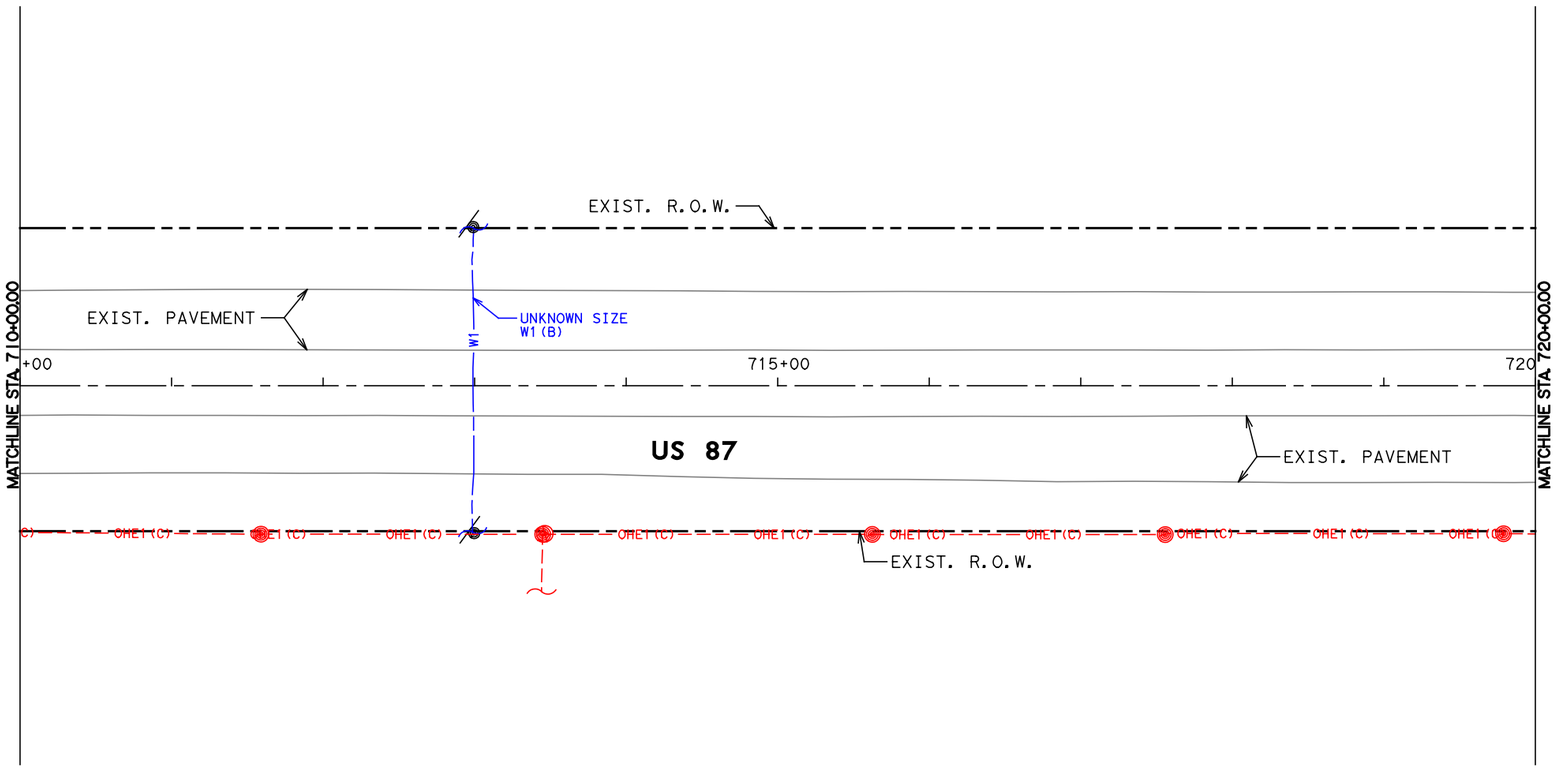

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 710+00 TO STA. 720+00
SHEET 38 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	121
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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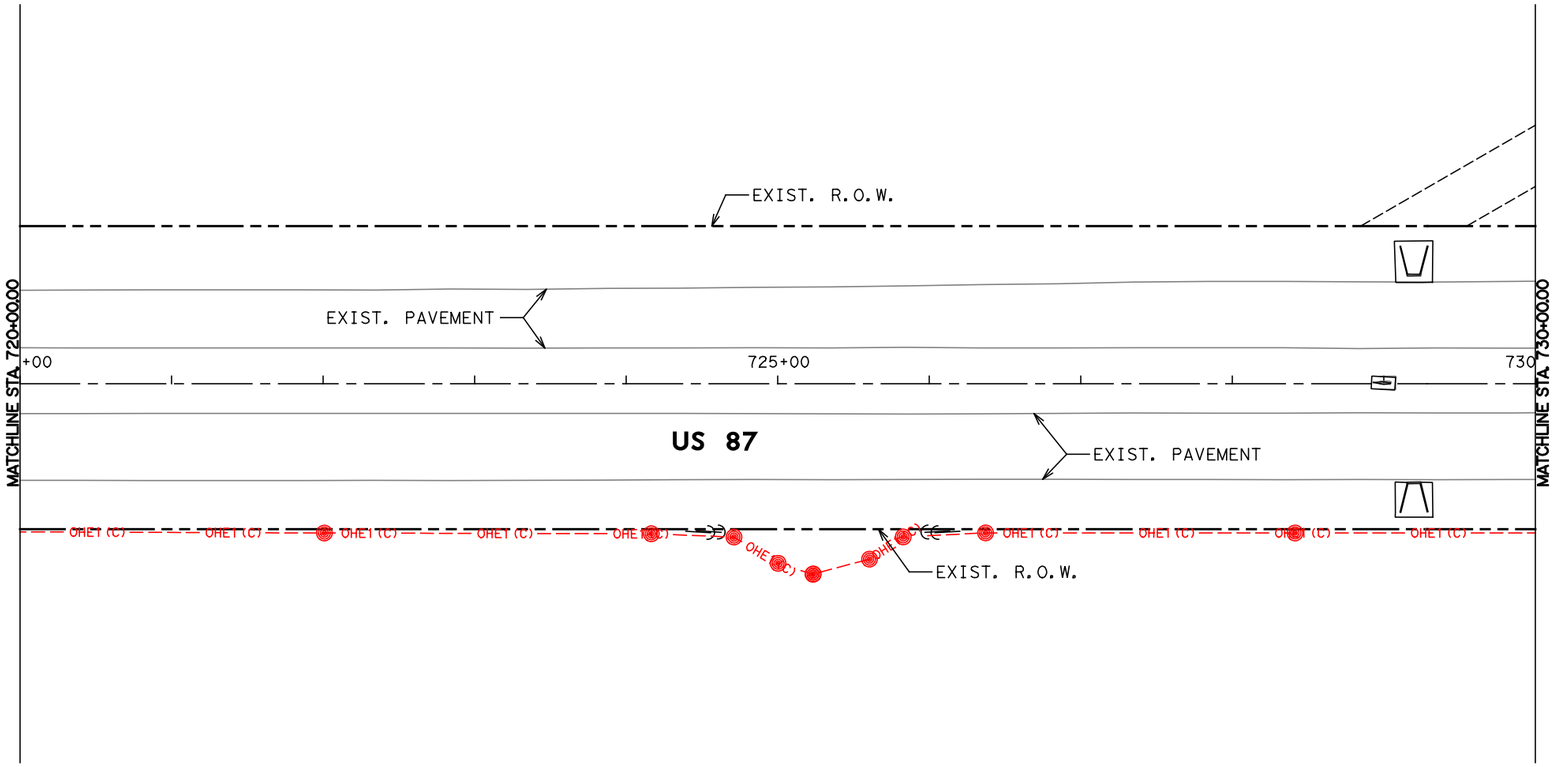

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 720+00 TO STA. 730+00

SHEET 39 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	122
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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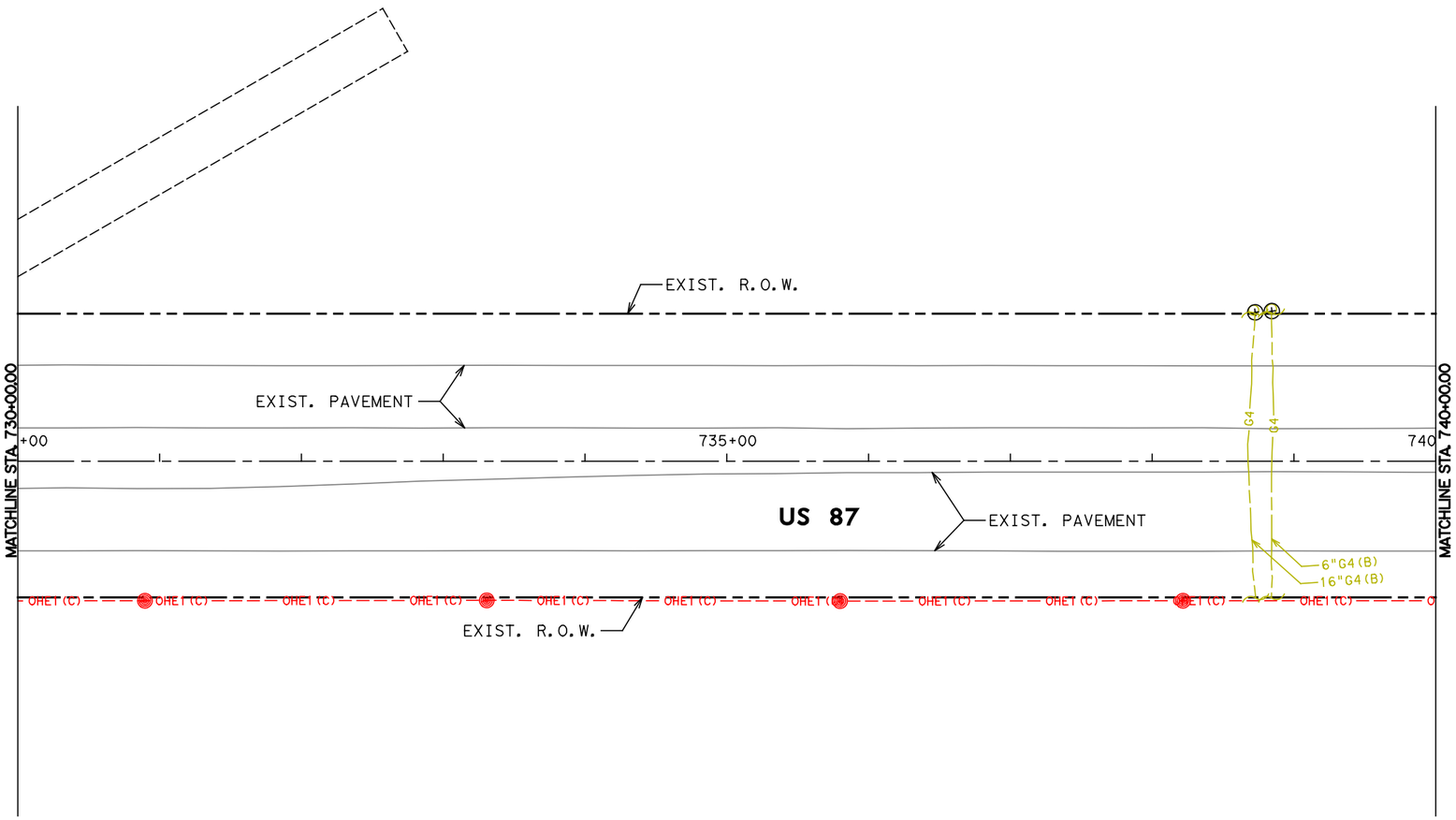

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 730+00 TO STA. 740+00
SHEET 40 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	123
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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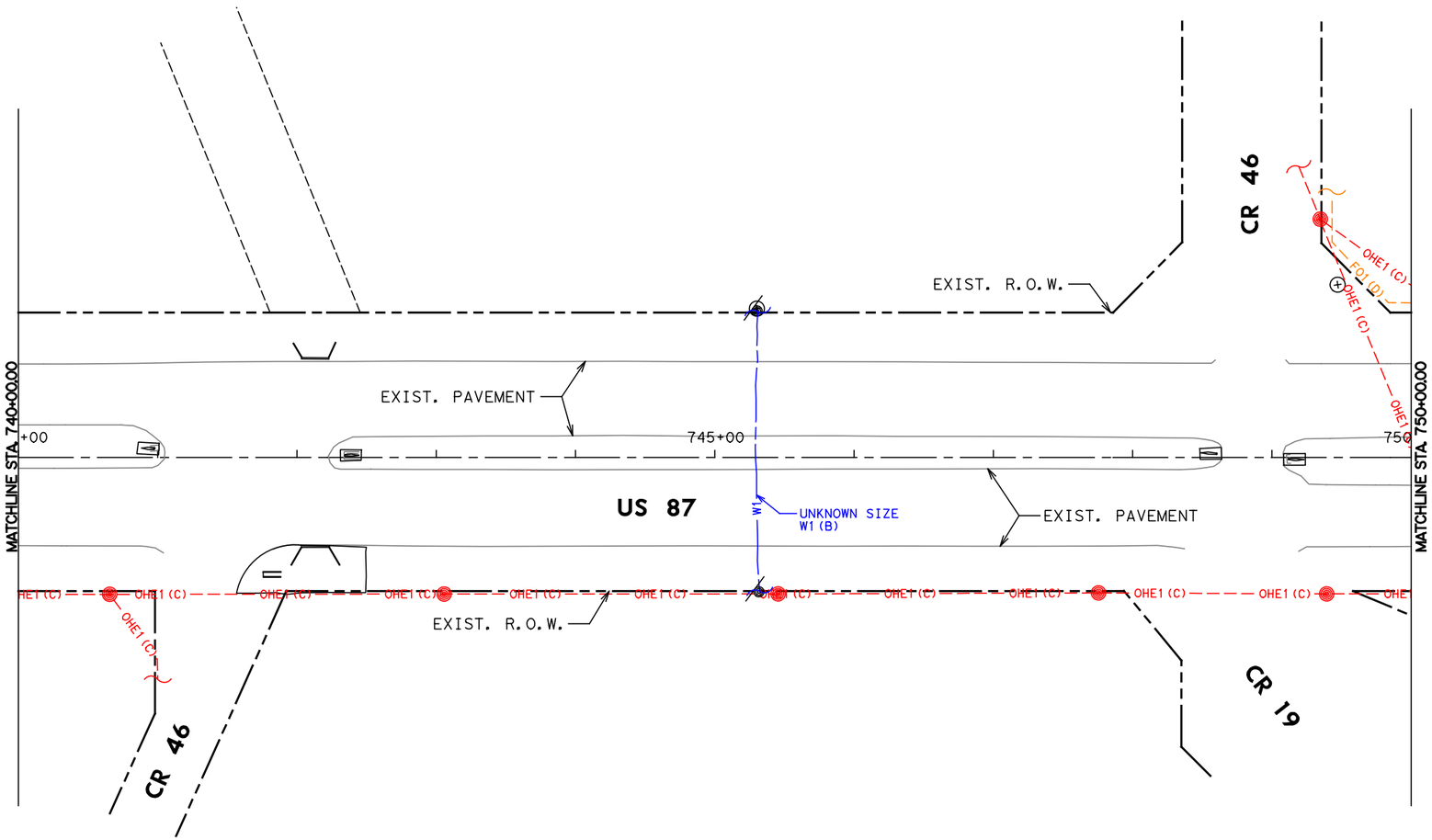
DATE: 5/26/2021 8:59:07 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 740+00 TO STA. 750+00
SHEET 41 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	124
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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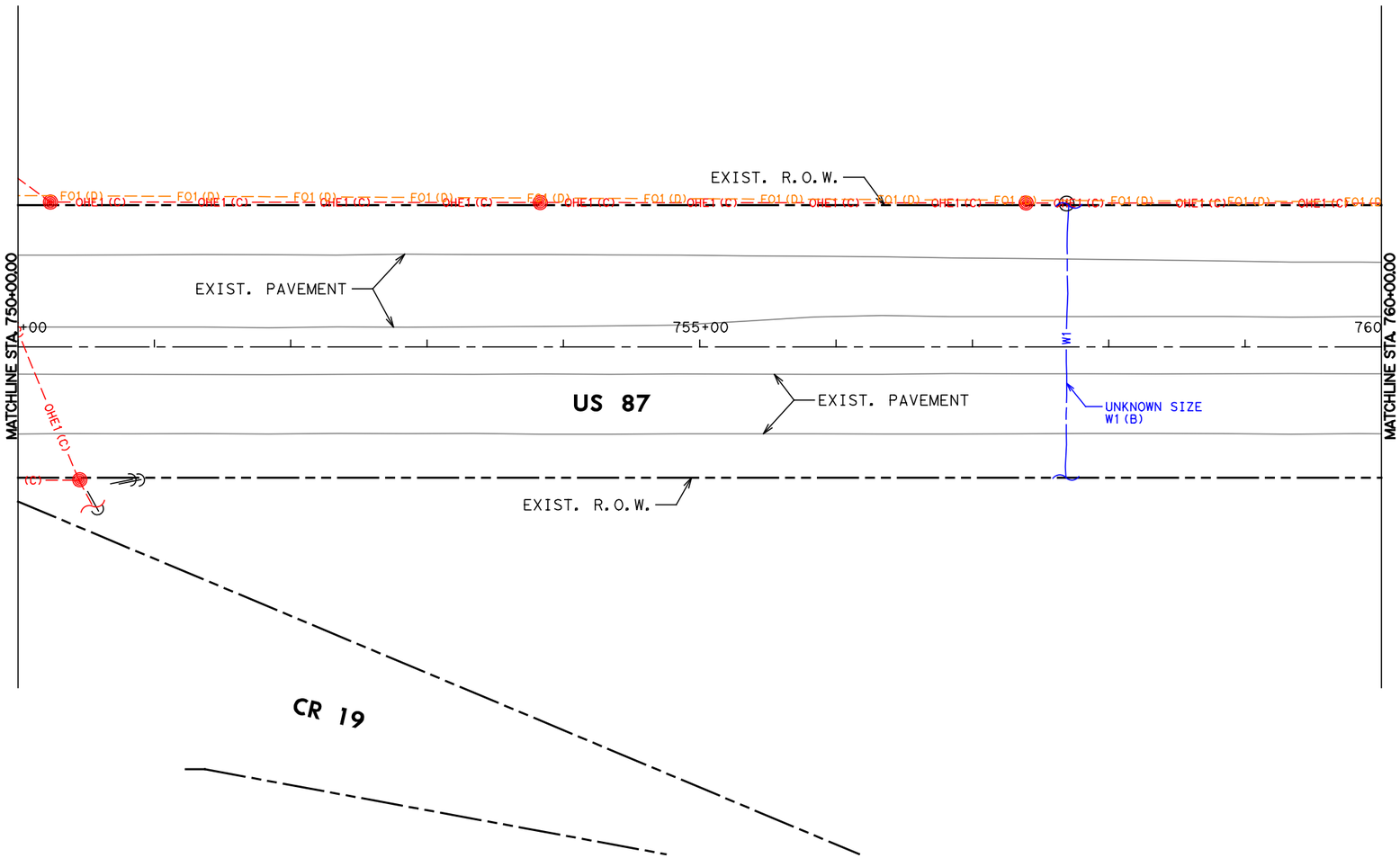

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 750+00 TO STA. 760+00

SHEET 42 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	125
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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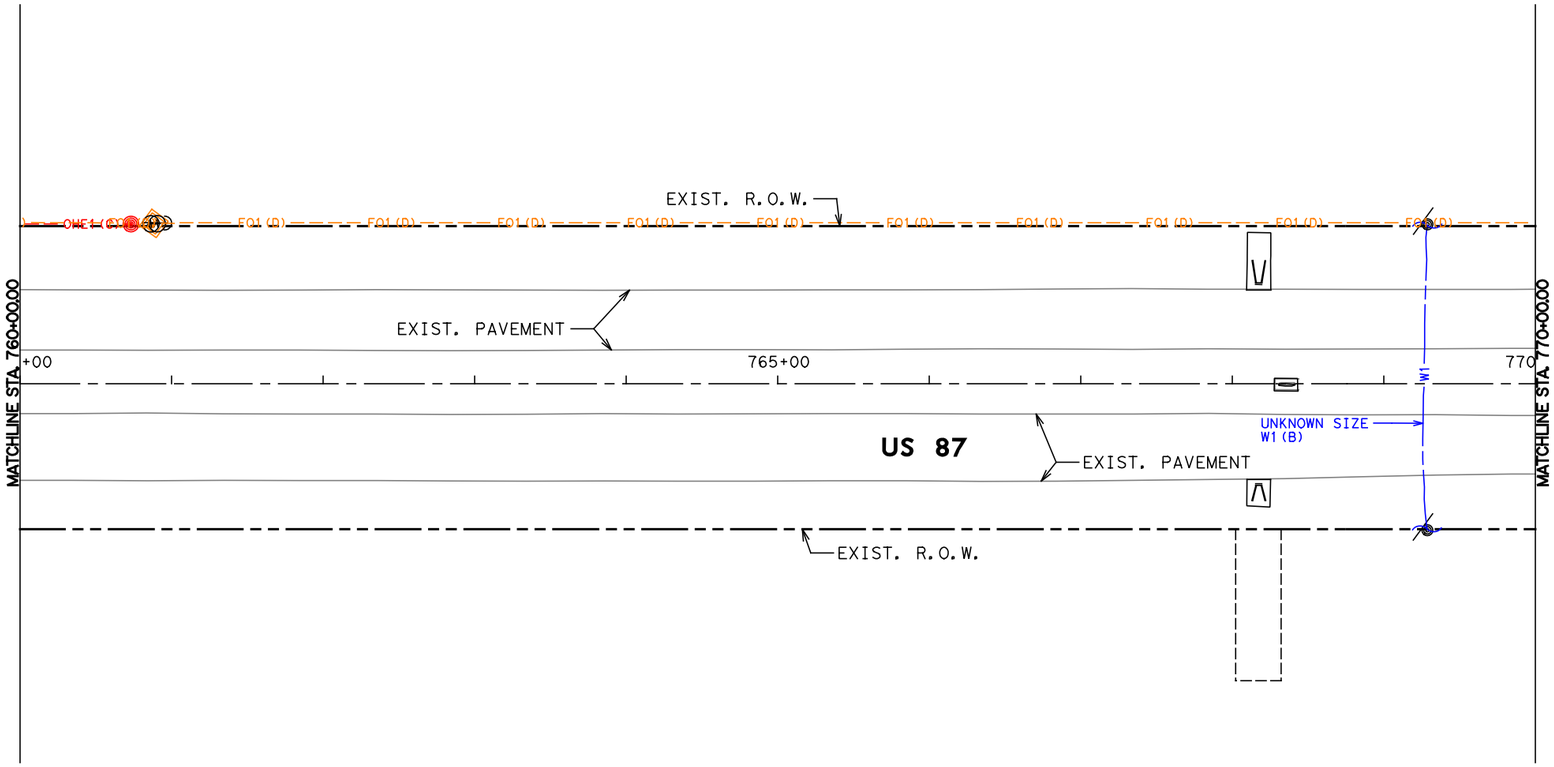

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 760+00 TO STA. 770+00

SHEET 43 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	126
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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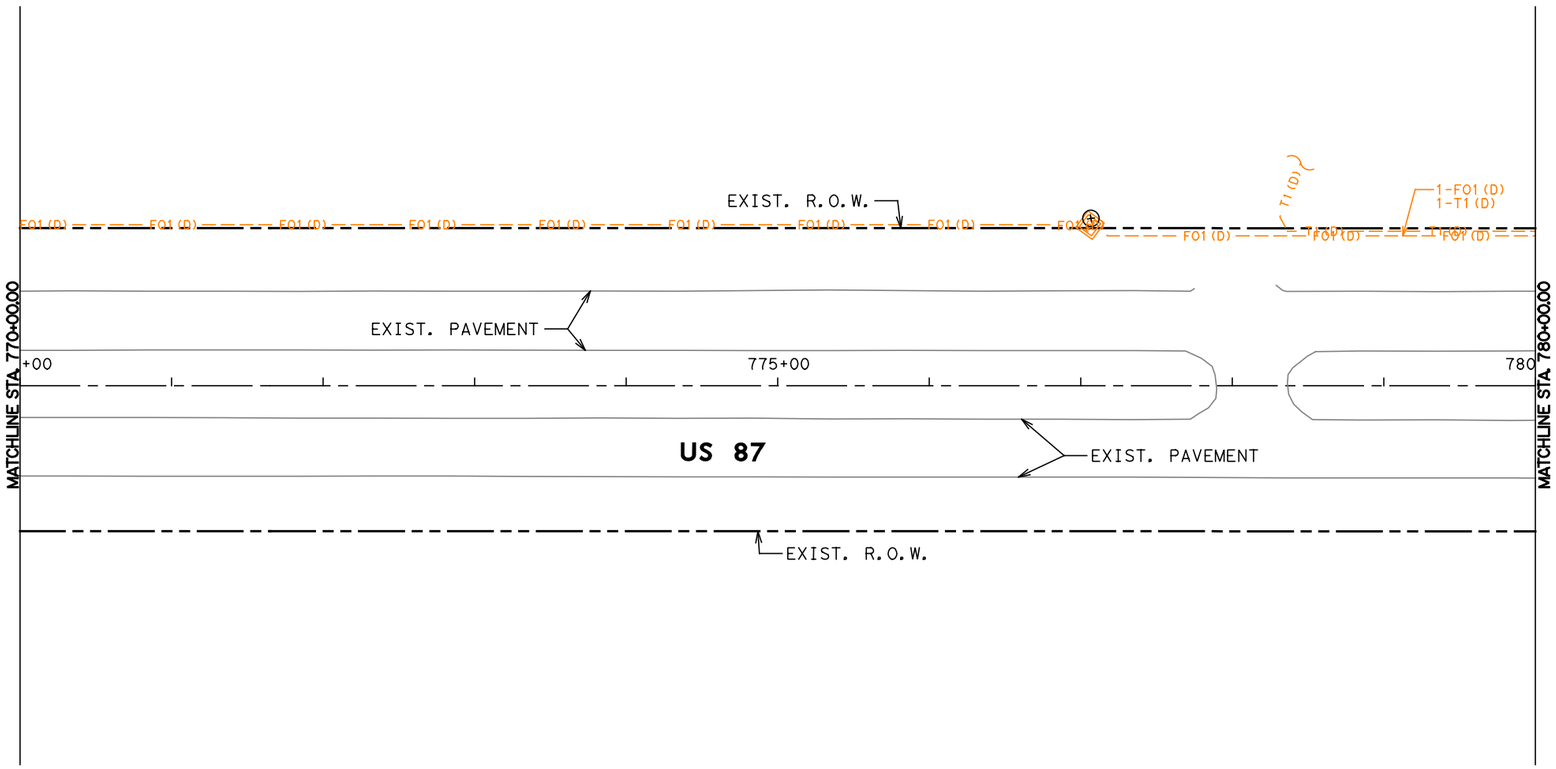

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 770+00 TO STA. 780+00
SHEET 44 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	127
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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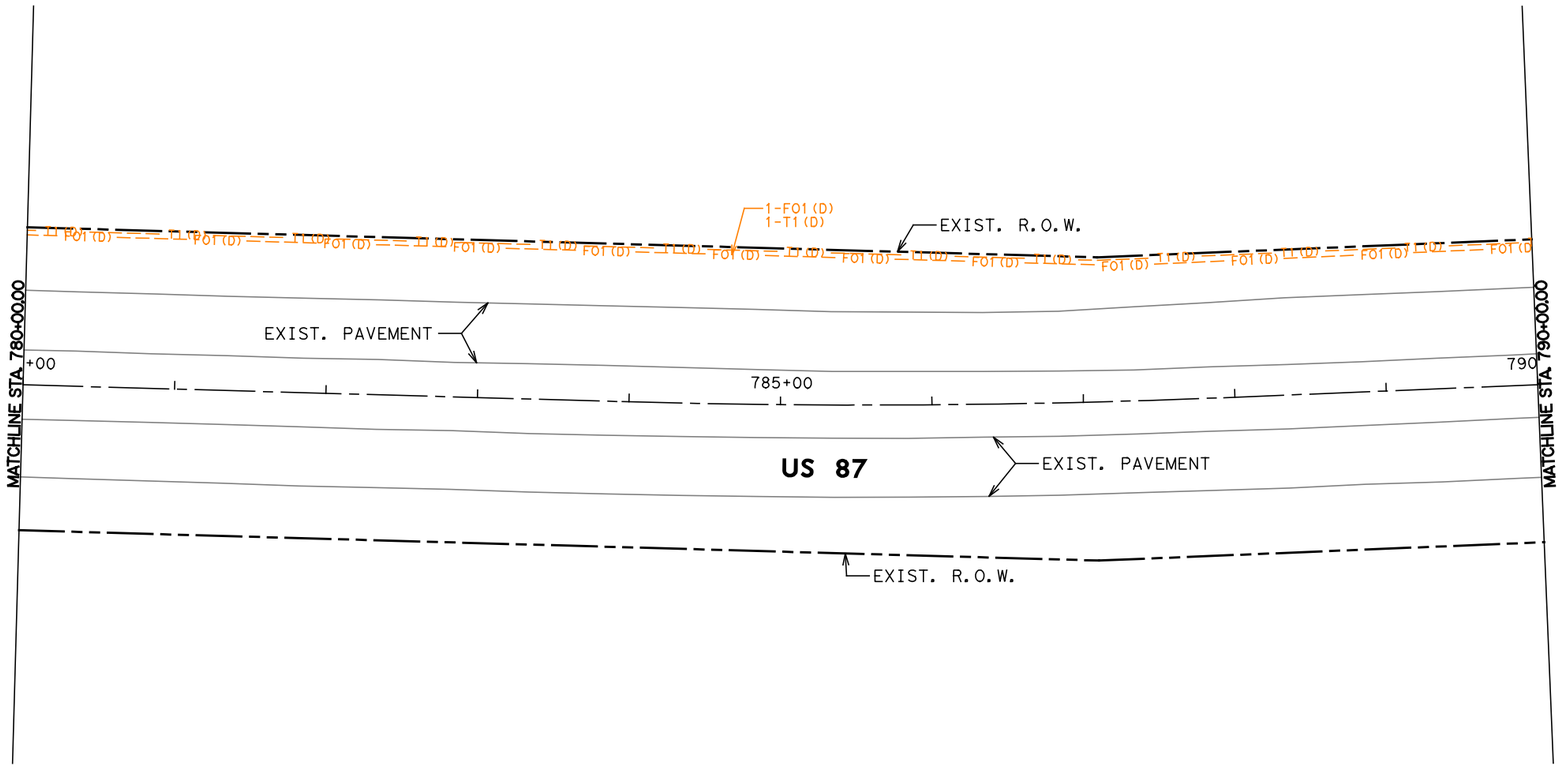

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 780+00 TO STA. 790+00
SHEET 45 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	128
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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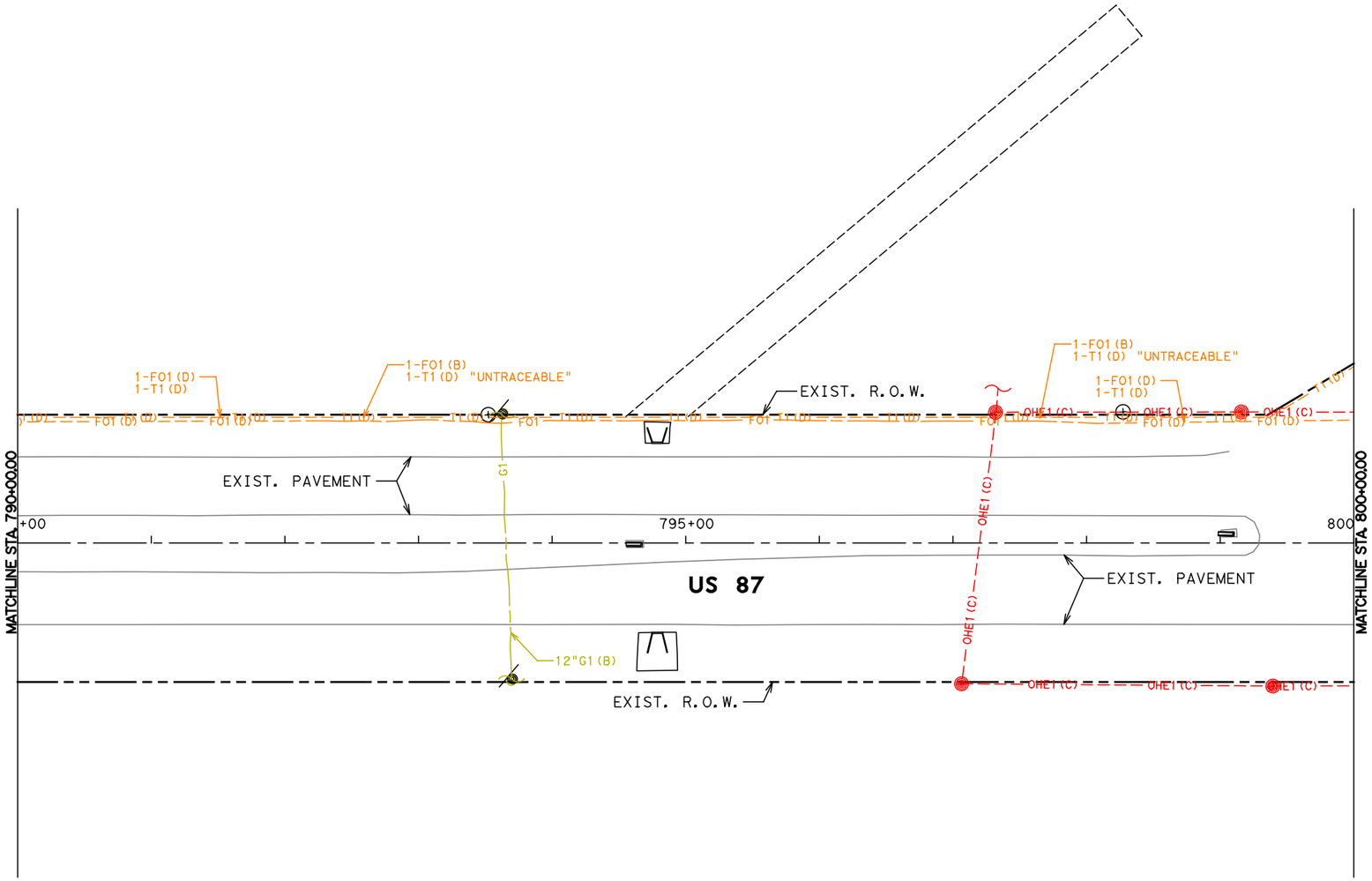

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
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129816
PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 790+00 TO STA. 800+00

SHEET 46 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	129
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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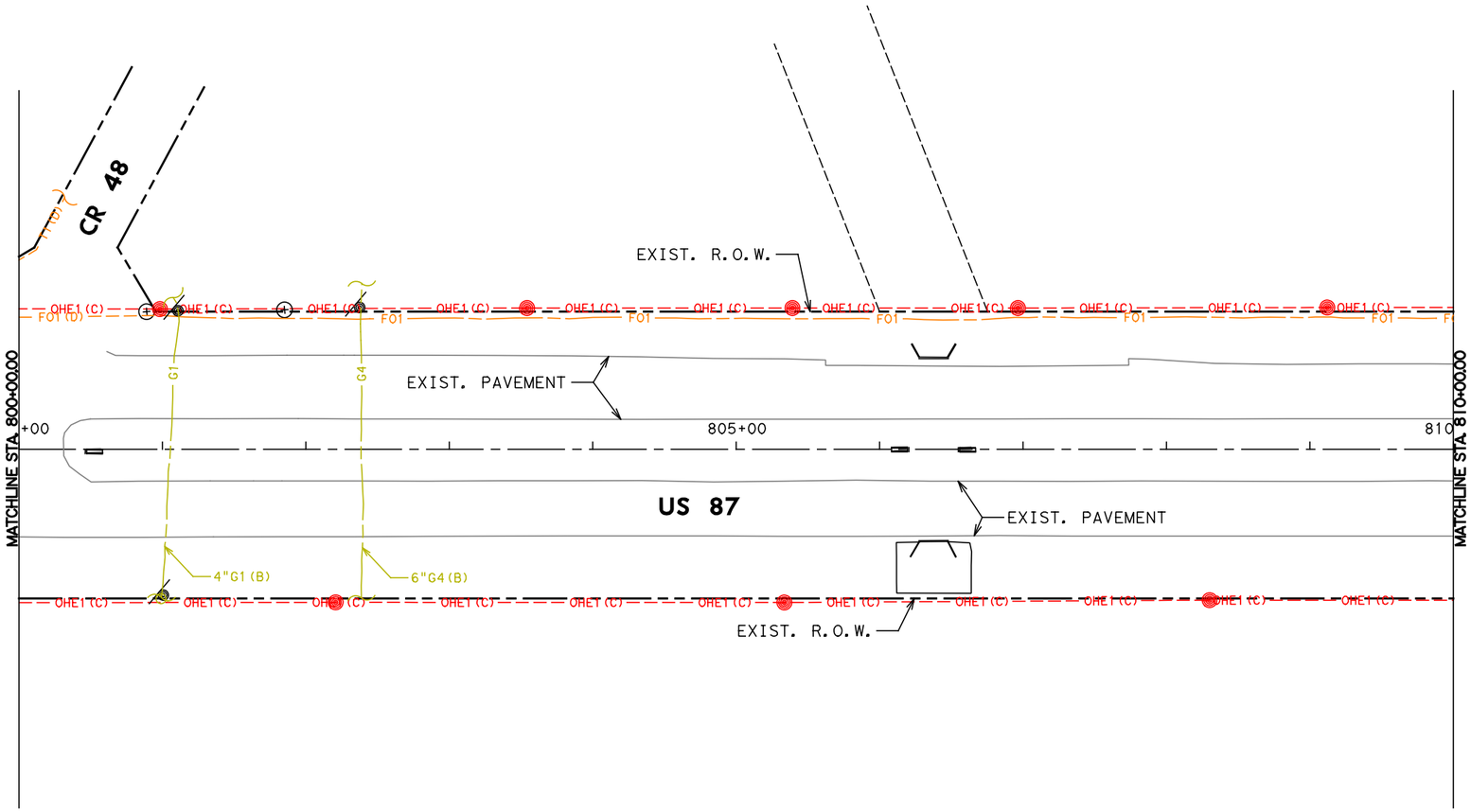

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 800+00 TO STA. 810+00
SHEET 47 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	130
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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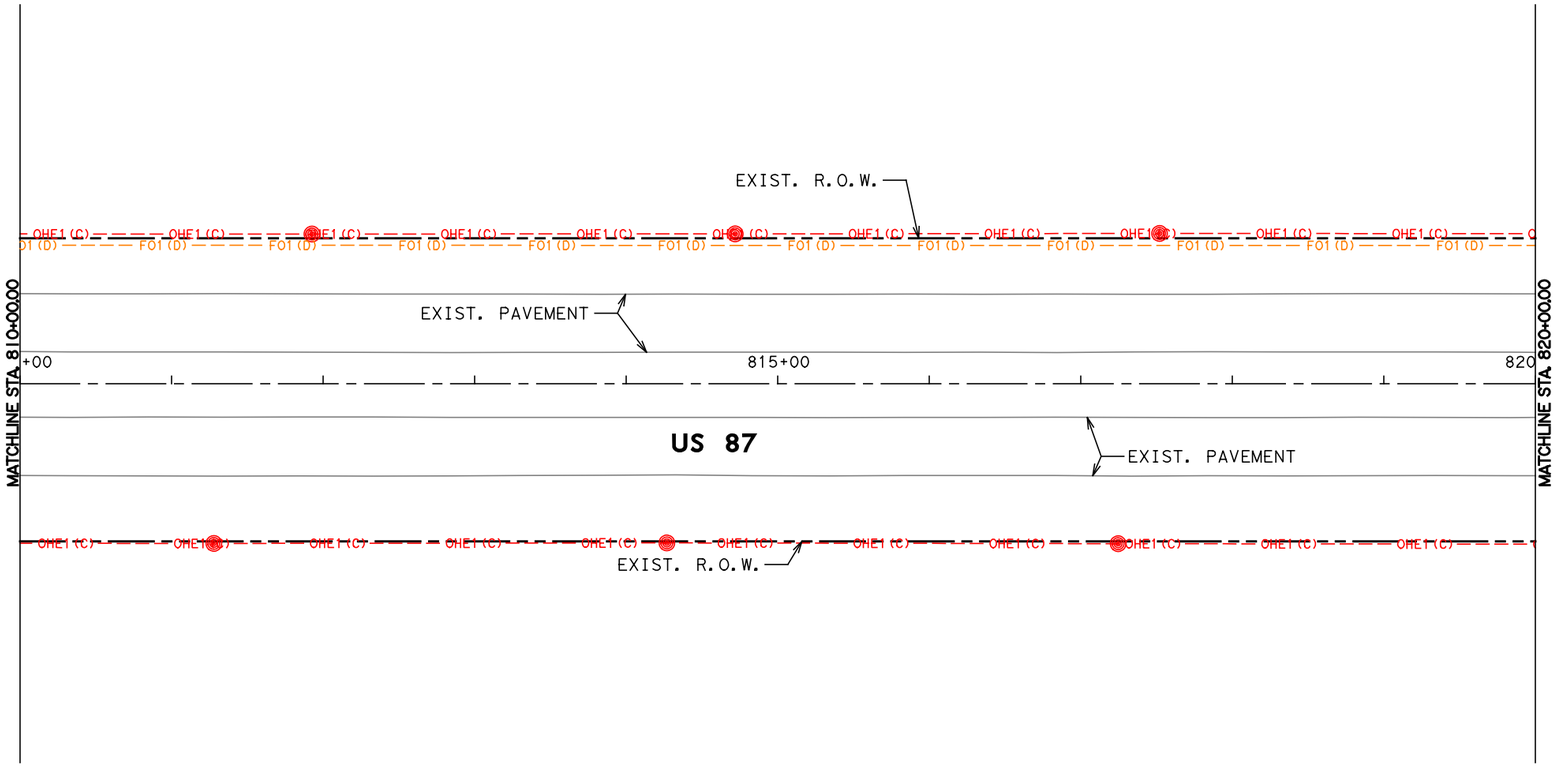

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
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5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 810+00 TO STA. 820+00

SHEET 48 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	131
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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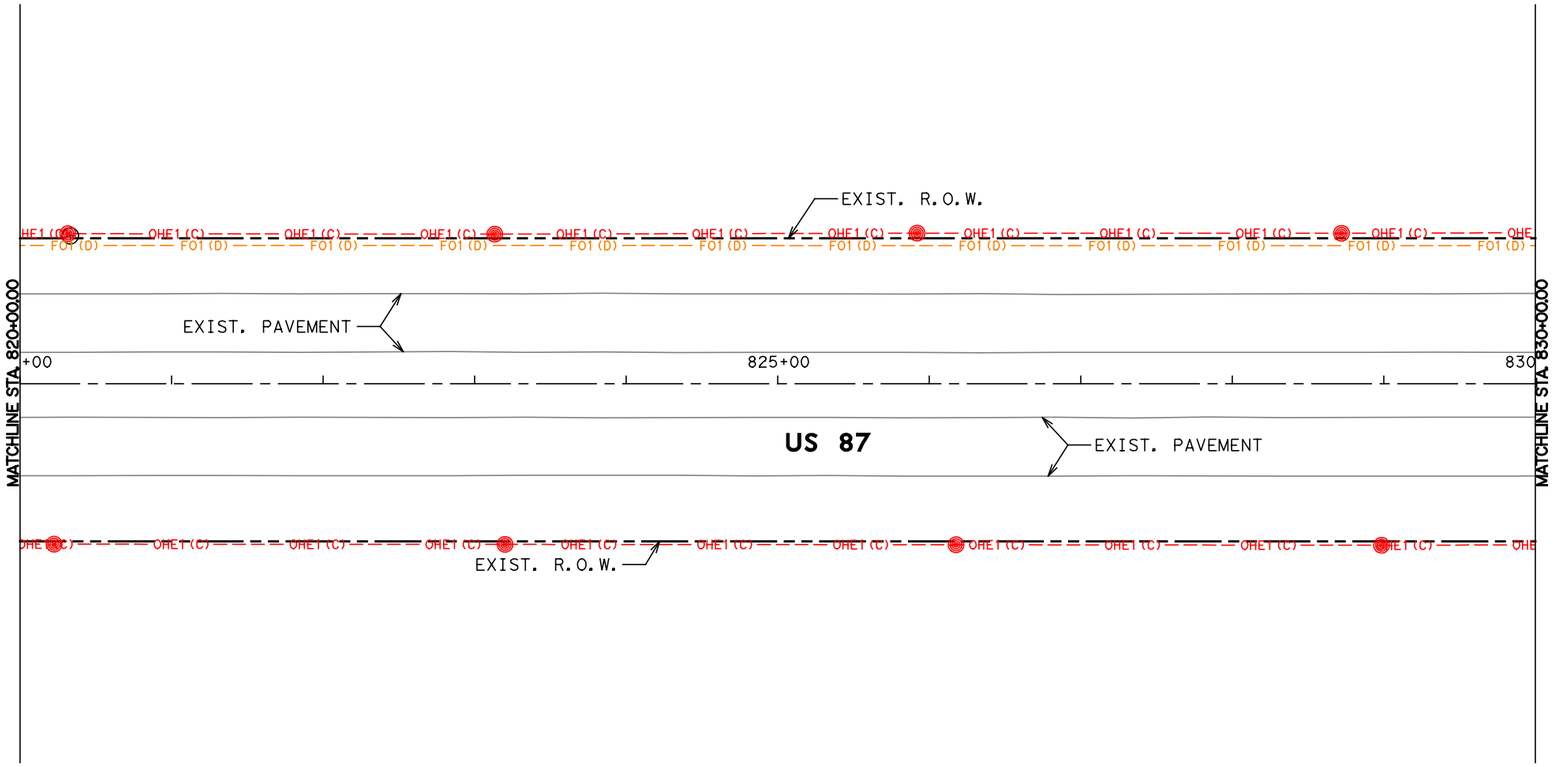

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 820+00 TO STA. 830+00
SHEET 49 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	132
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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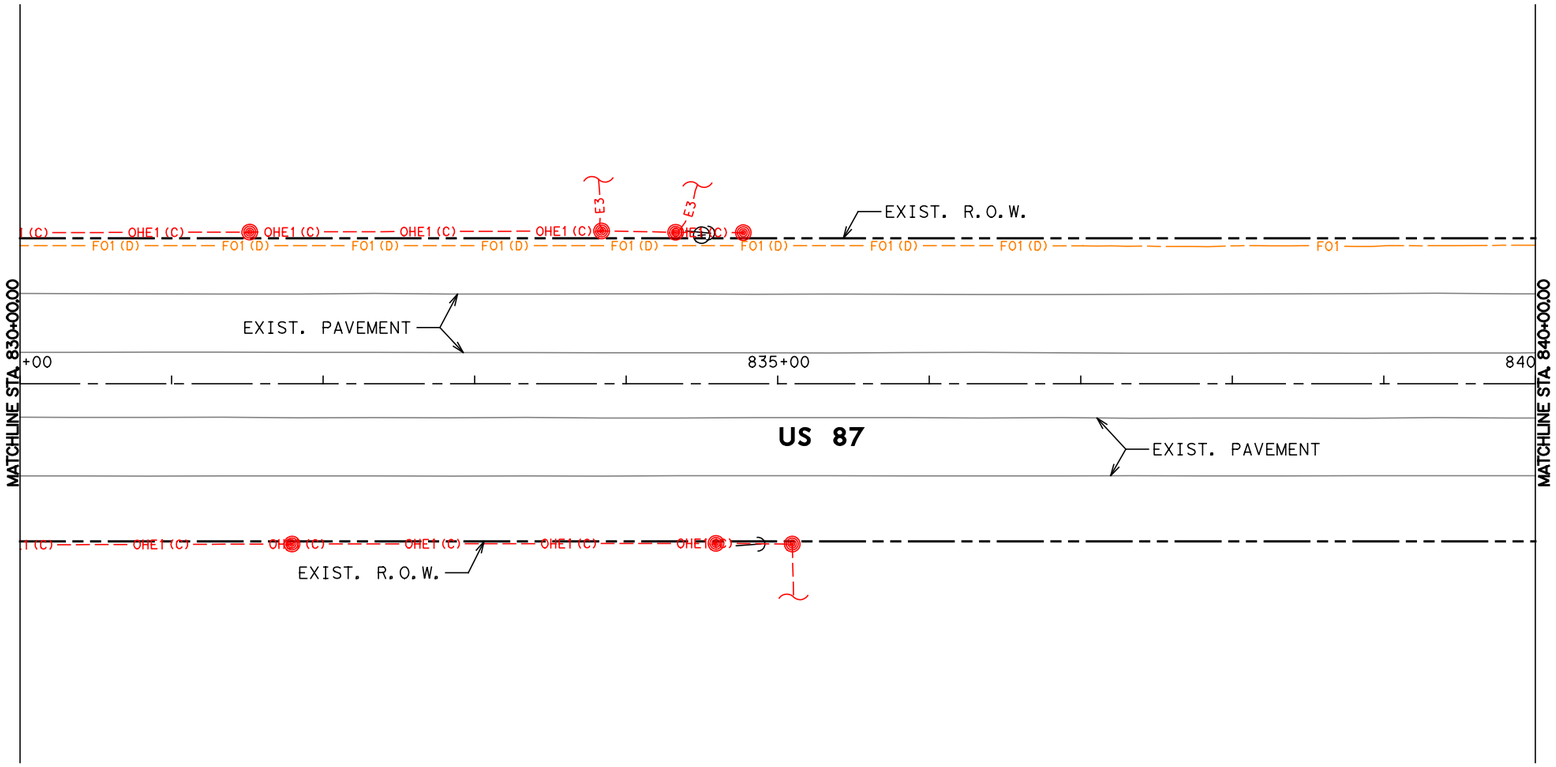

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 830+00 TO STA. 840+00

SHEET 50 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	133
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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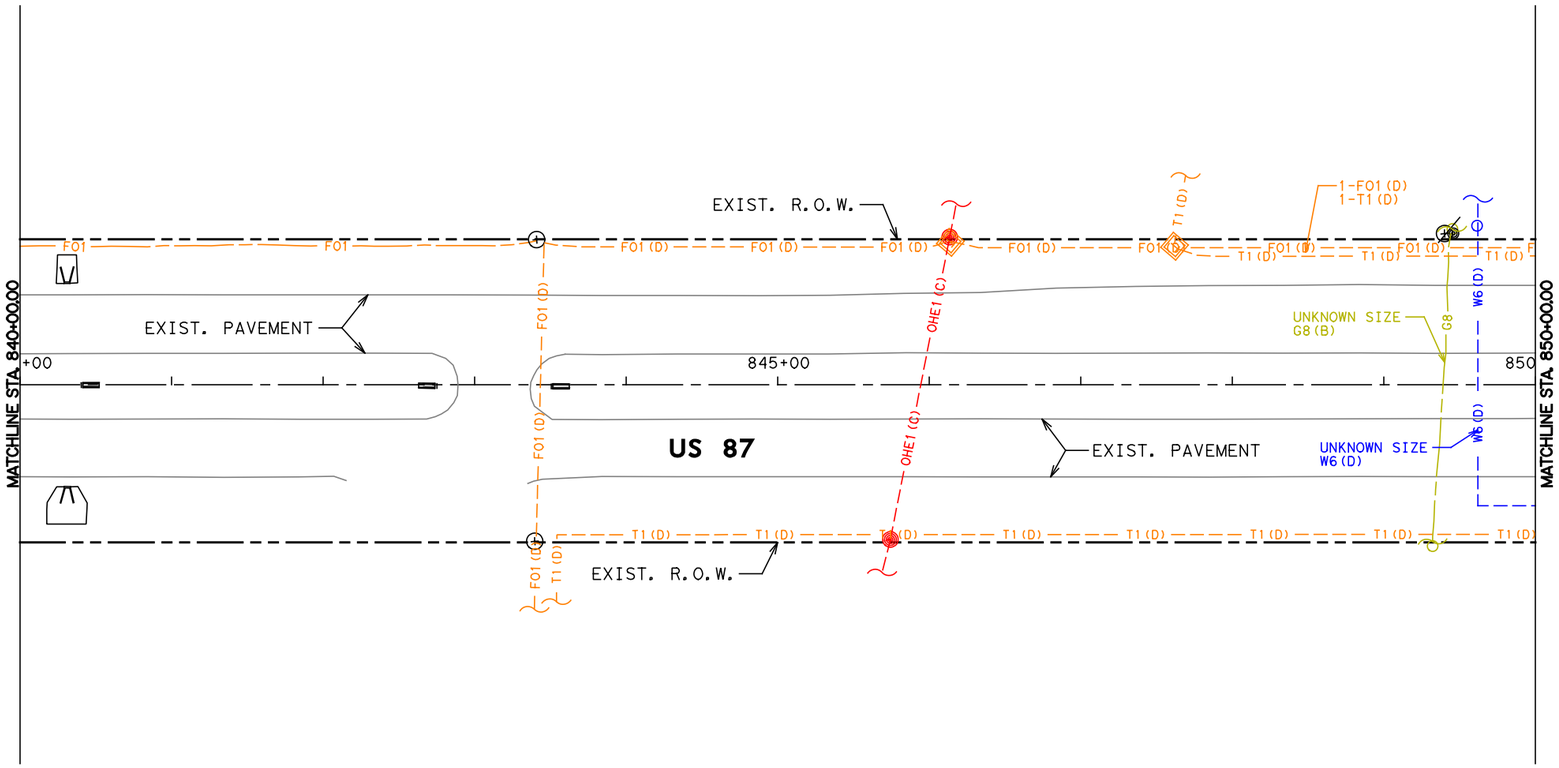

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 840+00 TO STA. 850+00
SHEET 51 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	134
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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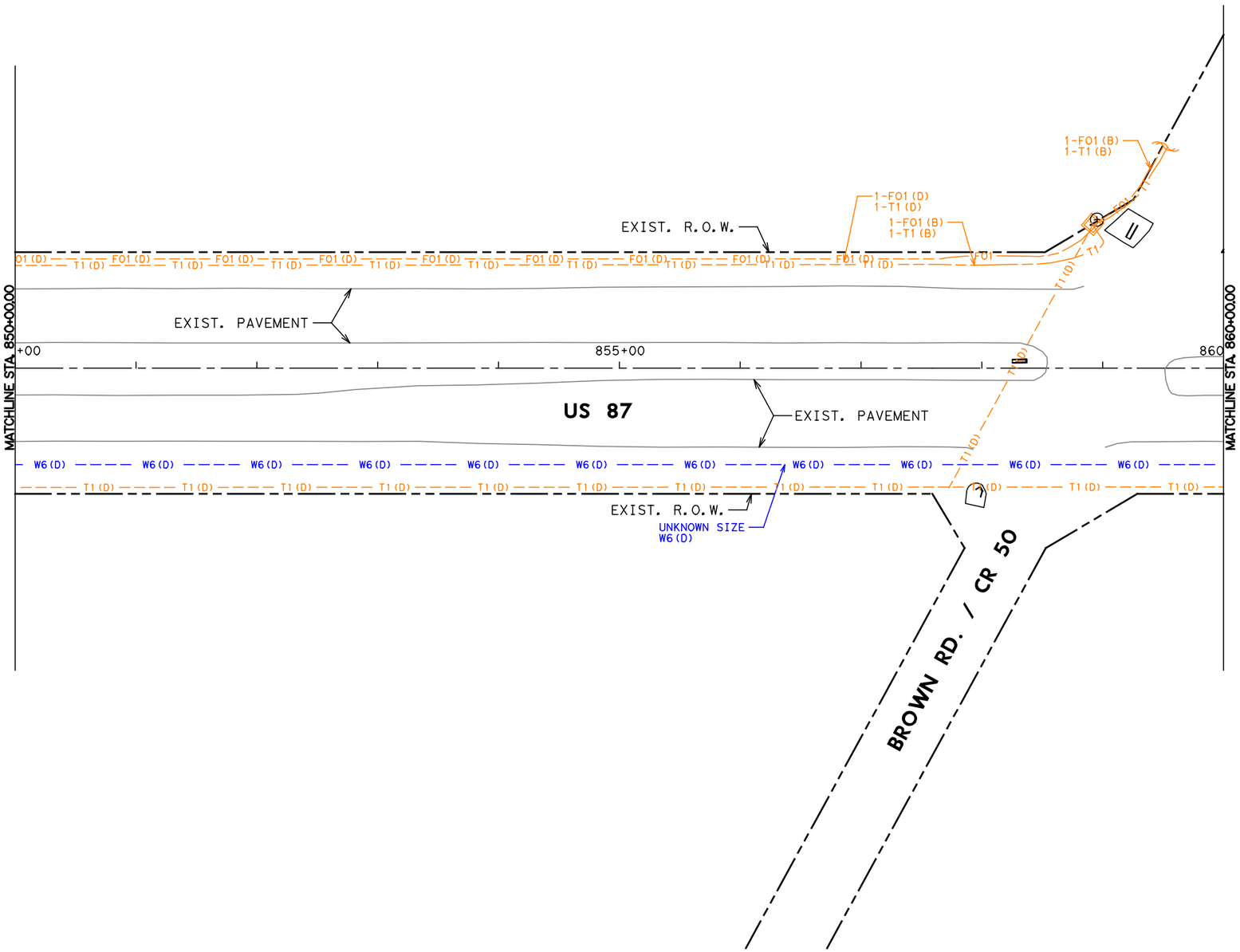

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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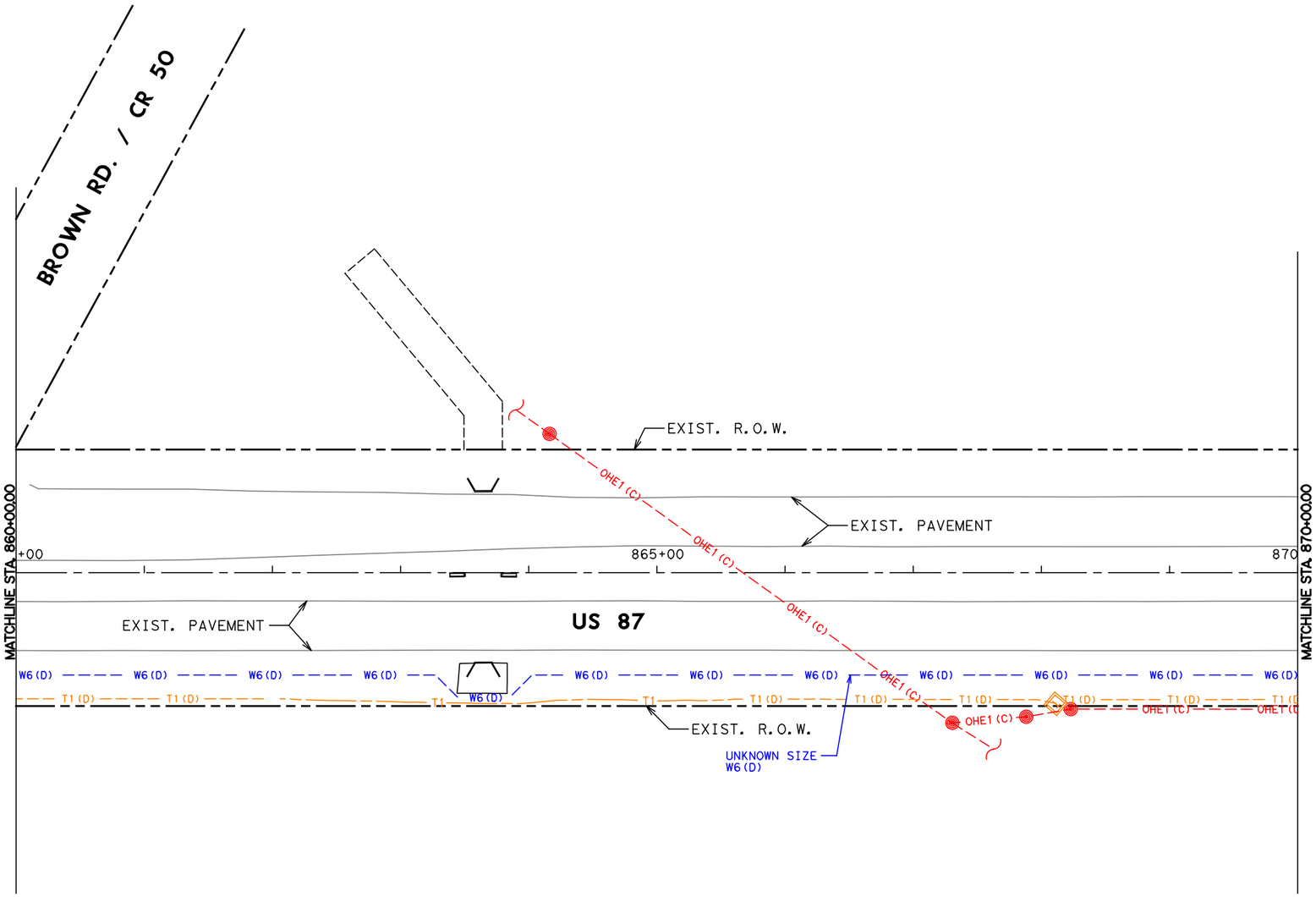
US 87
EXISTING UTILITY PLANS
FROM STA. 850+00 TO STA. 860+00
SHEET 52 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	135
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\Northn\135 EXISTING UTILITY PLANS.dgn
DATE: 5/26/2021 8:59:28 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 860+00 TO STA. 870+00
SHEET 53 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	136
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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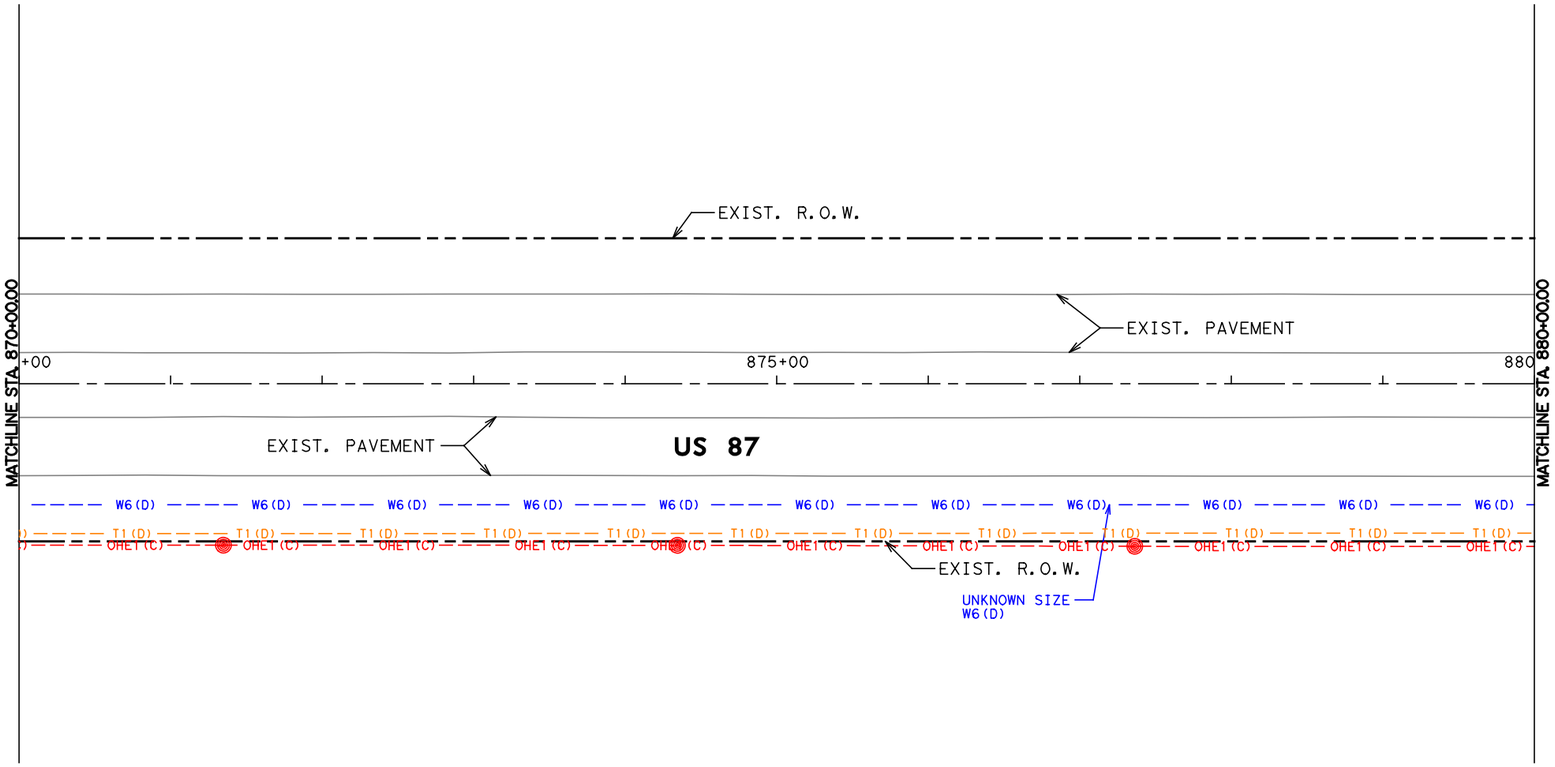

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 870+00 TO STA. 880+00

SHEET 54 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	137
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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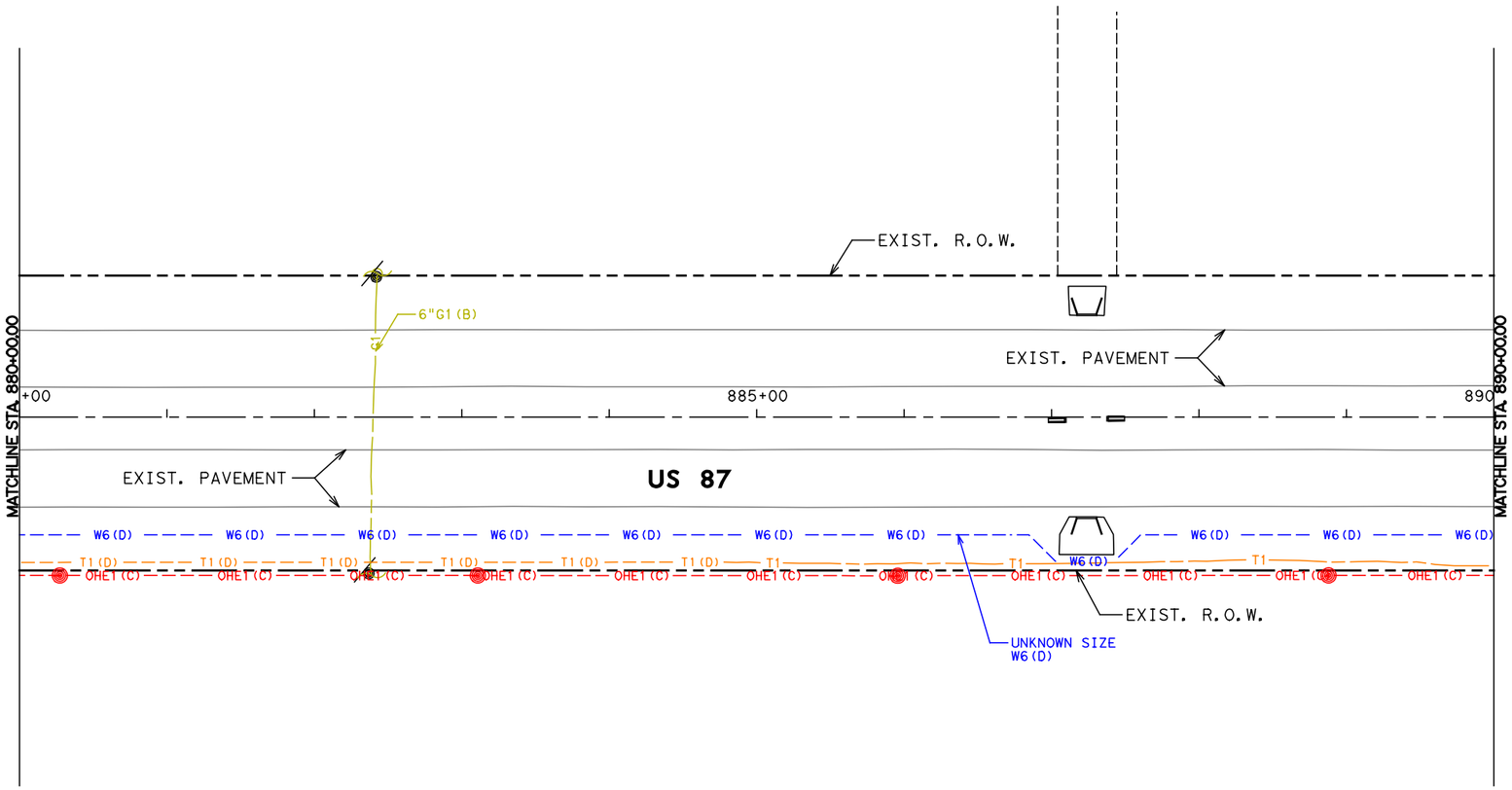

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 880+00 TO STA. 890+00

SHEET 55 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	138
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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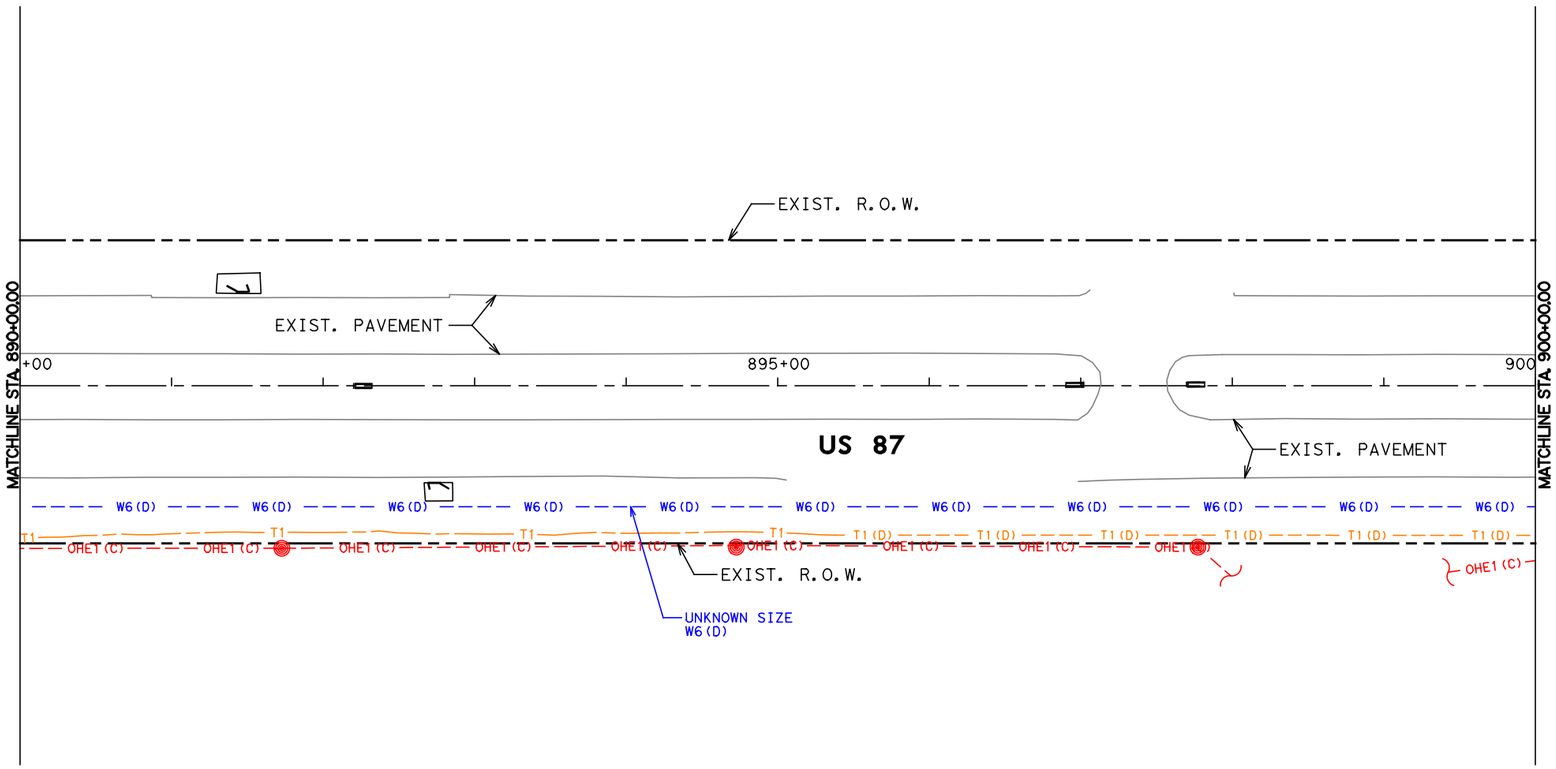

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 890+00 TO STA. 900+00
SHEET 56 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	139
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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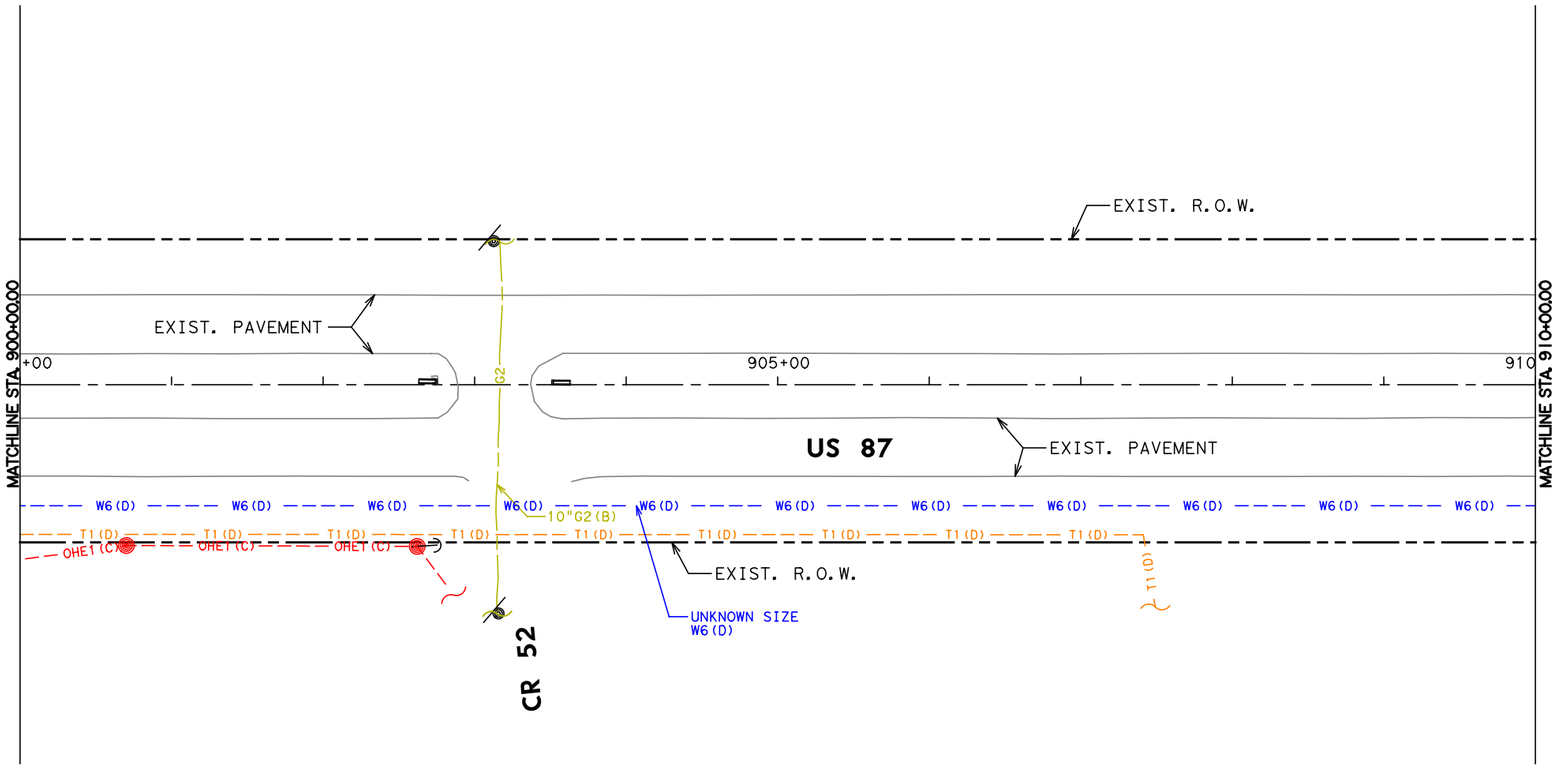

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 900+00 TO STA. 910+00

SHEET 57 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	140
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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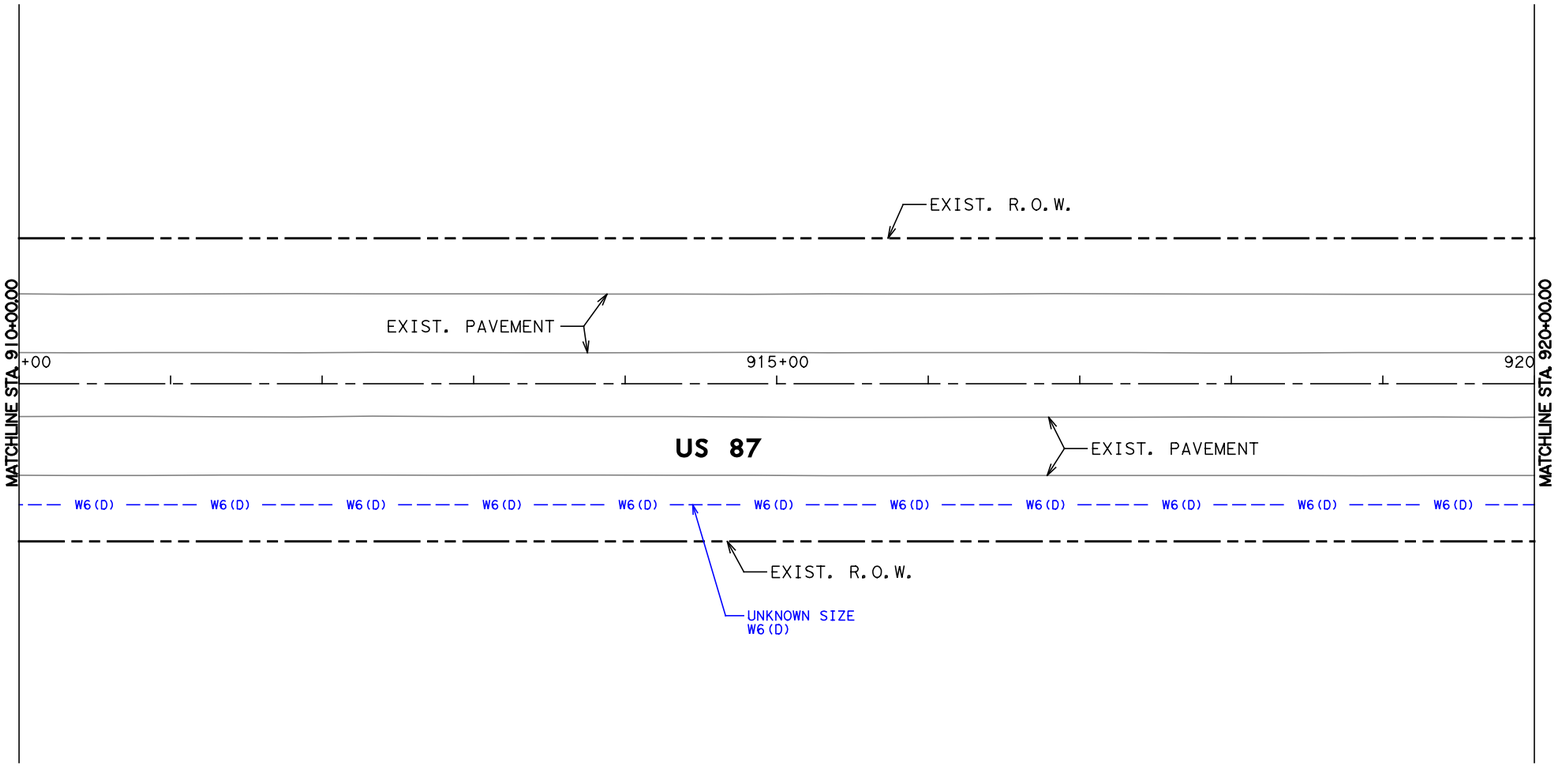

0 25 50 100

SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87

EXISTING UTILITY PLANS

FROM STA. 910+00 TO STA. 920+00

SHEET 58 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	141
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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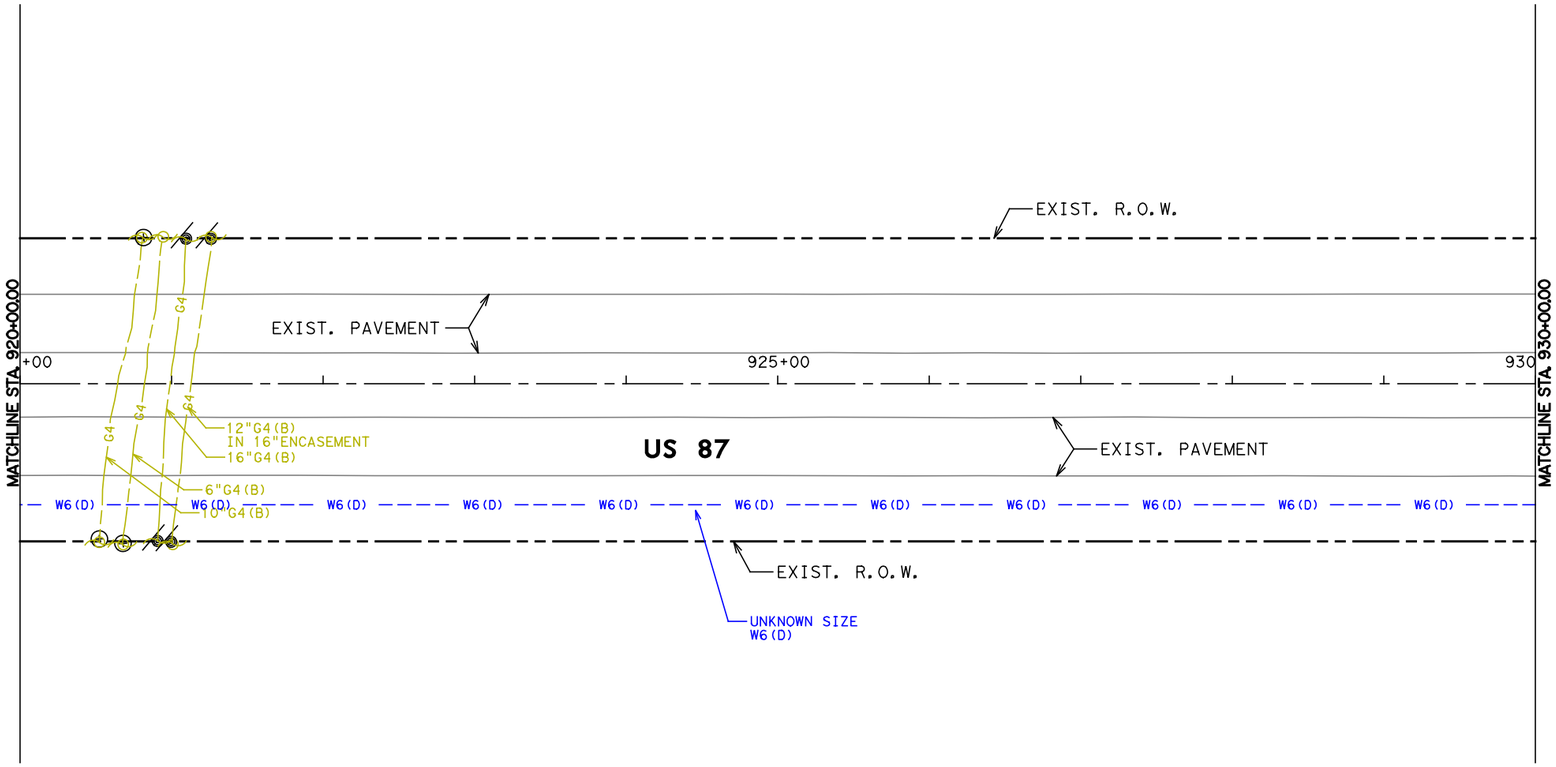

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 920+00 TO STA. 930+00
SHEET 59 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	142
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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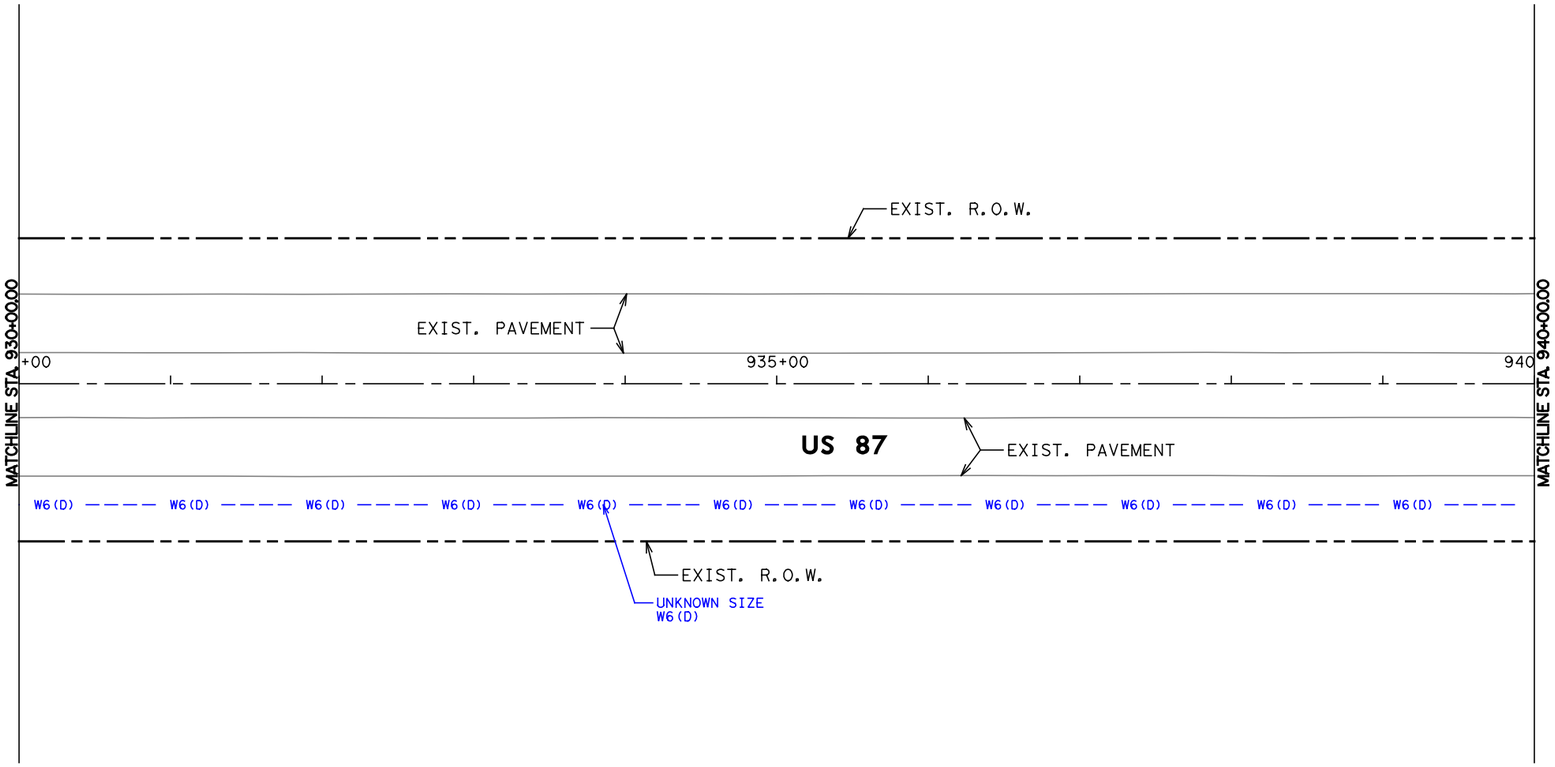

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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US 87
EXISTING UTILITY PLANS
FROM STA. 930+00 TO STA. 940+00
SHEET 60 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	143
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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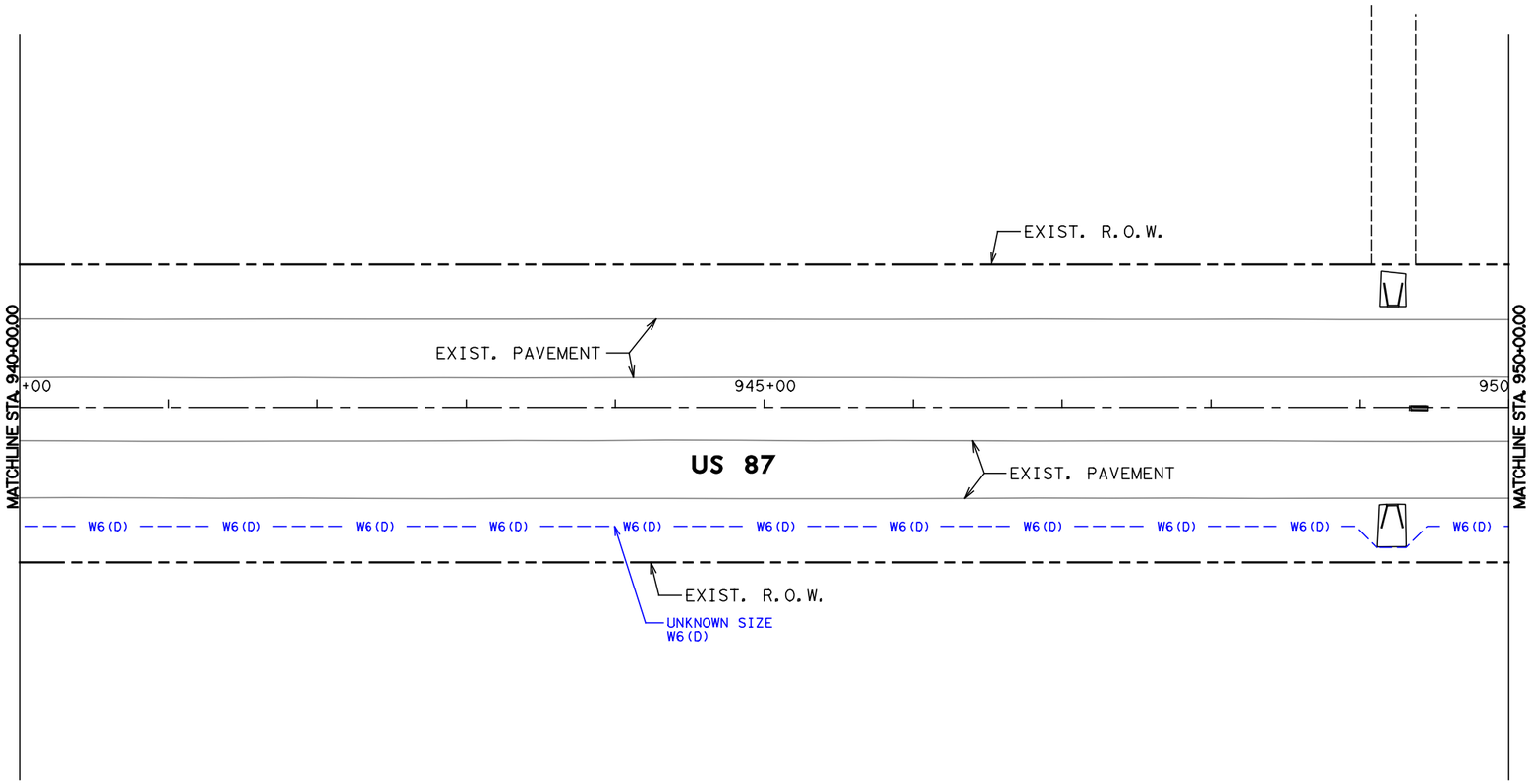

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

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US 87
EXISTING UTILITY PLANS
FROM STA. 940+00 TO STA. 950+00

SHEET 61 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	144
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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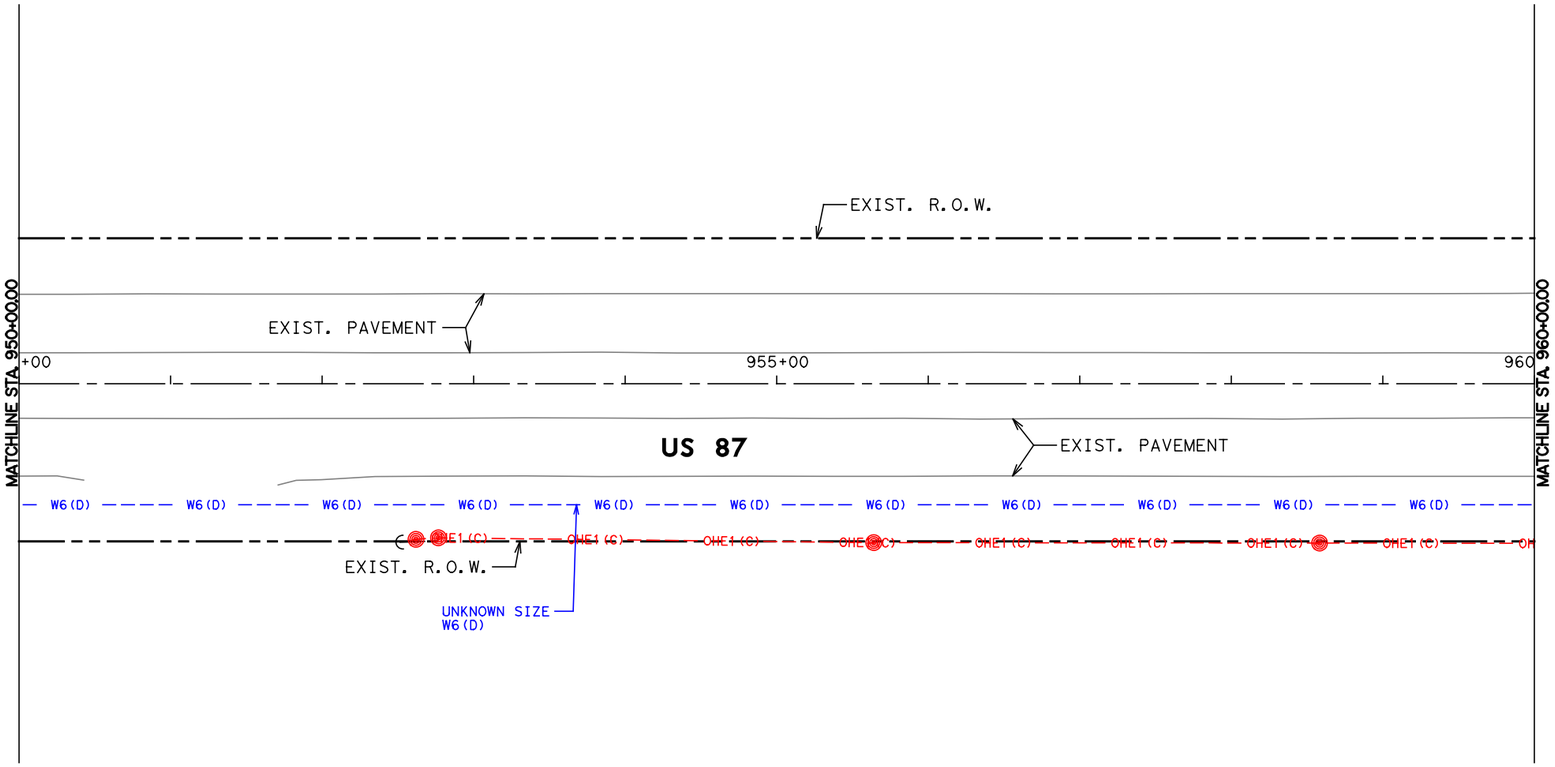

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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Curt Fakler
5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 950+00 TO STA. 960+00
SHEET 62 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	145
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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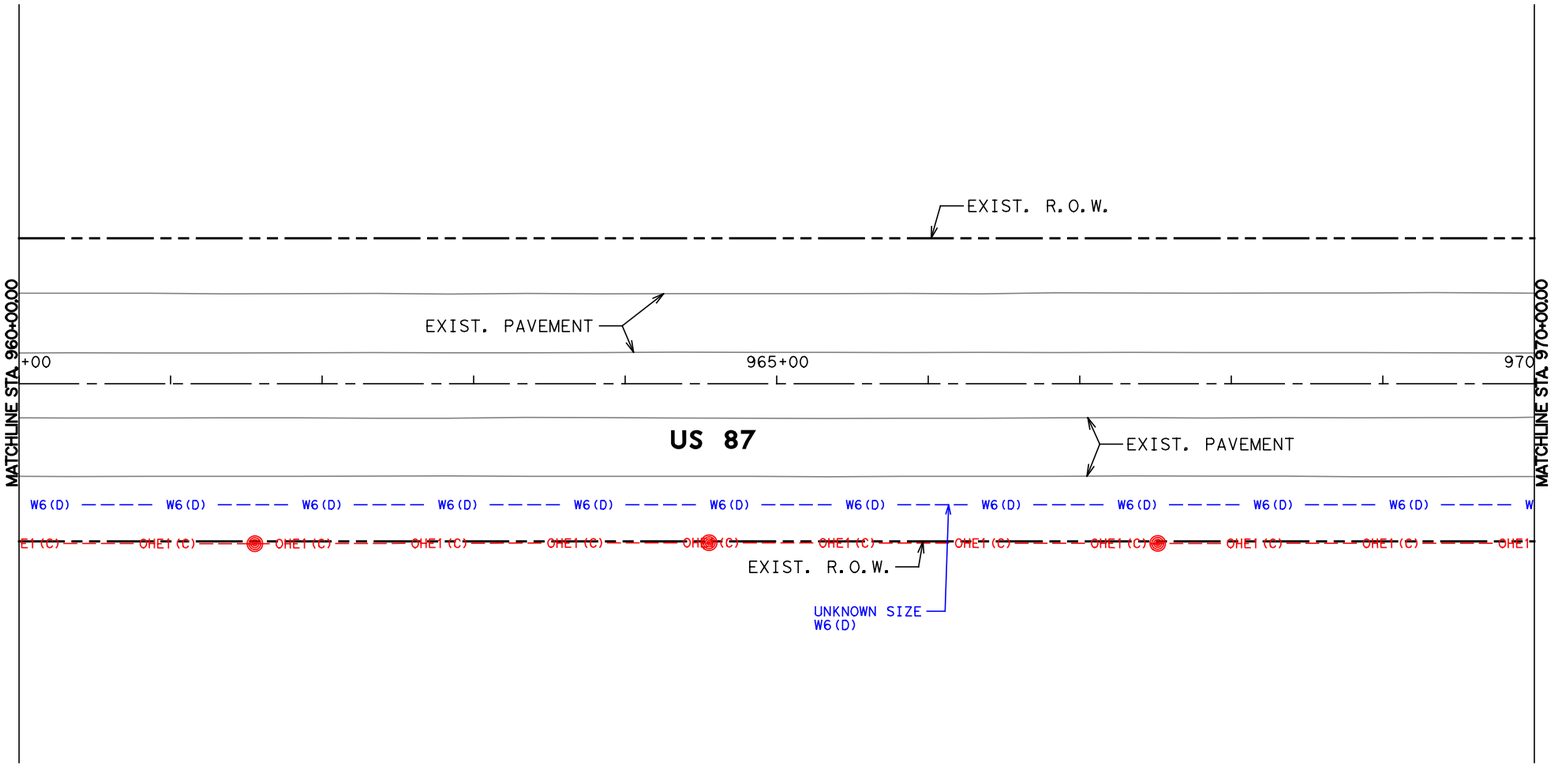

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 960+00 TO STA. 970+00

SHEET 63 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	146
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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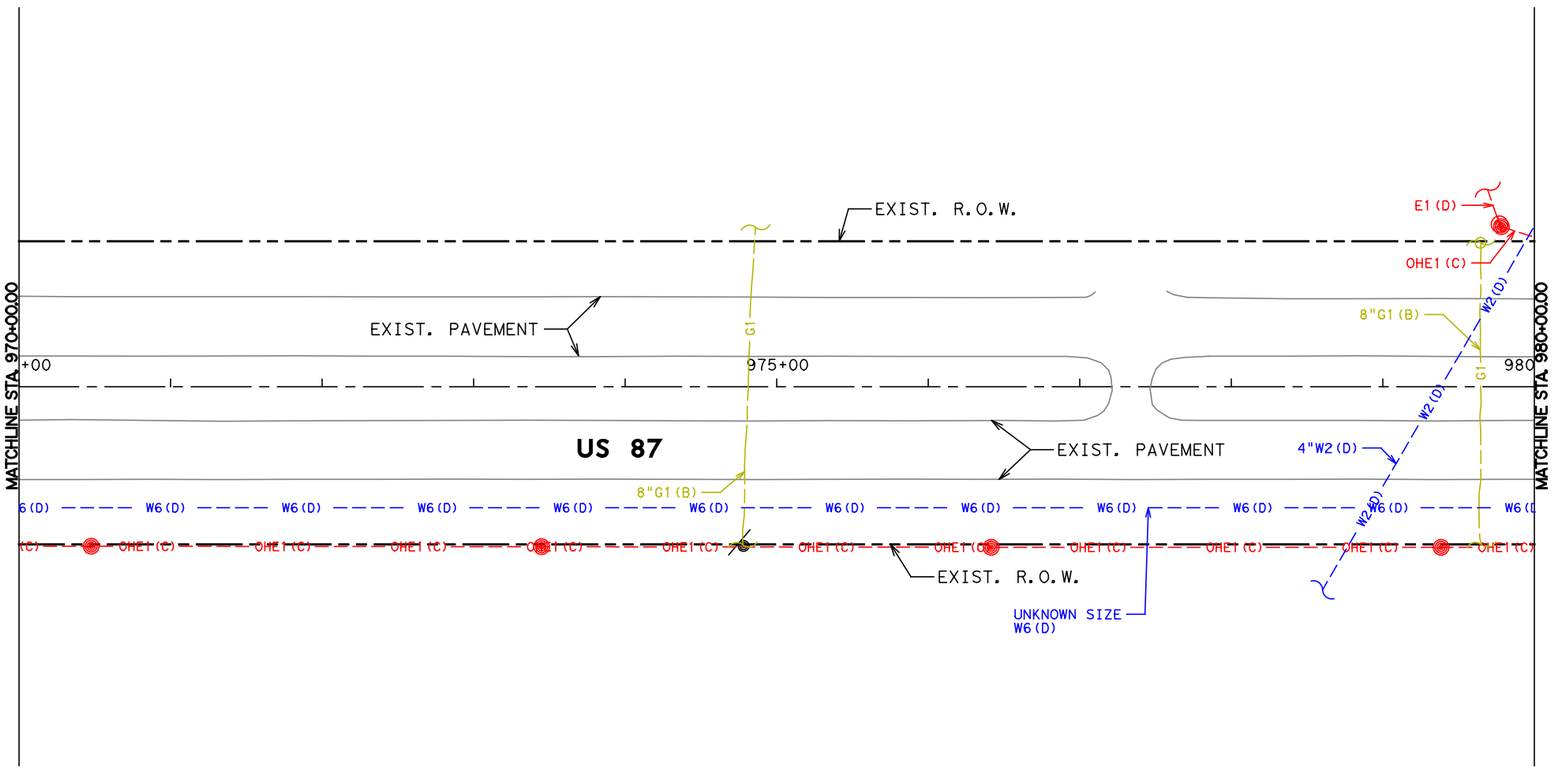

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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5/26/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 970+00 TO STA. 980+00
SHEET 64 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	147
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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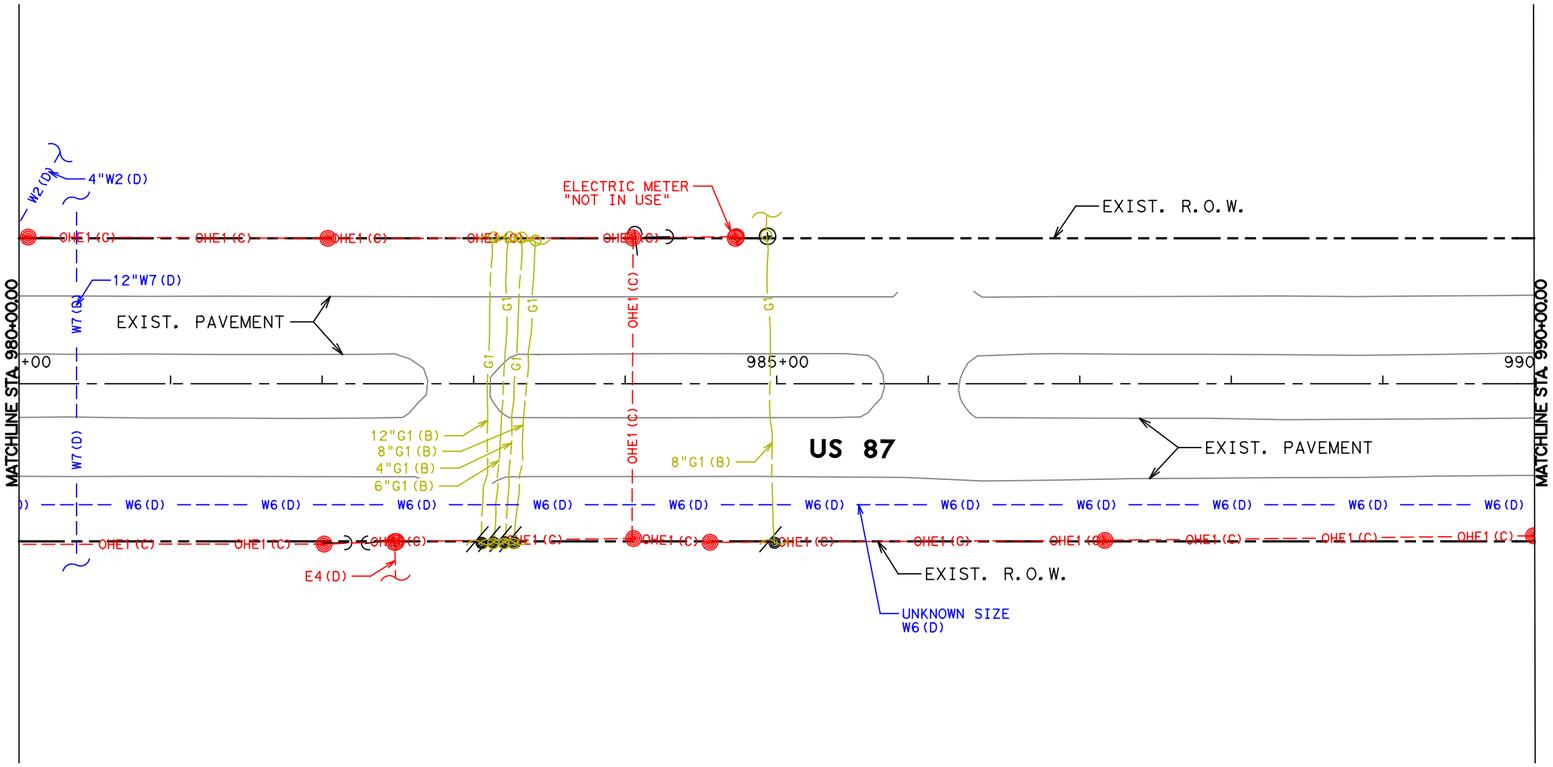

0 25 50 100
SCALE: 1" = 100' HOR.

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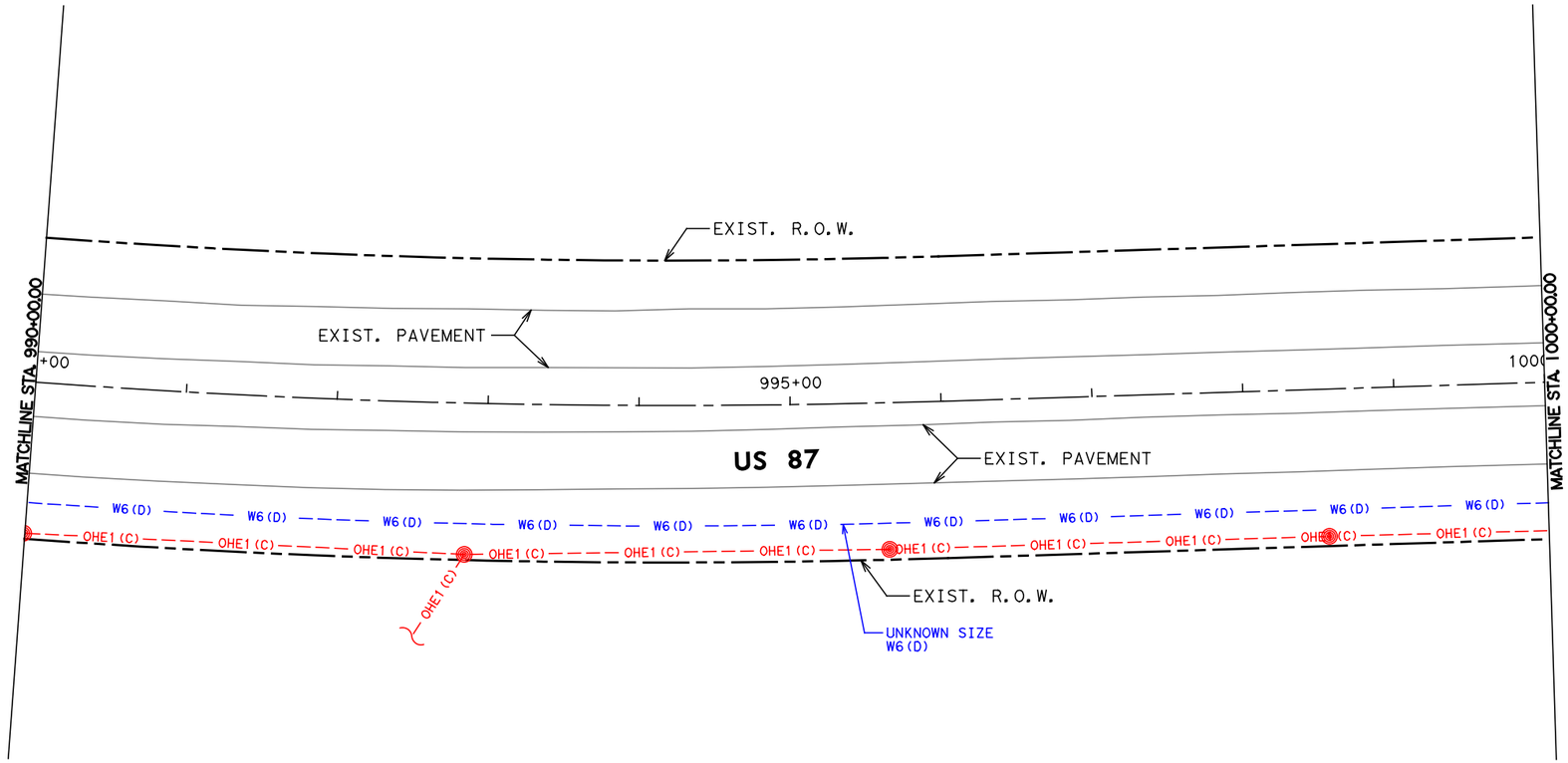
US 87
EXISTING UTILITY PLANS
FROM STA. 980+00 TO STA. 990+00

SHEET 65 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	148
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\148 EXISTING UTILITY PLANS.dgn
DATE: 5/26/2021 8:59:38 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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5/26/2021

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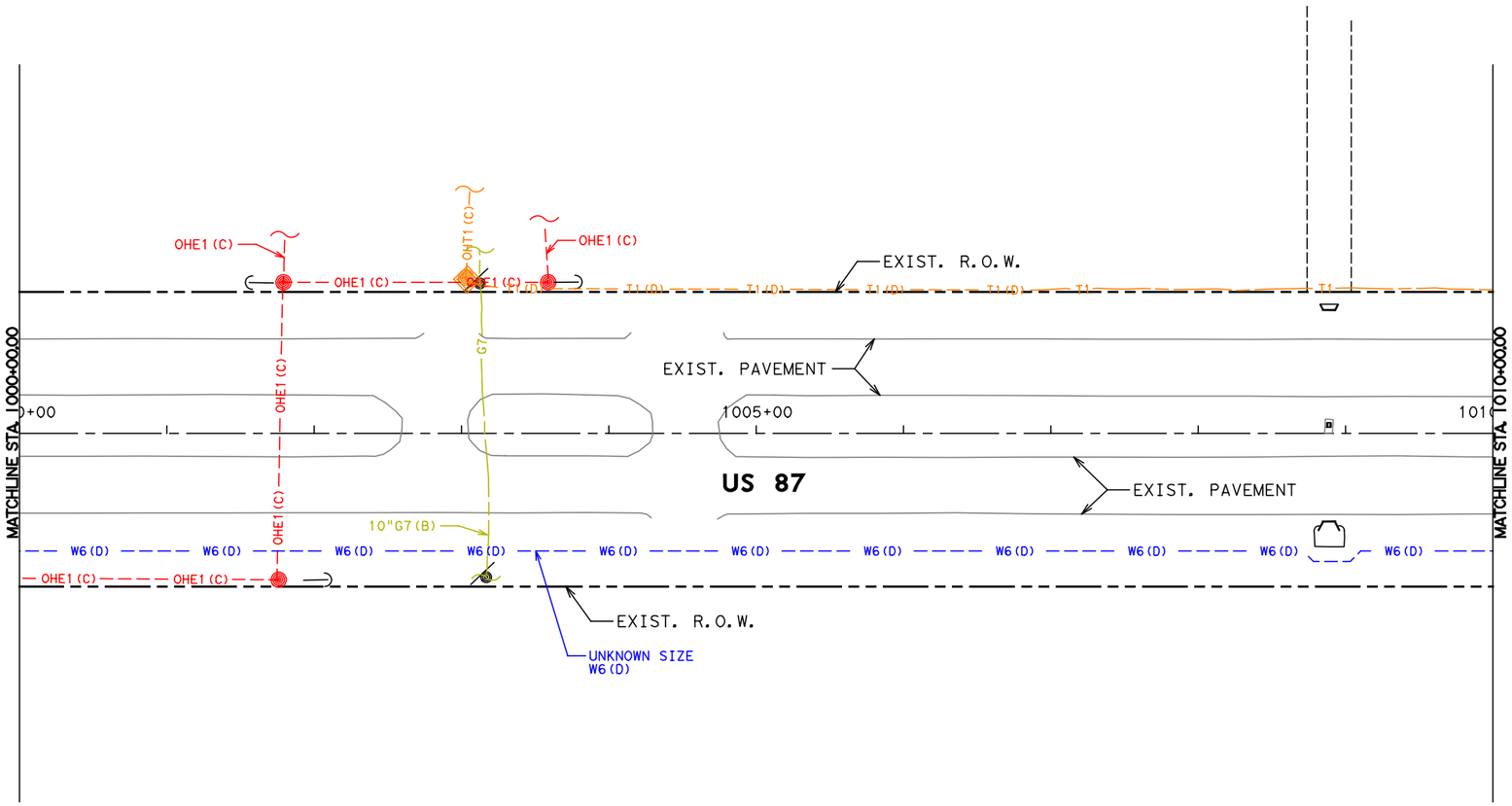
US 87
EXISTING UTILITY PLANS
FROM STA. 990+00 TO STA. 1000+00
SHEET 66 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	149
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\149 EXISTING UTILITY PLANS.dgn
DATE: 5/26/2021 8:59:38 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

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US 87
EXISTING UTILITY PLANS
FROM STA. 1000+00 TO STA. 1010+00
SHEET 67 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	150
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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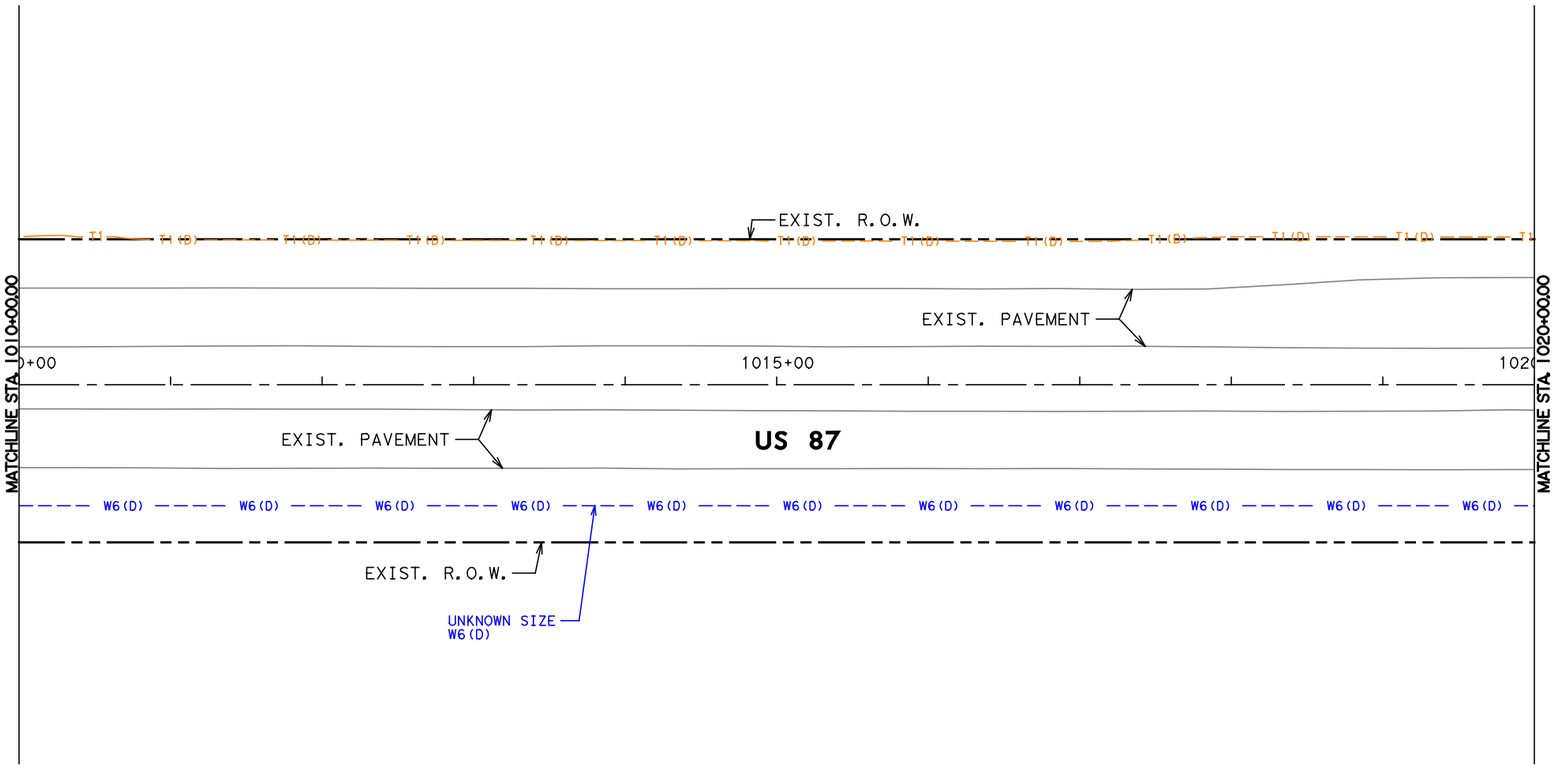
DATE: 5/26/2021 8:59:39 AM dsmyers



SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1010+00 TO STA. 1020+00

SHEET 68 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	151
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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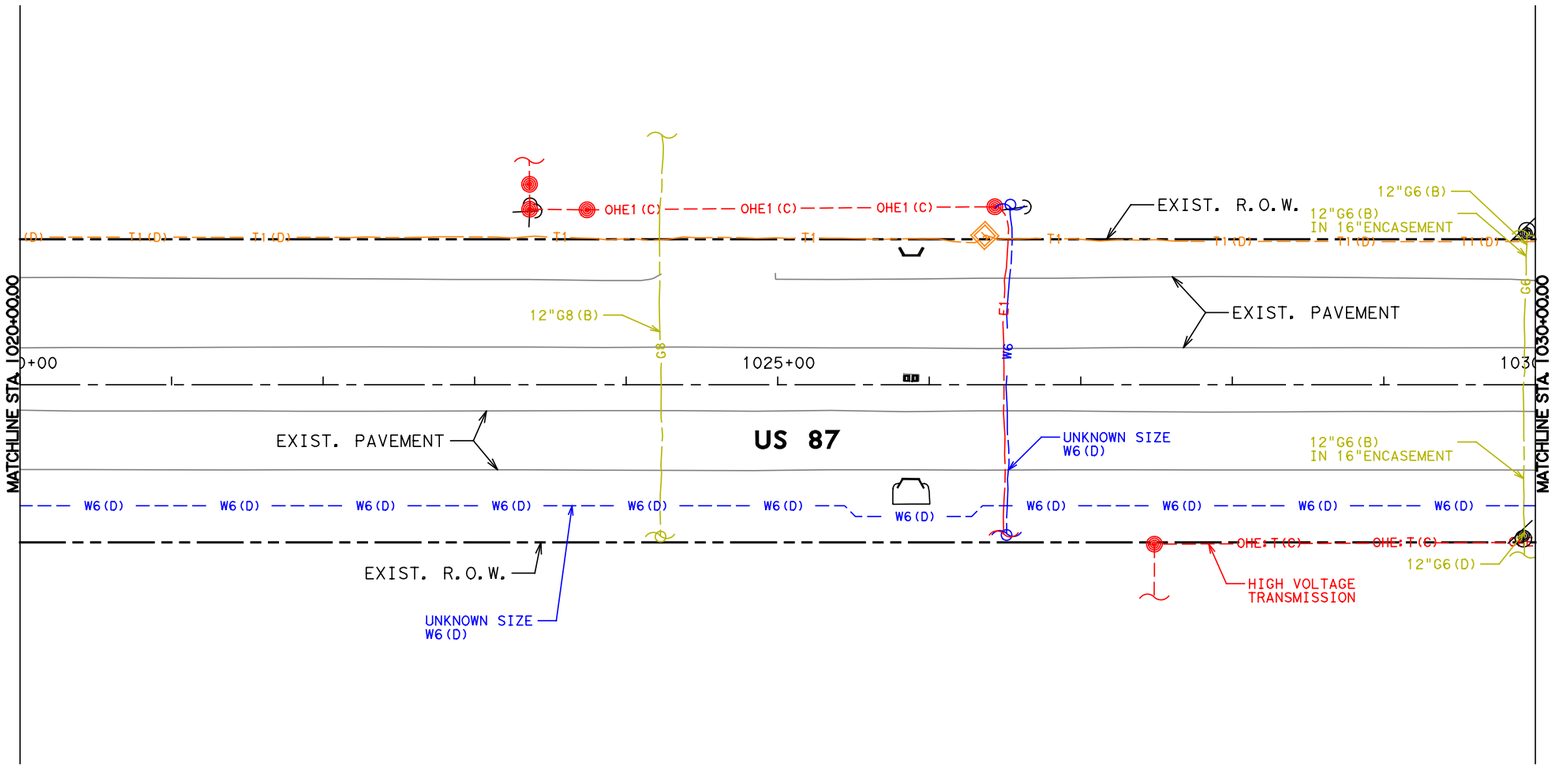

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp
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US 87
EXISTING UTILITY PLANS
FROM STA. 1020+00 TO STA. 1030+00
SHEET 69 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	152
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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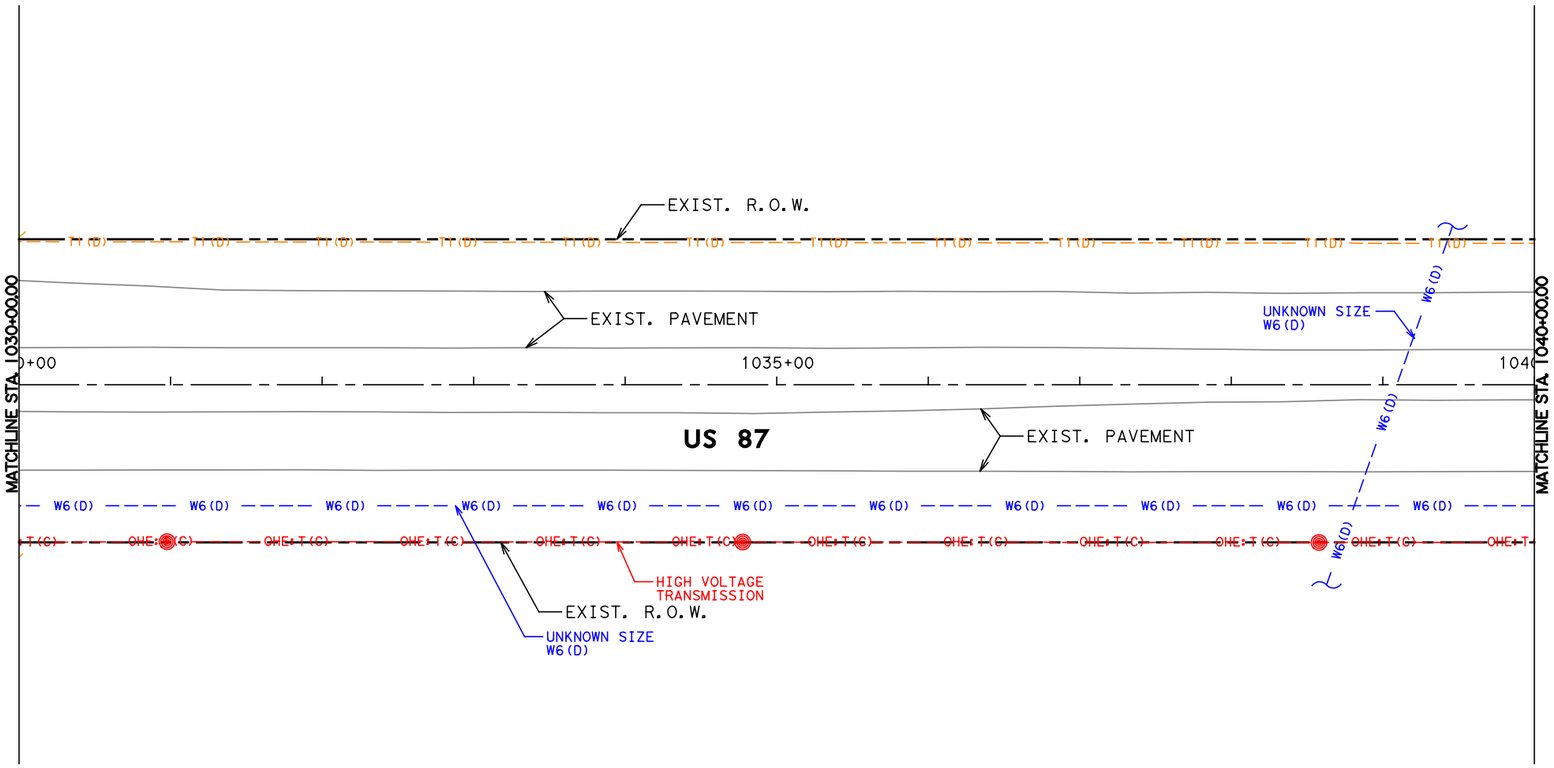

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1030+00 TO STA. 1040+00
SHEET 70 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	153
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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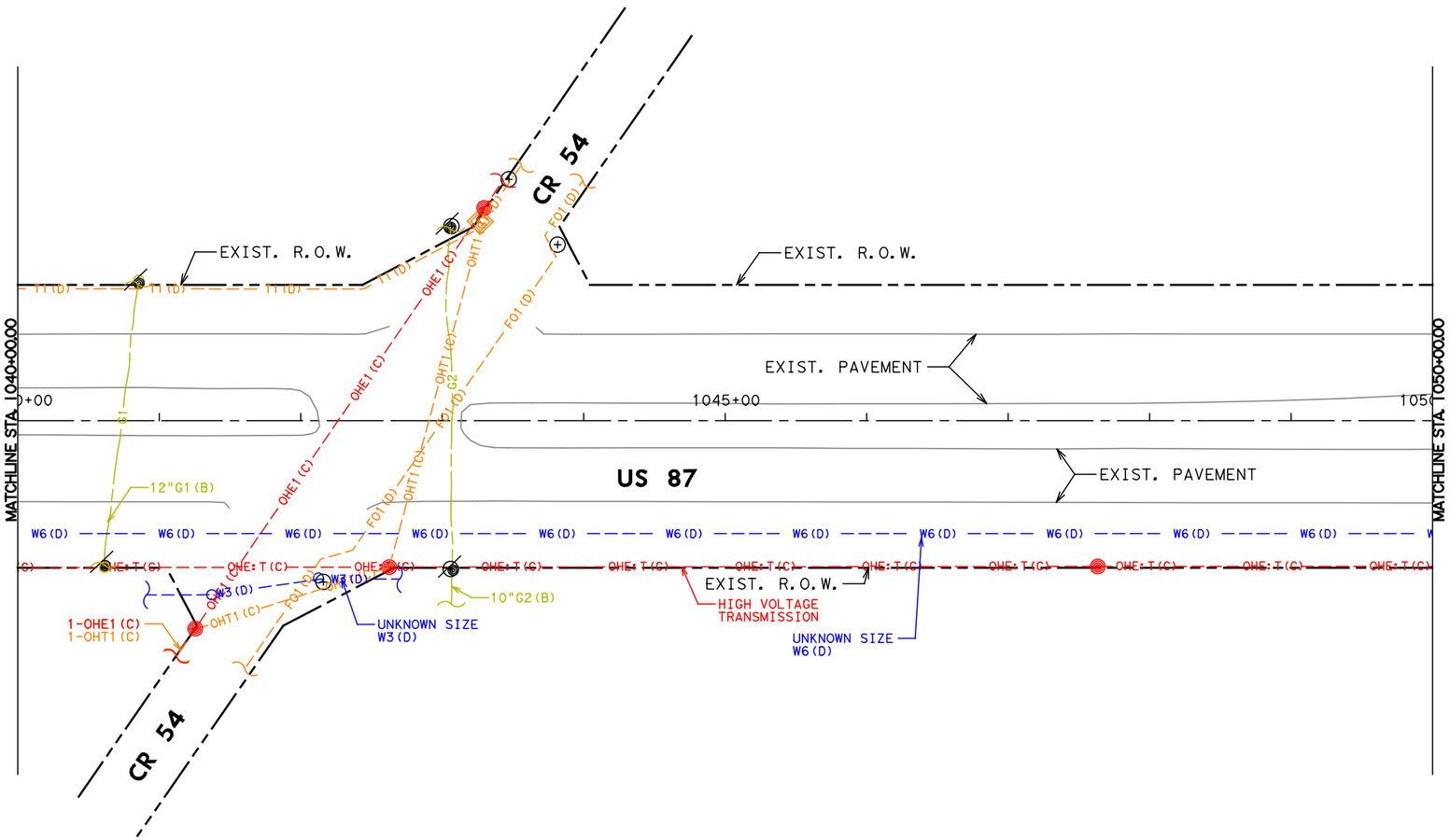

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1040+00 TO STA. 1050+00
SHEET 71 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	154
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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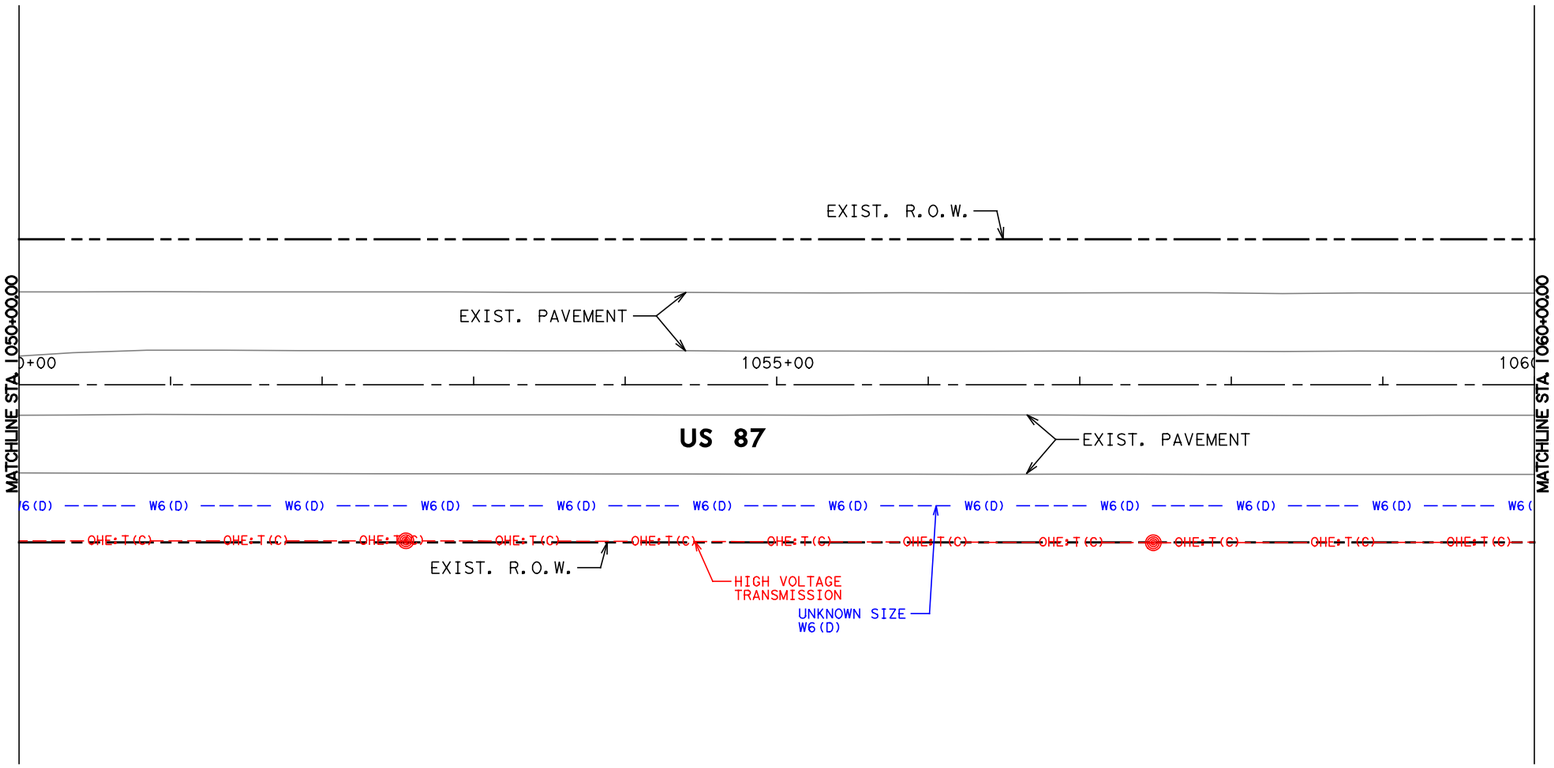
DATE: 5/26/2021 8:59:43 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1050+00 TO STA. 1060+00
SHEET 72 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	155
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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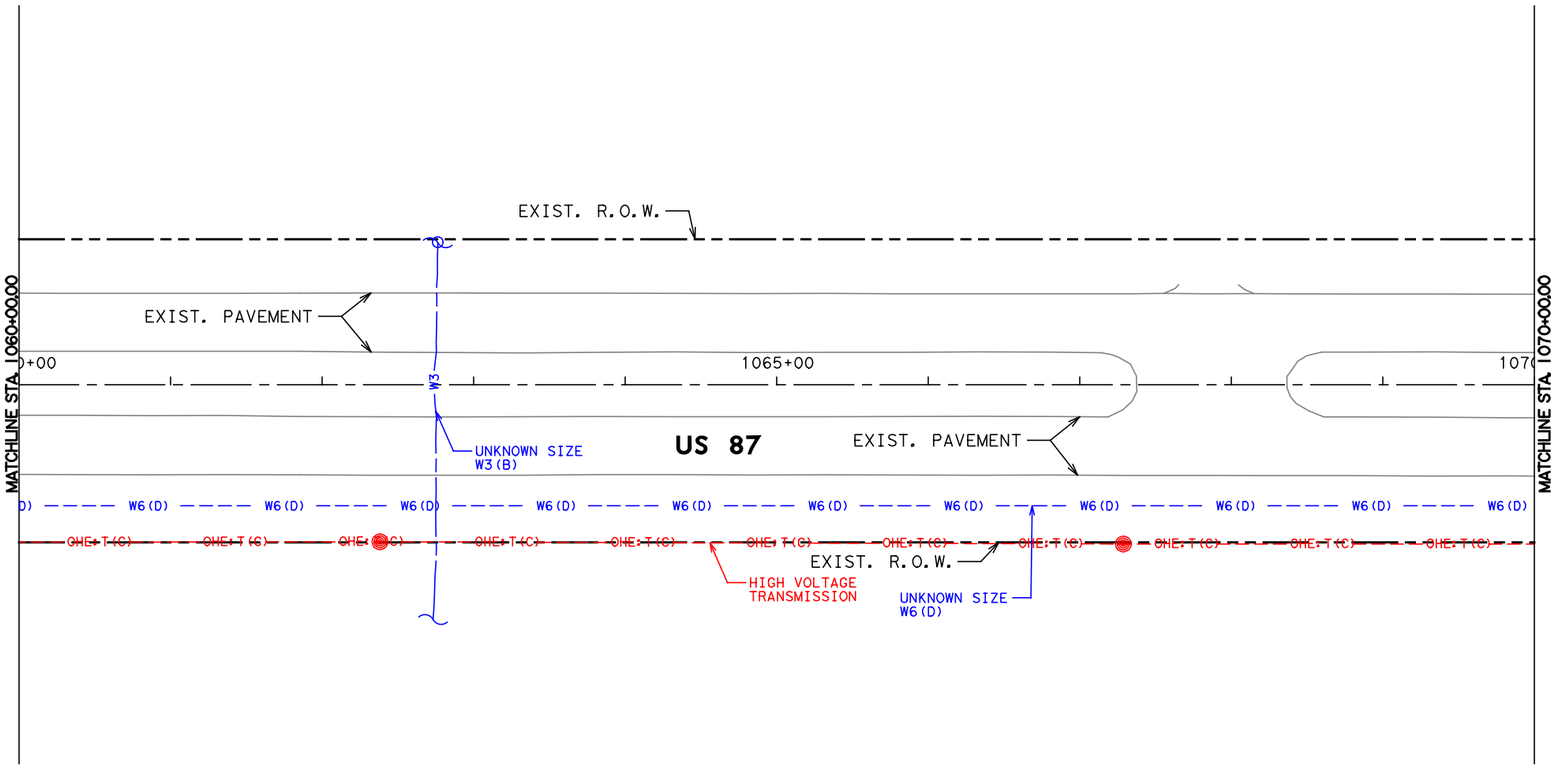

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1060+00 TO STA. 1070+00
SHEET 73 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	156
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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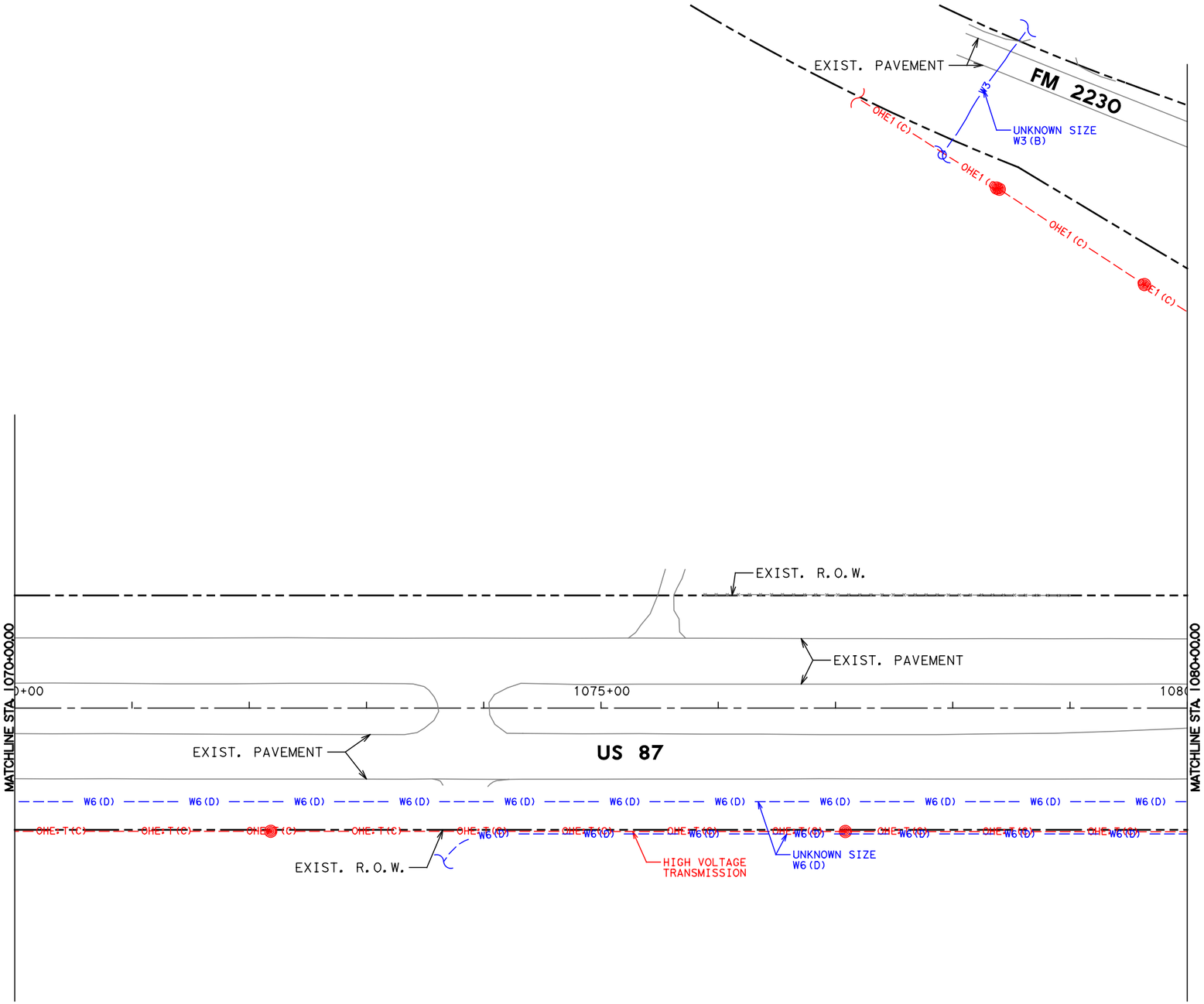

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
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5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1070+00 TO STA. 1080+00

SHEET 74 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	157
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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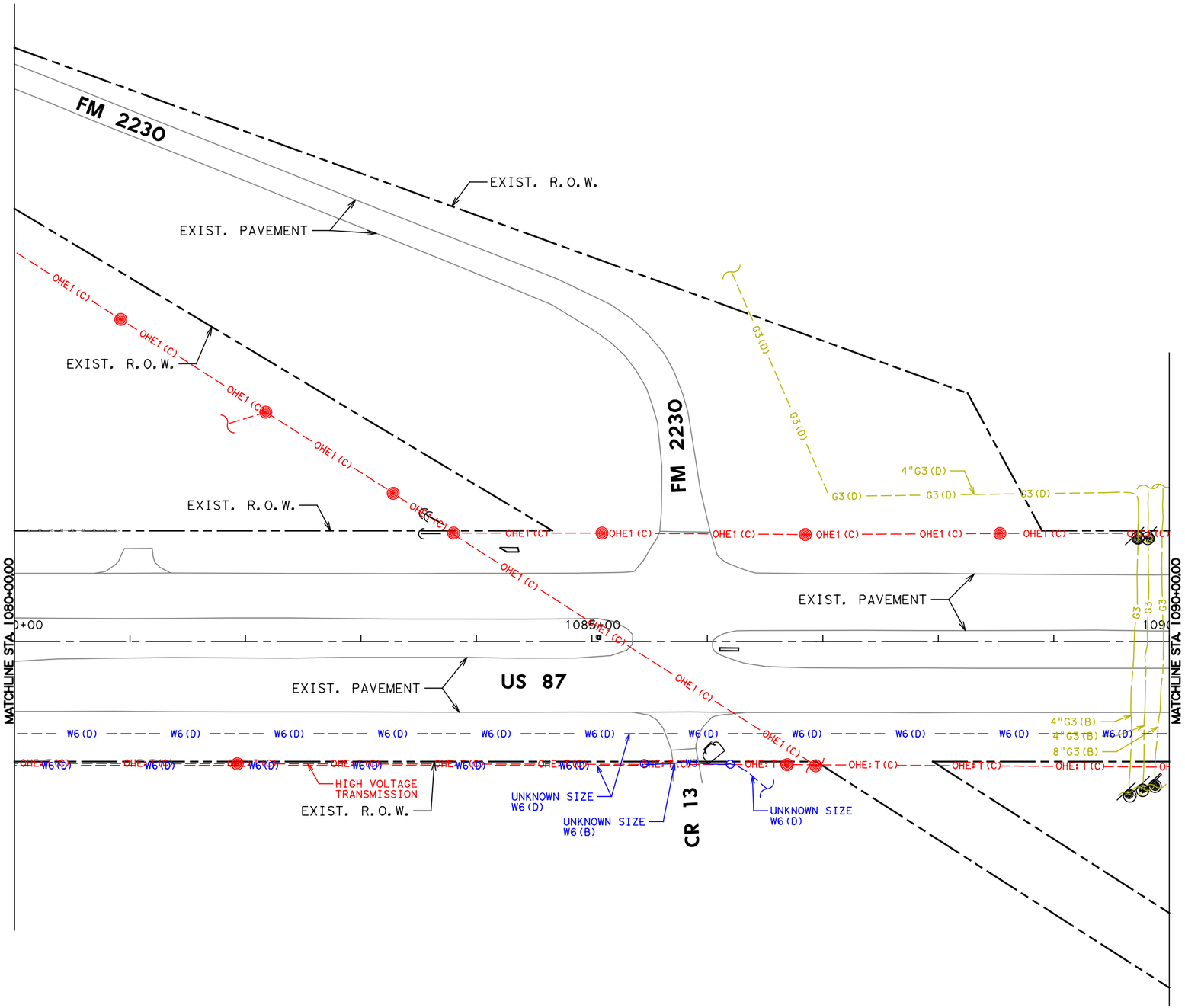

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1080+00 TO STA. 1090+00

SHEET 75 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	158
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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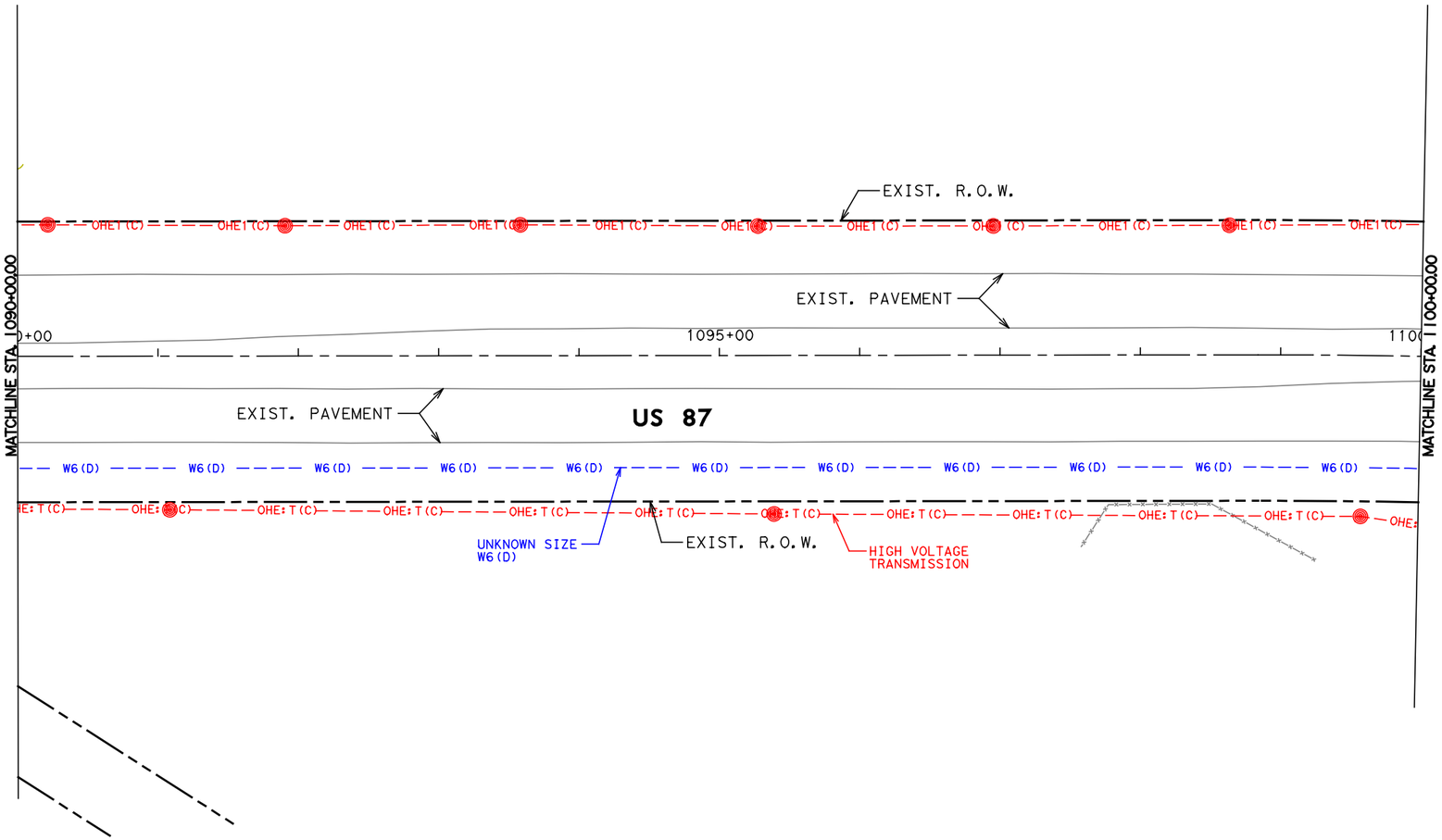

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1090+00 TO STA. 1100+00
SHEET 76 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	159
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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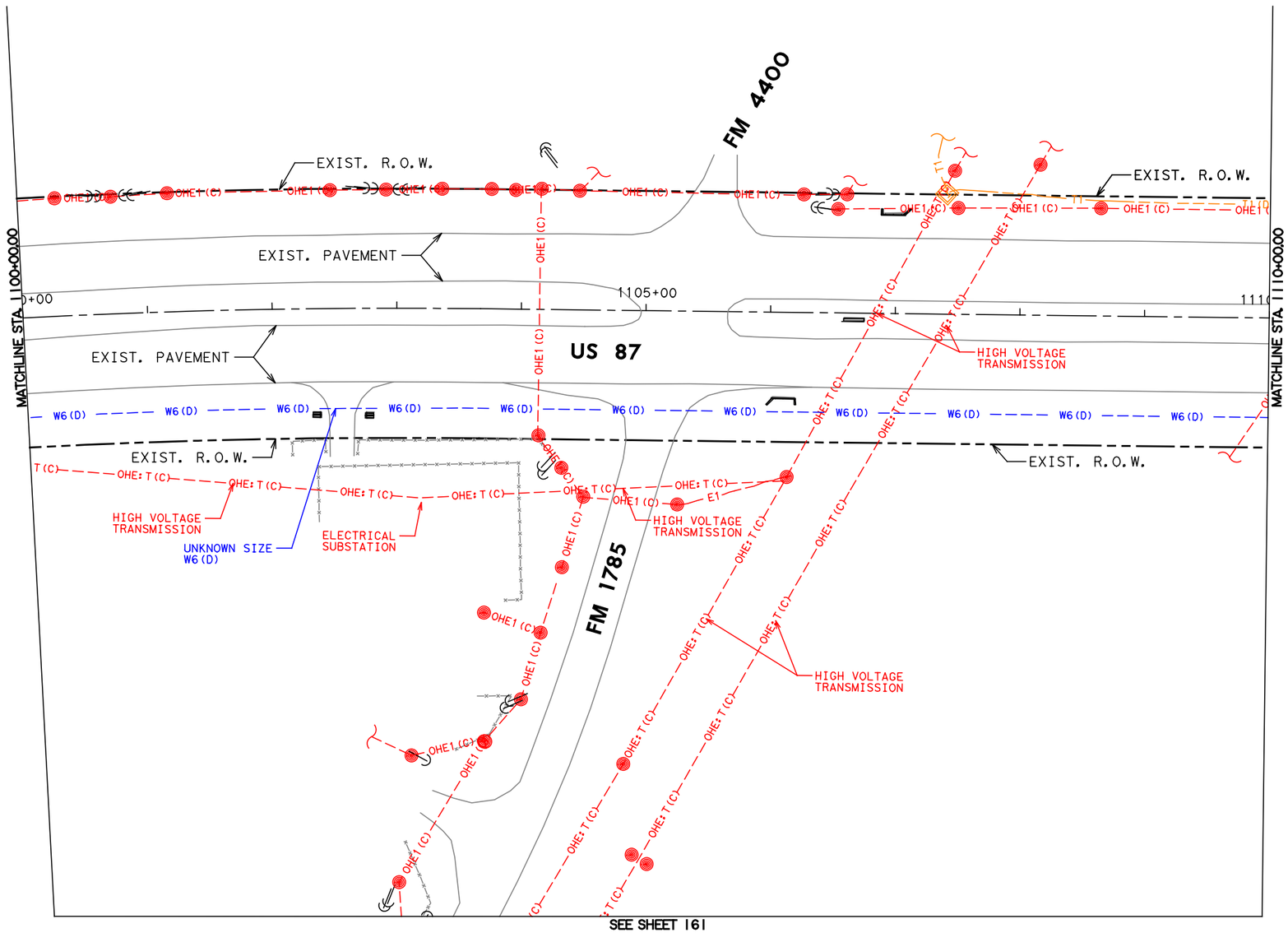

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1100+00 TO STA. 1110+00

SHEET 77 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	160
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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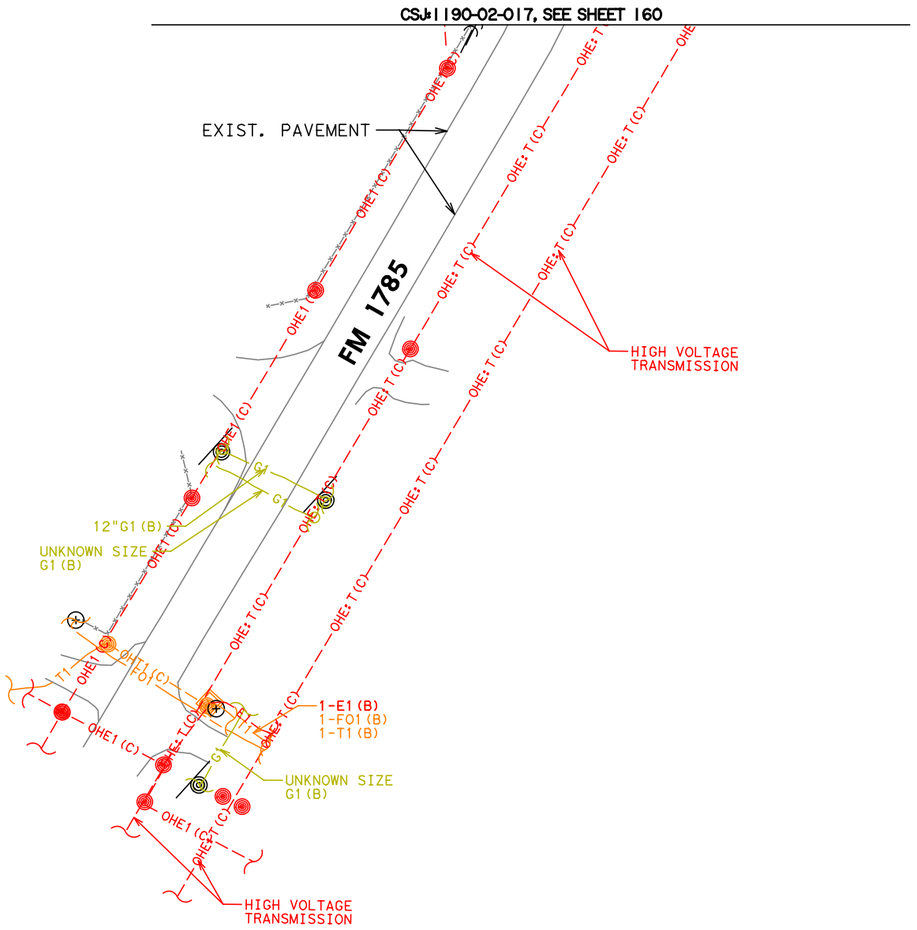

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FM 1785 EAST OF US 87
SHEET 78 OF 83

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	161
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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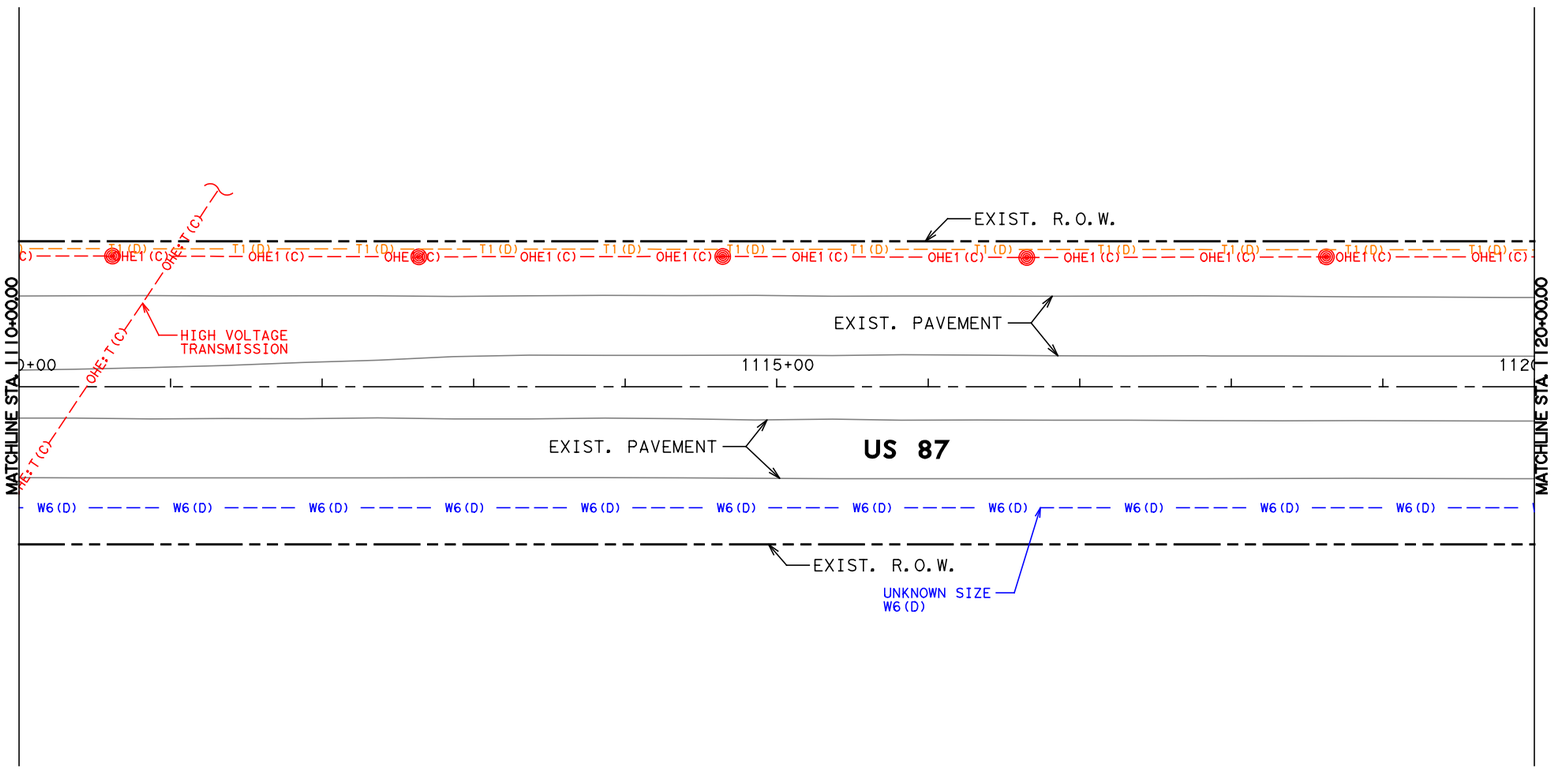

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1110+00 TO STA. 1120+00
SHEET 79 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	162
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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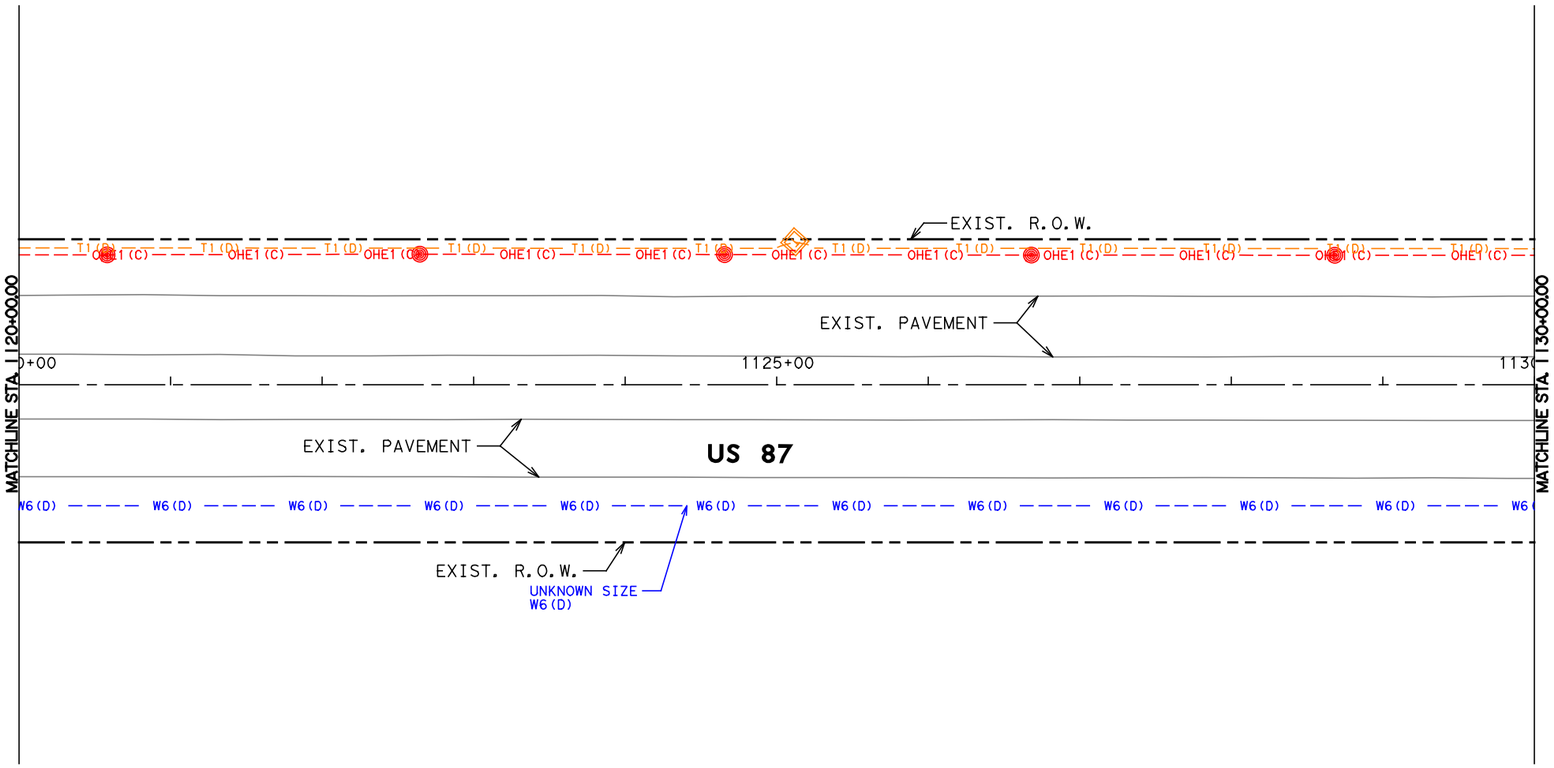

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

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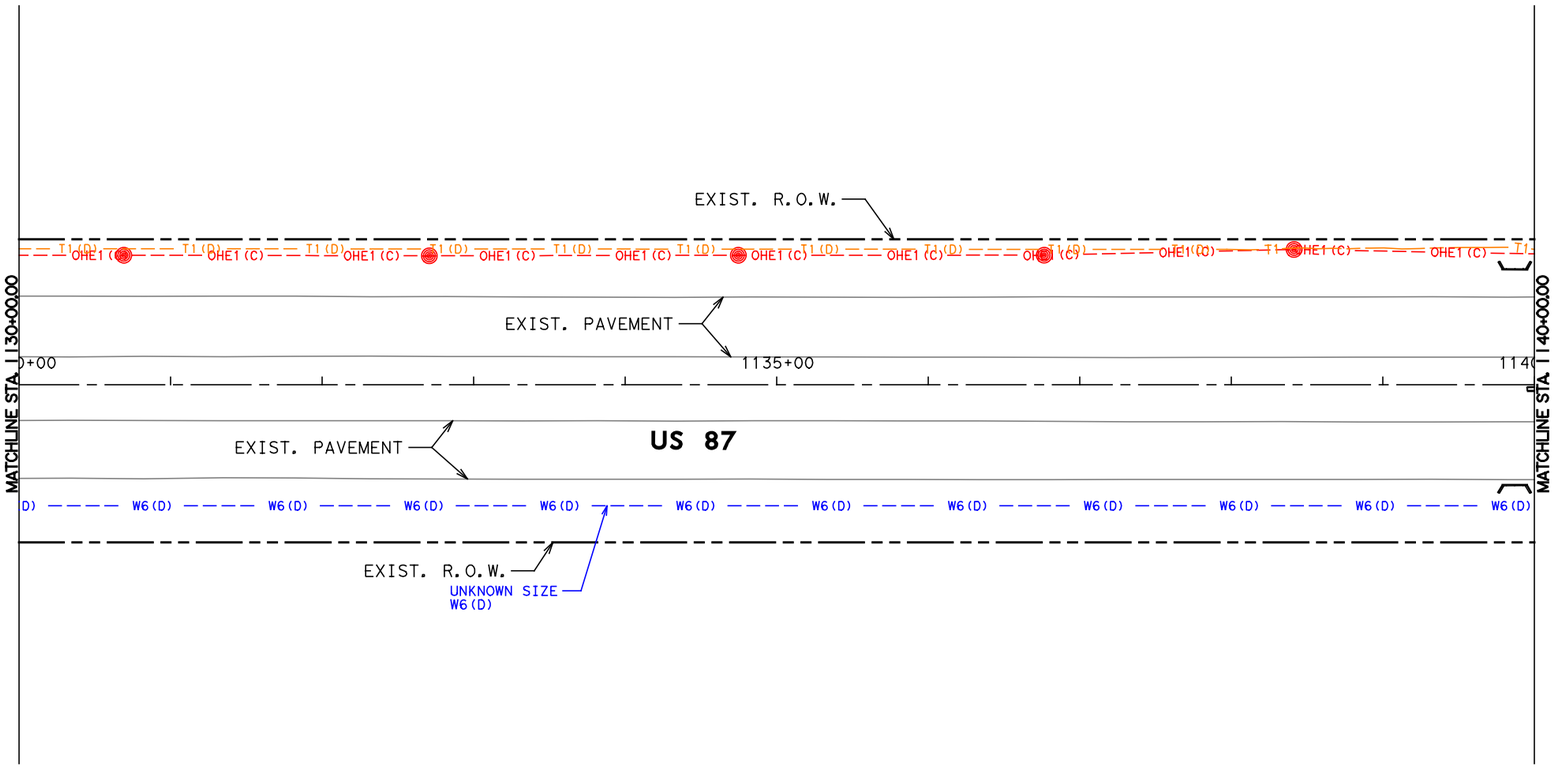
US 87
EXISTING UTILITY PLANS
FROM STA. 1120+00 TO STA. 1130+00
SHEET 80 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	163
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\163 EXISTING UTILITY PLANS.dgn
DATE: 5/26/2021 8:59:50 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

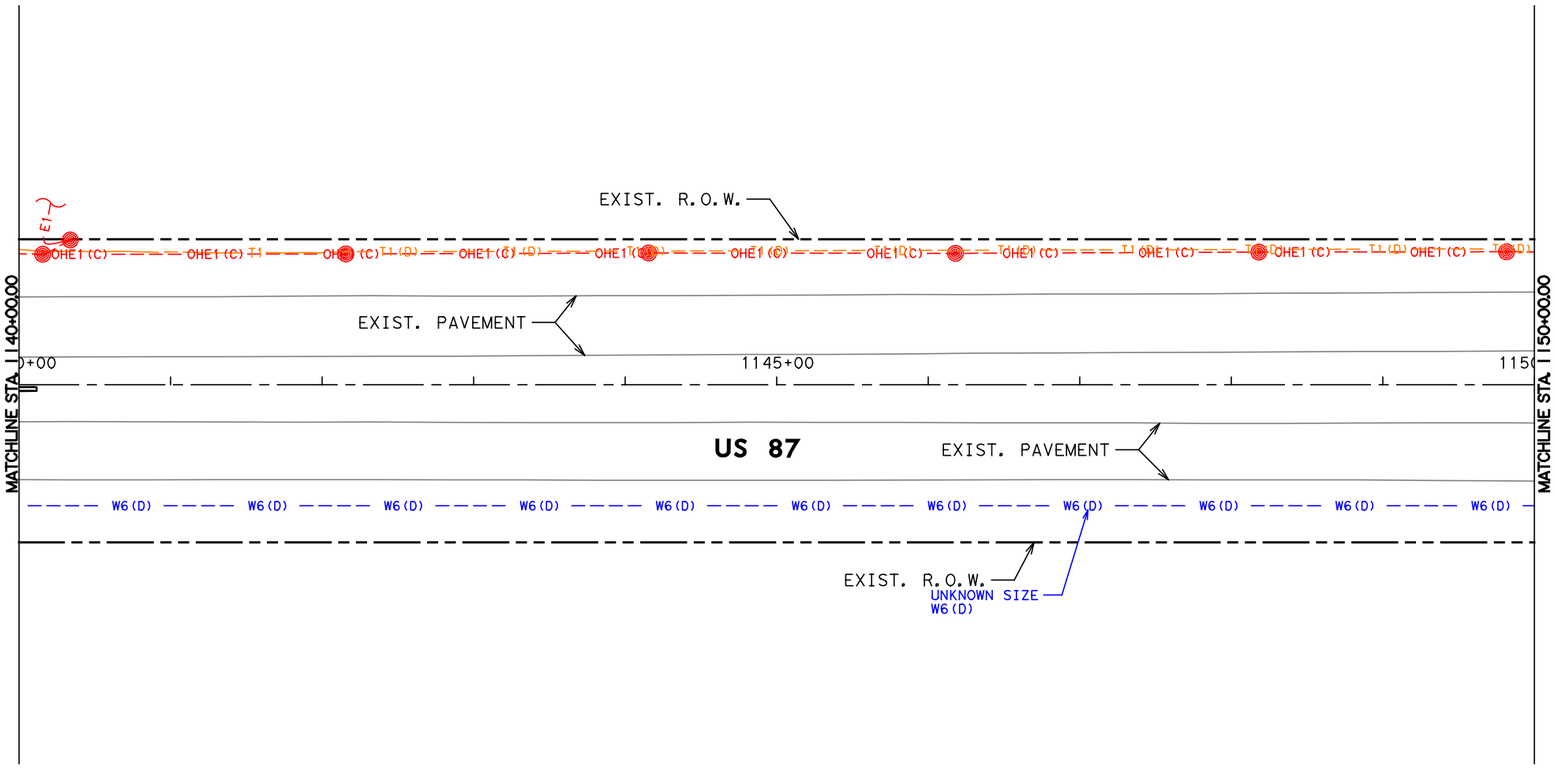
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1130+00 TO STA. 1140+00
SHEET 81 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	164
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\164 EXISTING UTILITY PLANS.dgn
DATE: 5/26/2021 8:59:51 AM dsmyers



0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1140+00 TO STA. 1150+00
SHEET 82 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	165
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

FILE: P:\UMT\PROJECTS\TXD20207*PROD*SHEETS\North\165 EXISTING UTILITY PLANS.dgn
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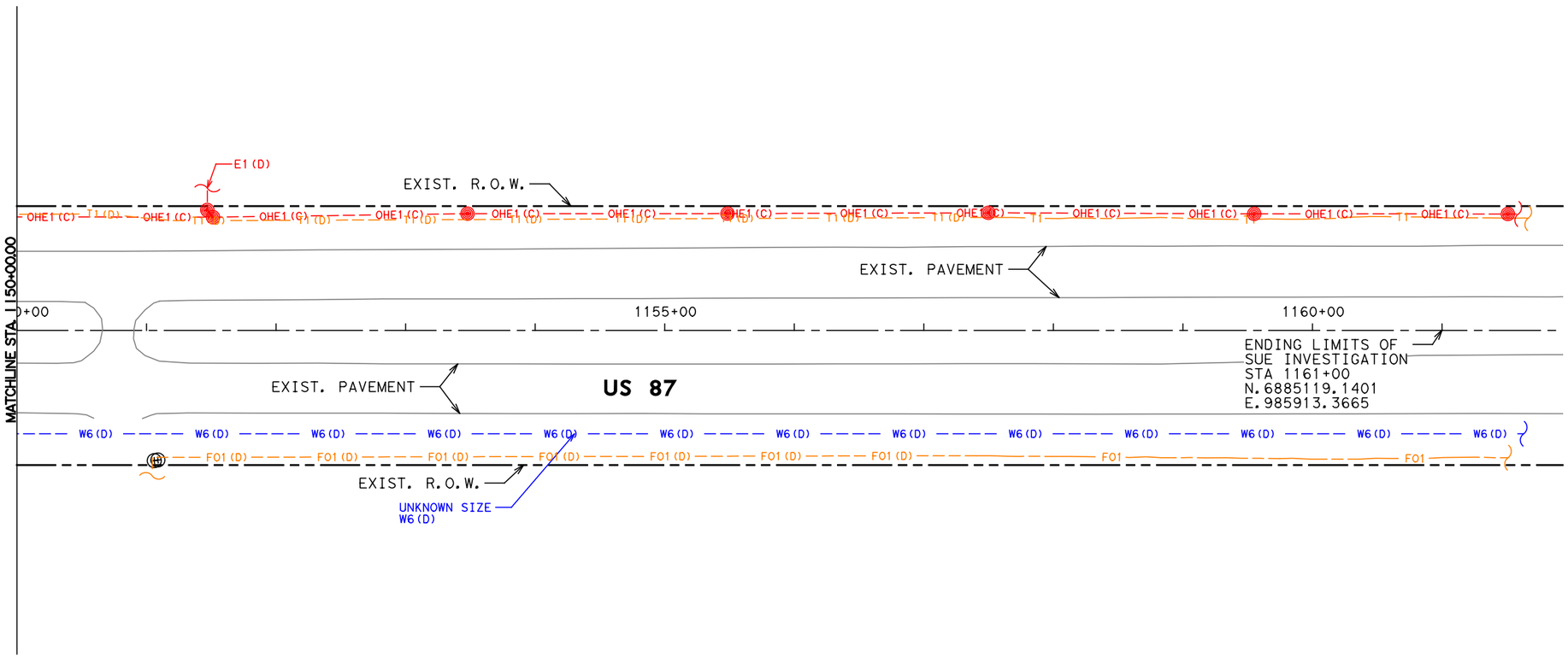

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
5/26/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 1150+00 TO ENDING
SHEET 83 OF 83

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	166
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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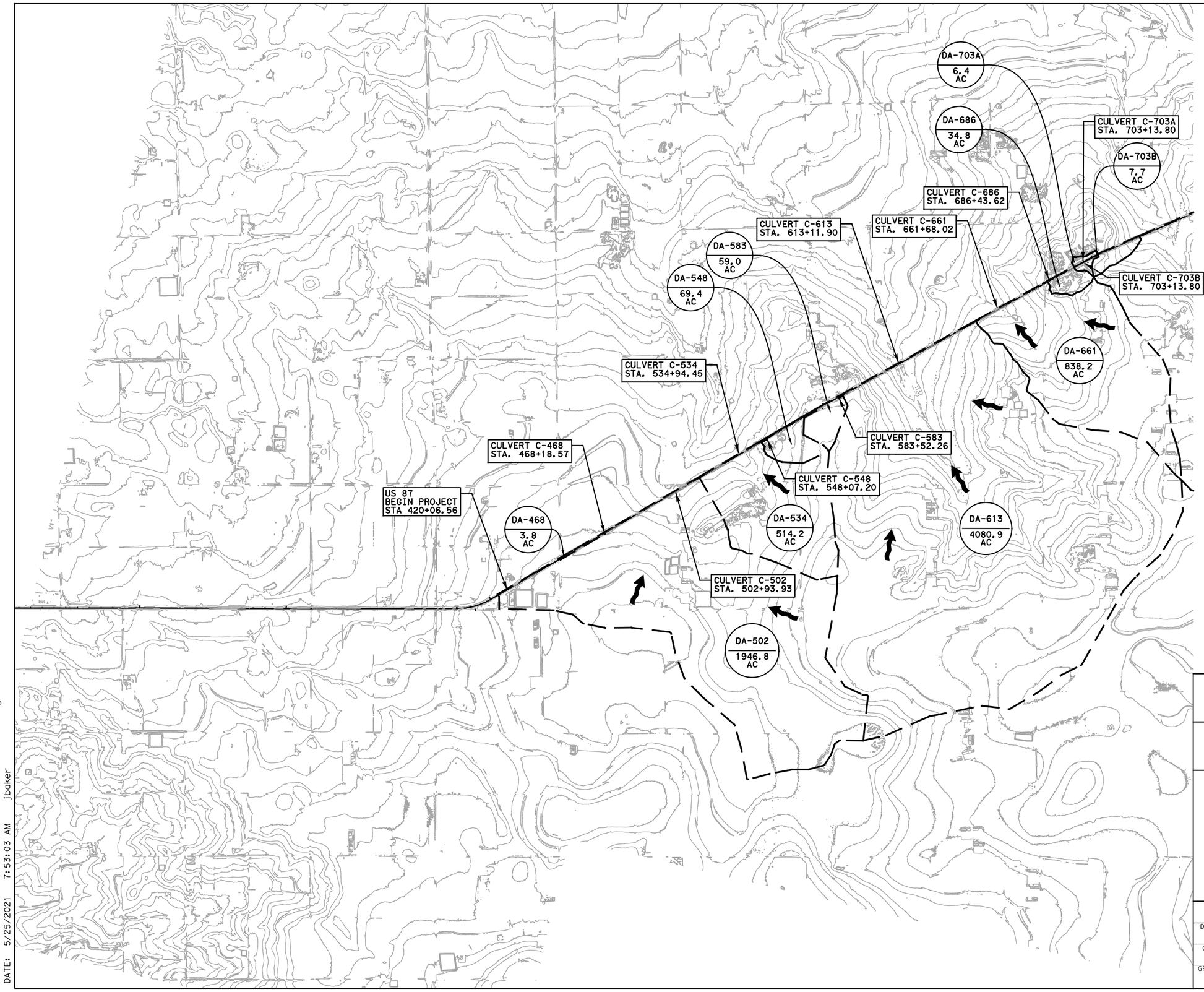

2000 1000 0 2000 4000

SCALE: 1" = 4000'

LEGEND

- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY
- 5 FT CONTOURS
- DA-XX / XXX.XX AC — DRAINAGE AREA ID / ACREAGE

STATE OF TEXAS
Dustin C. Ogle
91101
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

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US 87

DRAINAGE AREA MAP

SHEET (1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
FR	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
DO	TX	ABL	HOWARD	167
GRAPHICS	CONTROL	SECTION	JOB	
FR	0068	07	052, ETC	
GRPH CHECK				
DO				

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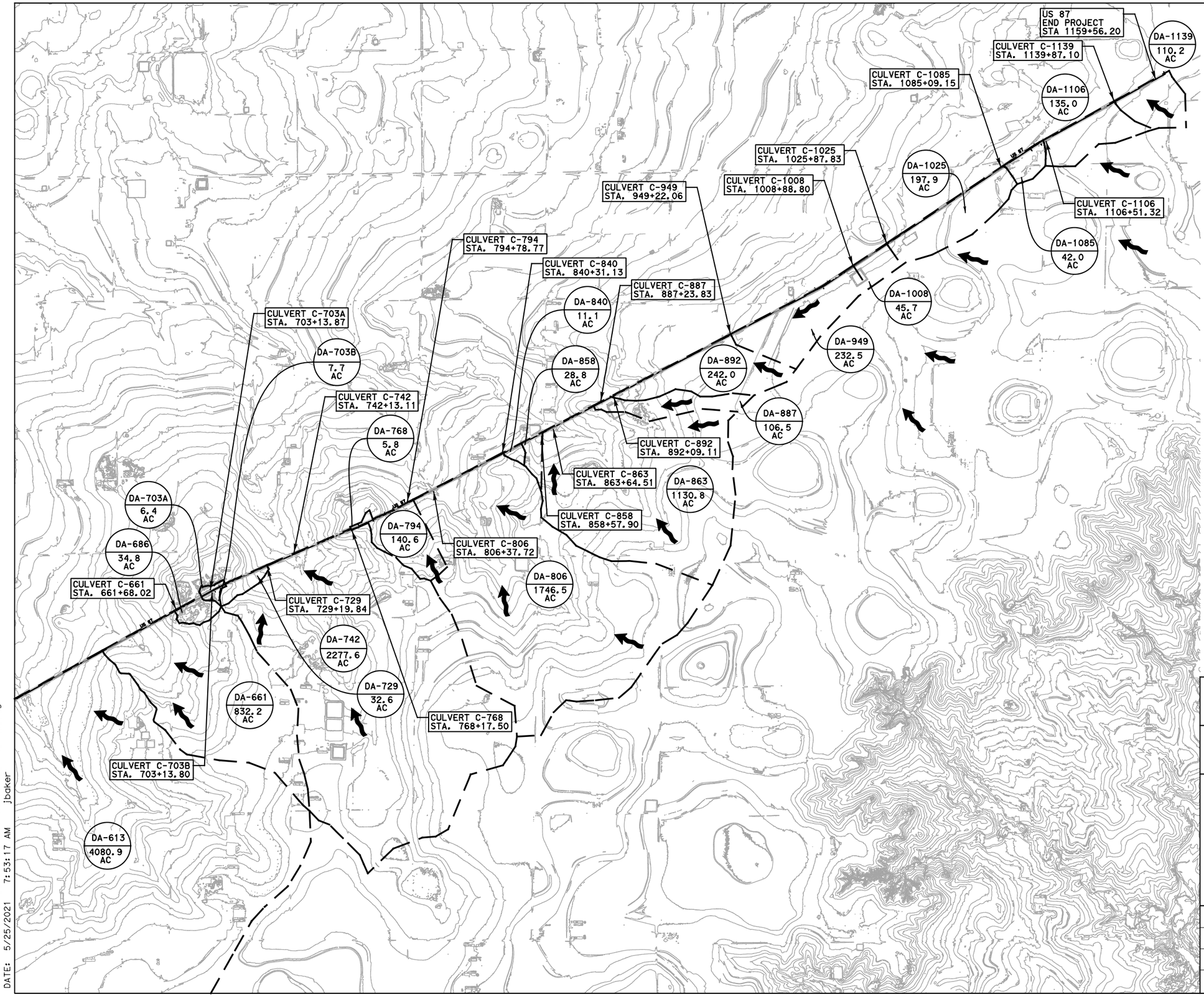

STATE OF TEXAS
Dustin C. Ogle
91101
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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US 87

DRAINAGE AREA MAP

SHEET (2 OF 2)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	168
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\DAM02.dgn
DATE: 5/25/2021 7:53:17 AM jbaker

DRAINAGE AREA ID	DRAINAGE STRUCTURE ID	EXISTING STRUCTURE	STATION	DRAINAGE AREA (ACRES)	Tc (MIN)	COMPOSITE 'C' VALUE	INTENSITY 25-YR (IN/HR)	INTENSITY 100-YR (IN/HR)	CURVE NUMBER	Q 25-YR (CFS)	Q 100-YR (CFS)
DA-468	C-468	1 - 3'x2'	468+18.57	3.8	135	0.4	3.99	5.26		6	8
DA-502	C-502	4 - 5'x4'	502+93.93	1946.8	28		NRCS METHOD		74	2447	3292
DA-534	C-534	2 - 6'x4'	534+94.45	514.2	41		NRCS METHOD		67	1083	1523
DA-548	C-548	1 - 6'x6'	548+07.20	69.4	40	0.4	3.25	4.31		90	120
DA-583	C-583	1 - 5'x2'	583+52.26	59.0	49	0.4	2.84	3.79		67	90
DA-613	C-613	6 - 6'x6'	613+11.90	4080.9	65		NRCS METHOD		58	4953	7245
DA-661	C-661	2 - 8'x4'	661+68.02	838.2	96		NRCS METHOD		57	773	1132
DA-686	C-686	1 - 3'x2'	686+43.62	34.8	26	0.4	4.15	5.46		59	78
DA-703A	C-703A	1 - 3'x2'	703+13.80	6.4	8	0.4	6.89	8.78		18	23
DA-703B	C-703B	1 - 3'x2'	703+13.80	7.7	23	0.4	4.42	5.80		14	19
DA-729	C-729	1 - 8'x4'	729+19.84	32.6	37	0.4	3.41	4.52		47	62
DA-742	C-742	3 - 6'x6'	742+13.11	2277.6	131		NRCS METHOD		65	2254	3177
DA-768	C-768	1 - 3'x2'	768+17.50	5.8	20	0.4	4.75	6.21		10	14
DA-794	C-794	1 - 7'x3'	794+78.77	140.6	44	0.4	3.04	4.04		158	210
DA-806	C-806	3 - 6'x6'	806+37.72	1746.5	124		NRCS METHOD		65	2519	3537
DA-840	C-840	1 - 3'x2'	840+31.13	11.1	13	0.4	5.87	7.58		25	32
DA-858	C-858	1 - 3'x2'	858+57.90	28.8	33	0.4	3.61	4.78		40	52
DA-863	C-863	2 - 6'x6'	863+64.51	1130.8	67		NRCS METHOD		67	1829	2526
DA-887	C-887	2 - 6'x3'	887+23.83	106.5	88	0.4	1.90	2.55		75	101
DA-892	C-892	1 - 5'x2'	892+09.11	242.0	94		NRCS METHOD		76	405	532
DA-949	C-949	1 - 7'x2'	949+22.06	232.5	51		NRCS METHOD		76	554	737
DA-1008	C-1008	1 - 8'x3'	1008+88.80	45.7	34	0.3	3.55	4.70		52	69
DA-1025	C-1025	2 - 5'x3'	1025+87.83	197.9	52	0.3	2.73	3.65		162	217
DA-1085	C-1085	1 - 7'x2'	1085+09.15	42.0	28	0.3	3.96	5.22		52	68
DA-1106	C-1106	3 - 5'x2'	1106+51.32	135.0	45	0.3	3.01	4.01		122	162
DA-1139	C-1139	3 - 5'x2'	1139+87.10	110.2	62	0.3	2.43	3.26		83	111

STATE OF TEXAS
Dustin C. Ogle
91101
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

DRAINAGE AREA DATA SHEET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
FR	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
DO	TX	ABL	HOWARD	169
GRAPHICS	CONTROL	SECTION	JOB	
FR	0068	07	052, ETC	
GRPH CHECK				
DO				

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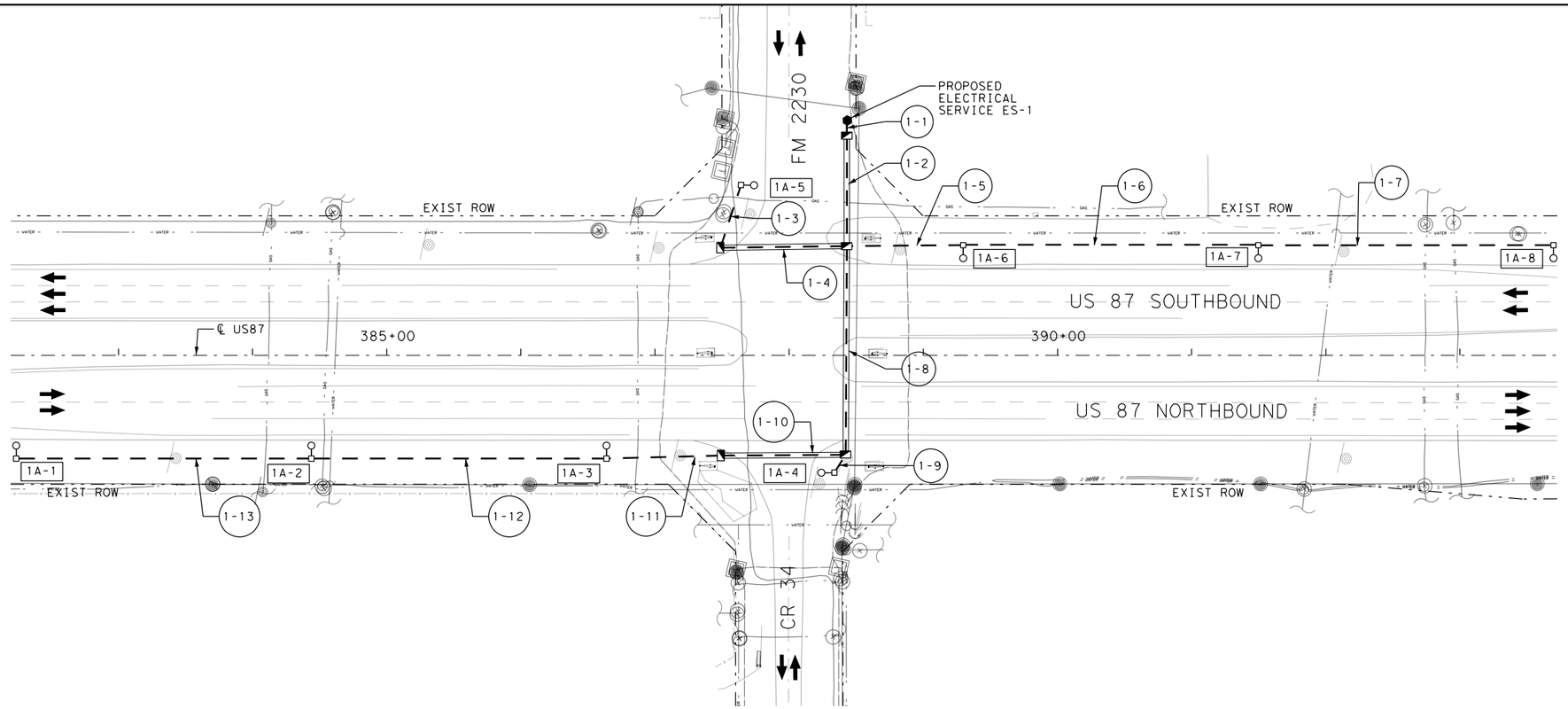

50′ 25′ 0 50′ 100′

HORIZ SCALE: 1" = 100′

LEGEND

- DIRECTION OF TRAVEL
- EXIST ROW
- ILL CONDUIT 2" PVC SCH 40
- ILL CONDUIT BORE 2" PVC SCH 80
- RD IL (TY SA) 40T-12(250W EQ)LED
- GROUND BOX TY A W/APRON
- ELECTRICAL SERVICE
- EXIST CONDUIT
- EXIST ILLUMINATION POLE
- EXIST GROUND BOX
- EXIST ELECTRICAL SERVICE

1-1 RUN DESIGNATION
RUN NUMBER
SERVICE NUMBER

1A-1 POLE DESIGNATION
POLE NUMBER
CIRCUIT IDENTIFICATION
SERVICE NUMBER

CONDUIT AND CABLE CHART

RUN NO	CONDUIT STATUS	CONDUIT ITEM 618 2" PVC TRENCHED QTY	CONDUIT ITEM 618 2" PVC TRENCHED LEN	CONDUIT ITEM 618 2" PVC BORED QTY	CONDUIT ITEM 618 2" PVC BORED LEN	CABLE STATUS	CONDUCTORS ITEM 620 NO. 8 BARE WIRE QTY	CONDUCTORS ITEM 620 NO. 8 BARE WIRE LEN	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE QTY	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE LEN	TOTAL LENGTH OF RUN	RUN NO
1-1	I	1	15			I	1	15	2	30	15	1-1
1-2	I			1	85	I	1	85	2	170	85	1-2
1-3	I	1	50			I	1	50	2	100	50	1-3
1-4	I			1	95	I	1	95	2	190	95	1-4
1-5	I	1	90			I	1	90	2	180	90	1-5
1-6	I	1	220			I	1	220	2	440	220	1-6
1-7	I	1	220			I	1	220	2	440	220	1-7
1-8	I			1	160	I	1	160	2	320	160	1-8
1-9	I	1	20			I	1	20	4	80	20	1-9
1-10	I			1	95	I	1	95	2	190	95	1-10
1-11	I	1	95			I	1	95	2	190	95	1-11
1-12	I	1	220			I	1	220	2	440	220	1-12
1-13	I	1	220			I	1	220	2	440	220	1-13
TOTAL			1150		435			1585		3210		

CONDUIT STATUS: I=INSTALL; E=EXISTING; A=ABANDON; R=REMOVE AND SALVAGE

LUMINAIRES

POLE NO.	ITEM	DESCRIPTION	CIRCUIT	STATION	OFFSET (FT)	ITEM 416 DIA	ITEM 416 DEPTH	ITEM 432 RIP RAP	NOTES:
1A-1	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	382 + 24	77 R	30"	8 FT	0.35 CY	
1A-2	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	384 + 44	77 R	30"	8 FT	0.35 CY	
1A-3	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	683 + 64	77 R	30"	8 FT	0.35 CY	
1A-4	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	388 + 34	87 R	30"	8 FT	0.35 CY	
1A-5	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	387 + 64	127 L	30"	8 FT	0.35 CY	
1A-6	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	389 + 30	82 L	30"	8 FT	0.35 CY	
1A-7	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	391 + 50	82 L	30"	8 FT	0.35 CY	
1A-8	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	393 + 70	82 L	30"	8 FT	0.35 CY	

STATION AND OFFSETS ARE REFERENCED FROM CL US-87 UNLESS OTHERWISE NOTED.

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES PRIOR TO WORK.
2. LOCATIONS OF THE PROPOSED LIGHT POLES ARE APPROXIMATE AND EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD WITH THE ENGINEER'S APPROVAL.

STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

US 87

ILLUMINATION LAYOUT
FM 2230 (SOUTH) INTERSECTION

SHEET (1 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	170
JR	0068	07	052, ETC.	
GRPH CHECK				
BH				

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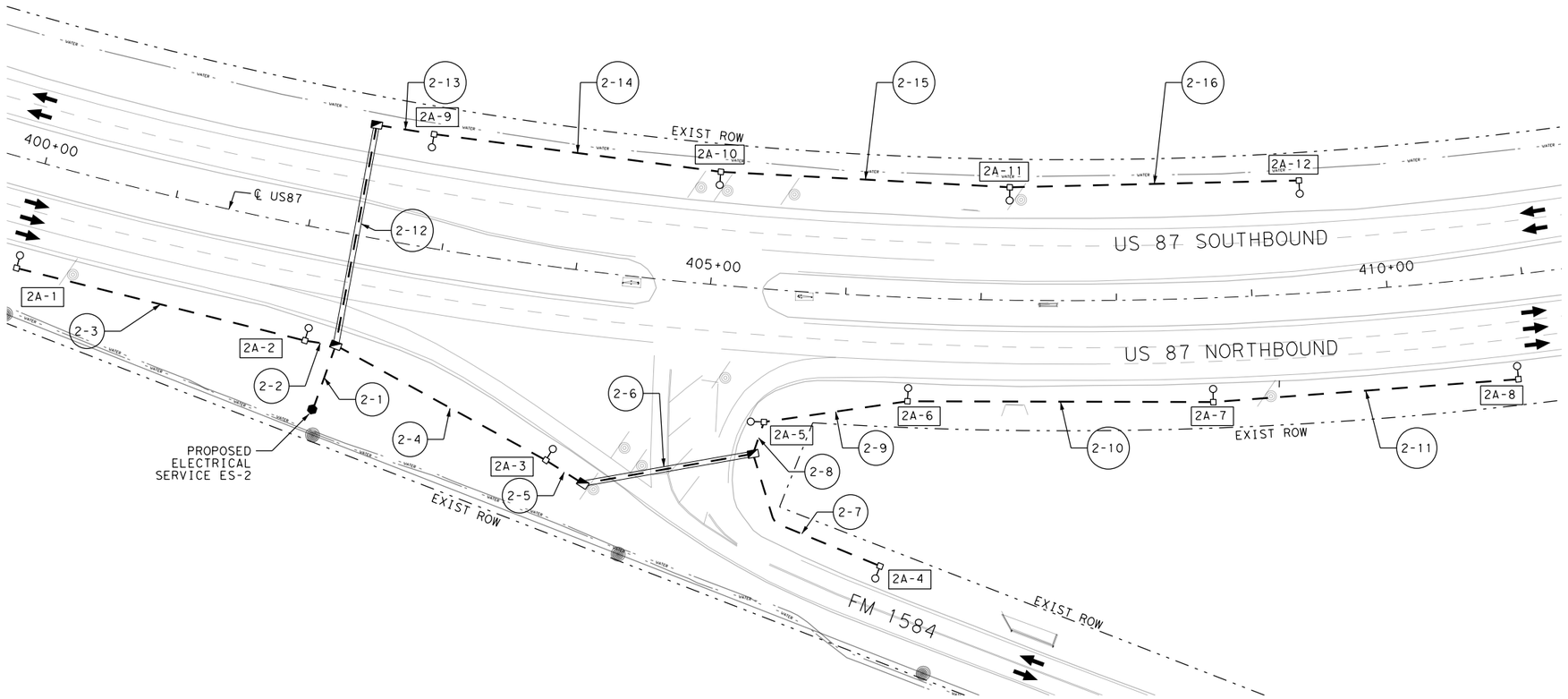

50′ 25′ 0 50′ 100′

HORIZ SCALE: 1" = 100′

LEGEND

- DIRECTION OF TRAVEL
- EXIST ROW
- ILL CONDUIT 2" PVC SCH 40
- ILL CONDUIT BORE 2" PVC SCH 80
- RD IL (TY SA) 40T-12(250W EQ)LED
- GROUND BOX TY A W/APRON
- ELECTRICAL SERVICE
- EXIST CONDUIT
- EXIST ILLUMINATION POLE
- EXIST GROUND BOX
- EXIST ELECTRICAL SERVICE

1-1 RUN DESIGNATION
- RUN NUMBER
- SERVICE NUMBER

1A-1 POLE DESIGNATION
- POLE NUMBER
- CIRCUIT IDENTIFICATION
- SERVICE NUMBER

CONDUIT AND CABLE CHART

RUN NO	CONDUIT STATUS	CONDUIT ITEM 618 2" PVC TRENCHED QTY	CONDUIT ITEM 618 2" PVC TRENCHED LEN	CONDUIT ITEM 618 2" PVC BORED QTY	CONDUIT ITEM 618 2" PVC BORED LEN	CABLE STATUS	CONDUCTORS ITEM 620 NO. 8 BARE WIRE QTY	CONDUCTORS ITEM 620 NO. 8 BARE WIRE LEN	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE QTY	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE LEN	TOTAL LENGTH OF RUN	RUN NO
2-1	I	1	50			I	1	50	2	100	50	2-1
2-2	I	1	25			I	1	25	6	150	25	2-2
2-3	I	1	220			I	1	220	2	440	220	2-3
2-4	I	1	195			I	1	195	2	390	195	2-4
2-5	I	1	20			I	1	20	2	40	20	2-5
2-6	I	1	130			I	1	130	2	260	130	2-6
2-7	I			1	140	I	1	140	2	280	140	2-7
2-8	I	1	25			I	1	25	2	50	25	2-8
2-9	I	1	110			I	1	110	2	220	110	2-9
2-10	I	1	225			I	1	225	2	450	225	2-10
2-11	I	1	225			I	1	225	2	450	225	2-11
2-12	I			1	165	I	1	165	2	330	165	2-12
2-13	I	1	45			I	1	45	2	90	45	2-13
2-14	I	1	215			I	1	215	2	430	215	2-14
2-15	I	1	215			I	1	215	2	430	215	2-15
2-16	I	1	215			I	1	215	2	430	215	2-16
TOTAL			1915		305			2220		4540		

CONDUIT STATUS: I=INSTALL; E=EXISTING; A=ABANDON; R=REMOVE AND SALVAGE

LUMINAIRES

POLE NO.	ITEM	DESCRIPTION	CIRCUIT	STATION	OFFSET (FT)	ITEM 416 DIA	ITEM 416 DEPTH	ITEM 432 RIP RAP	NOTES:
2A-1	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	400 + 00	80 R	30"	8 FT	0.35 CY	
2A-2	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	402 + 14	84 R	30"	8 FT	0.35 CY	
2A-3	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	404 + 10	149 R	30"	8 FT	0.35 CY	
2A-4	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	406 + 34	199 R	30"	8 FT	0.35 CY	
2A-5	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	405 + 47	98 R	30"	8 FT	0.35 CY	
2A-6	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	406 + 49	77 R	30"	8 FT	0.35 CY	
2A-7	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	408 + 69	77 R	30"	8 FT	0.35 CY	
2A-8	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	410 + 89	77 R	30"	8 FT	0.35 CY	
2A-9	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	402 + 80	84 L	30"	8 FT	0.35 CY	
2A-10	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	405 + 00	84 L	30"	8 FT	0.35 CY	
2A-11	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	407 + 20	84 L	30"	8 FT	0.35 CY	
2A-12	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	409 + 40	84 L	30"	8 FT	0.35 CY	

STATION AND OFFSETS ARE REFERENCED FROM CL US-87 UNLESS OTHERWISE NOTED.

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES PRIOR TO WORK.
2. LOCATIONS OF THE PROPOSED LIGHT POLES ARE APPROXIMATE AND EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD WITH THE ENGINEER'S APPROVAL.

STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

US 87

ILLUMINATION LAYOUT
FM 1584 INTERSECTION

SHEET (2 OF 5)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	171
JR				
GRPH CHECK	0068	07	052, ETC.	
BH				

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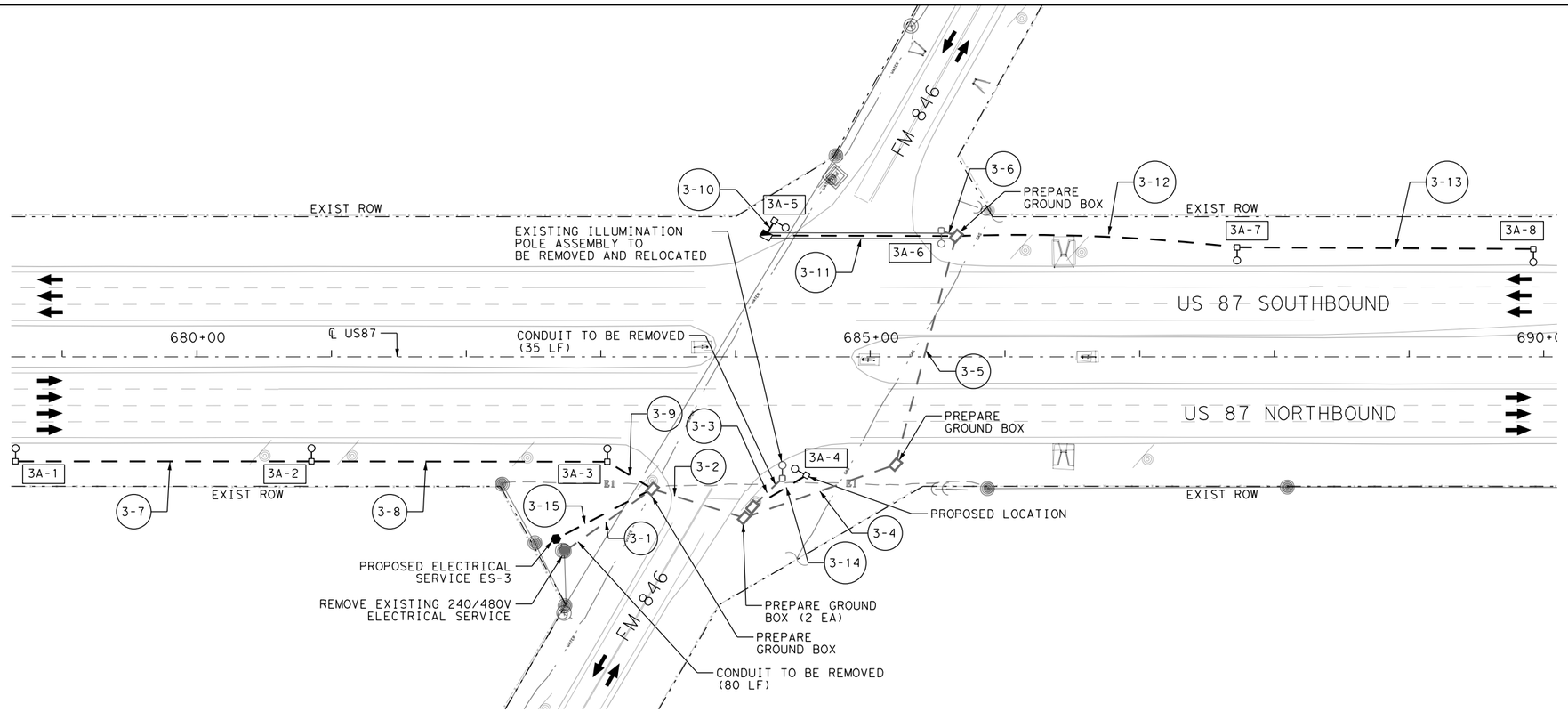

50′ 25′ 0 50′ 100′

HORIZ SCALE: 1" = 100′

LEGEND

- DIRECTION OF TRAVEL
- EXIST ROW
- ILL CONDUIT 2" PVC SCH 40
- ILL CONDUIT BORE 2" PVC SCH 80
- RD IL (TY SA) 40T-12(250W EQ)LED
- GROUND BOX TY A W/APRON
- ELECTRICAL SERVICE
- EXIST CONDUIT
- EXIST ILLUMINATION POLE
- EXIST GROUND BOX
- EXIST ELECTRICAL SERVICE

1-1 RUN DESIGNATION
- RUN NUMBER
- SERVICE NUMBER

1A-1 POLE DESIGNATION
- POLE NUMBER
- CIRCUIT IDENTIFICATION
- SERVICE NUMBER

CONDUIT AND CABLE CHART

RUN NO	CONDUIT STATUS	CONDUIT ITEM 618 2" PVC TRENCHED QTY	CONDUIT ITEM 618 2" PVC TRENCHED LEN	CONDUIT ITEM 618 2" PVC BORED QTY	CONDUIT ITEM 618 2" PVC BORED LEN	CONDUIT ITEM 690 REMOVAL OF CONDUIT QTY	CONDUIT ITEM 690 REMOVAL OF CONDUIT LEN	CONDUIT ITEM 6027 PREPARE QTY	CONDUIT ITEM 6027 PREPARE LEN	CABLE STATUS	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE QT	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE LEN	CONDUCTORS ITEM 620 NO. 8 BARE WIRE QT	CONDUCTORS ITEM 620 NO. 8 BARE WIRE LEN	CONDUCTORS ITEM 620 NO. 8 XHHW WIRE QT	CONDUCTORS ITEM 620 NO. 8 XHHW WIRE LEN	TOTAL LENGTH OF RUN	RUN NO
3-1	R					1	80			R					3		80	3-1
3-2	E							1	75	E					3		75	3-2
3-3	R					1	35			R					3		35	3-3
3-4	E							1	120	E					3		120	3-4
3-5	E							1	175	E					3		175	3-5
3-6	E							1	15	E					3		15	3-6
										I	4	60					15	
3-7	I	1	220							I	2	440	1	220			220	3-7
3-8	I	1	220							I	2	440	1	220			220	3-8
3-9	I	1	40							I	2	80	1	40			40	3-9
3-10	I	1	15							I	2	30	1	15			15	3-10
3-11	I			1	145					I	2	290	1	145			145	3-11
3-12	I	1	210							I	2	420	1	210			210	3-12
3-13	I	1	220							I	2	440	1	220			220	3-13
3-14	I	1	50							I	2	100	1	50			50	3-14
3-15	I	1	80							I			1	80	2	160	80	3-15
TOTAL			1055		145		115		385			2300		1200		160		

CONDUIT STATUS: I=INSTALL; E=EXISTING*; A=ABANDON; R=REMOVE**
* - INFORMATION PERTAINING TO THE EXISTING CONDUITS & CONDUCTORS WAS TAKEN FROM AS BUILT INFORMATION PROVIDED BY TXDOT. THE CONTRACTOR SHALL VERIFY ALL INSTALLATIONS.
** - REMOVAL OF CONDUCTORS SHALL BE SUBSIDIARY TO CONDUIT REMOVAL.

LUMINAIRES

POLE NO.	ITEM	DESCRIPTION	CIRCUIT	STATION	OFFSET (FT)	ITEM 416 DIA	ITEM 416 DEPTH	ITEM 432 RIP RAP	NOTES:
3A-1	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	678 + 65	78 R	30"	8 FT	0.35 CY	
3A-2	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	680 + 85	78 R	30"	8 FT	0.35 CY	
3A-3	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	683 + 05	78 R	30"	8 FT	0.35 CY	
3A-4	610	RELOCATE RD IL ASM (TRANS-BASE)	A	684 + 53	88 R	30"	8 FT	0.35 CY	RELOCATE POLE TO PROPOSED LOCATION
	610	REPLACE LUMINAIRE W/LED (250W EQ)							
3A-5	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	684 + 28	88 L	30"	8 FT	0.35 CY	
3A-6		EXISTING ASSEMBLY	A	+					EXISTING ASSEMBLY TO REMAIN AS INSTALLED
	610	REPLACE LUMINAIRE W/LED (250W EQ)							
3A-7	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	687 + 73	89 L	30"	8 FT	0.35 CY	
3A-8	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	689 + 93	89 L	30"	8 FT	0.35 CY	

STATION AND OFFSETS ARE REFERENCED FROM CL US-87 UNLESS OTHERWISE NOTED.

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES PRIOR TO WORK.
2. LOCATIONS OF THE PROPOSED LIGHT POLES ARE APPROXIMATE AND EXACT LOCATIONS SHALL BE DETERMINED IN THE FIELD WITH THE ENGINEER'S APPROVAL.

STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

US 87

ILLUMINATION LAYOUT FM 846 INTERSECTION

SHEET (3 OF 5)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	172
GRAPHICS	CONTROL	SECTION	JOB	
JR	0068	07	052, ETC.	
GRPH CHECK				
BH				

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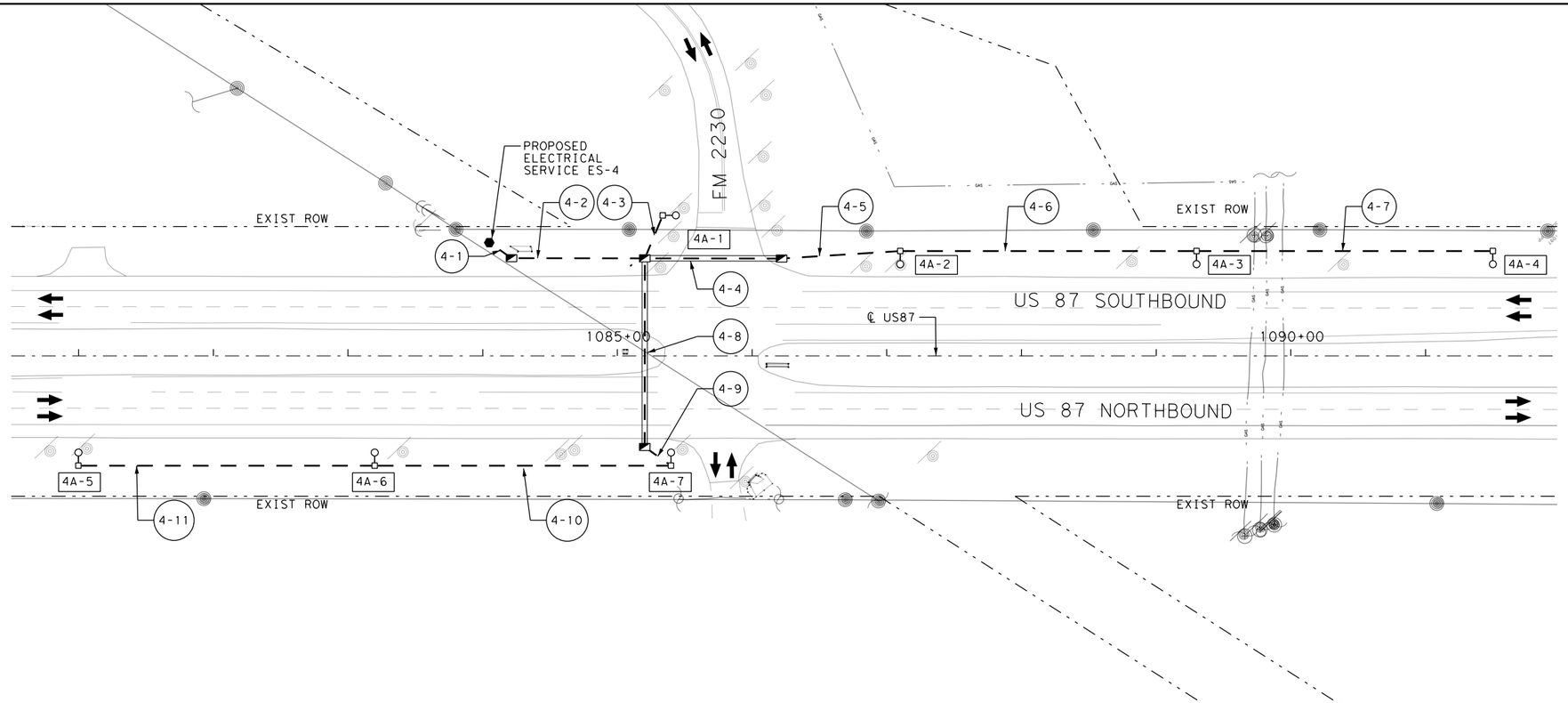

50′ 25′ 0 50′ 100′

HORIZ SCALE: 1" = 100′

LEGEND

- DIRECTION OF TRAVEL
- EXIST ROW
- ILL CONDUIT 2" PVC SCH 40
- ILL CONDUIT BORE 2" PVC SCH 80
- RD IL (TY SA) 40T-12(250W EQ)LED
- GROUND BOX TY A W/APRON
- ELECTRICAL SERVICE
- EXIST CONDUIT
- EXIST ILLUMINATION POLE
- EXIST GROUND BOX
- EXIST ELECTRICAL SERVICE

1-1 RUN DESIGNATION
- RUN NUMBER
- SERVICE NUMBER

1A-1 POLE DESIGNATION
- POLE NUMBER
- CIRCUIT IDENTIFICATION
- SERVICE NUMBER

CONDUIT AND CABLE CHART

RUN NO	CONDUIT STATUS	CONDUIT ITEM 618 2" PVC TRENCHED QTY	2" PVC TRENCHED LEN	2" PVC BORED QTY	2" PVC BORED LEN	CABLE STATUS	CONDUCTORS ITEM 620 NO. 8 BARE WIRE QTY	NO. 8 BARE WIRE LEN	NO. 12 XHHW WIRE QTY	NO. 12 XHHW WIRE LEN	TOTAL LENGTH OF RUN	RUN NO
4-1	I	1	20			I	1	20	2	40	20	4-1
4-2	I	1	100			I	1	100	2	200	100	4-2
4-3	I	1	35			I	1	35	6	210	35	4-3
4-4	I			1	105	I	1	105	2	210	105	4-4
4-5	I	1	90			I	1	90	2	180	90	4-5
4-6	I	1	220			I	1	220	2	440	220	4-6
4-7	I	1	220			I	1	220	2	440	220	4-7
4-8	I			1	140	I	1	140	2	280	140	4-8
4-9	I	1	25			I	1	25	2	50	25	4-9
4-10	I	1	220			I	1	220	2	440	220	4-10
4-11	I	1	220			I	1	220	2	440	220	4-11
TOTAL			1150		245			1395		2930		

CONDUIT STATUS: I=INSTALL; E=EXISTING; A=ABANDON; R=REMOVE AND SALVAGE

LUMINAIRES

POLE NO.	ITEM	DESCRIPTION	CIRCUIT	STATION	OFFSET (FT)	ITEM 416 DIA	ITEM 416 DEPTH	ITEM 432 RIP RAP	NOTES:
4A-1	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1081 + 00	105 L	30"	8 FT	0.35 CY	
4A-2	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1083 + 20	82 L	30"	8 FT	0.35 CY	
4A-3	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1085 + 40	82 L	30"	8 FT	0.35 CY	
4A-4	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1085 + 34	82 L	30"	8 FT	0.35 CY	
4A-5	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1087 + 10	78 R	30"	8 FT	0.35 CY	
4A-6	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1089 + 30	78 R	30"	8 FT	0.35 CY	
4A-7	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1091 + 50	78 R	30"	8 FT	0.35 CY	

STATION AND OFFSETS ARE REFERENCED FROM CL US-87 UNLESS OTHERWISE NOTED.

NOTES:

1. CONTRACTOR SHALL VERIFY LOCATION AND DEPTH OF ALL UNDERGROUND UTILITIES PRIOR TO WORK.
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STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED
PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

US 87

ILLUMINATION LAYOUT
FM 2230 (NORTH) INTERSECTION

SHEET (4 OF 5)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK JL	STATE	DISTRICT	COUNTY	SHEET NO.
GRAPHICS JR	TX	ABL	HOWARD	173
GRPH CHECK	CONTROL	SECTION	JOB	
BH	0068	07	052, ETC.	

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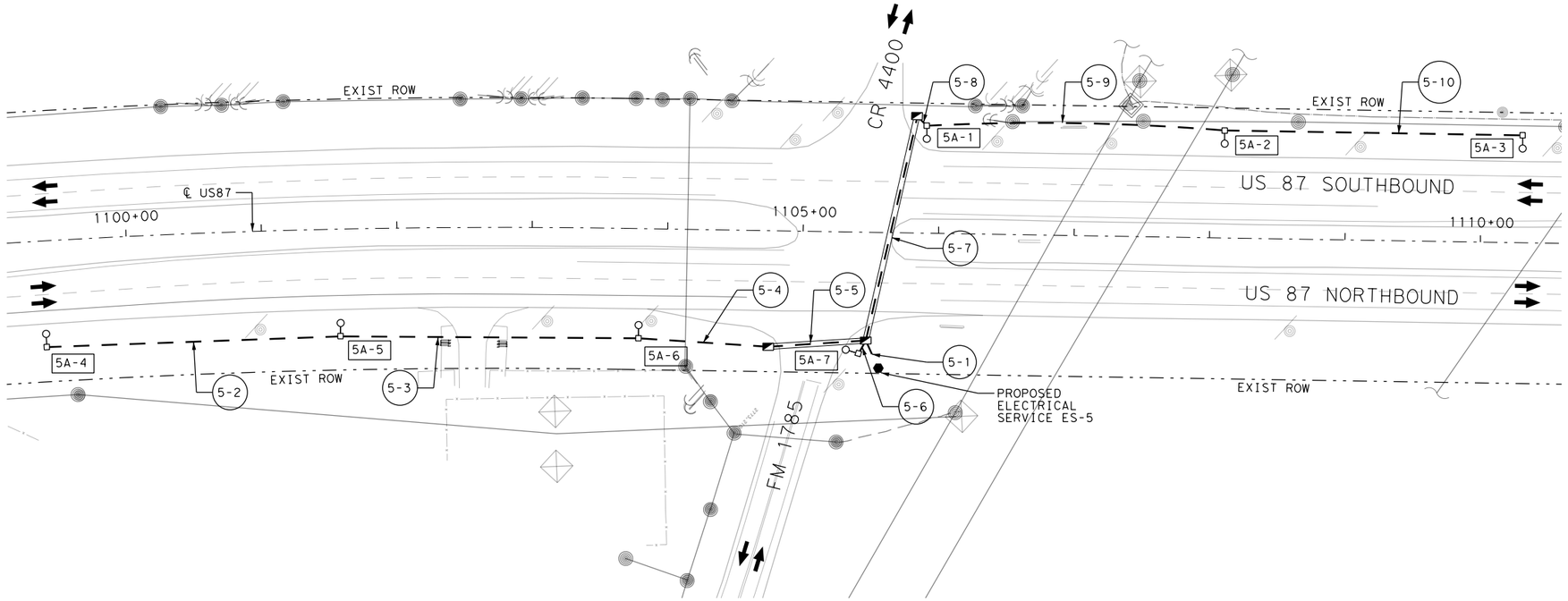

50′ 25′ 0 50′ 100′

HORIZ SCALE: 1" = 100′

LEGEND

- DIRECTION OF TRAVEL
- EXIST ROW
- ILL CONDUIT 2" PVC SCH 40
- ILL CONDUIT BORE 2" PVC SCH 80
- RD IL (TY SA) 40T-12(250W EQ)LED
- GROUND BOX TY A W/APRON
- ELECTRICAL SERVICE
- EXIST CONDUIT
- EXIST ILLUMINATION POLE
- EXIST GROUND BOX
- EXIST ELECTRICAL SERVICE

1-1 RUN DESIGNATION
- RUN NUMBER
- SERVICE NUMBER

1A-1 POLE DESIGNATION
- POLE NUMBER
- CIRCUIT IDENTIFICATION
- SERVICE NUMBER

CONDUIT AND CABLE CHART

RUN NO	CONDUIT STATUS	CONDUIT ITEM 618 2" PVC TRENCHED QTY	CONDUIT ITEM 618 2" PVC TRENCHED LEN	CONDUIT ITEM 618 2" PVC BORED QTY	CONDUIT ITEM 618 2" PVC BORED LEN	CABLE STATUS	CONDUCTORS ITEM 620 NO. 8 BARE WIRE QTY	CONDUCTORS ITEM 620 NO. 8 BARE WIRE LEN	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE QTY	CONDUCTORS ITEM 620 NO. 12 XHHW WIRE LEN	TOTAL LENGTH OF RUN	RUN NO
5-1	I	1	25			I	1	25	2	50	25	5-1
5-2	I	1	220			I	1	220	2	440	220	5-2
5-3	I	1	220			I	1	220	2	440	220	5-3
5-4	I	1	100			I	1	100	2	200	100	5-4
5-5	I			1	75	I	1	75	2	150	75	5-5
5-6	I	1	15			I	1	15	6	90	15	5-6
5-7	I			1	170	I	1	170	2	340	170	5-7
5-8	I	1	15			I	1	15	2	30	15	5-8
5-9	I	1	220			I	1	220	2	440	220	5-9
5-10	I	1	220			I	1	220	2	440	220	5-10
TOTAL			1035		245			1280		2620		

CONDUIT STATUS: I=INSTALL; E=EXISTING; A=ABANDON; R=REMOVE AND SALVAGE

LUMINAIRES

POLE NO.	ITEM	DESCRIPTION	CIRCUIT	STATION	OFFSET (FT)	ITEM 416 DIA	ITEM 416 DEPTH	ITEM 432 RIP RAP	NOTES:
5A-1	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1105 + 90	80 L	30"	8 FT	0.35 CY	
5A-2	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1108 + 10	80 L	30"	8 FT	0.35 CY	
5A-3	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1110 + 30	80 L	30"	8 FT	0.35 CY	
5A-4	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1099 + 38	82 R	30"	8 FT	0.35 CY	
5A-5	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1101 + 59	80 R	30"	8 FT	0.35 CY	
5A-6	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1103 + 80	80 R	30"	8 FT	0.35 CY	
5A-7	610	IN RD IL (TY ST) 40T-12 (250W EQ) LED	A	1105 + 43	90 R	30"	8 FT	0.35 CY	

STATION AND OFFSETS ARE REFERENCED FROM CL US-87 UNLESS OTHERWISE NOTED.

NOTES:

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STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED
PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

US 87

ILLUMINATION LAYOUT
FM 1785 INTERSECTION

SHEET (5 OF 5)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	174
JR	0068	07	052, ETC.	
GRPH CHECK				
BH				

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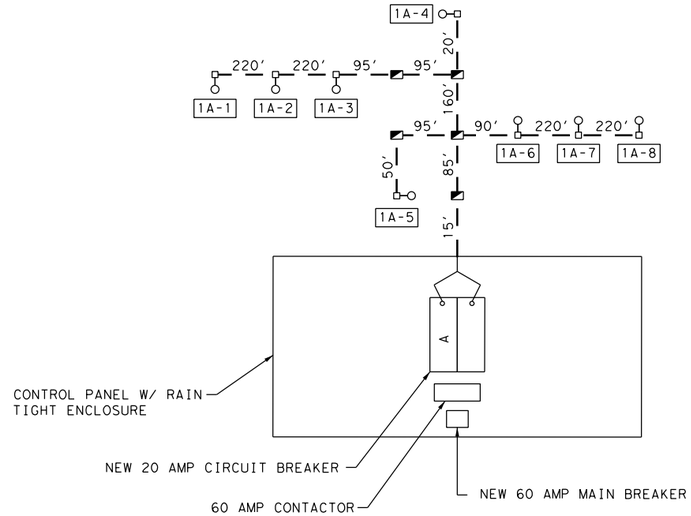
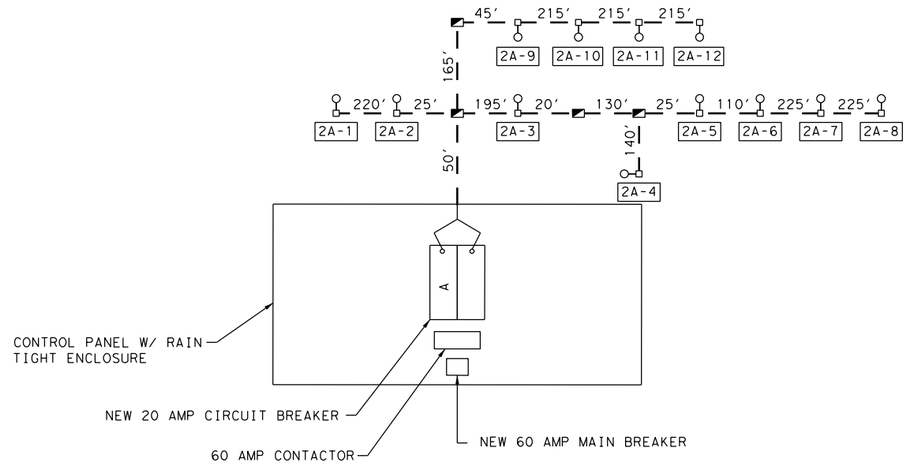


ELECTRICAL SERVICE DATA ITEM 628												
ELEC. SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)**	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMP	TWO-POLE CONTACTOR AMPS	PANELBD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-01	1 OF 5	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	1-1/4"	3 / #6	N/A	2P / 60	60	100	A	2P/20	5.7	2.8

** - VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO THE UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.



ELECTRICAL SERVICE DATA ITEM 628												
ELEC. SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)**	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMP	TWO-POLE CONTACTOR AMPS	PANELBD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-02	2 OF 5	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	1-1/4"	3 / #6	N/A	2P / 60	60	100	A	2P/20	8.5	4.1

** - VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO THE UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.

STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED
PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

US 87

ELECTRICAL SERVICE DATA SHEET

SHEET (1 OF 3)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	175
JR				
GRPH CHECK	0068	07	052, ETC.	
BH				

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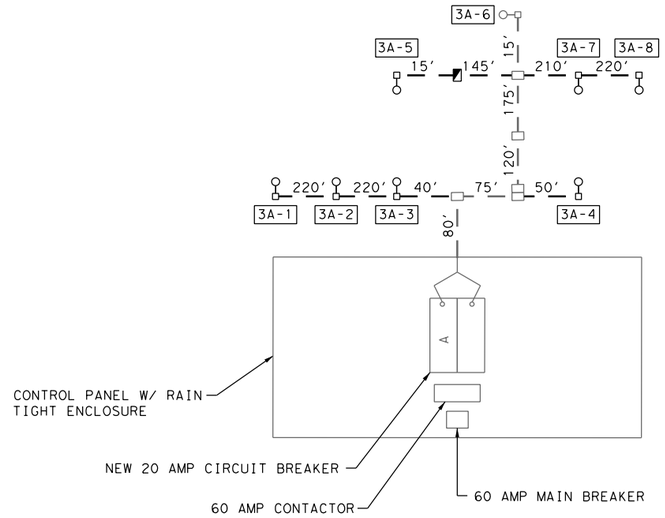
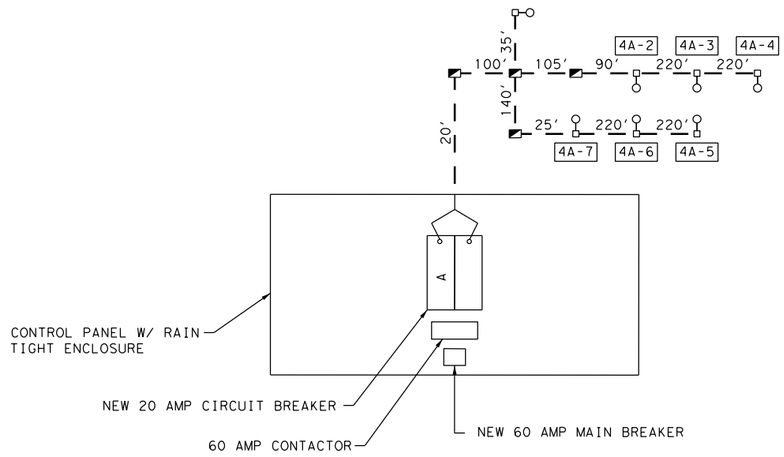


ELECTRICAL SERVICE DATA ITEM 628												
ELEC. SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMP	TWO-POLE CONTACTOR AMPS	PANELBD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-03	3 OF 5	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	1-1/4"	3 / #6	N/A	2P / 60	60	100	A	2P/20	5.7	2.8

** - VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO THE UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.



ELECTRICAL SERVICE DATA ITEM 628												
ELEC. SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)**	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMP	TWO-POLE CONTACTOR AMPS	PANELBD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-04	4 OF 5	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	1-1/4"	3 / #6	N/A	2P / 60	60	100	A	2P/20	5	2.4

** - VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO THE UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.

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STATE OF TEXAS
IN SUNG HWANG
131159
LICENSED
PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

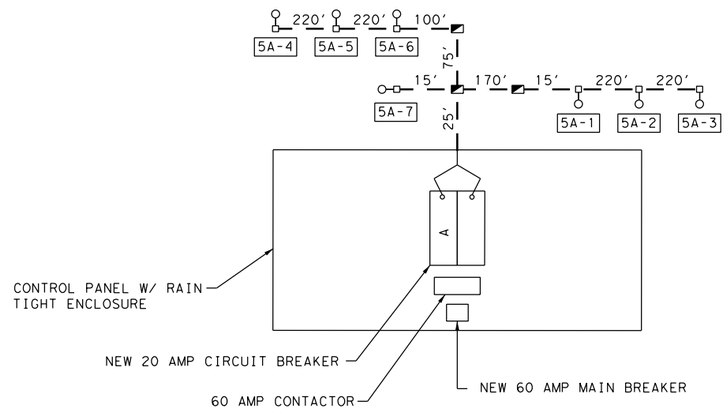
Texas Department of Transportation

US 87

ELECTRICAL SERVICE DATA SHEET

SHEET (2 OF 3)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	176
GRAPHICS	CONTROL	SECTION	JOB	
JR	0068	07	052, ETC.	
GRPH CHECK				
BH				



ELECTRICAL SERVICE DATA
ITEM 628

ELEC. SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE (PVC)**	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE / AMP	TWO-POLE CONTACTOR AMPS	PANELBD. / LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE / AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-05	5 OF 5	ELC SRV TY A 120/240 060(NS)AL(E)SP(O)	1-1/4"	3 / #6	N/A	2P / 60	60	100	A	2P/20	5	2.4

** - VERIFY SERVICE CONDUIT SIZE WITH UTILITY. SIZE MAY CHANGE DUE TO THE UTILITY METER REQUIREMENTS. ENSURE CONDUIT SIZE MEETS THE NATIONAL ELECTRICAL CODE.

STATE OF TEXAS
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131159
LICENSED PROFESSIONAL ENGINEER
5/24/2021

OTHON ENGINEERING
FIRM REGISTRATION NO. F-1471

Texas Department of Transportation

US 87

ELECTRICAL SERVICE DATA SHEET

SHEET (3 OF 3)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
BH	6	(SEE TITLE SHEET)		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
JL	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	177
JR				
GRPH CHECK	0068	07	052, ETC.	
BH				

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

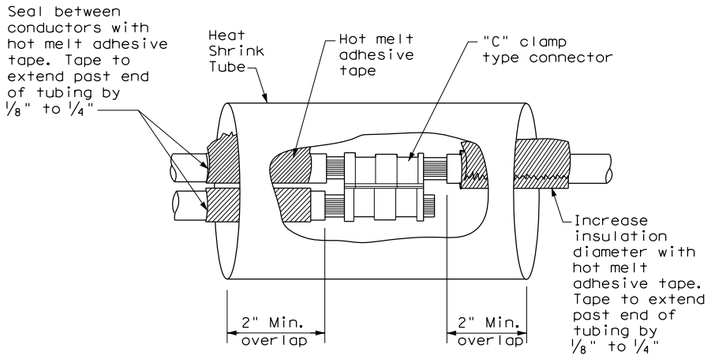
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

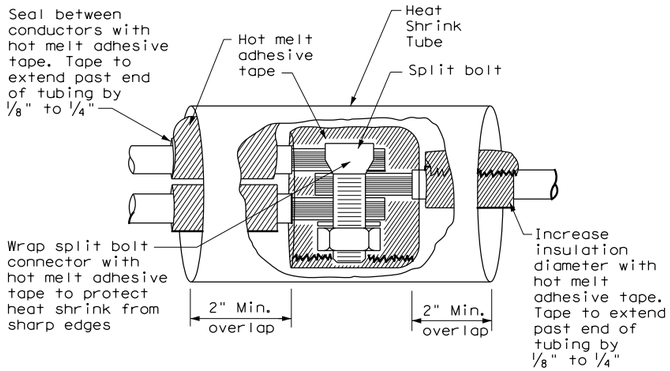
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

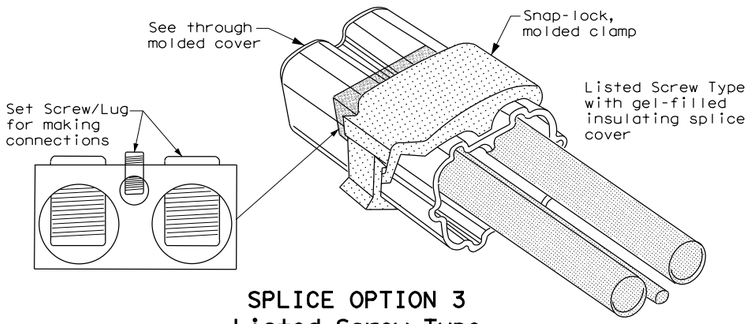
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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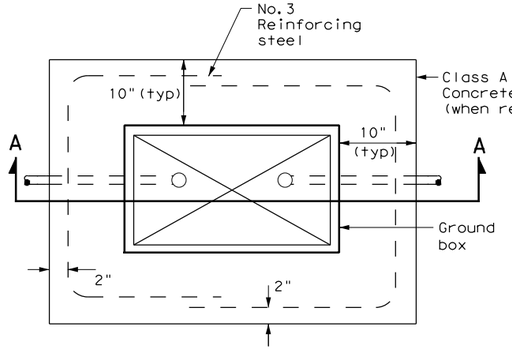
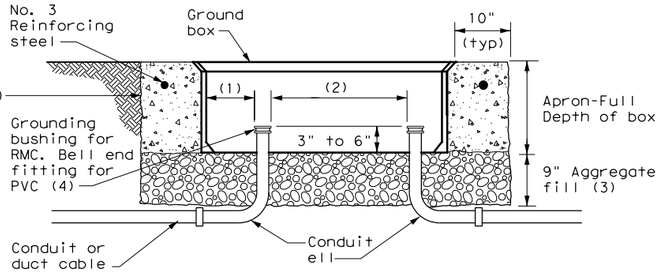


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

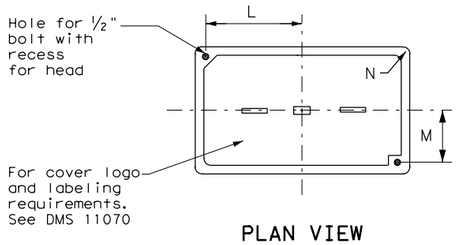
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

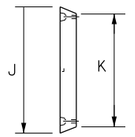
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

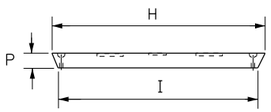
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

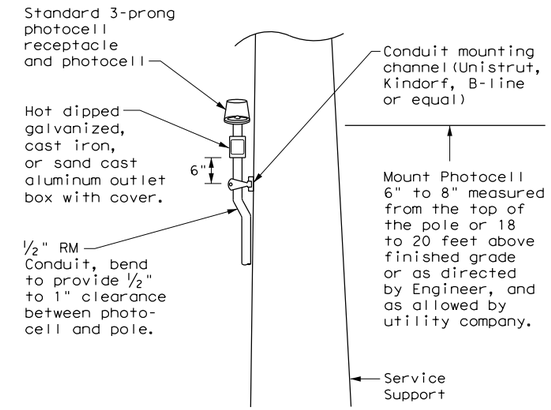
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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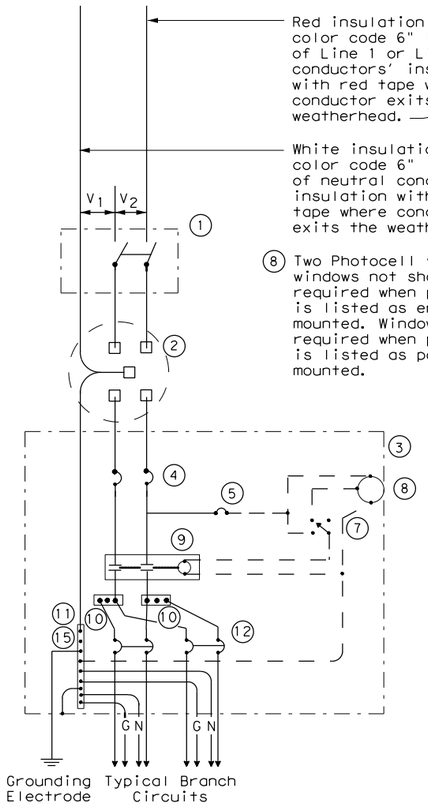
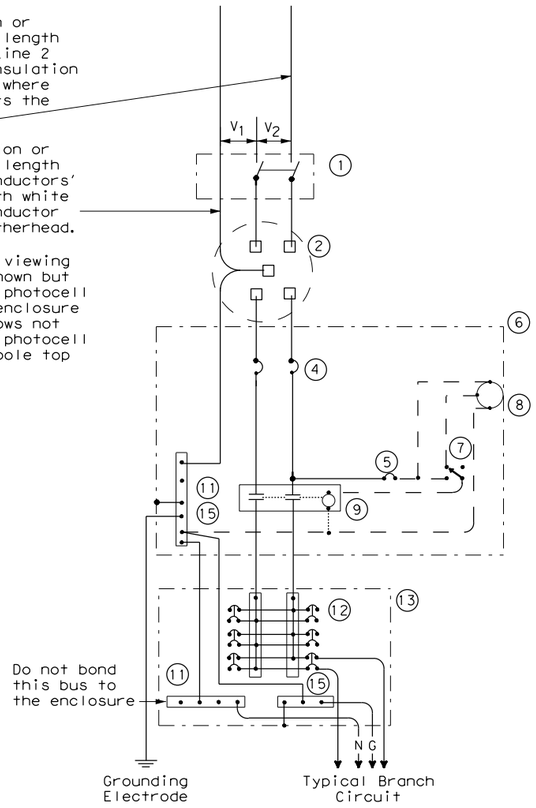
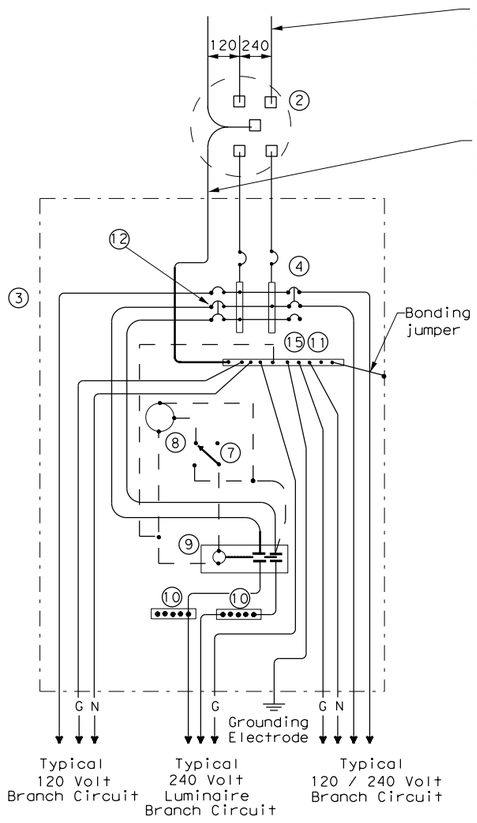


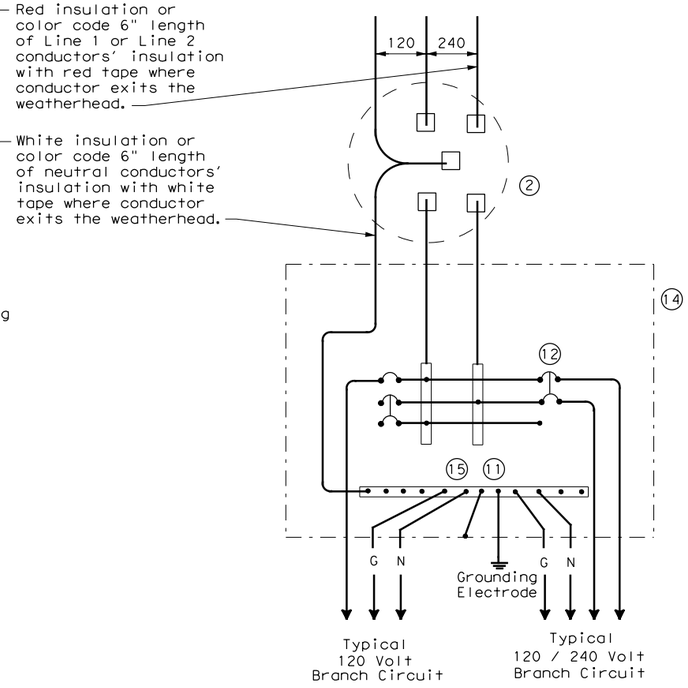
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- — —	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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71F

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 5/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.

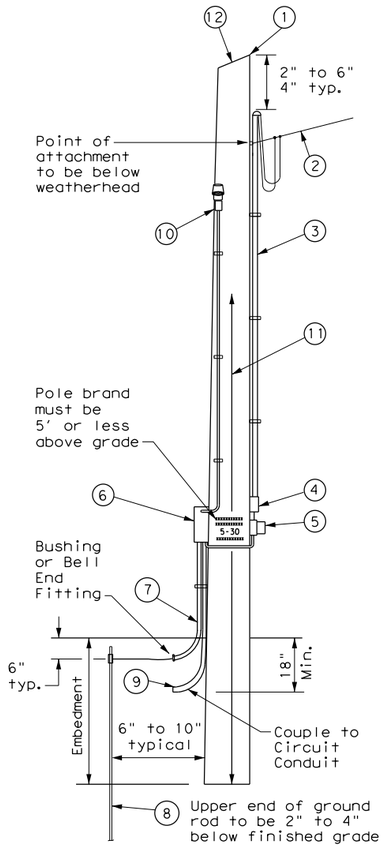
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

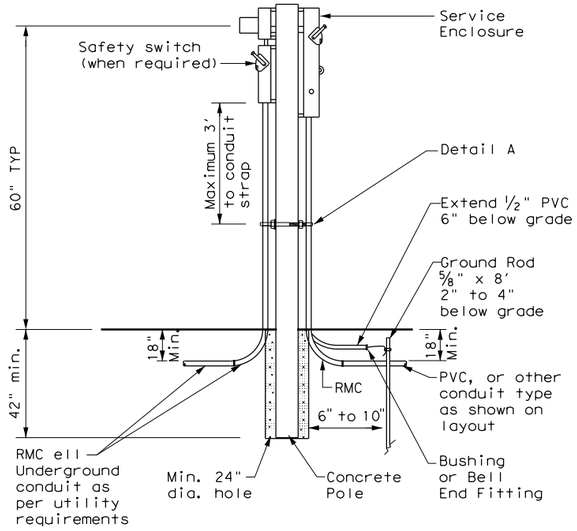


SERVICE SUPPORT TYPE TP (O)

GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

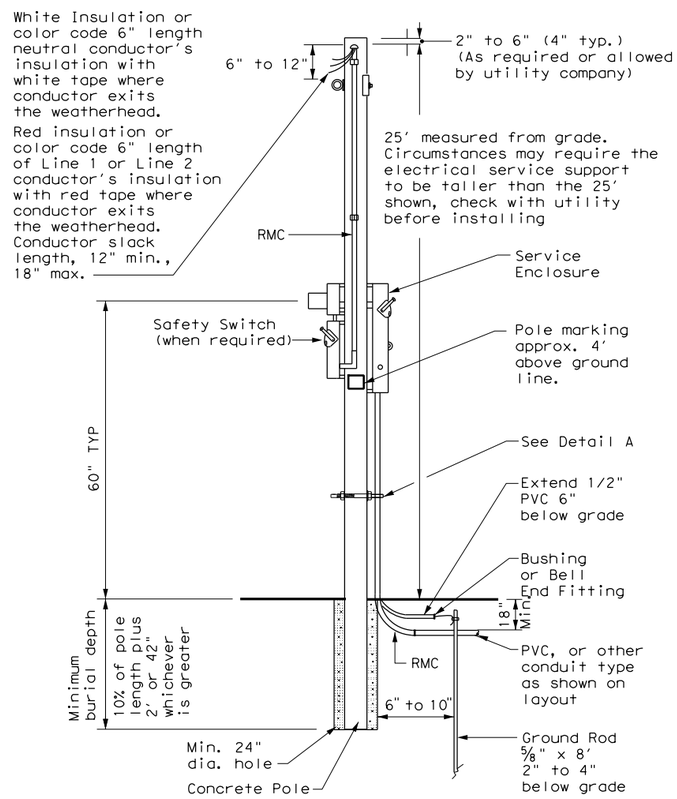
Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



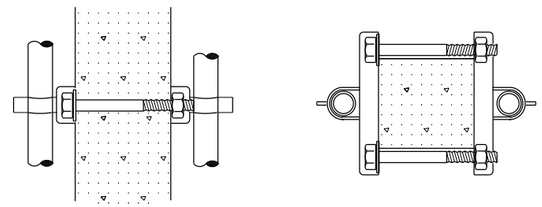
CONCRETE SERVICE SUPPORT

Underground (U)



CONCRETE SERVICE SUPPORT

Overhead (O)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

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ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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71K

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC),TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA),and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25′ above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25′ above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

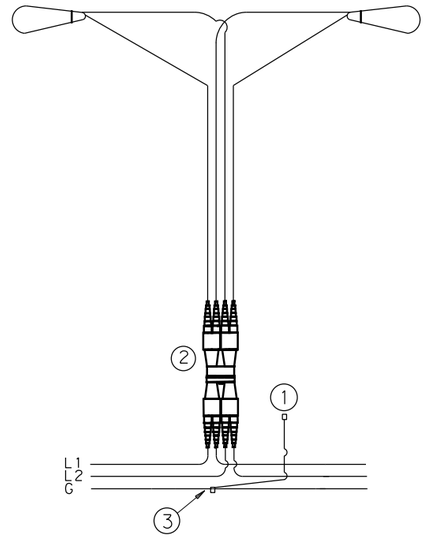
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

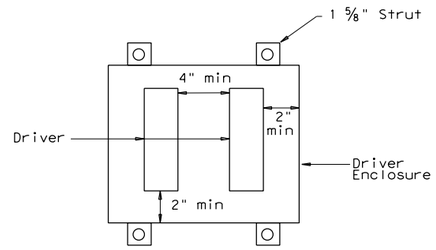
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

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ROADWAY ILLUMINATION DETAILS

RID(1)-20

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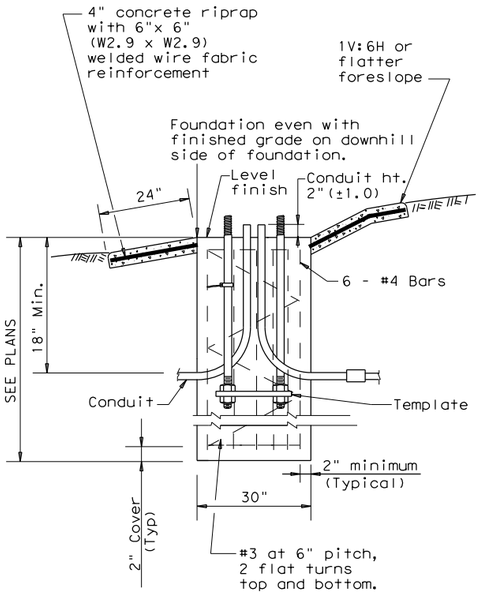
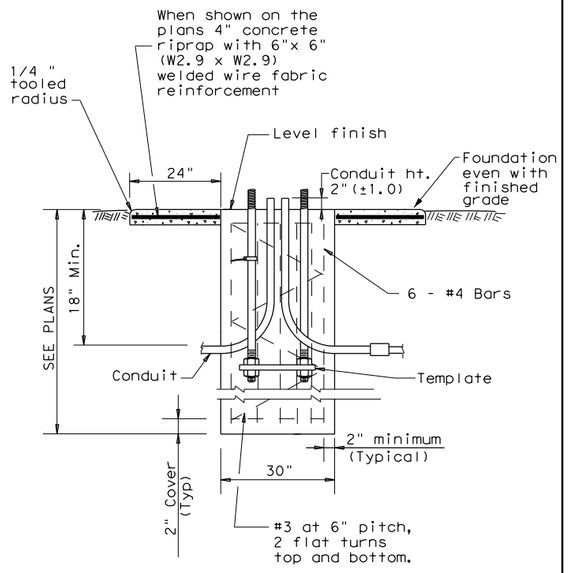


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS
(See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6′	6′	6′
>20 ft. to 30 ft.	8′	6′	6′
>30 ft. to 40 ft.	8′	8′	6′
>40 ft. to 50 ft.	10′	8′	6′

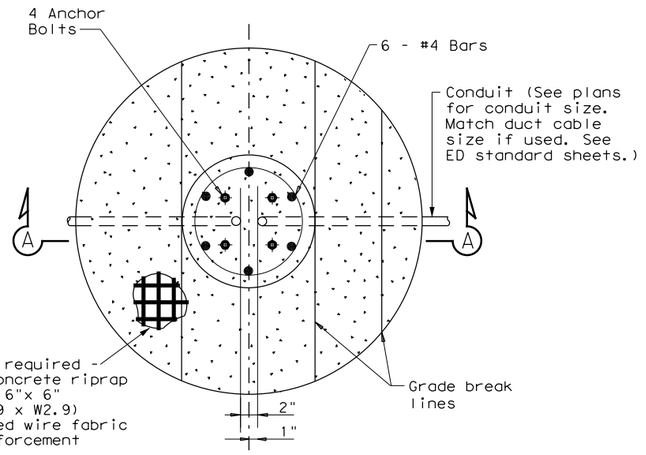
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

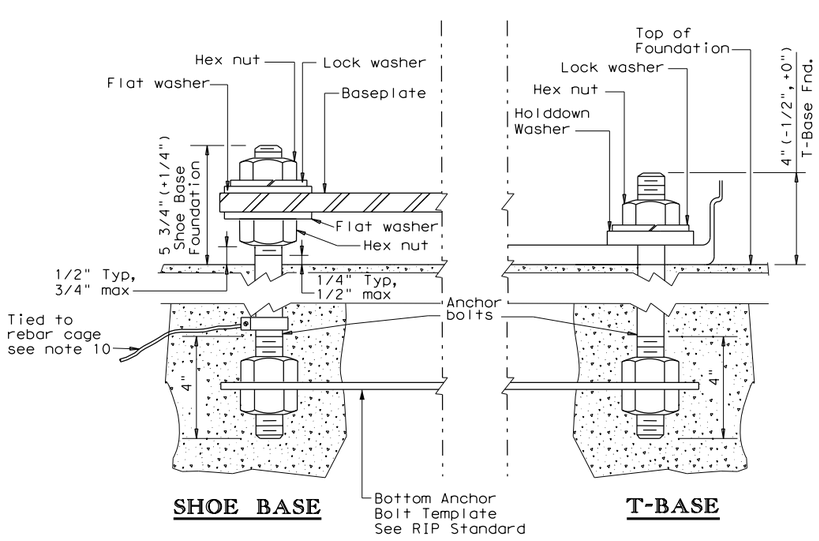
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



SHOE BASE T-BASE

ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

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Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS
(RDWY ILLUM FOUNDATIONS)

RID(2)-20

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72B

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation				Shoe Base Quantity	T-Base Designation				T-Base Quantity	CSB/SSCB Mounted Designation				CSB/SSCB Mounted Quantity
	Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire	
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED	
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)			(250W EQ) LED	
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED	
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)			(250W EQ) LED	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)			(250W EQ) LED	
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED		(Type SP 38 S - 8)			(250W EQ) LED	
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)			(250W EQ) LED	
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)			(250W EQ) LED	
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)			(250W EQ) LED	
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED	40	(Type SP 38 S - 12)			(250W EQ) LED	
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)			(250W EQ) LED	
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
	(Type SA 50 S - 4 - 4)			(400W EQ) LED		(Type SA 50 T - 4 - 4)			(400W EQ) LED		(Type SP 48 S - 4 - 4)			(400W EQ) LED	
	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)			(400W EQ) LED	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
	(Type SA 50 S - 10 - 10)			(400W EQ) LED		(Type SA 50 T - 10 - 10)			(400W EQ) LED		(Type SP 48 S - 10 - 10)			(400W EQ) LED	
	(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED		(Type SP 48 S - 12)			(400W EQ) LED	
	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)			(400W EQ) LED	

OTHER Designation				Quantity
Pole	A1	A2	Luminaire	

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

- SA: Pole and mast arm may be steel or aluminum.
- ST: Pole and mast arm must be steel.
- AL: Pole and mast arm must be aluminum.
- SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

SHEET 1 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(1)-19

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	ABL	HOWARD		186

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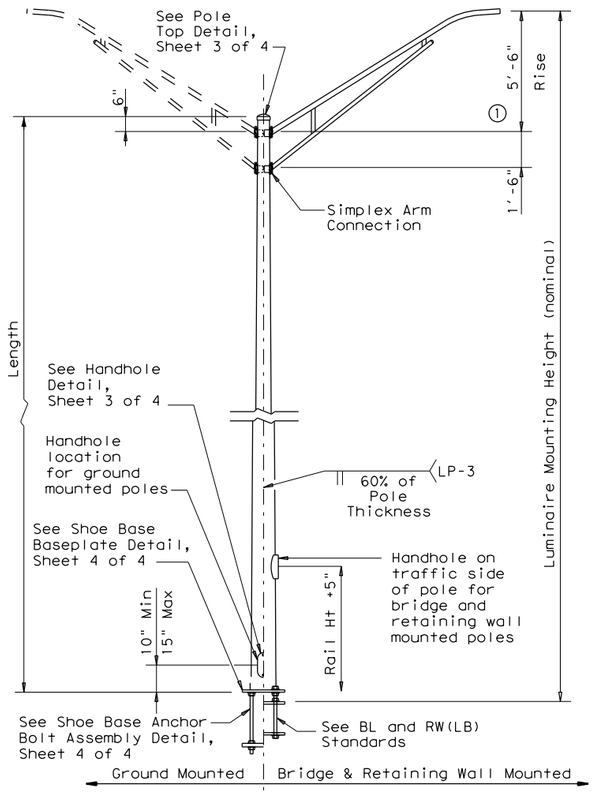
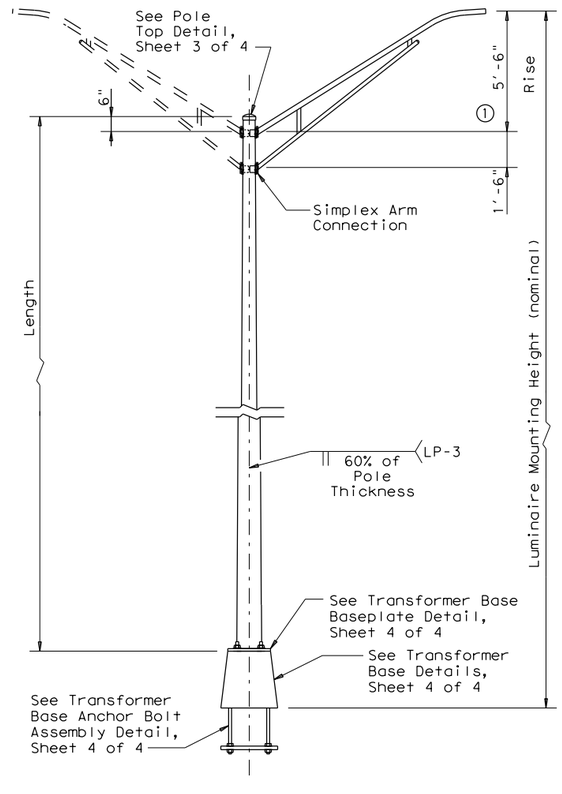


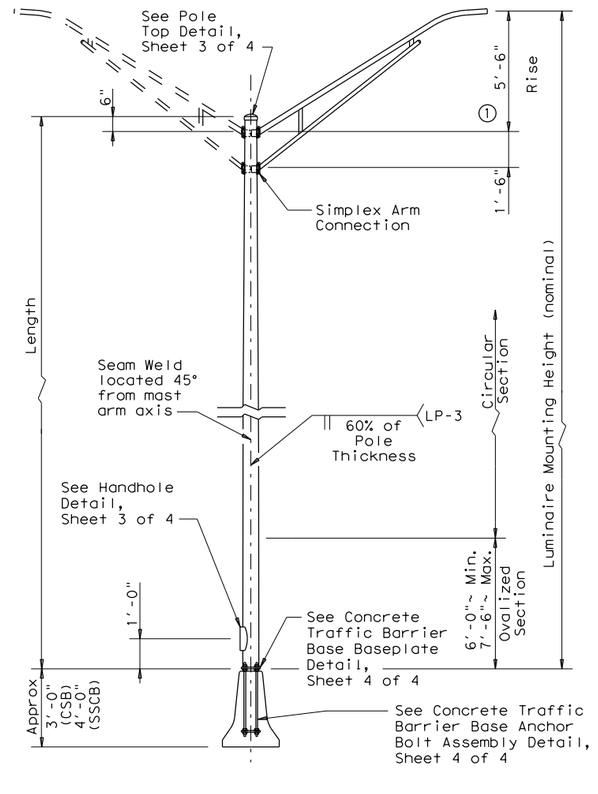
SHOE BASE POLE

SHOE BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



TRANSFORMER BASE POLE

TRANSFORMER BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

MATERIAL DATA		
COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals , 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
6. Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
13. Erect transformer base poles in accordance with sheet RID(1).

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Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(2)-19

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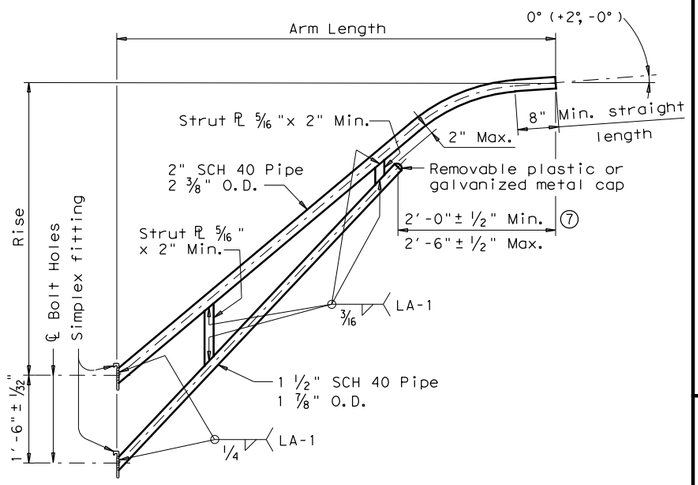
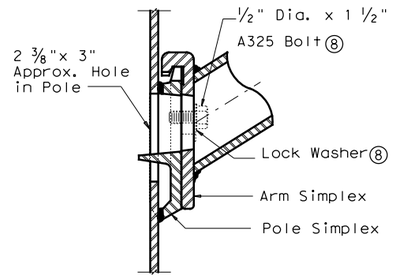


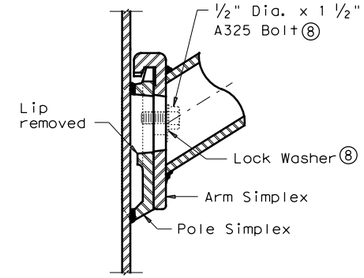
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

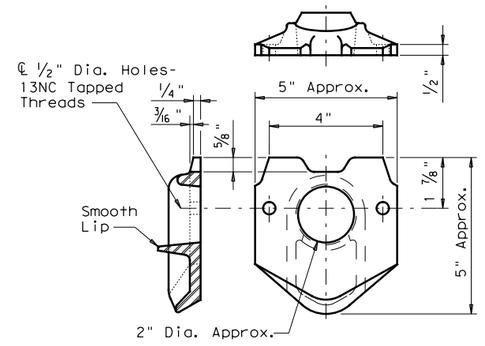


UPPER SIMPLEX FITTING
(Gusset not shown for clarity)

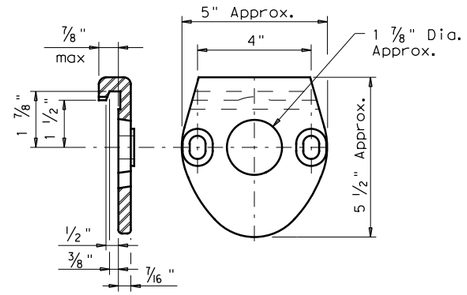


LOWER SIMPLEX FITTING
(Gusset not shown for clarity)

SECTION B-B



POLE SIMPLEX DETAIL ⑨



ARM SIMPLEX DETAIL ⑨

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

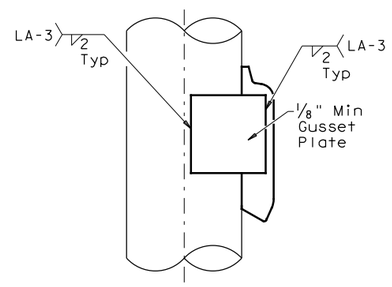
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

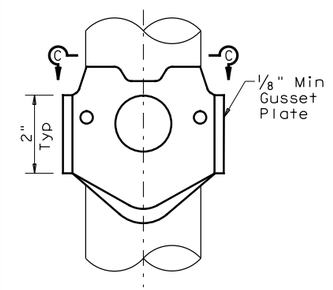
⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

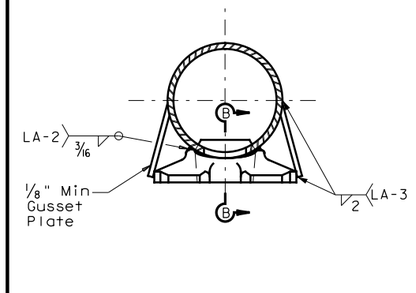
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



SIDE

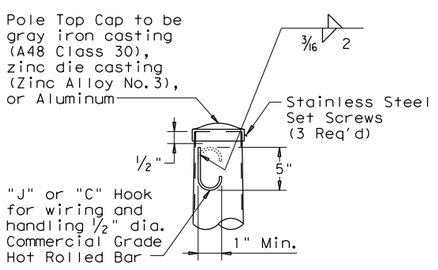


ELEVATION

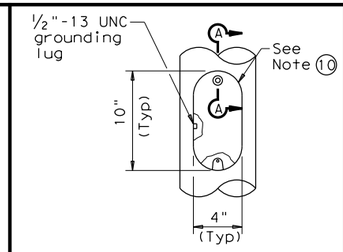


SECTION C-C

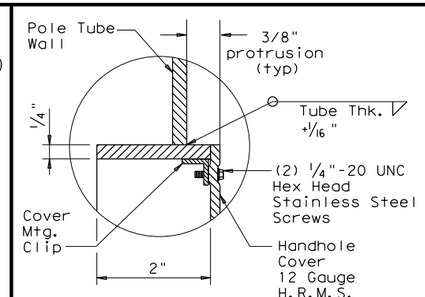
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

SHEET 3 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

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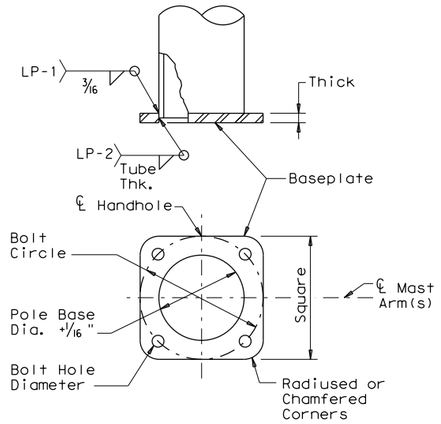
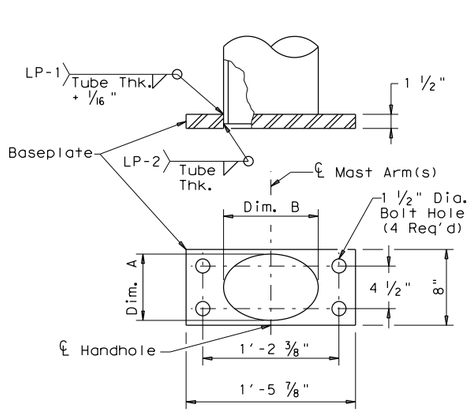


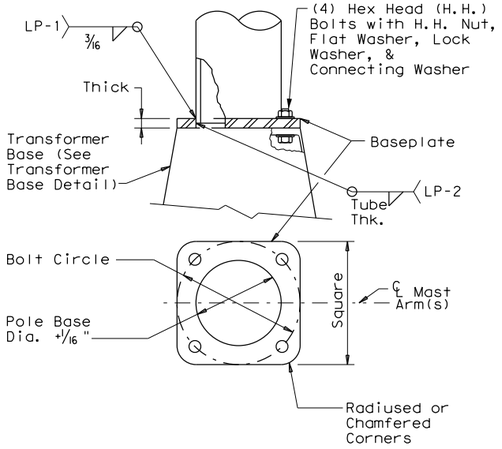
SHOE BASE BASEPLATE

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20′ - 39′	13"	13"	1 1/4"	1 1/4"
40′	15"	15"	1 1/4"	1 1/2"
50′	15"	15"	1 1/2"	1 1/2"



CONCRETE TRAFFIC BARRIER BASE BASEPLATE

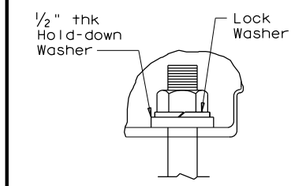
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28′ - 38′	9"	7" ± 1/4"	10" ± 1/4"
48′	10 1/2"	7" ± 1/4"	13" ± 1/4"



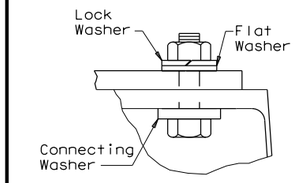
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFOMER BASE TYPE
20′ - 39′	13"	13"	1 1/4"	1"	1 1/4"	A
40′	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50′	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

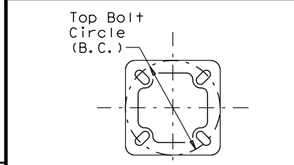
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



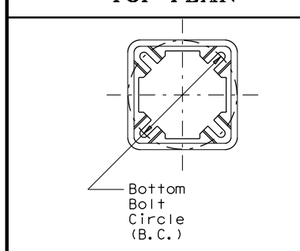
DETAIL A



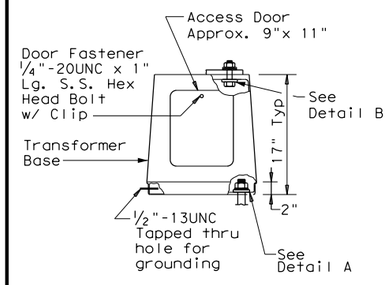
DETAIL B



TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

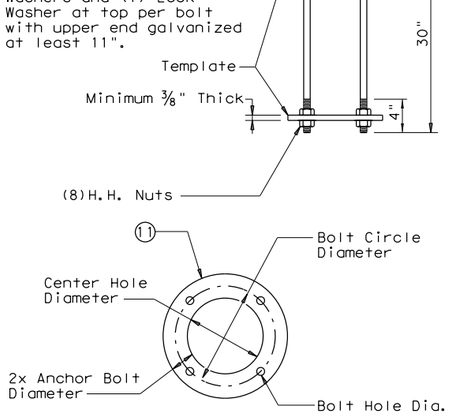
1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
3. Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
4. Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
5. Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

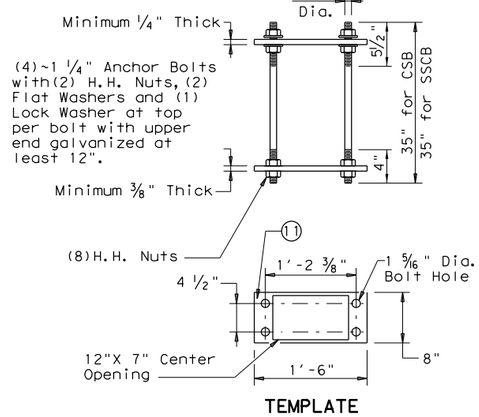
(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



SHOE BASE ANCHOR BOLT ASSEMBLY

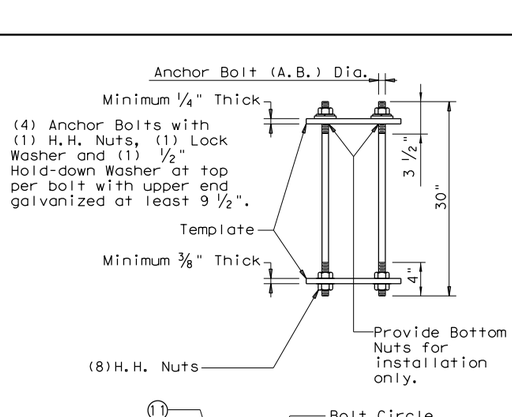
SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′-39′	1"	13"	11"	1 1/16"
40′-50′	1 1/4"	15"	12 1/2"	1 5/16"



TEMPLATE

CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′- 39′	1"	14"	12"	1 1/16"
40′- 50′	1 1/4"	17 1/4"	14 3/4"	1 5/16"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

SHEET 4 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS 7-17 12-19	0068	07	052, ETC.	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		189

730

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FILE: rip(1-4)-19 US87.dgn

SUMMARY OF SMALL SIGNS

SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX)

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
39	1	R5-11T (TWO PANELS)	FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY	48"X48" BACK-TO-BACK	X		10BWG	1	SA	P		
44	2	R5-11T (TWO PANELS)	FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY	48"X48" BACK-TO-BACK	X		10BWG	1	SA	P		
46	3	R5-11T (TWO PANELS)	FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY	48"X48" BACK-TO-BACK	X		10BWG	1	SA	P		
52	4	R5-11T (TWO PANELS)	FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY	48"X48" BACK-TO-BACK	X		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
4-16 8-16	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		190

18

DATE: 5/25/2021 7:53:32 AM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

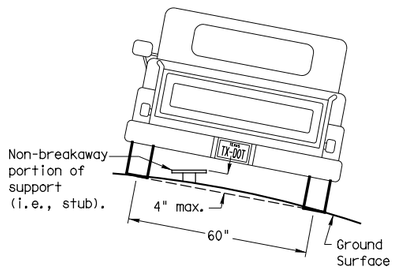
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

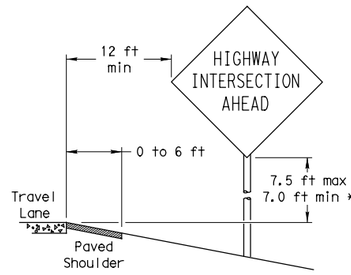
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

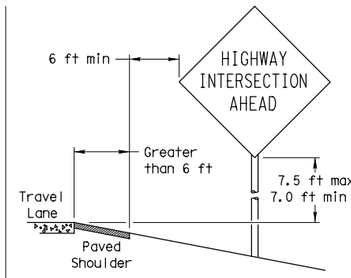
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

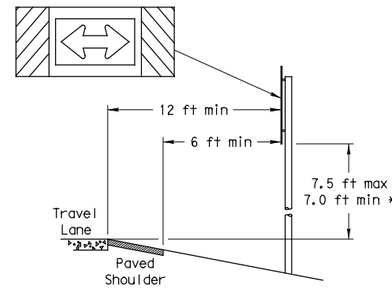
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



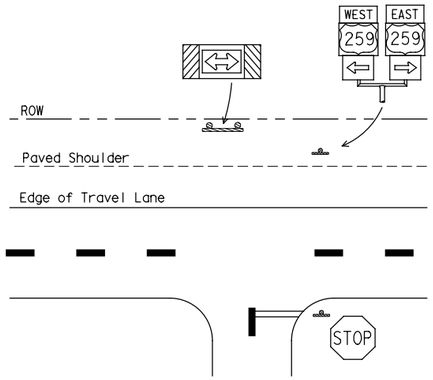
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

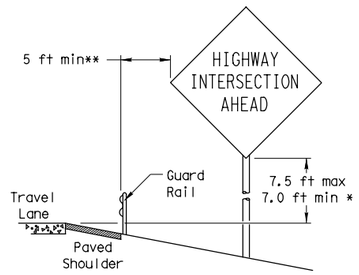
T-INTERSECTION



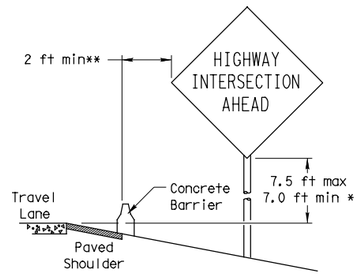
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



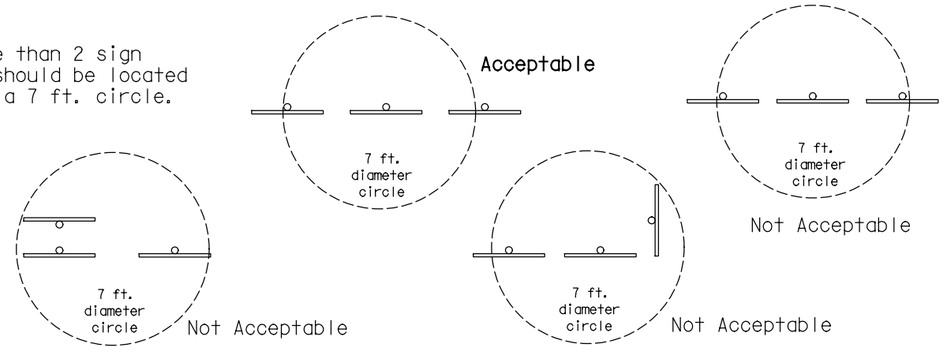
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

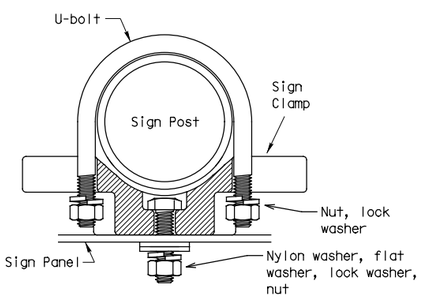
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.

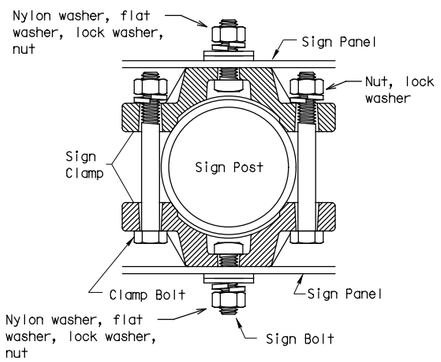


TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



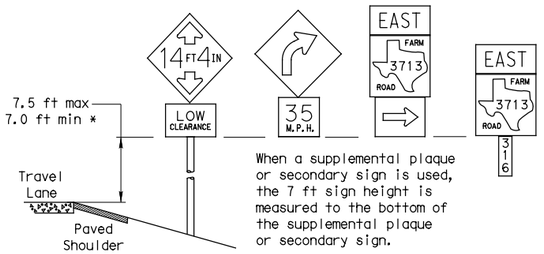
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

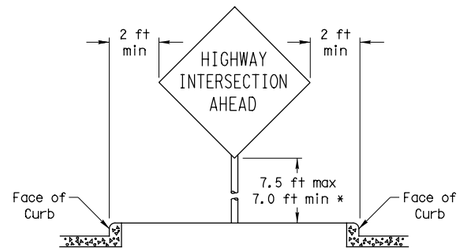
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



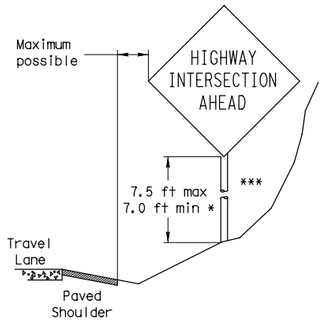
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

* 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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0068	07	052, ETC	US 87
DIST	COUNTY		SHEET NO.
ABL	HOWARD		191

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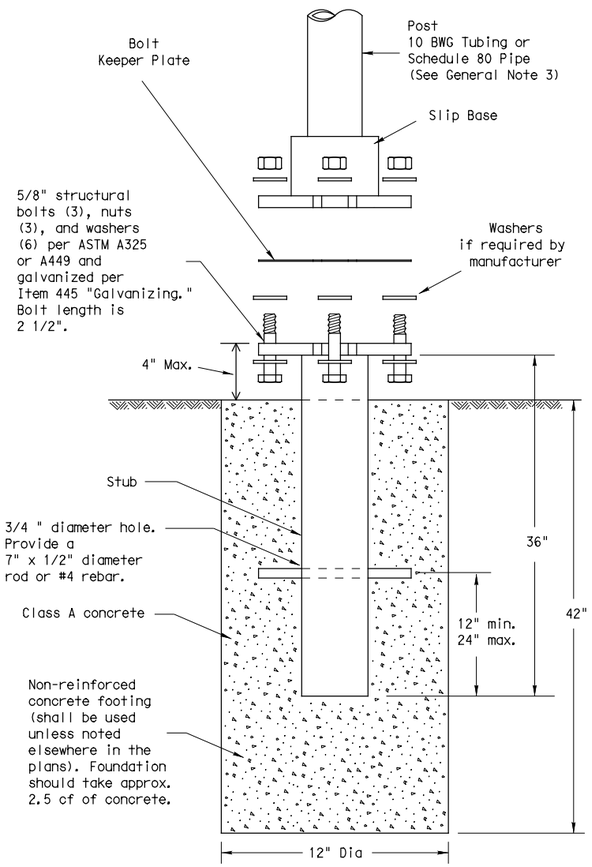
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

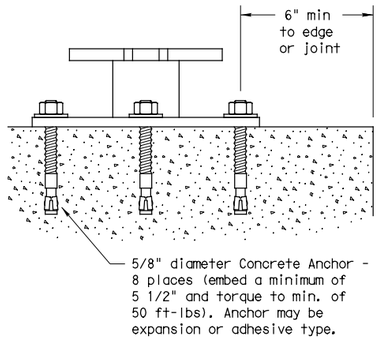
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0068	07	052, ETC	US 87
DIST	COUNTY		SHEET NO.
ABL	HOWARD		191

DATE: 5/25/2021 7:53:35 AM
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DATE: 5/25/2021 7:53:36 AM
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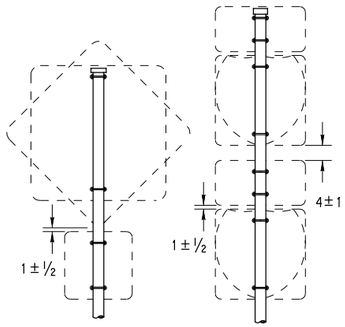
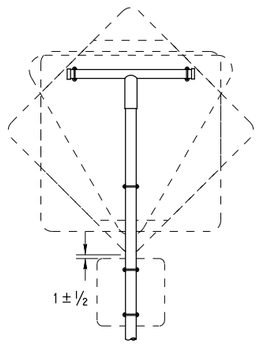
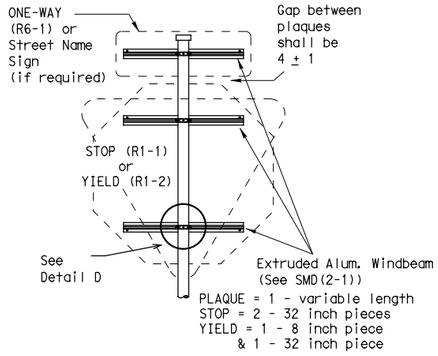


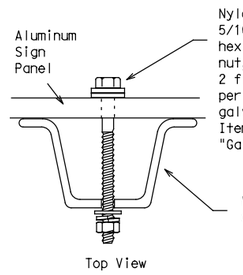
SM RD SGN ASSM TY XXXXX(1)XX(P)



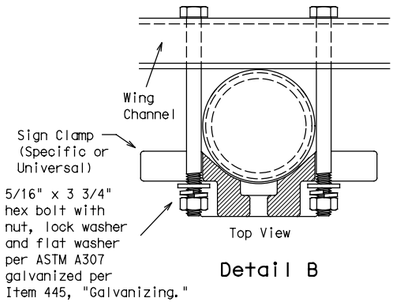
SM RD SGN ASSM TY XXXXX(1)XX(T)



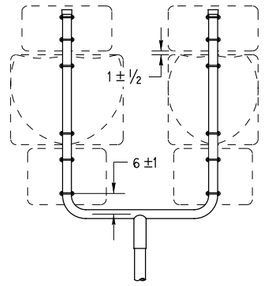
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



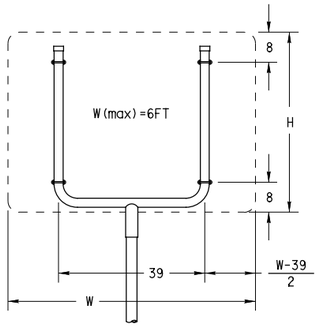
Detail A



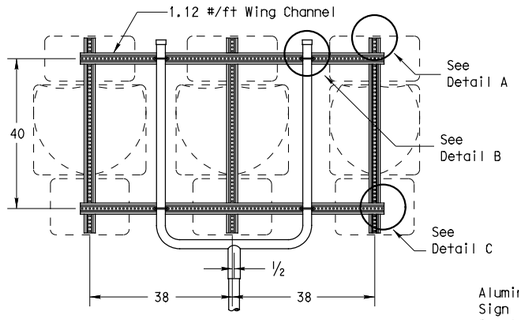
Detail B



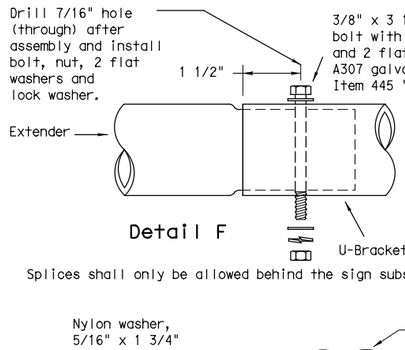
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

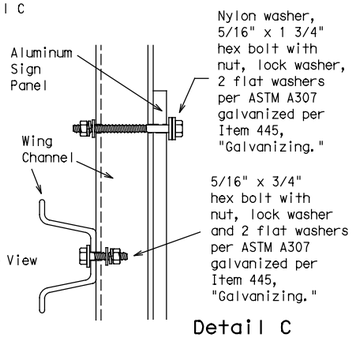


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

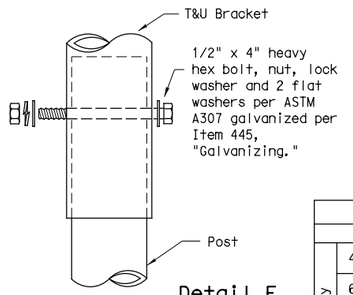


Detail F

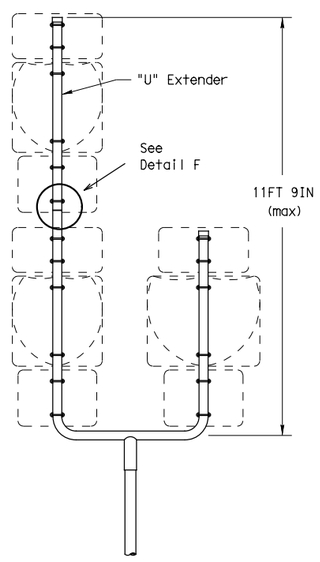
Splices shall only be allowed behind the sign substrate.



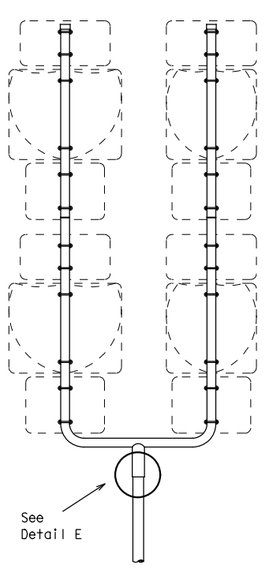
Detail C



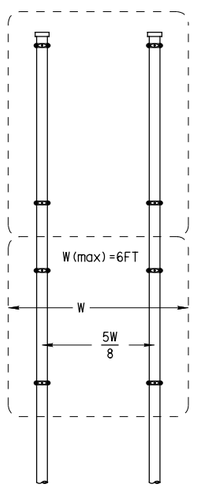
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

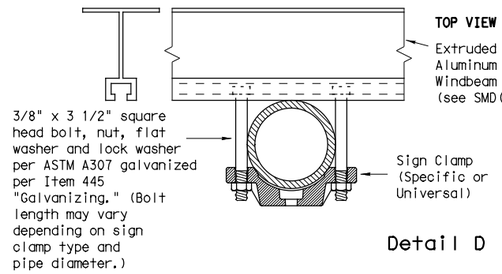


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

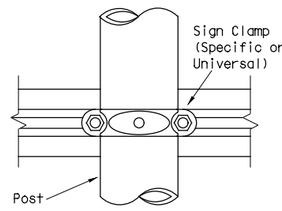


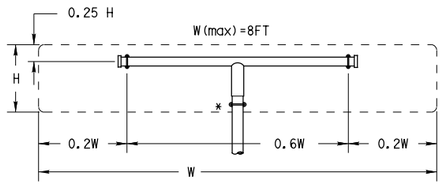
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

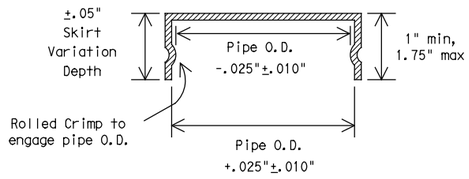




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

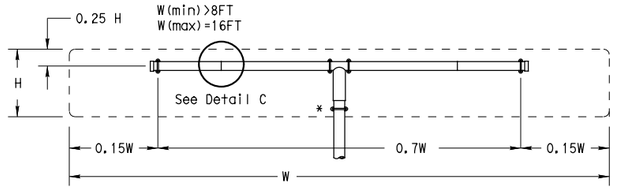
REQUIRED SUPPORT			
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

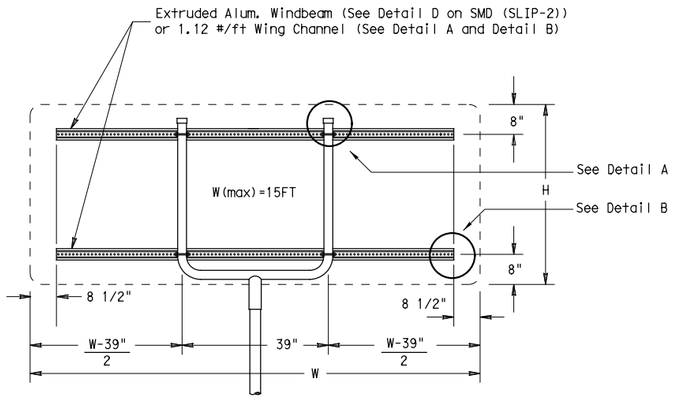
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

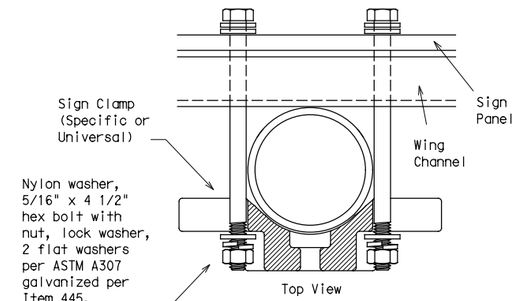
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		193



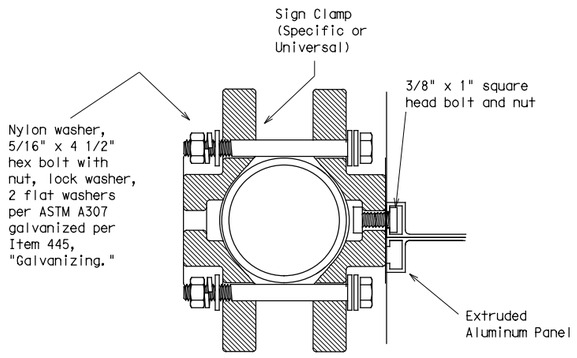
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



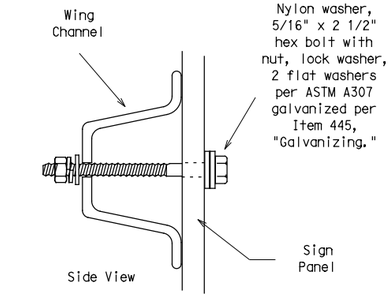
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



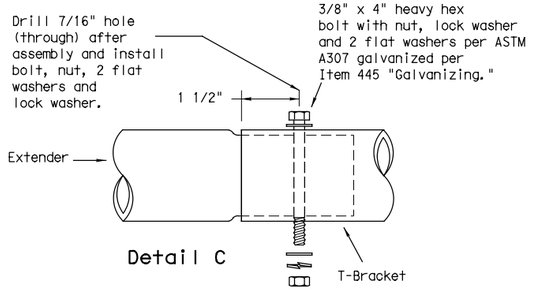
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

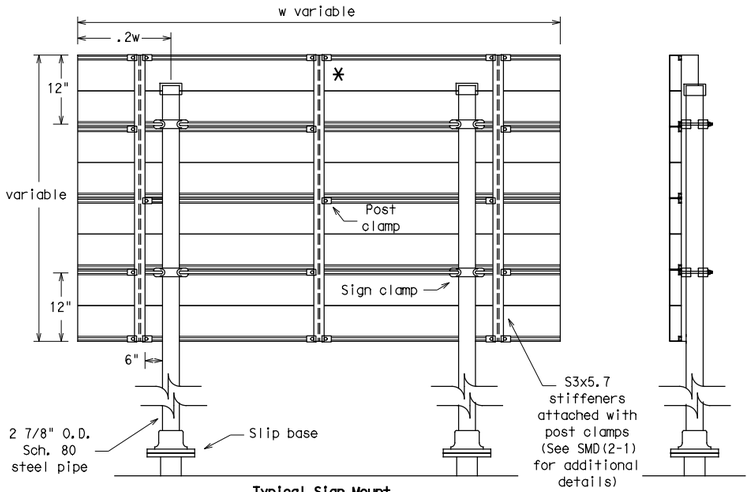


Detail B



Detail C

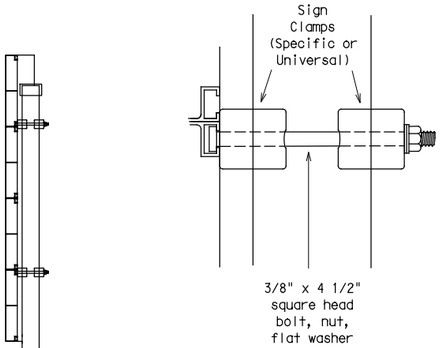
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

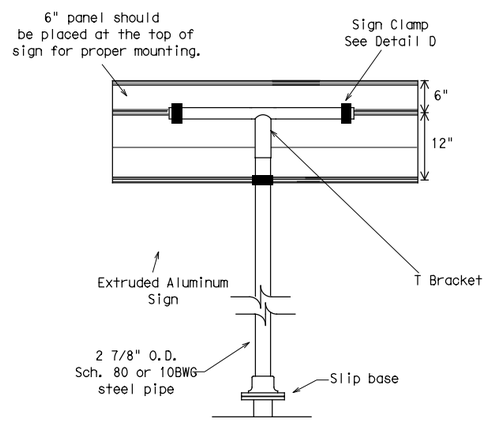
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

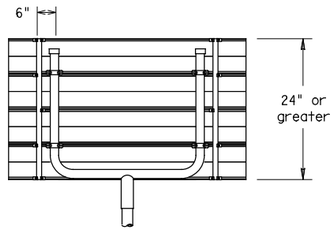


See Detail E
for clamp installation

Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		194

DATE: 5/25/2021 7:53:37 AM
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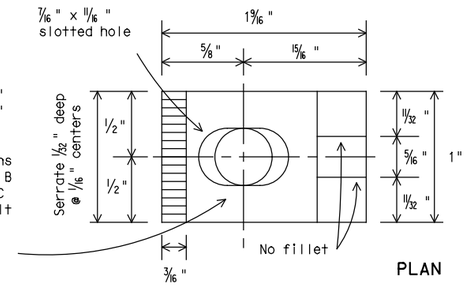
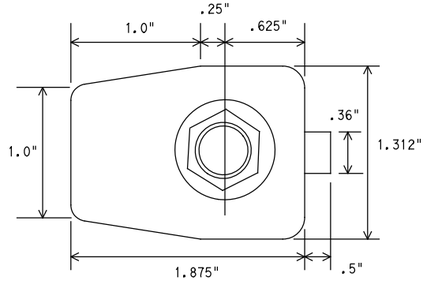
DATE: 5/25/2021 7:53:38 AM
FILE: P:\MSGP\TXD2020\US 87\PROD_SHEETS\STANDARDS\Traffic Items\smd21-08.dgn

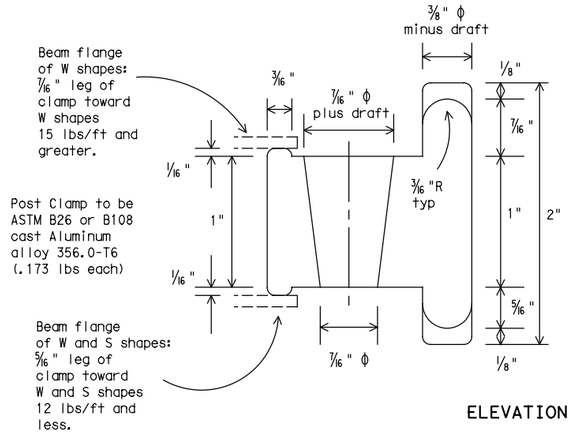
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



PLAN

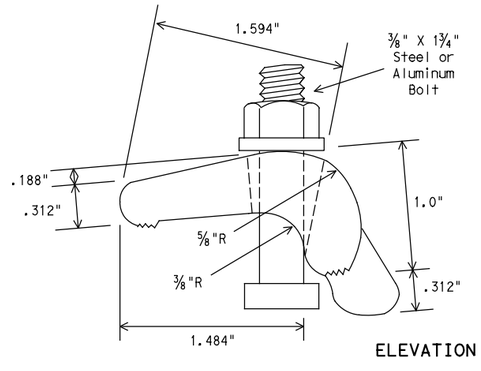


PLAN



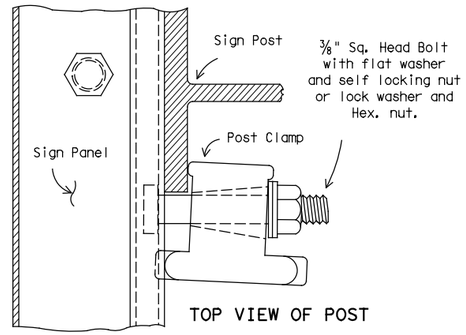
ELEVATION

POST CLAMP DETAIL

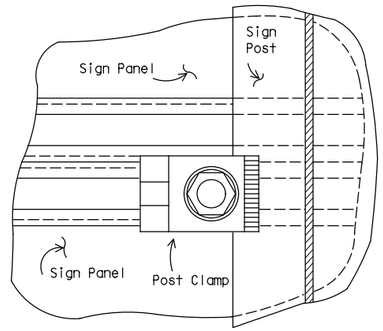


ELEVATION

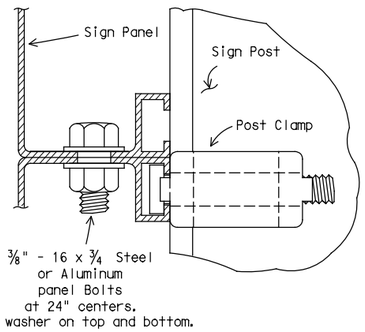
ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



TOP VIEW OF CLAMP



SIDE VIEW OF PANELS

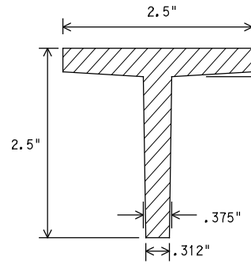
CONNECTION DETAILS

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.

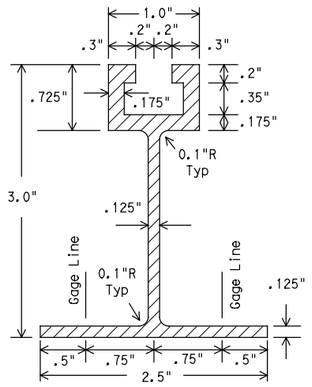


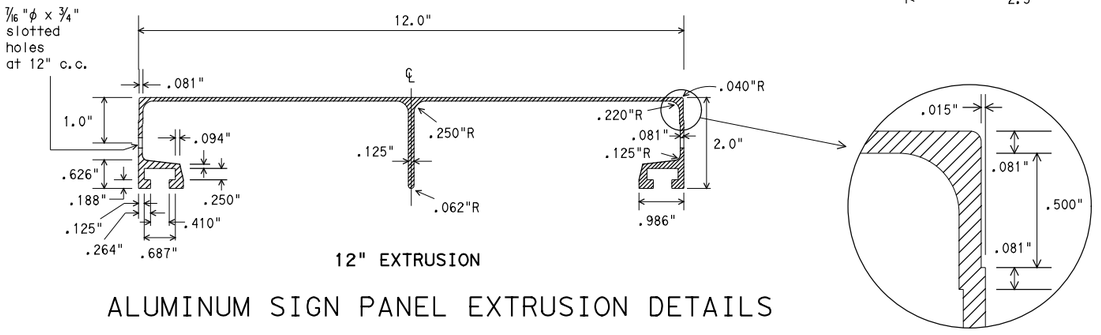
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

WINDBEAM CROSS SECTION

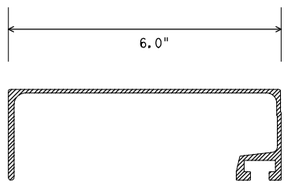
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



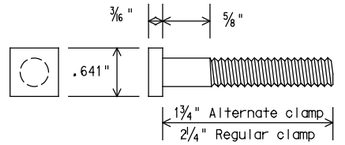


12" EXTRUSION

ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

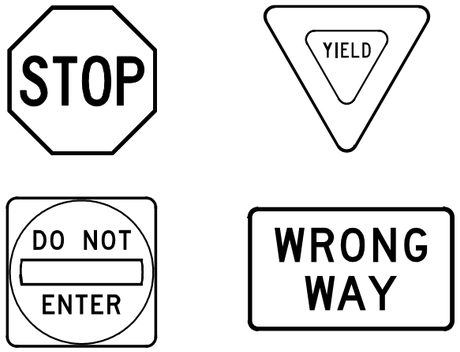
REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0068	07	052, ETC	US 87

DIST	COUNTY	SHEET NO.
ABL	HOWARD	195

DATE: 5/25/2021 7:53:39 AM
FILE: P:\WSGP\TxD2020TUS 87\PROD_SHEETS\STANDARDS\Traffic Items\tsr4-13.dgn

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

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.

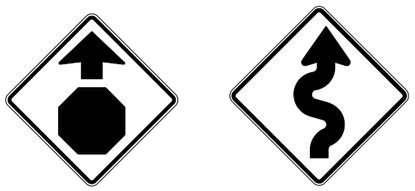
ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

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/

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

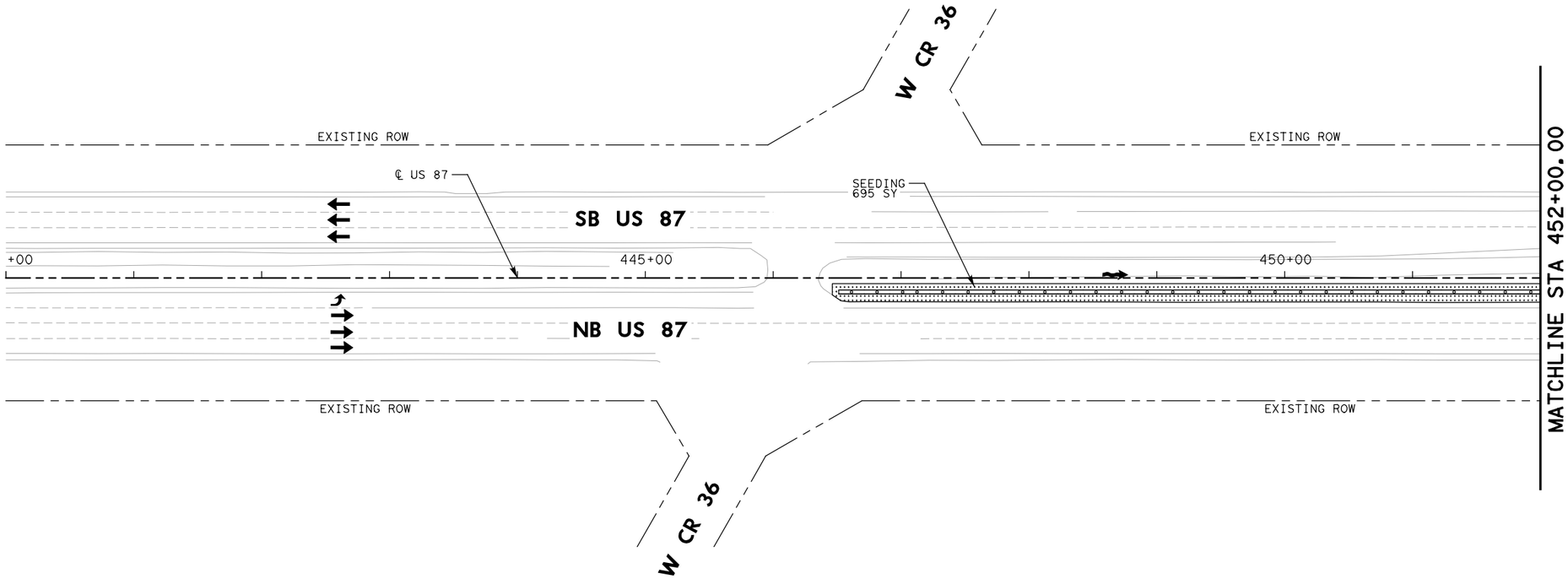
Texas Department of Transportation

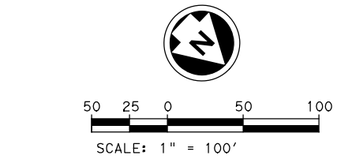
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

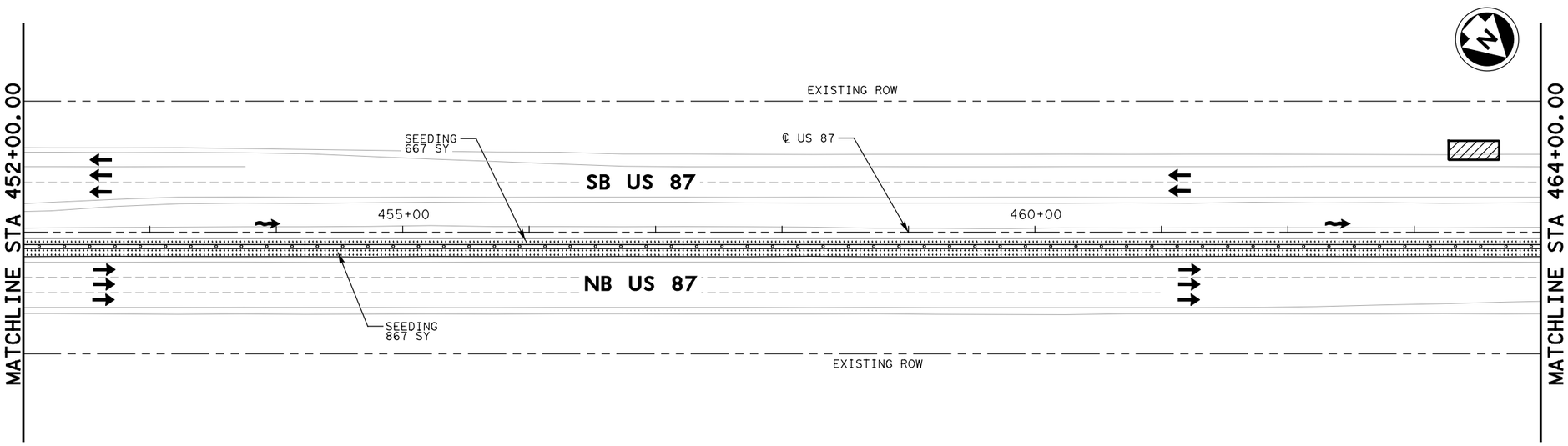
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ABL	HOWARD		196





LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

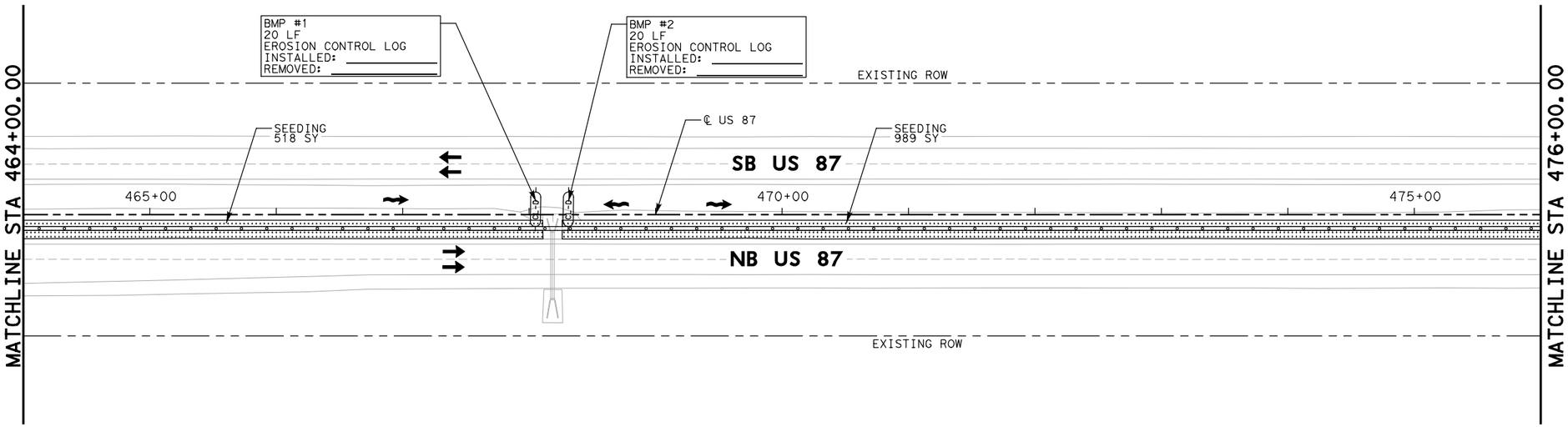
US 87

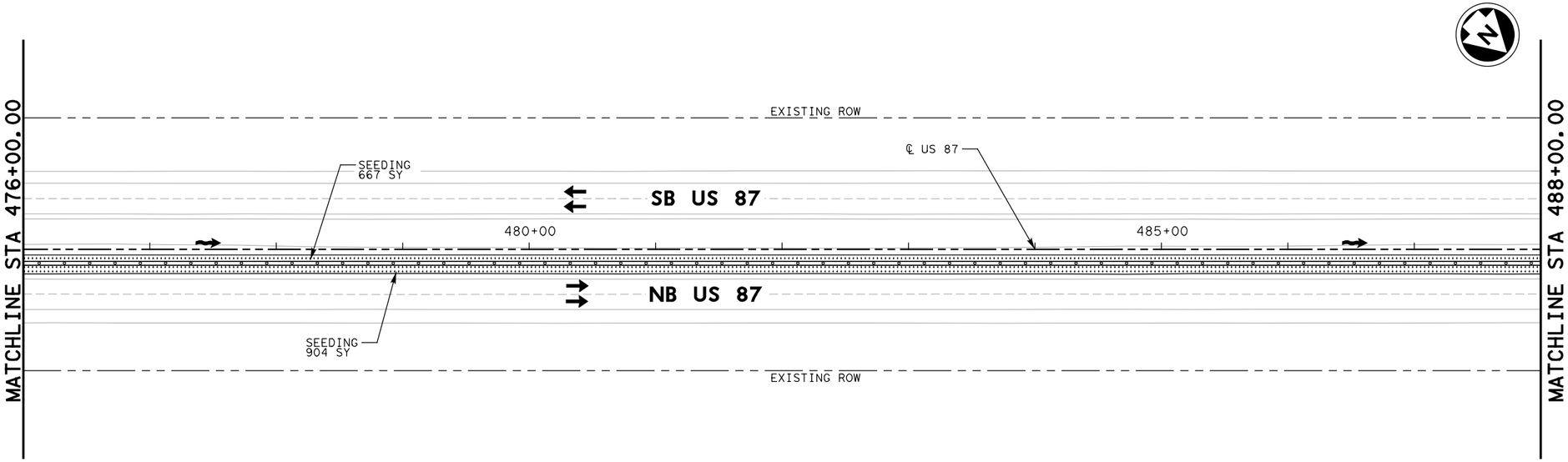
SW3P
SITE PLAN

SHEET (1 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	197
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP01.dgn
DATE: 5/25/2021 7:53:46 AM jbaker





50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (2 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	198
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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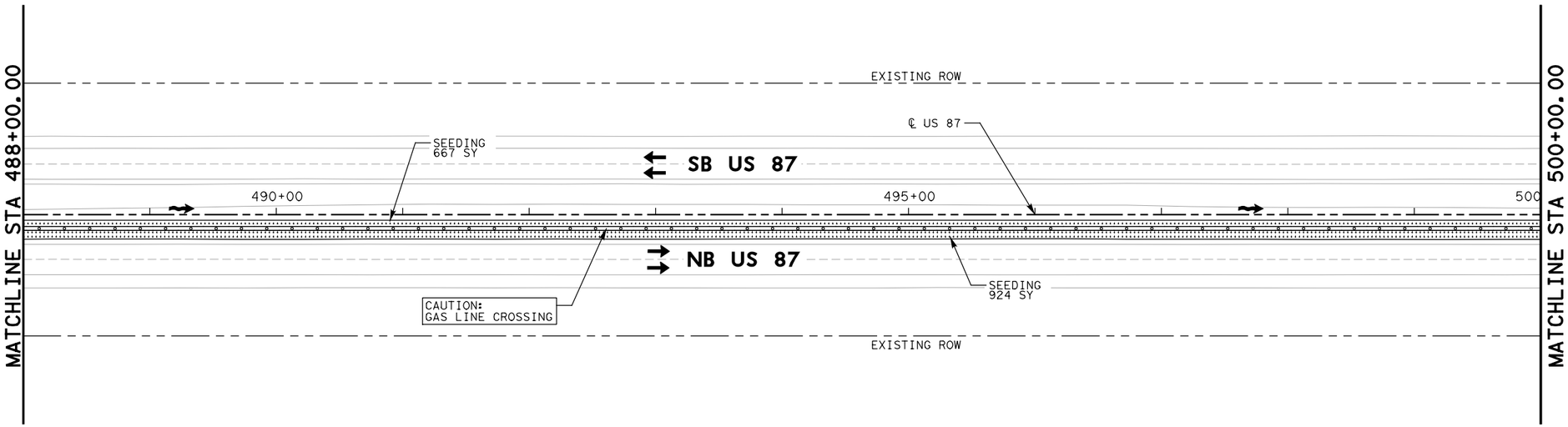
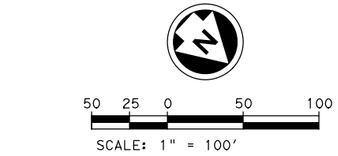
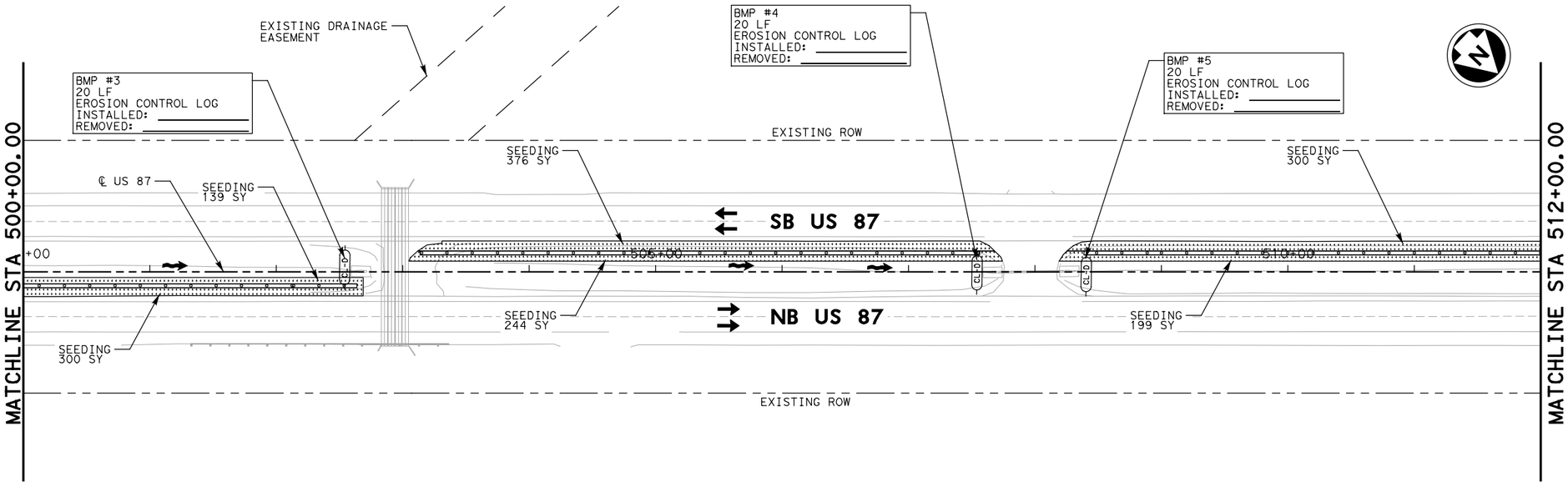




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (3 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	199
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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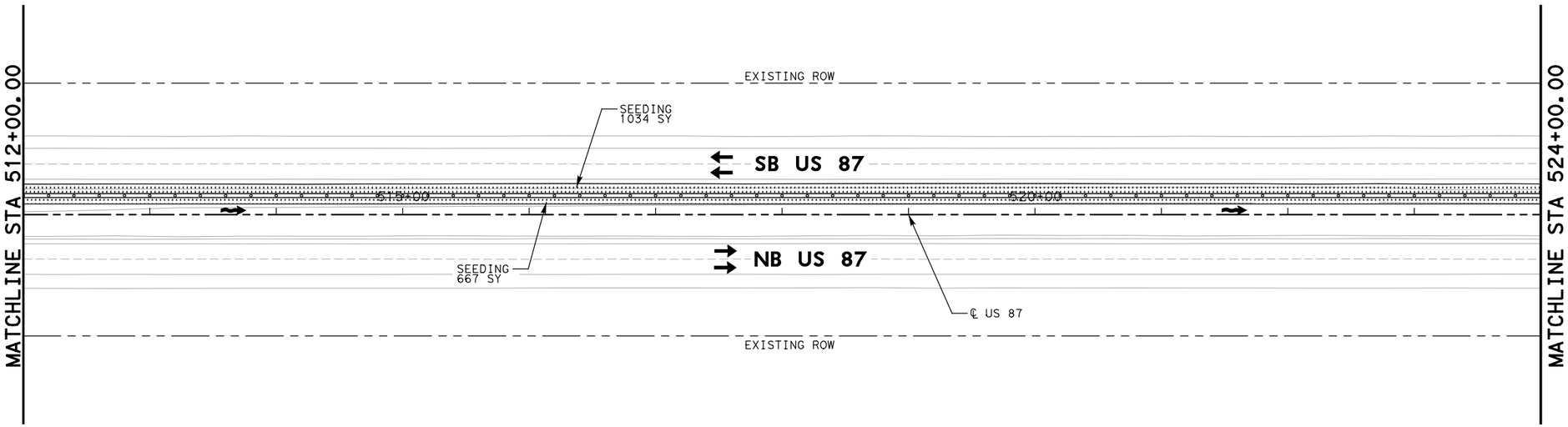
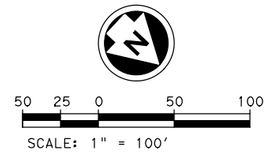
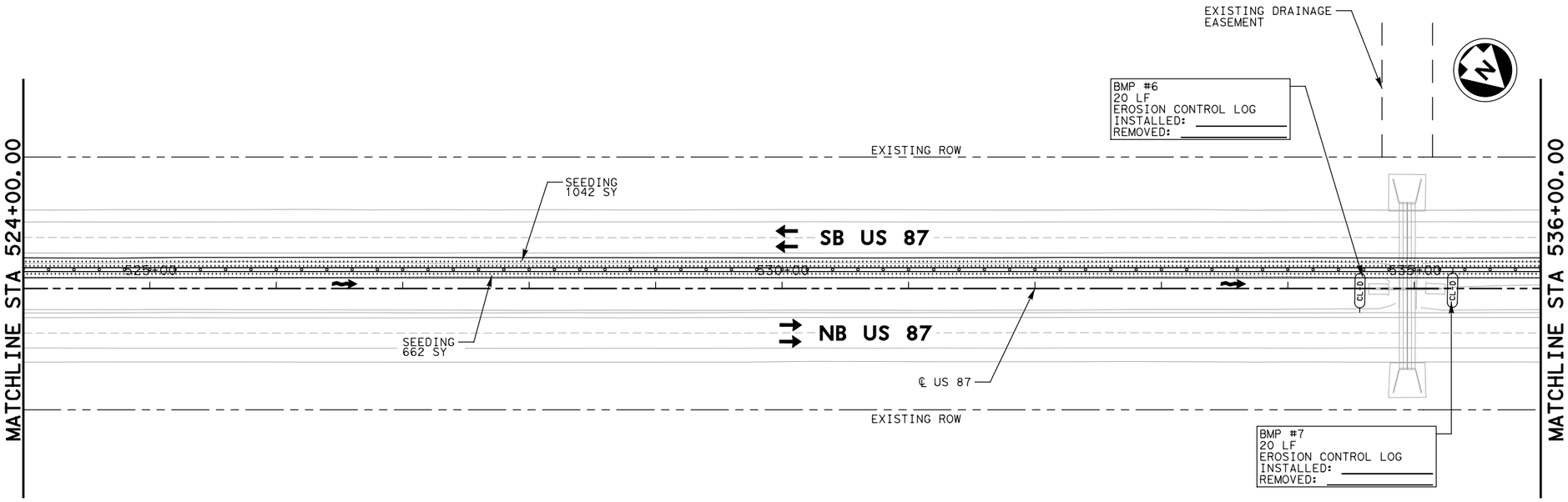




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (4 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	
AR	CONTROL	SECTION	JOB	200
GRPH CHECK				
JKB	0068	07	052, ETC	

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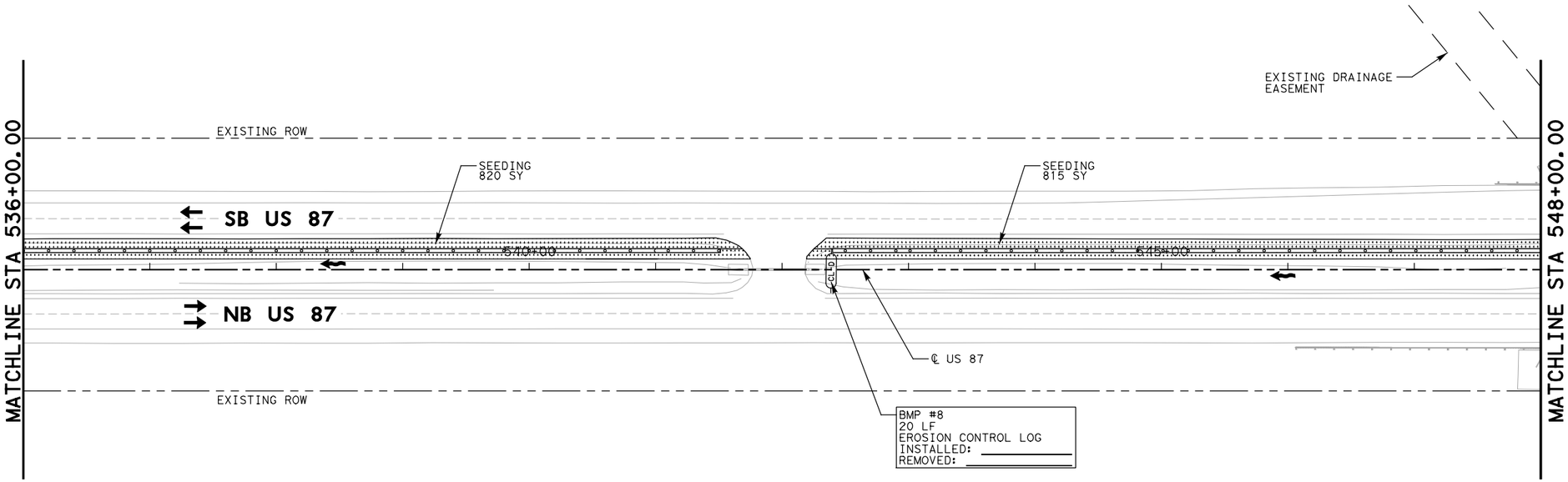
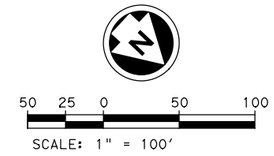
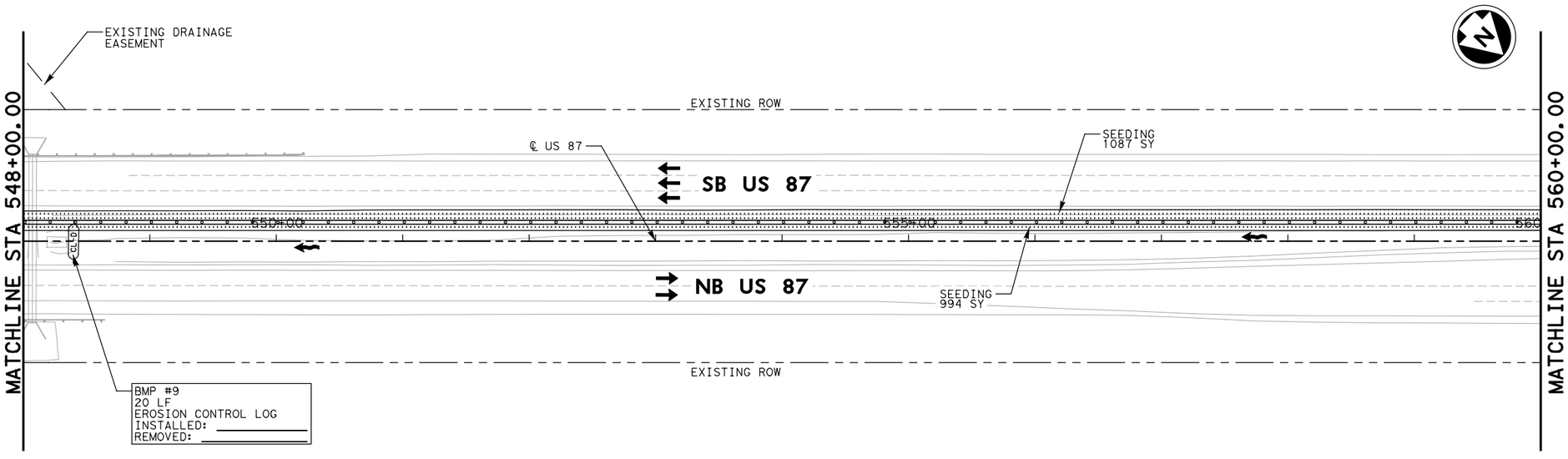




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (5 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	201
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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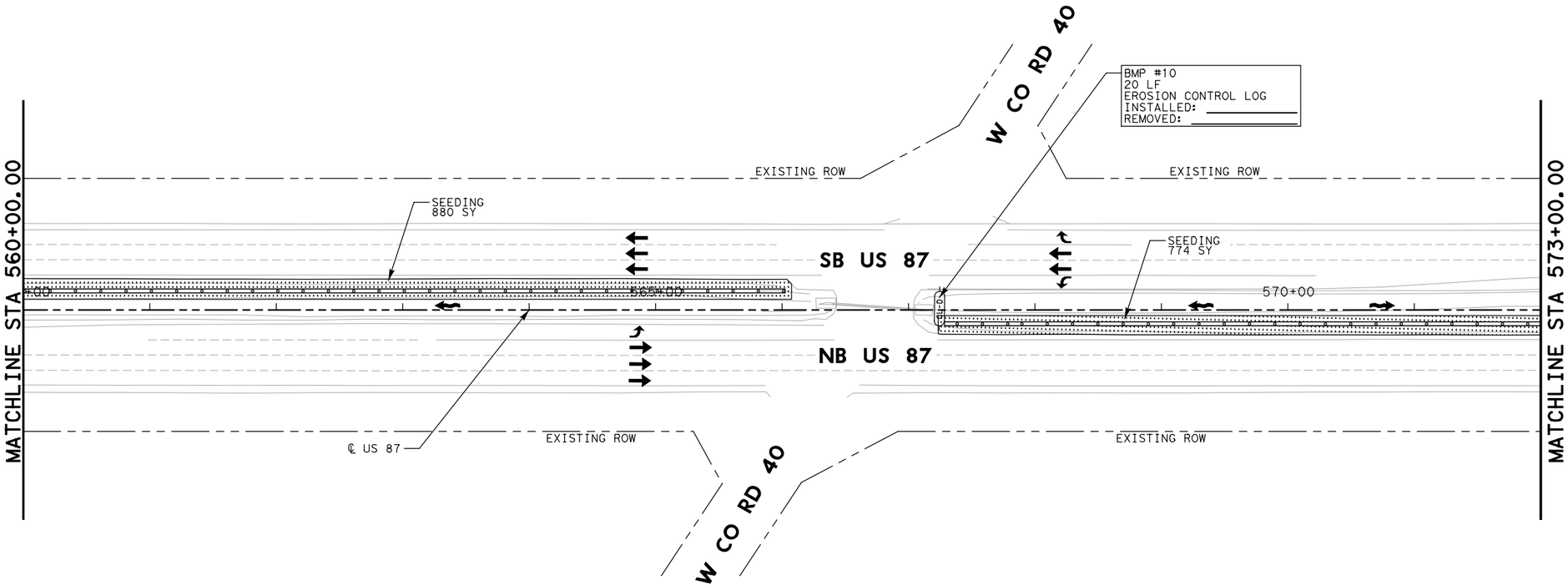
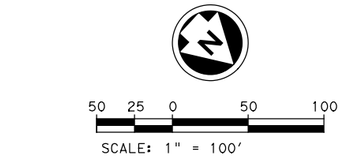
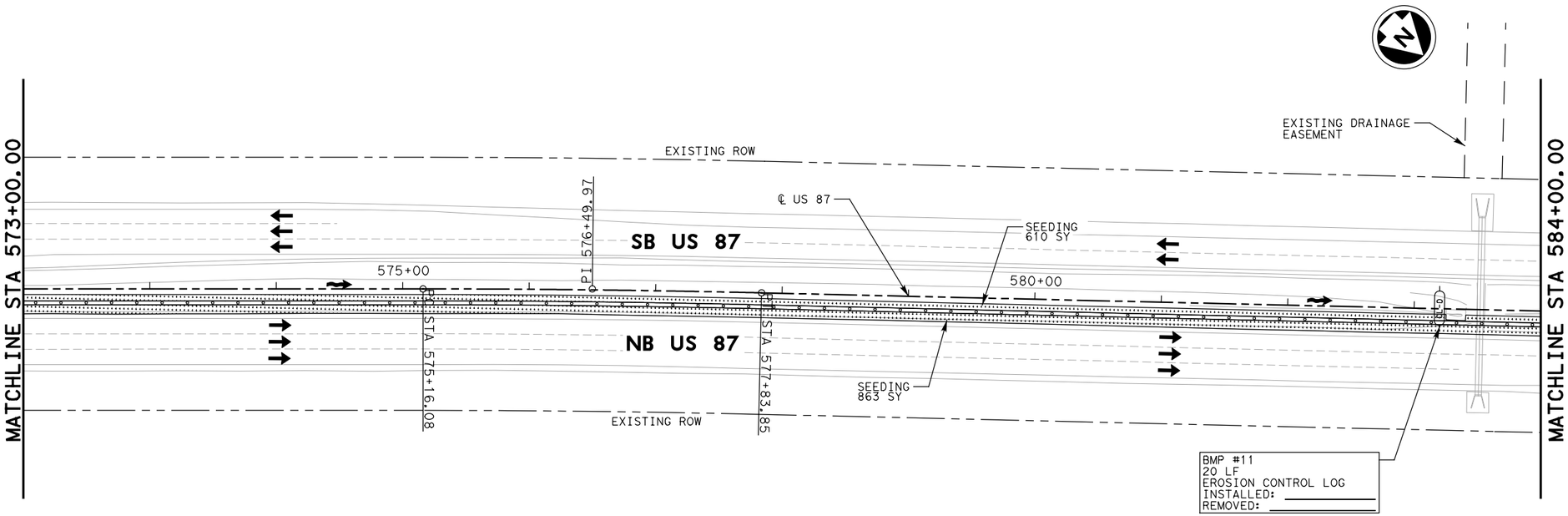




LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (6 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	202
AR	CONTROL	SECTION	JOB	
GRPH CHECK				
JKB	0068	07	052, ETC	

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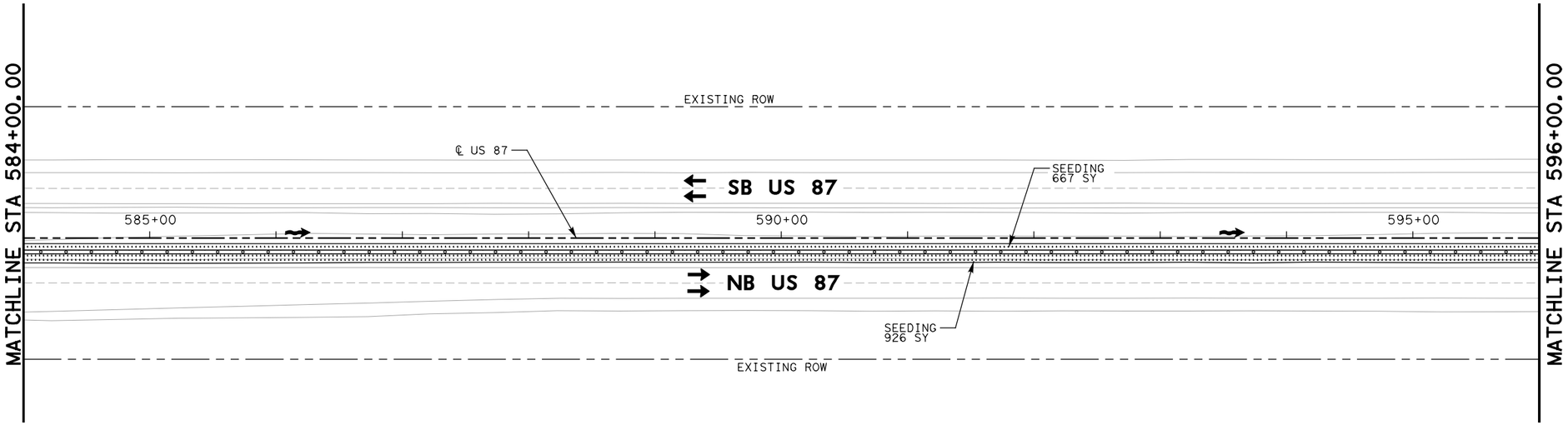
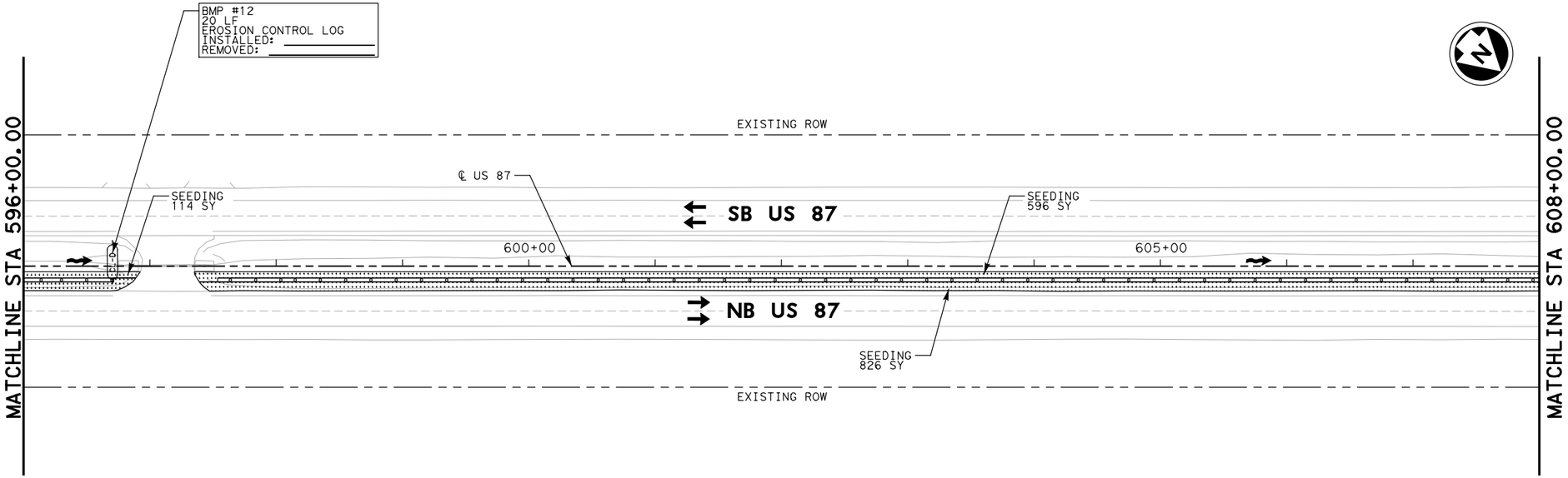




50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

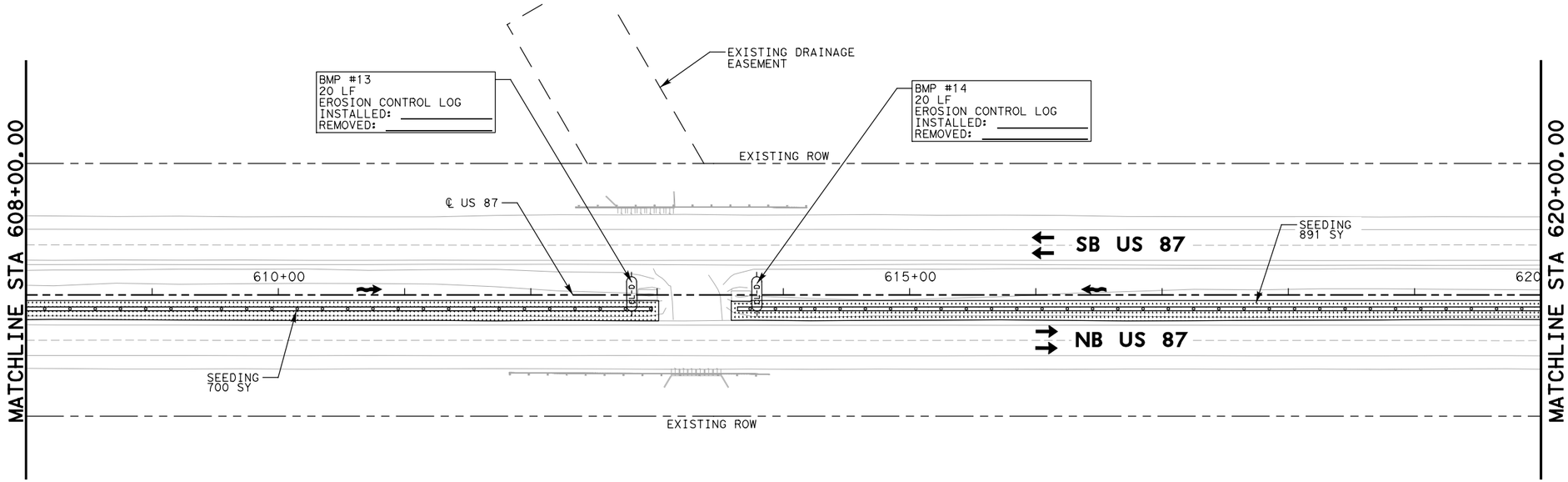
US 87

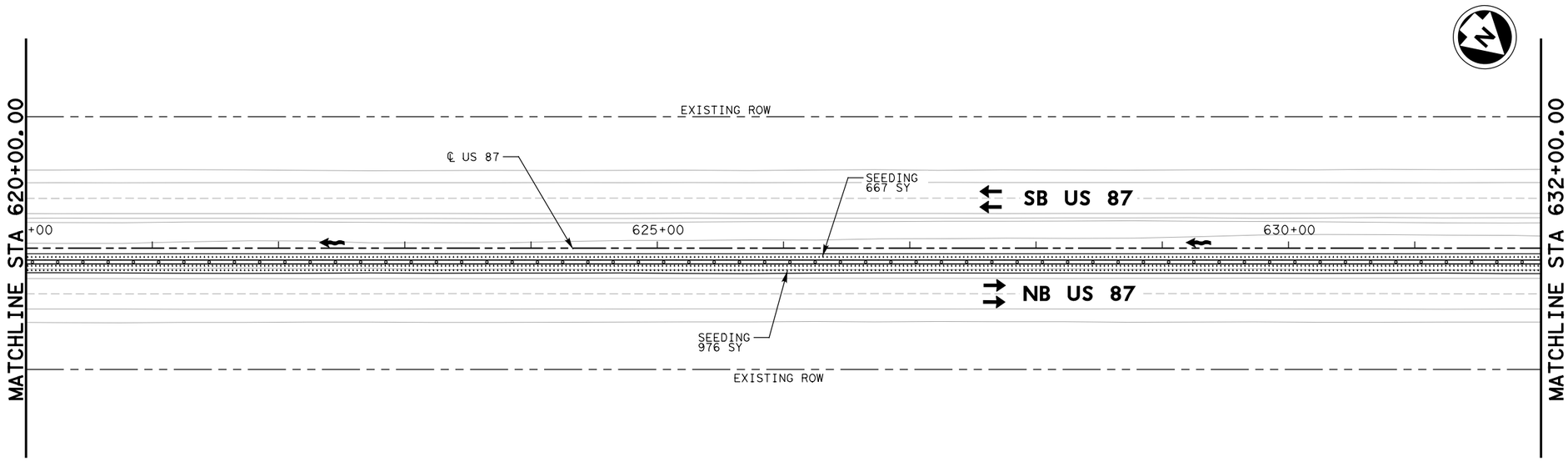
SW3P
SITE PLAN

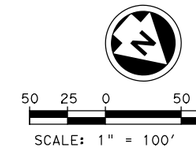
SHEET (7 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	203
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP07.dgn
DATE: 5/25/2021 7:54:07 AM jbaker







LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

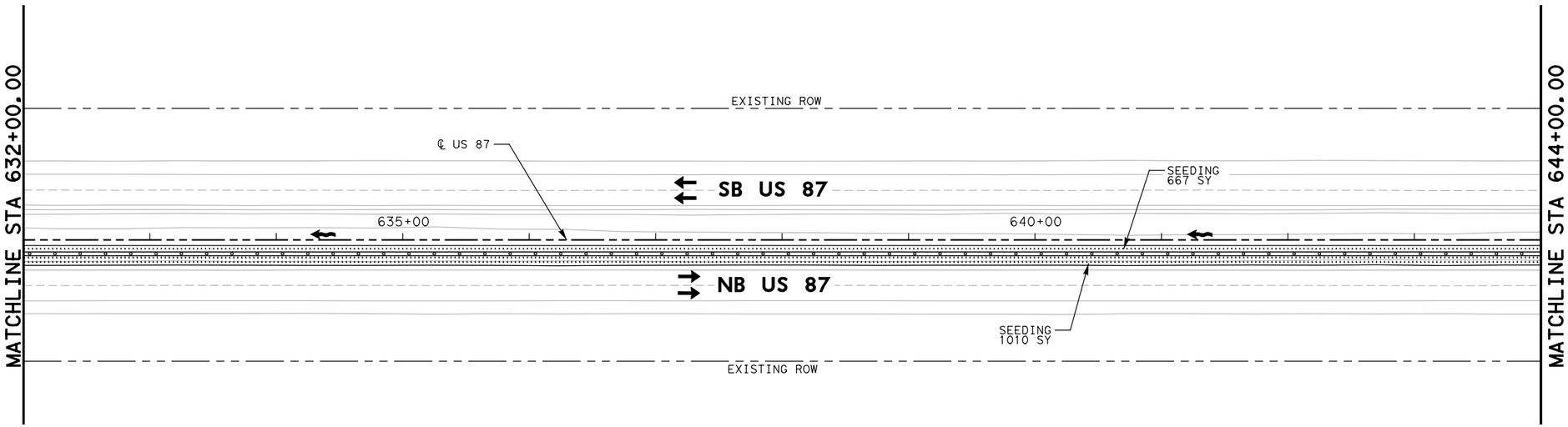
US 87

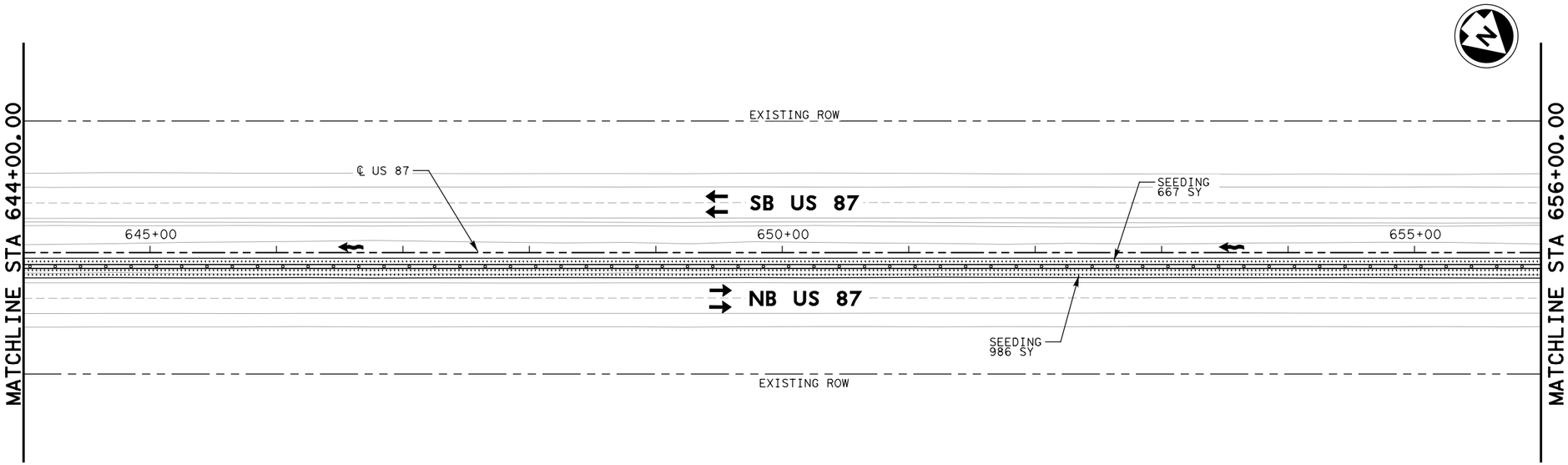
SW3P
SITE PLAN

SHEET (8 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	204
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP08.dgn
DATE: 5/25/2021 7:54:09 AM jbaker





50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

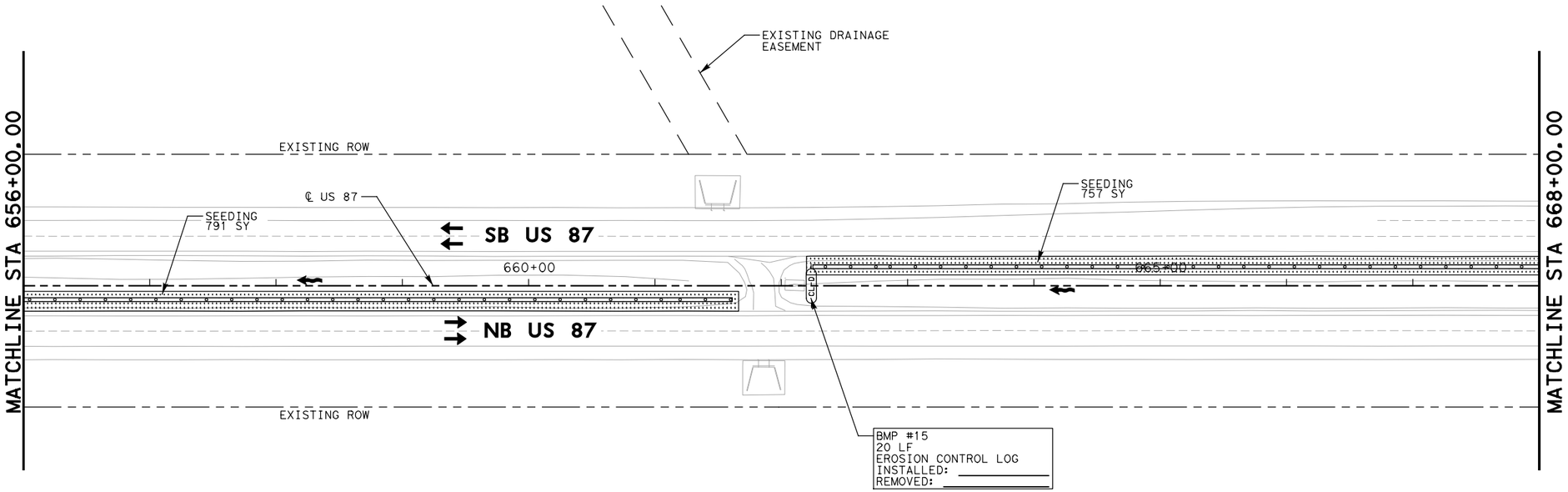
US 87

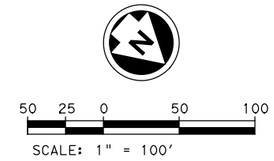
SW3P
SITE PLAN

SHEET (9 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	205
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

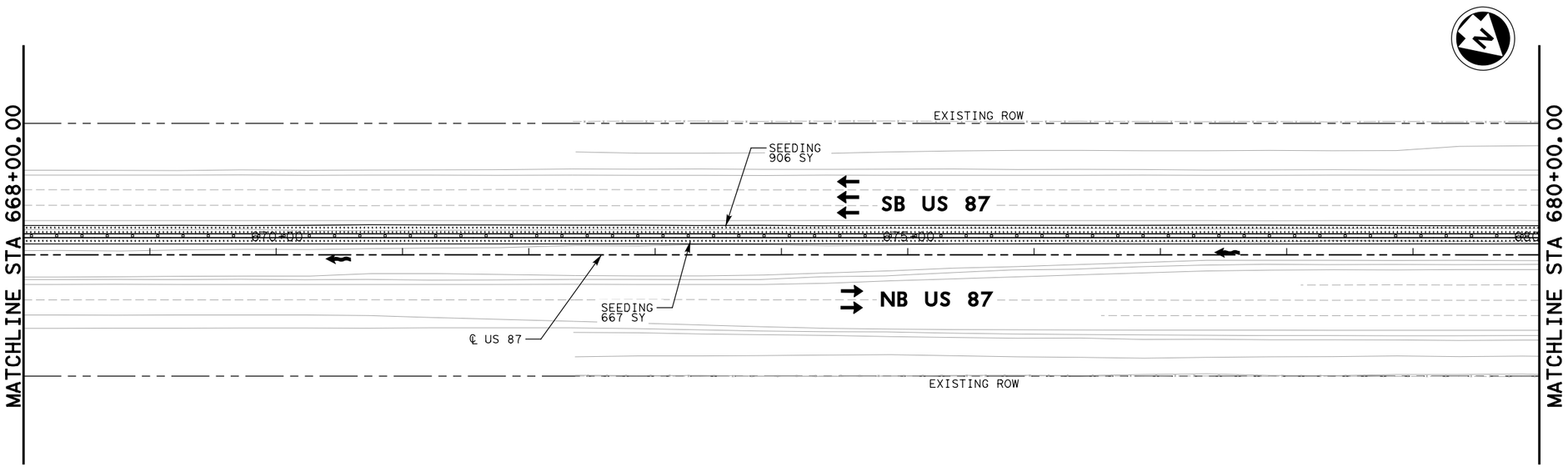
FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP09.dgn
DATE: 5/25/2021 7:54:10 AM jbaker





LEGEND

- EROSION CONTROL LOG DAM
- EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT



STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

SW3P
SITE PLAN

SHEET (10 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH				
GRAPHICS	TX	ABL	HOWARD	
AR	CONTROL	SECTION	JOB	206
GRPH CHECK				
JKB	0068	07	052, ETC	

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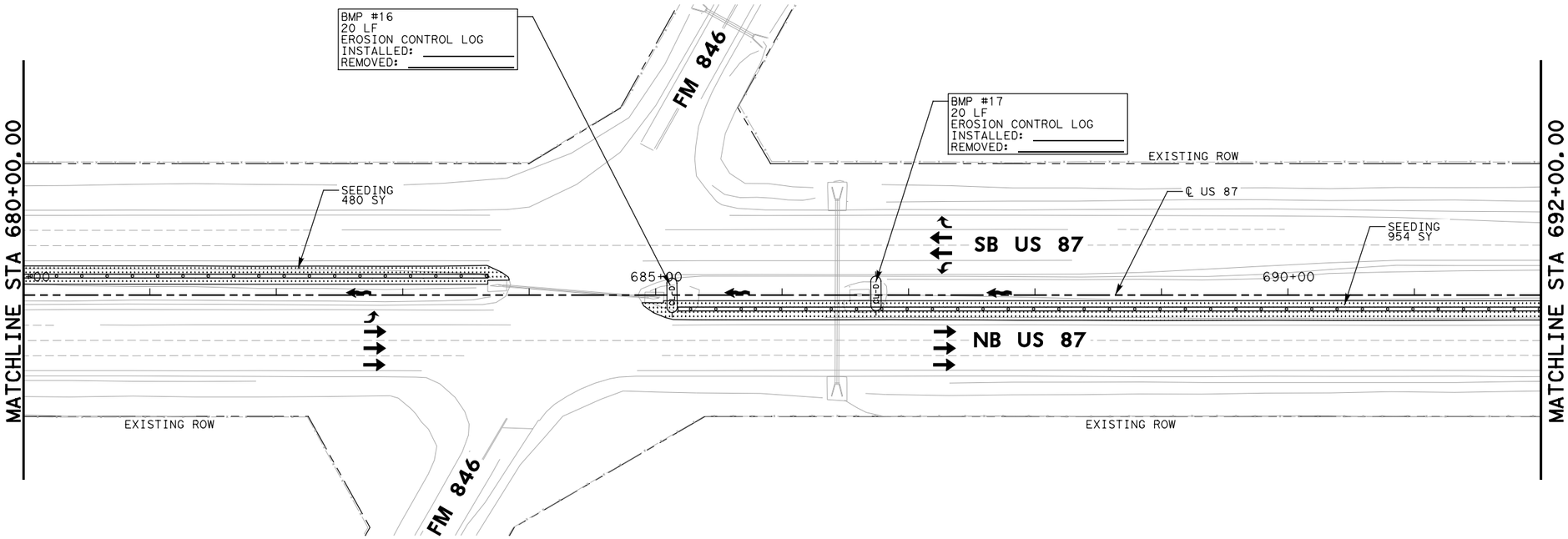
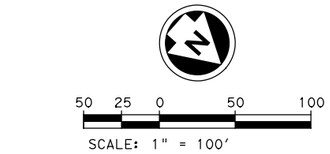
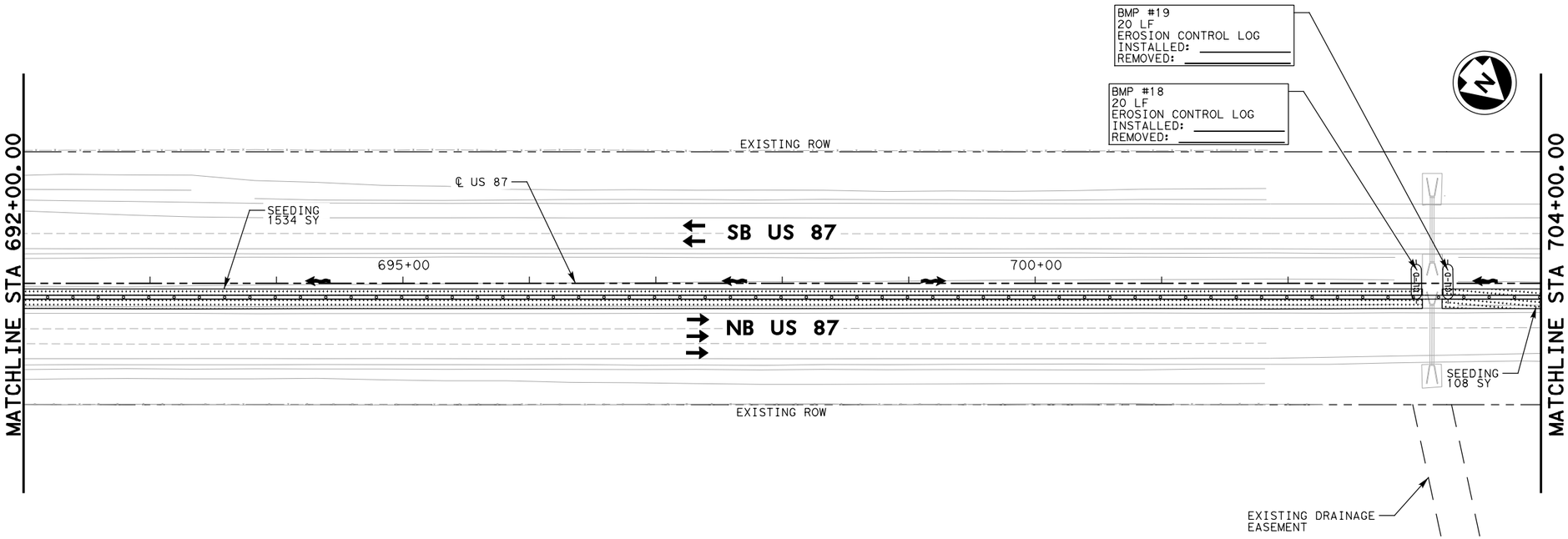
DATE: 5/25/2021 7:54:11 AM jbaker





LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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SW3P
SITE PLAN

SHEET (11 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	207
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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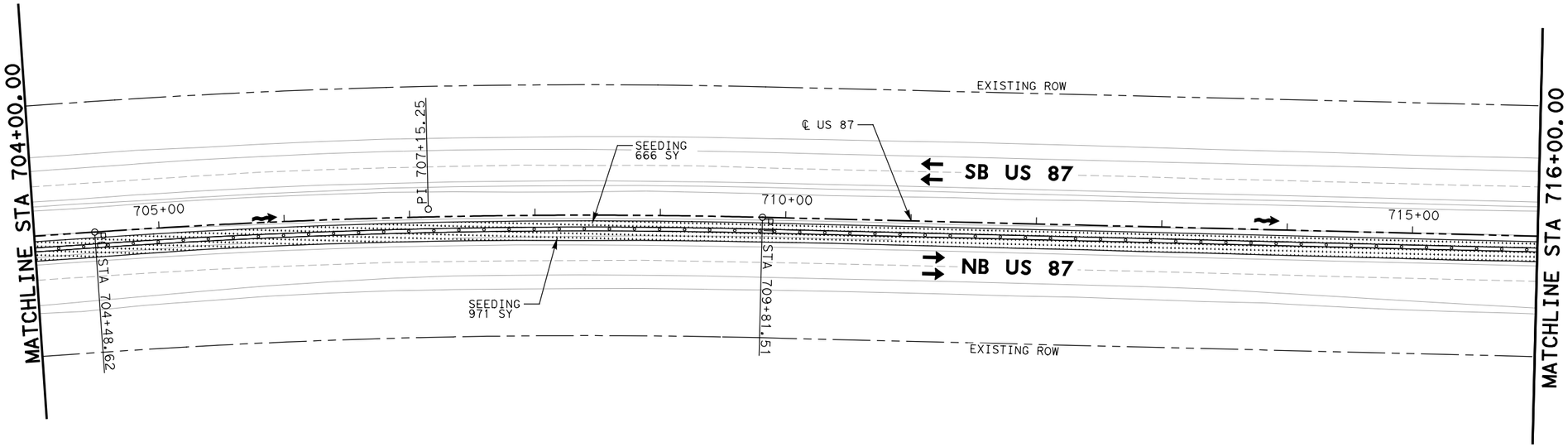
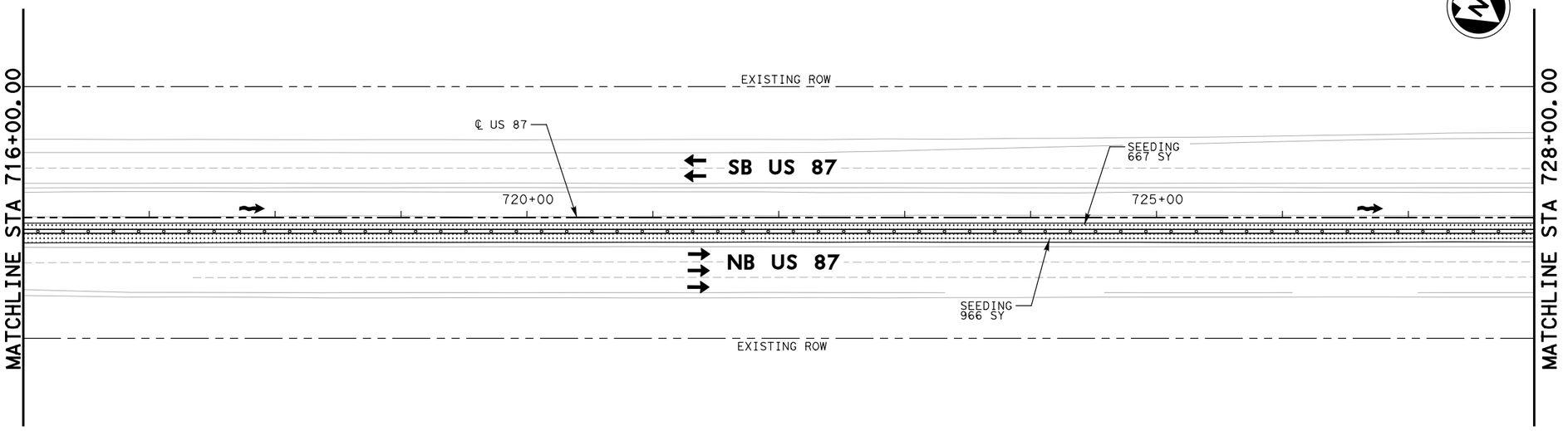
DATE: 5/25/2021 7:54:13 AM jbaker





50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

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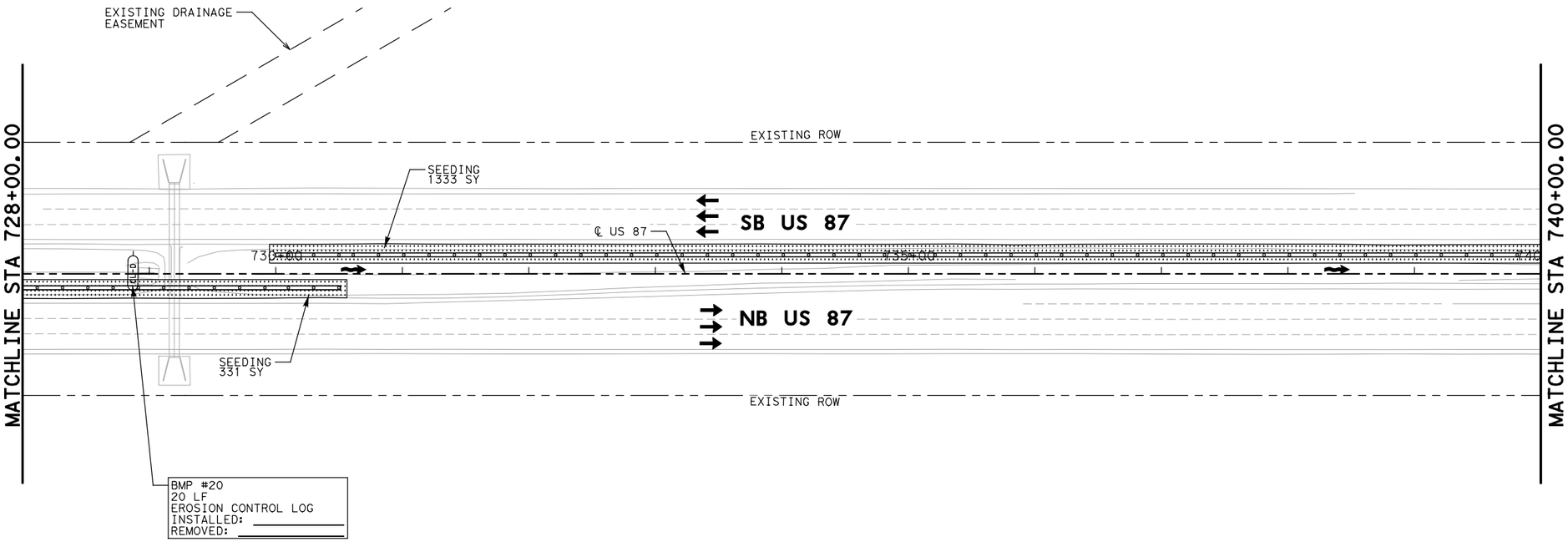
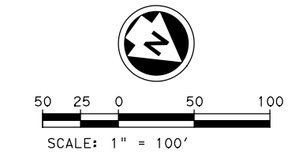
SITE PLAN

SHEET (12 OF 30)

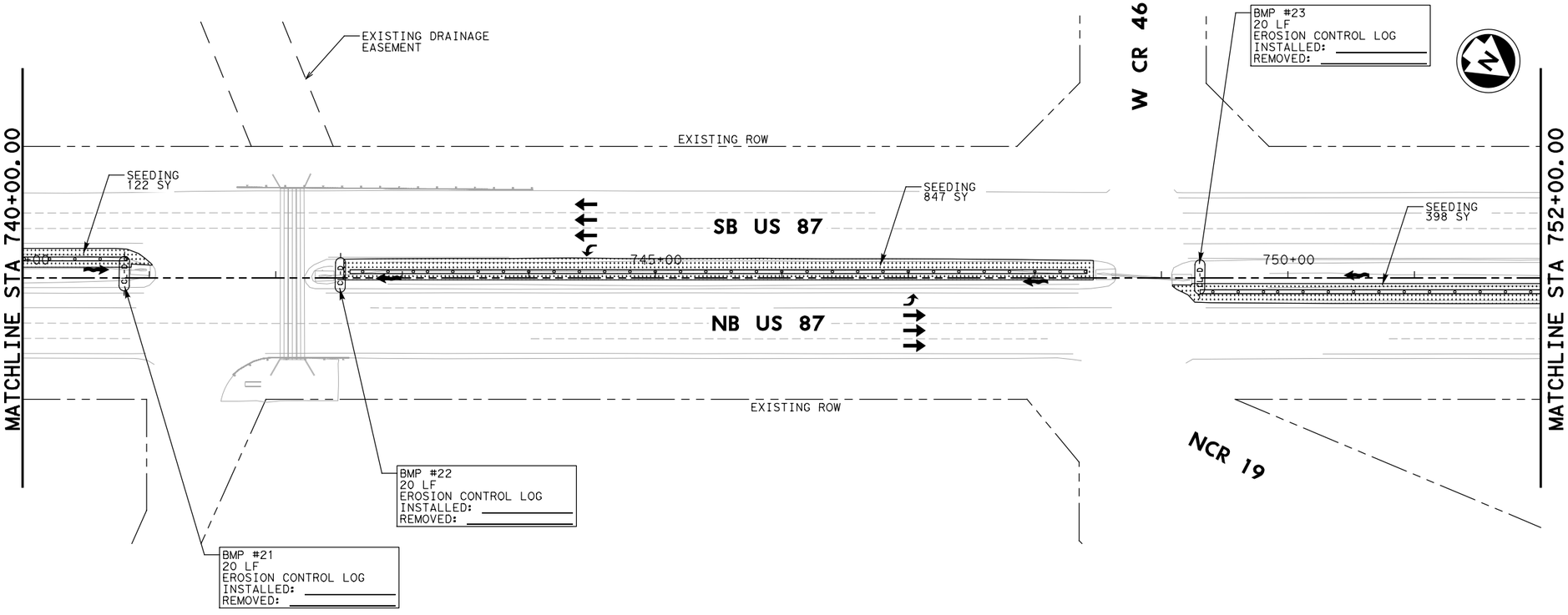
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	208
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP12.dgn
DATE: 5/25/2021 7:54:15 AM jbaker





LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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SW3P
SITE PLAN

SHEET (13 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	209
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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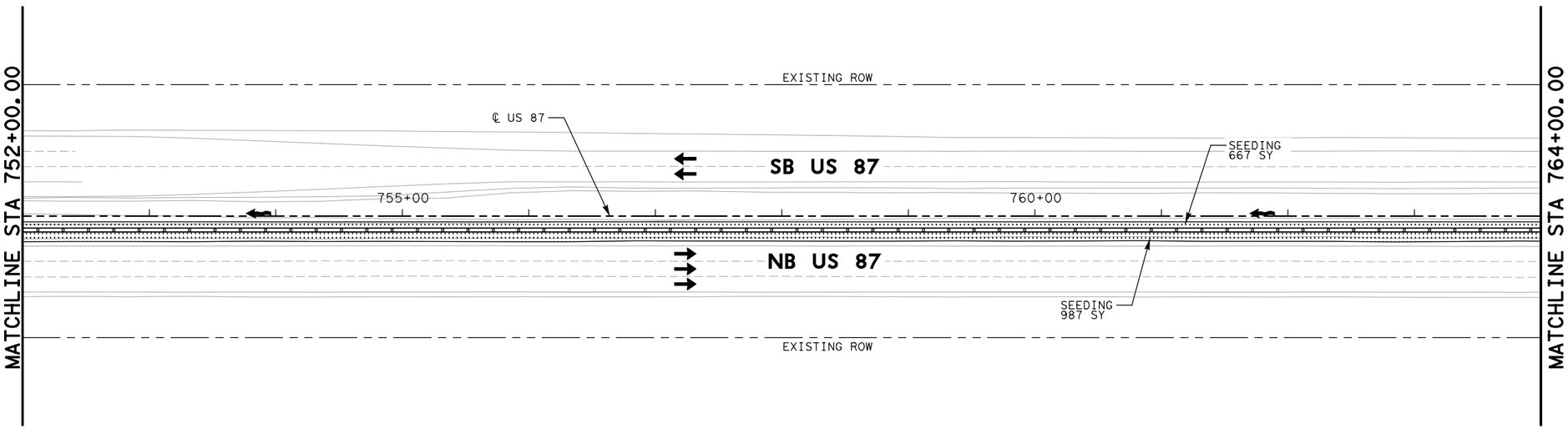

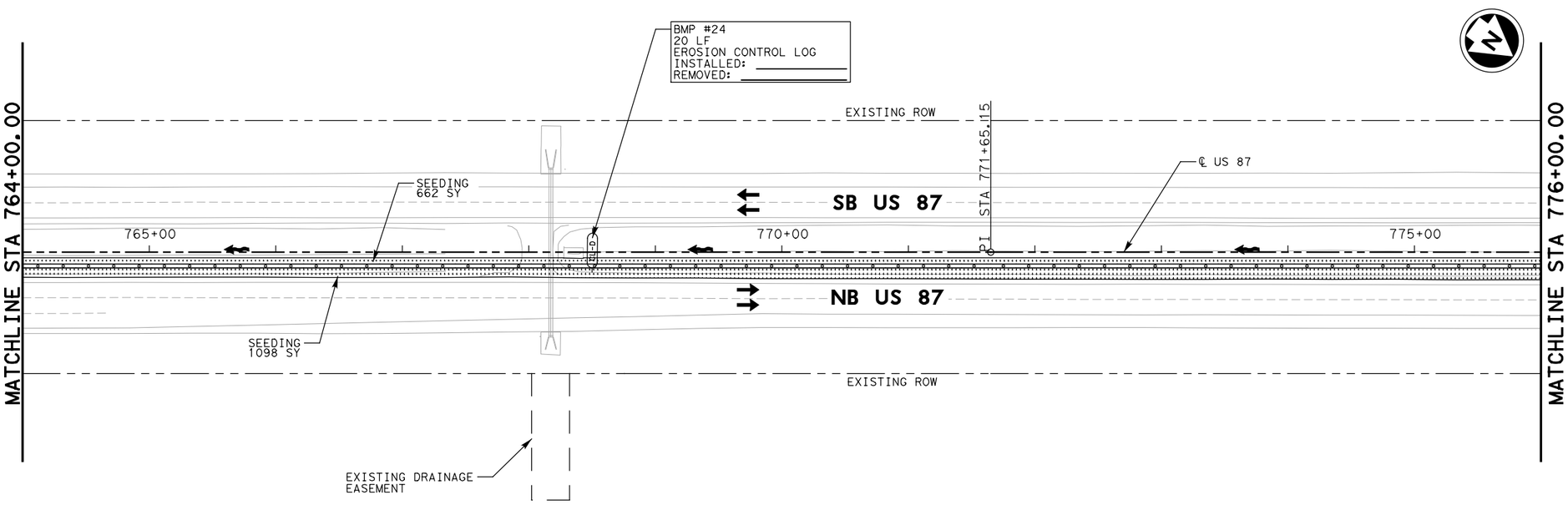

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

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SW3P
SITE PLAN

SHEET (14 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	210
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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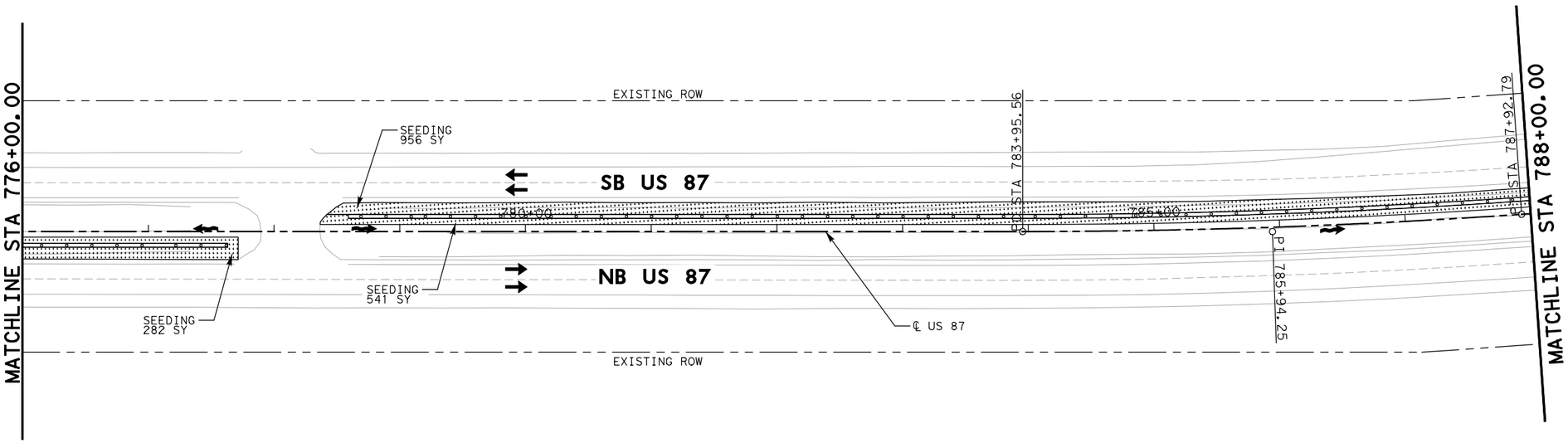
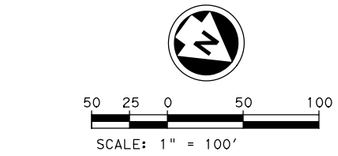
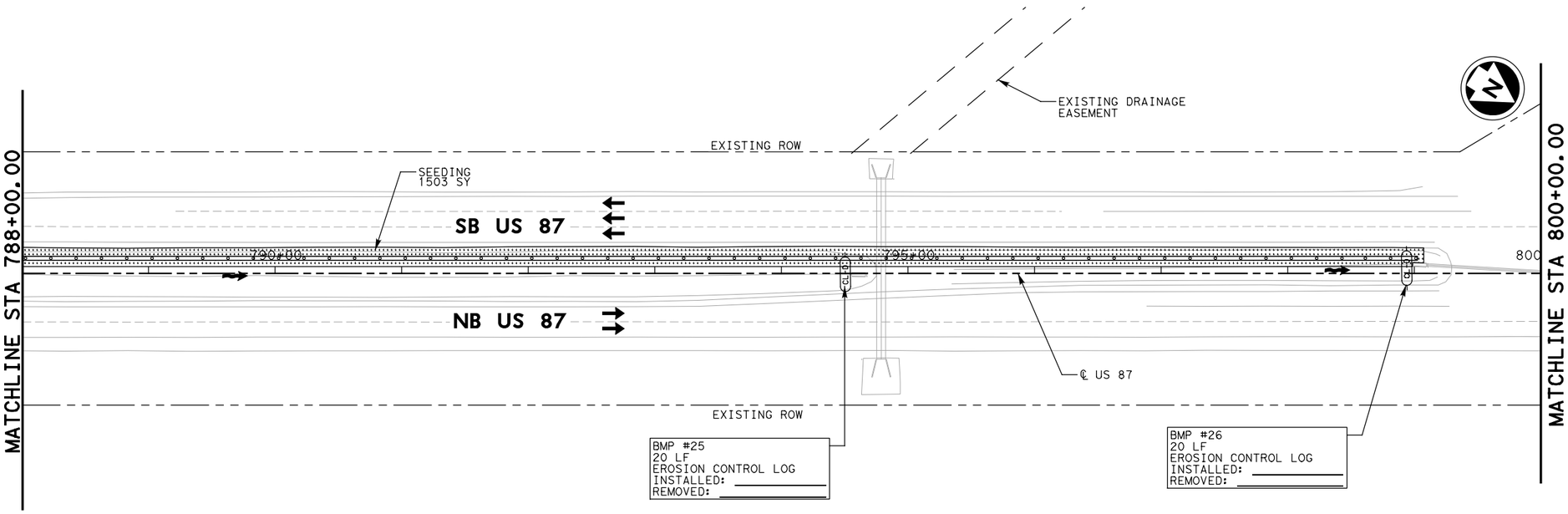




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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SHEET (15 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	211
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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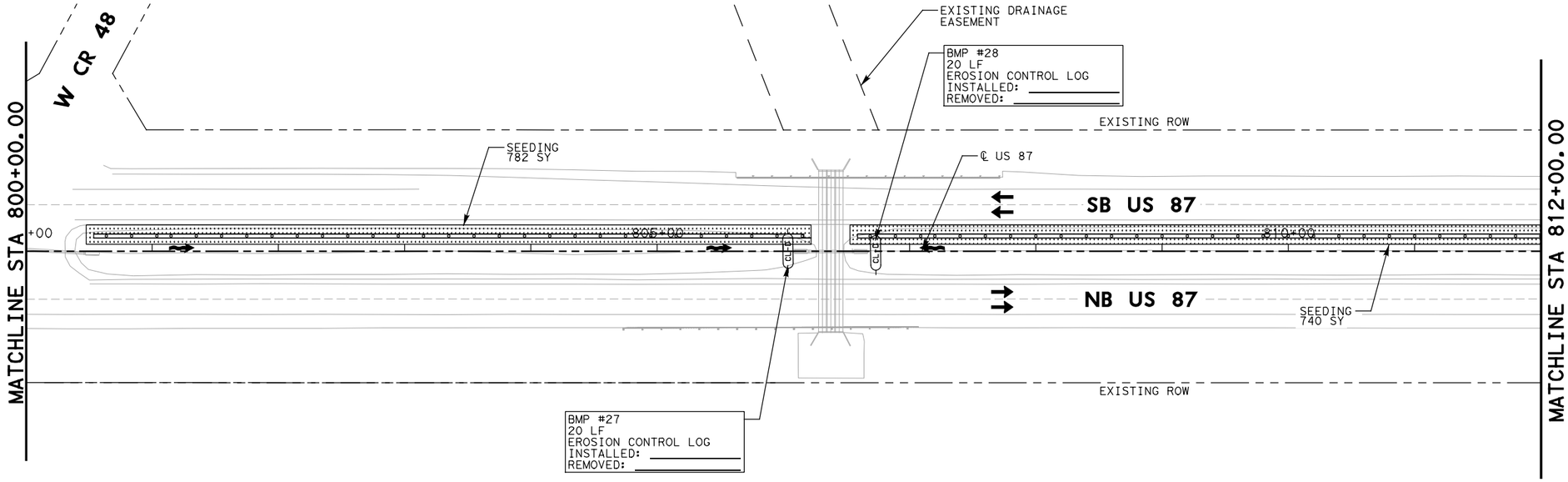
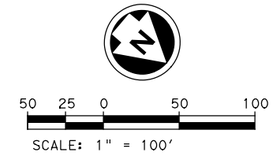
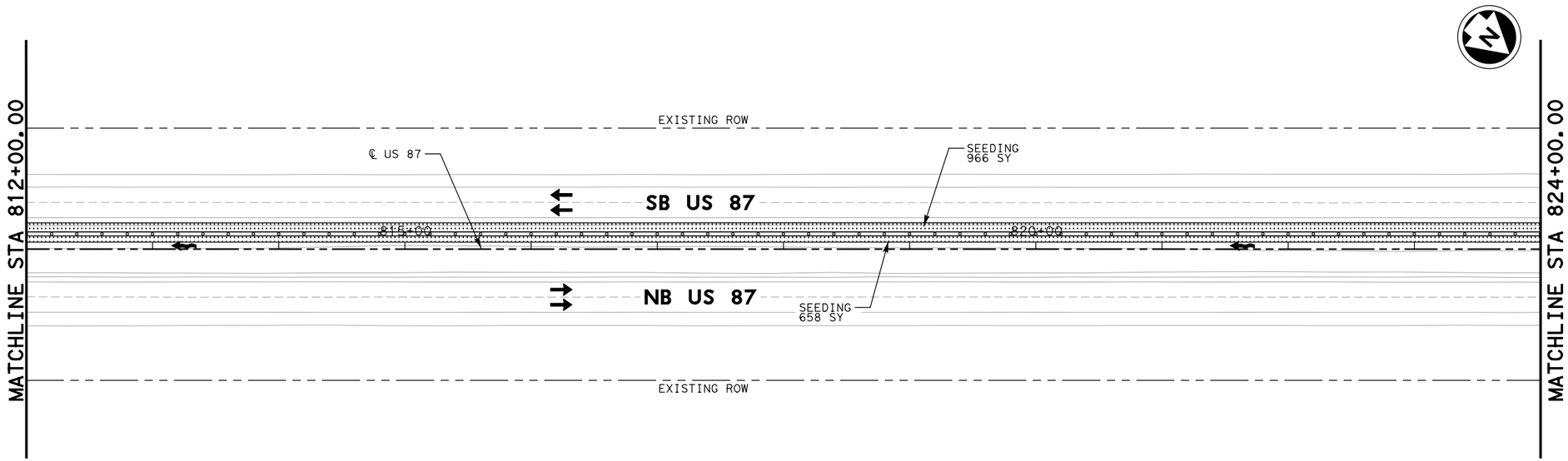




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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SHEET (16 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	212
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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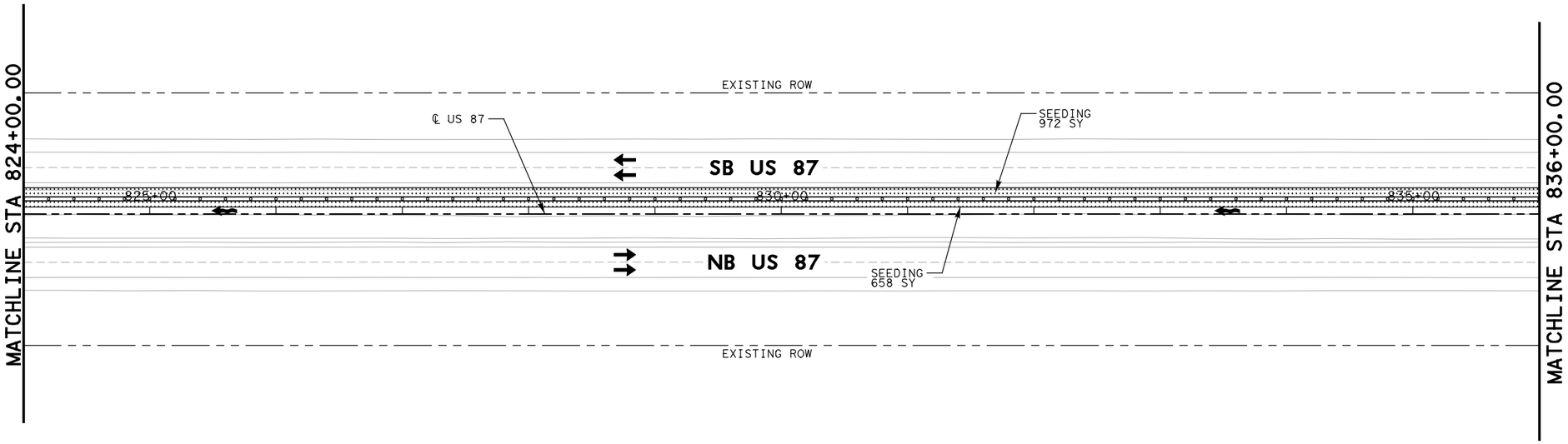
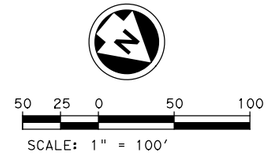
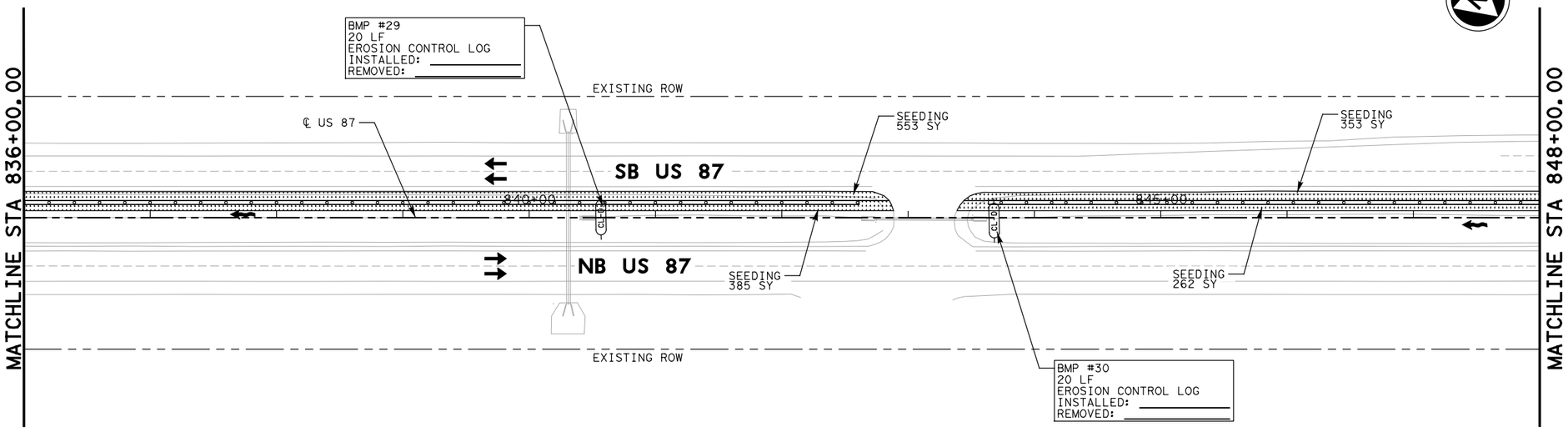




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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SW3P
SITE PLAN

SHEET (17 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	213
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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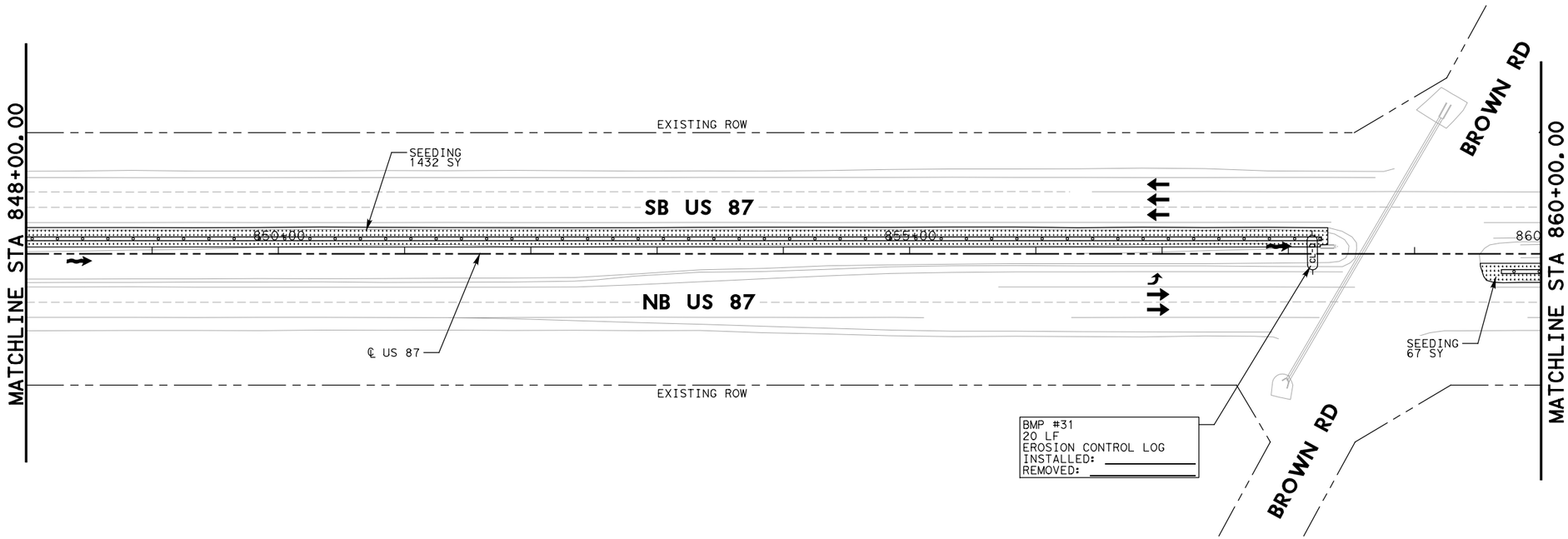
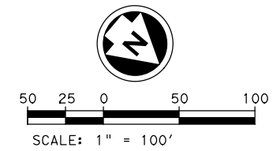
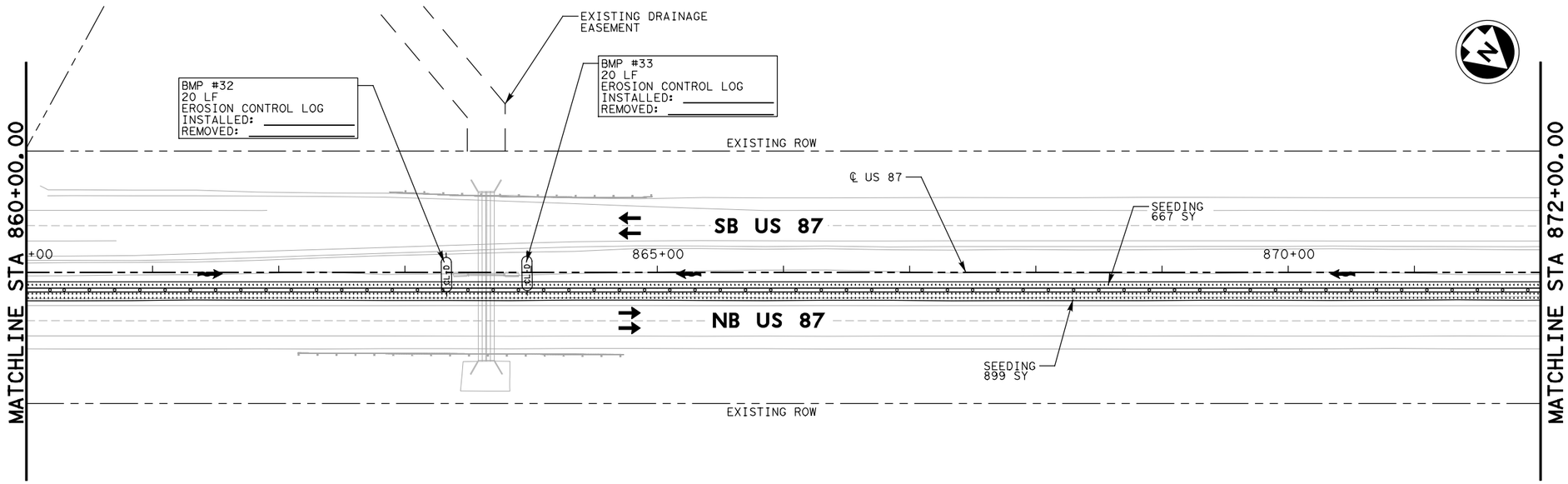
DATE: 5/25/2021 7:54:23 AM jbaker





LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



STATE OF TEXAS
JUSTIN K. BAKER
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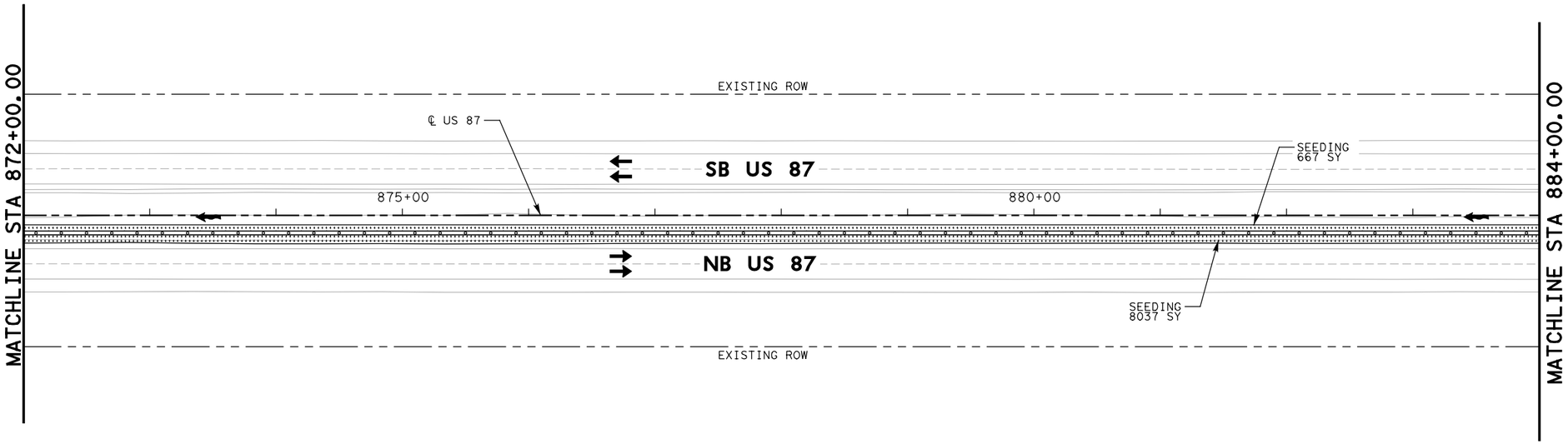
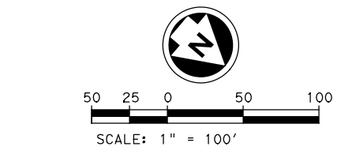
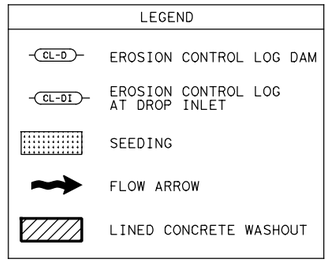
SHEET (18 OF 30)

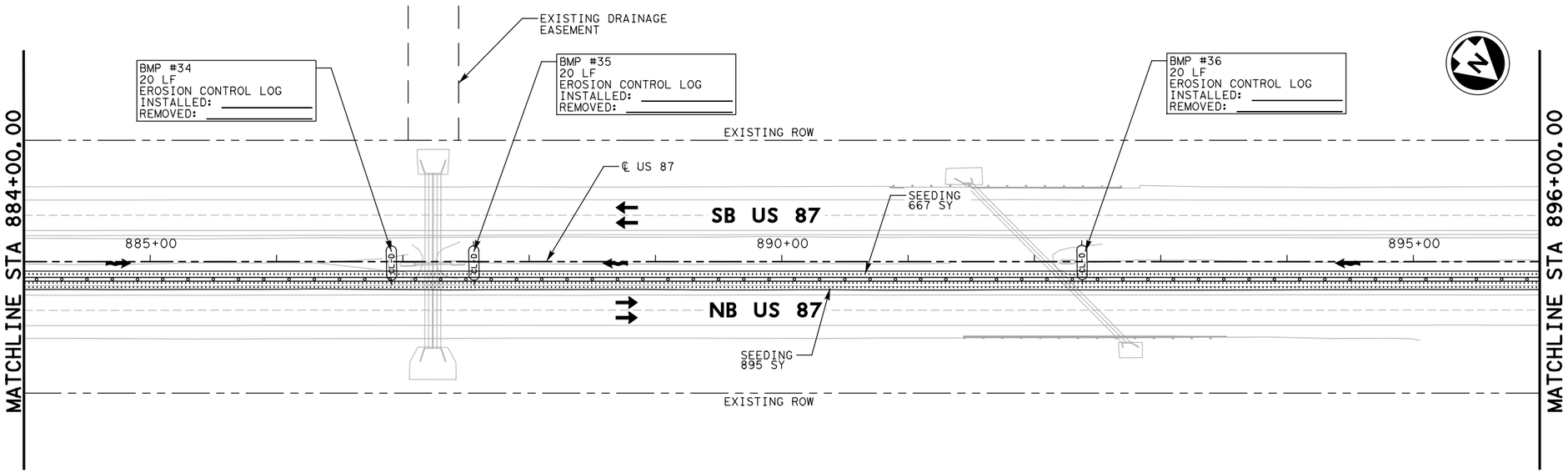
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	214
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP18.dgn
DATE: 5/25/2021 7:54:25 AM jbaker









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SITE PLAN

SHEET (19 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	215
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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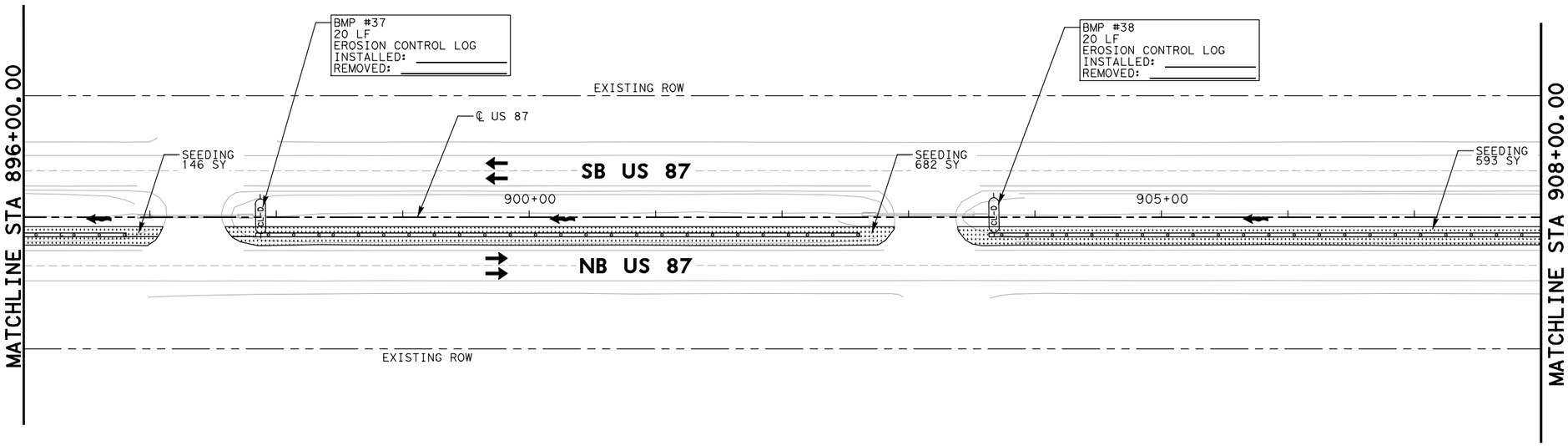
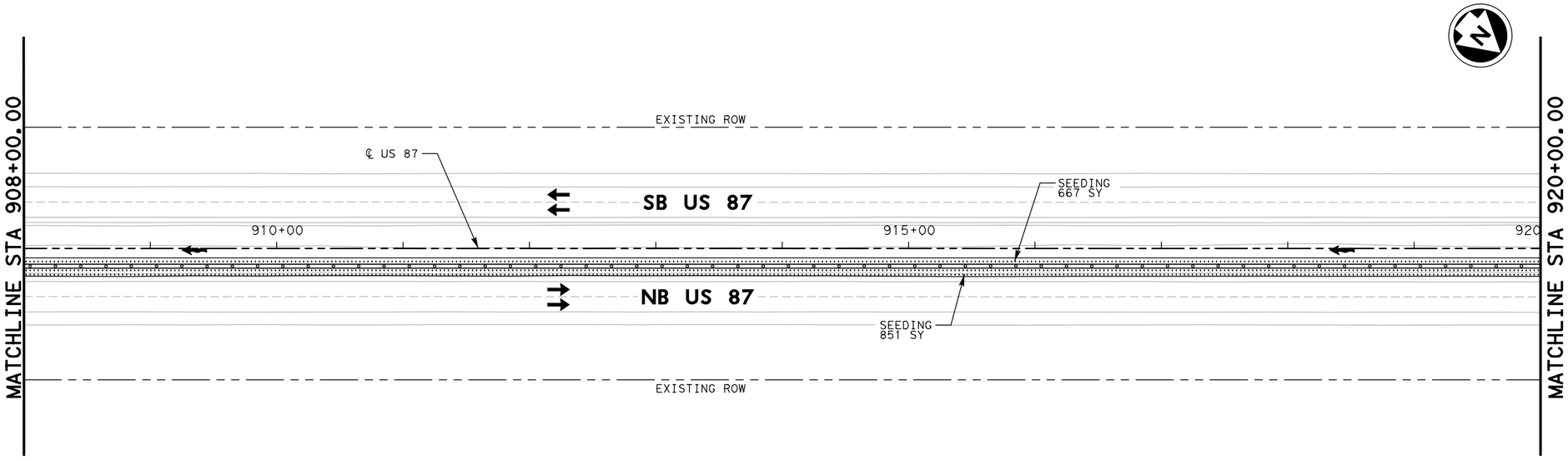
DATE: 5/25/2021 7:54:26 AM jbaker





50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

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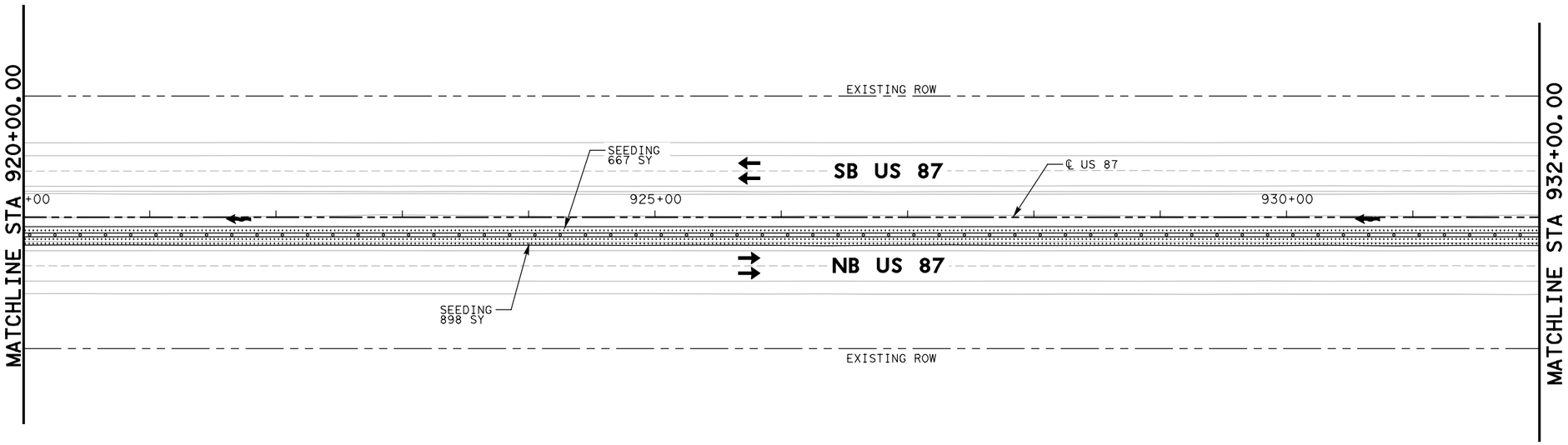
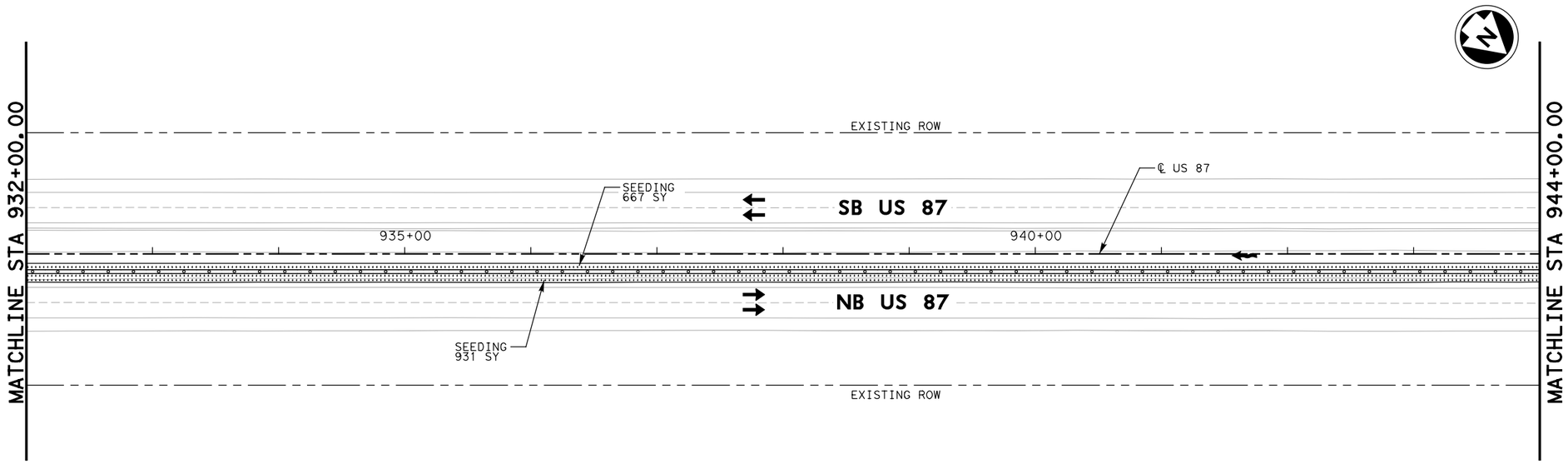
SHEET (20 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	216
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP20.dgn
DATE: 5/25/2021 7:54:28 AM jbaker





50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
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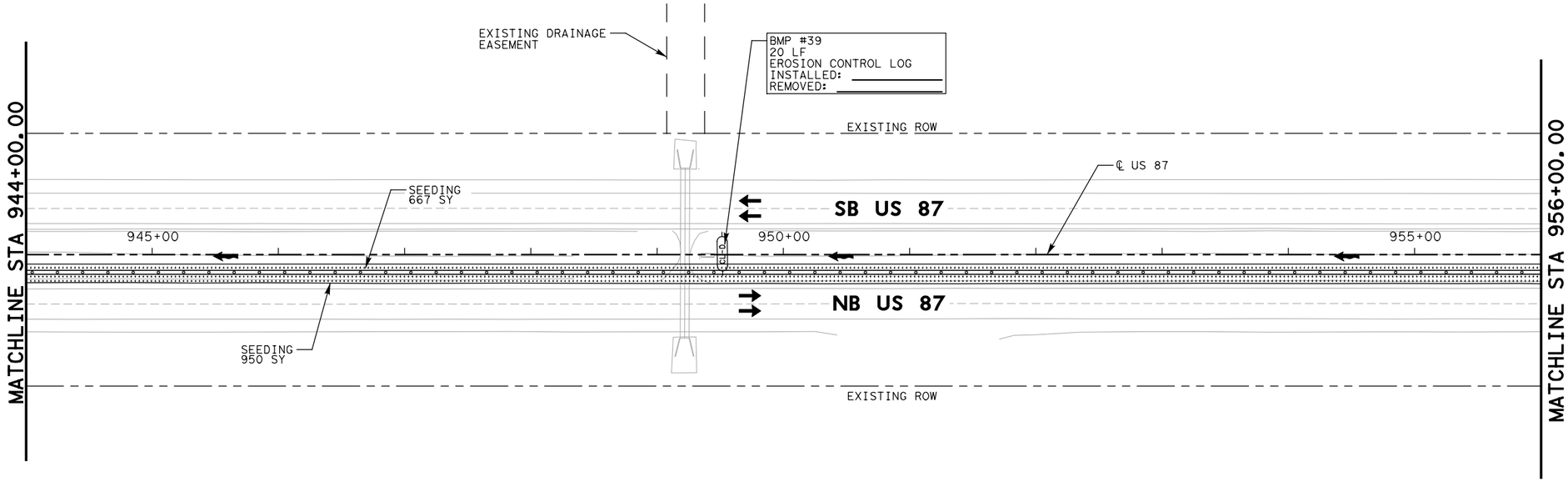
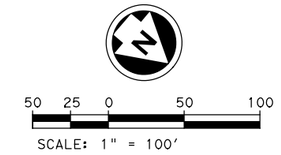
SHEET (21 OF 30)

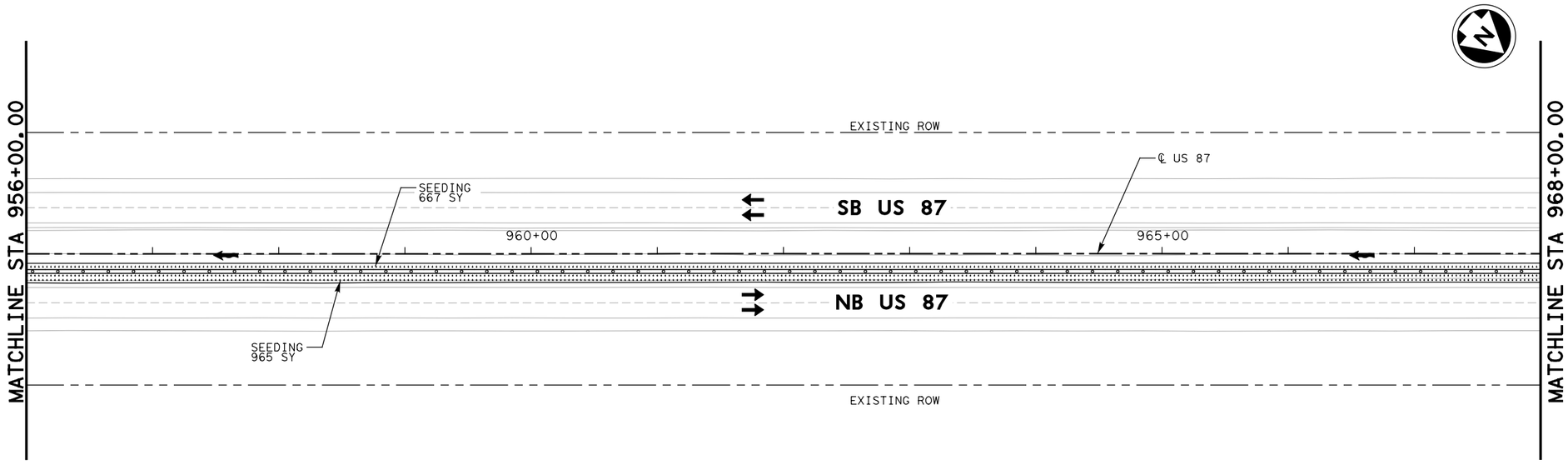
DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	217
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP21.dgn
DATE: 5/25/2021 7:54:29 AM jbaker





LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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SHEET (22 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	218
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87\PROD*SHEETS\SPP22.dgn
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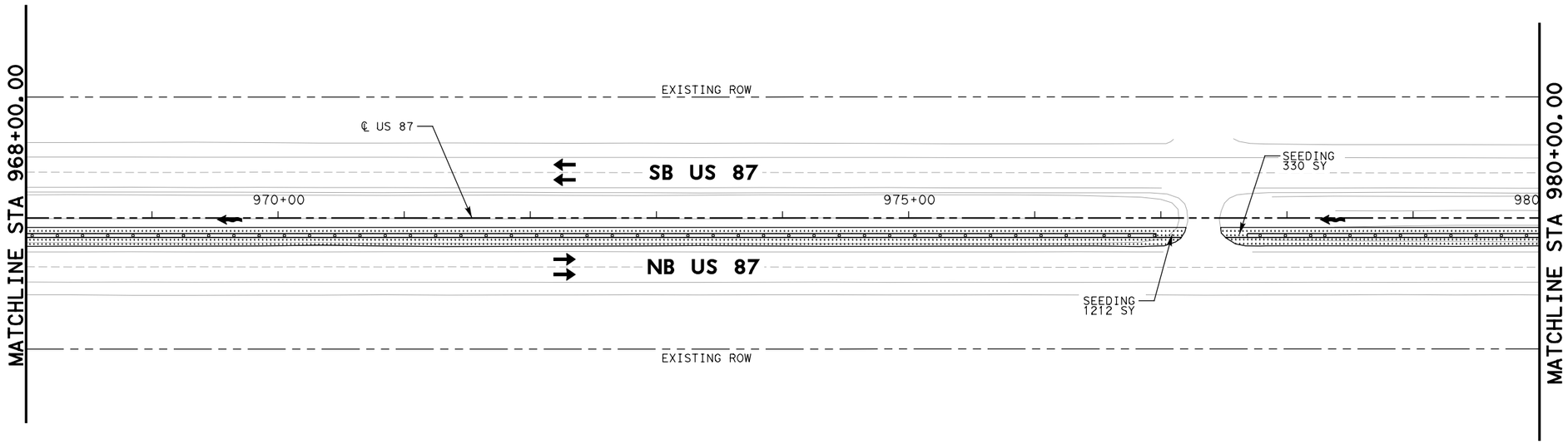

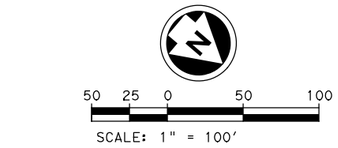

LEGEND	
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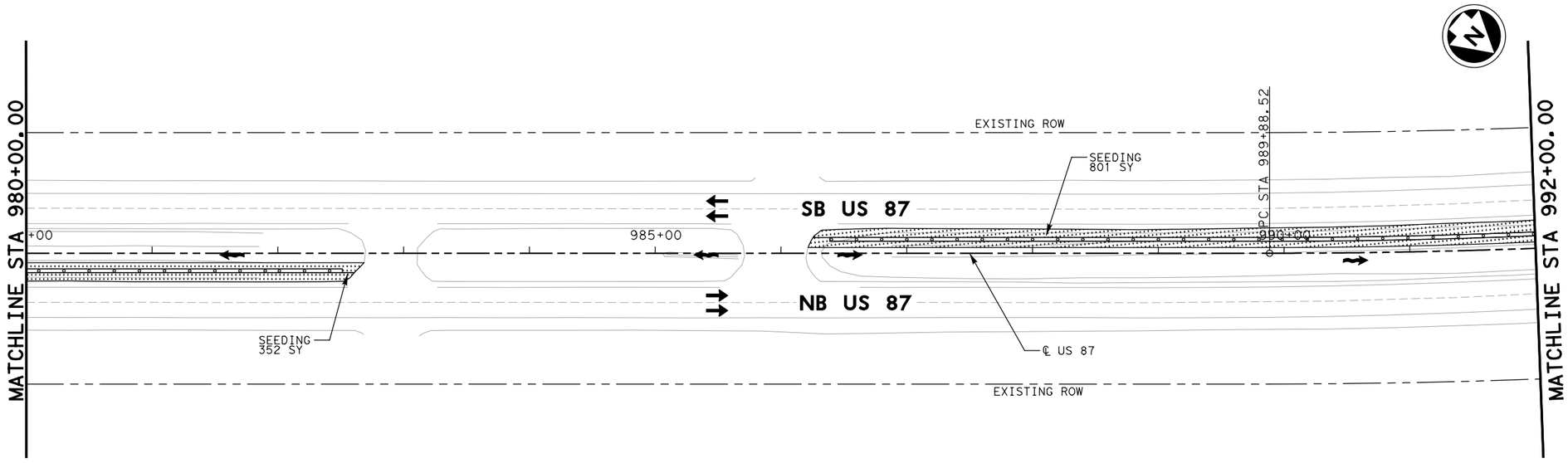
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

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US 87

SW3P
SITE PLAN

SHEET (23 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	219
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	07	052, ETC	
JKB				

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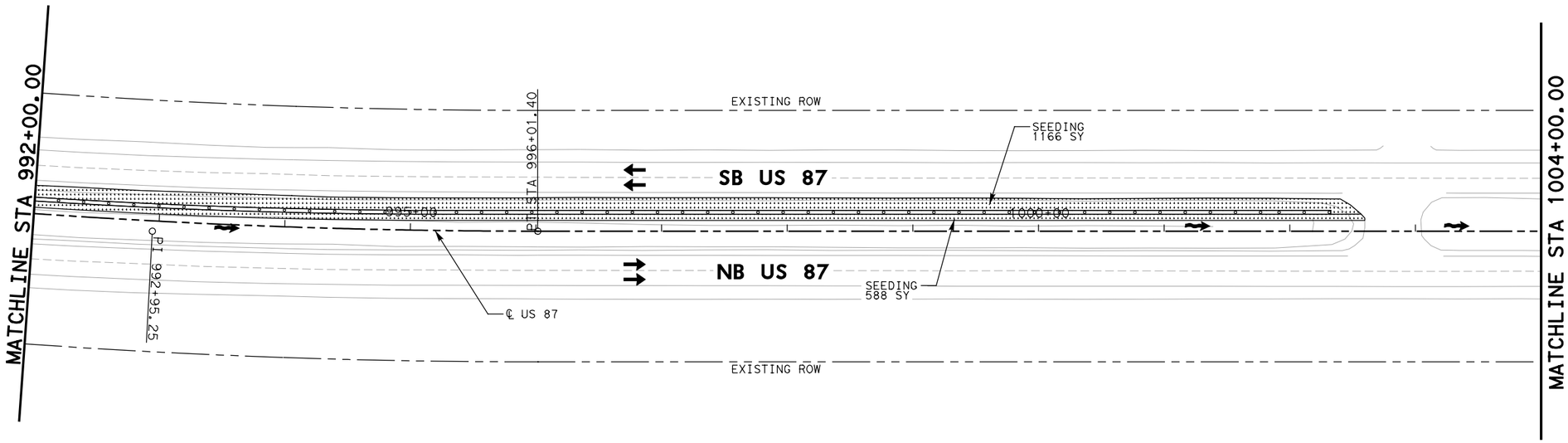
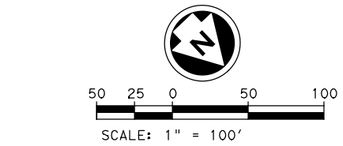
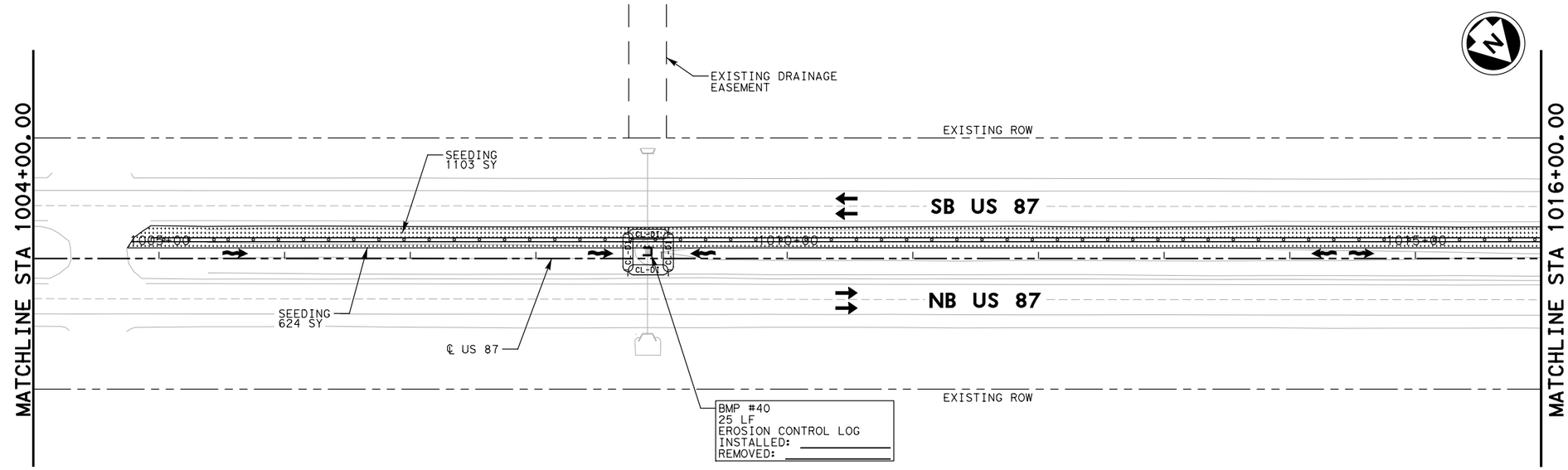




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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US 87

SW3P
SITE PLAN

SHEET (24 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	220
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK	0068	07	052, ETC	
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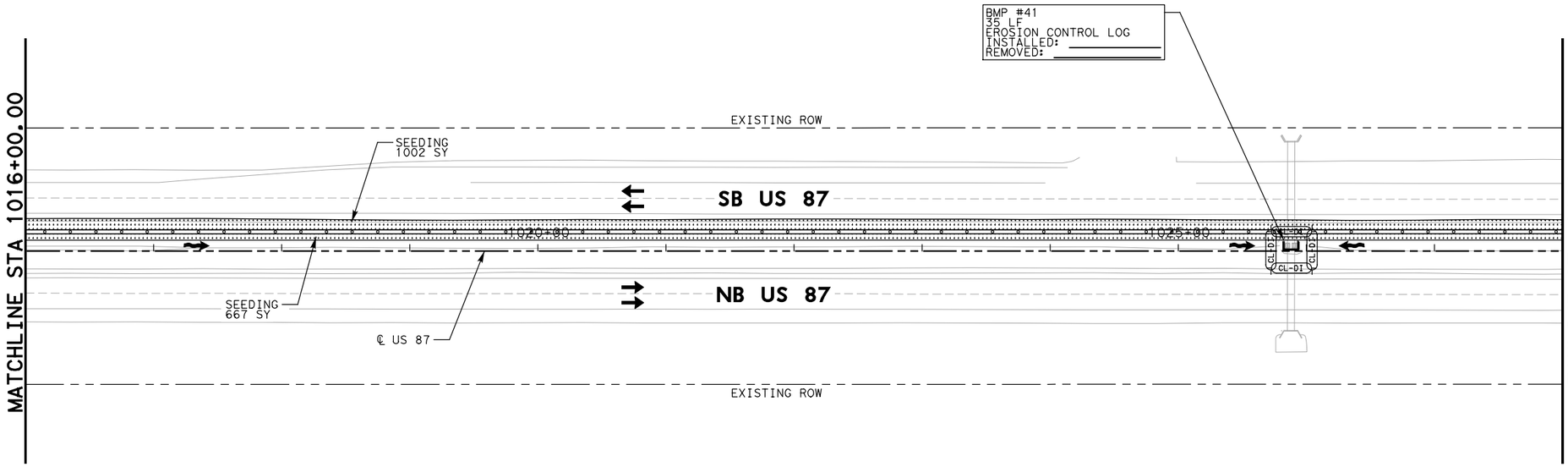
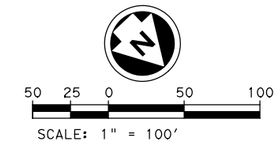
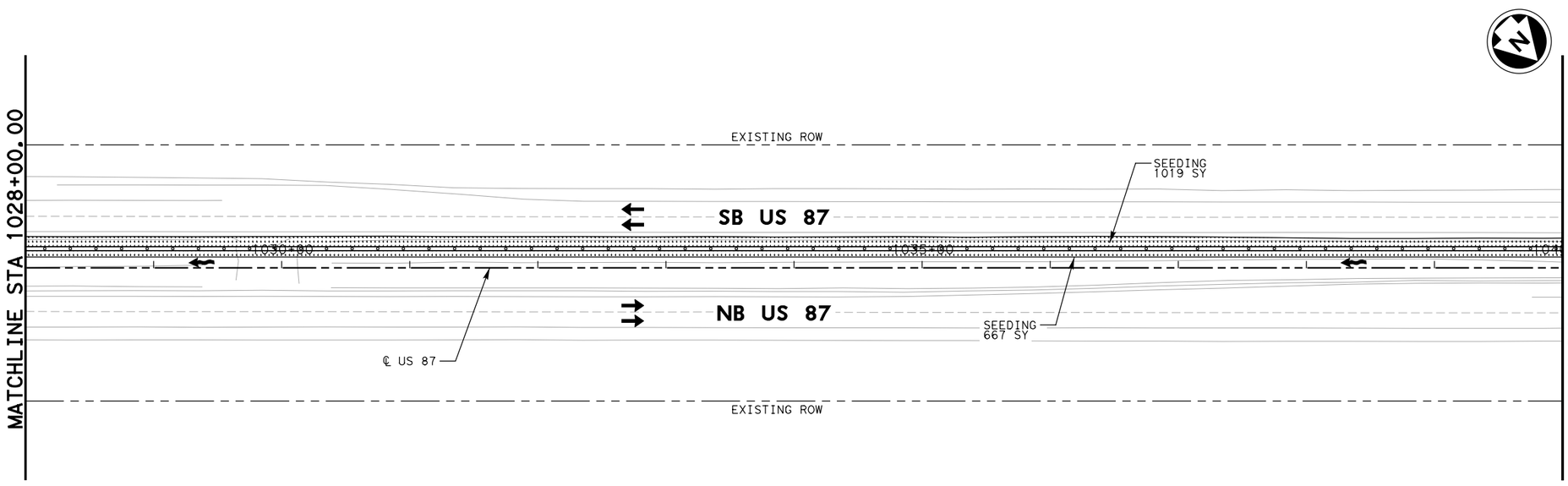




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



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Texas Department of Transportation

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SW3P
SITE PLAN

SHEET (25 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	221
GRAPHICS	CONTROL	SECTION	JOB	
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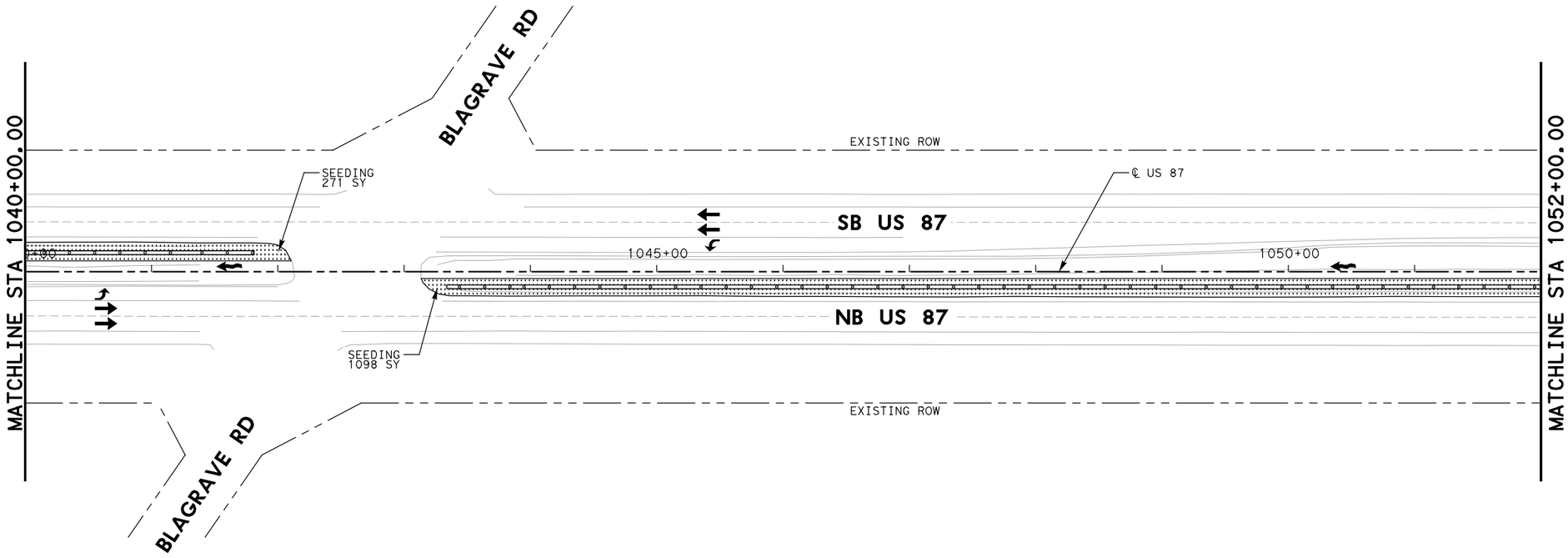

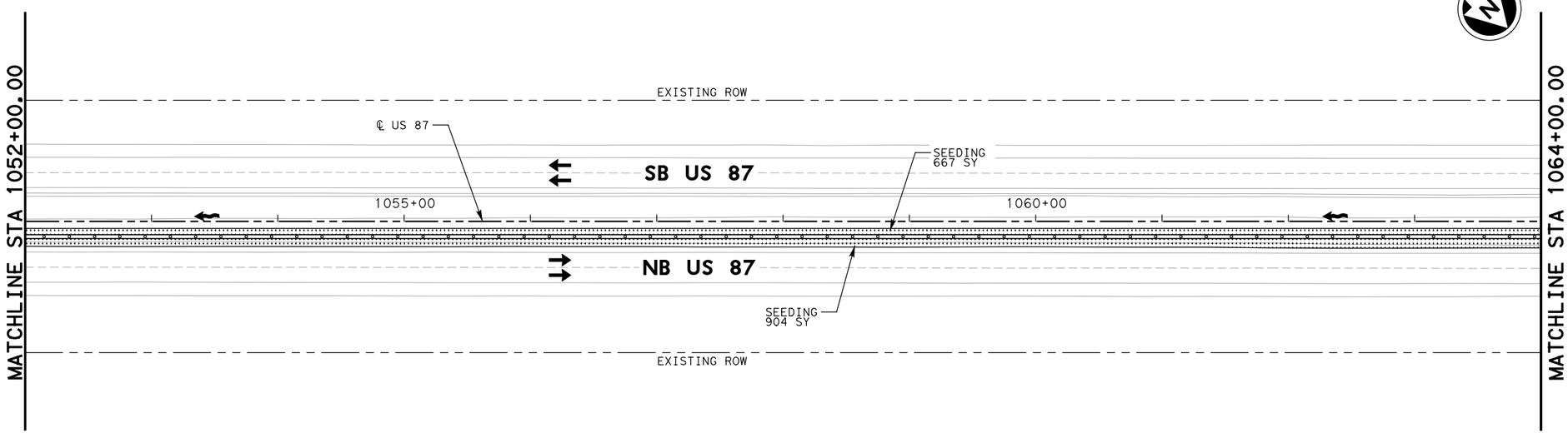

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
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5/25/2021

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US 87

SW3P
SITE PLAN

SHEET (26 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	222
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GRPH CHECK	0068	07	052, ETC	
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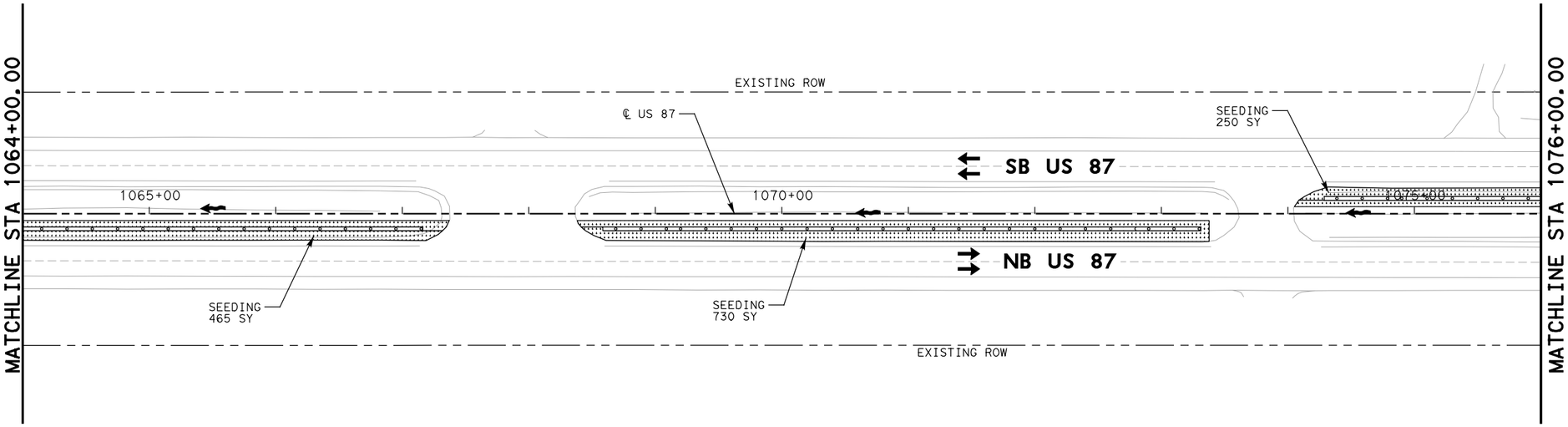
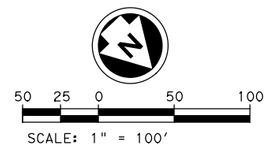
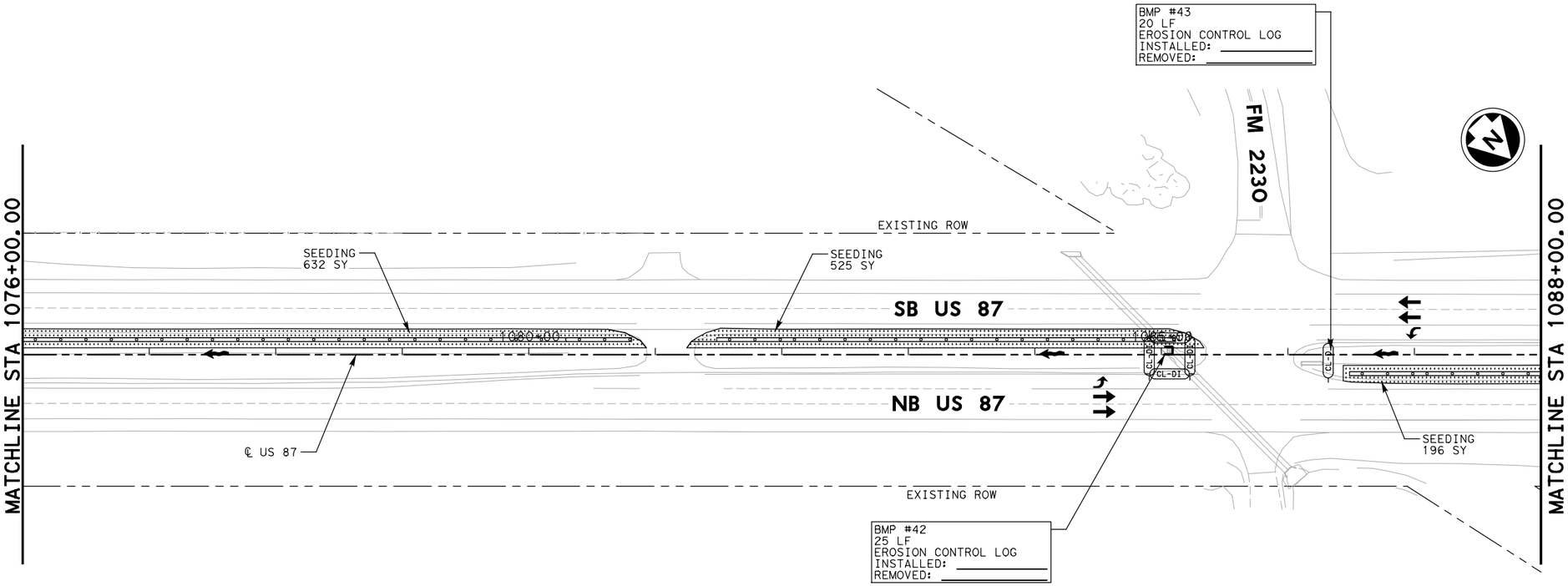




LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT



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SW3P
SITE PLAN

SHEET (27 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	223
GRAPHICS	CONTROL	SECTION	JOB	
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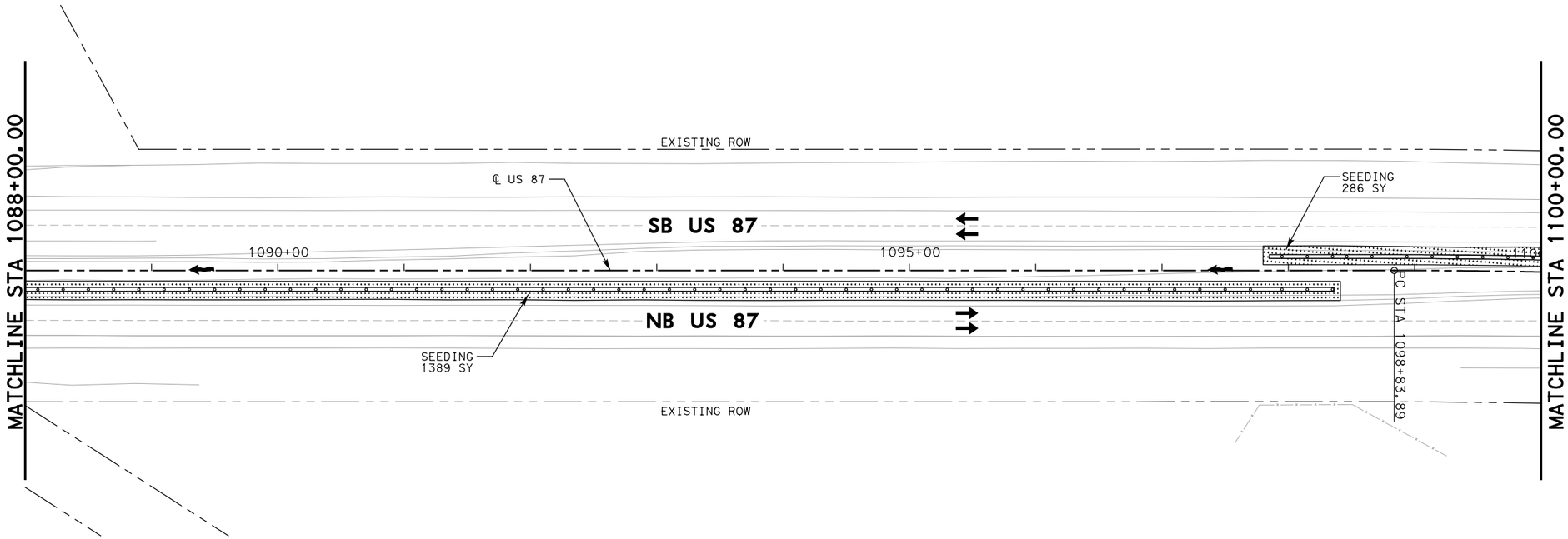
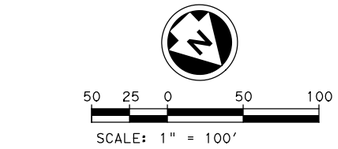
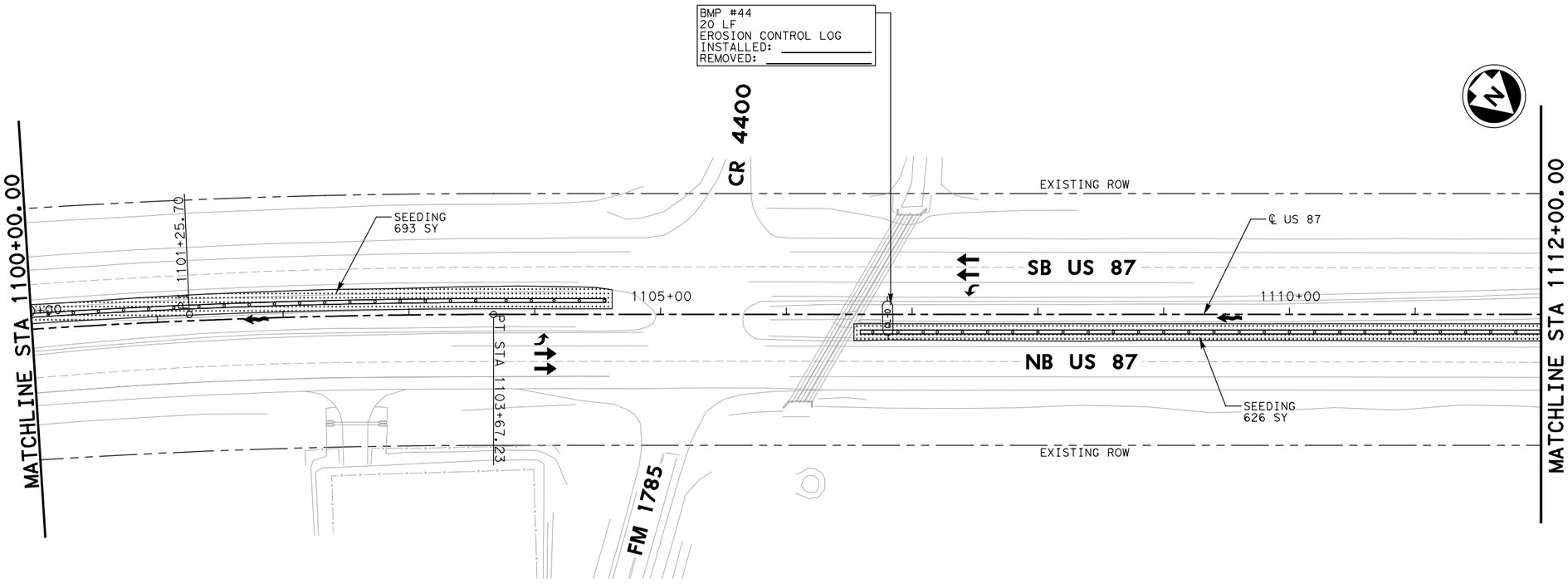




LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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SW3P
SITE PLAN

SHEET (28 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	224
GRAPHICS	CONTROL	SECTION	JOB	
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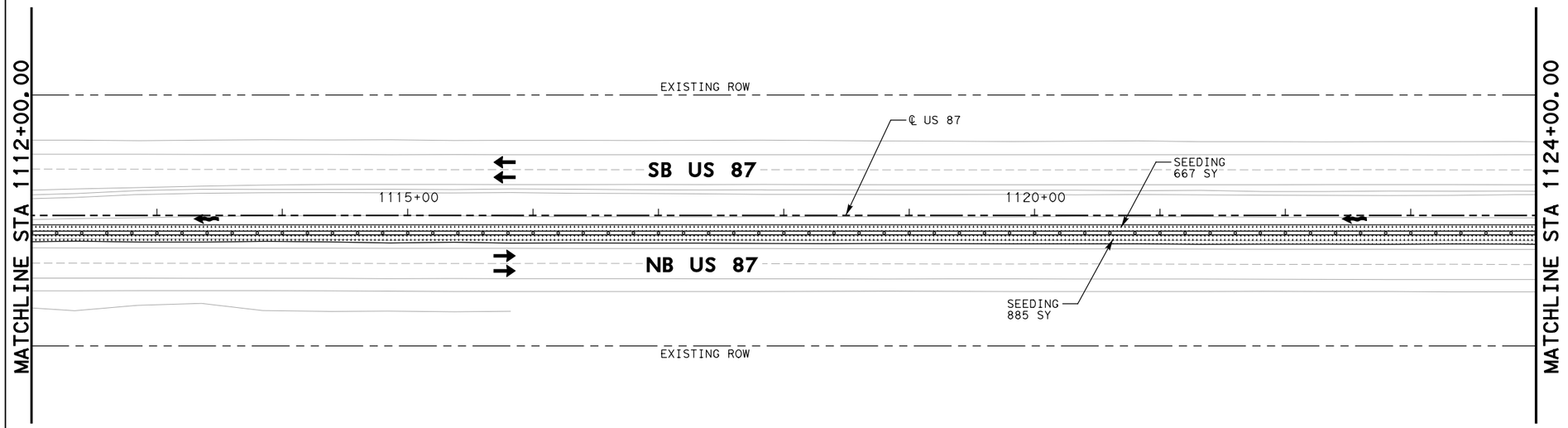
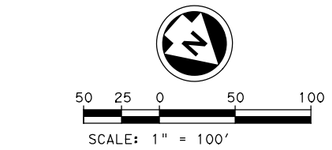
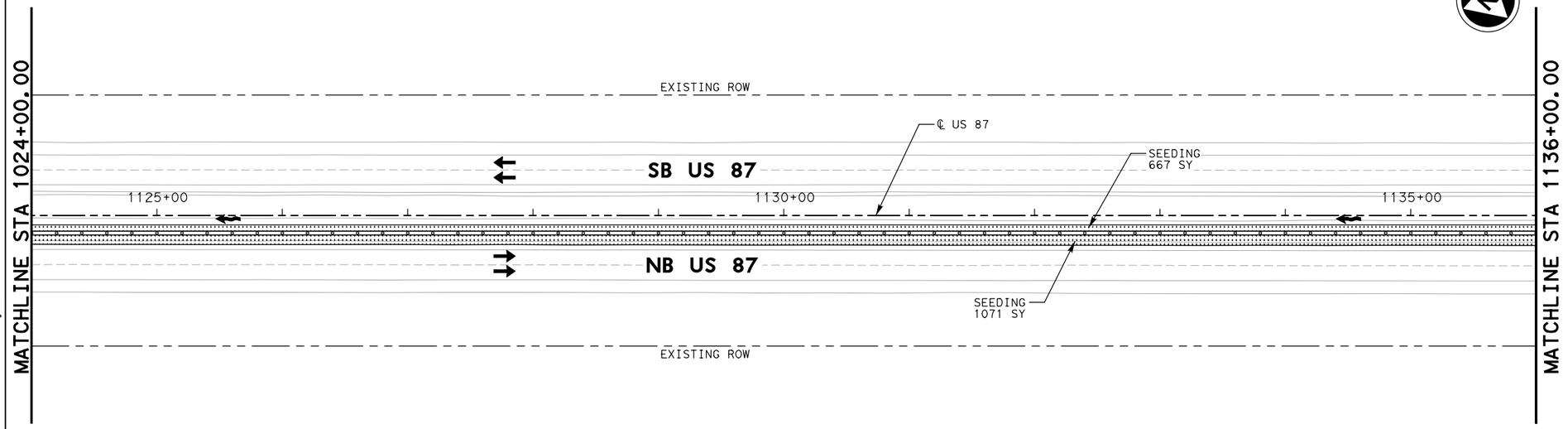




LEGEND	
CL-D	EROSION CONTROL LOG DAM
CL-DI	EROSION CONTROL LOG AT DROP INLET
	SEEDING
	FLOW ARROW
	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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US 87

SW3P
SITE PLAN

SHEET (29 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	225
GRAPHICS	CONTROL	SECTION	JOB	
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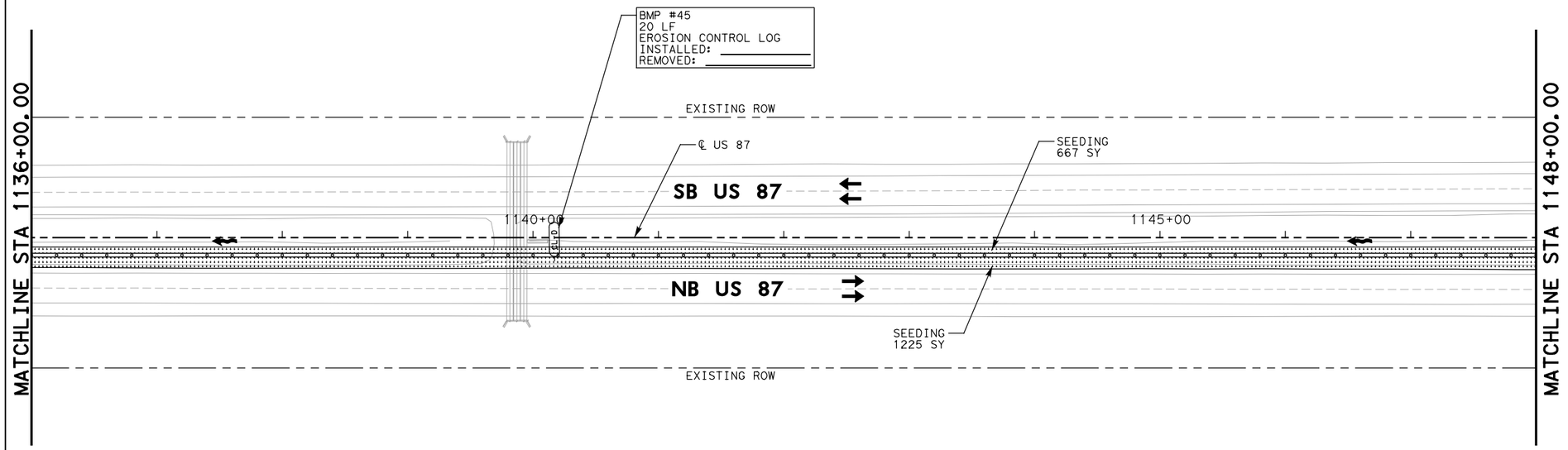
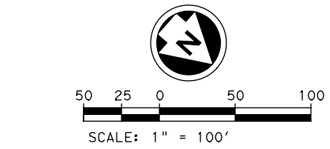
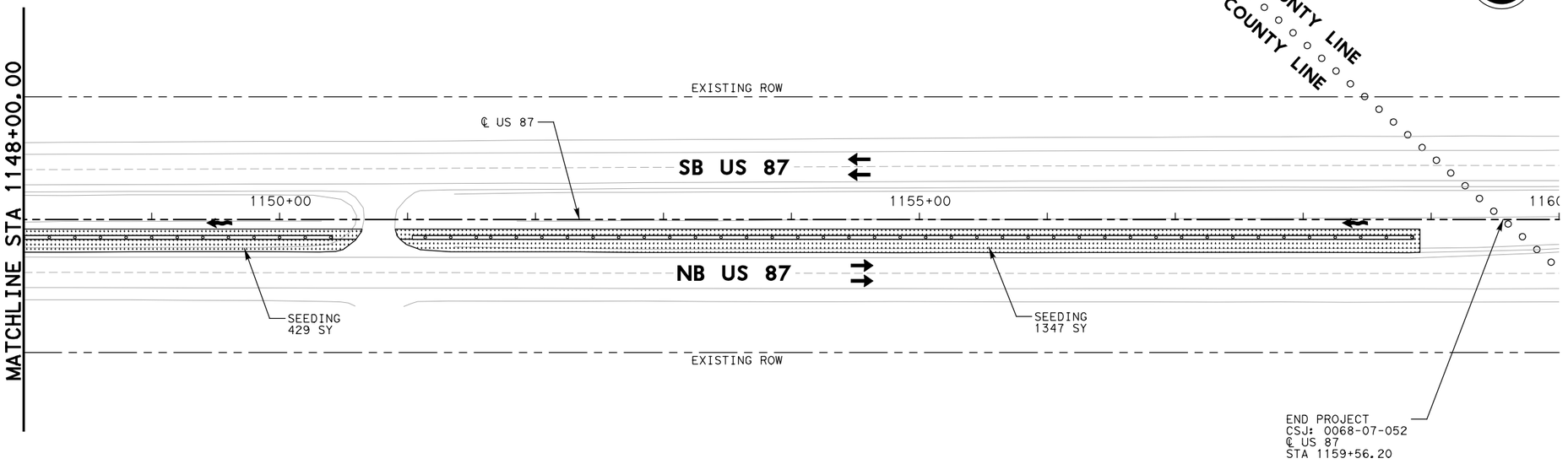




LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- SEEDING
- FLOW ARROW
- LINED CONCRETE WASHOUT



STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

FIRM REGISTRATION NO. F-230

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US 87

SW3P
SITE PLAN

SHEET (30 OF 30)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	226
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	07	052, ETC	
GRPH CHECK				
JKB				

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DATE: 5/25/2021 7:54:43 AM jbaker

SITE DESCRIPTION

PROJECT LIMITS:
THE PROJECT LIMITS SHOWN ON THE TITLE SHEET AND LIMITS OF TXDOT RIGHT OF WAY SHALL ALSO BE THE LIMITS OF COVERAGE OF THE SW3P.

PROJECT LOCATION MAPS: TITLE SHEET

DRAINAGE PATTERNS: DRAINAGE AREA MAPS <OR POSSIBLY SW3P SITE PLAN>

APPROX. SLOPES ANTICIPATED AFTER MAJOR GRADING AND AREAS OF SOIL DISTURBANCE: TYPICAL SECTIONS

MAJOR CONTROLS AND LOCATIONS OF STABILIZATION PRACTICES: SW3P SITE PLAN

PROJECT SPECIFIC LOCATIONS: TO BE SPECIFIED BY PROJECT FIELD OFFICE AND LOCATED IN THE PROJECT SW3P FILE.

SURFACE WATERS AND DISCHARGE LOCATIONS: DRAINAGE AND CULVERT LAYOUT SHEETS

TYPICAL AREAS WHICH WILL NOT BE DISTURBED: SW3P SITE PLAN

ENDANGERED SPECIES, DESIGNATED CRITICAL HABITAT AND HISTORIC PROPERTY: EPIC SHEET

ESTIMATED START DATES AND DURATION OF ACTIVITIES IN THE INTENDED SCHEDULE/SEQUENCE OF EARTH-DISTURBING ACTIVITIES: CONTRACT TIME ESTIMATE

NATURE OF ACTIVITY:
INSTALL CABLE BARRIER SYSTEM AND SAFETY LIGHTING

MAJOR SOIL DISTURBING ACTIVITIES:
INSTALL CABLE BARRIER SYSTEM

TOTAL PROJECT AREA:
357.17 ACRES

TOTAL AREA TO BE DISTURBED (AT EACH SITE):
24.18 ACRES

WEIGHTED RUNOFF COEFFICIENT BEFORE CONSTRUCTION:
0.35

WEIGHTED RUNOFF COEFFICIENT AFTER CONSTRUCTION:
0.35

EXISTING CONDITION OF SOIL & VEGETATIVE COVER:
NATIVE GRASSES

% OF EXISTING VEGETATIVE COVER:
70%

NAME OF RECEIVING WATERS:
STREAM SEGMENT 1412 OF THE COLORADO RIVER BASIN

$FILE$
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EROSION AND SEDIMENT CONTROLS

USE "T" OR "P" IN THE BLANKS BELOW IF APPLICABLE (T= TEMPORARY, P= PERMANENT)

SOIL STABILIZATION PRACTICES:

P	BUFFER ZONES	P	PERMANENT PLANTING, SODDING, OR SEEDING
	MULCHING	P	PRESERVATION OF NATURAL RESOURCES
	TEMPORARY SEEDING		SOIL RETENTION BLANKET
	OTHER		OTHER

OTHER:

DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME WITHIN 14 DAYS.

FOR CONSTRUCTION PROJECTS, THIS DISTRICT OF THE TEXAS DEPARTMENT OF TRANSPORTATION USES SITEMANAGER, A COMPUTER BASED CONSTRUCTION RECORD-KEEPING SYSTEM, AS PART OF RECORD FOR PROJECT WORK INCLUDING ENVIRONMENTAL RELATED ACTIVITIES. DOCUMENTATION DESCRIBING MAJOR GRADING ACTIVITES, TEMPORARY OR PERMANENT CESSATION OF CONSTRUCTION AND STABILIZATION MEASURE IS PART OF THIS SYSTEM AND IS INCORPORATED BY REFERENCE INTO THIS SW3P.

STRUCTURAL PRACTICES:

	CHANNEL LINERS		DIVERSION DIKE AND SWALE COMBINATIONS
	CURBS AND GUTTERS		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
	HAY BALES		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
	PAVED FLUMES		ROCK BEDDING AT CONSTRUCTION EXIT
	PIPE SLOPE DRAINS		STONE OUTLET STRUCTURES
	STORM SEWERS		STORM INLET SEDIMENT TRAP
	SEDIMENT BASINS	T	TEMPORARY EROSION CONTROL LOGS (BIOLOGS)
	SEDIMENT TRAPS		TIMBER MATTING AT CONSTRUCTION EXIT
	SILT FENCES		VEGETATIVE FILTER STRIPS
	ROCK FILTER DAMS		VELOCITY CONTROL DEVICES
T	EROSION CONTROL LOGS	T	LINED CONCRETE WASHOUT

OFFSITE VEHICLE TRACKING CONTROLS:

HAUL ROADS DAMPENED FOR DUST CONTROL
EXCESS DIRT ON ROAD REMOVED DAILY
LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
STABILIZED CONSTRUCTION ENTRANCE
OTHER

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

1. INSTALL EROSION CONTROL LOGS.
2. INSTALL CABLE BARRIER.
3. SEED DISTURBED AREAS.
4. REMOVE TEMPORARY SW3P DEVICES AFTER CONSTRUCTION AREA IS STABILIZED.

STORM WATER MANAGEMENT:
NA

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREAS ADJACENT TO CREEKS AND DRAINAGE WAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING STORM SEWER INLETS.

INSPECTION:
AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR EVERY 7 DAYS. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS:
ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE. CONSTRUCTION DEBRIS AND LITTER SHOULD BE PICKED UP ON A DAILY BASIS UNLESS OTHERWISE DIRECTED BY THE ENGINEER. WASTE AND DIRT PILES SHOULD BE REMOVED ON A WEEKLY BASIS.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
NO LONG TERM WATER QUALITY IMPACTS ARE EXPECTED AS A RESULT OF THE PROPOSED PROJECT. SEE THE NEXT PLAN SHEET FOR A LIST OF POTENTIAL POLLUTANTS. IN THE EVENT OF A MAJOR SPILL, NOTIFY THE TXDOT ENGINEER IMMEDIATELY. ALL PERSONNEL WILL BE INSTRUCTED IN THE PROCEDURES FOR SPILL HANDLING AND DISPOSING OF ANY HAZARDOUS MATERIALS THEY WILL BE USING. ALL SPILLS, INCLUDING THOSE OF LESS THAN 25 GALLONS SHALL BE CLEANED IMMEDIATELY AND ANY CONTAMINATED SOIL SHALL BE IMMEDIATELY REMOVED FROM THE SITE AND BE DISPOSED OF PROPERLY. DESIGNATED AREAS SHALL BE DETERMINED BY THE AREA ENGINEER FOR SPOILS DISPOSAL AND MATERIAL STORAGE. THESE AREAS SHALL BE PROTECTED FROM RUN-ON AND RUN-OFF. MATERIALS RESULTING FROM THE DESTRUCTION OF EXISTING ROADS AND BEING REMOVED AND/OR DISPOSED OF BY THE CONTRACTOR WILL BE DONE SO IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES AND REGULATIONS AND WITH THE APPROVAL OF THE PROJECT ENGINEER. ANY CHANGES TO AMBIENT WATER QUALITY DURING CONSTRUCTION OF THE PROPOSED PROJECT SHALL BE PROHIBITED AND MAY RESULT IN ADDITIONAL WATER QUALITY CONTROL MEASURES, WHICH SHALL BE MITIGATED AS SOON AS POSSIBLE AND SHALL BE REPORTED TO THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) WITHIN 24 HOURS OF BECOMING AWARE OF IMPACTS.

SANITARY WASTE:
ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

REMARKS:
CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS. ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT PART OF THE FINISHED WORK. DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATER BODY OR STREAMBED.

NO SCALE

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		227
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	07	052, ETC

LIST OF POTENTIAL POLLUTANTS

POTENTIAL POLLUTANT	RELATED SOURCE	CONTROLS
CEMENTATEOUS MATERIAL AND CEMENTATEOUS AGGREGATES (BROKEN CONCRETE)	REMOVAL OF CONCRETE RIPRAP, CULVERT COMPONENTS, BRIDGE COMPONENTS, ETC.	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
MILLED ASPHALTIC CEMENT PAVEMENT (MILLINGS)	OBLITERATION OF ABANDONED ROAD AND PLANING OF ASPHALT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
VIRGIN ASPHALTIC MATERIAL INCLUSIVE OF PRIME OILS, PRECOAT AGGREGATES, AND HOT MIX BITUMINOUS MIXTURES	APPLICATIONS OF PRIME COATS, SEAL COAT, AND PAVING OPERATIONS	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND TCEQ WILL BE IMMEDIATELY NOTIFIED.
CONCRETE, REBAR, WIRE, WIRE FABRIC LUMBER, NAILS, STYROFOAM BLOCK, FIBERBOARD, CURING COMPOUND AND LINSEED OIL	CONSTRUCTION OF CONCRETE BRIDGE COMPONENTS SUCH AS DRILLED SHAFTS, CULVERTS, ABUTMENTS, BENTS, REINFORCED CONCRETE SLABS, RAIL, INLET, CONCRETE TRAFFIC BARRIERS, CURB AND GUTTER, RIPRAP AND SIGN FOUNDATIONS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF. ANY TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO THEIR PREEXISTING CONDITION/ELEVATION.
MASONRY CONCRETE BLOCK, GEOGRID FABRIC, CARDBOARD, AND PLASTIC RAP	CONSTRUCTION OF MODULAR RETAINING WALL SYSTEMS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POSTS, STEEL POSTS, BARRELS, CONES, SIGN BOARDS (ALUMINUM AND PLYBOARD), FASTENERS, NUTS, BOLTS, AND WASHERS	PLACEMENT AND/OR REMOVAL OF BARRICADES, SIGNS AND TRAFFIC CONTROL DEVICES	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POST, STEEL POST, STEEL FASTENERS, NUTS, BOLTS, AND WASHERS	CONSTRUCTION OF METAL BEAM GUARD FENCE	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
STRUCTURAL STEEL I-BEAM, SIGN BOARDS, AND CONCRETE FOUNDATIONS	REMOVAL OF ROADSIDE SIGN ASSEMBLIES LARGE AND SMALL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
THERMOPLASTIC PAINT, GLASS BEADS, REFLECTIVE TABS, AND RAISED REFLECTIVE PAVEMENT MARKERS	APPLICATION OF PAVEMENT MARKINGS/MARKERS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
PETROLEUM PRODUCTS (SMALL QUANTITIES INTRODUCED BY CONTRACTOR)	EQUIPMENT FAILURE, MAINTENANCE AND REPAIR	ALL EQUIPMENT AND VEHICLE MAINTENANCE SHALL BE PERFORMED IN A DESIGNATED AREA WITH APPROPRIATE MEASURES FOR CONTAINMENT AND PROPER DISPOSAL OF ALL WASTE MATERIALS INCLUDING HYDRAULIC OIL AND OTHER LIQUIDS IN ACCORDANCE STATE AND LOCAL WASTE MANAGEMENT REGULATIONS. ALL MATERIAL STORED PRIOR TO DISPOSAL SHALL BE CONTAINED IN A CONTAINER WITH A SECURE COVER MEETING ALL STATE AND LOCAL WASTE MANAGEMENT REGULATIONS.
ELIGIBLE NON-STORM WATER DISCHARGES INCLUDING BUT NOT LIMITED TO NON-POTABLE WATER AND NON-STORM WATER DISCHARGE	MOISTURE APPLICATIONS FOR DUST CONTROL, DENSITY, VEGETATION WATERING, NON-DETERGENT VEHICLE WASHING, AND AIR CONDITIONING CONDENSATE	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND THE NON-POTABLE WATER WILL BE RECOVERED AND PROPERLY STORED FOR REUSE.
SURVEY STAKE, FLAGGING TAPE AND PAINT	SURVEY STAKING, ALIGNMENT ESTABLISHMENT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WASTEWATER	WASHOUT AND CLEANOUT OF STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
SOAPS AND SOLVENTS	VEHICLE AND EQUIPMENT WASHING	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
UNSUITABLE FILL MATERIAL	EXCAVATION - ROADWAY, SPECIAL AND EROSION CONTROL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.

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STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/25/2021

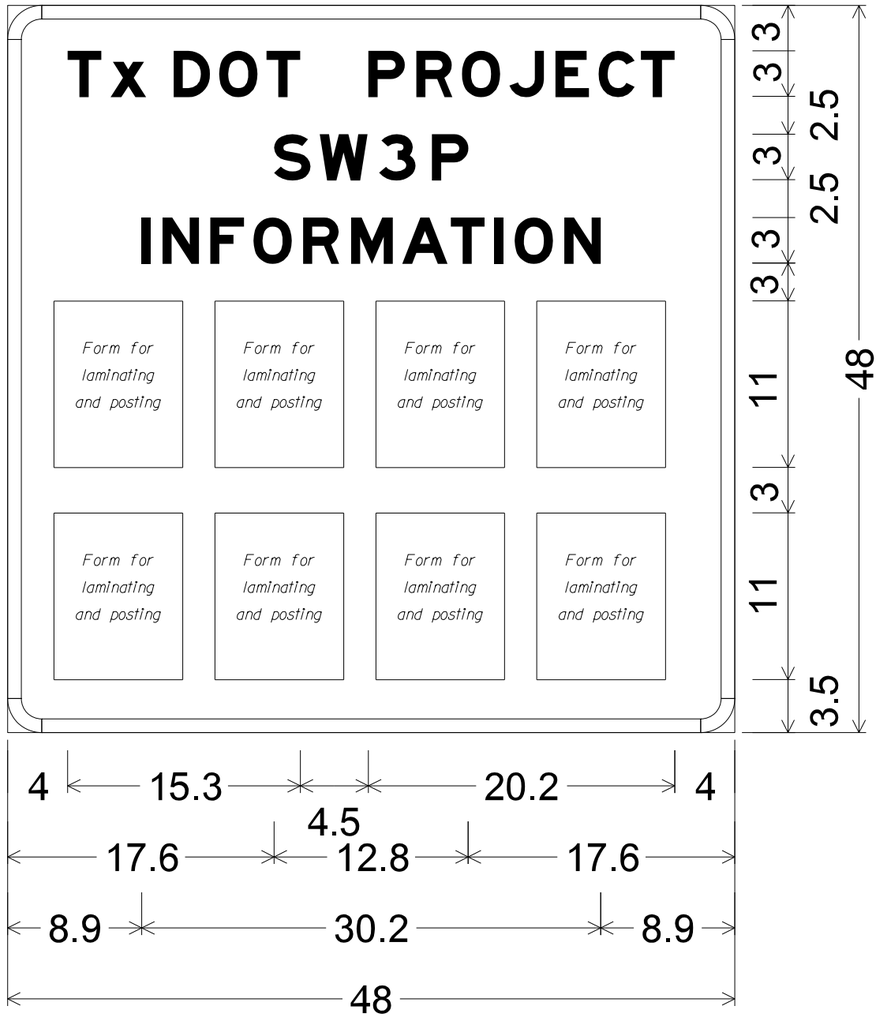
Texas Department of Transportation

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

REV. DATE: 02/27/2014

NO SCALE

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		228
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	07	052, ETC



2.3" Radius, 0.9" Border, White on Blue;
[TxDOT PROJECT] E Mod;
[SW3P] E Mod;
[INFORMATION] E Mod;

NOTE:

The Forms needed for laminating and posting to the SW3P Notification Board will be provided by the Engineer. The total number of forms may vary. Notification Boards are to be constructed from Plywood, ½ or ⅝-inch thick, in accordance with TxDOT Departmental Material Specification (DMS)-7100. 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 sign will be placed at a location within the right-of-way but outside the clear zone as directed by the Engineer. This work will not be paid for directly, but will be considered subsidiary to other items.

THIS DOCUMENT IS RELEASED
FOR THE PURPOSE OF PRELIMINARY
REVIEW UNDER THE AUTHORITY OF
JUSTIN K. BAKER, P.E. 114172

DATE: 02-26-2021

IT IS NOT TO BE USED FOR BIDDING,
CONSTRUCTION, OR PERMITTING PURPOSES.

SW3P NOTIFICATION BOARD DETAIL

Texas Department of Transportation

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		229
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	07	052, ETC

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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. COMPLY WITH E.O. 13112 ON USE OF NATIVE VEGETATION.
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. COMPLY WITH MIGRATORY BIRD TREATY ACT FOR PROTECTION OF BIRDS AND NESTS.
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

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© 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.	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		230

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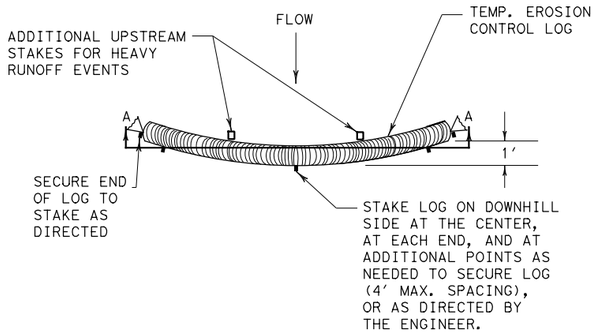
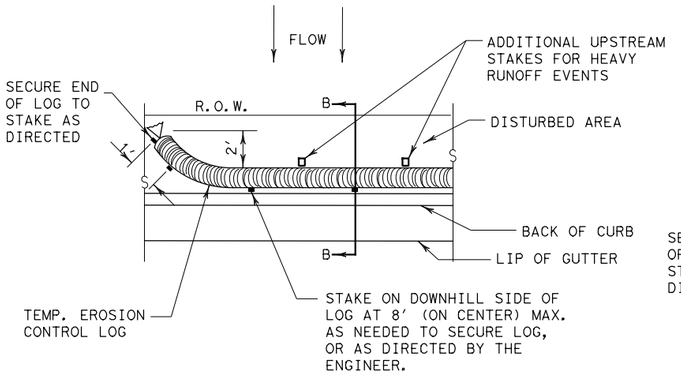


PLAN VIEW



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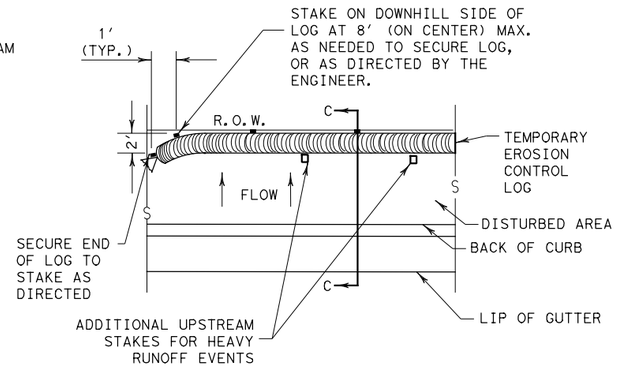

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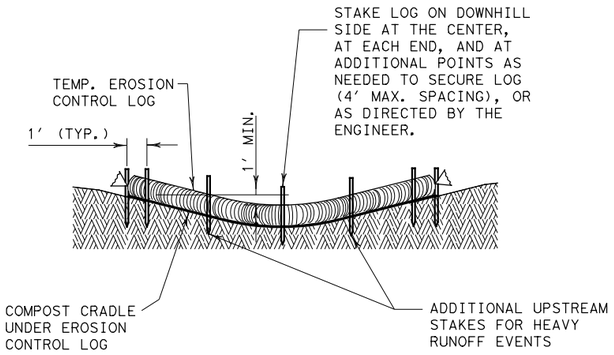
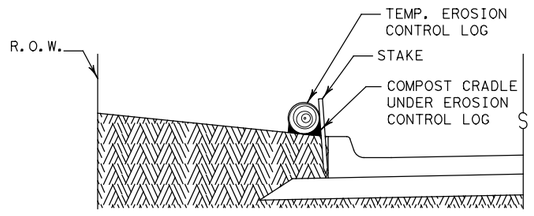


SECTION A-A

EROSION CONTROL LOG DAM

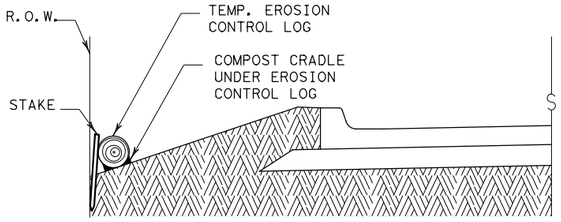
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

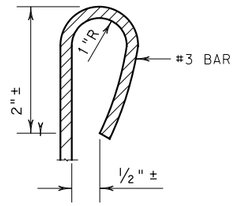
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

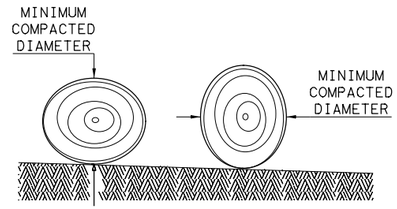
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

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© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
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	DIST		COUNTY			SHEET NO.
	ABL		HOWARD			231

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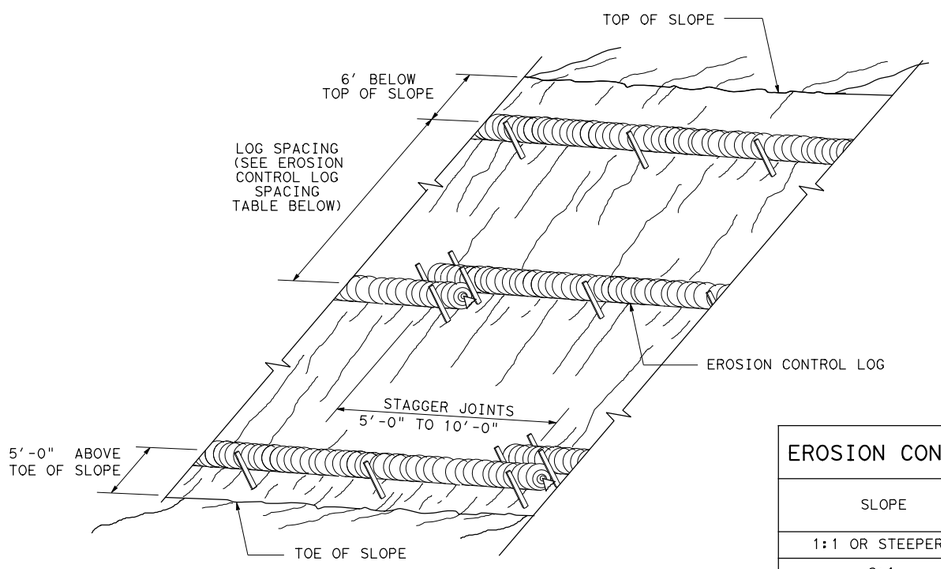
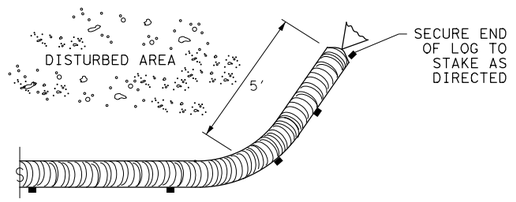


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

CL-SST

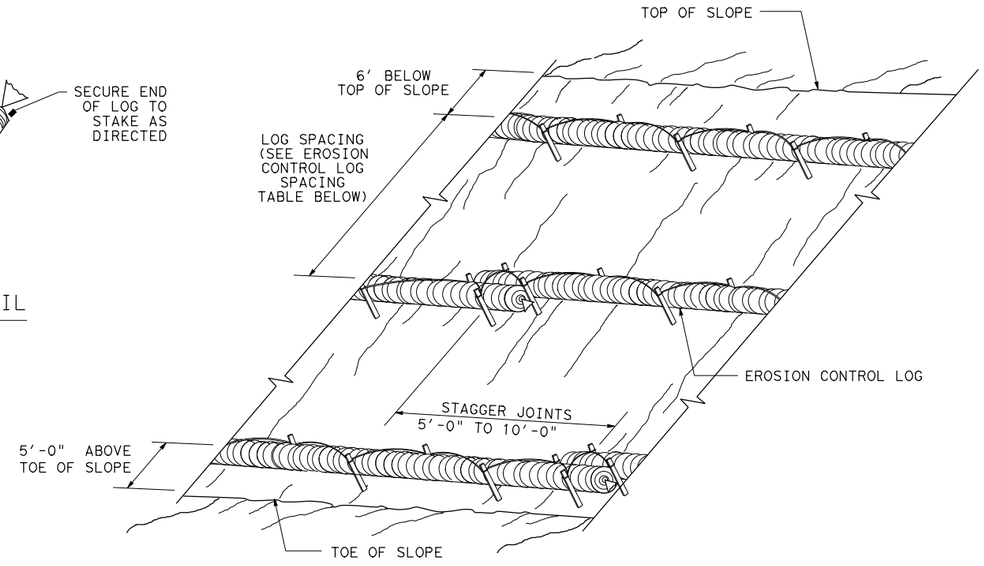


END SECTION RAP DETAIL

EROSION CONTROL LOG SPACING TABLE

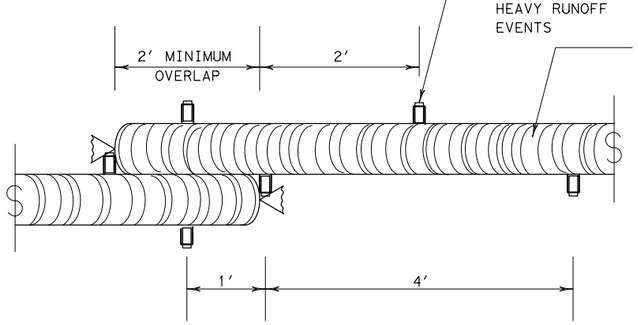
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5′	10′	15′	20′
2:1	10′	20′	30′	40′
3:1	15′	30′	45′	60′
4:1 OR FLATTER	20′	40′	60′	80′

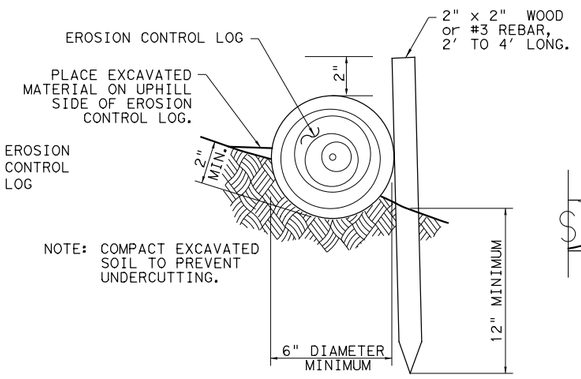
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL



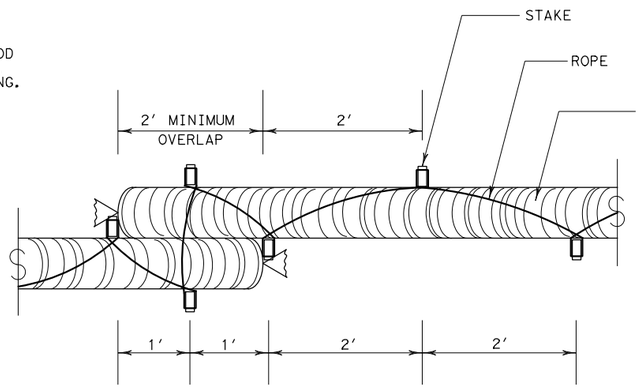


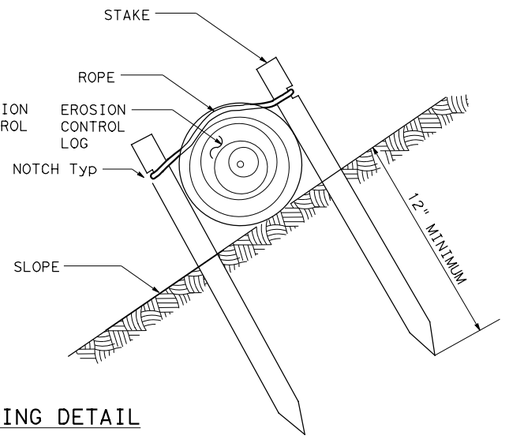
STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

TRENCH DEPTH TABLE

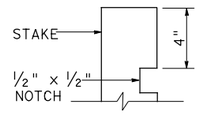
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL

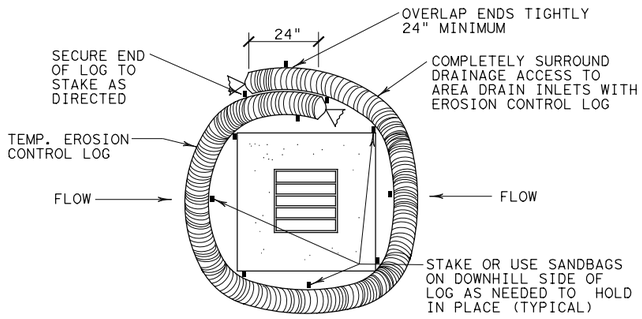


STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

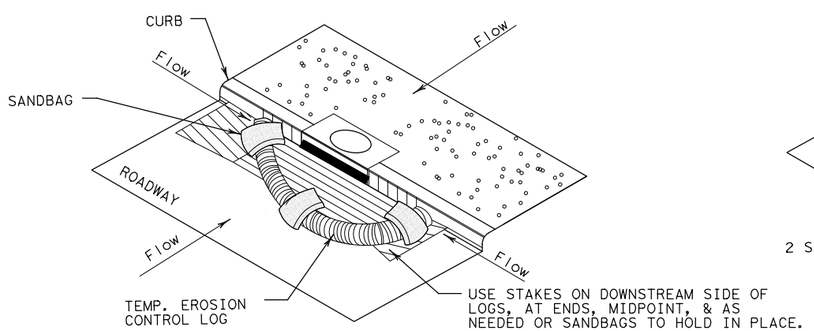
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	07	052, ETC	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		232



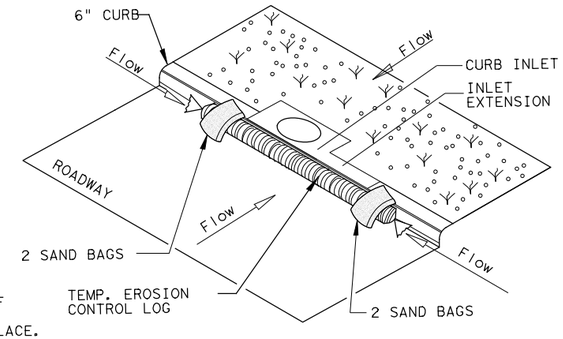
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

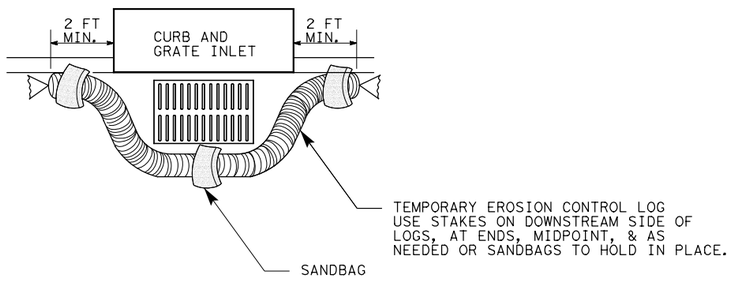
CL-CI



EROSION CONTROL LOG AT CURB INLET

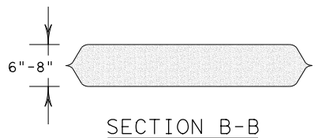
CL-CI

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.

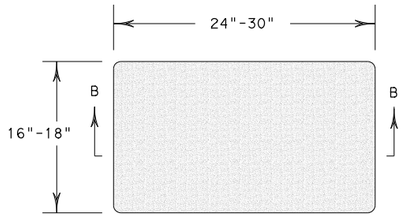


EROSION CONTROL LOG AT CURB & GRADE INLET

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	0068	07	052, ETC		US 87	
	DIST	COUNTY			SHEET NO.	
	ABL	HOWARD			233	

DATE: 5/25/2021 7:54:55 AM
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