FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	C 2906-1-6		1
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS

SEE SHEET 2

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT NO. C 2906-1-6

MIDLAND, ETC.
RM 1492

NET LENGTH OF PROJECT: 95,068.690 FT = 18.006 MI — 2906-01-006 = 5,676.000 FT = 1.075 MI; 2906-02-007 = 89,395.690 FT = 16.931 MI

LIMITS: FROM SH 1787 TO SH 329

FOR THE CONSTRUCTION OF REHABILITATION OF EXISTING ROAD

CONSISTING OF SUBGRADE WIDENING, FLEXBASE, HOTMIX, CULVERT EXTENTIONS, ILLUMINATION, SIGNS, AND PAVEMENT MARKINGS.

Functional Classification: RURAL MINOR COLLECTOR

DESIGN SPEED = 40 MPH

ADT = 2,037 (2021)
2,600 (2041)

FINAL PLANS

CONTRACTOR:

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

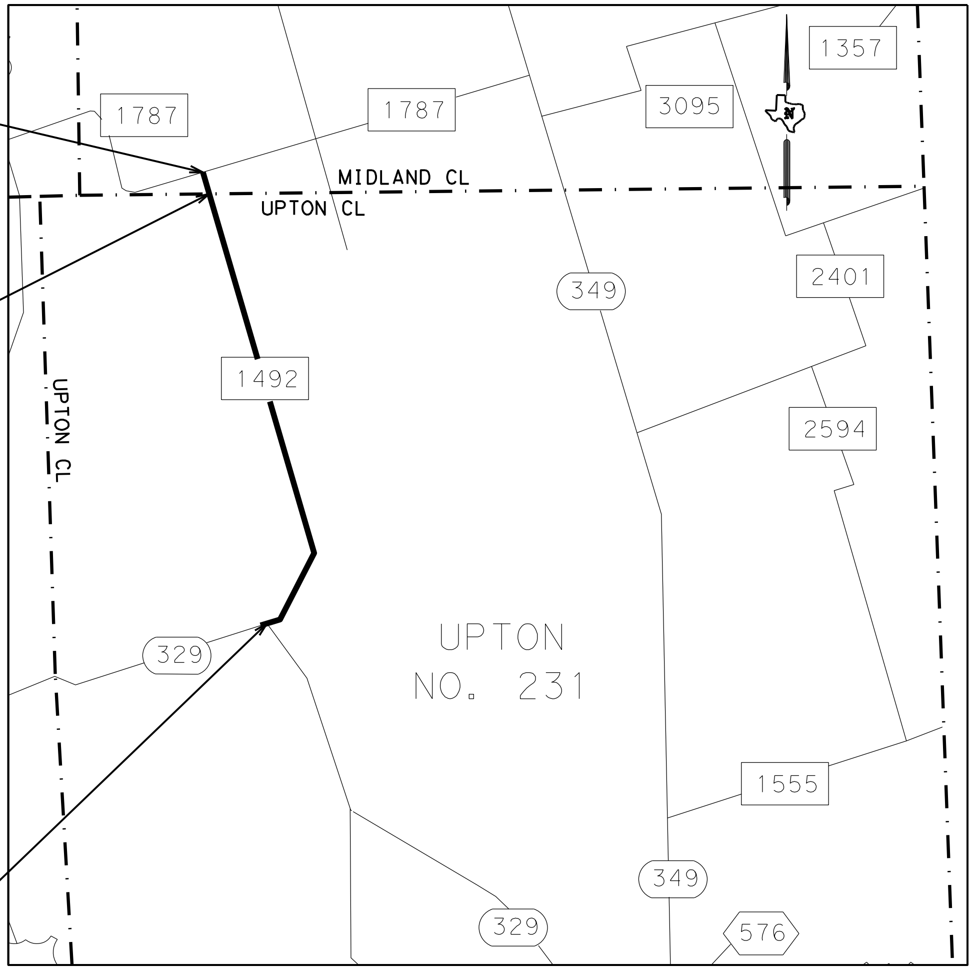
DATE WORK WAS ACCEPTED:

FINAL CONTRACT COST: $

BEGIN PROJECT
BEGIN CSJ 2906-01-006
STA. 1+90.60
REF. MRK. 342-0.090

END CSJ 2906-01-006
STA. 63+98.88
BEGIN CSJ 2906-02-007
STA. 62+07.07+.700

END PROJECT
END CSJ 2906-02-007
STA. 890+56.40



RR CROSSINGS: NOT APPLICABLE

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING: 10/10/2022

Docusigned by: [signature], P.E.
AREA ENGINEER

RECOMMENDED FOR LETTING: 10/10/2022

DocuSigned by: [signature], P.E.
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 10/10/2022

DocuSigned by: Eric L. Lykins, P.E., P.E.
DISTRICT ENGINEER

PRINTED DATE: XX/XX/XXXX

COUNTY ____ PROJ. NO. ____
HWY. NO. ____ LETTING DATE ____
DATE ACCEPTED ____

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000--008).

SCALE:

FED08

INDEX OF SHEETS

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

DocuSigned by:
Saul Romero, PE
88BF61DF326A480...

10/10/2022
DATE

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

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Texas Department of Transportation

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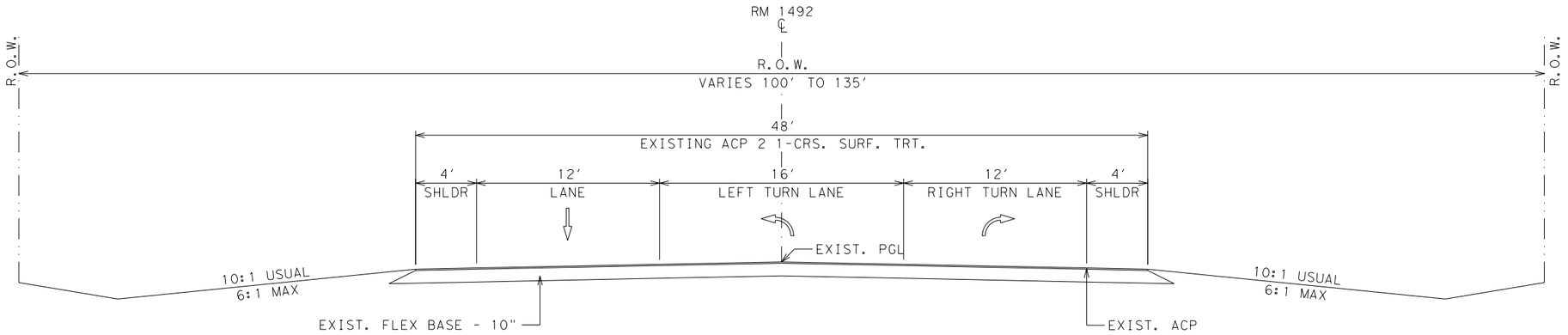
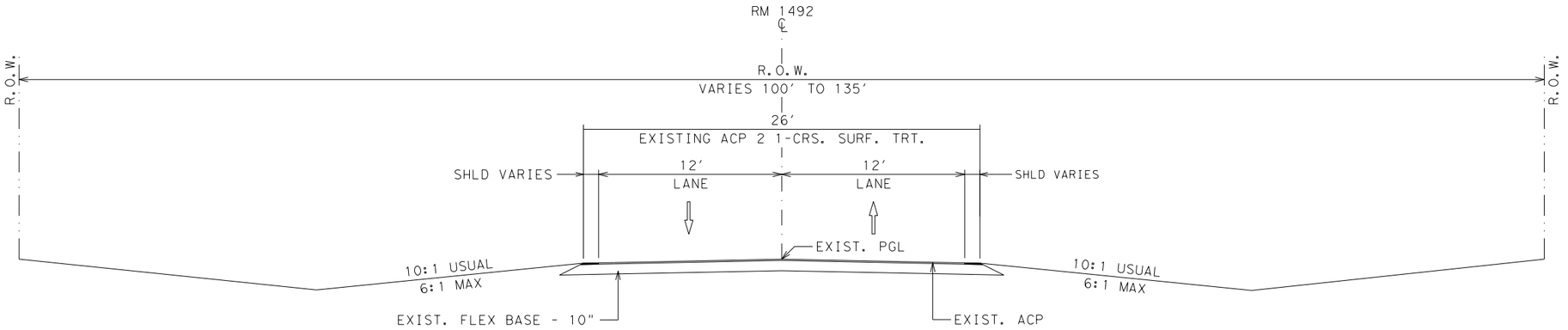
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



EXISTING TYPICAL SECTION

STA. 1+90.60 TO STA. 8+56.00 (2906-01-006)
STA. 8+56.00 TO STA. 12+75.00 TRANSITION FROM 48' TO 26' (2906-01-006)



EXISTING TYPICAL SECTION

STA. 12+75.00 TO STA. 63+98.88 (2906-01-006)
STA. 0+00.00 TO STA. 864+00 (2906-02-007)
STA. 872+00.00 TO STA. 887+10.00 (2906-02-007)
STA.887+10.00 TO STA. 889+60.00 (2906-02-007) (TRANSITION FROM 11' LANES TO 20' LANES)

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
10/10/2022 PE
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TYPICAL SECTIONS

SHEET 1 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			3
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
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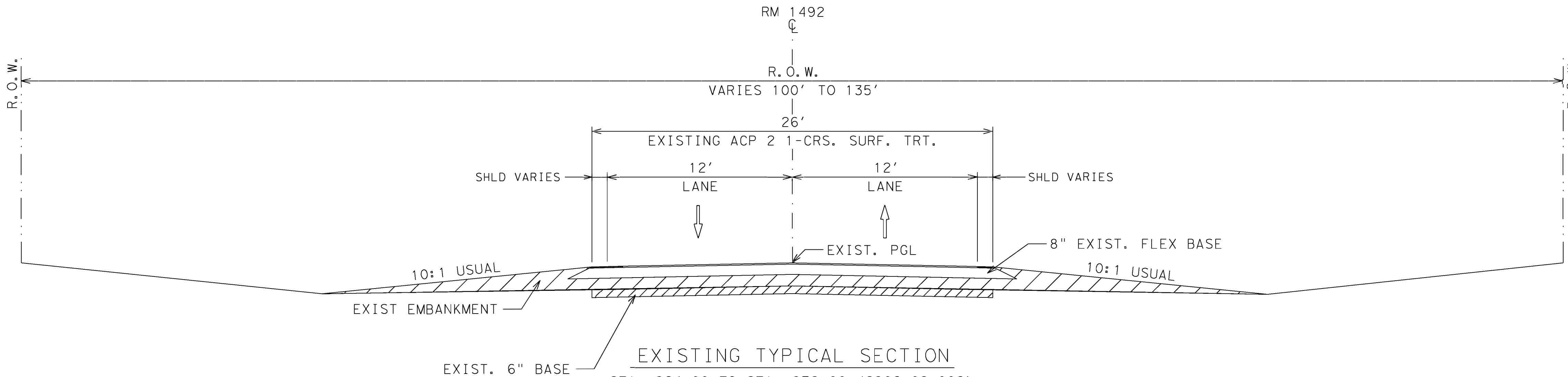
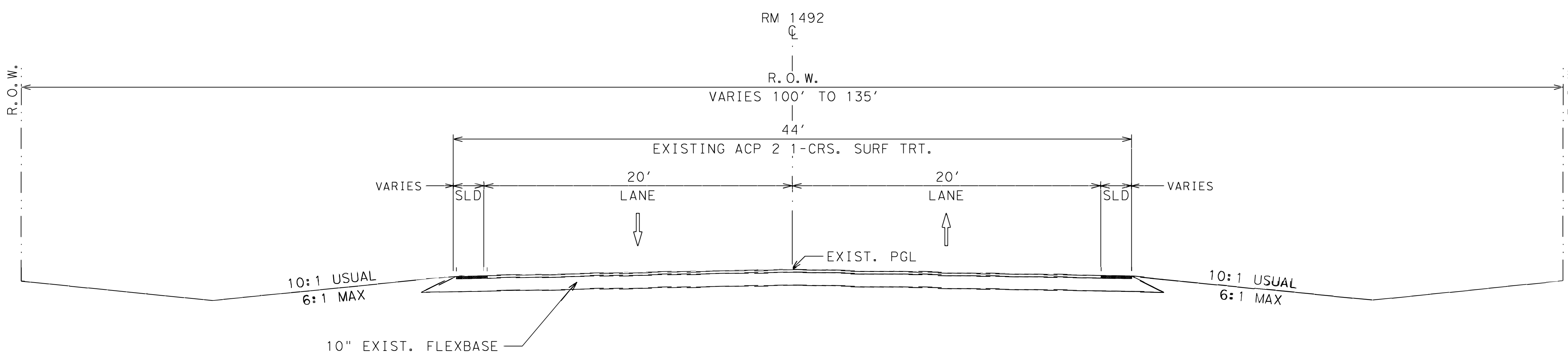


EXISTING TYPICAL SECTION

STA. 864+00 TO STA. 872+00 (2906-02-006)



EXISTING TYPICAL SECTION

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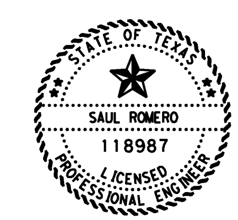

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10/20/2022
88BF6...

TYPICAL SECTIONS

SHEET 2 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
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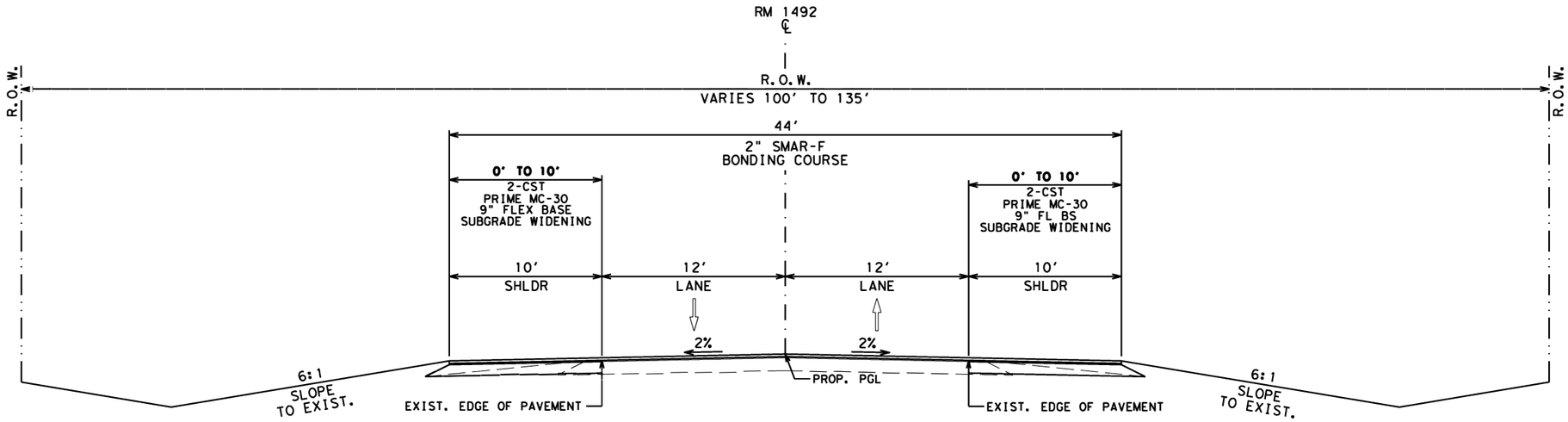
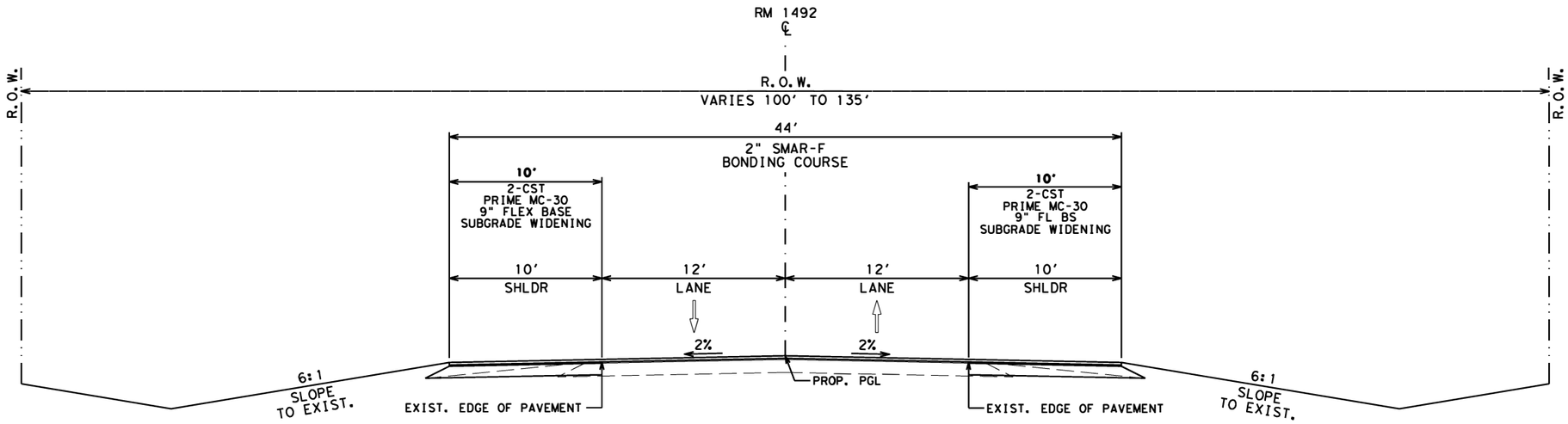


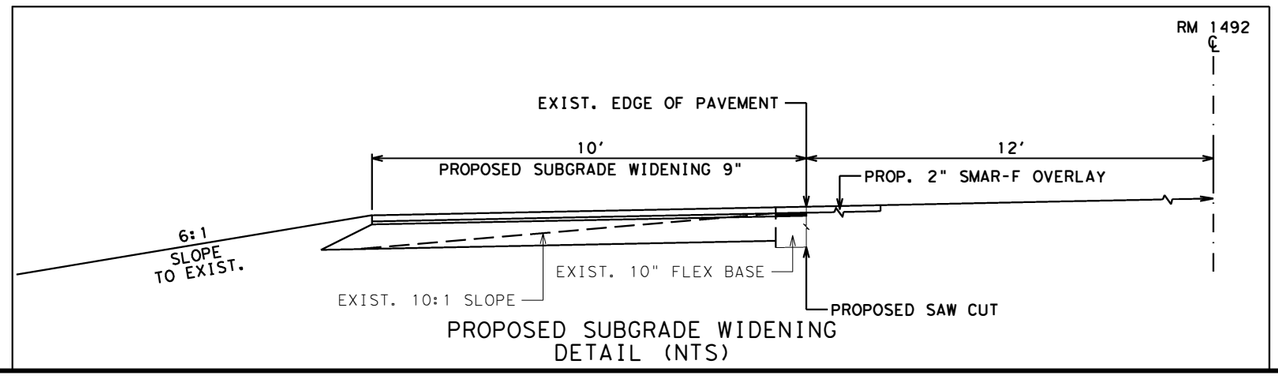
PROPOSED TYPICAL SECTION

STA. 9+32.00 TO STA. 12+75.00 WIDENING TRANSITION FROM 0' TO 10' (2906-01-006)
STA. 15+00 TO STA. 62+07.7 (2906-01-006)
STA. 0+00.00 TO STA. 864+00 (2906-02-007)
STA. 872+00.00 TO STA. 887+10.00 (2906-02-007)
STA. 887+10 TO STA. 890+56.40 TRANSITION FROM 12' LANES TO 20' LANES (2906-02-007)



PROPOSED TYPICAL SECTION

STA. 864+00 TO STA. 872+00 (2906-02-007)



PROPOSED SUBGRADE WIDENING DETAIL (NTS)

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
10/10/2022
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PROPOSED TYPICAL SECTIONS

SHEET 3 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
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Material Specification Information

Grading Requirements (gn1)

Item	Description	Grading Requirements Percent Retained - Sieves				Soil Constants		Wet Ball Mill
						L.L. Max.	P.I. Max.	Max.
		1-3/4”	7/8”	3/8”	#40			
247	Type A GR 4	0-3	10-35	20-55	65-85	40	12	40

The maximum increase in material passing the number 40 sieve resulting from the wet ball mill test shall not exceed 20%.

Cure the finished section of flex base until the moisture content is at least half of the optimum moisture content or as directed by the engineer before applying the next successive course or prime coat.

There is potential for gypsum in the area and additional time may be necessary to process the subgrade and/or base material.

Contractor questions on this project will be accepted through email at the following address:

- ODA-PreLettingQuestions@txdot.gov

All contractor questions will be reviewed by the Engineer. All questions and/or responses will be posted to TxDOT’s Public FTP at the following Address:

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

The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Item 5: Control of the Work

The following TxDOT Department standards have been modified for this project:

*RFBA-13 (MOD)

For any structures containing bird nests, schedule all work to complete the demolition of the existing structures identified in the plans between September 15, 2023 and March 15, 2023. Failure to complete this work during the specified timeframe may cause construction delays due to environmental regulations.

The existing alignment is the control for the Contractor staking. Establish reference points for the control prior to removing the existing surface.

Use Method C for construction surveying.

In the event the finished surface does not conform to the typical sections or does not meet the required IRI, rework the non-conforming area to the limits necessary and employ additional survey control as directed.

Item 6: Control of Materials

Restrict storage of equipment and materials to approved areas. The Engineer will not approve storage in any TxDOT yard.

Promptly and properly dispose of any waste generated from servicing equipment on the project.

Item 7: Legal Relations and Responsibilities

If access to the project is required through a new or unapproved driveway (i.e. Material source, stockpile location, field office, etc.), obtain an approved “Permit to Construct Access Driveway Facilities on Highway Right Of Way” (TxDOT Form 1058) before beginning any construction operations.

Utilities (public, private and TxDOT) exist throughout the project. Prior to any excavation, investigate to determine the utility locations within the project right of way. Contact the TxDOT Odessa Traffic Operations shop at 432-498-4690 to investigate and determine the location of any TxDOT utility that may exist within the project right of way. Exercise caution when excavating in areas where investigations have determined that utilities exist. The contractor is responsible for maintaining utility markings.

No significant traffic generator events identified.

As an element of ensuring public safety and convenience under Article 7.2.4, the Contractor is hereby directed to open all closed lanes and shoulder and remove all traffic control devices from any areas where work is not being actively performed unless overnight traffic control is required and approved by the engineer. Removed devices must be stored outside of the clear zones near the right of way line or removed from the right of way line entirely.

At any time during construction that a previously installed crash cushion is damaged by the traveling public and is requested to be repaired by the Engineer, the repair will be paid at the same unit cost as the original installation.

Item 8: Prosecution and Progress

The following portions of the plans may affect the Contractor's planned construction sequencing. The Contractor’s attention is directed to the appropriate plan sheet or standard sheet.

-Traffic Control Plan

-Storm Water Pollution Prevention Plan

-Environmental Permit, Issues And Commitments (EPIC)

Maintain ingress and egress to side streets and private property at all times.

Initiate the installation of Item 628 “Electrical Services” as part of the initial work sequence to allow TxDOT the lead-time necessary for coordination with utility companies to establish and provide for electrical service(s) proposed for this project.

Working day charges will start 03/16/2023.

Start roadway work by 03/16/2023.

Working days will be computed and charged in accordance with Article 8. 3.1.4. “Standard Workweek.”

90 day lead time is needed to allow for sufficient time to obtain and produce materials needed for various bid items in this project.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Saw cut and remove existing asphaltic pavement by an approved method.

Item 150: Blading

Use blading to construct and remove side road turnouts, and other work as directed.

Item 216: Proof Rolling

Proof rolling will be required on rock embankments where density tests are not practical and at other locations as directed.

Item 247: Flexible Base

The estimated quantity of flexible base shown includes all roadways, intersecting streets and driveways. The measured area for payment will be the crown width only. The side slope tapers are not included in the measurements for the flexible base but are considered subsidiary to this item.

Maintain moisture during compaction as directed by the Engineer. Determine the moisture content of the material in accordance with Tex-115-E or Tex-103-E as directed by the Engineer.

Item 302: Aggregates for Surface Treatments

Flakiness index for aggregates will not be required on this project.

Coat aggregate with 1.0 percent by weight of residual bitumen.

Use an unmodified asphalt with a minimum performance grade of 64-16 (PG 64-16) or better for aggregate pre-coating.

Use a liquid asphalt anti-stripping agent of a type and at a rate approved by the Engineer. (d302)

Item 310: Prime Coat

MC-30 will have a minimum 72 hour curing time or as directed by the engineer.

Item 316: Seal Coat

Apply “2-CRS” surface treatment(s).

Furnish Class A aggregate for the surface course.

Furnish Class A aggregate for the non-surface course.

Do not apply asphalt cement between August 31st and May 1st unless authorized in writing.

Place a string line or other suitable marking where needed to assure smooth neat lines or as directed.

Surface treat the existing surfaced intersections, auxiliary lanes, curve widenings and widened dip sections plus any additional areas encountered during construction to conform to the existing surface. The limits are the greater of the end of the curb returns, the right of way line, or the adjacent traffic lane.

Rates are shown in the plans.

Perform rock land and shoot test strips for each day’s work at each location or as directed by the Engineer.

Provide the Engineer with this information prior to the seal coat application. Provide control that is acceptable to the Engineer for yield calculations.

Wet the stockpile of aggregate prior to use.

The use of a variable rate nozzle will be required on this project as determined by the engineer.

Contractor shall provide a list of stockpile locations prior to any material placed on the job site. Contractor shall have the Engineer and Odessa District Environmental Officer approve any and all stockpile locations prior to stockpiling of aggregate or other material. Stockpile locations will not be permitted on or adjacent to landscaped and non-mow areas.

As seal coat operations are completed at each location, clean and level all stockpile locations to the satisfaction of the Engineer.

Clean up paper, asphalt and excess rock after seal coat placement as each reference location is completed. Contractor shall not proceed ahead more than two reference locations before clean-up operations have been accomplished at the previous completed reference locations.

Contractor shall clean and remove asphalt from unauthorized concrete at the expense of the Contractor.

Item 400: Excavation and Backfill for Structures

Aggregate for cement stabilized backfill will be an approved material.

The addition of cement stabilized backfill under the pipe will not be required for this project. However, the Contractor will be required to shape the subgrade (trench bottom) to conform to a Class

C bedding in sand or loam. If rock or rock outcrops are encountered, a Class B bedding consisting of sand or chat material will be required under the pipe.

Item 416: Drilled Shaft Foundations

For drilled shaft foundations for roadway illumination assemblies, provide Class C concrete with 6-1/2" slump for dry type placements in accordance with Table 2, Slump Requirements.

Item 420: Concrete Structures

Mass concrete will be paid for by the quantity shown in the plans.

Item 421: Hydraulic Cement Concrete

Furnish a job site curing tank equipped with a recording thermometer with the capability to chart temperatures for 24 hours, 7 days and 30 days. Furnish the Engineer with copies of the temperature records.

Furnish disposable 4" or 6" cylinder molds and caps that meet testing tolerances.

The Engineer will provide strength testing equipment for acceptance testing.

Within seven (7) days after concrete has been placed for foundations for traffic signals, roadway illumination assemblies, or high mast illumination assemblies, provide a rub finish for exposed surfaces in accordance with Item 427, Surface Finishes for Concrete, Article 4.3.3.

Furnish Type II or IP cement.

Furnish Type II or IP cement for cast-in-place concrete.

All plants and trucks may be inspected and approved by the Engineer in lieu of the NRMCA or Non-Department Engineer Sealed Certifications. The criteria and frequency of the Engineer approval of plants and trucks is the same used for NRMCA Certification.

Item 427: Surface Finishes for Concrete

For Surface Area I, provide a rub finish with the exception of abutments.

Item 432: Riprap

Reinforce all riprap on this project with no. 3 bars spaced 12 inches O.C.B.W. or no. 4 bars spaced at 18 inches O.C.B.W.

Broom finish all riprap on this project unless otherwise directed.

Polypropylene fiber may not be used in lieu of reinforcing steel.

Item 464: Reinforced Concrete Pipe

At locations where existing culverts are cut, use Class A concrete to patch the areas at the joint between the new construction and the existing structure.

Item 467: Safety End Treatment

Provide shop drawings for pipe runners.

Item 502: Barricades, Signs, and Traffic Handling

Stop work immediately if any major traffic control element such as an advanced warning flashing panel or TMA or PCMS is not in good working order or control setup.

Maintain "No Center Line", "Do Not Pass" and "Pass With Care" signs until the permanent lane markings have been placed in accordance with plans.

Use Shoulder Drop-Off (CW8-9A) signs during construction when shoulder drop-off conditions are 3 inches or greater or as directed. Placement shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices".

This project has a regulatory work zone speed reduction within the project limits. The work zone speed limit is reduced from 75 mph to 60 mph. Placement of speed reduction zone signs shall comply with BC (3)-21. Speed resumption sign(s) is required at the end of a speed reduction zone.

This project has an advisory work zone speed plaque of 60 mph to be placed on the xxxxxxx warning sign. This advisory plaque will be used to supplement the warning sign and to indicate speed for the condition indicated. The warning sign and advisory speed plaque will be removed by the State once the condition or need for the sign no longer exists.

Place chevrons, at a minimum, on every other drum used for outsides of curves, merging tapers and shifting tapers.

Vertical panels shall be self-righting.

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.

When construction operations result in a drop-off of more than 2 inches, a 3:1 or flatter slope will be required. The slope must be constructed with a compacted material capable of supporting vehicles as approved by the Engineer. This work shall be done expeditiously during daylight hours. Flaggers and appropriate signing to safely guide traffic through the work area will be required as directed by the Engineer. This shall be considered subsidiary to Item 502.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

In accordance with the Construction General Permit (CGP), erosion control and stabilization measures should be initiated as soon as practicable to include (list what our stabilization measures are – for example, replacing topsoil from windrow, erosion control blankets, seeding, etc.)

-Biodegradable Erosion Control Logs

-Construction Exits

The total disturbed area for this project is 45.38 Acres. The disturbed area in this project, all project locations in the contract, and Contractor Project Specific Locations (PSLS), within 1 mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges. The department will obtain an authorization to discharge storm water from the Texas Commission On Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain any required authorization from the TCEQ for any Contractor PSLS for construction support activities on or off the right of way. When the total area disturbed for all projects 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 right of way, to the Engineer (or to the appropriate MS4 operator when on an off-state system route).

Upon acceptance of the project, all SW3P devices will become property of the State and maintenance responsibility is transferred to the State until final stabilization is attained.

When applying cement for emulsion, asphalt treatment, or any other soil stabilization, sprinkle water as needed to control cement from blowing and contaminating adjacent vegetation and waters.

Provide a minimum of two SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice (TxDOT) and Contractor's copy of the Construction Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" plywood sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

After construction, restore the adjacent surface to a condition approved by the Engineer. Consider this work subsidiary to this bid item.

Item 530: Intersections, Driveways, and Turnouts

Reinforce concrete driveways with no. 3 bars spaced at 12" O.C.B.W. or with #4 bars spaced at 18" O.C.B.W.

Surface treat turnouts before the roadway is treated with the second one course surface treatment.

Polypropylene fiber may not be used in lieu of reinforcing steel.

Item 585: Ride Quality for Pavement Surfaces

Use surface test Type B pay adjustment schedule 2 to evaluate ride quality of the travel lanes in accordance with Item 585, "Ride Quality for Pavement Surfaces."

Item 610: Roadway Illumination Assemblies

Changes in the locations of poles, conduit, pull boxes, or other items as shown on the plans may be made in those instances deemed necessary, or when requested by the Contractor and approved.

Item 618: Conduit

Place a single continuous piece of warning tape in accordance with this item along the entire length of each underground conduit installation. Locate warning tape approximately twelve inches above conduit as indication that a buried electrical line exists below the tape. Cement stabilized backfilled conduit is exempt from this requirement. Comply with warning tape requirements for any installation of buried conduit, including portions of conduit located outside of cement stabilized backfill.

When trenched conduit is proposed beneath roadways under construction, install conduit after grading operations have been completed and before any surfacing begins at that location.

When shown on the plans as bored conduit, install conduit by an approved directional boring method.

Maintain a minimum 24" depth from finish grade to top of conduit for conduit proposed beneath pavement.

Use an approved ditching method. Place and backfill conduit proposed beneath existing pavement in accordance with the section shown in the plans. Schedule and complete work so that all lanes open to traffic at night.

Item 620: Electrical Conductors

Note the requirements of Item 7, Article 18. Electrical Requirements, of the standard specifications.

Do not exceed four hundred and fifty feet (450') between ground boxes where conduit and conductor is used.

Item 622: Duct Cable

Place a single continuous piece of warning tape in accordance with Item 618, "Conduit", along the entire length of each underground duct cable installation. Locate warning tape approximately twelve inches above the duct as indication that a buried electrical line exists below the tape.

For conductors in duct cable, provide one (1) black XHHW insulated conductor, and one (1) red XHHW insulated conductor for ungrounded conductors, and provide one (1) green XHHW or bare conductor for the grounding conductor. Do not use red tape to color code a black insulated conductor. Unless otherwise approved, use full jacket color coding of conductor insulation.

Item 628: Electrical Services

Initiate and complete the construction of all electrical services at the earliest possible time to facilitate lead-time required to coordinate with utility companies and establish power for the proposed electrical service(s.)

Before construction or installation of any electrical service(s) on this project, contact TxDOT Odessa Traffic Operations shop at 432-498-4690 to facilitate coordination with the appropriate energy company or companies.

Physically identify the location for each proposed electrical service on the project, and request the physical address for each proposed electrical service identified; the Engineer will provide the physical address for each respective location. Permanently mark the physical address of any proposed electrical service on the respective meter base lid. Use one of two methods for permanent marking. For the preferred method of marking, use an approved die-stamp, with a minimum ½" height of alpha-numeric characters and stamp physical address on meter base lid. After stamping, apply coating of zinc-rich paint to the stamped area. Do not damage meter base. Replace meter base if determined by the Engineer as damaged or unacceptable. No additional compensation will be made for replacement of meter bases in the event an unacceptable determination is made. When approved, use an alternate method of marking by providing a brass or aluminum plate tag with the physical address embossed by a machine-stamp process. Affix this tag to the meter base by a method approved by the Engineer. Provide a sample of a stamped plate tag for approval of this alternate method. The permanent physical address is required to be marked on the meter base prior to initiation of electrical service. Materials, labor, tools, equipment and incidentals necessary to complete this work will be considered as subsidiary to Item 628, "Electrical Services".

Use materials from the Prequalified Material Producer Lists as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) Material Producer List. See TxDOT website (www.TxDOT.gov) - business > resources > material producer list - for list of prequalified manufacturers. Category is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list."

For incidental material and parts necessary for construction of electrical services, including the service entrance weather-head, rigid metal conduit (RMC) and PVC conduit, conduit fittings, service conductors, circuit breakers, ground rods and clamps, grounding bushing(s), and mounting hardware including straps and channel brackets for conduit support, furnish products and/or materials that comply with the plans and specifications. Prior to construction of any electrical service, submit to the Engineer respective catalog cut sheets for incidental materials and parts. Electrical services constructed of materials or parts which do not comply with the plans and specifications will be cause for rejection of a portion or all of the work.

Install photocell(s) facing north when practical.

Item 644: Small Roadside Sign Assemblies

All new sign supports for stop and yield signs will have a 12" red strip of Type C High Specific Intensity Reflective tape. Place the top of the tape 4' above the edge of the roadway. This work will not be paid for directly and will be subsidiary to the pertinent bid item.

For standard small sign details and dimensions, refer to the "Standard Highway Sign Designs for Texas (SHSD)"; a supplement to the Texas Manual on Uniform Traffic Control Devices (TMUTCD)".

Locate and mark existing reference marker(s) perpendicular to the road and along the right of way, or as directed, prior to removal. Erect new reference marker(s) at the original location, upon completion of construction.

Only bolt clamp style slip bases will be allowed for sign assemblies. Set screws will not be allowed.

Item 656: Foundations for Traffic Control Devices

Install a 5/8" x 8' copper clad ground rod in all signal poles and signal controller foundations, and make a system ground connection at the ground rod in addition to the ground connection required by the standard sheet, "Traffic Signal Controller Slab And Base". Maintain two inches (2") of ground rod extension above the finish surface of the foundation. Material, labor, tools, and incidentals necessary to provide and install this ground rod are considered subsidiary to the various bid items**.**

Item 658: Delineator and Object Marker Assemblies

Delineator and object marker assembly posts shall be composed of post-consumer recycled materials. Embedded stub shall be perforated square tubing.

Item 662: Work Zone Pavement Markings

After permanent pavement markings are placed, pull tabs from hot mix surface and/or cut off tabs flush with the pavement on seal coat surface. Remove tabs from the project and dispose of properly.

Materials used for non-removable work zone pavement markings will be paint and beads or other approved materials.

Item 666 Retroreflectorized Pavement Markings

Type I markings shall meet the minimum retroreflectivity values defined by Article 4.4 Retroreflectivity Requirements.

This Contract totals more than 200,000 feet of pavement markings; use a mobile retroreflectometer for retroreflectivity measurements. Portable retroreflectometers may not be used for this Contract.

Place Type I pavement markings with a ribbon-gun application.

Measure thickness for markings in accordance with Tex-854-B using usage rates (Part II).

Item 685: Roadside Flashing Beacon Assemblies

Provide a minimum of 7 feet from the roadway surface to the bottom of the flashing signal head.

Item 3077: Superpave Mixtures

Binder:

Provide a binder that has a Performance Grade of SAC-B (PG 70 -22) for the SP-C mix.

Aggregate quality:

Furnish Class A aggregate for the Type SP-C mix. Blending of SAC A and SAC B material will not be allowed for coarse aggregates.

Furnish aggregates for the shoulders and/or ramps that meet project SAC requirements.

Magnesium sulfate soundness loss will not be greater than 20 percent when Class A aggregate is required.

Mixture design:

Design a mixture with a gradation that has stone on stone contact and passes below the reference zone.

Placement:

Semi-trailer type vehicles are prohibited from dumping directly into the finishing machine for the finished surface unless the trailer is equipped with an auger slatted chain or another approved conveyor.

No RAP will be allowed in the surface course.

No more than 10% RAP will be allowed in non-surface courses.

No RAS will be allowed.

Mineral filler will not be allowed.

Lime will not be allowed as an anti-stripping agent.

Field sand will not be allowed.

Item 3080: Stone-Matrix Asphalt

Binder:

Provide a binder that has a Performance Grade of SAC-A (PG 70 -22) for the SMAR-F mix.

Furnish Type I asphalt-rubber binder containing Grade C rubber.

Aggregate quality:

Provide Class A aggregate. Blending of SAC A and SAC B material will not be allowed for the coarse and intermediate aggregate.

Magnesium sulfate soundness loss will not be greater than 20 percent when Class A aggregate is required.

Mixture design:

Test method Tex-530-C (Boil Test) will not be required.

Placement:

Semi-trailer type vehicles are prohibited from dumping directly into the finishing machine for the finished surface unless the trailer is equipped with an auger slatted chain or another approved conveyor.

No RAP will be allowed in the surface course.

No RAS will be allowed.

Mineral filler will not be allowed.

Lime will not be allowed as an anti-stripping agent.

Field sand will not be allowed.

Item 6001: Portable Changeable Message Sign

PCMS shall be placed in operation a minimum of one (1) week prior to construction. Location(s) and duration for PCMS shall be as directed by the Engineer;

Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

General Note 7 of TCP (1-3)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as "required" plus the 'additional shadow vehicle' is the quantity that has been estimated for this operation.

General Note 5 of TCP (2-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as "required" plus the 'additional shadow vehicle' is the quantity that has been estimated for this operation.

General Note 8 of TCP (2-3)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as

"required" plus the 'additional shadow vehicle' is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (5-1)-18; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-1)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-2)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-3)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-4)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-5)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-6)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-7)-12; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-8)-14; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (6-9)-14; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

Basis of Estimate For Stationary TMAs				
Standard	Description	TMA (Stationary)		
		Required	Optional	Total
TCP 1-3a	TCP - Traffic Shifts On Two Lane Roads - Adequate View	1 EA	1 EA	2 EA
TCP 1-3b	TCP - Traffic Shifts On Two Lane Roads - Inadequate View	2 EA	2 EA	4 EA
TCP 2-1	TCP - Conventional Road Shoulder Work	1EA	1 EA	2 EA
TCP 2-3a	TCP - Traffic Shifts On Two Lane Roads - Adequate View	1 EA	1 EA	2 EA
TCP 2-3b	TCP - Traffci Shifts On Two Lane Roads - Inadequate View	2 EA	2 EA	2 EA

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-4)-13; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-5)-15; the shadow vehicle(s) with TMA specified on the traffic control plan as "required" is the quantity that has been estimated for this operation.

Basis of Estimate For Mobile Operation TMAs				
Standard	Description	TMA (Mobile Operation)		
		Required	Optional	Total
TCP 3-1	TCP - Mobile Operations - Undivided Highways	2 EA	0 EA	2 EA
TCP 3-3	TCP- Mobile Operation - 2 Lane Highway With Shoulders	2 EA	0 EA	2 EA

The Contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2906-01-006 **DISTRICT** Odessa **COUNTY** Midland, Upton
HIGHWAY RM 1492

				CONTROL SECTION JOB	2906-01-006		2906-02-007		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00128940		A00128942			
				COUNTY	Midland		Upton			
				HIGHWAY	RM 1492		RM 1492			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	104-6010	REMOVING CONC (RIPRAP)	CY				3.330		3.330	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY		276.000		348.000		624.000	
	112-6004	SUBGRADE WIDENING (ORD COMP)	SY		11,769.000		197,412.000		209,181.000	
	134-6002	BACKFILL (TY B)	STA		56.000		893.000		949.000	
	150-6002	BLADING	HR				80.000		80.000	
	216-6001	PROOF ROLLING	HR				80.000		80.000	
	247-6064	FL BS (CMP IN PLC)(TY A GR 4) (6")	SY				2,769.000		2,769.000	
	247-6242	FL BS (CMP IN PLACE)(TY A GR 4)(9")	SY		11,769.000		197,412.000		209,181.000	
	310-6009	PRIME COAT (MC-30)	GAL		2,355.000		39,484.000		41,839.000	
	315-6004	FOG SEAL (CSS-1H)	GAL		1,096.000		17,818.000		18,914.000	
	316-6017	ASPH (AC-20-5TR)	GAL		7,063.000		118,448.000		125,511.000	
	316-6126	AGGR(TY-PB GR-4 SAC-A)	CY		197.000		3,291.000		3,488.000	
	400-6005	CEM STABIL BKFL	CY		12.000		138.000		150.000	
	460-6010	CMP AR (GAL STL DES 3)	LF				87.000		87.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF		48.000		180.000		228.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF				88.000		88.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF				90.000		90.000	
	467-6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA		4.000		16.000		20.000	
	467-6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	EA				8.000		8.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA				4.000		4.000	
	467-6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	EA				4.000		4.000	
	467-6536	SET (TY II) (DES 3) (CMP) (6: 1) (C)	EA				8.000		8.000	
	496-6004	REMOV STR (SET)	EA		4.000		40.000		44.000	
	496-6007	REMOV STR (PIPE)	LF		16.000		115.000		131.000	
	500-6001	MOBILIZATION	LS		1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO		20.000				20.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF				1,200.000		1,200.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF				1,200.000		1,200.000	
	530-6004	DRIVEWAYS (CONC)	SY		232.000		216.000		448.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF		5,124.000		89,035.000		94,159.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF		5,124.000		89,035.000		94,159.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF		20.000				20.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA		1.000				1.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF		16.000				16.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA		2.000		11.000		13.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA		4.000		14.000		18.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA		6.000		25.000		31.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2906-01-006 **DISTRICT** Odessa **COUNTY** Midland, Upton
HIGHWAY RM 1492

									TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**2906-01-006**		**2906-02-007**				
		PROJECT ID		**A00128940**		**A00128942**				
		COUNTY		**Midland**		**Upton**				
		HIGHWAY		**RM 1492**		**RM 1492**				
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL			
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2.000		28.000			30.000	
	658-6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2.000		28.000			30.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	12,417.000		178,113.000			190,530.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	12,417.000		178,113.000			190,530.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	1,863.000		26,718.000			28,581.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	10,248.000		178,070.000			188,318.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	4,649.000		87,972.000			92,621.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2,965.000		8,098.000			11,063.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF			22.000			22.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	110.000		1,206.000			1,316.000	
	685-6005	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)	EA	1.000					1.000	
	690-6006	REMOVAL OF GROUND BOXES	EA	1.000					1.000	
	690-6009	REMOVAL OF CABLES	LF	20.000					20.000	
	3077-6023	SP MIXESSP-CSAC-B PG70-22	TON			369.000			369.000	
	3080-6021	STONE-MTRX-ASPH SMAR-F SAC-A	TON	2,941.000		47,902.000			50,843.000	
	3084-6001	BONDING COURSE	GAL	2,674.000		43,547.000			46,221.000	
	6185-6002	TMA (STATIONARY)	DAY			276.000			276.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY			10.000			10.000	
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000					1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000					1.000	

TYPICAL SECTION	BEGIN STA.	END STA.	LENGTH	BEGIN WIDTH	END WIDTH	BEGIN WIDENING WIDTH	END WIDENING WIDTH	AREA - LENGTH X AVG WIDTH	WIDENING AREA - LENGTH X AVG WIDTH	ROADWAY SUMMARY								
										0104 6017	0112 6004	0134 6002	0150 6002	0216 6001	0247 6064	0247 6242	0310 6009	0315 6004
										REMOVING CONC (DRIVEWAYS)	SUBGRADE WIDENING (ORD COMP)	BACKFILL (TY B)	BLADING	PROOF ROLLING	FL BS (CMP IN PLC)(TY A GR 4) (6")	FL BS (CMP IN PLACE)(TY A GR 4)(9")	PRIME COAT (MC-30)	FOG SEAL (CSS-1H)
										SY	SY	STA	HR	HR	SY	SY	GAL 0.2 GAL/SY	GAL 0.3 GAL/SY 2 FT
			FT	FT	FT	FT	FT	SY	SY									
2906-01-006																		
FULL WIDTH (2906-01-006	09+32.00	12+75.00	343	44	44	0	20	1,677	382		382	4			0	382	77	70
FULL WIDTH (2906-01-006	12+75.00	63+98.88	5,124	44	44	20	20	25,051	11,387		11,387	52			0	11,387	2,278	1,026
20906-02-007																		
FULL WIDTH (2906-02-007	00+00.00	864+00.00	86,400	44	44	20	20	422,400	192,000		192,000	864			0	192,000	38,400	17,280
FULL WIDTH (2906-02-007	864+00.00	872+00.00	800	44	44	20	20	3,912	1,778		1,778	8	80	80	0	1,778	356	161
FULL WIDTH (2906-02-007	872+00.00	887+10.00	1,510	44	44	20	20	7,383	3,356		3,356	16			0	3,356	672	303
FULL WIDTH (2906-02-007	887+10.00	889+60.00	250	44	44	20	0	1,223	278		278	3			0	278	56	51
FULL WIDTH (2906-02-007	889+60.00	890+68.28	108	44	44	0	0	530	0		0	2			0	0	0	23
							DRIVEWAYS	1,474		624	0	0			1,474	0	0	0
							TURNOUTS	1,295			0	0			1,295	0	0	0
							PROJECT TOTAL	462,176	209,181	624	209,181	949	80	80	2,769	209,181	41,839	18,914

TYPICAL SECTION	BEGIN STA.	END STA.	LENGTH	BEGIN WIDTH	END WIDTH	BEGIN WIDENING WIDTH	END WIDENING WIDTH	AREA - LENGTH X AVG WIDTH	WIDENING AREA - LENGTH X AVG WIDTH	ROADWAY SUMMARY					
										0316 6017	0316 6126	0344 6048	0346 6040	0530 6004	3084 6001
										ASPH (AC-20-5TR)	AGGR(TY-PB GR-4 SAC-A)	SUPERPAVE MIXTURES SP-C SAC-B PG70-22	STONE-MTRX-ASPH SMAR-F SAC-A	DRIVEWAYS (CONC)	BONDING COURSE
										GAL	CY	TON	TON	SY	GAL
										0.3 GAL/SY	120 SY/CY	110 LBS/SY/IN 4.0 IN	110 LBS/SY/IN 2.0 IN		0.1 GAL/SY
			FT	FT	FT	FT	FT	SY	SY						
2906-01-006															
FULL WIDTH (2906-01-006	09+32.00	12+75.00	343	44	44	0	20	1,677	382	230	7	0	185	232	168
FULL WIDTH (2906-01-006	12+75.00	63+98.88	5,124	44	44	20	20	25,051	11,387	6,833	190	0	2,756		2,506
20906-02-007															
FULL WIDTH (2906-02-007	00+00.00	864+00.00	86,400	44	44	20	20	422,400	192,000	115,200	3,200	0	46,464	216	42,240
FULL WIDTH (2906-02-007	864+00.00	872+00.00	800	44	44	20	20	3,912	1,778	1,067	30	0	431		392
FULL WIDTH (2906-02-007	872+00.00	887+10.00	1,510	44	44	20	20	7,383	3,356	2,014	56	0	813		739
FULL WIDTH (2906-02-007	887+10.00	889+60.00	250	44	44	20	0	1,223	278	167	5	0	135		123
FULL WIDTH (2906-02-007	889+60.00	890+68.28	108	44	44	0	0	530	0	0	0	0	59		53
							DRIVEWAYS	1,474		0	0	226	0	448	0
							TURNOUTS	1,295		0	0	143	0	0	0
							PROJECT TOTAL	462,176	209,181	125,511	3,488	369	50,843	448	46,221

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Saul Romero, PE 10/10/2022
88BF61DF326A480...

CONSOLIDATED SUMMARY

SHEET 1 OF 3

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			8
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

	CULVERT ITEMS														
	0104 6010	0400 6005	0460 6010	0464 6005	0464 6007	0464 6008	0467 6394	0467 6422	0467 6450	0467 6453	0467 6536	0496 6004	0496 6007	0658 6060	0658 6086
	REMOVING CONC (RIPRAP)	CEM STABIL BKFL	CMP AR (GAL STL DES 3)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	SET (TY II) (24 IN) (RCP) (6: 1) (C)	SET (TY II) (30 IN) (RCP) (6: 1) (C)	SET (TY II) (36 IN) (RCP) (4: 1) (C)	SET (TY II) (36 IN) (RCP) (6: 1) (C)	SET (TY II) (DES 3) (CMP) (6: 1) (C)	REMOV STR (SET)	REMOV STR (PIPE)	REMOVE DELIN & OBJECT MARKER ASSMS	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND
FM 1492	CY	CY	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	LF	EA	EA
CSJ 2906-01-006															
CULVERT NO. 1		12		48			4					4	16	2	2
CSJ 2906-02-007															
CULVERT NO. 2		8		24			2					2	5	2	2
CULVERT NO. 3		11		42			4					4	5	2	2
CULVERT NO. 4		5	22								2	2	5	2	2
CULVERT NO. 5		5	20								2	2	6	2	2
CULVERT NO. 6		5	22								2	2	6	2	2
CULVERT NO. 7		7		21			2					2	6	2	2
CULVERT NO. 8		8		23			2					2	7	2	2
CULVERT NO. 9		5	23								2	2	4	2	2
CULVERT NO. 10		8		23			2					2	6	2	2
CULVERT NO. 11		8		24			2					2	6	2	2
CULVERT NO. 12	3.33	17				42			2	2		4	12	2	2
CULVERT NO. 13		8		23			2					2	5	2	2
CULVERT NO. 14		19				48			2	2		4	14	2	2
CULVERT NO. 15		24			88			8				8	28	2	2
TOTAL	3.33	150	87	228	88	90	20	8	4	4	8	44	131	30	30

		TRAFFIC ITEMS													
		0533 6001	0533 6002	0618 6023	0624 6002	0636 6001	0644 6001	0644 6044	0644 6079	0666 6303	0666 6312	0666 6315	0668 6076	0672 6009	0685 6005
		RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	CONDT (PVC) (SCH 40) (2")	GROUND BOX TY A (122311)W/A PRON	ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TY10BWG(1)SA (P)	IN SM RD SN SUP&AM TY10BWG(1)SA (T)	REMOVE SM RD SN SUP & AM	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	PREFAB PAV MRK TY C (W)(24")(SLD)	REFL PAV MRKR TY II-A-A	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)
		LF	LF	LF	EA	SF	EA	EA	EA	LF	LF	LF	LF	EA	EA
CSJ 2906-01-006, ETC.															
FM 1492	PAVEMENT MARKINGS	94,159	94,159	20	1	16	13	18	31	188,318	92,621	11,063	22	1,316	1
	PROJECT TOTAL	94,159	94,159	20	1	16	13	18	31	188,318	92,621	11,063	22	1,316	1

		TRAFFIC ITEMS	
		0690 6006	0690 6009
		REMOVAL OF GROUND BOXES	REMOVAL OF CABLES
		EA	LF
CSJ 2906-01-006, ETC.			
FM 1492	PAVEMENT MARKINGS	1	20
	PROJECT TOTAL	1	20

TRAFFIC CONTROL ITEMS								
				0662 6004	0662 6034	0662 6111	6185 6002	6185 6005
				WK ZN PAV MRK NON-REMOV (W)4"(SLD)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	FROM STA.	TO STA.	LENGTH	LF	LF	EA	DAY	DAY
CSJ 2906-01-006								
RM 1492 PHASE 2B	01+90.60	63+98.88	6,208		6,208	621		
RM 1492 PHASE 2C	01+90.60	63+98.88	6,208		6,208	621		
RM 1492 PHASE 3	01+90.60	63+98.88	6,208	12,417	0	621		
CSJ 2906-02-007								
FM 1492 PHASE 2B	00+00.00	890+56.40	89,056		89,056	8,906		
FM 1492 PHASE 2C	00+00.00	890+56.40	89,056		89,056	8,906		
RM 1492 PHASE 3	00+00.00	890+56.40	89,056	178,113	0	8,906		
TMA TOTAL							276	10
TOTAL				190,529	190,530	28,581	276	10

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Saul Romero, PE
88BF61DE326A480...
10/10/2022

CONSOLIDATED SUMMARY

SHEET 2 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			9
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

SWP3 ITEMS		
	0506 6042	0506 6043
	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)
PLAN SHEET NO.	LF	LF
SWP3 PLAN SHEET 1	80	80
SWP3 PLAN SHEET 5	80	80
SWP3 PLAN SHEET 7	80	80
SWP3 PLAN SHEETS 8&9	80	80
SWP3 PLAN SHEET 11	80	80
SWP3 PLAN SHEET 14	80	80
SWP3 PLAN SHEET 17	80	80
SWP3 PLAN SHEET 18	80	80
SWP3 PLAN SHEET 19	80	80
SWP3 PLAN SHEET 29	80	80
SWP3 PLAN SHEET 31	80	80
SWP3 PLAN SHEET 33	80	80
SWP3 PLAN SHEET 35	80	80
SWP3 PLAN SHEET 38	80	80
SWP3 PLAN SHEET 39	80	80
TOTAL PROJECT	1,200	1,200

RSFB SUMMARY					
			RSFB1		
ITEM	DESCRIPTION	UNIT	SR1	SR2	TOTAL
0618 6023	CONDT (PVC) (SCH 40) (2")	LF	10	10	20
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	1		1
0636 6001	ALUMINUM SIGNS (TY A)	SF	12		12
0685 6005	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)	EA	1		1
0690 6006	REMOVAL OF GROUND BOXES	EA	1		1
0690 6009	REMOVAL OF CABLES	LF	10	10	20

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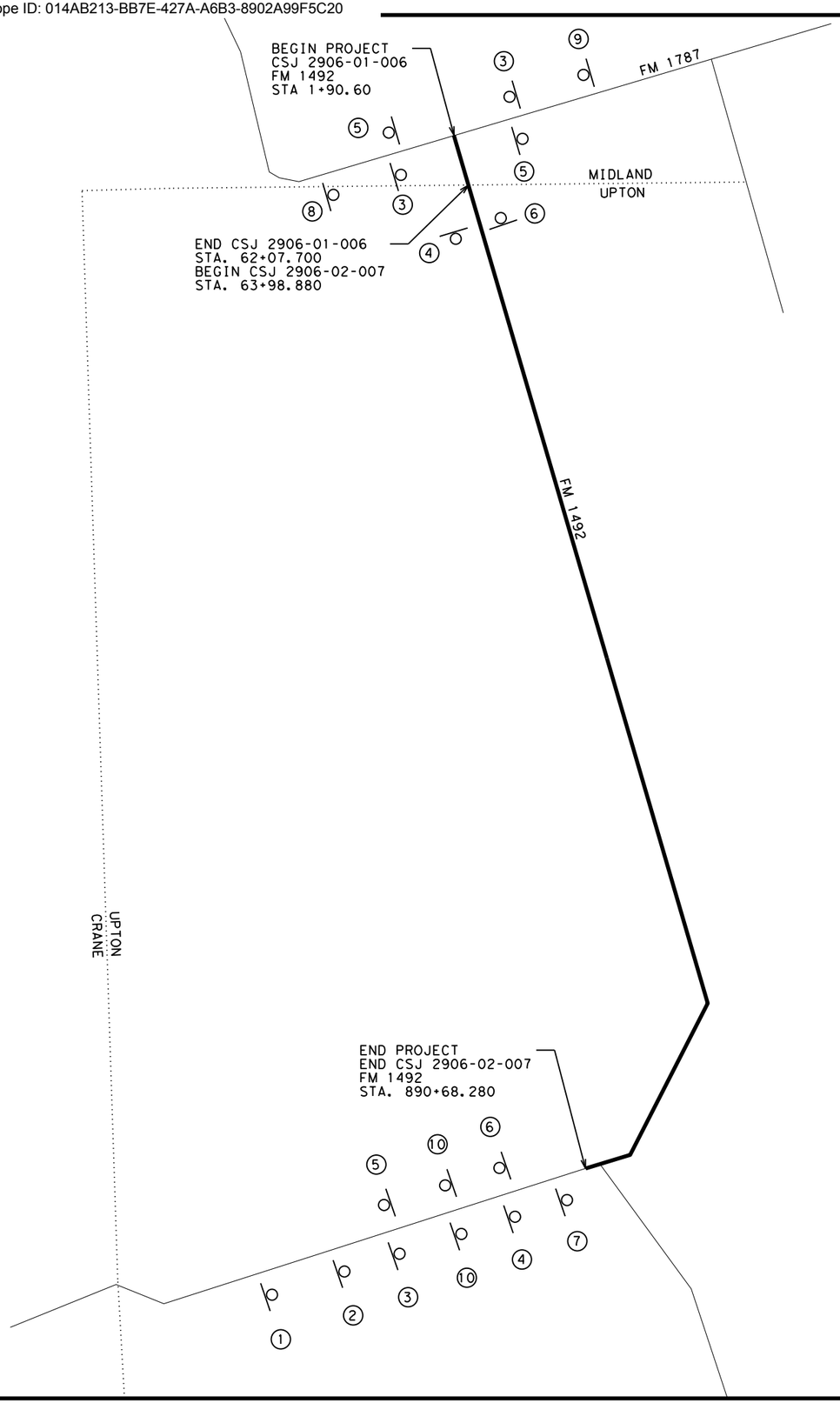
CONSOLIDATED SUMMARY

SHEET 3 OF 3

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			10
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



①	OBEY WARNING SIGNS STATE LAW	R20-3T 48" X 42"
②	STAY ALERT / TALK OR TEXT LATER	G20-10T 60" X 48"
③	BEGIN WORK ZONE	G20-9TP 36" X 30"
	TRAFFIC FINES DOUBLE	R20-5T 36" X 36"
	WHEN WORKERS ARE PRESENT	R20-5aTP 36" X 18"
④	BEGIN ROAD WORK NEXT 18 MILES	G20-5T 60" X 30"
	NAME ADDRESS CITY STATE / CONTRACTOR	G20-6 60" X 42"
⑤	END WORK ZONE	G20-2bT 48" X 24"
⑥	END ROAD WORK	G20-2 48" X 24"
⑦	ROAD WORK AHEAD	CW20-1D 48" X 48"
⑧	ROAD WORK NEXT 18 MILES ⇨	G20-1bR 72" X 24"
⑨	ROAD WORK ⇦ NEXT 18 MILES	G20-1bL 72" X 24"
⑩	SPEED LIMIT 60	R2-1 36" X 48"

LEGEND

SIGN

WORK AREA

NOTES:
1. REFER TO BC(3)-21 FOR WORK ZONE SPEED REDUCTION SIGN PLACEMENT.
2. SEE BC'S FOR WARNING SIGN SIZE AND SPACING CHART.

STATE OF TEXAS
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88BF61DF326A480...

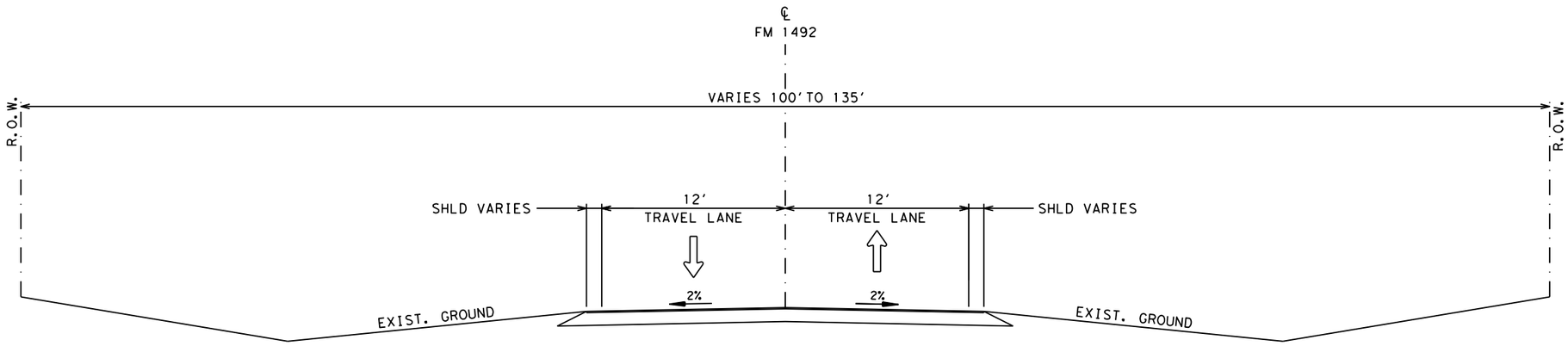
ADVANCED WARNING SIGNS

RM 1492

Texas Department of Transportation®

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			11
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PHASE 1



FROM STA. 1+90.60 TO STA. 63+98.88 (CSJ 2906-01-006 AND FROM STA. 0+00.00 TO STA. 890+56.40 (CSJ 2906-02-007)
1. INSTALL TRAFFIC CONTROL ADVANCE PROJECT WARNING SIGNS.
2. PLACE EROSION CONTROL LOGS IN ACCORDANCE WITH SWP3 SITE PLAN.
3. EXTEND EXISTING CULVERTS AS SHOWN ON PLANS AND INSTALL SAFETY END TREATMENTS.
   -REFER TO TCP(2-1)-12 DURING CULVERT EXTENSIONS.

LEGEND

- TREATED EDGE CONDITION TO BE PLACED AS DIRECTED BY THE ENGINEER
- TRAFFIC FLOW DIRECTION
- TWO-WAY TRAFFIC FLOW
- 42" TWO-PIECE CONES

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

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88BF61DF326A480...
10/10/2022

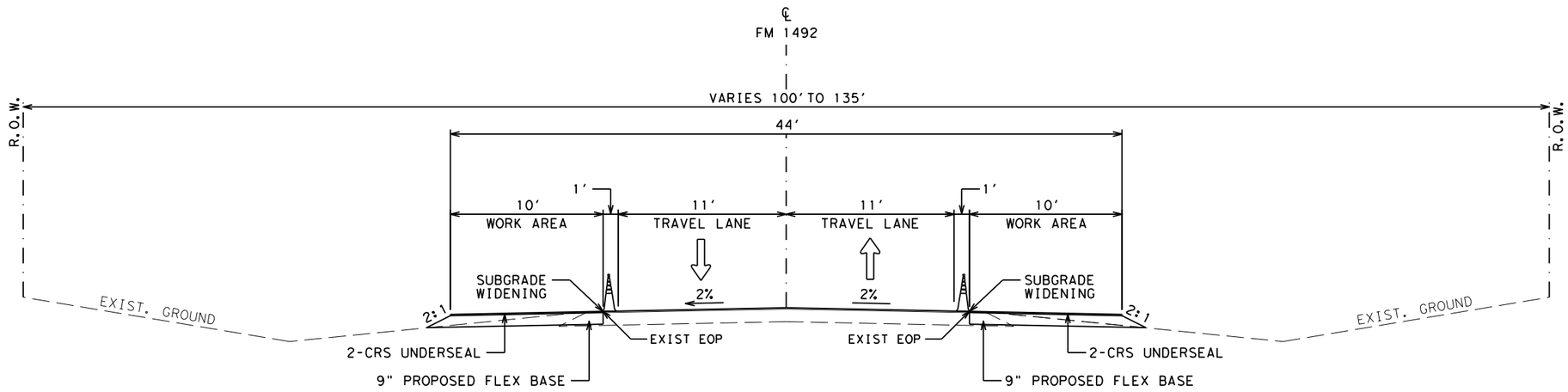
PHASE NARRATIVE

SHEET 1 OF 5

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			12
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PHASE 2A



LIMIT CONSTRUCTION PHASE 2 TO 4 MILE SECTIONS AND AS DIRECTED BY THE ENGINEER.
FROM STA. 1+90.60 TO STA. 63+98.88 (CSJ 2906-01-006) AND FROM STA. 0+00 TO STA. 890+56.40 (CSJ 2906-02-007).
1. PLACE WORK ZONE PAVEMENT MARKINGS AND INSTALL TRAFFIC CONTROL DEVICES AS APPROVED BY ENGINEER.
2. CONSTRUCT PROPOSED WIDEN SECTION:
   -SUBGRADE WIDEN FROM EXIST. EDGE OF PAVEMENT AS SHOWN ON PLANS AND IN ACCORDANCE WITH TYPICAL SECTIONS.
   -PLACE 9" FLEX BASE (CMP IN PLC) AS SHOWN ON PLANS AND IN ACCORDANCE WITH TYPICAL SECTIONS.
   -PLACE 2-CST AS SHOWN ON PLANS.

LEGEND

- TREATED EDGE CONDITION TO BE PLACED AS DIRECTED BY THE ENGINEER
- TRAFFIC FLOW DIRECTION
- TWO-WAY TRAFFIC FLOW
- 42" TWO-PIECE CONES

STATE OF TEXAS
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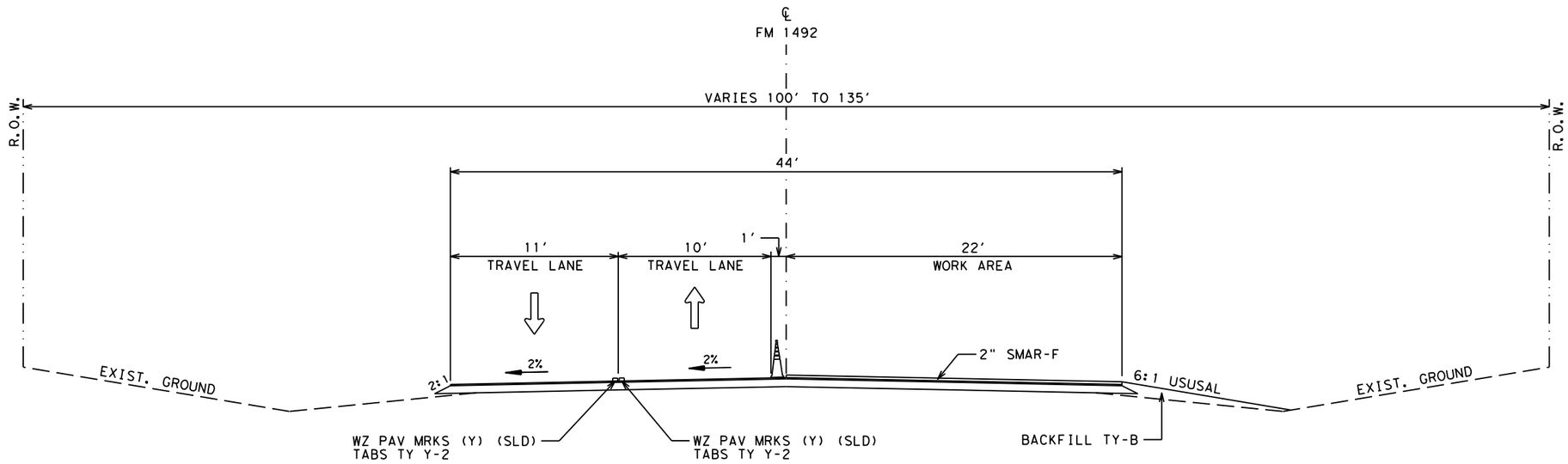
PHASE NARRATIVE

SHEET 2 OF 5

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			13
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PHASE 2B



LIMIT CONSTRUCTION PHASE 2 TO 4 MILE SECTIONS AND AS DIRECTED BY THE ENGINEER.
FROM STA. 1+90.60 TO STA. 63+98.88 (CSJ 2906-01-006) AND FROM STA. 0+00 TO STA. 890+56.40 (CSJ 2906-02-007).

1. PLACE WORK ZONE PAVEMENT MARKINGS AND INSTALL TRAFFIC CONTROL DEVICES AS APPROVED BY ENGINEER.
2. MOVE TRAFFIC AS SHOWN ON PLANS AND AS APPROVED BY ENGINEER.
2. PLACE OVERLAY:
   -PLACE BONDING COURSE IN ACCORDANCE TO THE PLANS AND TYPICAL SECTIONS.
   -PLACE 2" SMAR-F AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH TYPICAL SECTIONS.
   -PLACE BACKFILL TY-B IN ACCORDANCE WITH TYPICAL SECTIONS.

LEGEND

- TREATED EDGE CONDITION TO BE PLACED AS DIRECTED BY THE ENGINEER
- TRAFFIC FLOW DIRECTION
- TWO-WAY TRAFFIC FLOW
- 42" TWO-PIECE CONES

STATE OF TEXAS
SAUL ROMERO
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88BF61DF326A480...
10/10/2022

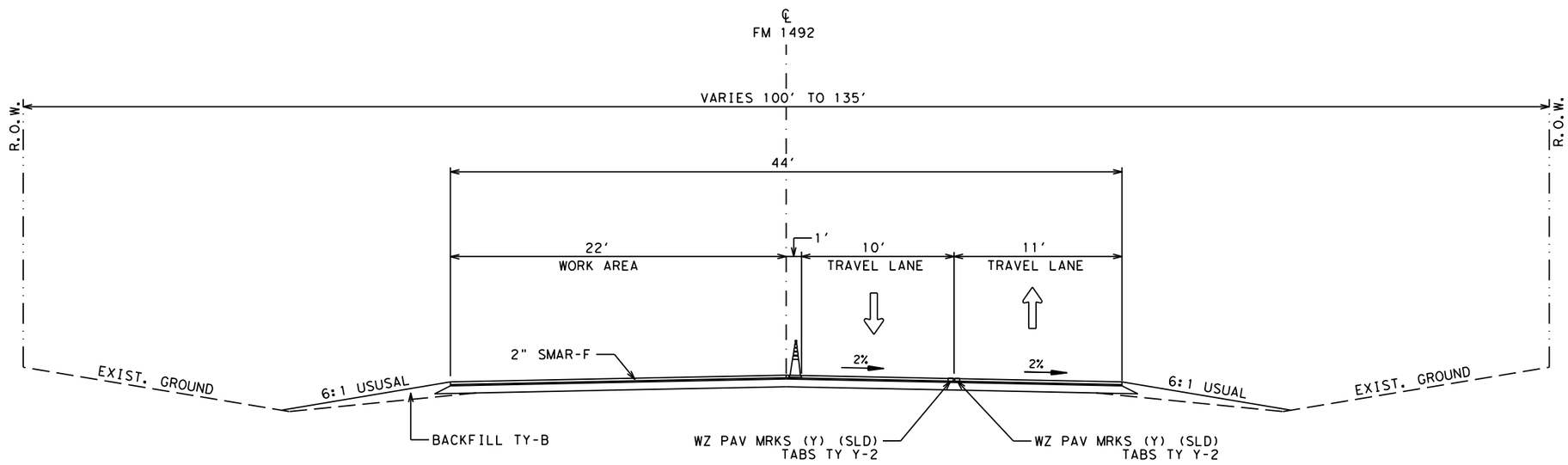
PHASE NARRATIVE

SHEET 3 OF 5

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			14
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PHASE 2C



LIMIT CONSTRUCTION PHASE 2 TO 4 MILE SECTIONS AND AS DIRECTED BY THE ENGINEER.
FROM STA. 1+90.60 TO STA. 63+98.88 (CSJ 2906-01-006) AND FROM STA. 0+00 TO STA. 890+56.40 (CSJ 2906-02-007).
1. PLACE WORK ZONE PAVEMENT MARKINGS AND INSTALL TRAFFIC CONTROL DEVICES AS APPROVED BY ENGINEER.
2. MOVE TRAFFIC AS SHOWN ON PLANS AND AS APPROVED BY ENGINEER.
2. PLACE OVERLAY:
   -PLACE BONDING COURSE IN ACCORDANCE TO THE PLANS AND TYPICAL SECTIONS.
   -PLACE 2" SMAR-F AS SHOWN ON THE PLANS AND IN ACCORDANCE WITH TYPICAL SECTIONS.
   -PLACE BACKFILL TY-B IN ACCORDANCE WITH TYPICAL SECTIONS.

LEGEND

- TREATED EDGE CONDITION TO BE PLACED AS DIRECTED BY THE ENGINEER
- TRAFFIC FLOW DIRECTION
- TWO-WAY TRAFFIC FLOW
- 42" TWO-PIECE CONES

STATE OF TEXAS
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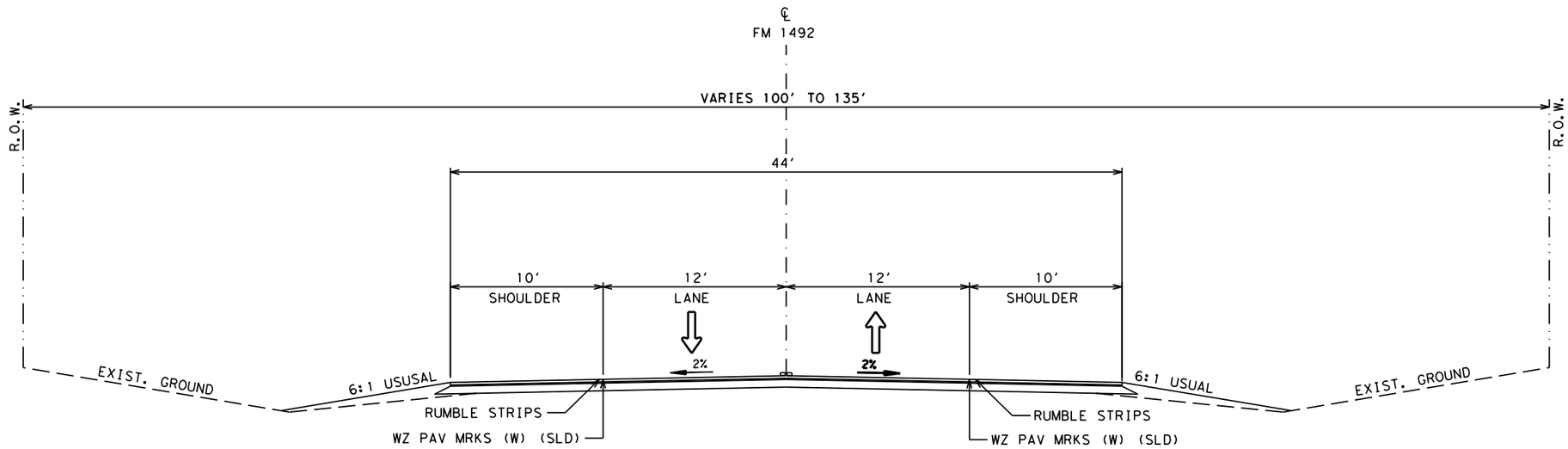
PHASE NARRATIVE

SHEET 4 OF 5

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			15
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PHASE 3



1. PLACE WORKZONE TABS AND PAVEMENT MARKINGS PRIOR TO FINAL PAVEMENT MARKINGS.
2. PLACE FINAL PAVEMENT MARKINGS.
3. PLACE RUMBLE STRIPS AS SHOWN ON PLANS AND AS APPROVED BY ENGINEER.
4. PLACE 2' FOG SEAL ON RUMBLE STRIPS AND AS APPROVED BY ENGINEER.
5. INSTALL SIGNS.
6. REMOVE/REPLACE ROADSIDE FLASHING BEACONS.
7. INSTALL ILLUMINATION.
8. FINAL CLEAN UP.

LEGEND

- TREATED EDGE CONDITION TO BE PLACED AS DIRECTED BY THE ENGINEER
- TRAFFIC FLOW DIRECTION
- TWO-WAY TRAFFIC FLOW
- 42" TWO-PIECE CONES

STATE OF TEXAS
SAUL ROMERO
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10/10/2022

PHASE NARRATIVE

SHEET 5 OF 5

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			16
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

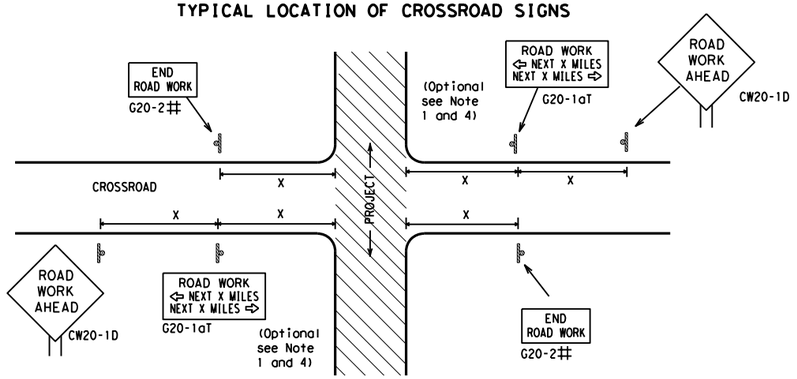
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ODA	MIDLAND, ETC.		17
5-10 5-21				

DATE:
FILE:

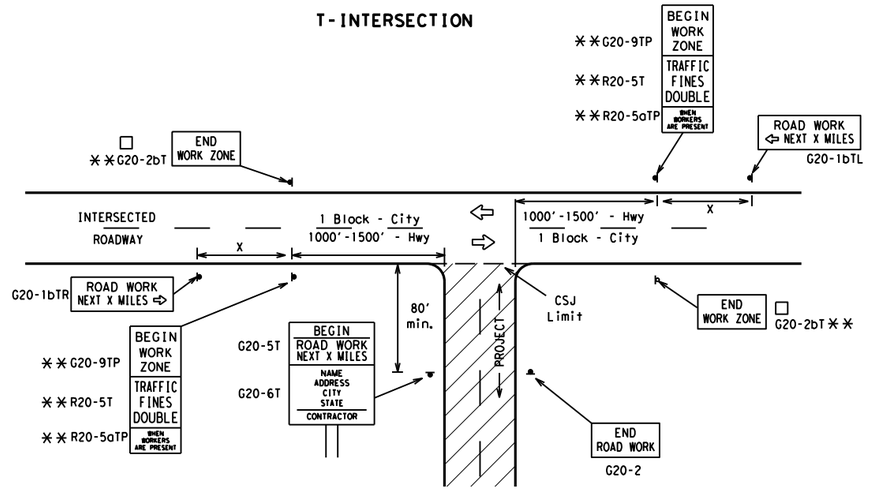
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

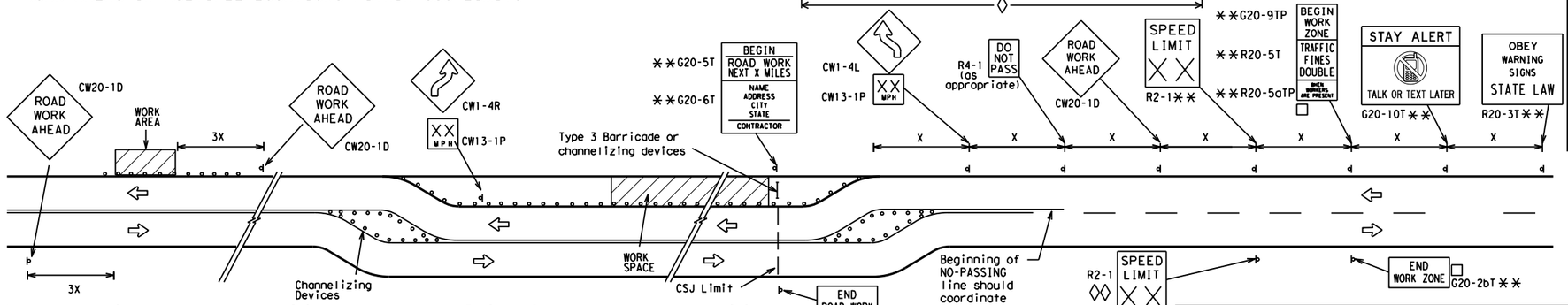
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

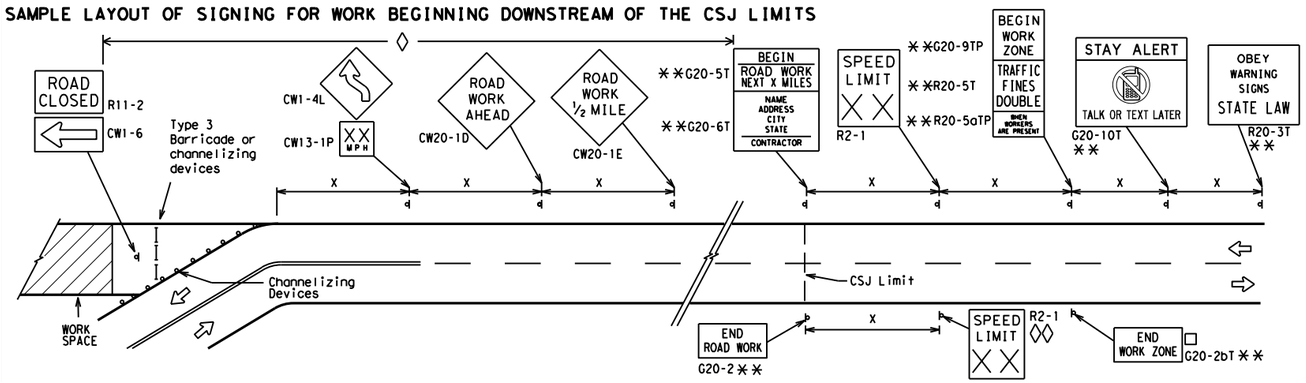
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	MIDLAND, ETC.		18

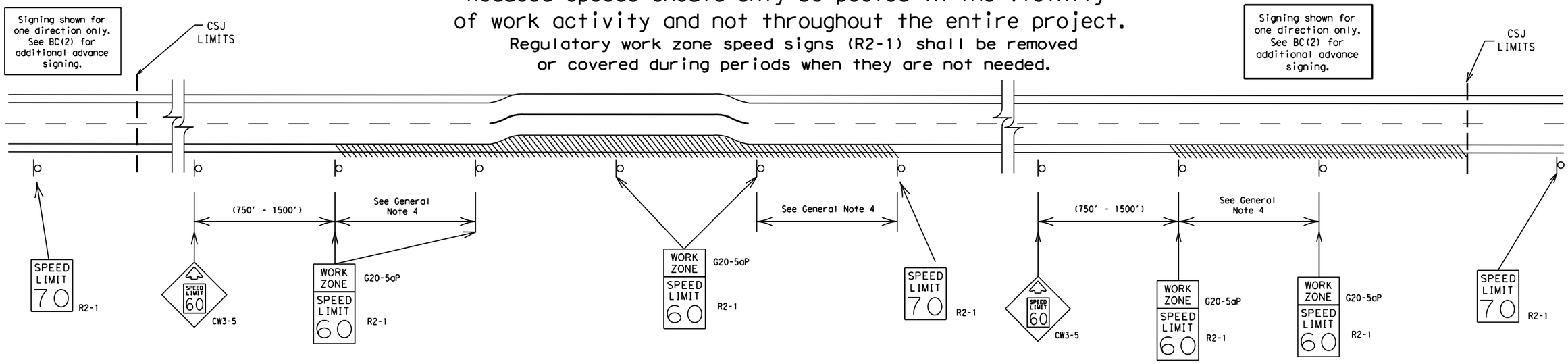
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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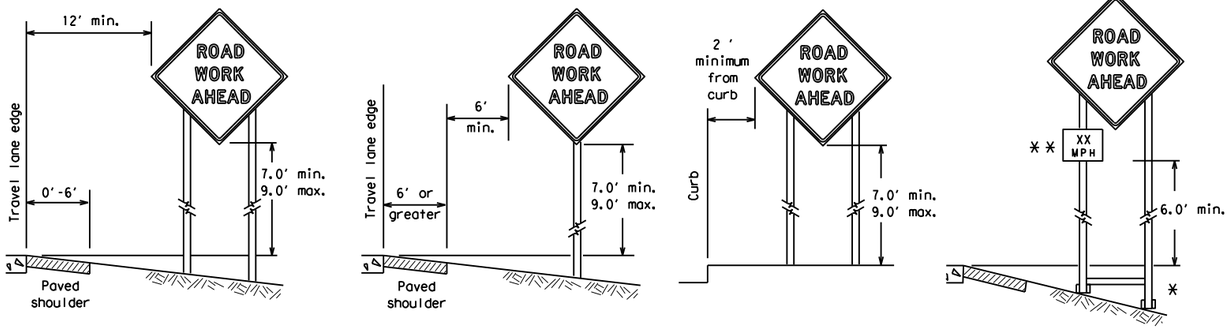
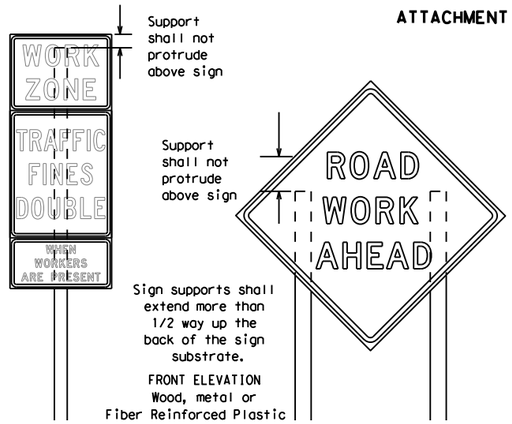
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

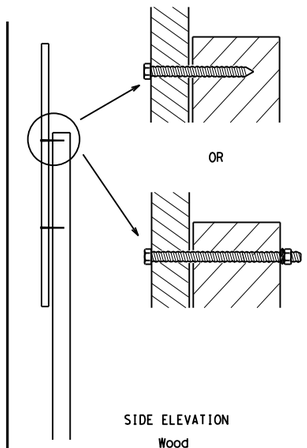


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





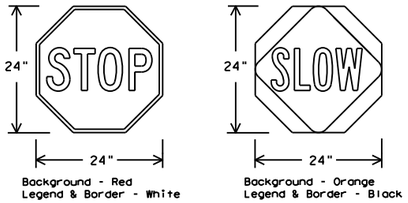
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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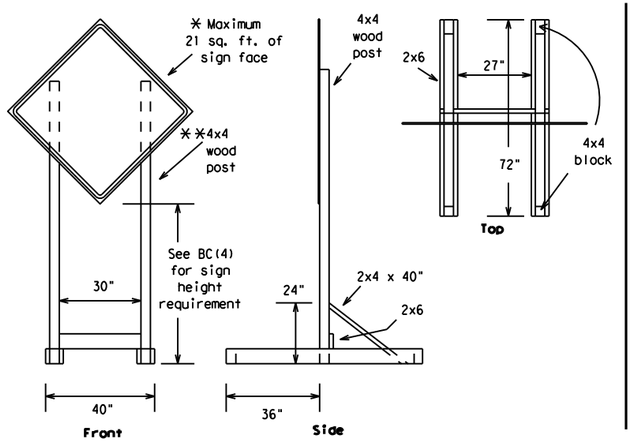
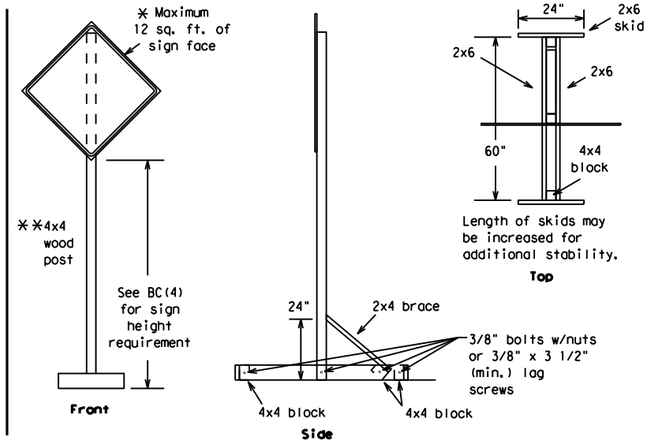
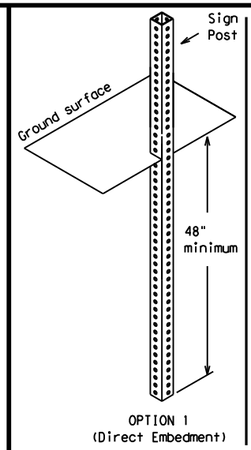
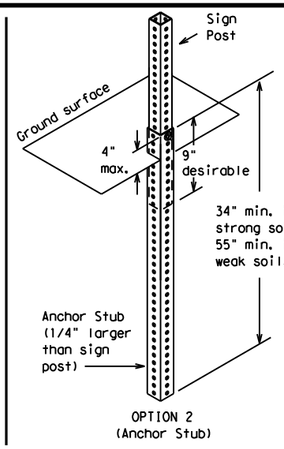


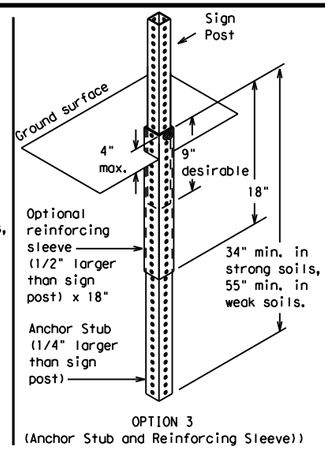


SKID MOUNTED WOOD SIGN SUPPORTS

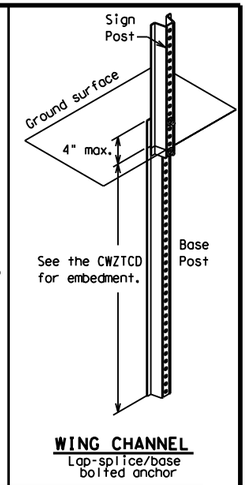
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







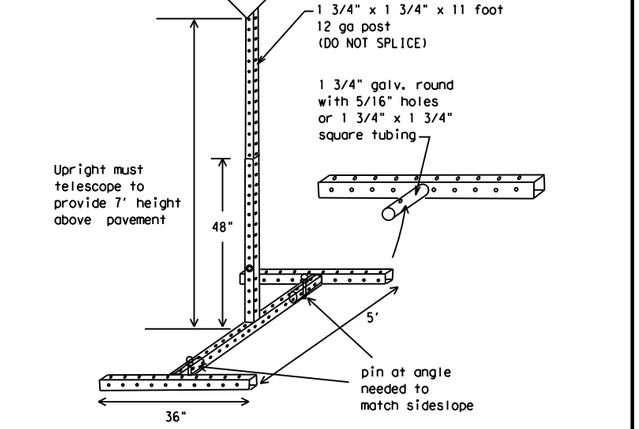
PERFORATED SQUARE METAL TUBING

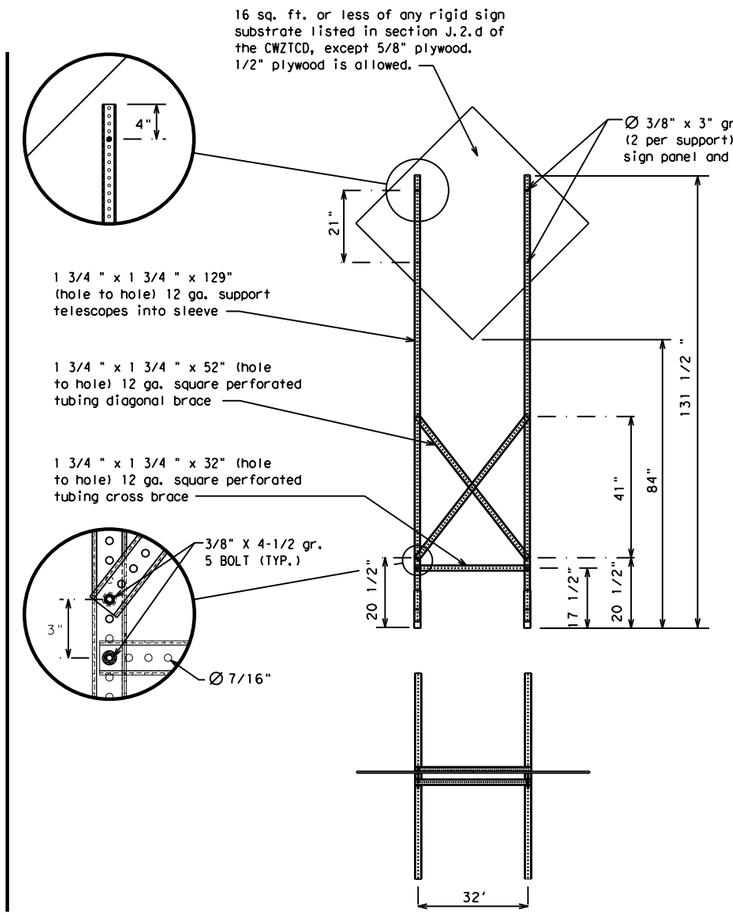


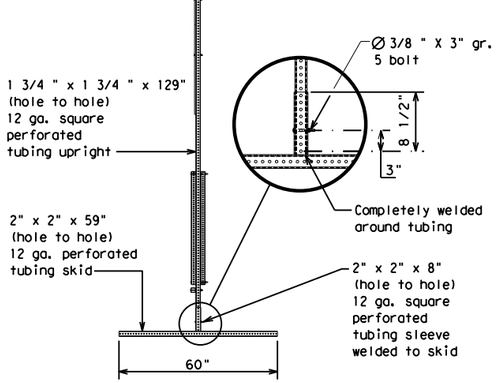
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE:	bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY
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DATE:
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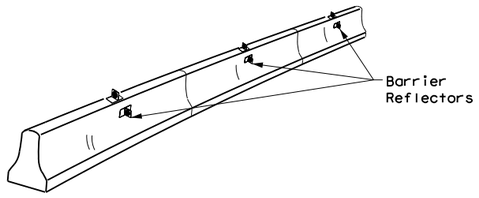
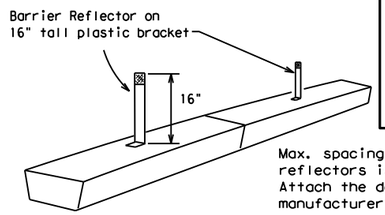
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



CONCRETE TRAFFIC BARRIER (CTB)

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

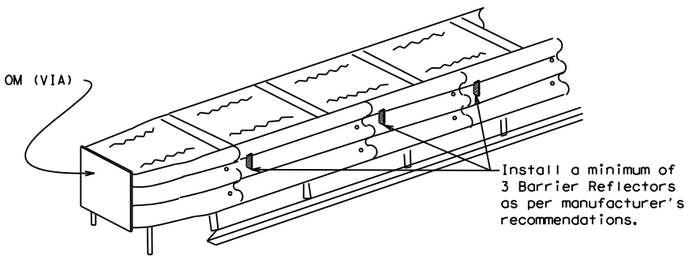


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

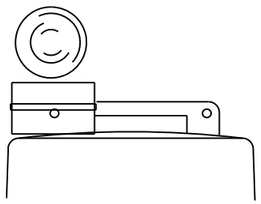


DELINEATION OF END TREATMENTS

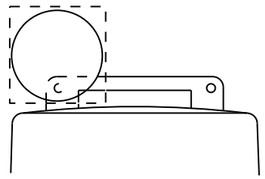
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

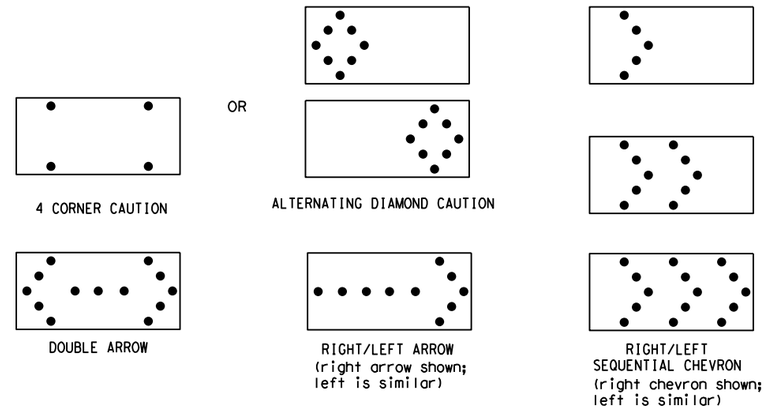
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
9-07 8-14	DIST	COUNTY		SHEET NO.
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

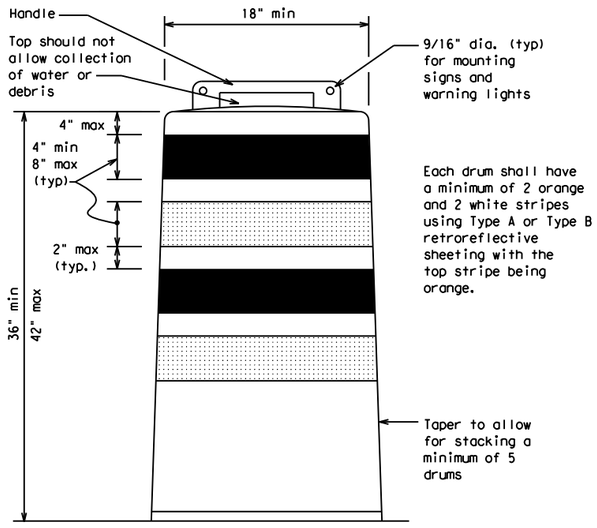
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

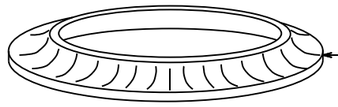
RETROREFLECTIVE SHEETING

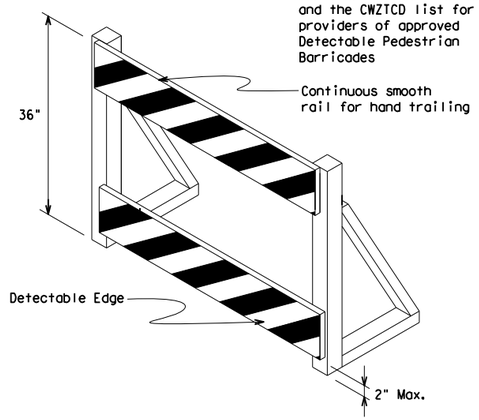
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

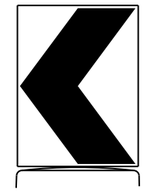




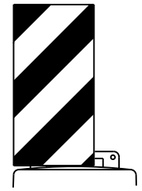


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ODA	MIDLAND, ETC.		24
7-13				

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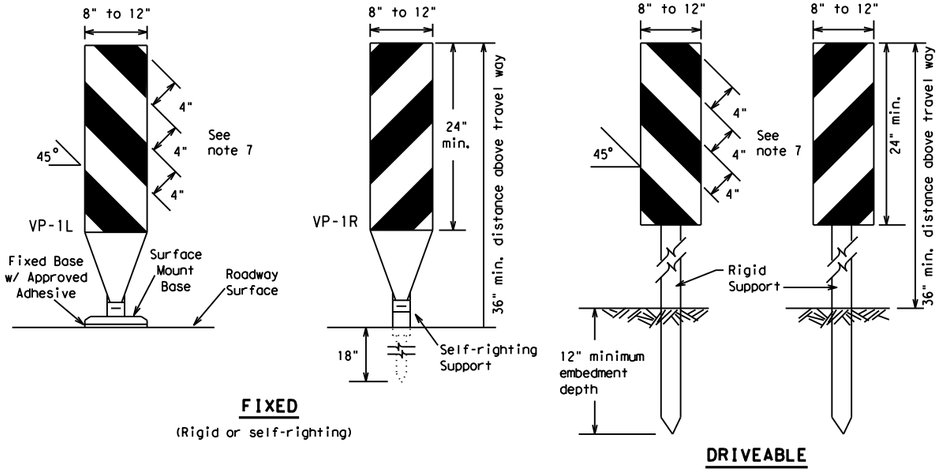
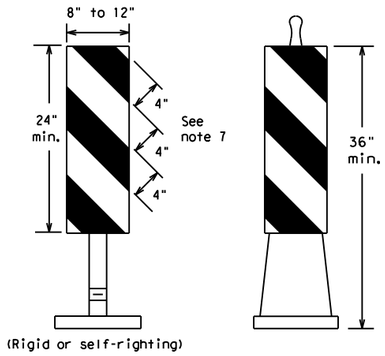


FIXED
(Rigid or self-righting)

DRIVEABLE

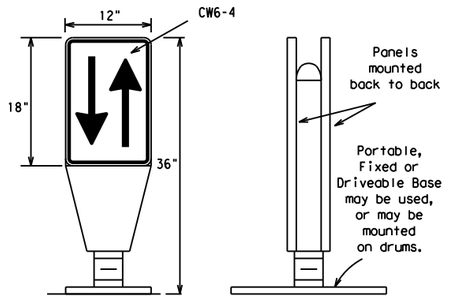


(Rigid or self-righting)

PORTABLE

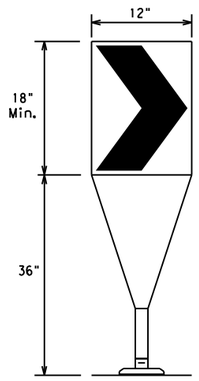
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



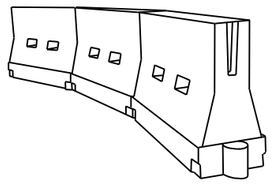
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2906	01	006, ETC.	RM 1492
9-07 8-14	DIST	COUNTY		SHEET NO.
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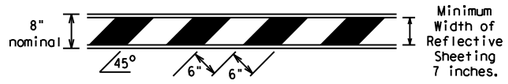
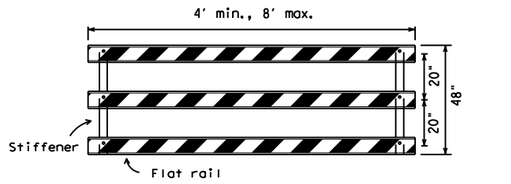
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



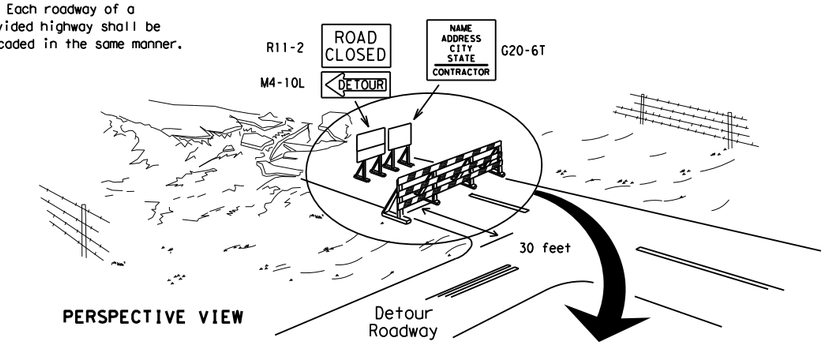
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

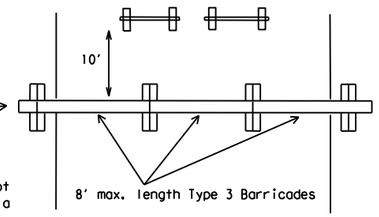
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

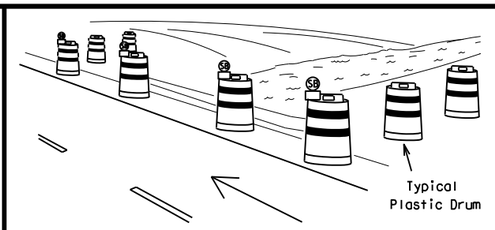
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

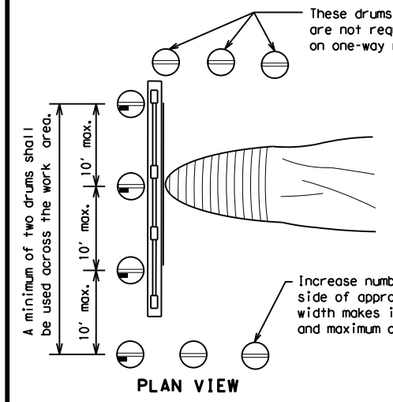
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

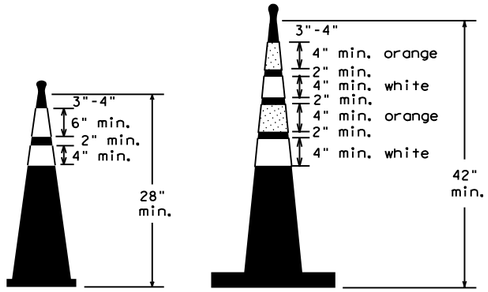
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

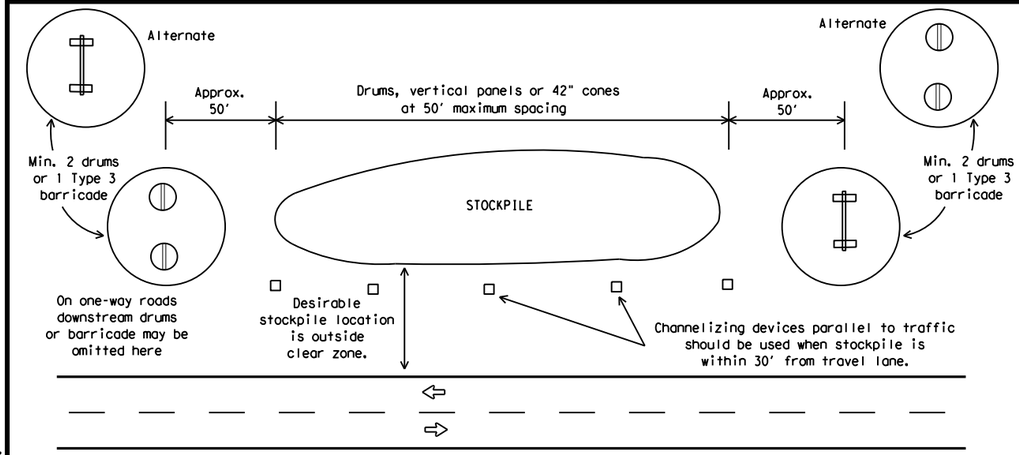
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

DATE:
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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	ODA	MIDLAND, ETC.		26

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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.

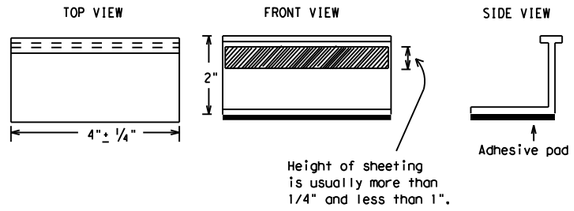
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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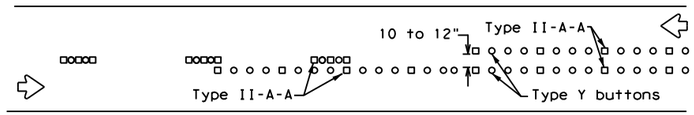
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	ODA	MIDLAND, ETC.		27
11-02 8-14				

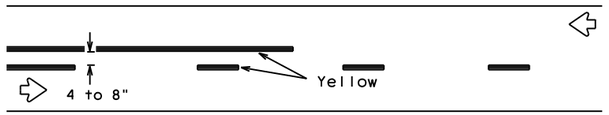
DATE:
FILE:

PAVEMENT MARKING PATTERNS

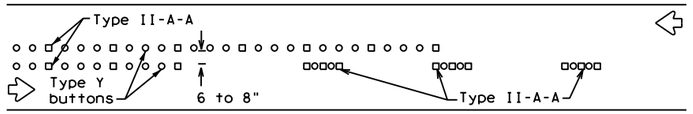
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



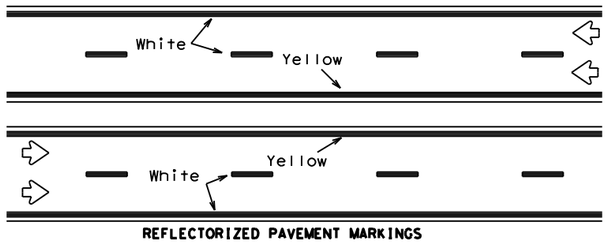
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



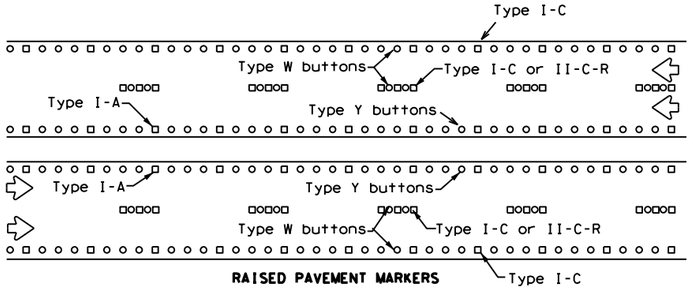
RAISED PAVEMENT MARKERS - PATTERN B

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

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



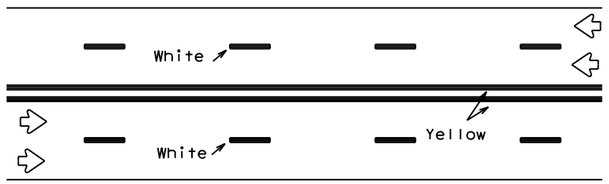
REFLECTORIZED PAVEMENT MARKINGS



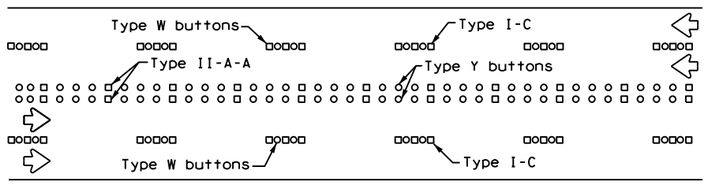
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



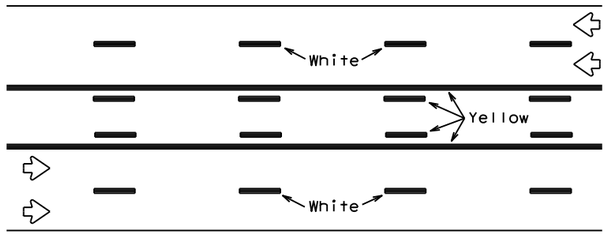
REFLECTORIZED PAVEMENT MARKINGS



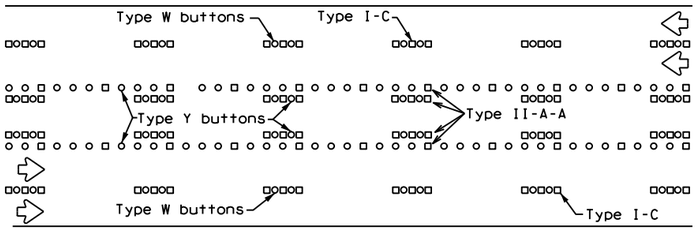
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

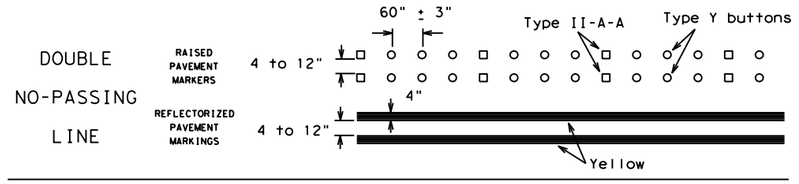
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

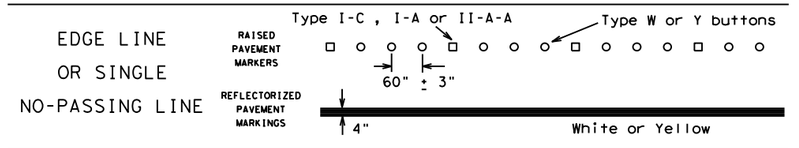
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

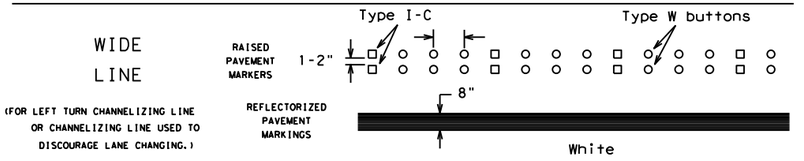


EDGE LINE OR SINGLE NO-PASSING LINE



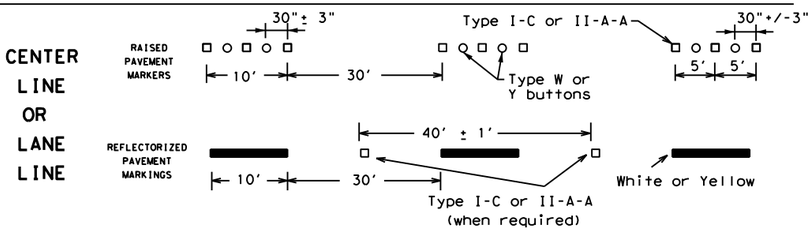
WIDE LINE

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

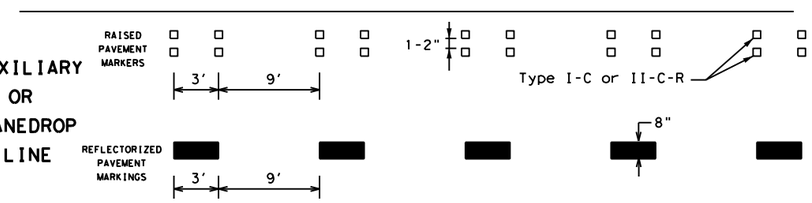


BROKEN LINES

CENTER LINE OR LANE LINE

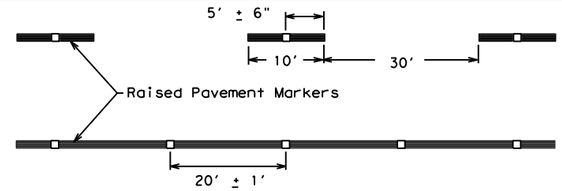


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

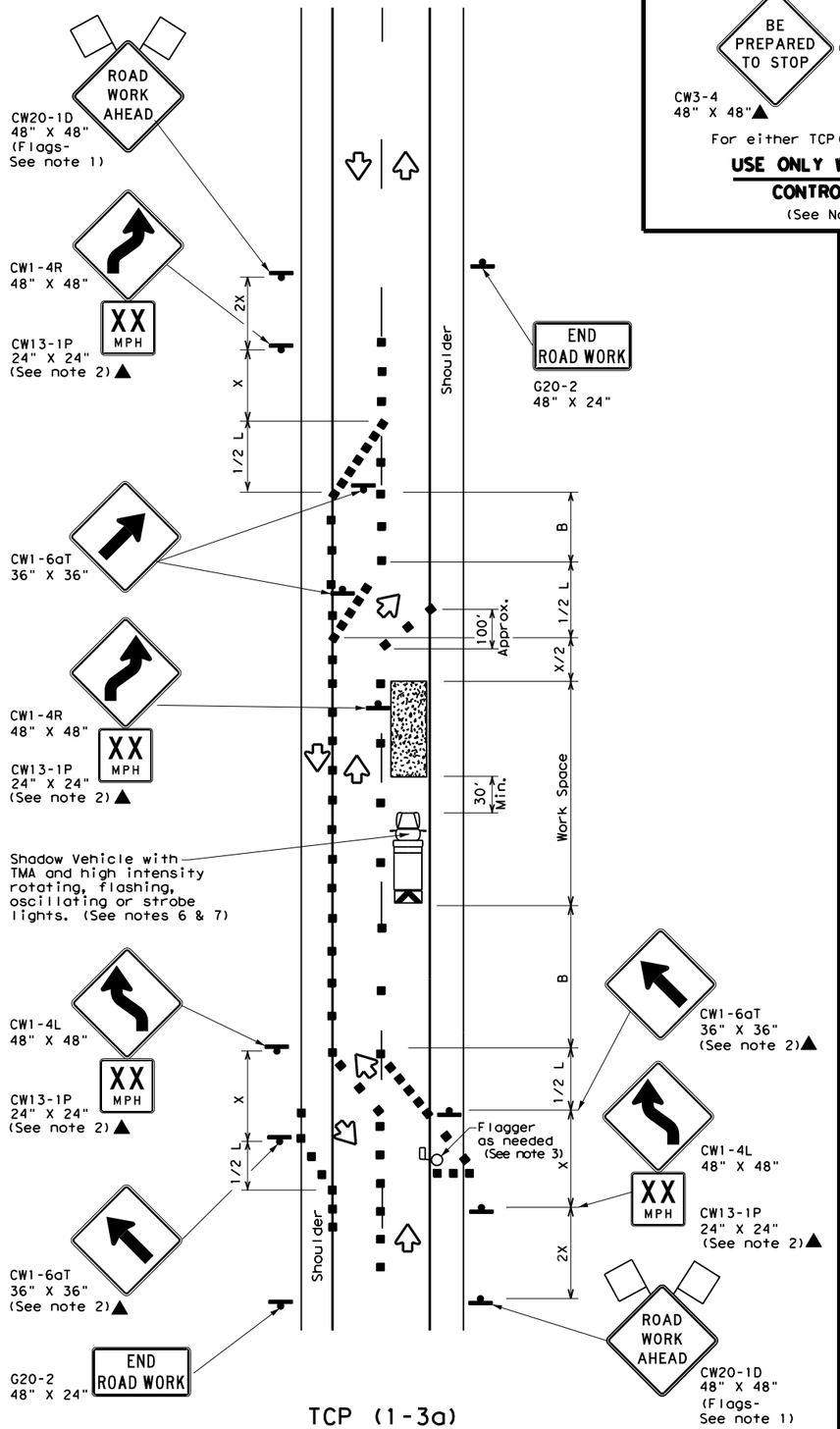
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

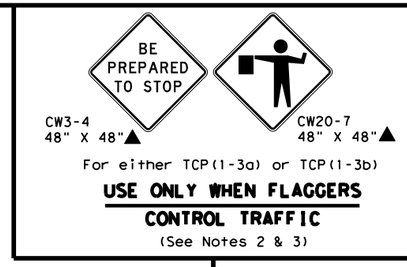
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		28

DATE:
FILE:



TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

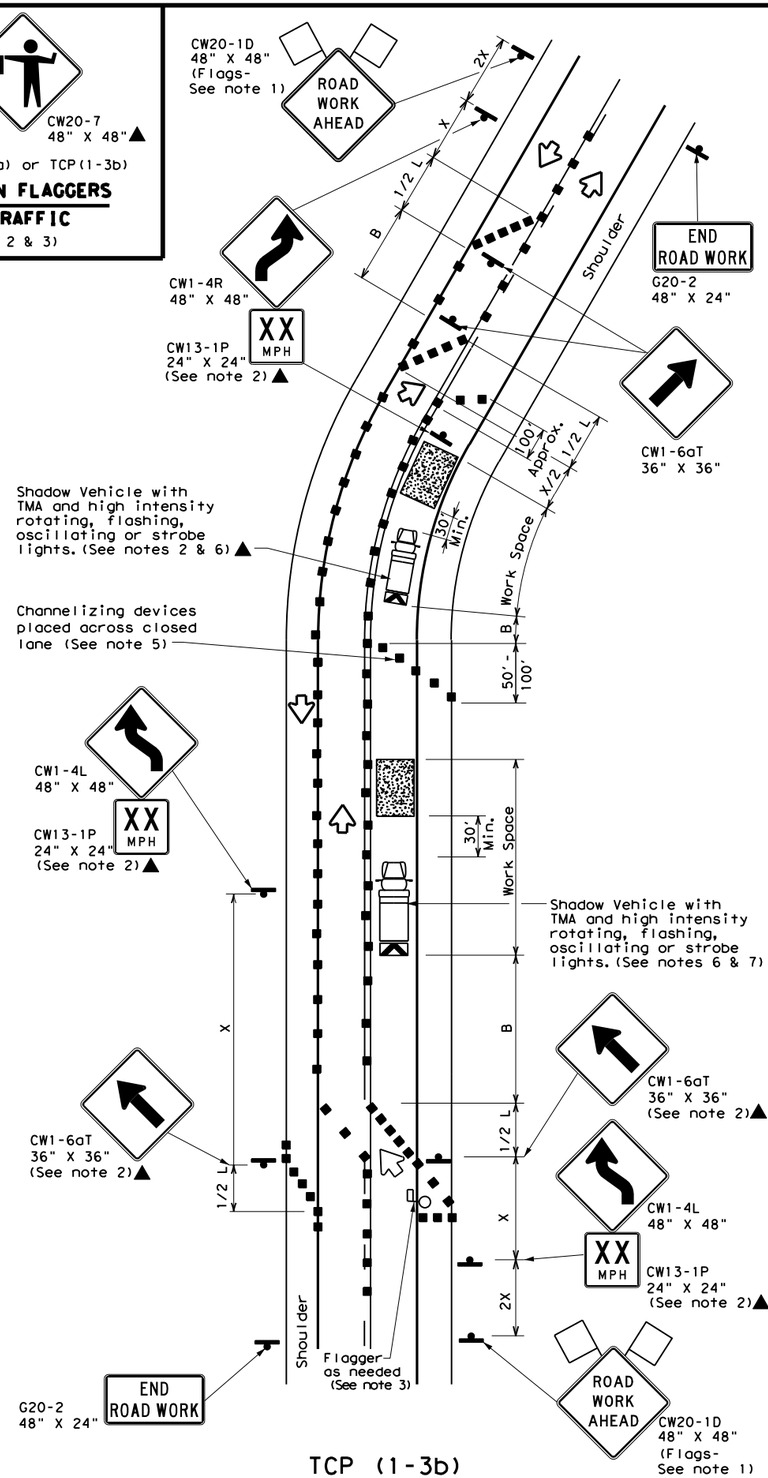
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

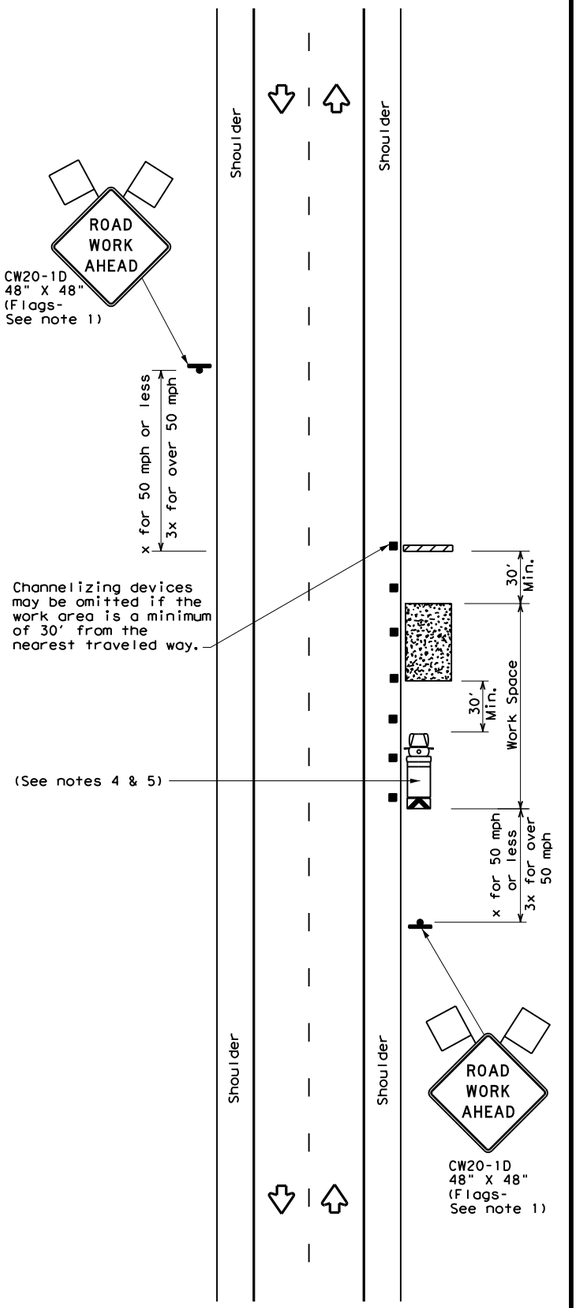
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

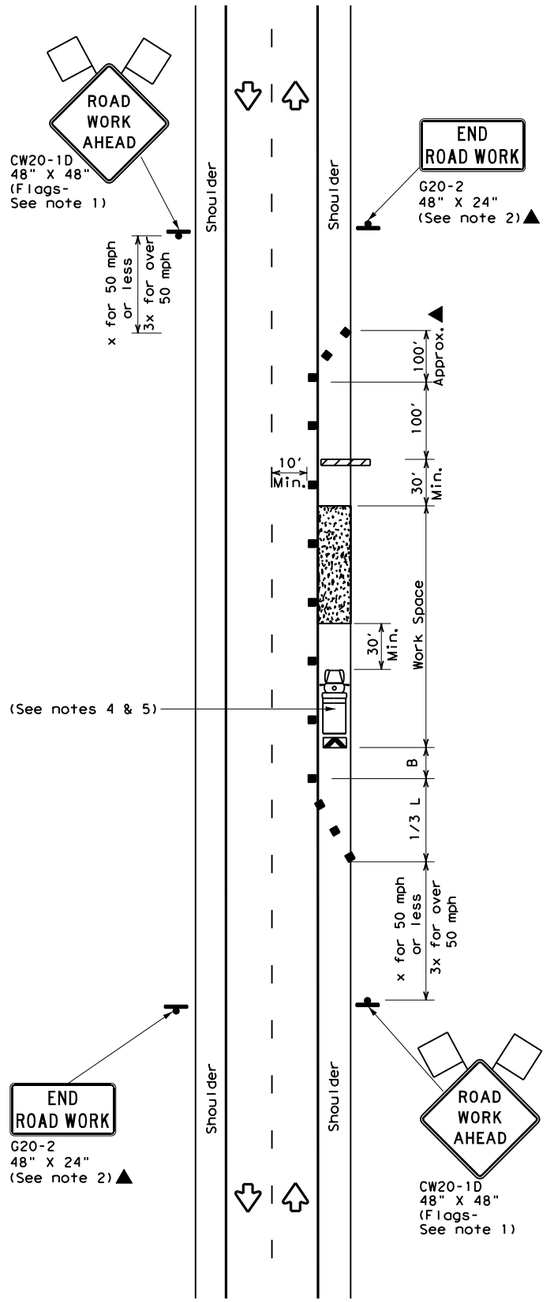
FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ODA	MIDLAND, ETC.		29
1-97 2-18				

DATE:
FILE:



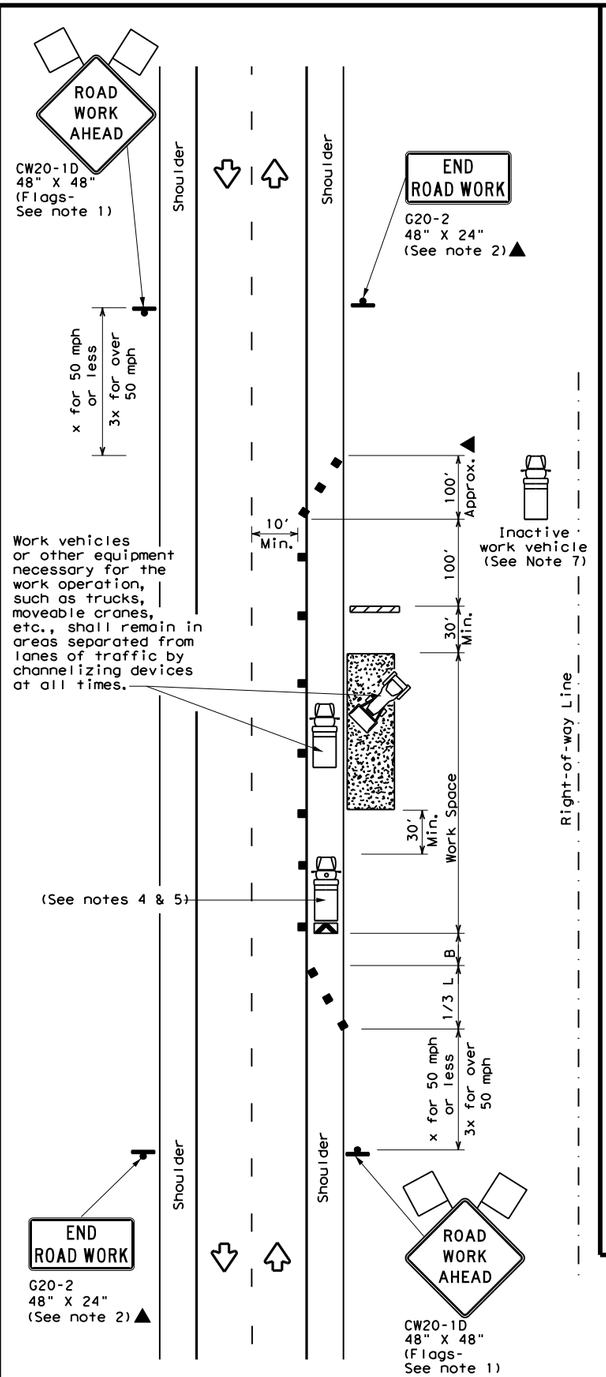
TCP (2-1a)

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

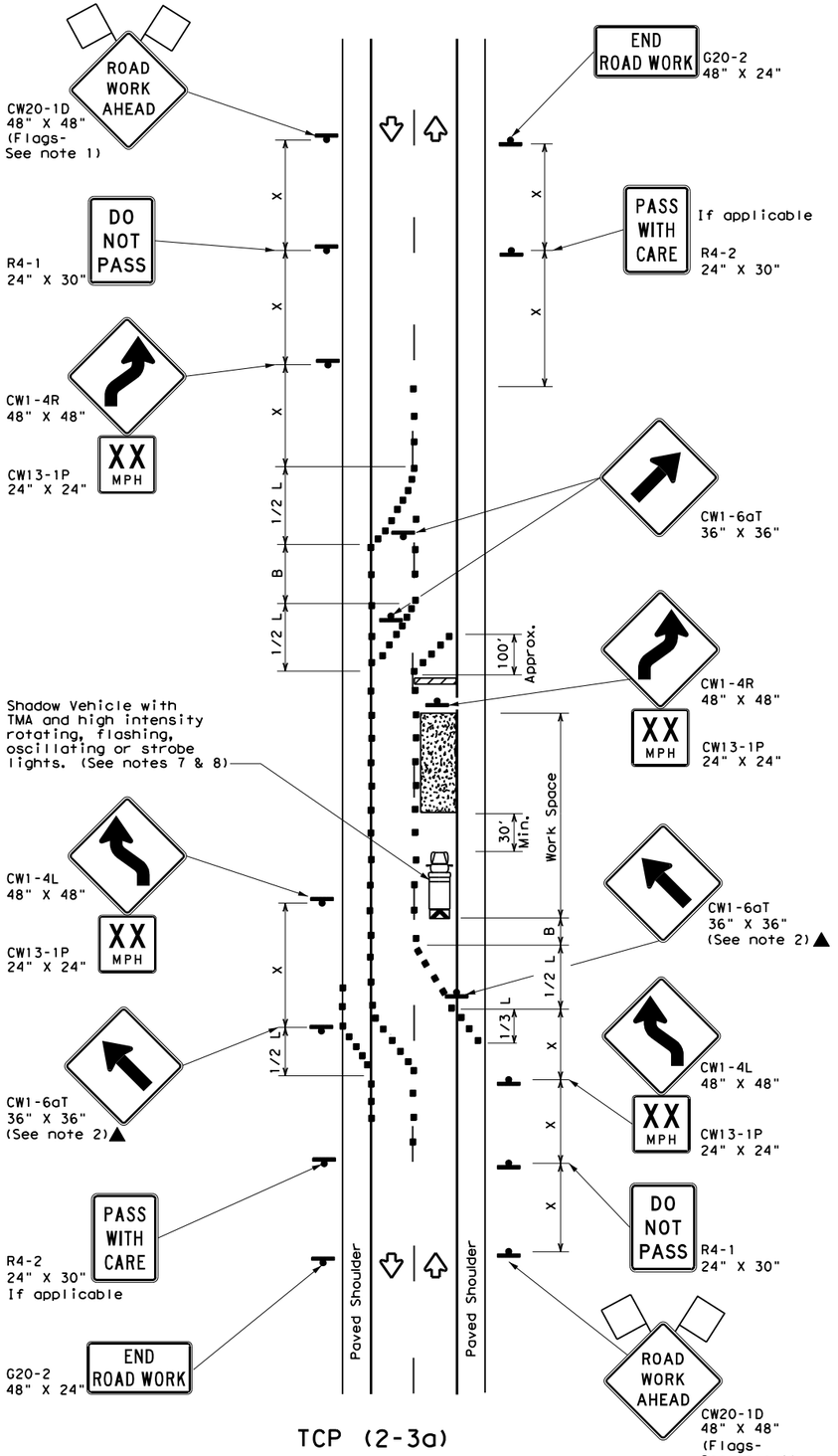
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

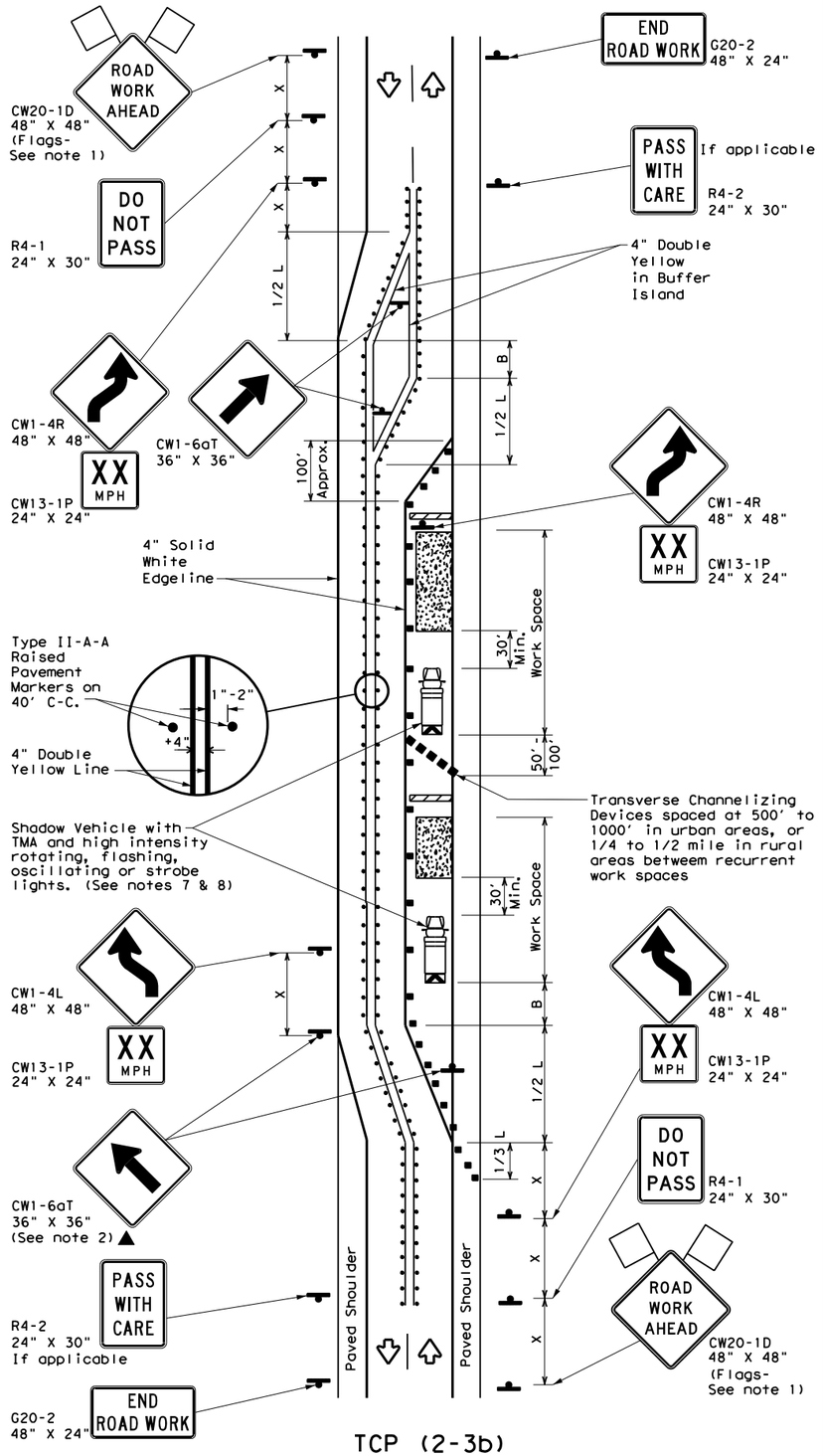
FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ODA	MIDLAND, ETC.		30
1-97 2-18				

DATE:
FILE:



TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND			
	Type 3 Barricade	■ ■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	....	Raised Pavement Markers Ty II-AA
	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
				TCP(2-3b)ONLY
			✓	✓

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. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

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

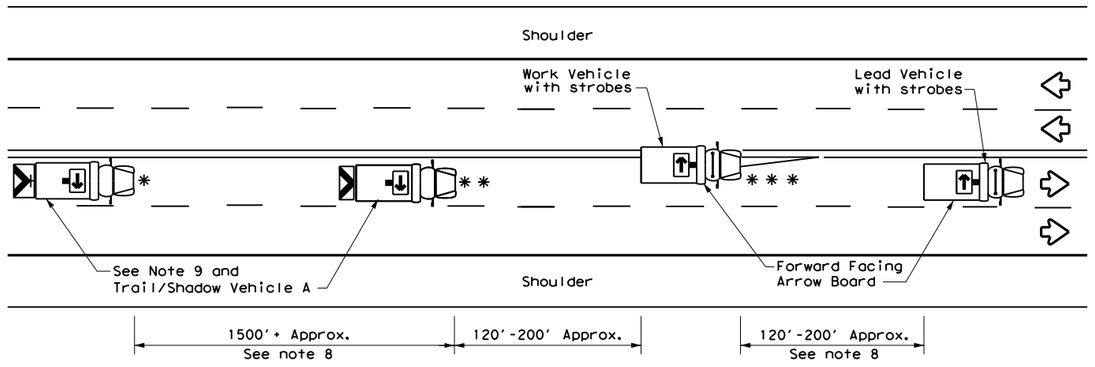
Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

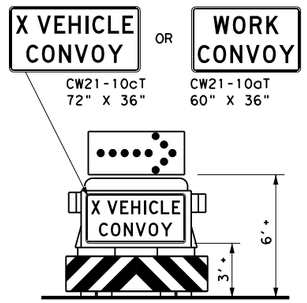
FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	ODA	MIDLAND, ETC.		31
4-98 2-18				

DATE:
FILE:



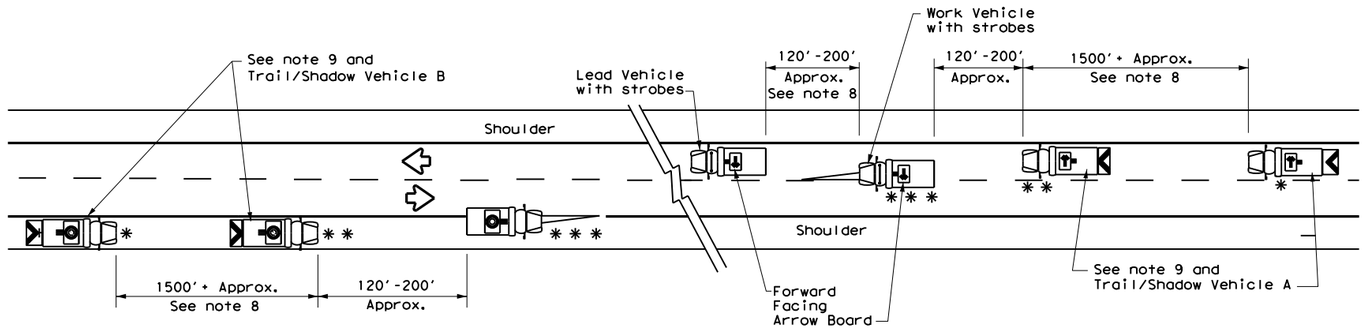
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

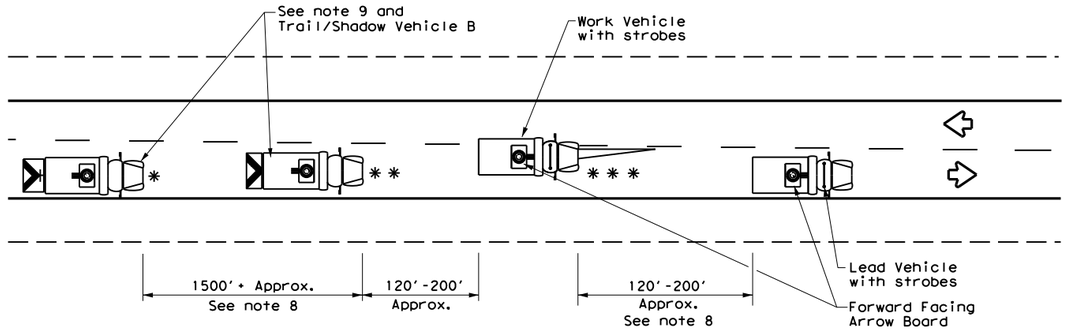


WORK ON SHOULDER

WORK ON TRAVEL LANE

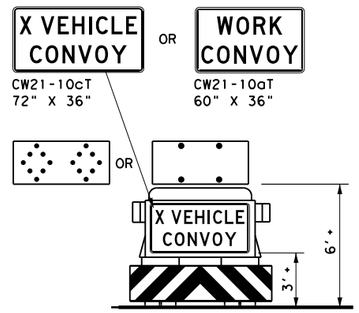
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

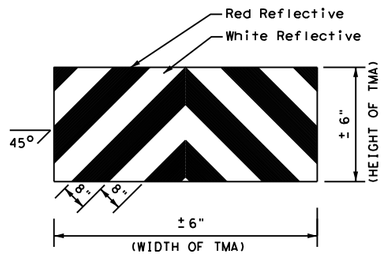
with Flashing Arrow Board in CAUTION display

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. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. 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.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
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 and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

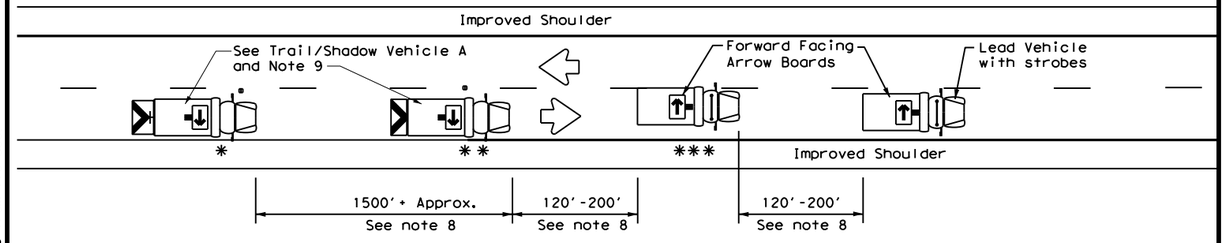
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

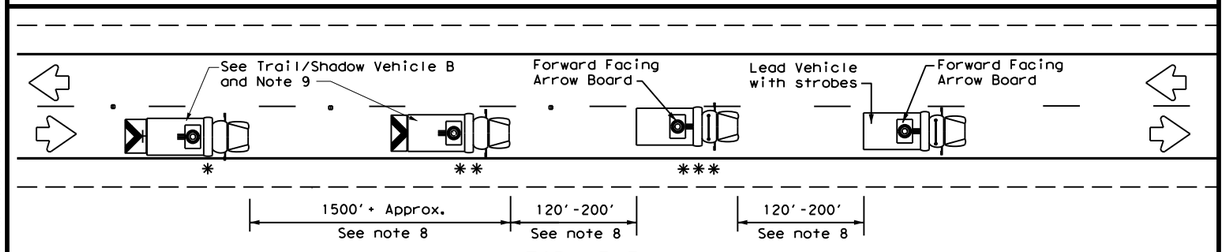
TCP(3-1)-13

FILE: tcp3-1.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	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		32



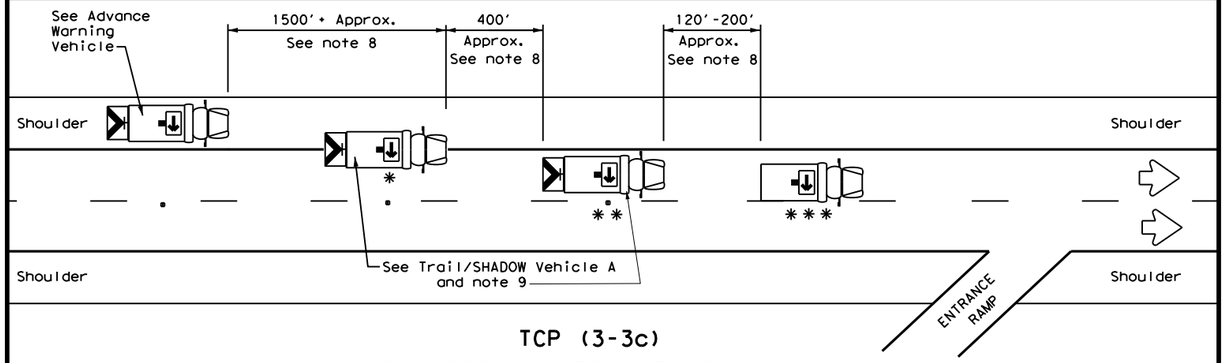
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS
(WORK ON TRAVEL LANE)



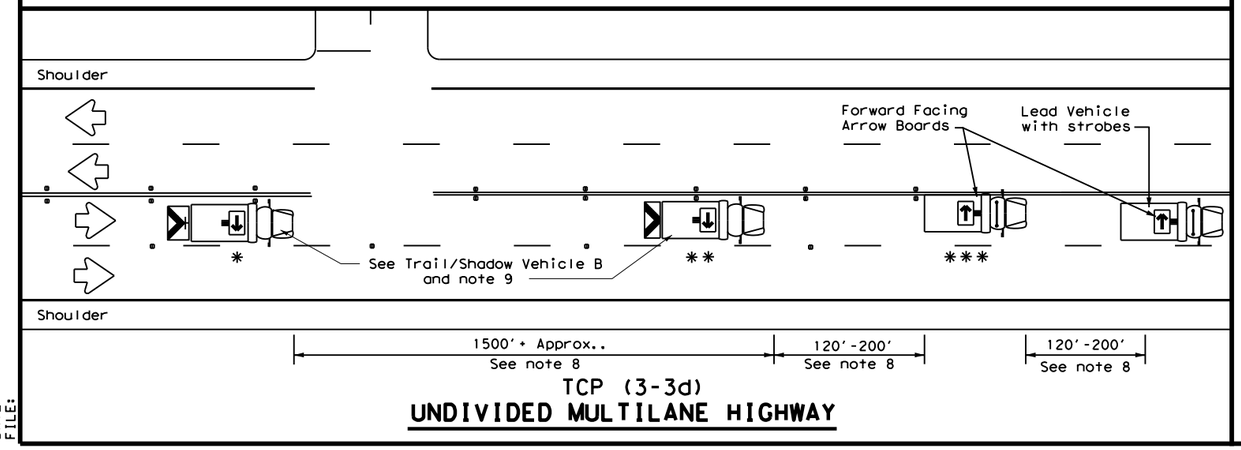
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS
(WORK ON TRAVEL LANE)



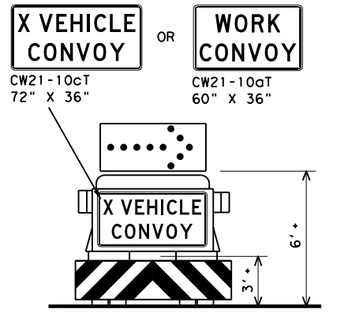
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



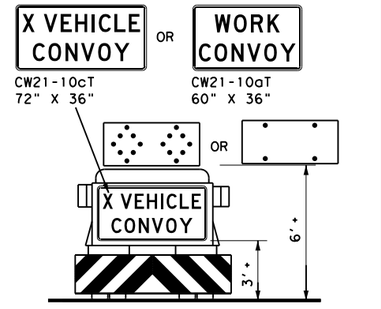
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



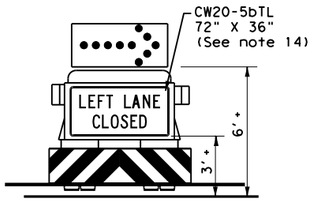
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

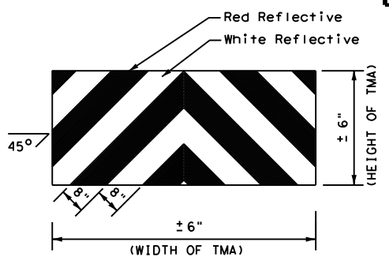


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. 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.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
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 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 and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or 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 may 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. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL
TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ODA	MIDLAND, ETC.		33
1-97 7-14				

DATE:
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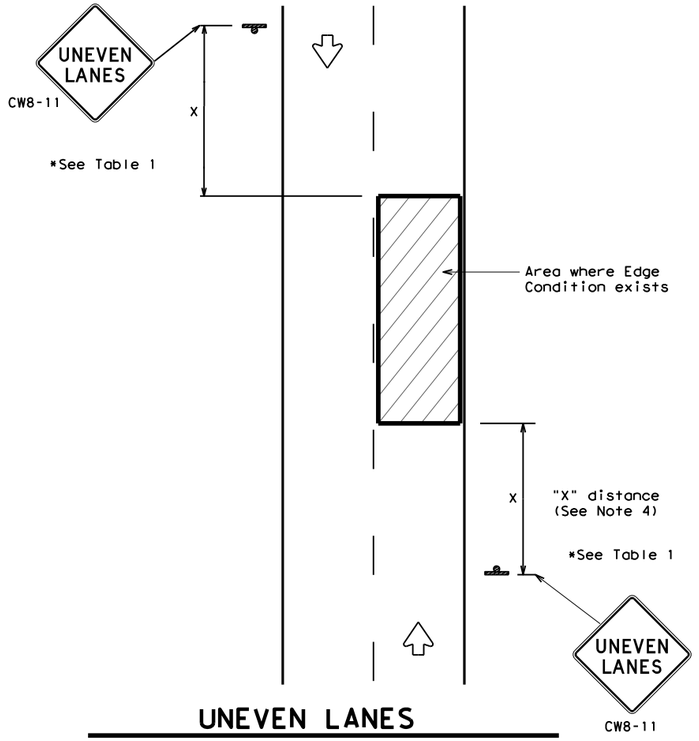
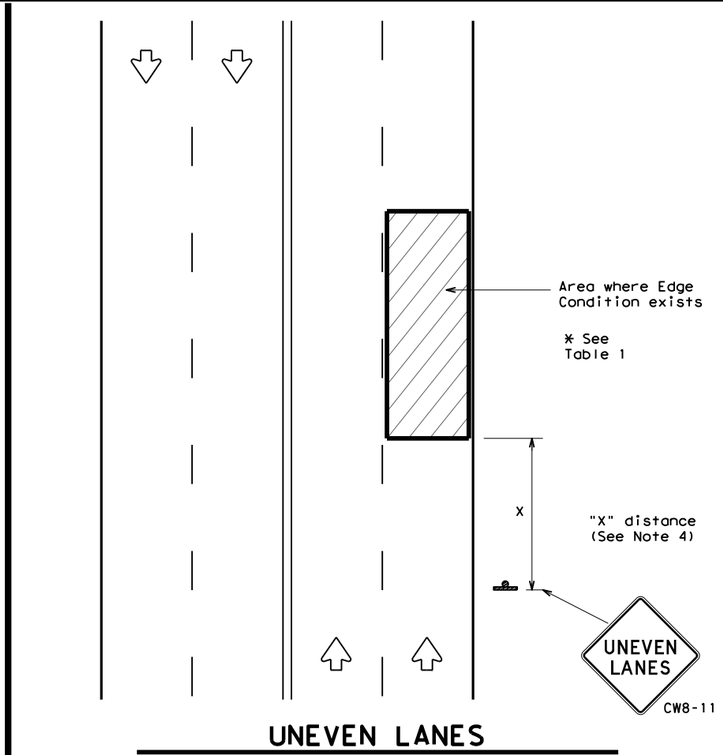
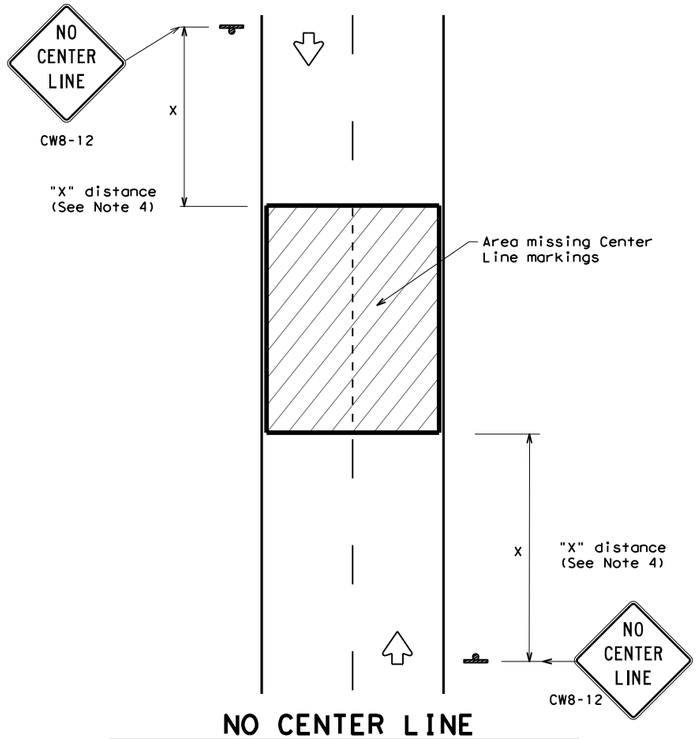


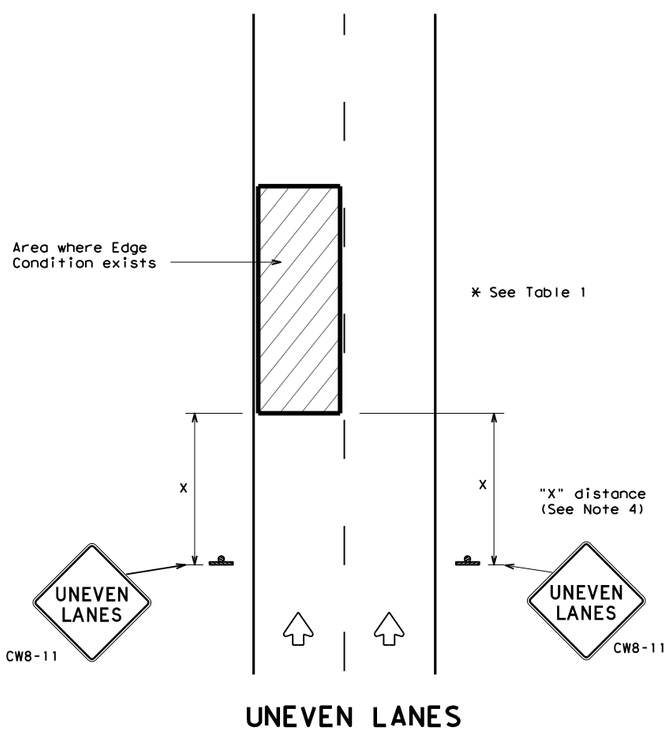
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

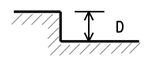
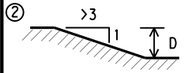
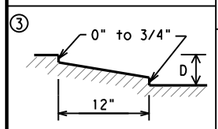
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL} SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

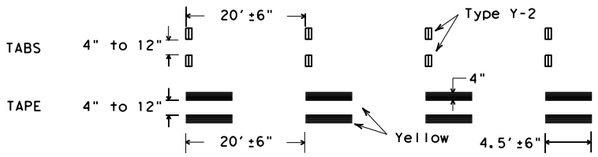
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	ODA	MIDLAND, ETC.		34

DATE:
FILE:

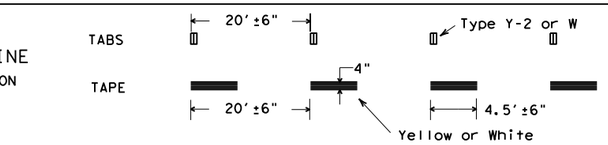
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

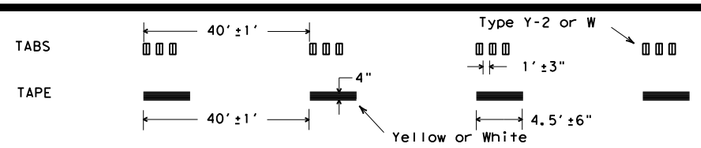


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



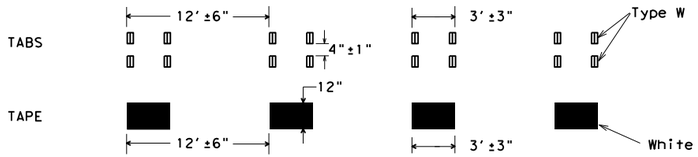
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

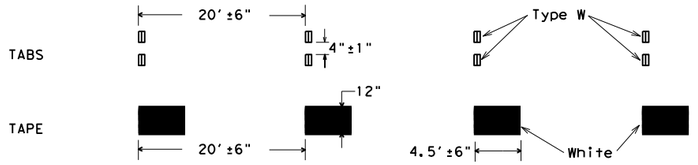


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



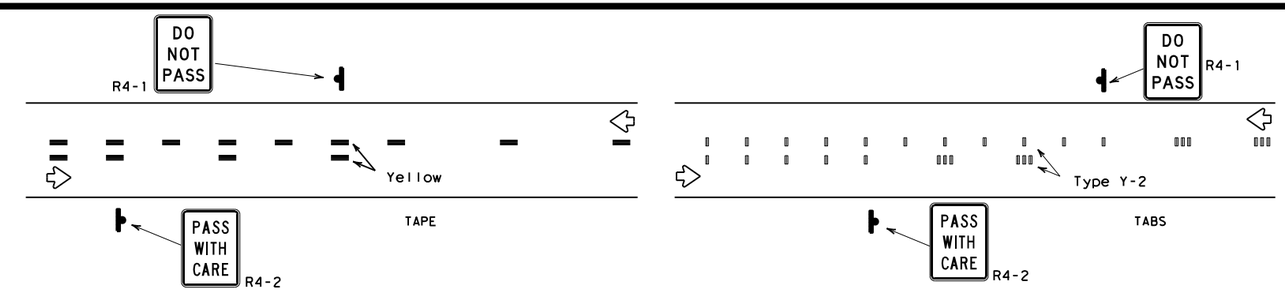
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

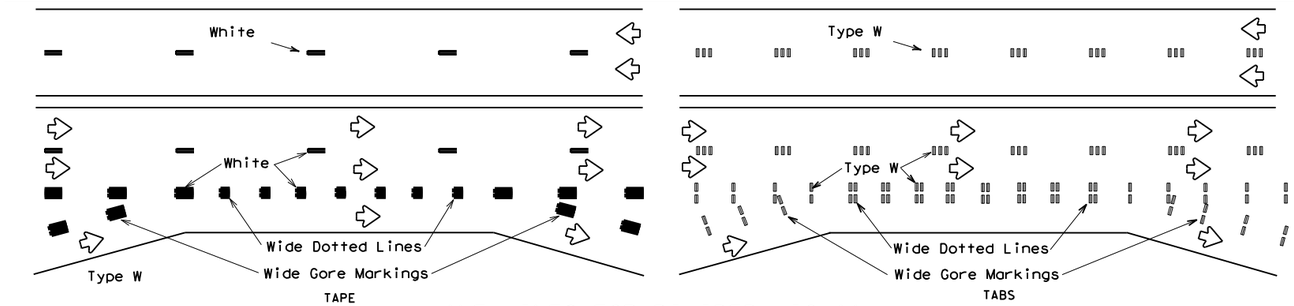
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

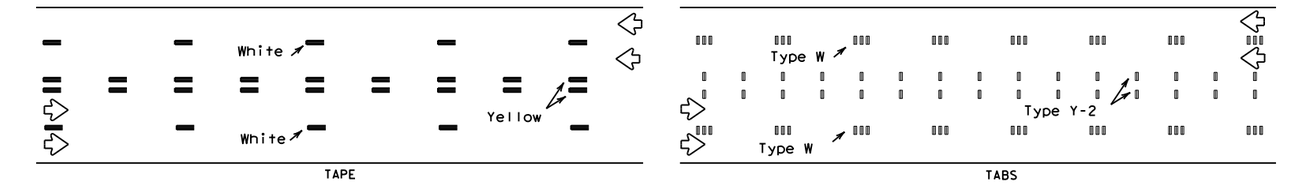
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



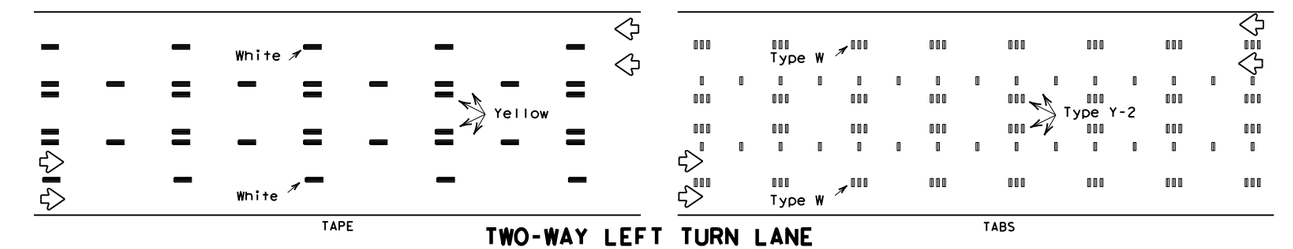
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



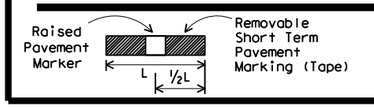
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

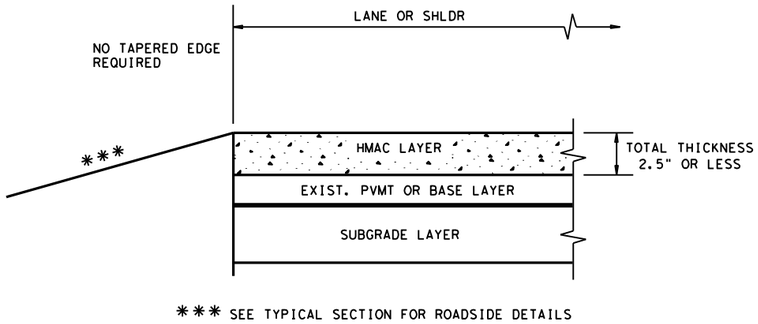
Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

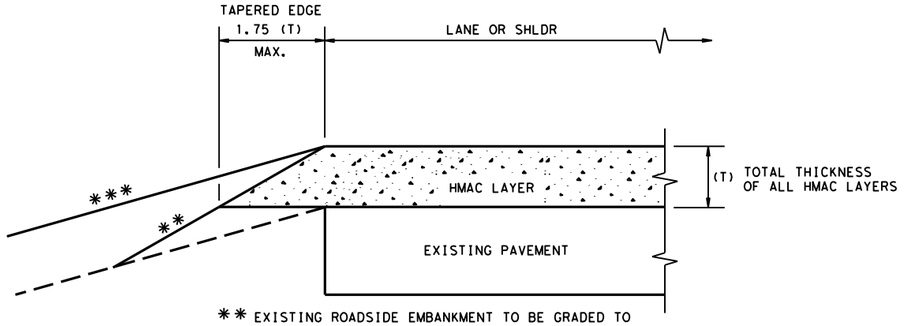
FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		2906	01	006, ETC.	RM 1492
1-97		DIST	COUNTY		SHEET NO.
3-03		ODA	MIDLAND, ETC.		35
7-13					

DATE:
FILE:



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

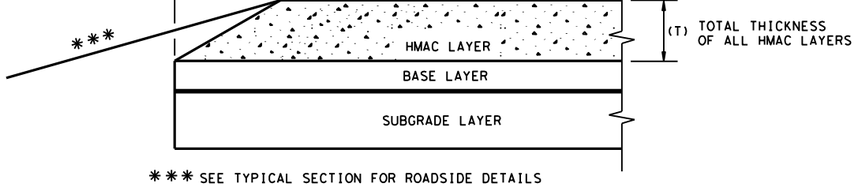
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

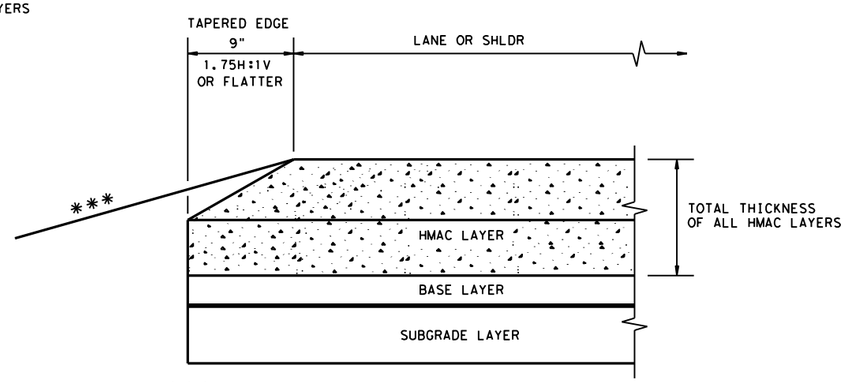
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
OVERLAY OF EXISTING PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:		
© TxDOT January 2011	CONT	SECT	JOB		HIGHWAY	
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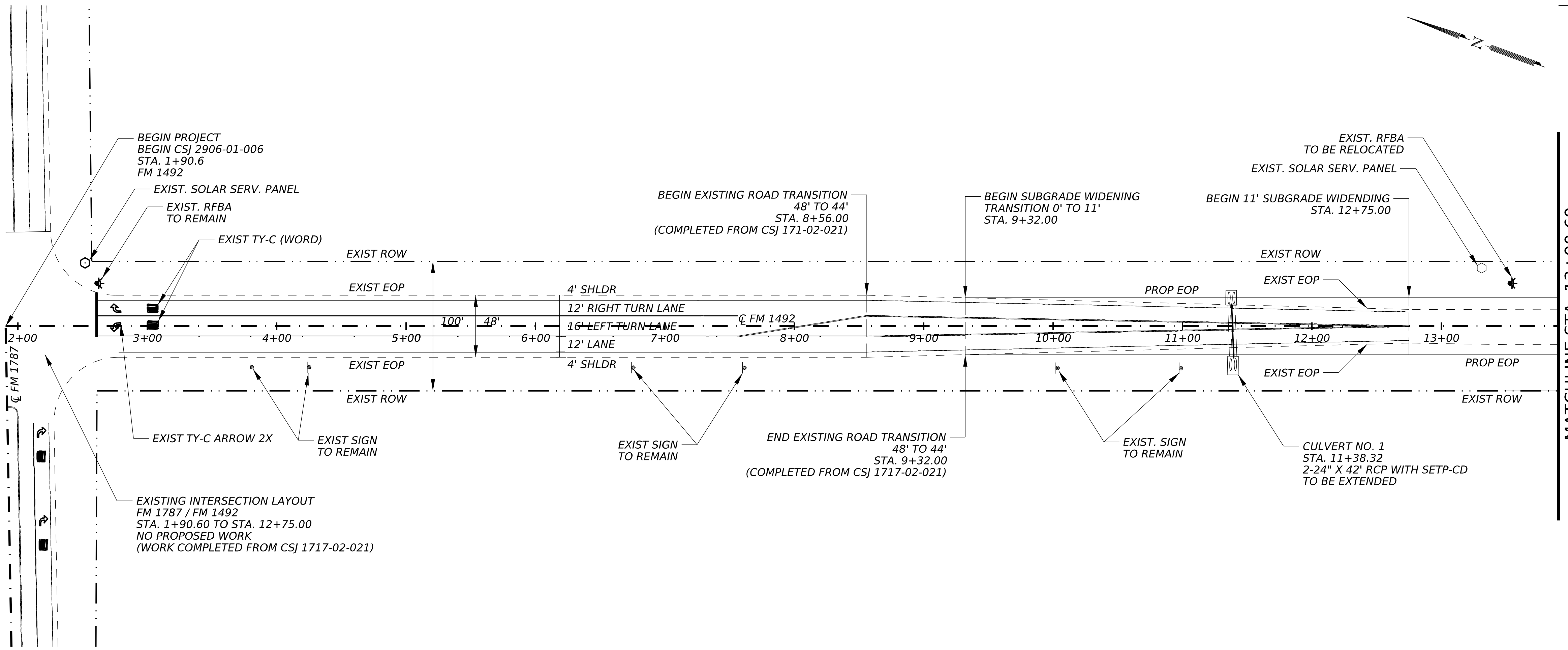
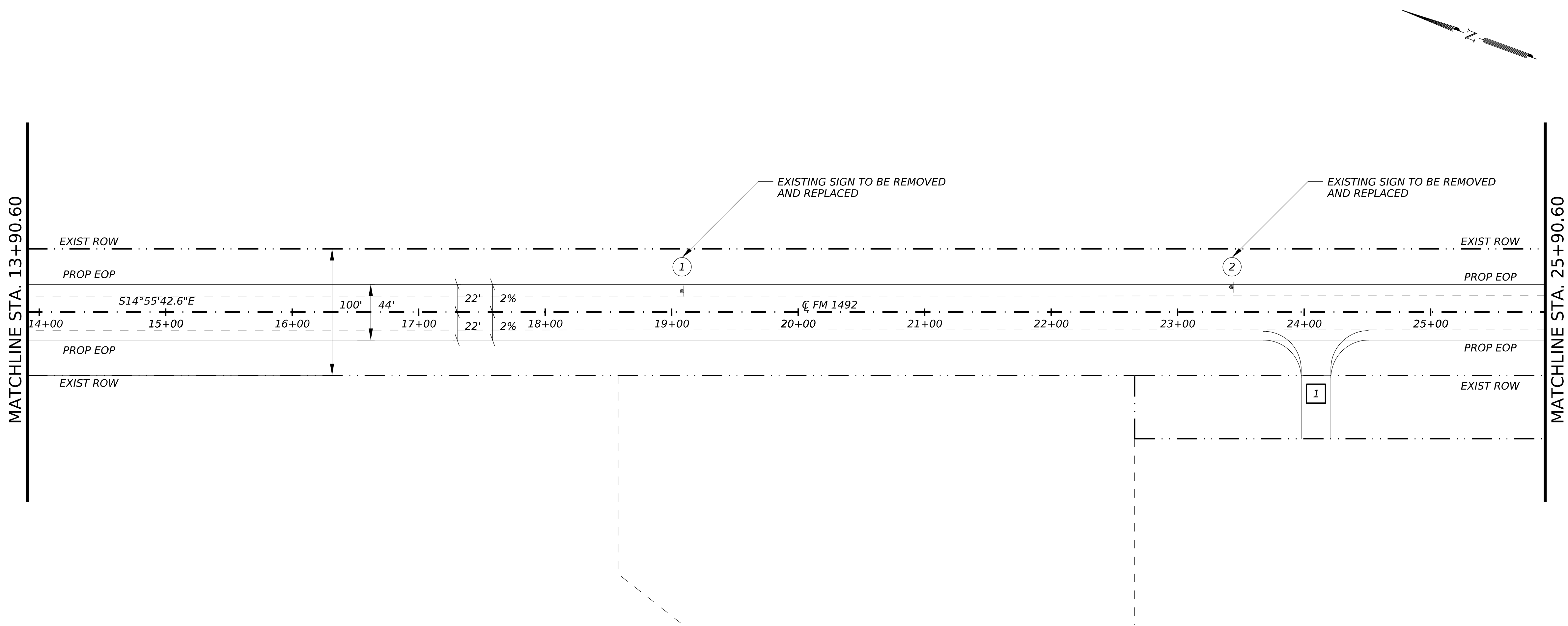
	DIST	COUNTY			SHEET NO.	
	ODA	MIDLAND, ETC.			36	



LEGEND

— · —	PROP. FM 1492 ℄
— · · —	EXIST. ROW
- - -	EXIST. EOP
⬡	EXIST. SOLAR SERVICE PANEL
	EXIST. RFBA
	EXIST. SIGN
(#)	EXIST. SIGN NO.
[#]	PERMITTED DRIVEWAY NO.
DRWY. NO. #	UNPERMITTED DRIVEWAY NO.
CR. NO.	COUNTY RD. NO.



STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
10/10/2022 P.E.
88BF61DF326A480...

Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 1 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		37

DATE: $DATE$ 10/3/2022
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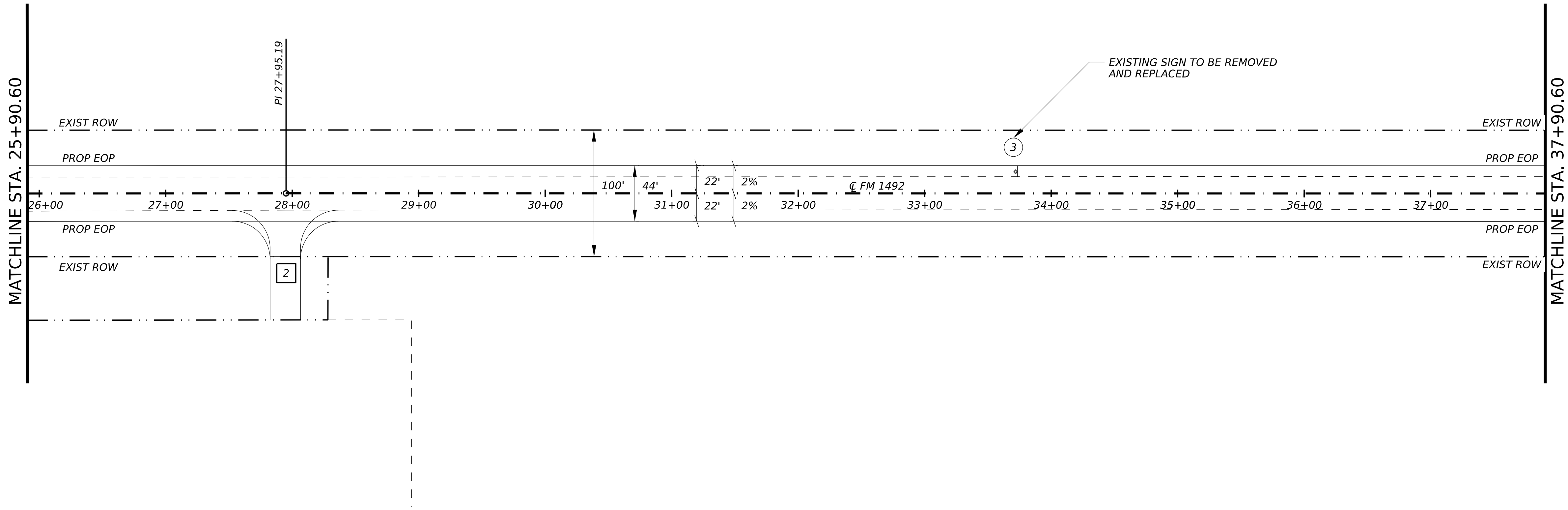


LEGEND

PROP. FM 1492 ℄

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

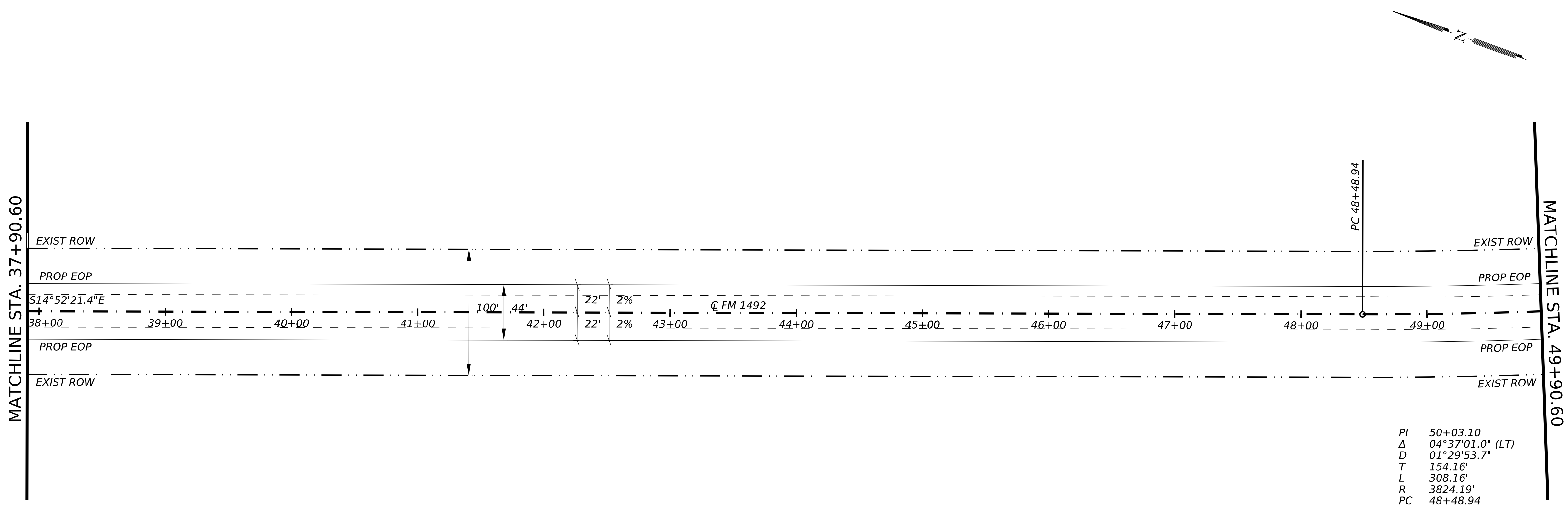
EXIST. SIGN

EXIST. SIGN NO.

PERMITTED DRIVEWAY NO.

DRWY. NO. # UNPERMITTED DRIVEWAY NO.

CR. NO. COUNTY RD. NO.



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L 308.16'
R 3824.19'
PC 48+48.94
PT 51+57.10

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ROADWAY PLAN SHEETS

SHEET 2 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		38

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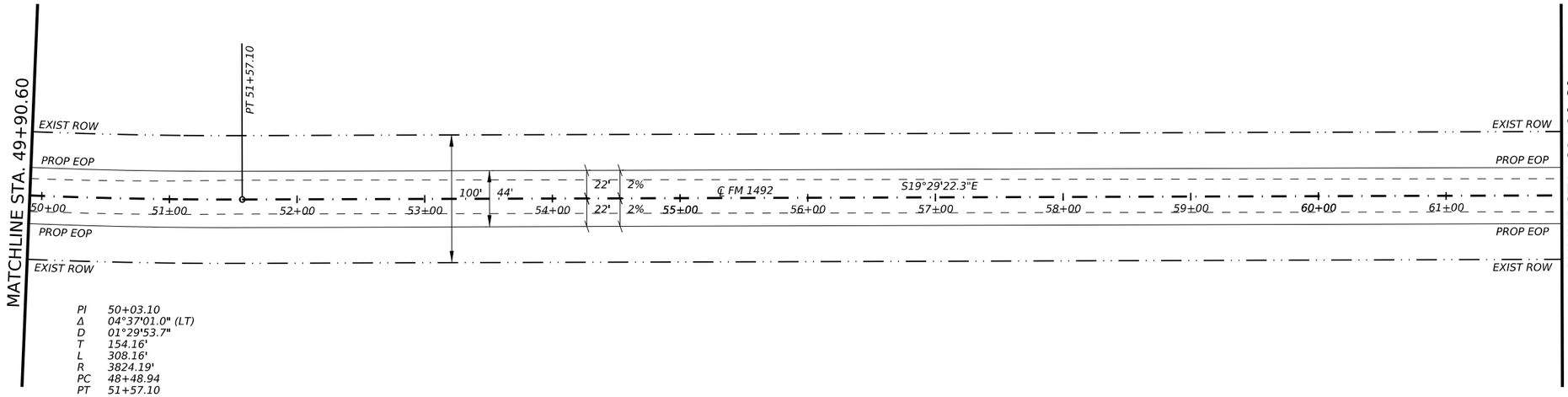

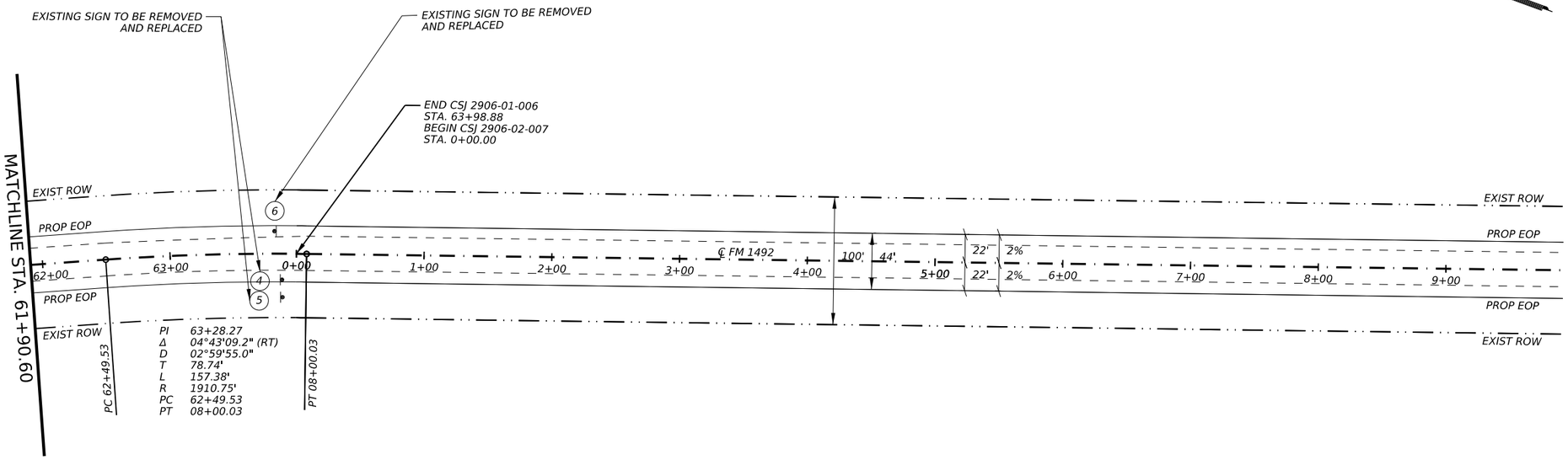

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- (#) EXIST. SIGN NO.
- [#] PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 3 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		39

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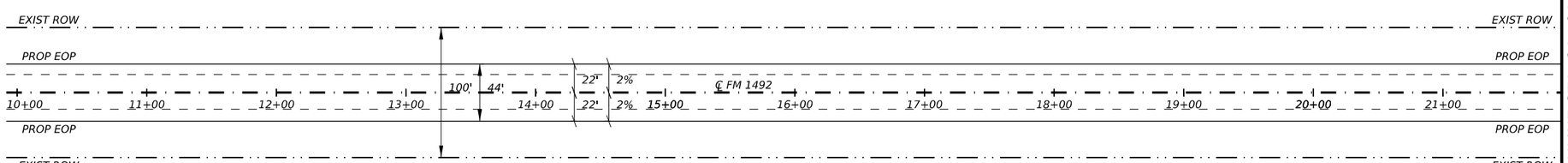

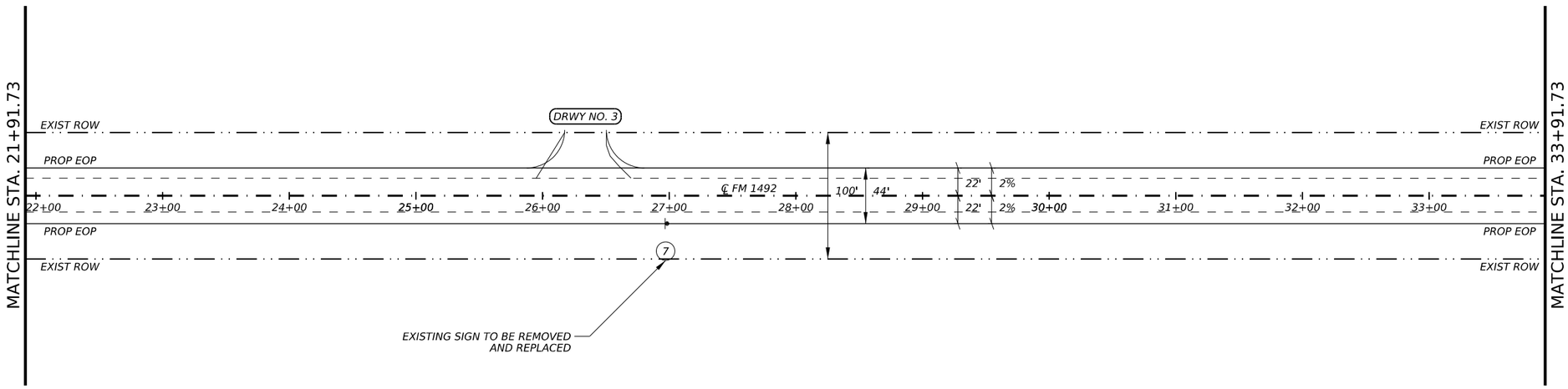

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- (#) EXIST. SIGN NO.
- [#] PERMITTED DRIVEWAY NO.
- (DRWY. NO. #) UNPERMITTED DRIVEWAY NO.
- [CR. NO.] COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 4 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		40

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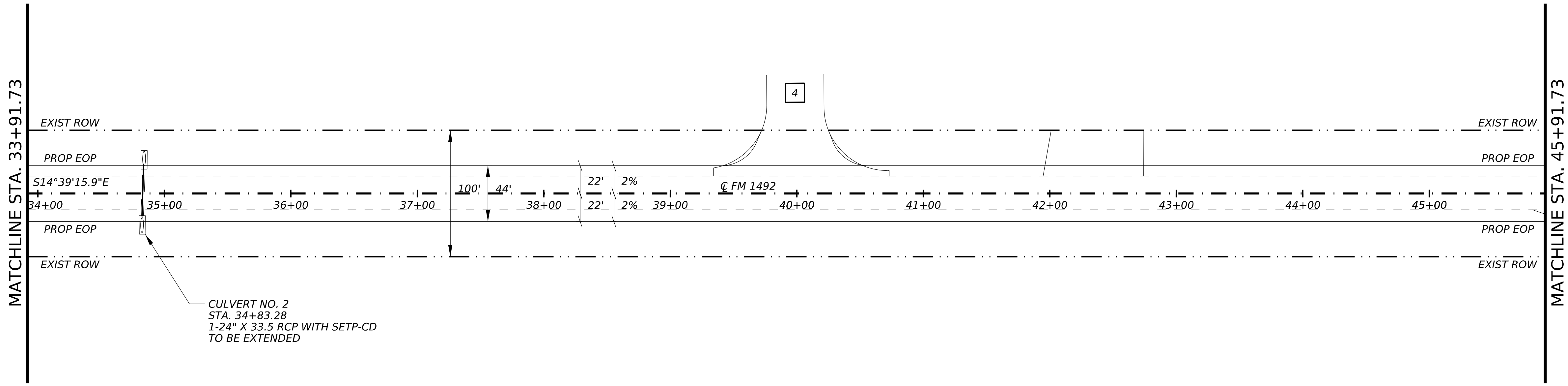

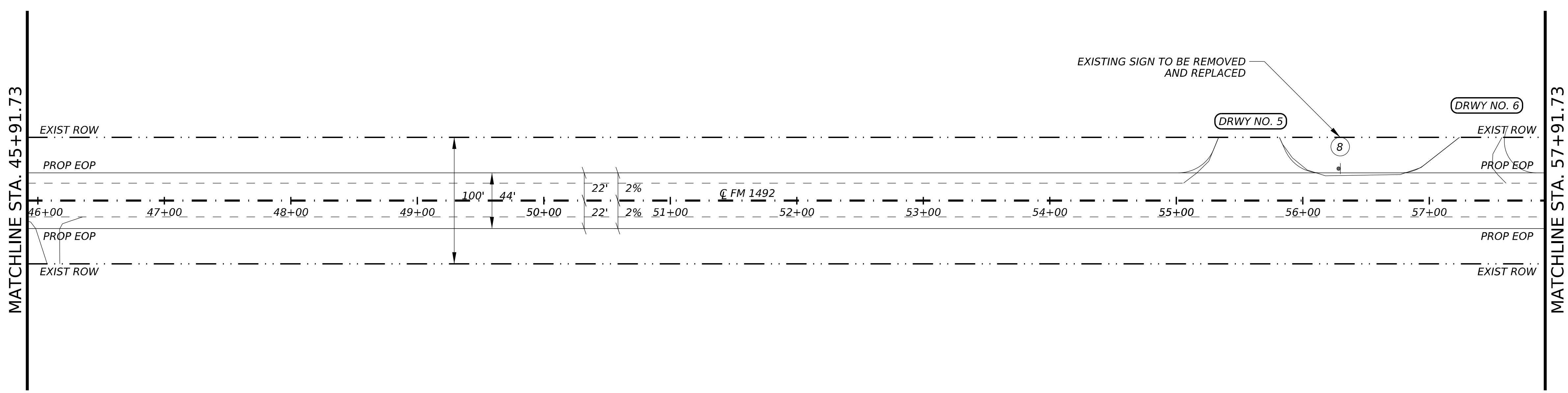

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- (#) EXIST. SIGN NO.
- [#] PERMITTED DRIVEWAY NO.
- (DRWY. NO. #) UNPERMITTED DRIVEWAY NO.
- [CR. NO.] COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 5 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		41

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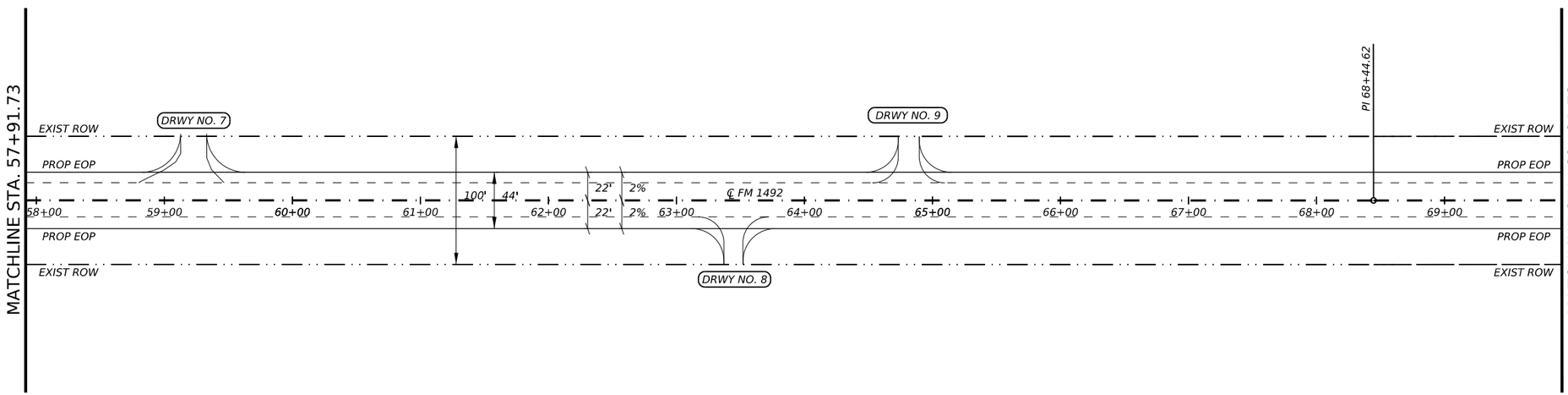

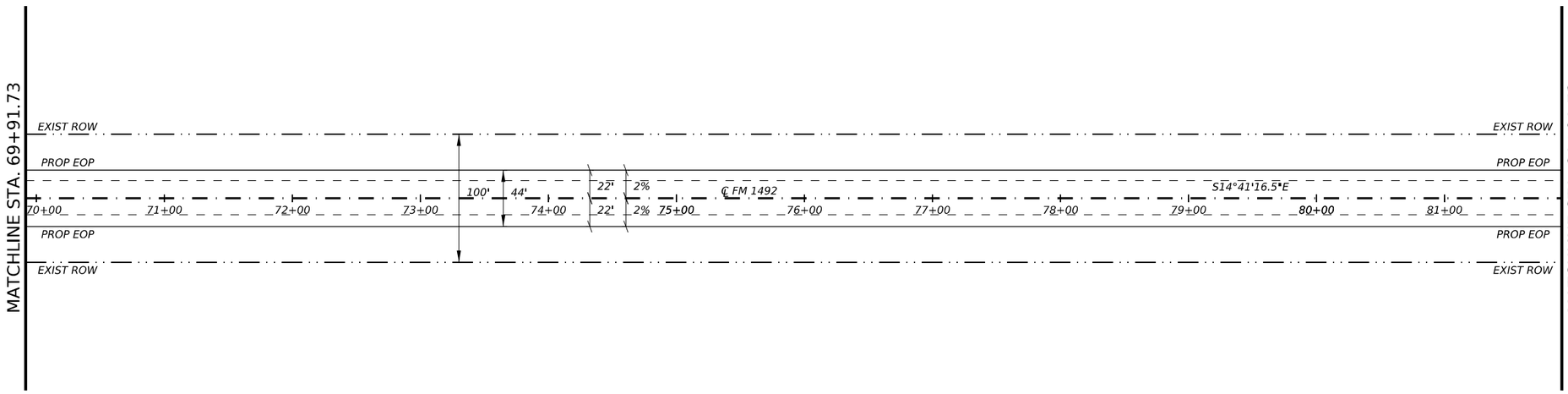

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 6 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		42

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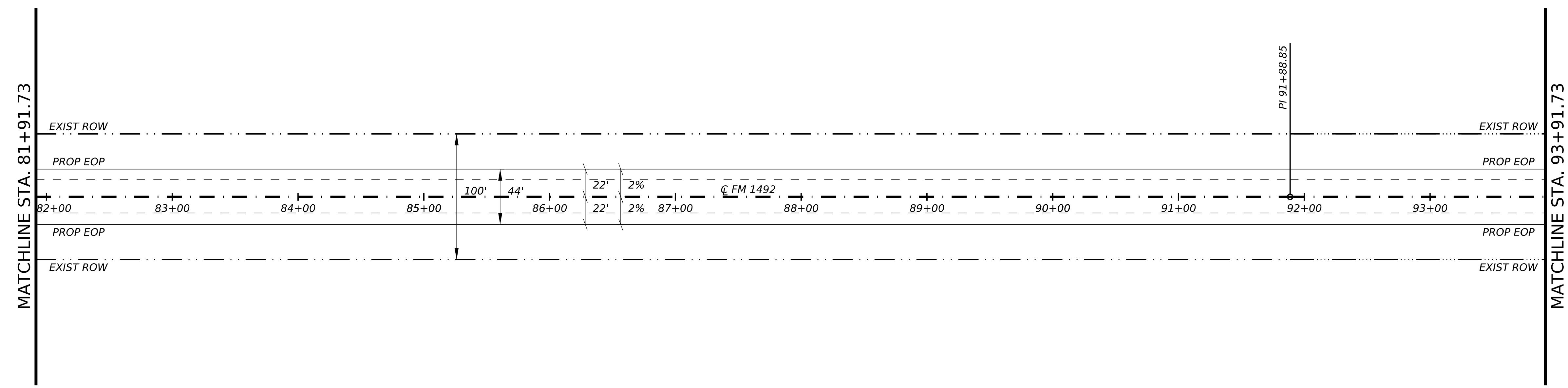

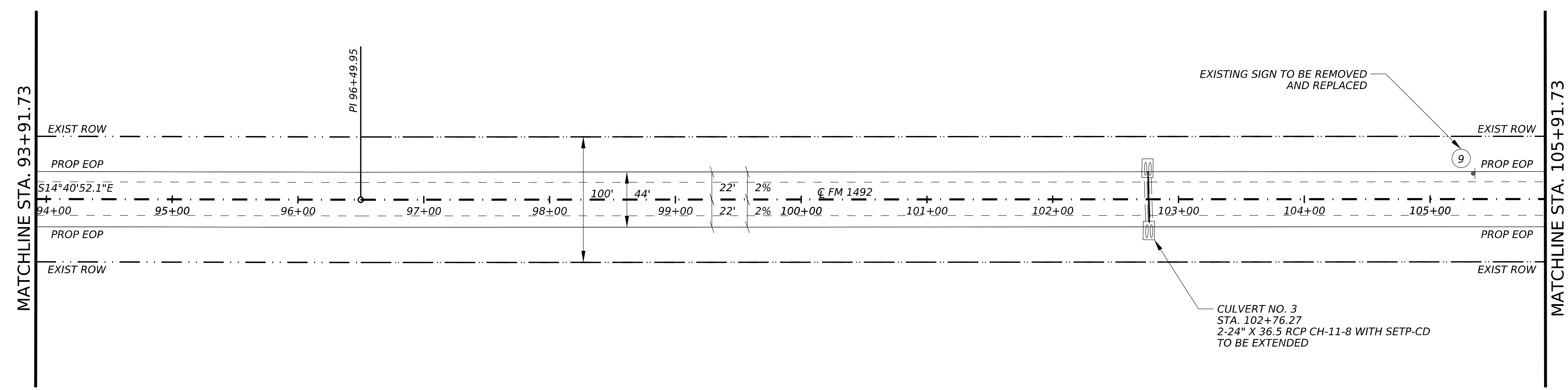

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 7 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		43

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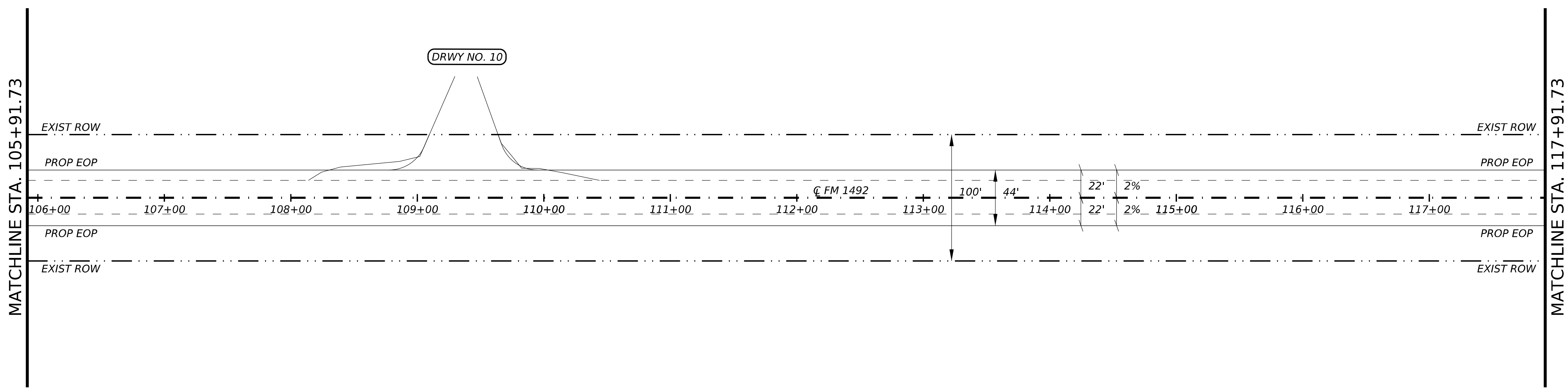

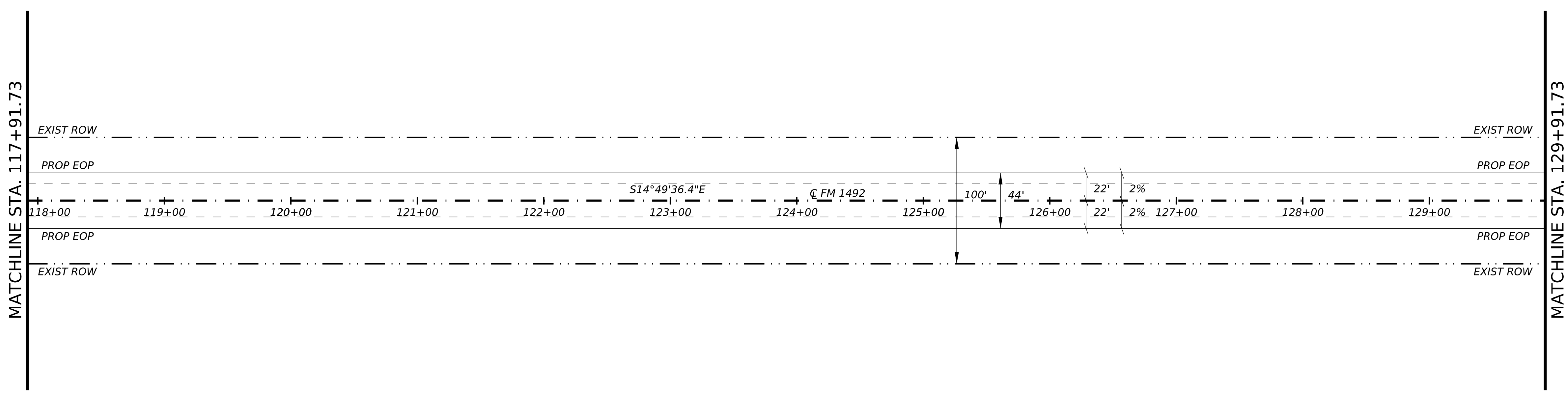

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 8 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		44

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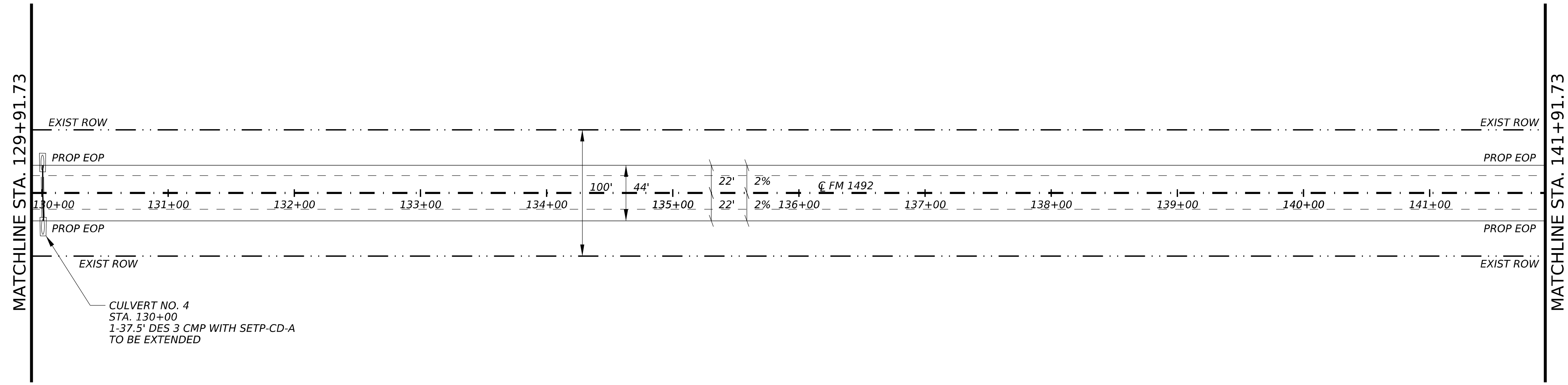
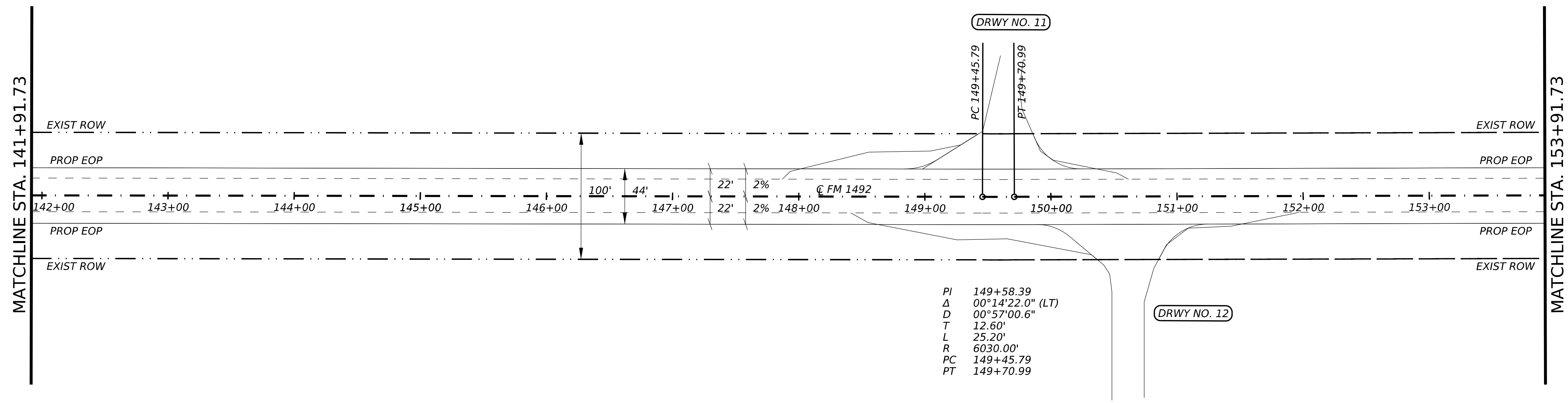


LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.



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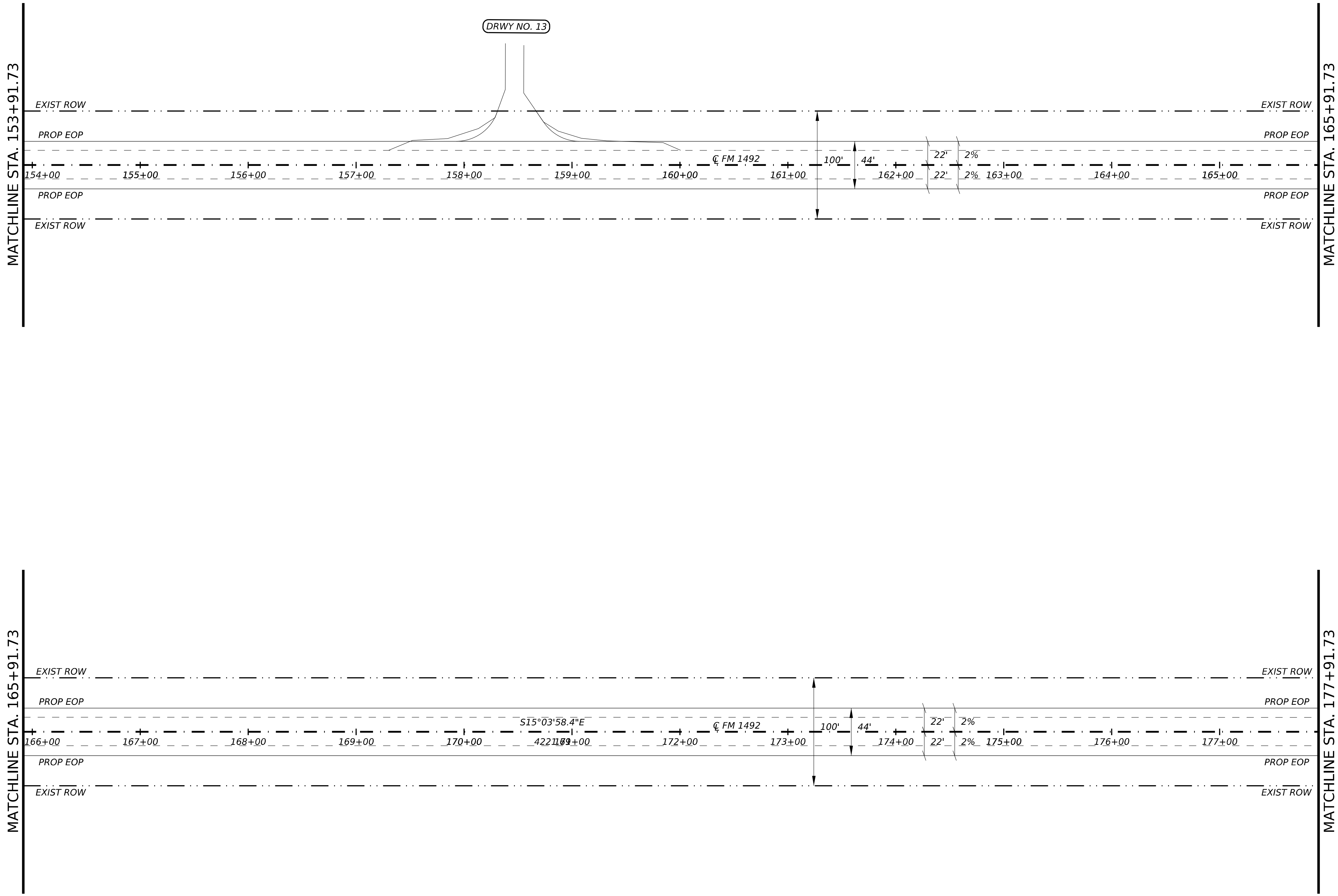
ROADWAY PLAN SHEETS

SHEET 9 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		45



LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 10 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	46

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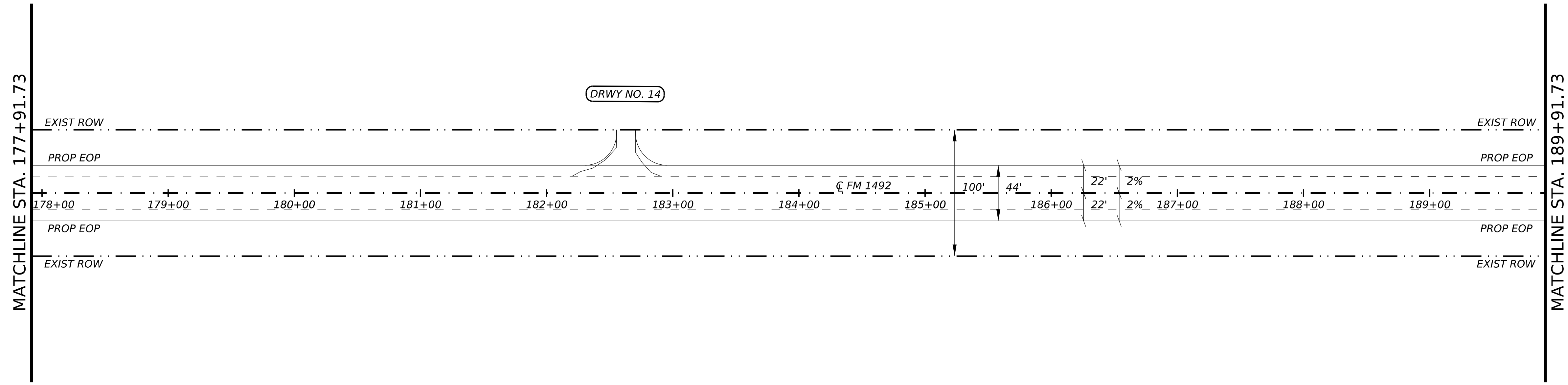
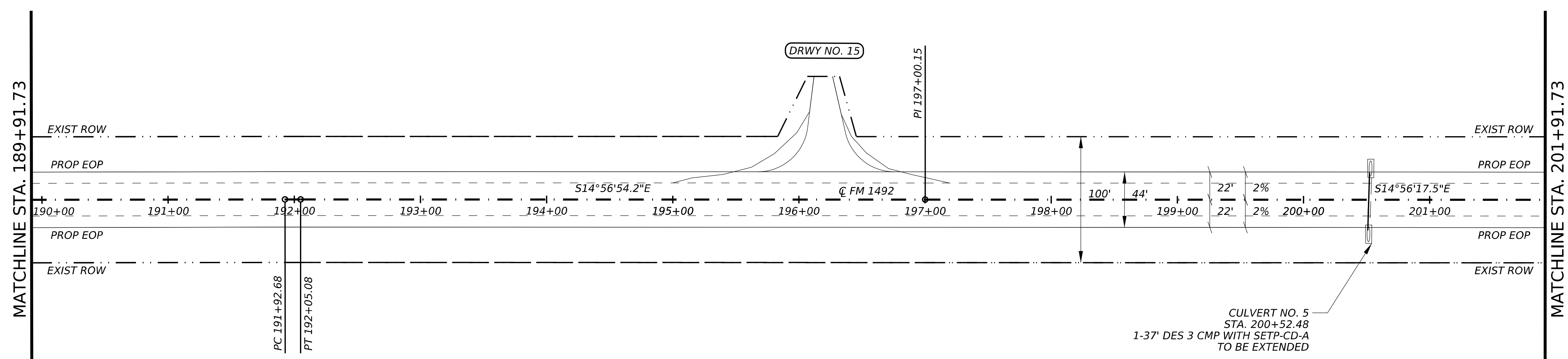
LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- UNPERMITTED DRIVEWAY NO.
- COUNTY RD. NO.





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L	12.40'
R	6030.00'
PC	191+92.68
PT	192+05.08

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ROADWAY PLAN SHEETS

SHEET 11 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		47

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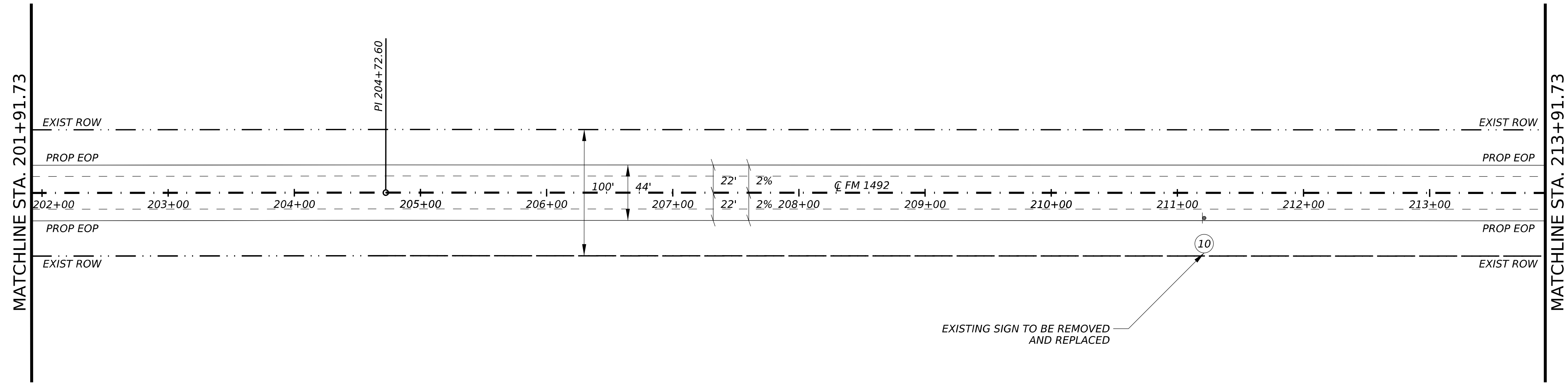

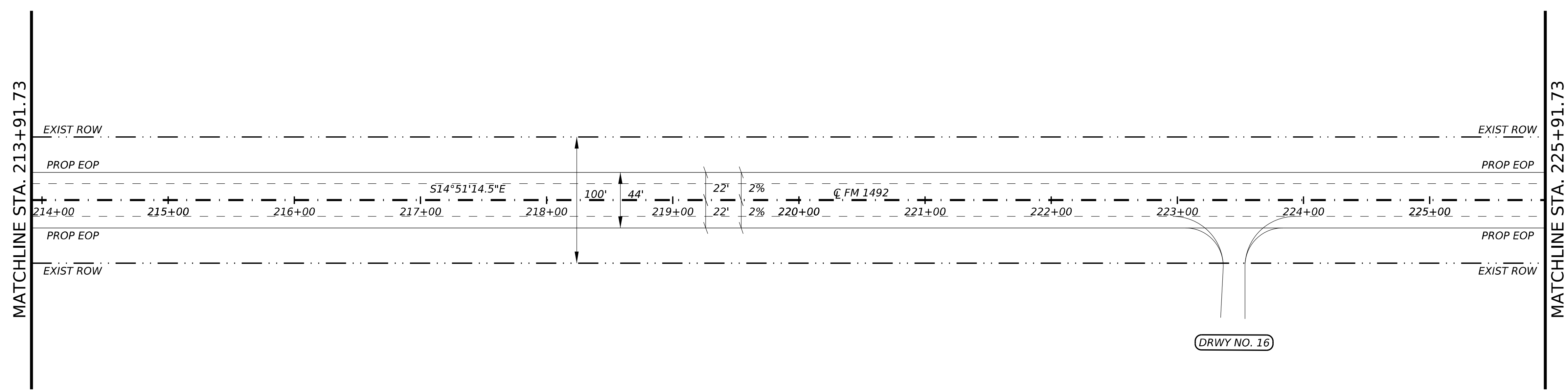

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 12 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		48

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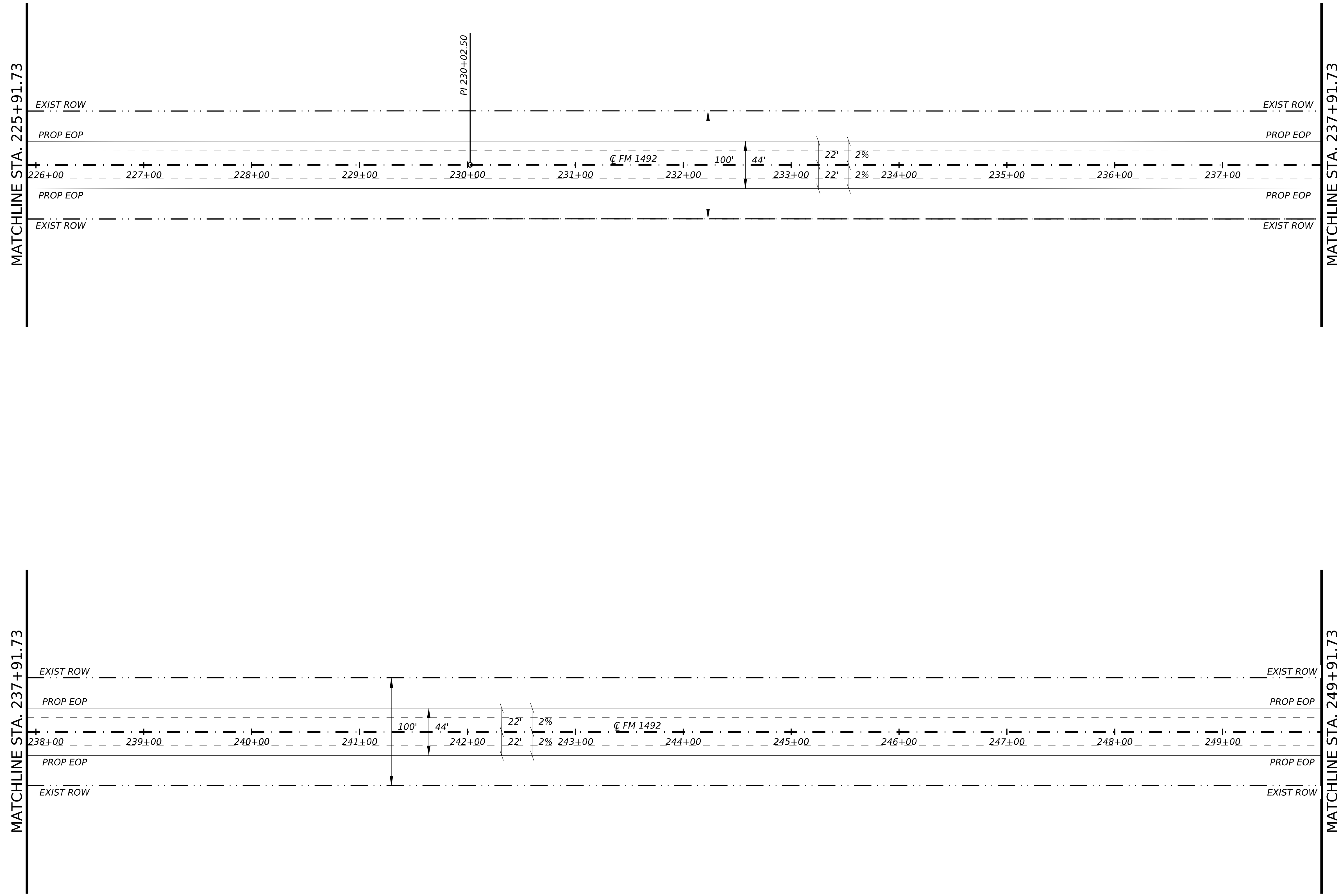

LEGEND

PROP. FM 1492 ₵

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

EXIST. SIGN

EXIST. SIGN NO.

PERMITTED DRIVEWAY NO.

DRWY. NO. # — UNPERMITTED DRIVEWAY NO.

CR. NO. — COUNTY RD. NO.

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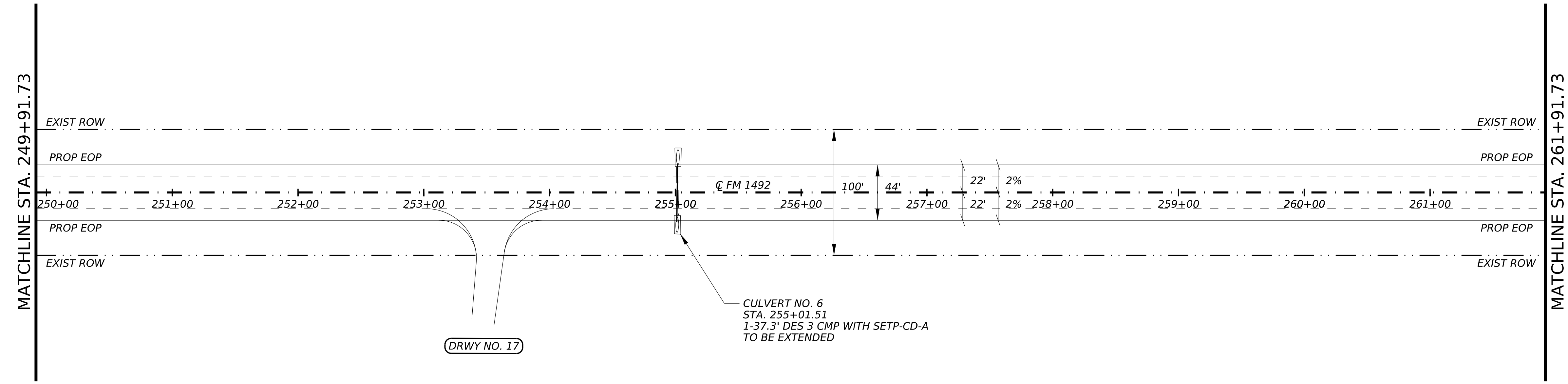
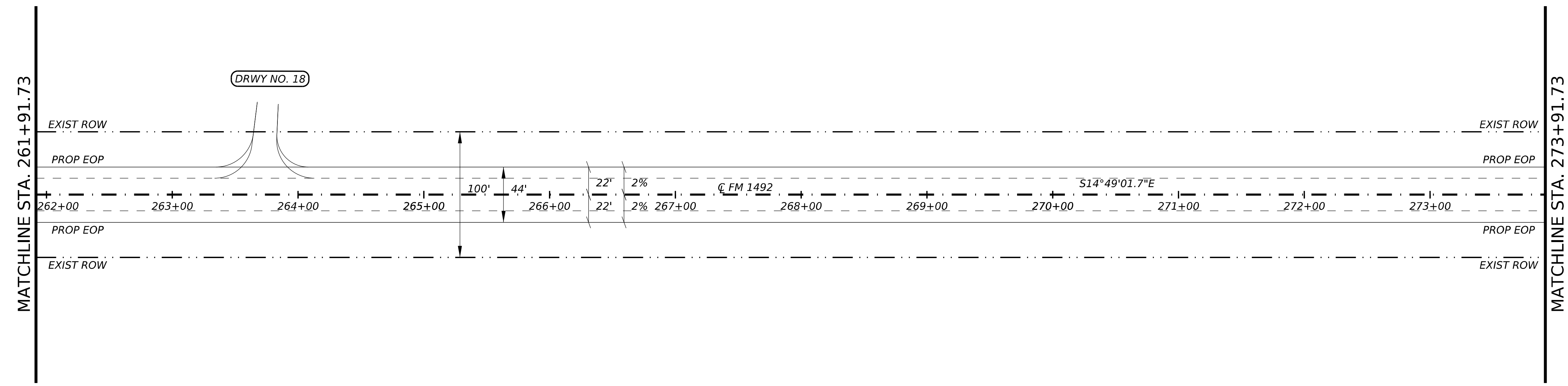
ROADWAY PLAN SHEETS

SHEET 13 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		49





LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET14 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		50

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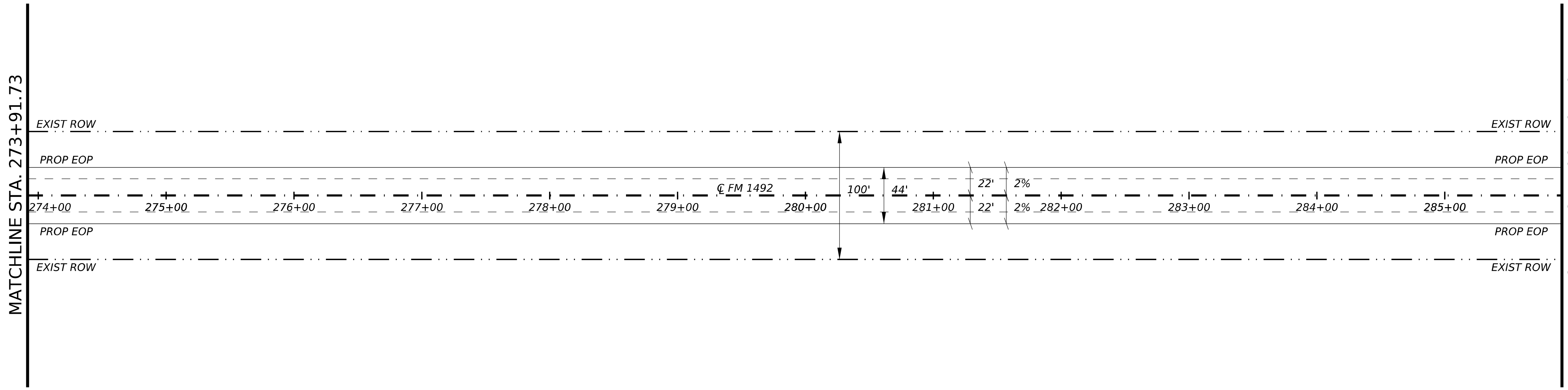

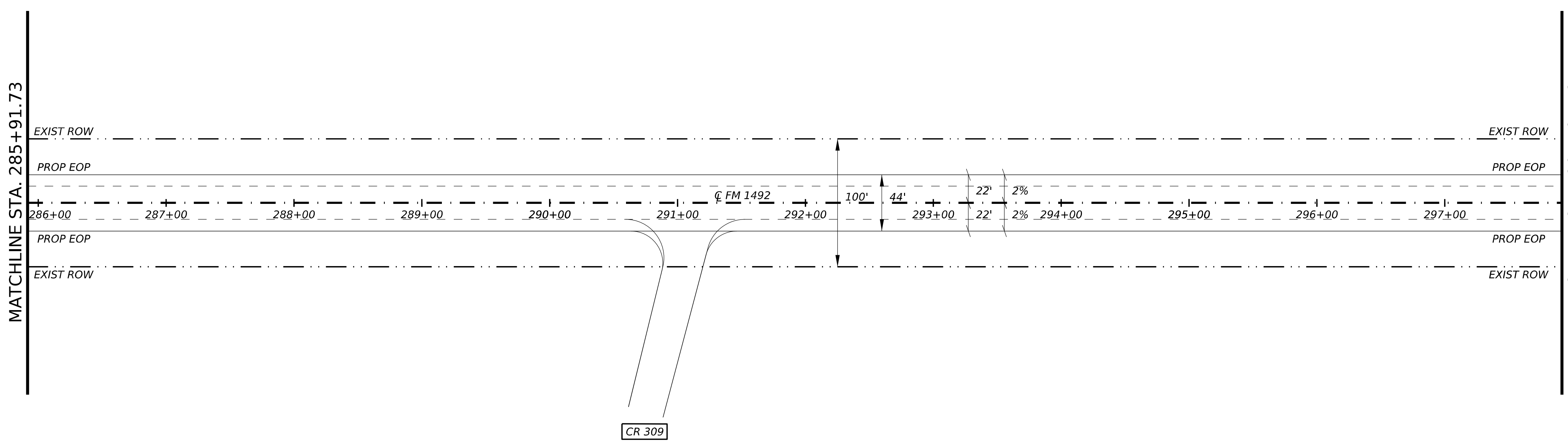

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 15 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		51

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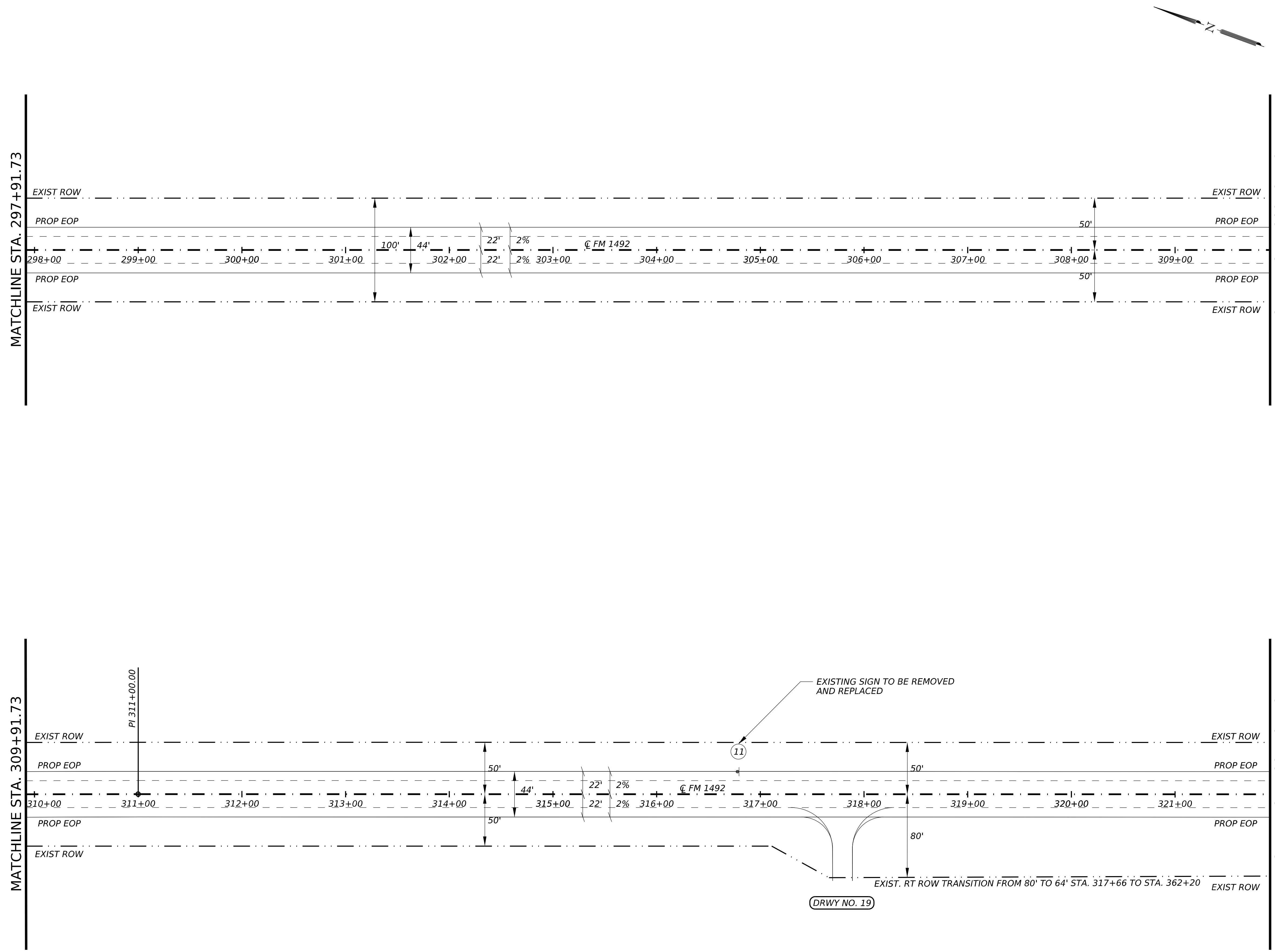

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET16 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		52

DATE: $DATE$ 03/31/2022
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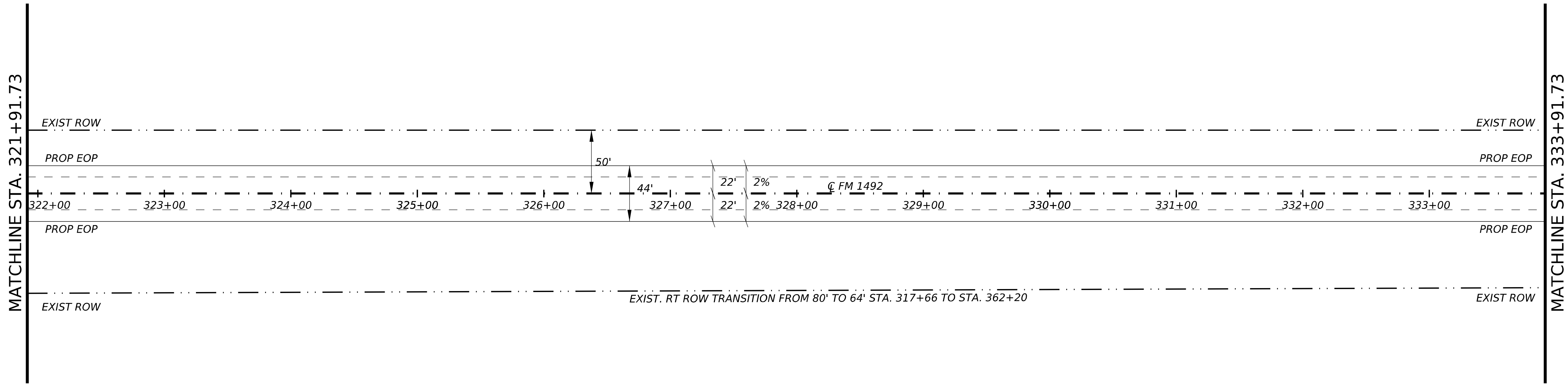

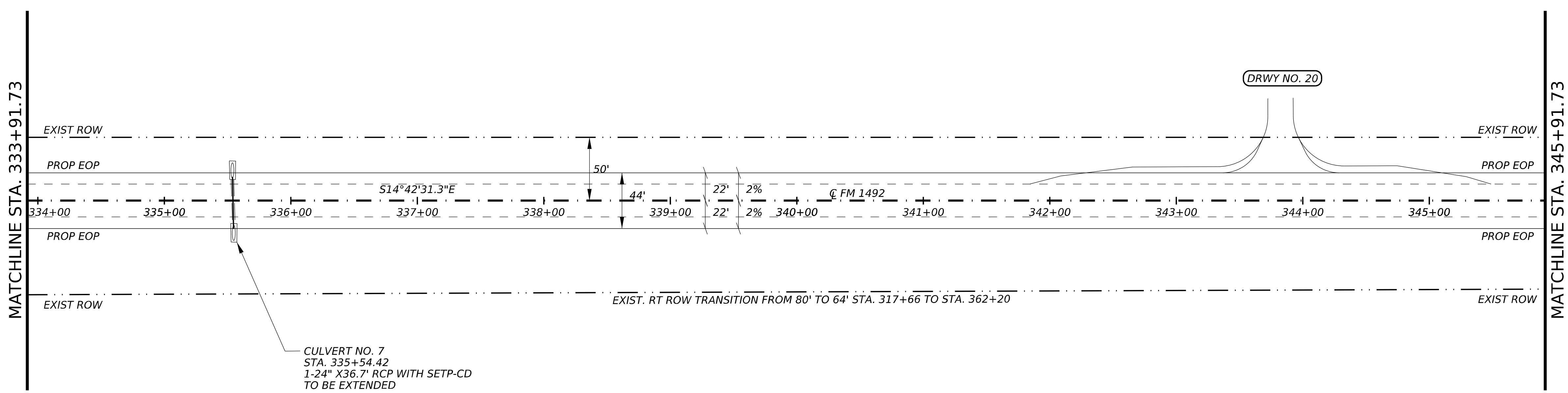

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET17 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		53

DATE: $DATE$ 03/11/2022
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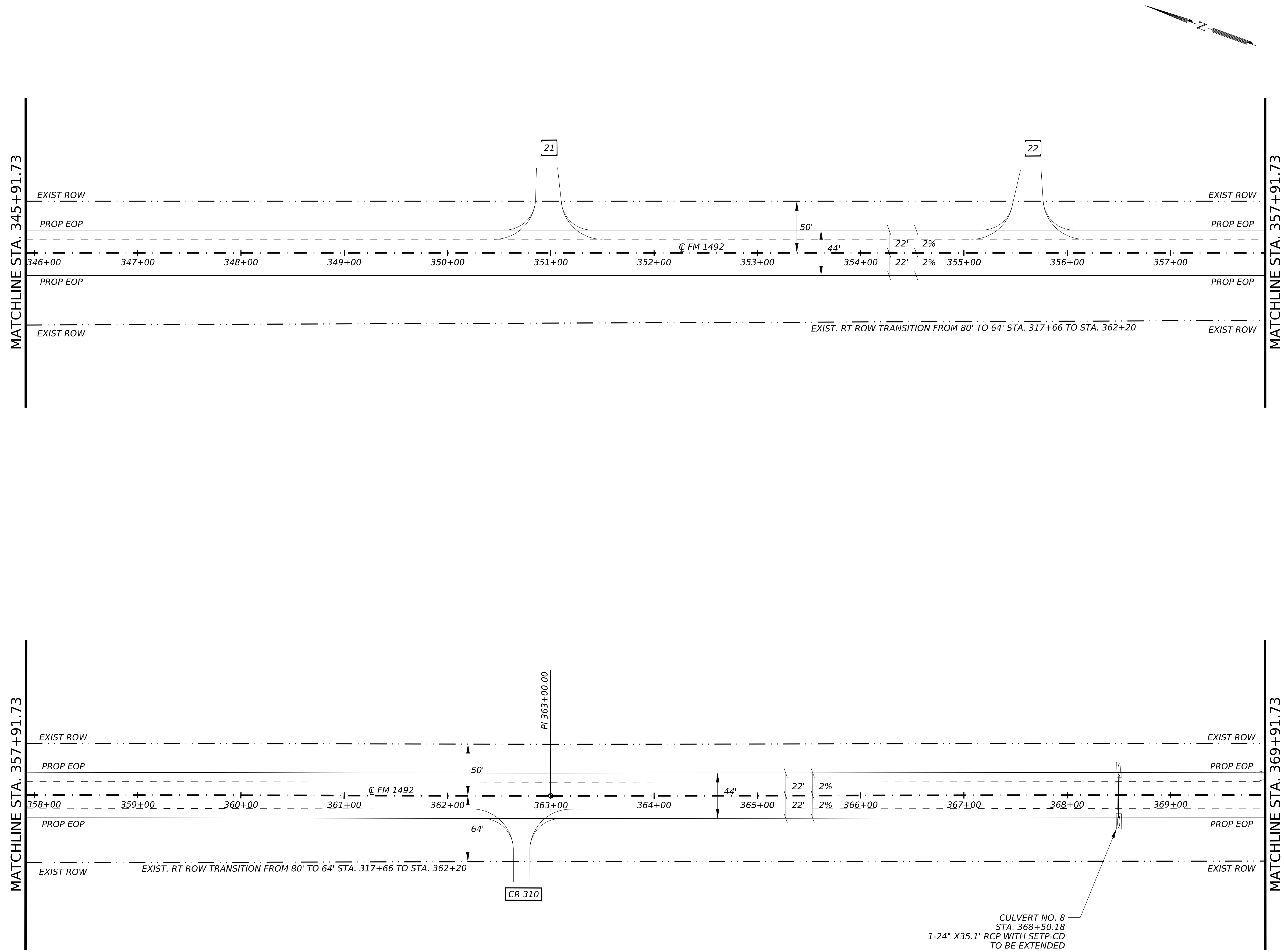

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

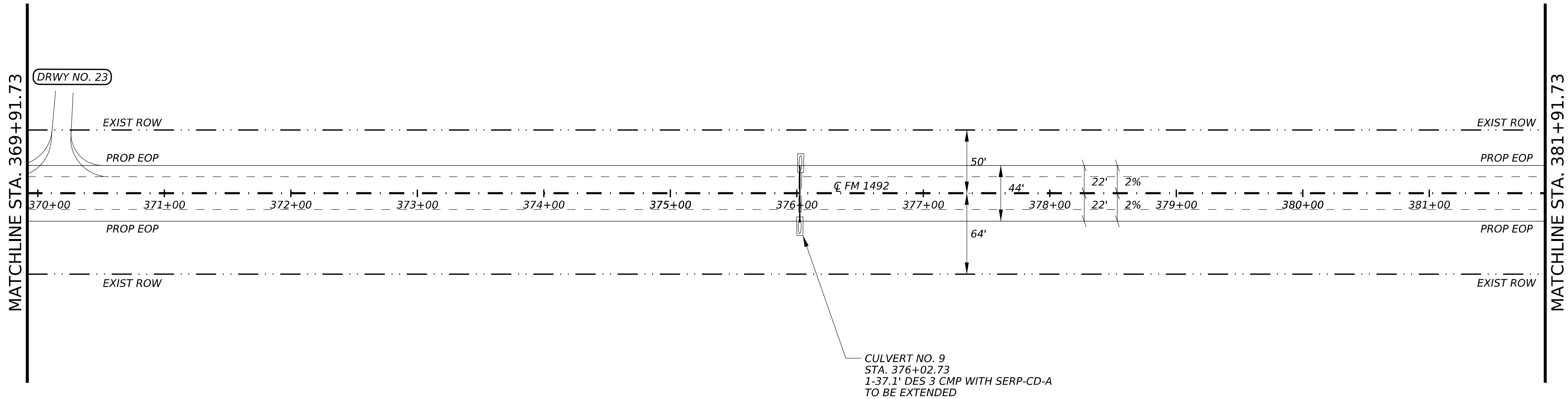
SHEET18 OF 40

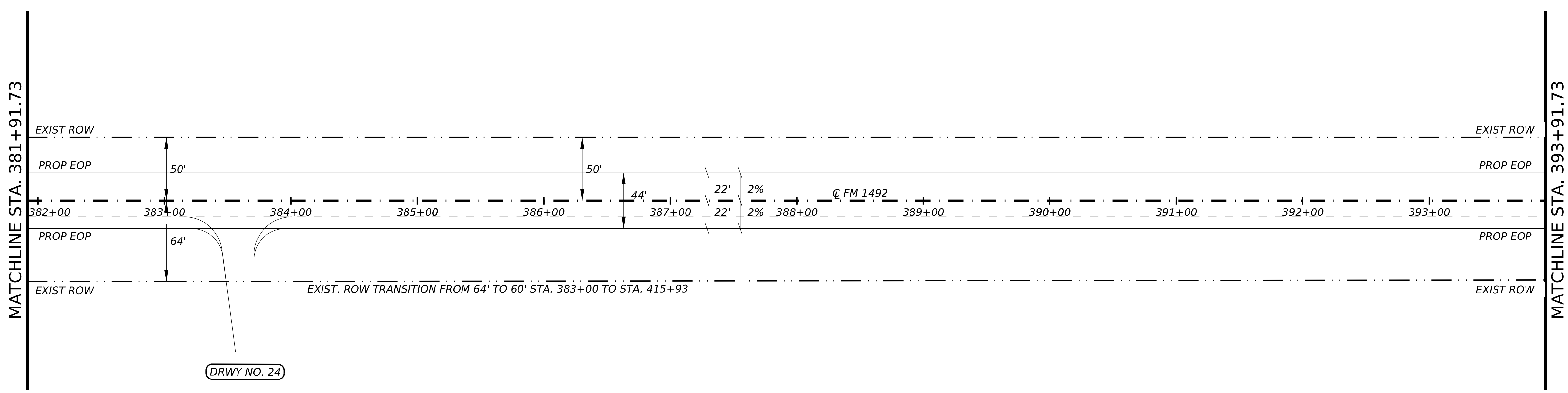
CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		54

DATE: $DATE$ 10/3/2022
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\1. Roadway\FM1492_UPT_15.dgn

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.





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ROADWAY PLAN SHEETS

SHEET 19 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		55

DATE: $DATE$ 03/31/2022
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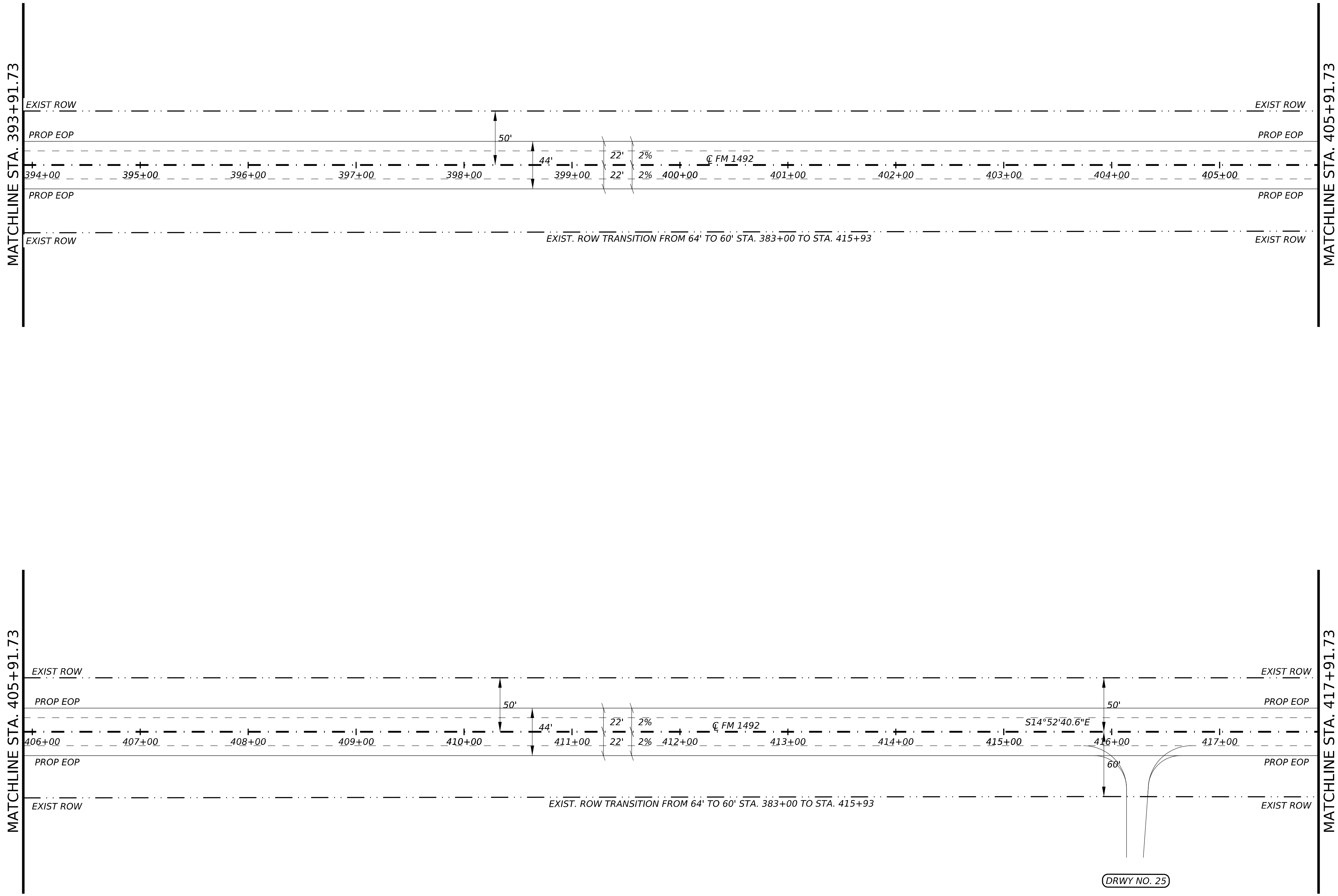

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- # PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 20 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		56

DATE: $DATE$ 03/18/2022
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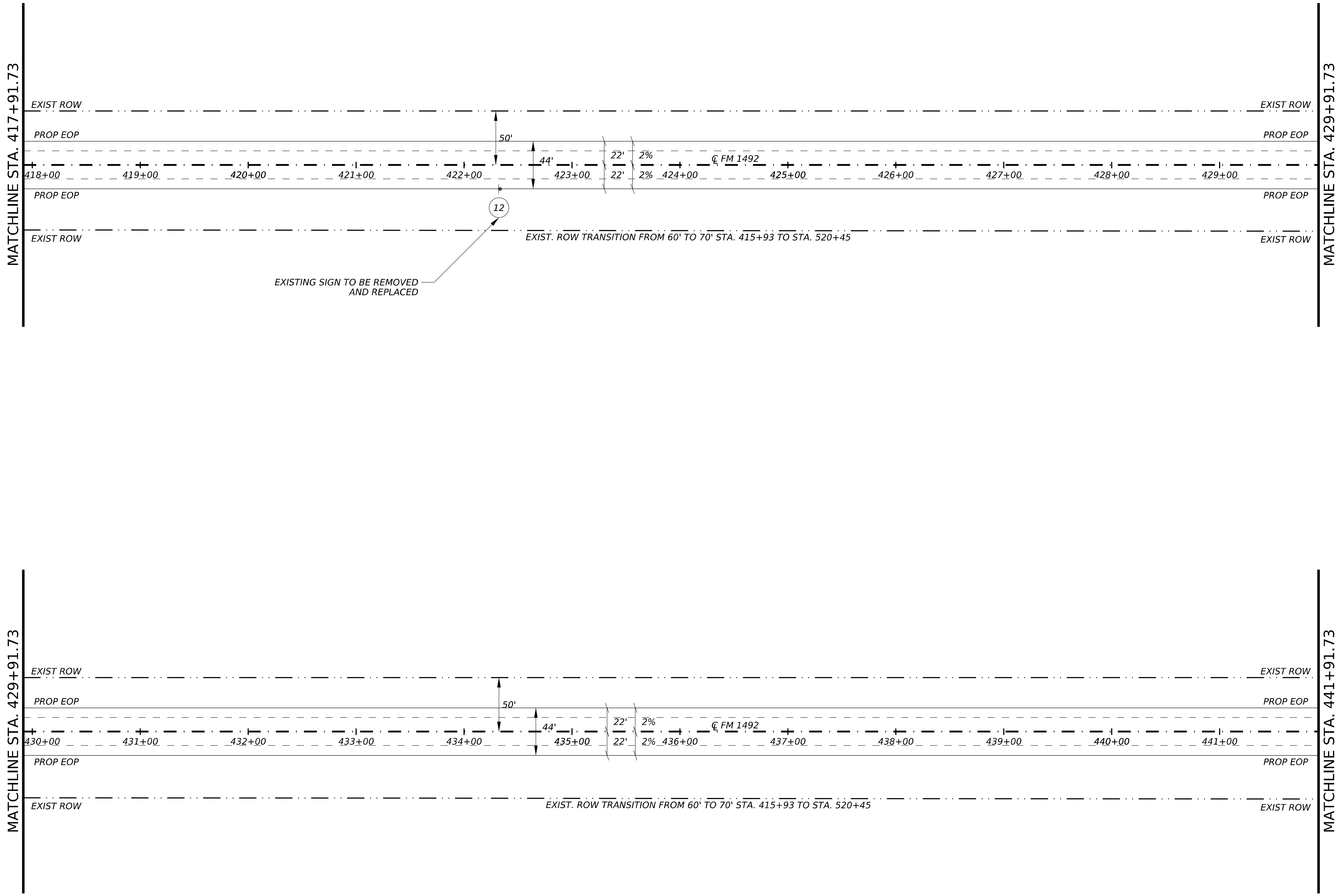

LEGEND

— · — · —	PROP. FM 1492 ℄
— · · — · ·	EXIST. ROW
- - - - -	EXIST. EOP
⬡	EXIST. SOLAR SERVICE PANEL
	EXIST. RFBA
	EXIST. SIGN
(#)	EXIST. SIGN NO.
[#]	PERMITTED DRIVEWAY NO.
DRWY. NO. #	UNPERMITTED DRIVEWAY NO.
CR. NO.	COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 21 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		57

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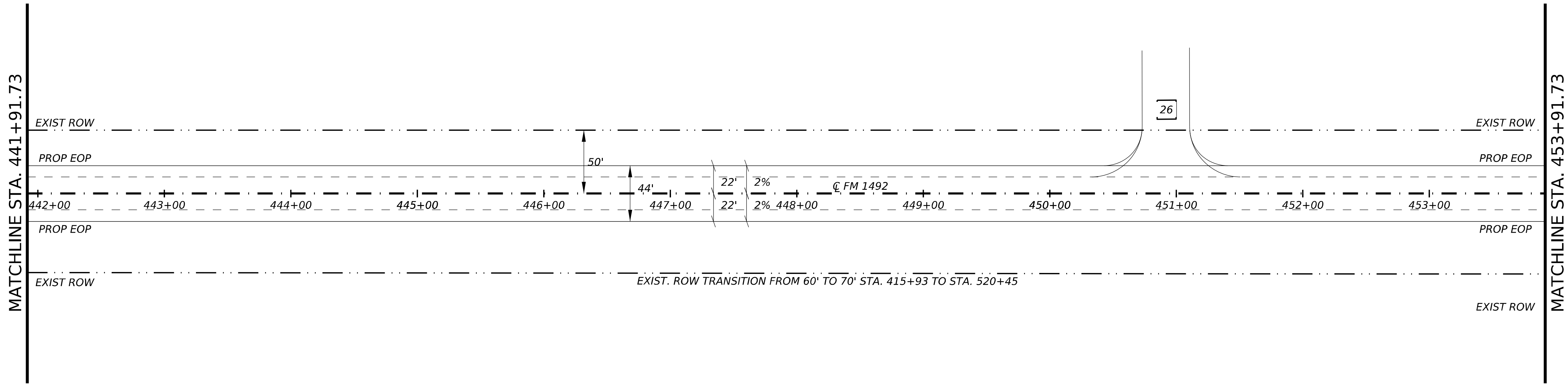

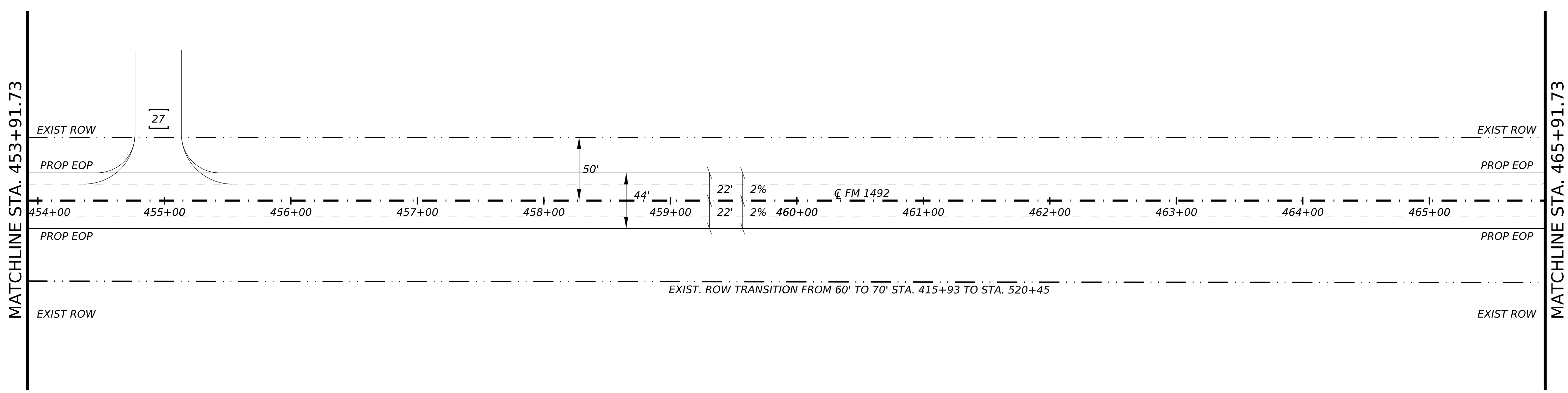

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO. (#)
- PERMITTED DRIVEWAY NO. [#]
- UNPERMITTED DRIVEWAY NO. (DRWY. NO. #)
- COUNTY RD. NO. (CR. NO.)

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ROADWAY PLAN SHEETS

SHEET 22 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		58

DATE: $DATE$ 03/31/2022
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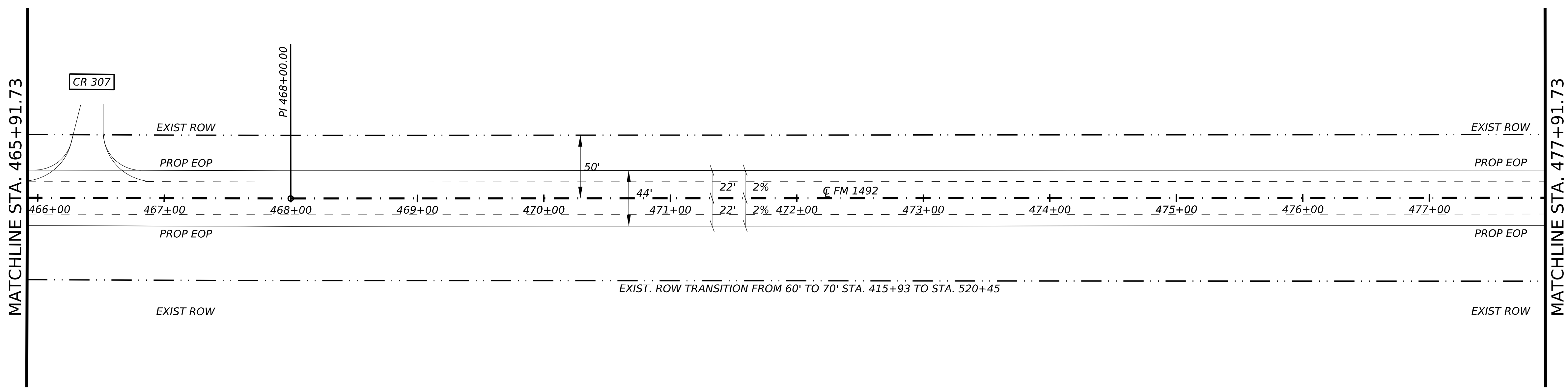

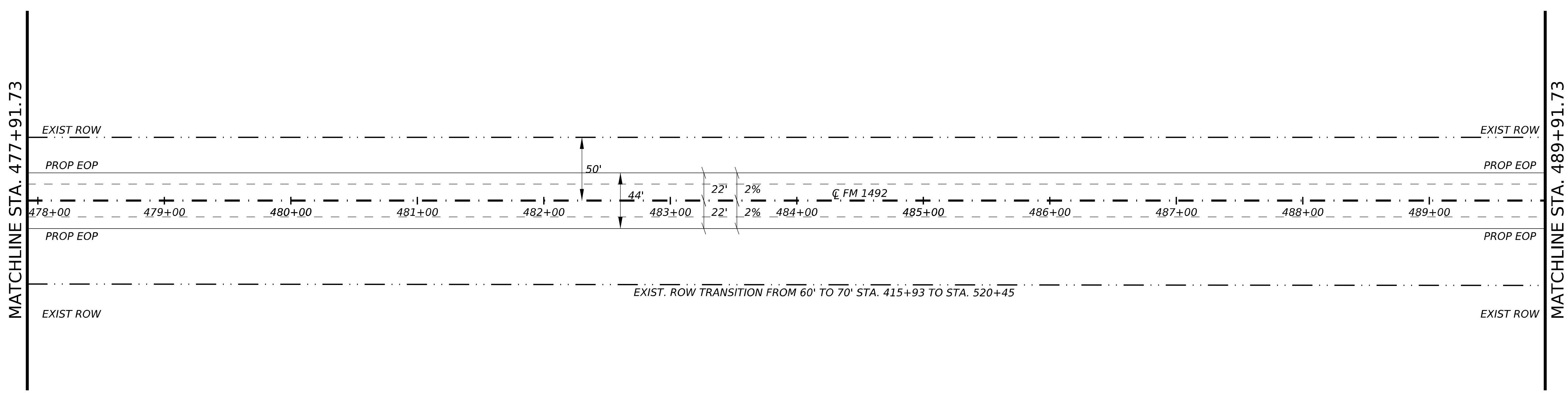

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 23 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		59

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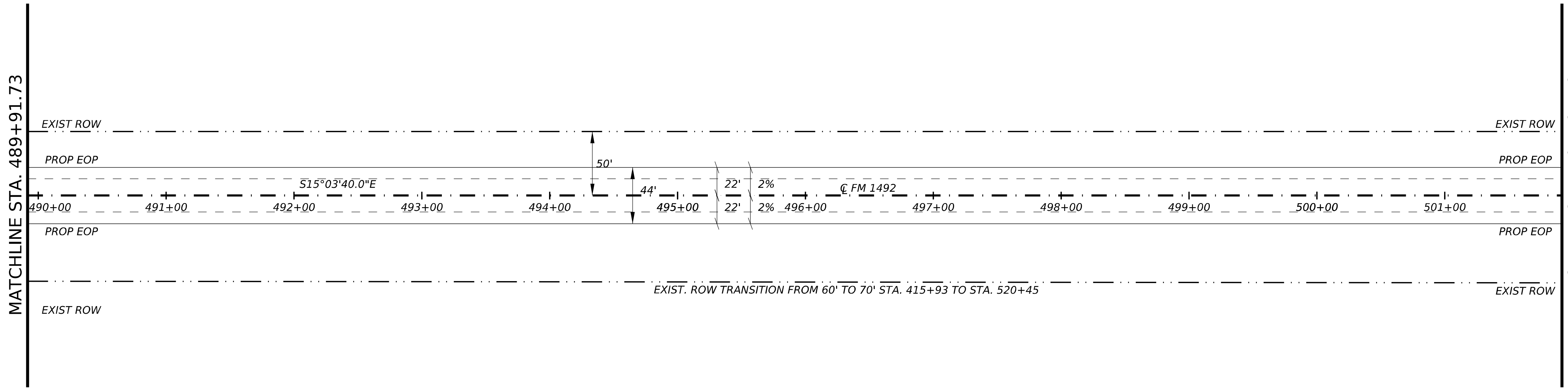

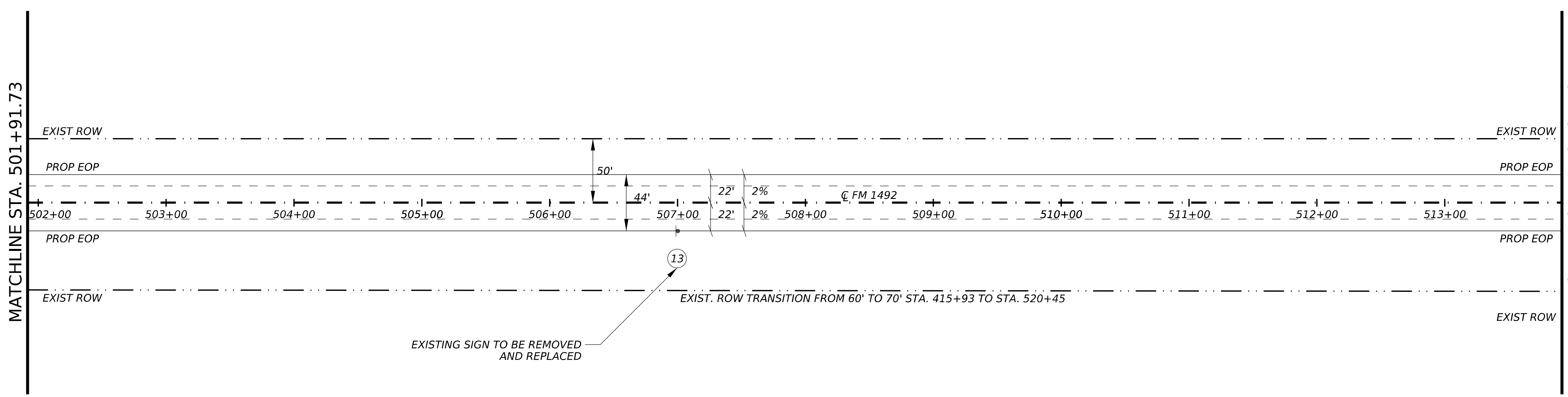

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- (#) EXIST. SIGN NO.
- [#] PERMITTED DRIVEWAY NO.
- (DRWY. NO. #) UNPERMITTED DRIVEWAY NO.
- [CR. NO.] COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 24 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	60

DATE: $DATE$ 10/4/2022
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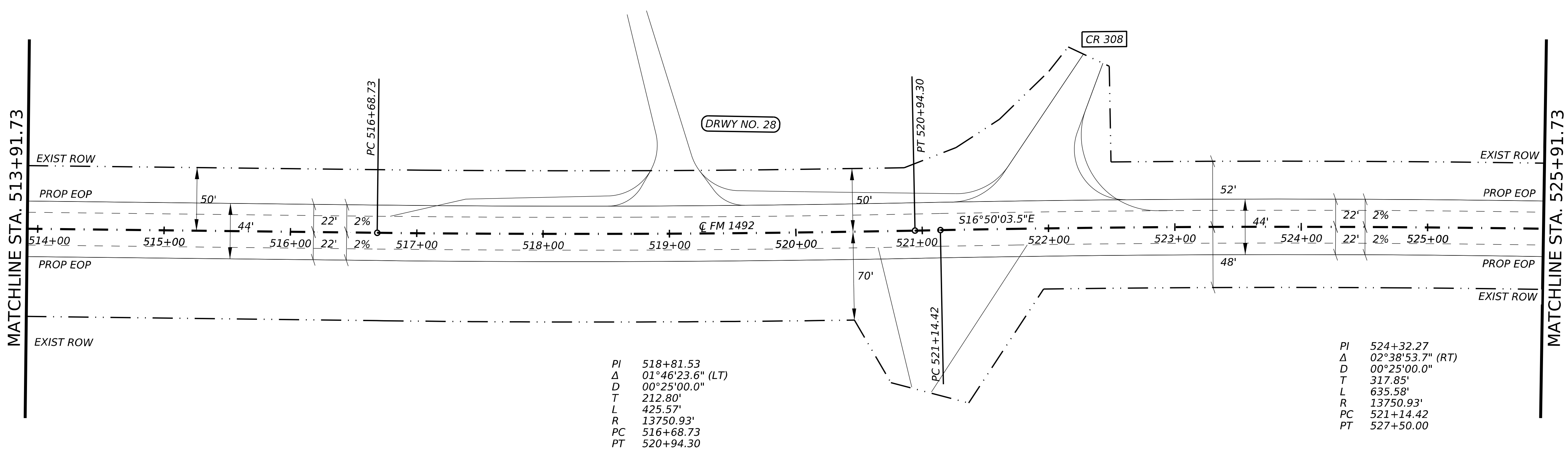

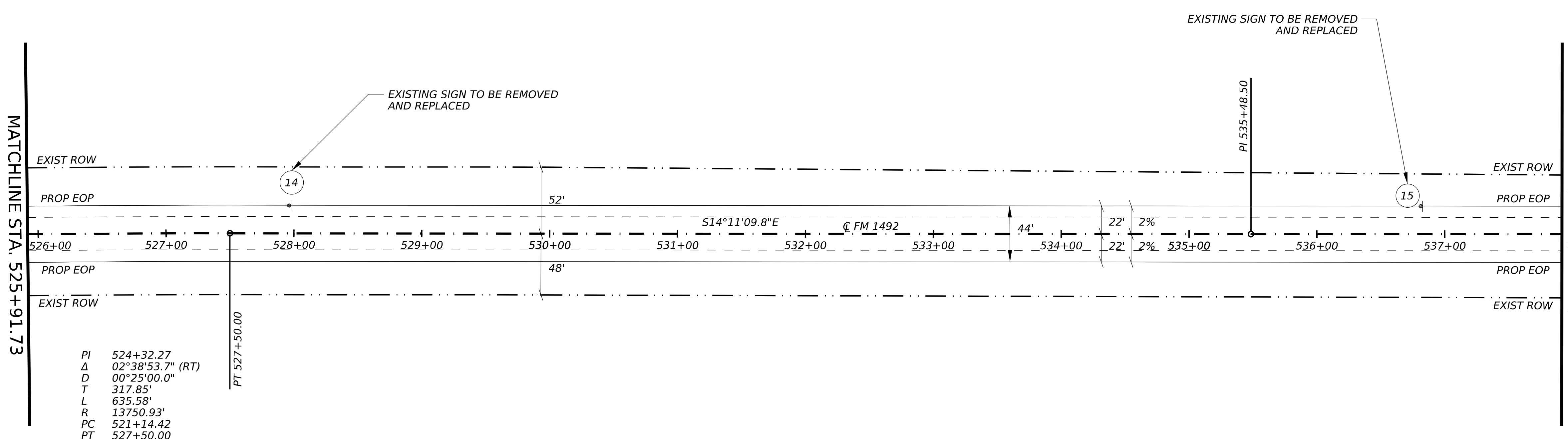

LEGEND

Symbol	Description
— · —	PROP. FM 1492 ℄
— · · —	EXIST. ROW
- - -	EXIST. EOP
⬡	EXIST. SOLAR SERVICE PANEL
	EXIST. RFBA
	EXIST. SIGN
# (circled)	EXIST. SIGN NO.
# (boxed)	PERMITTED DRIVEWAY NO.
DRWY. NO. #	UNPERMITTED DRIVEWAY NO.
CR. NO.	COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 25 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		61

DATE: $DATE$ 04/21/2022
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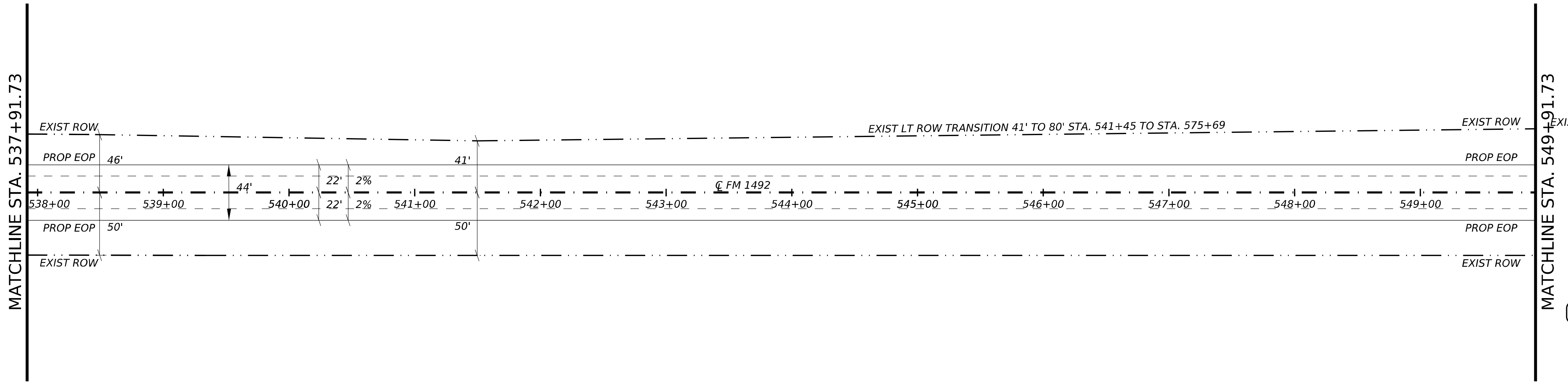
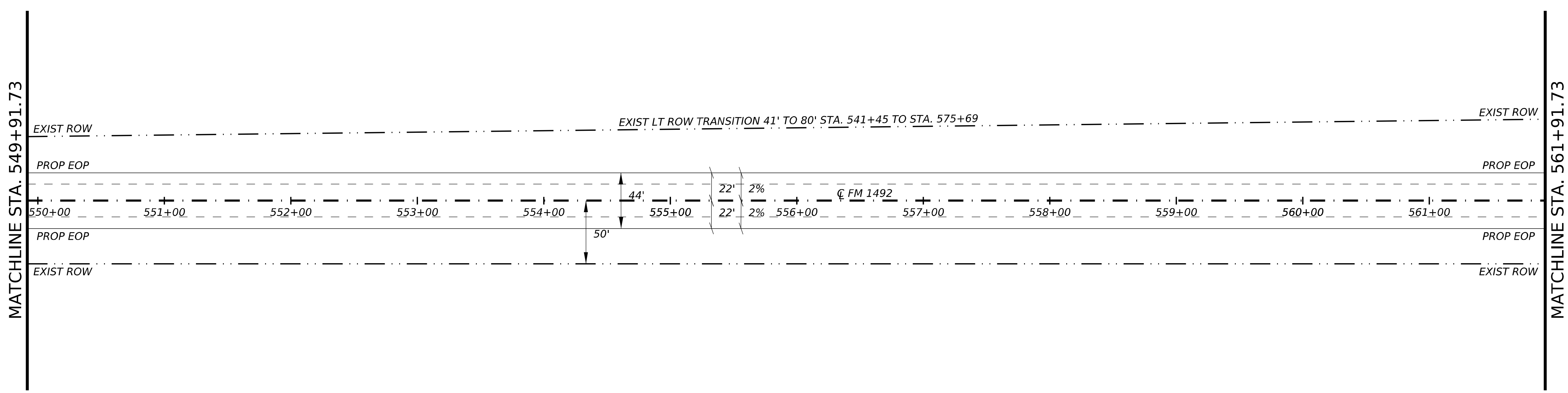
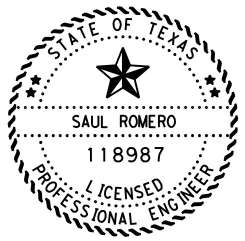




LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.



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ROADWAY PLAN SHEETS

SHEET 26 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		62

DATE: 10/31/2022 04/...
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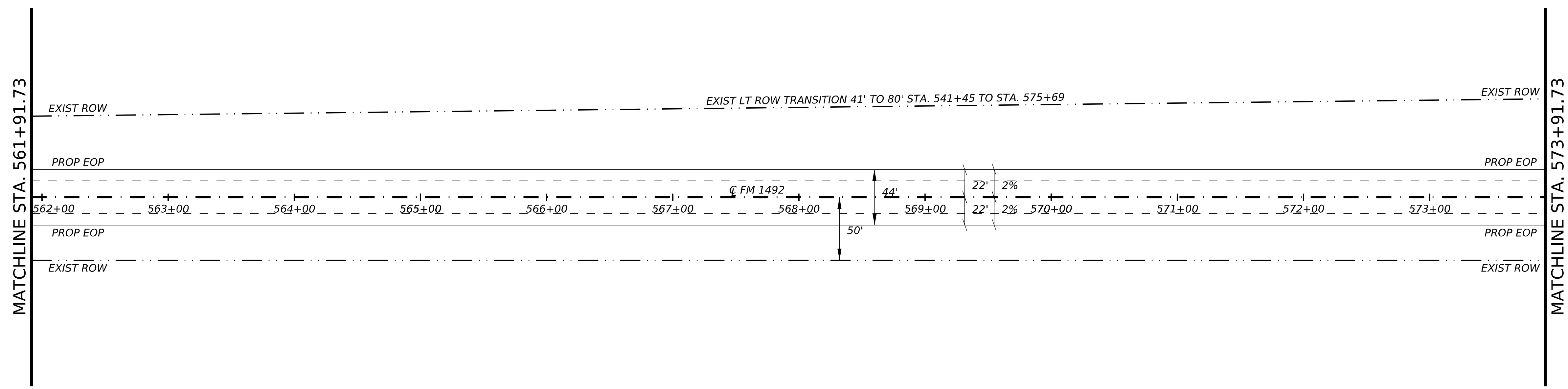

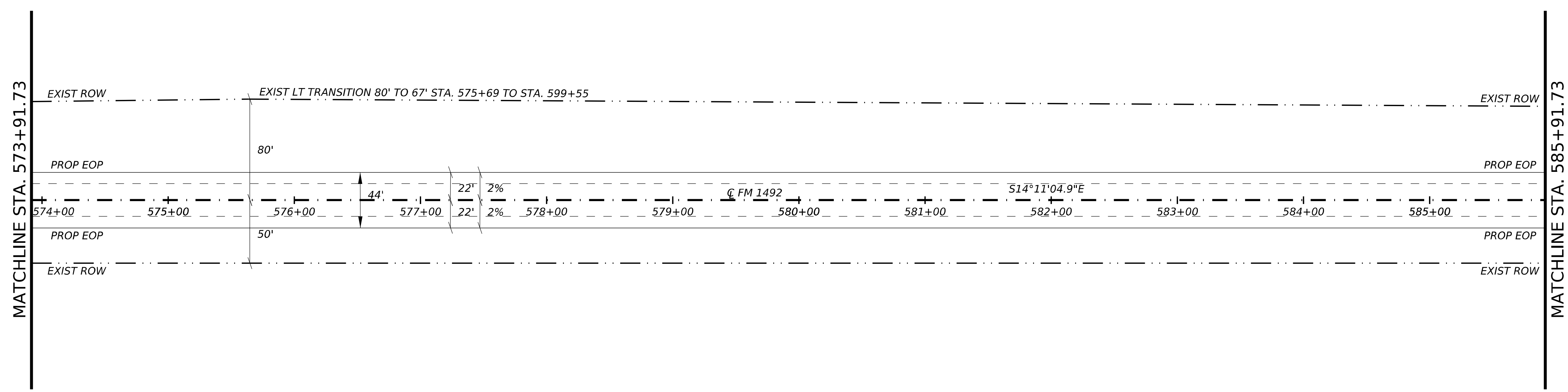

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 27 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		63

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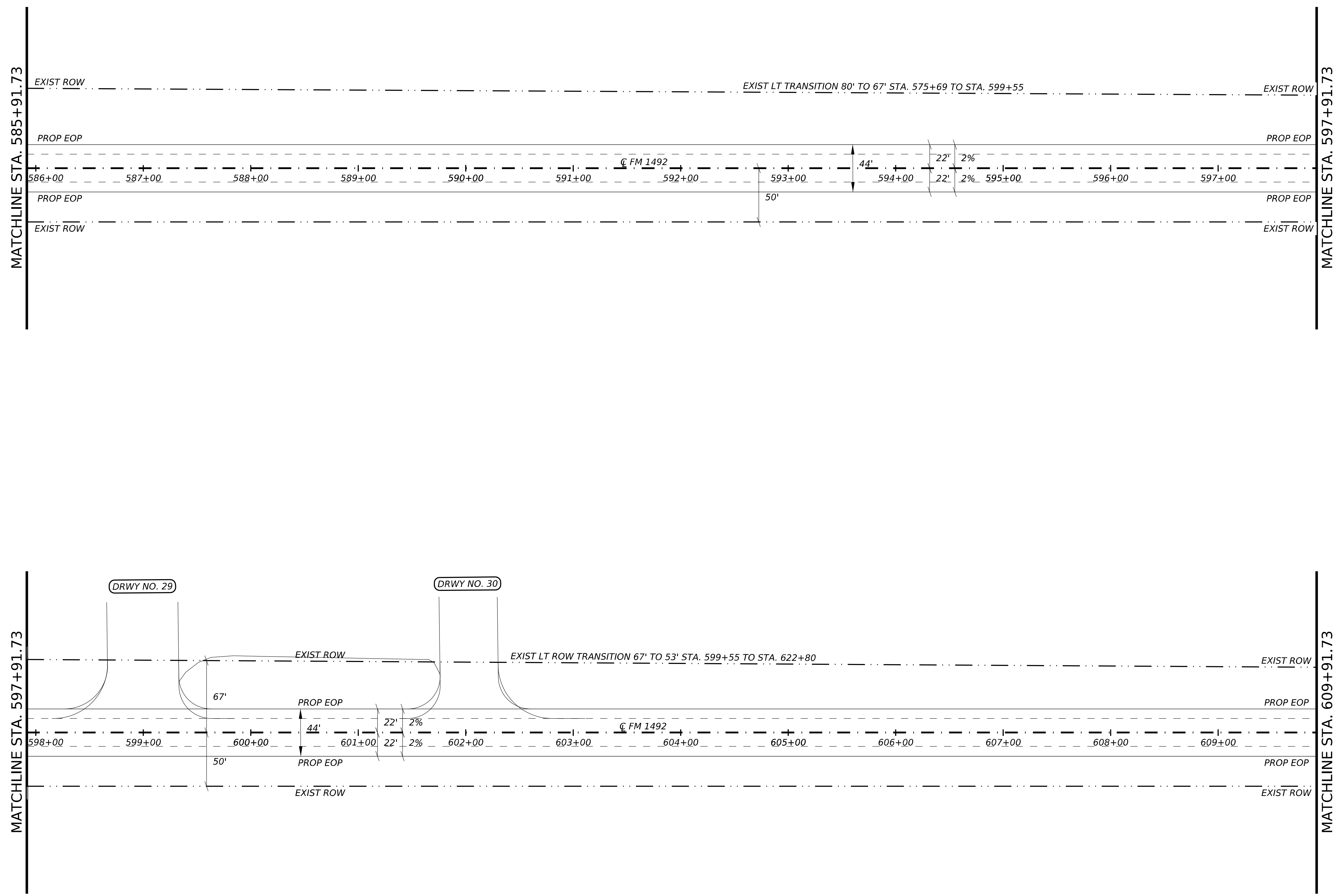

LEGEND

- PROP. FM 1492 ℄
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- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

STATE OF TEXAS
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ROADWAY PLAN SHEETS

SHEET 28 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		64

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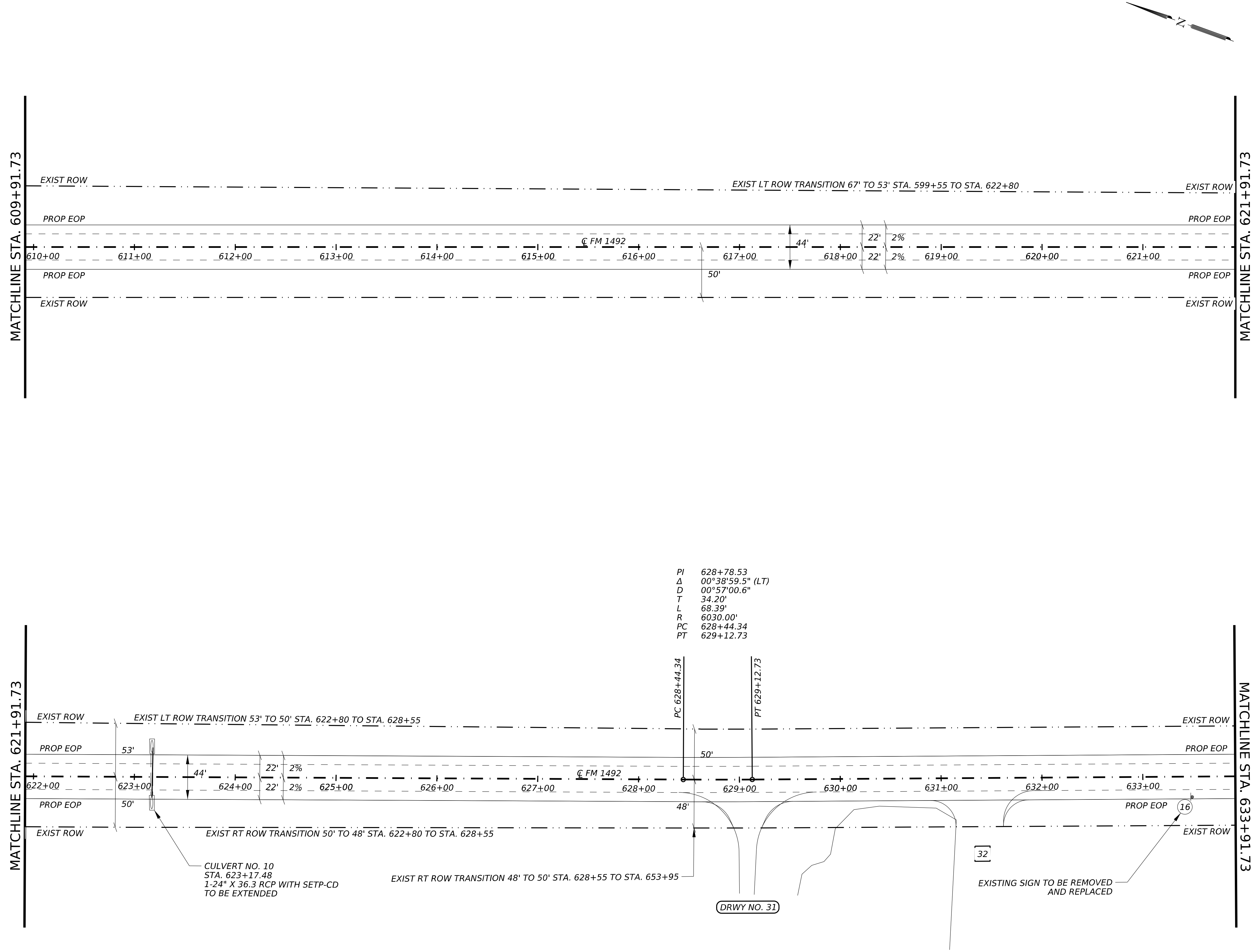

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- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- # PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 29 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		65

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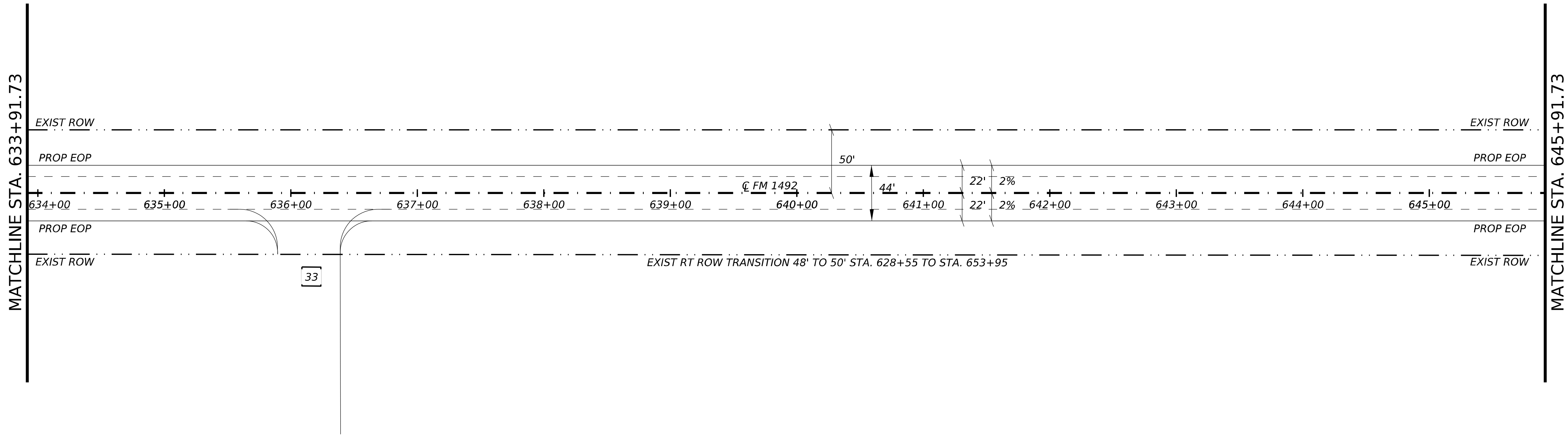

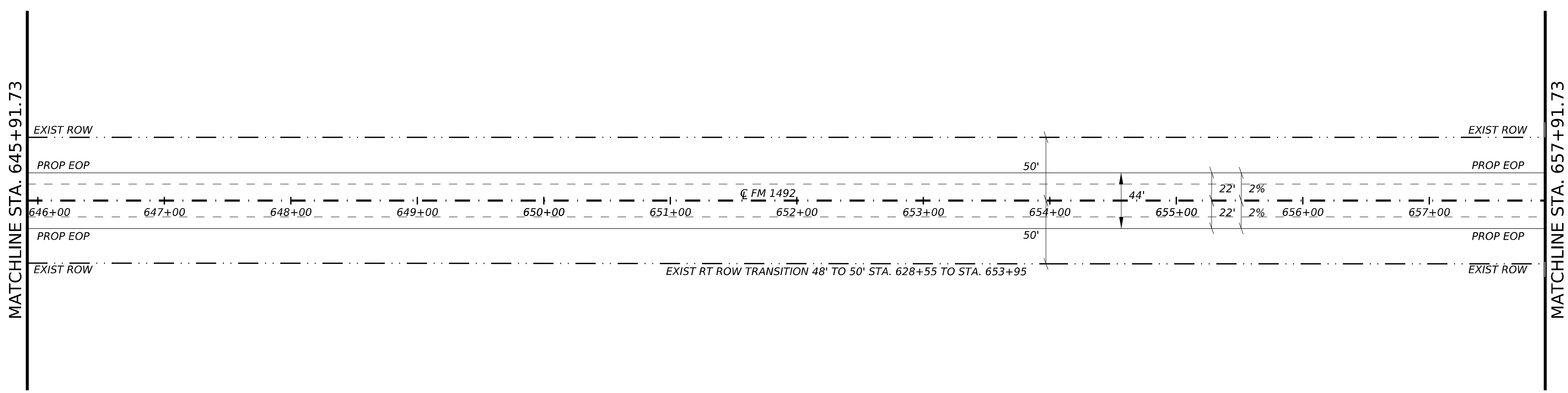

LEGEND

- PROP. FM 1492 ℄
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- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 30 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		66

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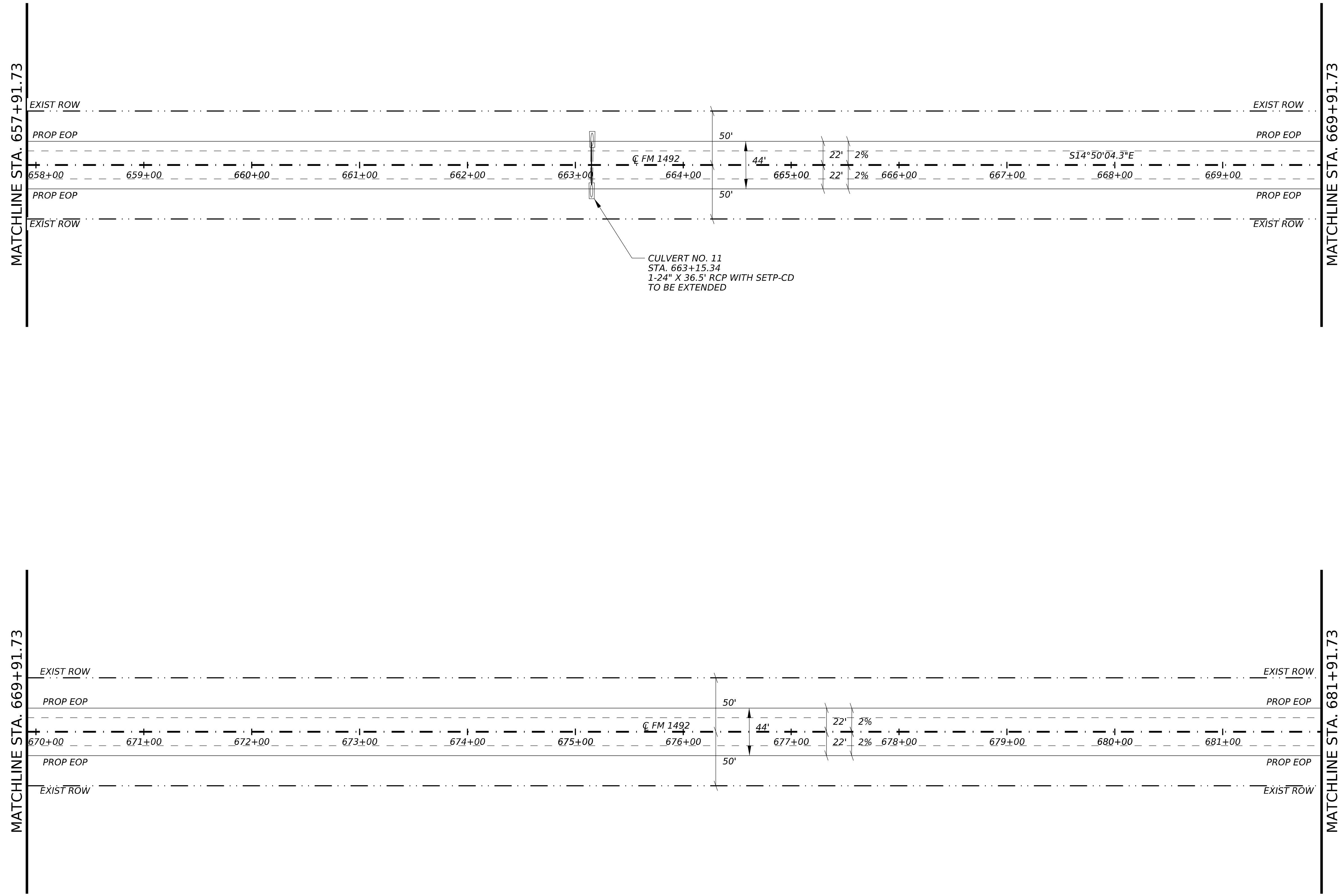

LEGEND

- PROP. FM 1492 ℄
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- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 31 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	67

DATE: $DATE$ 04/13/2022
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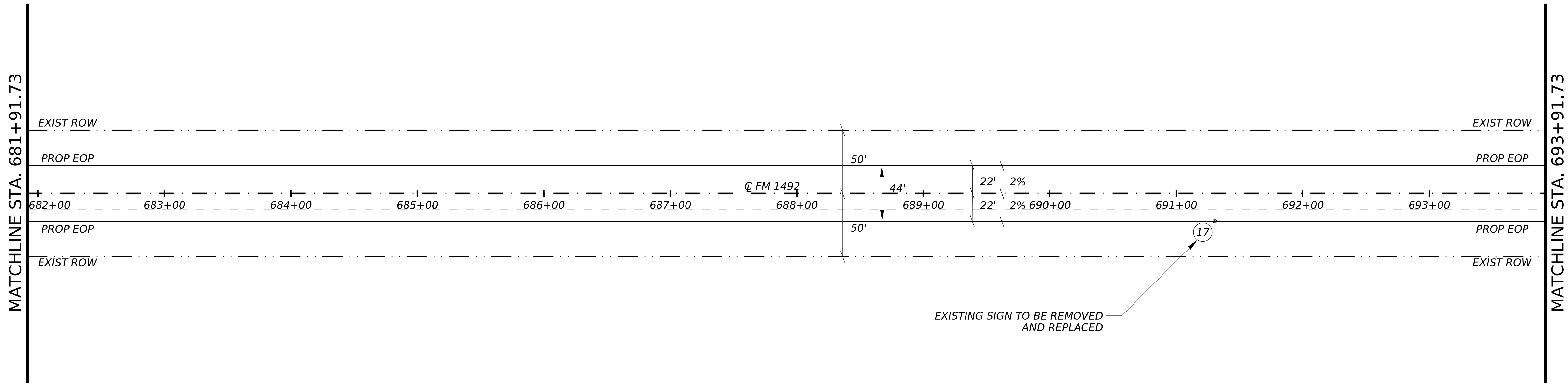

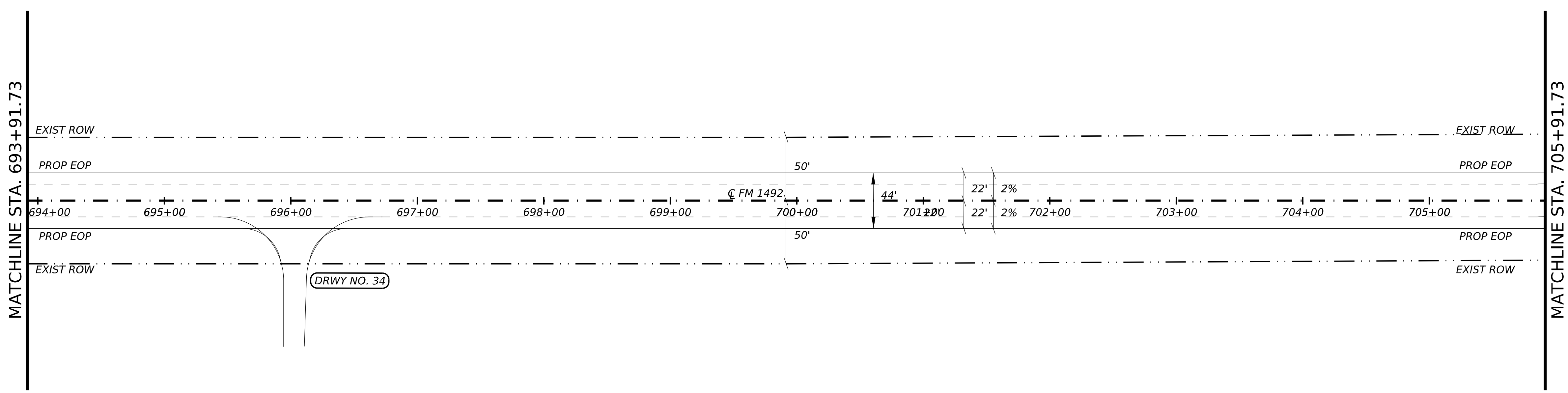

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- # EXIST. SIGN NO.
- # PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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ROADWAY PLAN SHEETS

SHEET 32 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	68

DATE: $DATE$ 04/13/2022
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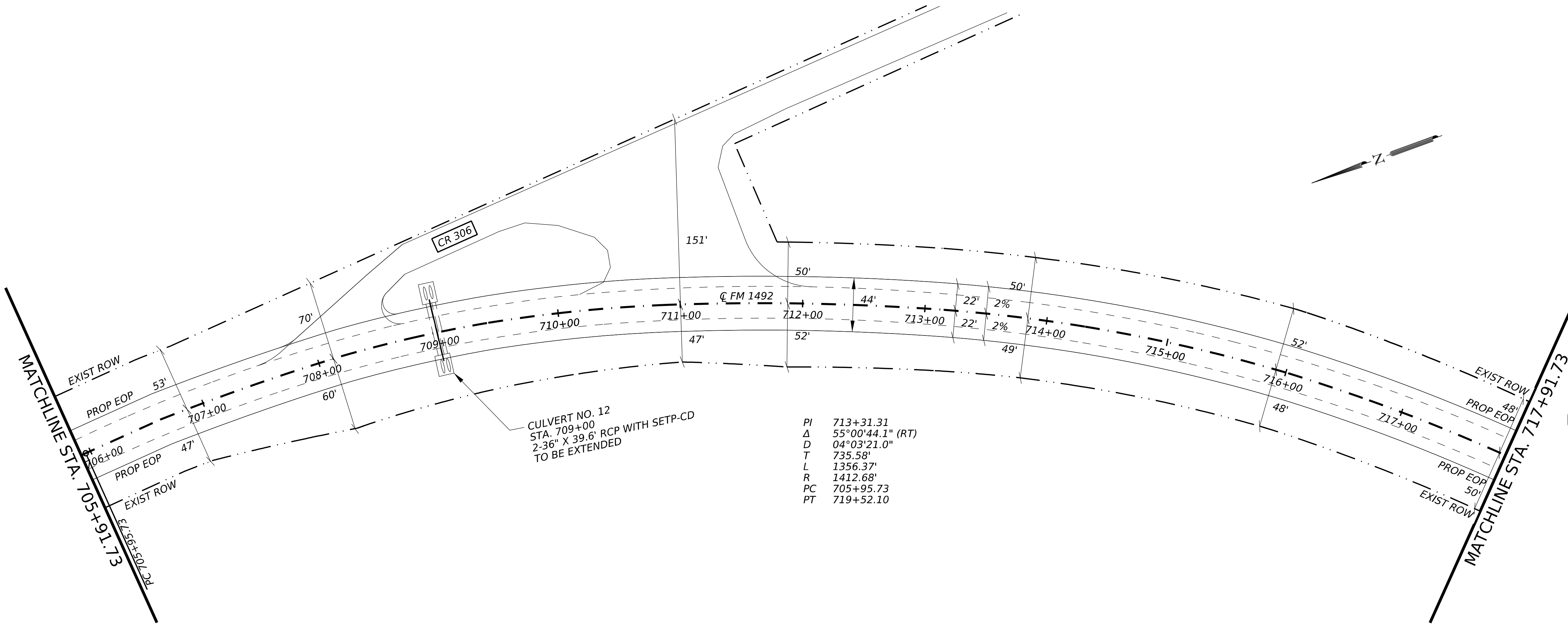

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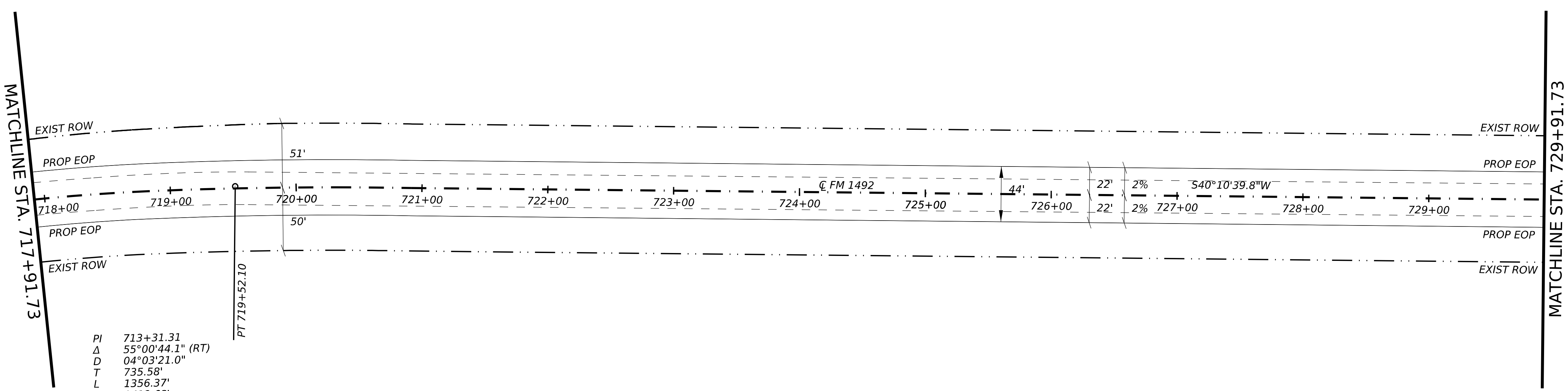
R 1412.68'
PC 705+95.73
PT 719+52.10



PI 713+31.31
Δ 55°00'44.1" (RT)
D 04°03'21.0"
T 735.58'
L 1356.37'
R 1412.68'
PC 705+95.73
PT 719+52.10

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

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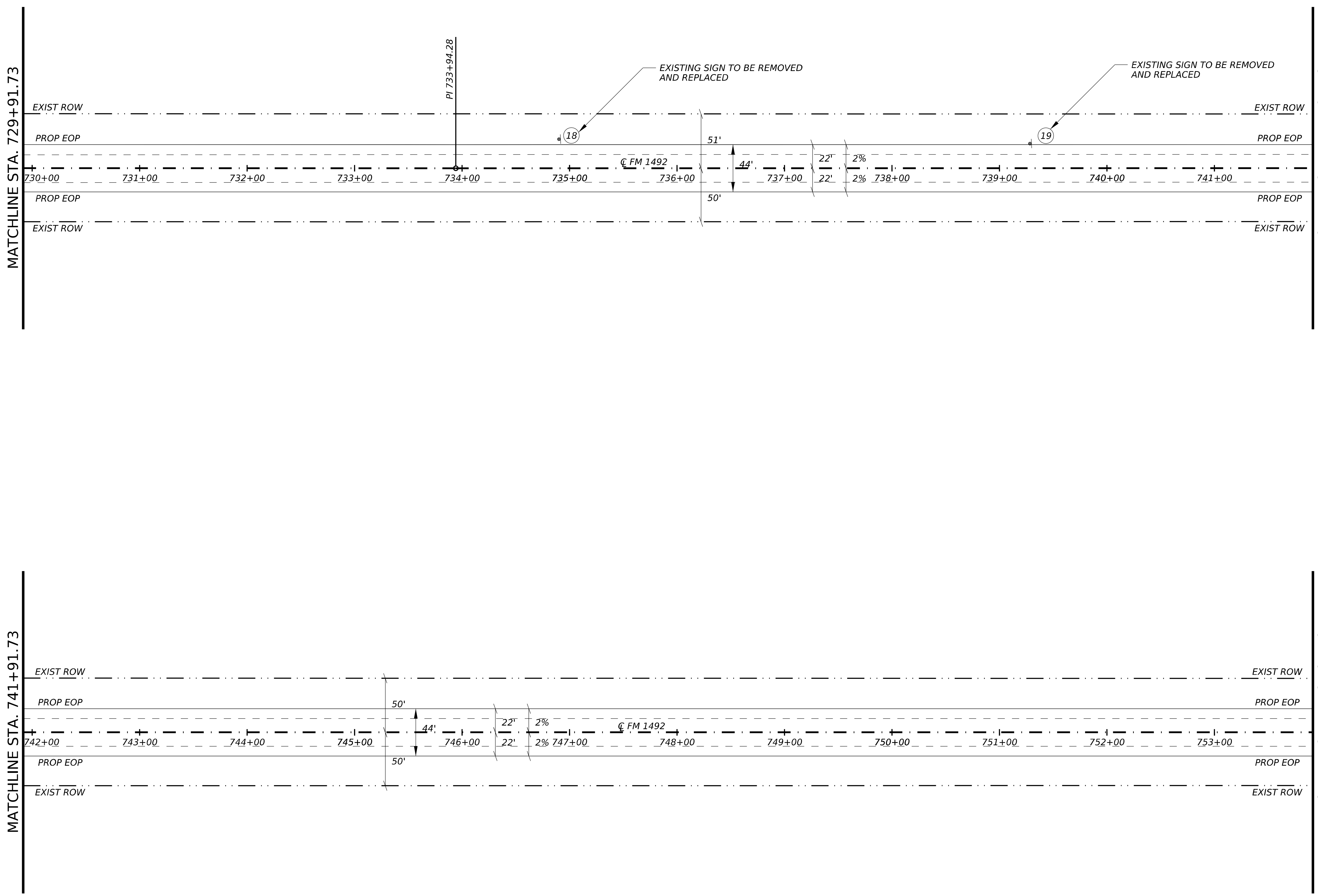
Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 33 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	69



LEGEND

PROP. FM 1492 ℄

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

EXIST. SIGN

EXIST. SIGN NO.

PERMITTED DRIVEWAY NO.

DRWY. NO. # UNPERMITTED DRIVEWAY NO.

CR. NO. COUNTY RD. NO.

STATE OF TEXAS
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Texas Department of Transportation

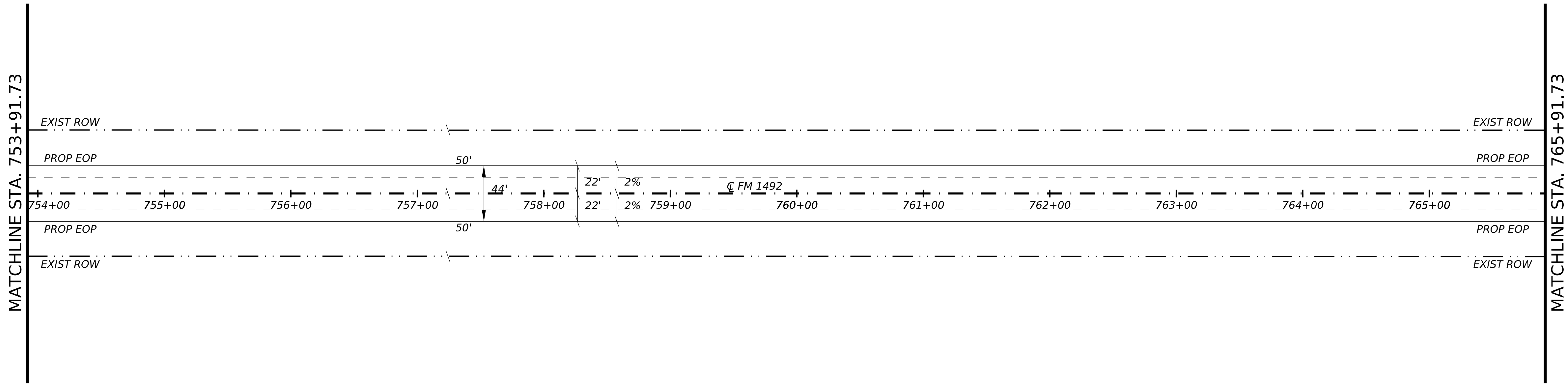
ROADWAY PLAN SHEETS

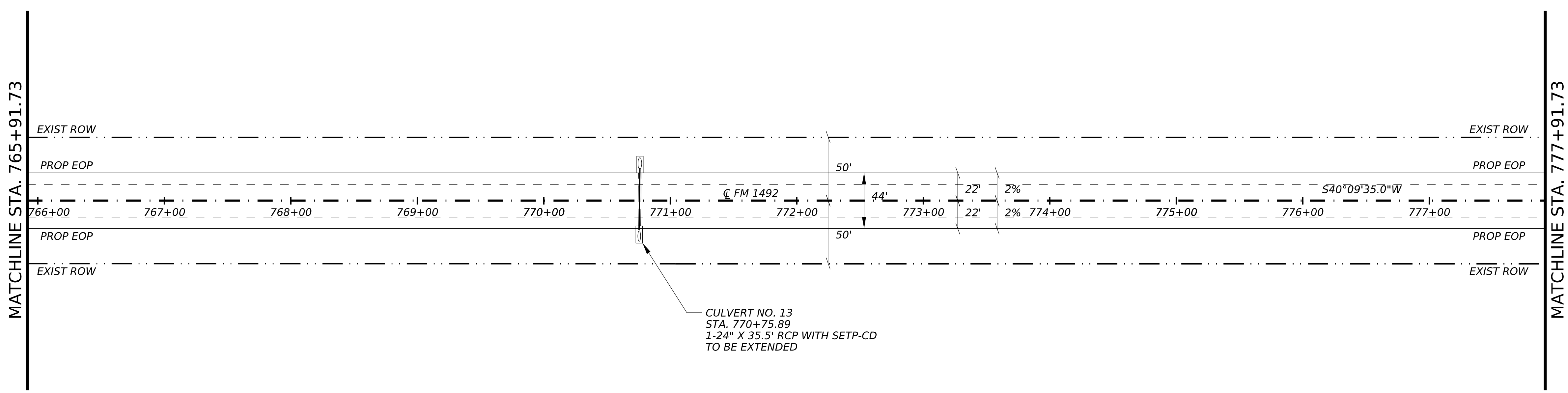
SHEET 34 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	70

DATE: $DATE$ 04/21/2022
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\- Roadway\FM1492_UPT_31.dgn





LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 35 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		71

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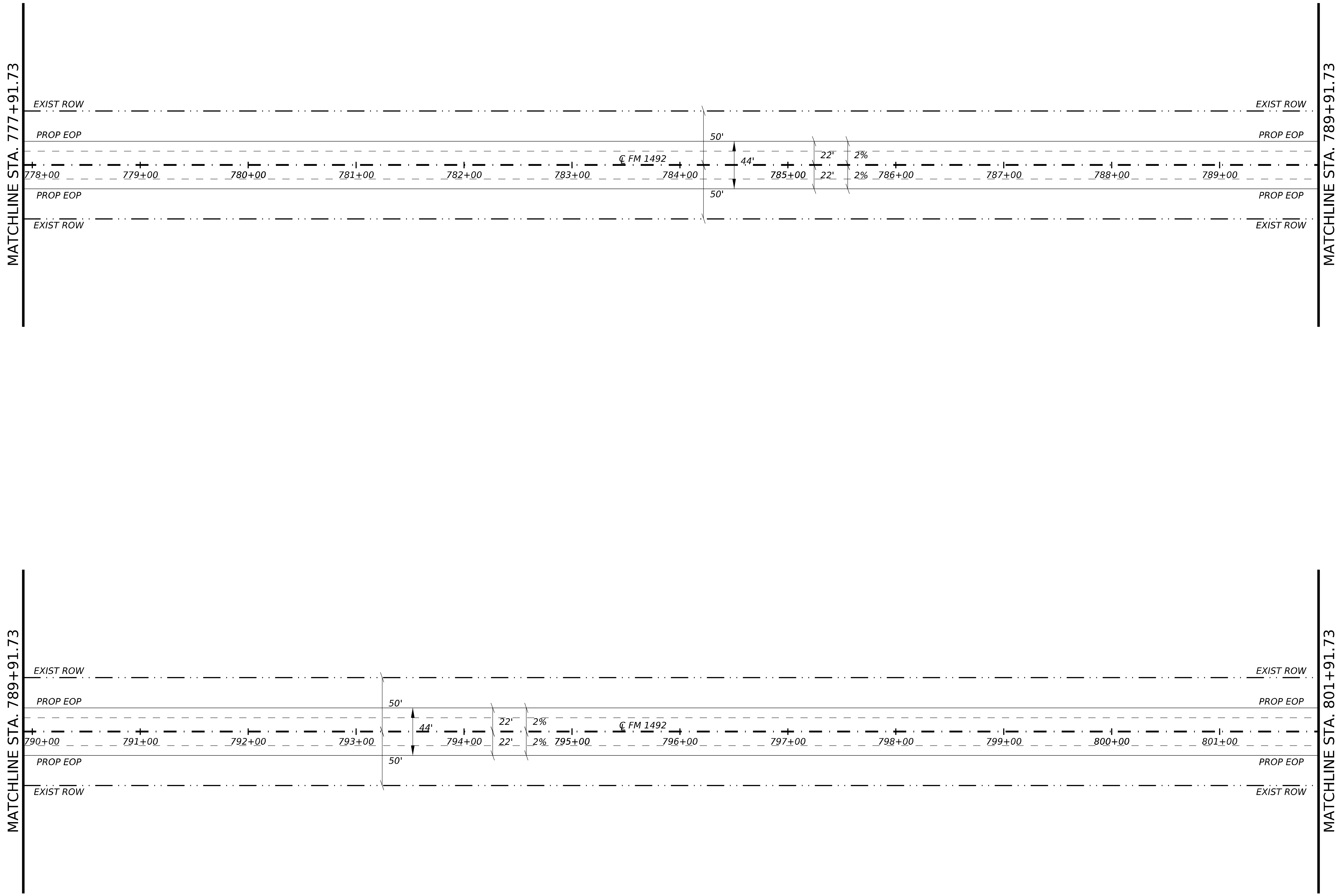

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
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STATE OF TEXAS
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Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 36 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	72

DATE: $DATE$ 04/11/2024
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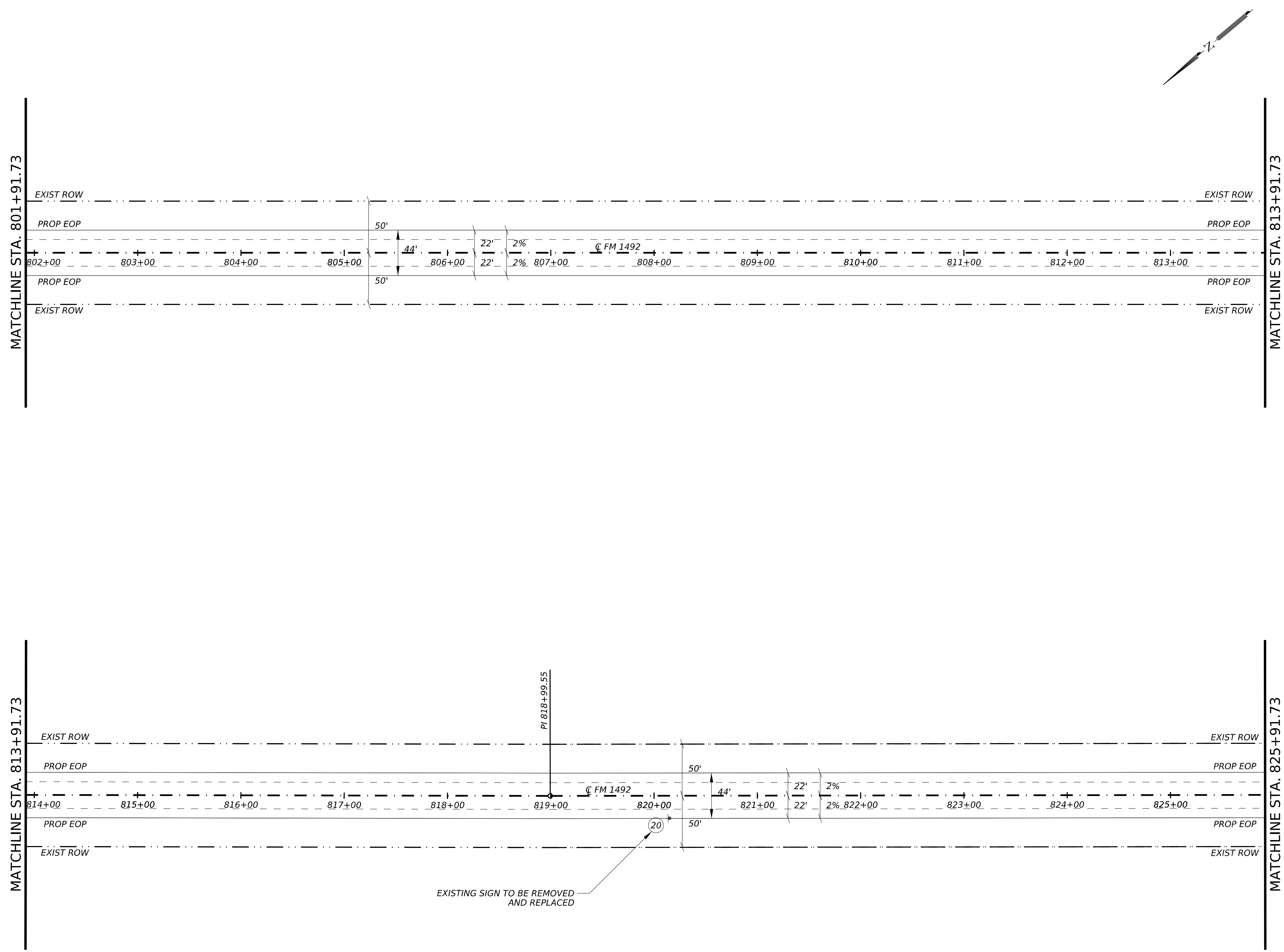

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET37 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		73

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FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\1 - ODA\Design Projects\290601006\1 - Design\Plan Set\1. Roadway\FM1492_UPT_34.dgn

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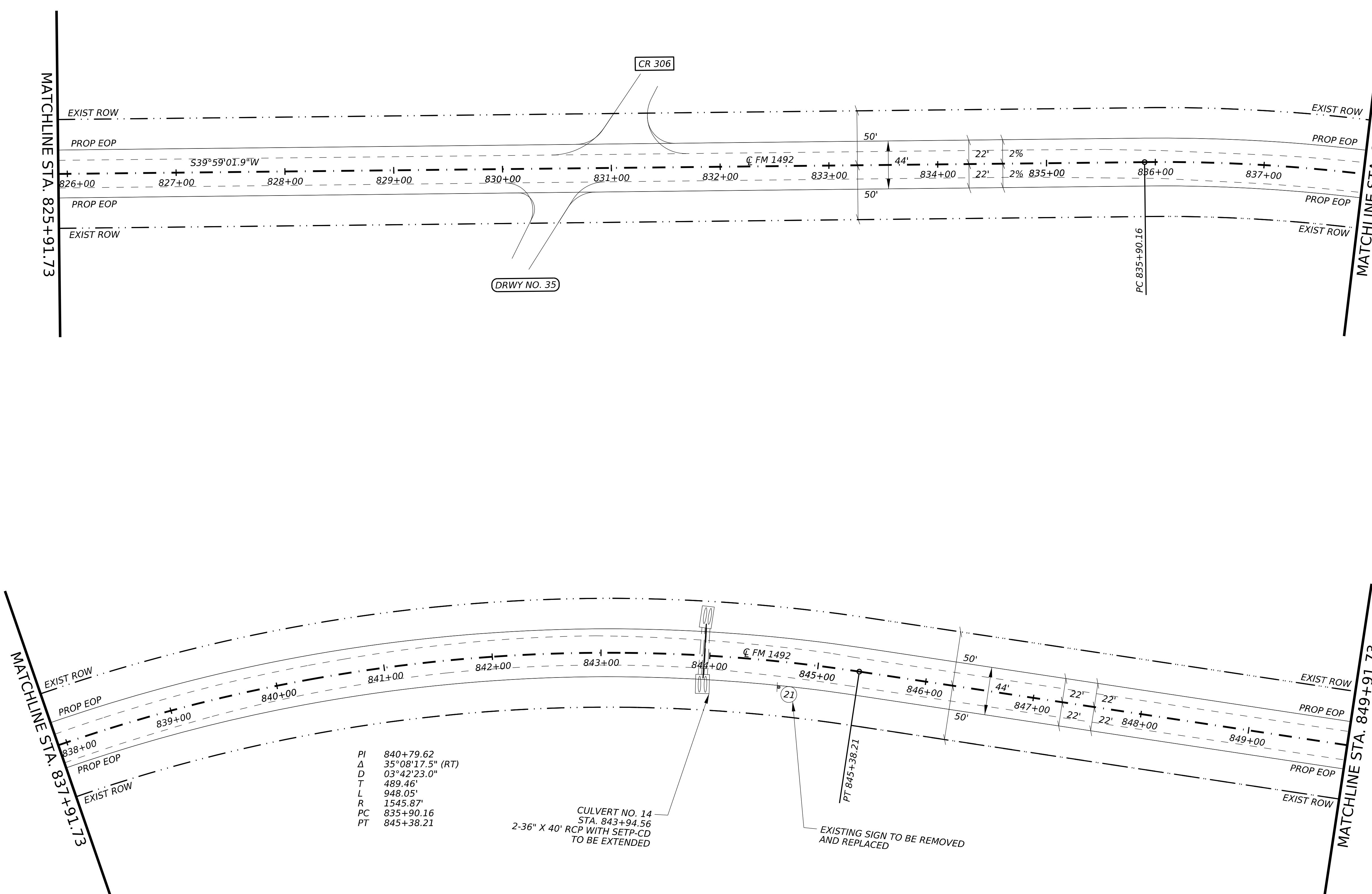

LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

STATE OF TEXAS
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10/10/2022, P.E.
88BF61DF326A480...

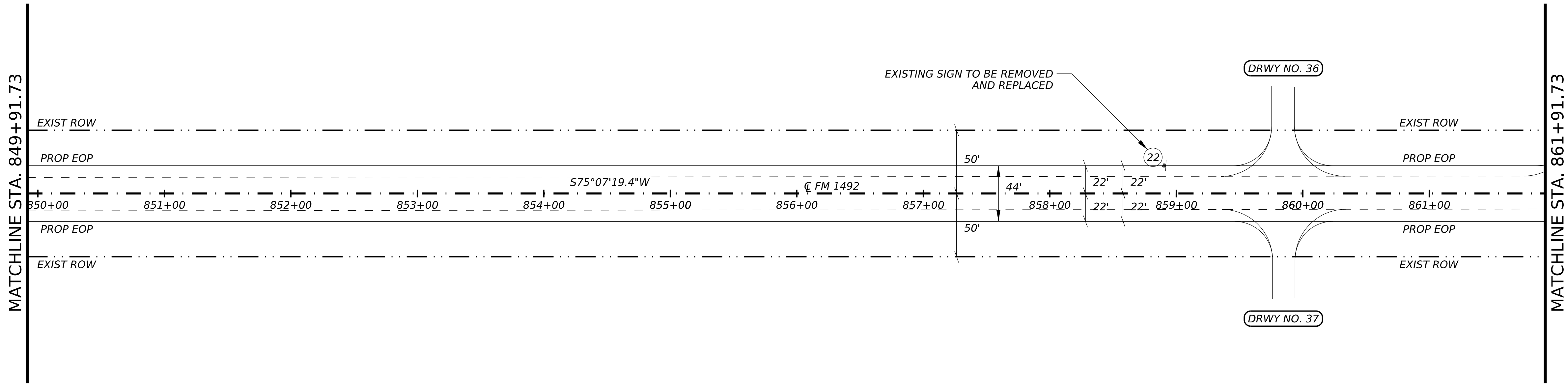
Texas Department of Transportation

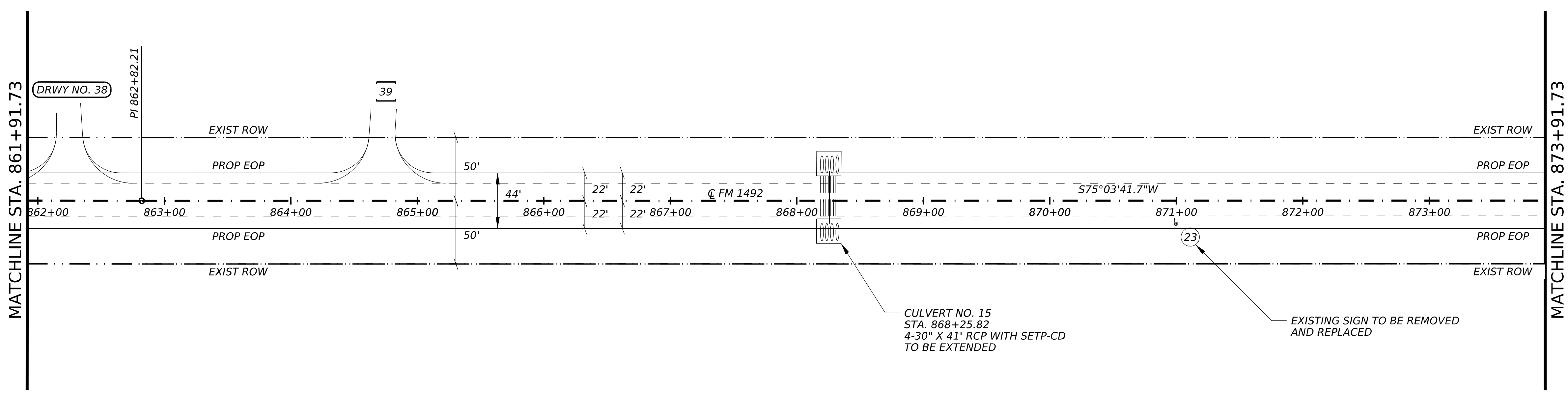
ROADWAY PLAN SHEETS

SHEET 38 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		74

DATE: $DATE$
FILE: $FILE$





LEGEND

- PROP. FM 1492 ℄
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # — UNPERMITTED DRIVEWAY NO.
- CR. NO. — COUNTY RD. NO.

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Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 39 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		75

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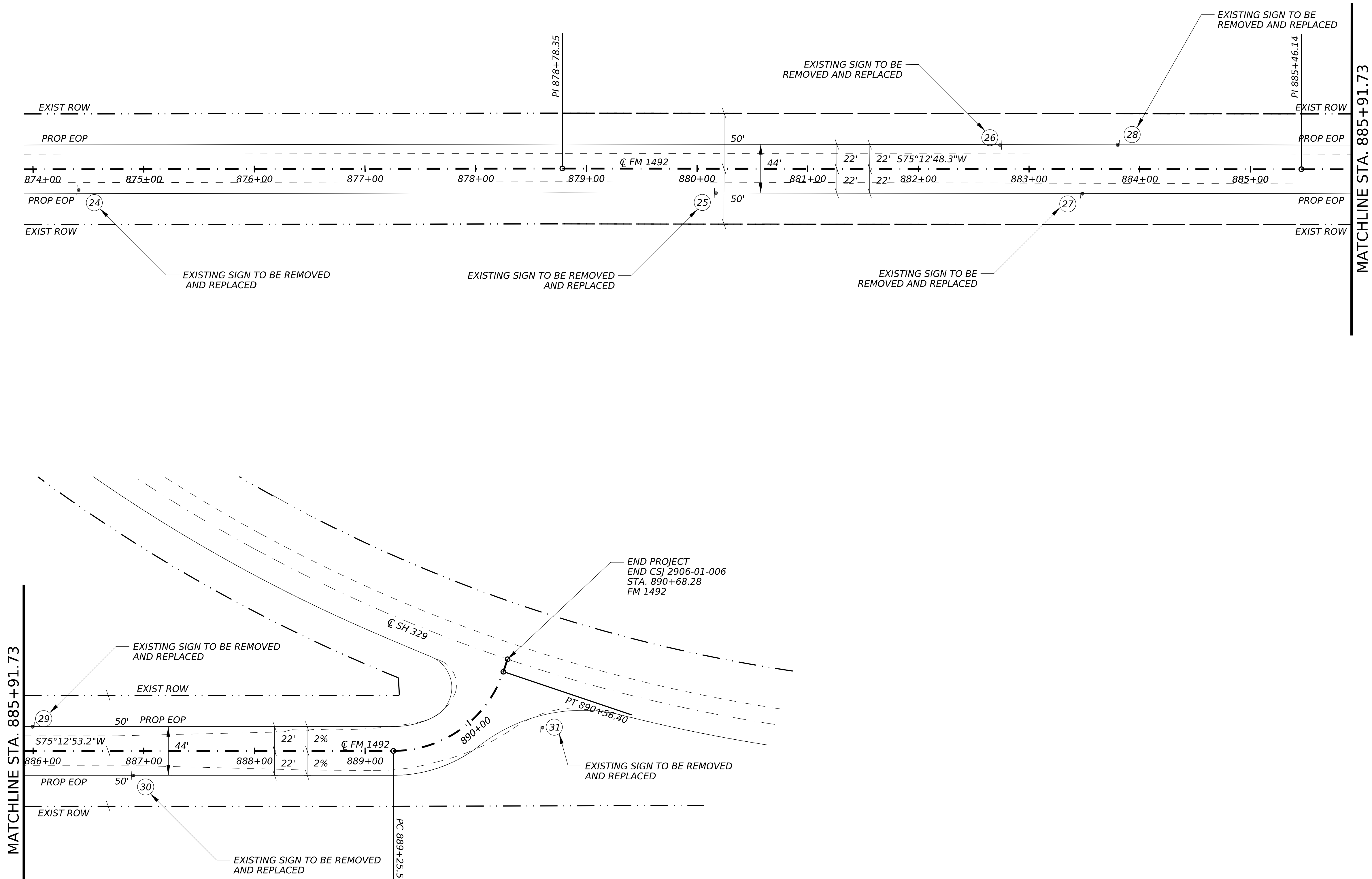

PI	890+01.01
Δ	71°23'38.8" (LT)
D	54°34'02.7"
T	75.44'
L	130.84'
R	105.00'
PC	889+25.56
PT	890+56.40

LEGEND

- PROP. FM 1492 ₵
- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- EXIST. SIGN NO.
- PERMITTED DRIVEWAY NO.
- DRWY. NO. # UNPERMITTED DRIVEWAY NO.
- CR. NO. COUNTY RD. NO.

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Texas Department of Transportation

ROADWAY PLAN SHEETS

SHEET 40 OF 40

CONT	SECT	JOB		HIGHWAY
2906	01	006		RM1492
DIST		COUNTY		SHEET NO.
ODA		MIDLAND		76

DATE: $DATE$ 04/18/2022
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Safety Appurtenances

This project meets the basic safety requirements of the 3R design criteria. signing, and pavement markings will be upgraded to current standards. Cross drainage box and pipe culverts, parallel and driveway culverts, luminaire supports and sign supports within the required obstruction clearance of 10 feet will be treated or upgraded to standard.

Existing/Proposed Horizontal Alignment and Superelevation

HORIZONTAL CURVES - FM 1492							
PC	PI	PT	DELTA	D	L (FT)	T (FT)	R (FT)
48+48.94	50+03.10	51+57.10	04°37'01.0"	01°29'53.7"	308.16	154.16	3,824.19
62+49.53	63+28.27	08+00.03	04°43'09.2"	02°59'55.0"	157.38	78.74	1,910.75
149+45.79	149+58.39	149+70.99	00°14'22.0"	00°57'00.6"	25.20	12.60	6,030.00
191+92.68	191+98.88	192+05.08	00°17'04.3"	00°57'00.6"	12.40	6.20	6,030.00
516+68.73	518+81.53	520+94.30	01°46'23.6"	00°25'00.0"	425.57	212.80	13,750.93
521+14.42	524+32.27	527+50.00	02°38'53.7"	00°25'00.0"	635.58	317.85	13,750.93
628+44.34	628+78.53	629+12.73	00°38'59.5"	00°57'00.6"	68.39	34.20	6,030.00
705+95.73	713+31.31	719+52.10	55°00'44.1"	04°03'21.0"	1,356.37	735.58	1,412.68
835+90.16	840+79.62	845+38.21	35°08'17.5"	03°42'23.0"	948.00	489.46	1,545.87

Existing and Proposed Vertical Alignment

VERTICAL CURVES - FM 1492							
VERTICAL CURVES							CREST OR SAG
PI	ELEV	LENGTH	G1%	G2%	g2 - g1 ≤ 0.5%	K	
01+90.60	2,879.44		N/A	-0.51	N/A		
11+40.60	2,874.75	59	-0.51	0.05	N/A	105	SAG
18+03.60	2,873.88		0.05	0.37	0.32		
21+85.60	2,875.30		0.37	0.79	0.42		
23+90.60	2,876.92	120	0.79	1.98	N/A	101	SAG
25+75.60	2,880.53		1.98	1.73	-0.25		
27+90.60	2,884.27	133	1.73	0.4	N/A	100	CREST
33+90.60	2,886.65		0.4	0.1	-0.3		
35+90.60	2,886.85		0.1	-0.04	-0.14		
53+16.60	2,886.22		-0.04	-0.39	-0.35		
55+90.60	2,885.20		-0.39	-0.89	-0.5		
58+40.60	2,882.99	286	-0.89	0.54	N/A	200	SAG
61+80.60	2,884.86		0.54	0.23	-0.31		
00+50.00	2,885.47		0.23	-0.04	-0.27		
42+00.00	2,883.85		-0.04	0.1	0.14		
83+90.00	2,888.21		0.1	-0.01	-0.11		
129+95.00	2,887.84		-0.01	0.32	0.33		
149+85.00	2,894.21		0.32	0.04	-0.28		
164+45.00	2,894.79		0.04	-0.16	-0.2		
217+25.00	2,886.19		-0.16	-0.25	-0.09		
229+33.00	2,883.22		-0.25	-0.58	-0.33		
255+47.00	2,867.95		-0.58	-0.28	0.3		

NOTE: Vertical Curve information is provided to verify 3R project requirements and is not intended for use in construction.

Project element information was taken from the as-built plans for CSJ 2906-02-006, ETC. & CSJ 1717-02-021

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

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ALIGNMENT DATA SHEET

SHEET 1 OF 2

Texas Department of Transportation®

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			77
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

Existing and Proposed Vertical Alignment

VERTICAL CURVES - FM 1492							
VERTICAL CURVES							CREST OR SAG
PI	ELEV	LENGTH	G1%	G2%	g2 - g1 ≤ 0.5%	K	
277+06.00	2,861.87		-0.28	-0.17	0.11		
282+07.00	2,861.02		-0.17	-0.05	0.12		
287+86.00	2,860.73		-0.05	-0.46	-0.41		
299+85.00	2,855.23		-0.46	-0.2	0.26		
318+43.00	2,851.46		-0.2	-0.16	0.04		
327+25.00	2,850.01		-0.16	-0.09	0.07		
333+35.00	2,849.80	207	-0.09	-0.78	N/A	300	CREST
336+30.00	2,847.12	222	-0.78	0.2	N/A	226	SAG
345+04.00	2,848.86		0.2	-0.18	-0.38		
370+22.00	2,844.23		-0.18	0.06	0.24		
396+39.00	2,845.68		0.06	-0.04	-0.1		
463+44.00	2,842.80		-0.04	-0.12	-0.08		
490+80.00	2,839.62		-0.12	-0.03	0.09		
541+05.00	2,838.12		-0.03	-0.01	0.02		
565+20.00	2,837.88		-0.01	-0.07	-0.06		
606+50.00	2,834.99		-0.07	-0.06	0.01		
654+08.00	2,832.10		-0.06	0.01	0.07		
684+52.00	2,832.38		0.01	0.06	0.05		
712+92.00	2,834.09		0.06	0.22	0.16		
735+12.00	2,839.02		0.22	0.01	-0.21		
766+27.00	2,839.45		0.01	-0.03	-0.04		
780+55.00	2,839.01		-0.03	0.15	0.18		
801+45.00	2,842.05		0.15	0.02	-0.13		
810+93.00	2,842.19		0.02	-0.17	-0.19		
817+88.00	2,841.03	205	-0.17	-0.75	N/A	351	CREST
829+32.00	2,832.45	260	-0.75	-1.4	N/A	399	CREST
833+93.00	2,825.98	179	-1.4	-0.21	N/A	150	SAG
836+16.00	2,825.52		-0.21	0.17	0.38		
837+99.00	2,825.83	108	0.17	-0.7	N/A	124	CREST
839+04.00	2,824.89		-0.7	-0.51	0.19		
840+64.00	2,823.77		-0.51	-0.06	0.45		
842+10.00	2,823.02		-0.06	-0.03	0.03		
844+00.00	2,822.93	113	-0.03	0.93	N/A	118	SAG
846+00.00	2,824.83		0.93	0.43	-0.5		
848+10.00	2,825.67	111	0.43	-0.33	N/A	147	CREST
849+90.00	2,825.08		-0.33	-0.43	-0.1		
854+21.00	2,823.23		-0.43	-0.13	0.3		
855+66.00	2,823.04		-0.13	-1.3	-1.17		
857+83.00	2,822.75		-1.3	-0.07	1.23		
860+06.00	2,822.60		-0.07	-0.4	-0.33		
862+20.00	2,821.74	320	-0.4	-1.17	N/A	418	CREST
863+79.00	2,819.40		-1.17	-0.74	0.43		
868+00.00	2,817.60	85	-0.74	0.06	N/A	106	SAG
871+99.00	2,816.61		0.06	0.5	0.44		
874+00.00	2,817.61		0.5	0.93	0.43		
876+77.00	2,820.18		0.93	1.11	0.18		
879+68.00	2,823.42		1.11	0.82	-0.29		
889+00.00	2,827.74		0.82		N/A		

NOTE: Vertical Curve information is provided to verify 3R project requirements and is not intended for use in construction.

Project element information was taken from the as-built plans for CSJ 2906-02-006, ETC. & CSJ 1717-02-021

STATE OF TEXAS
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10/10/2022, P.E.
88BE61DF326A480...

ALIGNMENT DATA SHEET

SHEET 2 OF 2

Texas Department of Transportation®

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			78
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

PLAN ver. 2013.04.05
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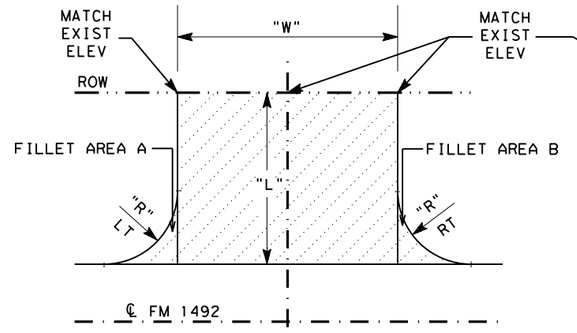
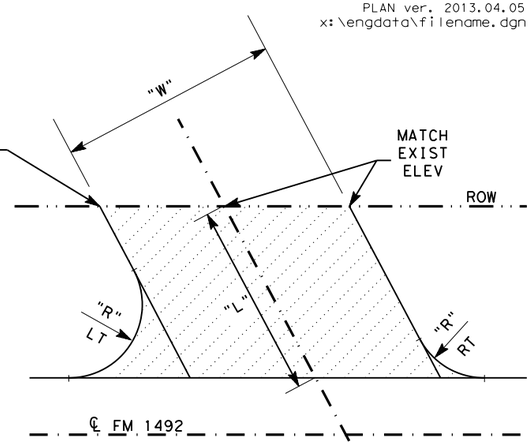
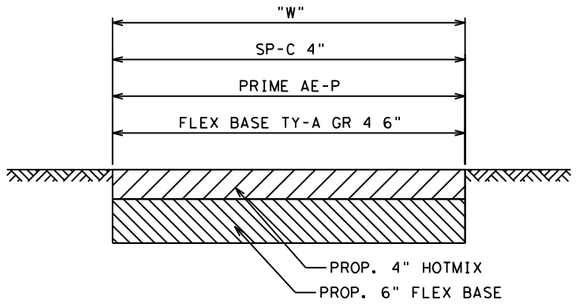
FM 1492 DRIVEWAY SUMMARY CSJ 2906-01-006 ETC.								
STATION	DRIVEWAY NO.	LT/RT SIDE	WIDTH	LENGTH	RADIUSLT	RADIUSRT	HOTMIX AREA	CONCRETE AREA
			FT	FT	FT	FT	SY	SY
CSJ 2906-01-006 STA. 01+90.6 TO STA. 63+98.88								
STA. 24+09.43	1	RT	25	35	30	30		116
STA. 27+94.53	2	RT	25	37	30	30		116
CSJ 2906-02-007 STA. 0+00.00 TO STA. 890+68.28								
STA. 26+34.02	3	LT	33	50	30	30		
STA. 39+98.64	4	LT	45	50	30	30		216
STA. 55+57.56	5	LT	48	50	30	30		
STA. 56+95.00	6	LT	34	68	30	25		
STA. 59+22.96	7	LT	20	50	30	30		
STA. 63+44.68	8	RT	15	50	25	25		
STA. 64+81.55	9	LT	16	50	25	25		
STA. 109+34.75	10	LT	54	50	30	30		
STA. 149+35.26	11	LT	43	58	50	40		
STA. 150+44.73	12	RT	48	53	40	40		
STA. 158+57.02	13	LT	36	51	40	40		
STA. 182+63.02	14	LT	15	50	25	25		
STA. 196+24.54	15	LT	15	76	40	40		
STA. 223+45.10	16	RT	17	50	30	30		
STA. 253+54.47	17	RT	22	50	30	30		
STA. 263+69.73	18	LT	19	50	30	25		
STA. 317+79.42	19	RT	20	80	30	30		
STA. 343+83.20	20	LT	28	50	30	30		
STA. 350+98.43	21	LT	25	50	30	30	121	
STA. 355+58.59	22	LT	29	50	30	30	134	
STA. 370+15.26	23	LT	15	50	30	25		
STA. 383+55.66	24	RT	22	64	25	25		
STA. 416+25.70	25	RT	20	60	30	30		
STA. 450+91.82	26	LT	37	50	30	30	160	
STA. 454+95.26	27	LT	37	50	30	30	158	
STA. 519+08.35	28	LT	39	50	30	30		
STA. 599+00.72	29	LT	66	45	40	30		
STA. 602+03.91	30	LT	54	44	30	30		
STA. 629+08.1	31	RT	28	48	30	30		
STA. 631+39.40	32	RT	47	48	25	25	168	
STA. 636+14.27	33	RT	50	49	25	25	177	
STA. 696+03.35	34	RT	21	50	30	30		
STA. 830+66.32	35	RT	26	58	15	30		
STA. 859+84.47	36	LT	18	50	30	30		
STA. 859+84.47	37	RT	18	50	30	30		
STA. 862+25.15	38	LT	21	50	30	30		
STA. 864+72.27	39	LT	21	50	30	30	108	
						TOTAL AREA	1,026	448

STATION	DRIVEWAY NO.	LT/RT SIDE	WIDTH	LENGTH	RADIUSLT	RADIUSRT	HOTMIX AREA
			FT	FT	FT	FT	SY
STA. 291+16.90	CR 309	RT	31	52	25	25	132
STA. 362+71.68	CR 310	RT	16	42	30	30	118
STA. 466+35.53	CR 307	LT	24	50	30	30	118
STA. 521+64.42	CR 308	LT	17	127	50	40	550
STA. 707+62.23	CR 306	LT	20	83	40	10	232
STA. 830+99.18	CR 306	LT	31	54	30	25	145
						TOTAL AREA	1,295





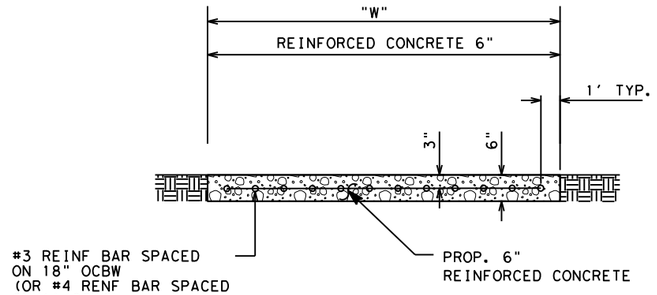
DRIVEWAY DETAILS



DRIVEWAY HOTMIX TYPICAL SECTION

(NOT TO SCALE)

DRIVEWAY DETAILS



DRIVEWAY TYPICAL SECTION

(NOT TO SCALE)

STATE OF TEXAS
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118987
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DRIVEWAY DETAILS

SHEET 1 OF 1

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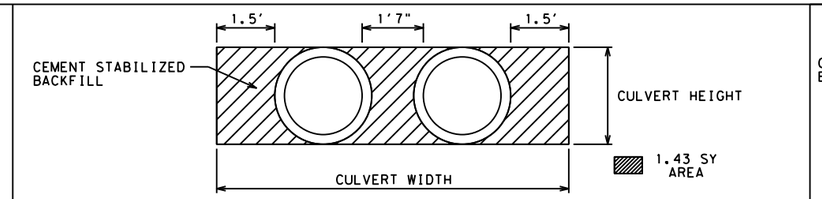
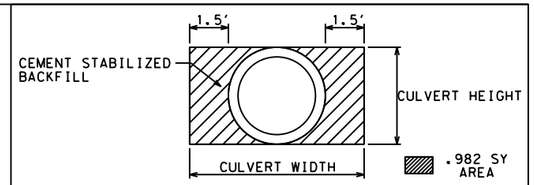
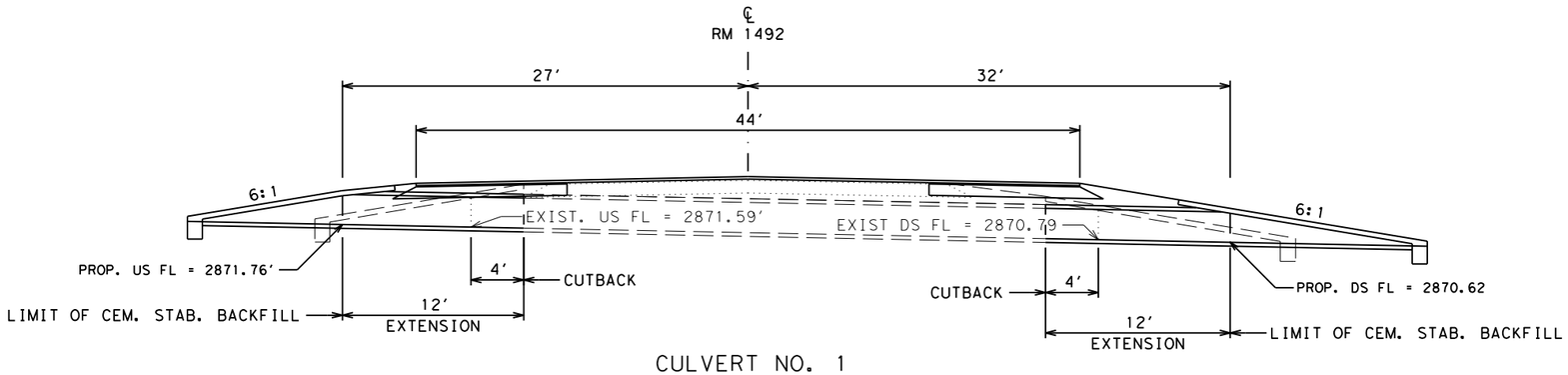
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			79
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



CULVERT NO.1 CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

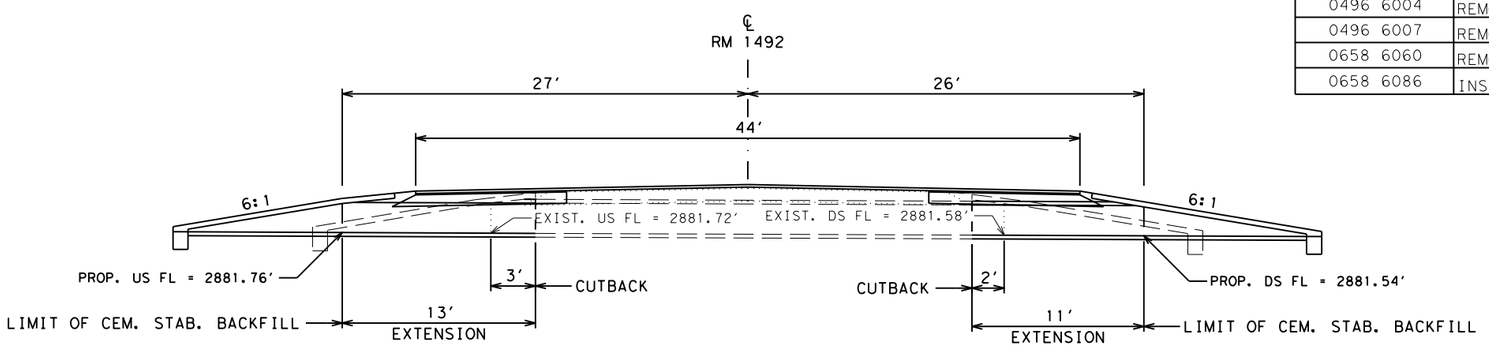


RCP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



CULVERT NO. 1
STA. 09+50.00
EXIST.: 2-24" X 42' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 2 - 24" RCP 12' LT & 12' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 1			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	12
0464 6005	RC PIPE (CL III)(24 IN)	LF	48
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	4
0496 6004	REMOV STR (SET)	EA	4
0496 6007	REMOV STR (PIPE)	LF	16
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 2
STA. 34+82.50
EXIST.: 1-24" X 34' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 13' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 2			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	8
0464 6005	RC PIPE (CL III)(24 IN)	LF	24
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	5
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2

STATE OF TEXAS
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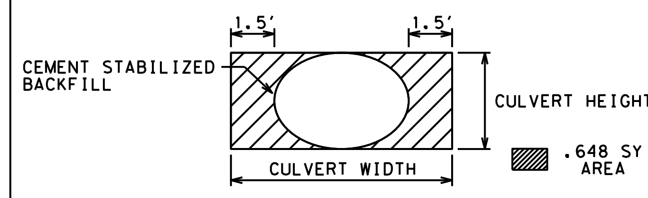
CULVERT CROSS SECTIONS

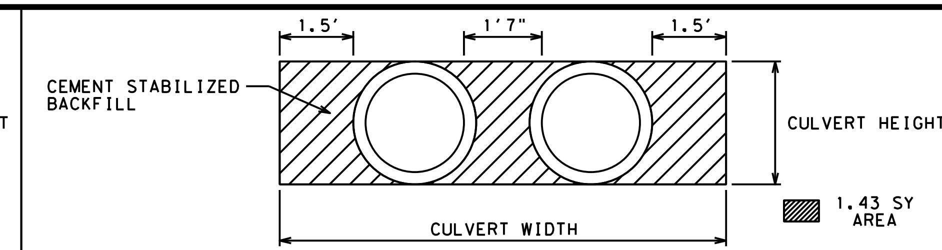
SHEET 1 OF 8

Texas Department of Transportation

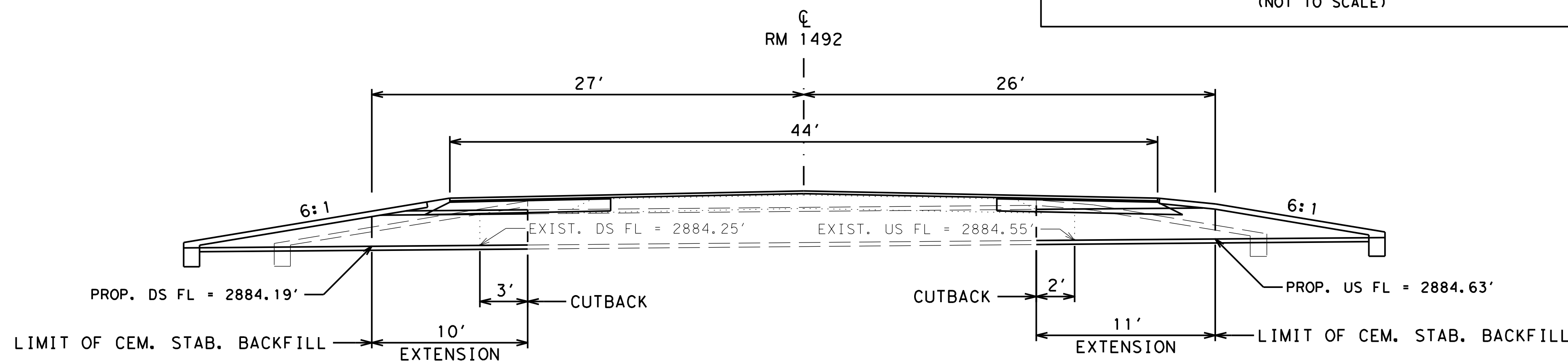
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			80
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



CMP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

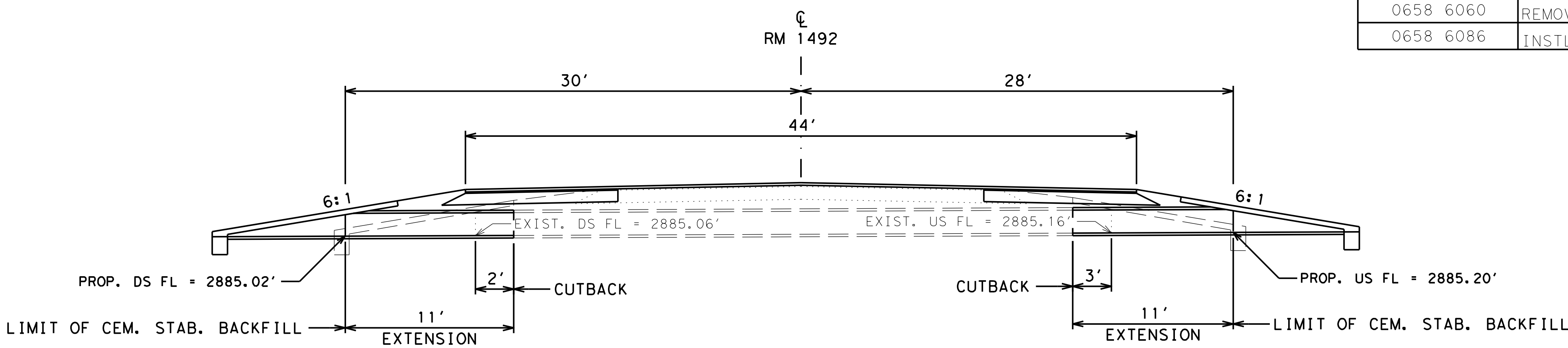


CULVERT NO.1 CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



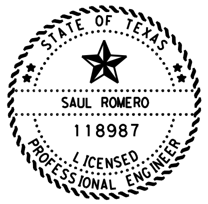
CULVERT NO. 3
STA. 102+75.30
EXIST.: 2-24" X 37' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 2 - 24" RCP 10' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 3			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	11
0464 6005	RC PIPE (CL III)(24 IN)	LF	42
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	4
0496 6004	REMOV STR (SET)	EA	4
0496 6007	REMOV STR (PIPE)	LF	5
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 4
STA. 130+00.00
EXIST.: 1-42' DES 3 CMP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 DES 3 CMP 11' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD-As

CULVERT NO. 4			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	5
0460 6010	CMP AR (GAL STL DES 3)	EA	22
0467 6536	SET (TY II) (DES 3) (CMP) (6: 1) (C)	LF	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	5
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



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CULVERT CROSS SECTIONS

SHEET 2 OF 8

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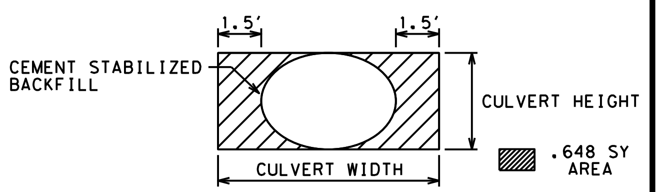
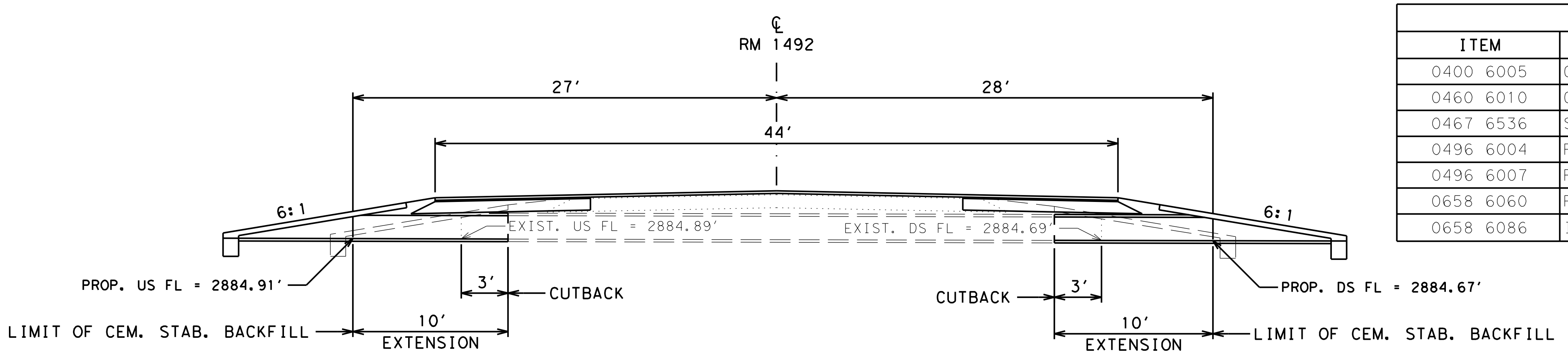
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			81
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



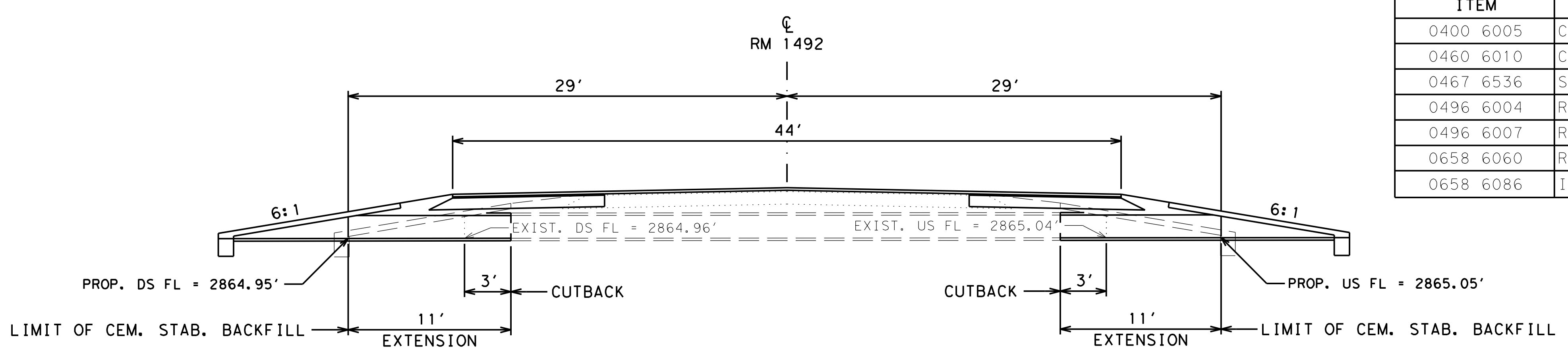
CMP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

CULVERT NO. 5			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	5
0460 6010	CMP AR (GAL STL DES 3)	EA	20
0467 6536	SET (TY II) (DES 3) (CMP) (6: 1) (C)	LF	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	6
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 5
STA. 200+50.00
EXIST.: 1-41' DES 3 CMP WITH SETP-CD-As (LT AND RT)
PROP.: EXTEND 1 DES 3 CMP 10' LT & 10' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD-As

CULVERT NO. 6			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	5
0460 6010	CMP AR (GAL STL DES 3)	EA	22
0467 6536	SET (TY II) (DES 3) (CMP) (6: 1) (C)	LF	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	6
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 6
STA. 255+00.00
EXIST.: 1-42' DES 3 CMP WITH SETP-CD-As (LT AND RT)
PROP.: EXTEND 1 DES 3 CMP 11' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD-As

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CULVERT CROSS SECTIONS

SHEET 3 OF 8

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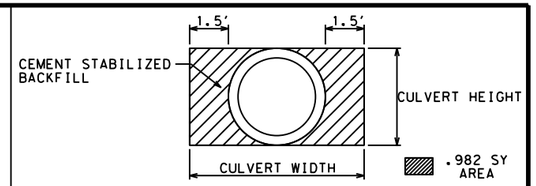
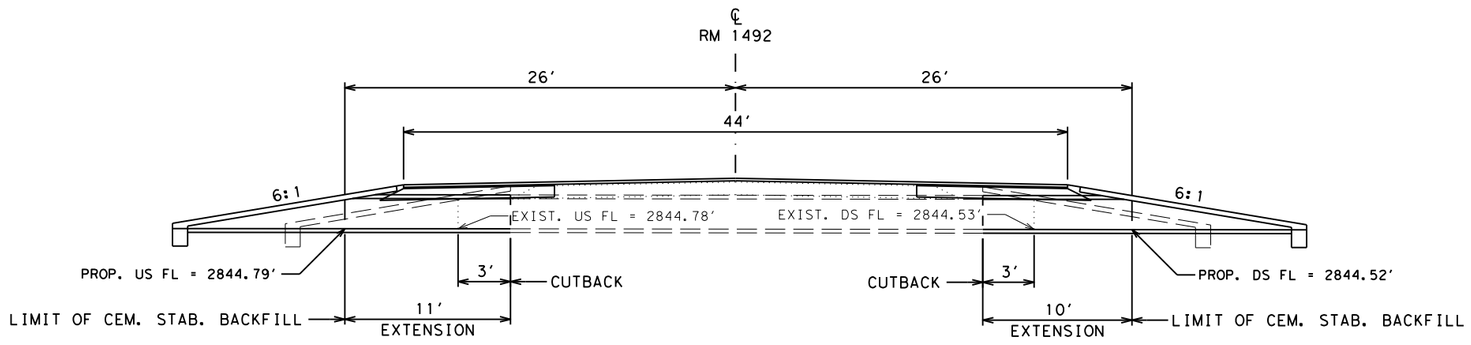
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			82
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



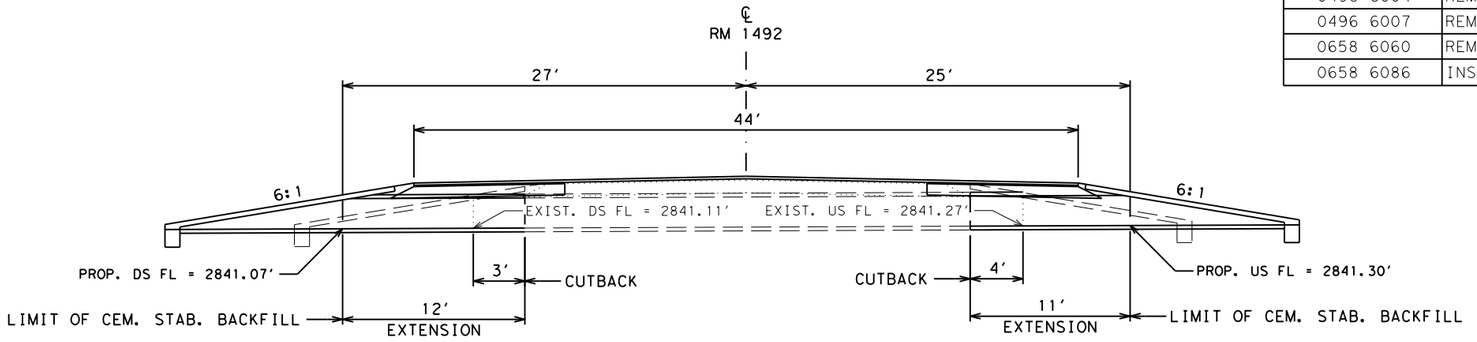
RCP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



CULVERT NO. 7

STA. 335+52.50
EXIST.: 1-24" X 38' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 11' LT & 10' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 7			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	7
0464 6005	RC PIPE (CL III)(24 IN)	LF	21
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	6
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 8

STA. 368+47.80
EXIST.: 1-24" X 36' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 12' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 8			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	8
0464 6005	RC PIPE (CL III)(24 IN)	LF	23
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	7
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2

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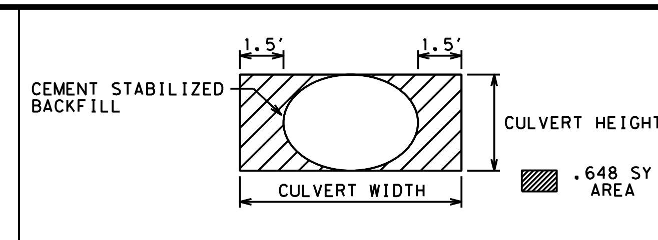
CULVERT CROSS SECTIONS

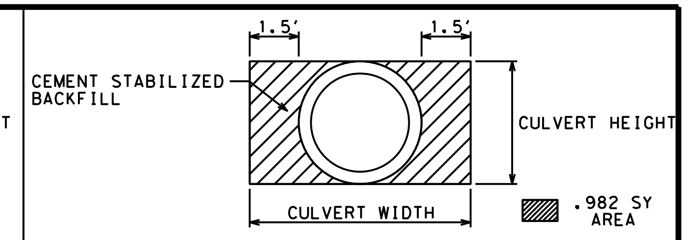
SHEET 4 OF 8

Texas Department of Transportation

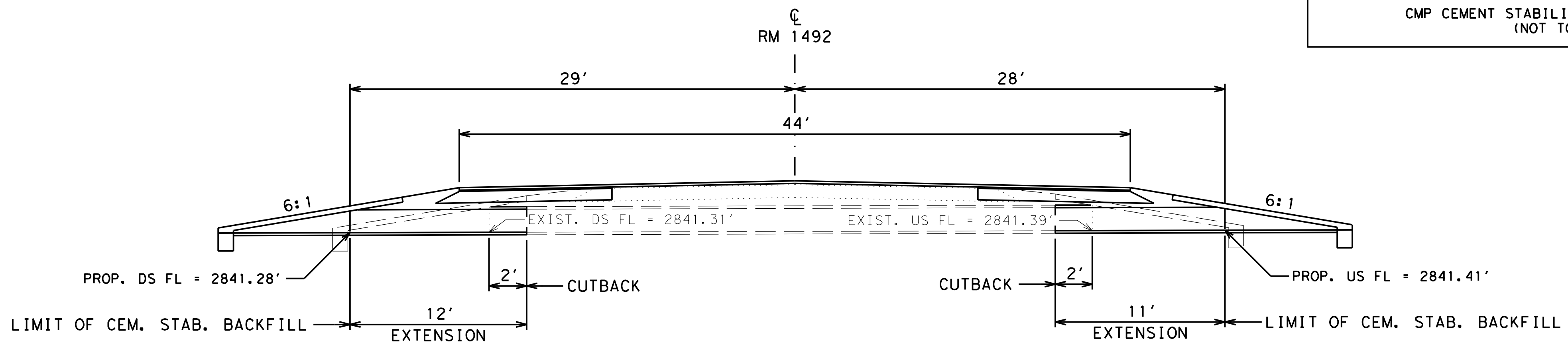
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			83
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



CMP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

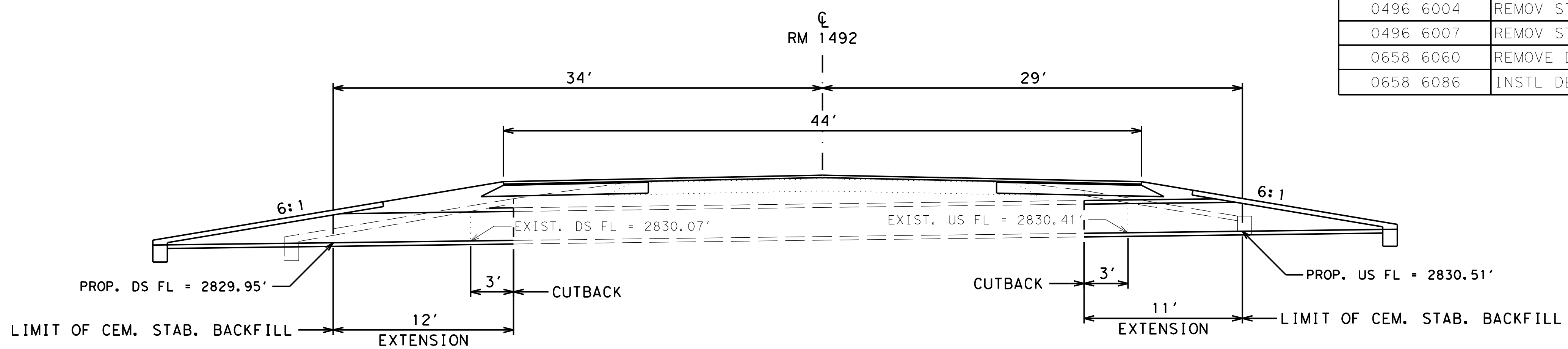


RCP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



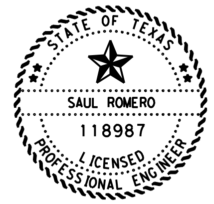
CULVERT NO. 9
STA. 376+00.00
EXIST.: 1-40' DES 3 CMP WITH SETP-CD-As (LT AND RT)
PROP.: EXTEND 1 DES 3 CMP 12' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD-A

CULVERT NO. 9			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	5
0460 6010	CMP AR (GAL STL DES 3)	EA	23
0467 6536	SET (TY II) (DES 3) (CMP) (6: 1) (C)	LF	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	4
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 10
STA. 623+18.00
EXIST.: 1-24" X 45' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 12' LT & 11' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 10			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	8
0464 6005	RC PIPE (CL III)(24 IN)	LF	23
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	6
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



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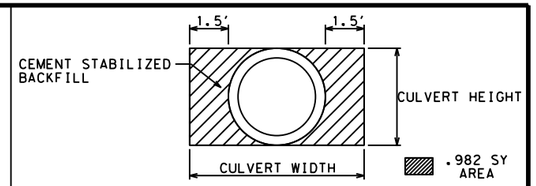
CULVERT CROSS SECTIONS

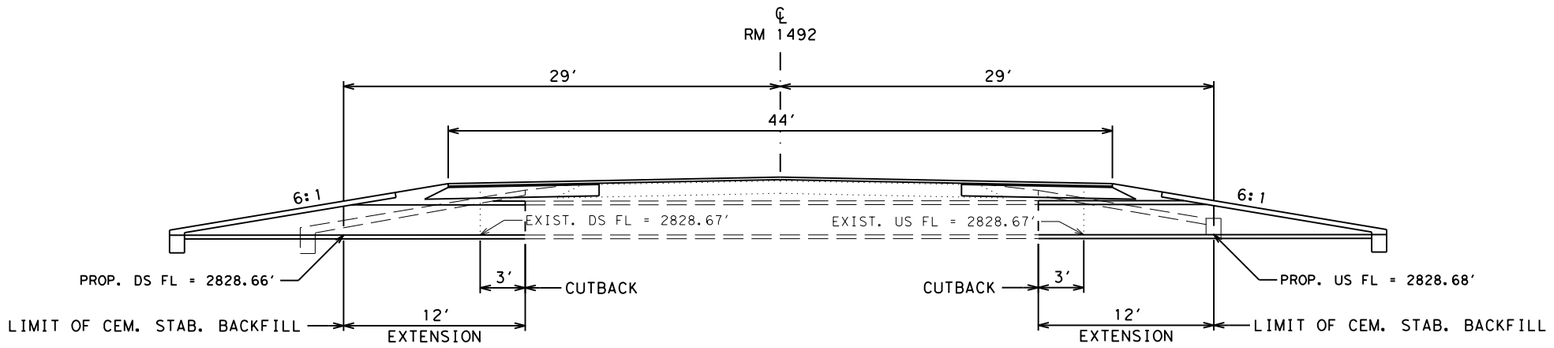
SHEET 5 OF 8

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			84
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



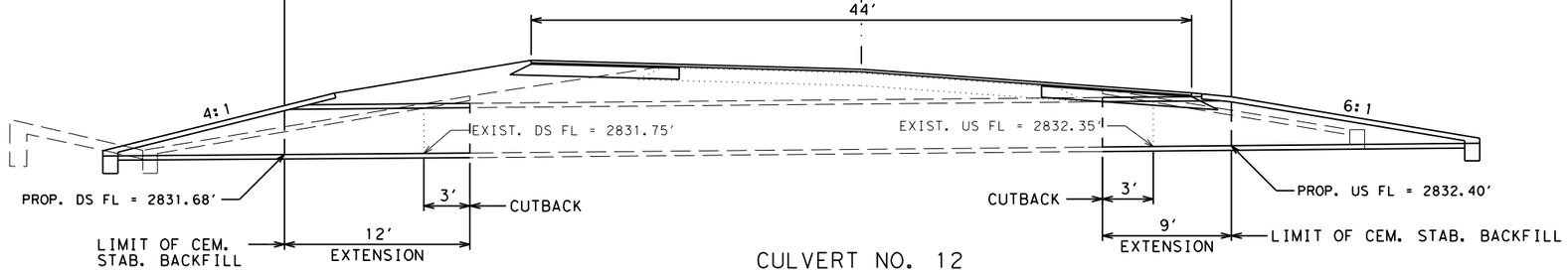
RCP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



CULVERT NO. 11

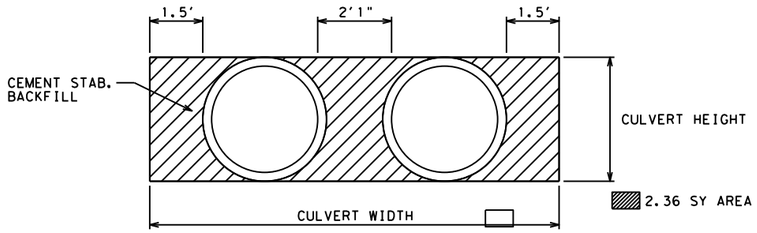
STA. 663+15.00
EXIST.: 1-24" X 40' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 12' LT & 12' RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 11			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	8
0464 6005	RC PIPE (CL III)(24 IN)	LF	24
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	6
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2



CULVERT NO. 12

STA. 709+04.00
EXIST.: 2-36" X 49' RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 2 - 36" RCP 12' LT & 9' RT W/ 4:1LT & 6:1RT TYPE II SETP-CDs



CULVERT NO. 12 CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

CULVERT NO. 12			
ITEM	DESCRIPTION	UNIT	QUANTITY
0104 6010	REMOVING CONC (RIPRAP)	CY	3.33
0400 6005	CEM STABIL BKFL	CY	17
0464 6008	RC PIPE (CL III)(36 IN)	LF	42
0467 6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	2
0467 6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	4
0496 6007	REMOV STR (PIPE)	LF	12
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2
0658 6086	INSTL DEL ASSM (D-SY)SZ 1(YFLX)GND	EA	2

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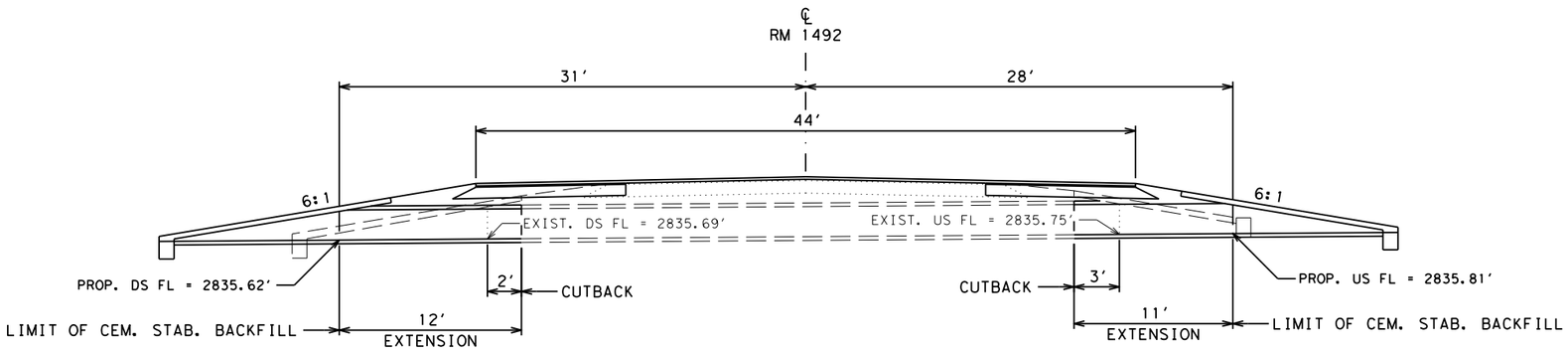
CULVERT CROSS SECTIONS

SHEET 6 OF 8

Texas Department of Transportation

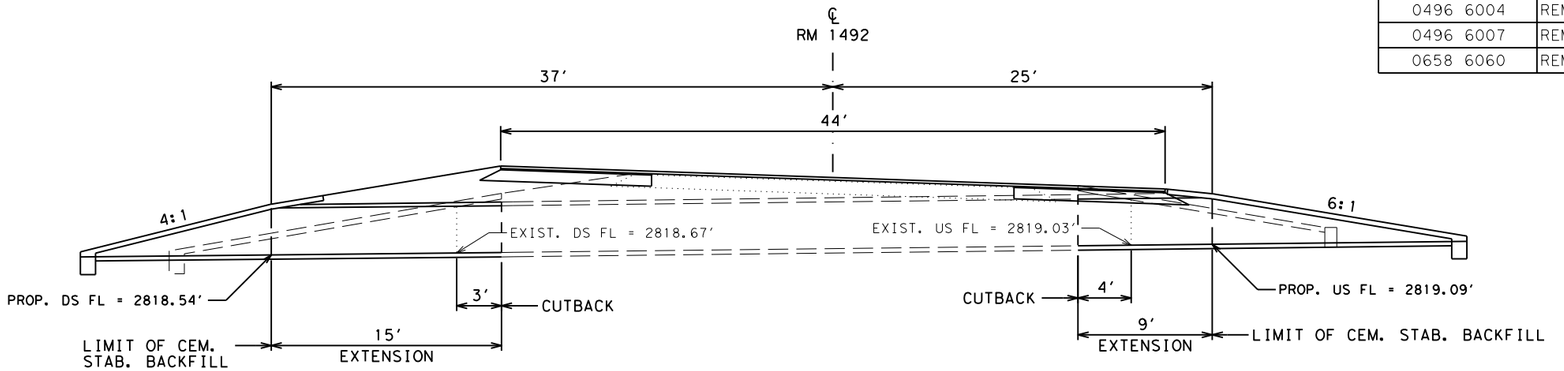
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			85
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



CULVERT NO. 13

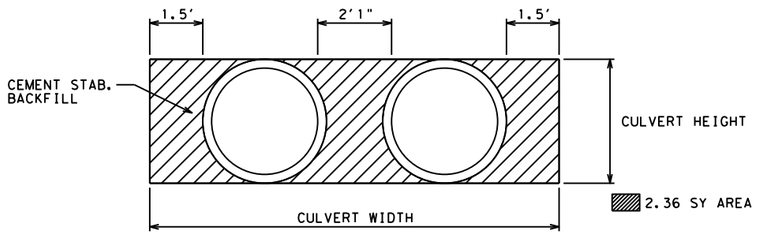
STA. 770+79.00
EXIST.: 1-24" X 42′ RCP WITH SETP-CD (LT AND RT)
PROP.: EXTEND 1 - 24" RCP 12′ LT & 11′ RT W/ 6:1LT & 6:1RT TYPE II SETP-CD

CULVERT NO. 13			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	8
0464 6005	RC PIPE (CL III)(24 IN)	LF	23
0467 6394	SET (TY II) (24 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	2
0496 6007	REMOV STR (PIPE)	LF	5
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2



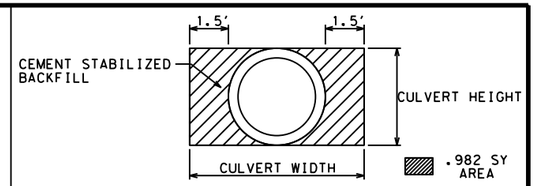
CULVERT NO. 14

STA. 843+98.00
EXIST.: 2-36" X 45′ RCP WITH SETP-CDs (LT AND RT)
PROP.: EXTEND 2 - 36" RCP 15′ LT & 9′ RT W/ 4:1LT & 6:1RT TYPE II SETP-CDs



CULVERT NO. 14 CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

CULVERT NO. 14			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	19
0464 6008	RC PIPE (CL III)(36 IN)	LF	48
0467 6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	2
0467 6453	SET (TY II) (36 IN) (RCP) (6: 1) (C)	EA	2
0496 6004	REMOV STR (SET)	EA	4
0496 6007	REMOV STR (PIPE)	LF	14
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2



RCP CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

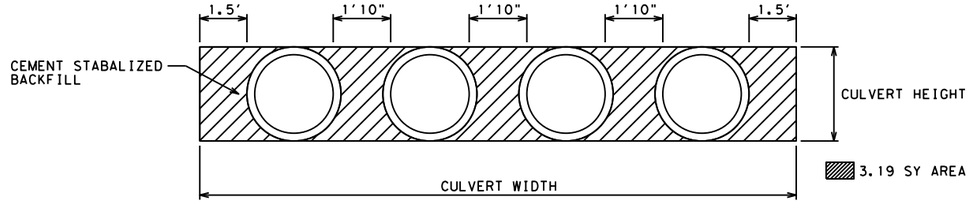
DocuSigned by:
10/30/2025, P.E.
88BF61DF326A480...

CULVERT CROSS SECTIONS

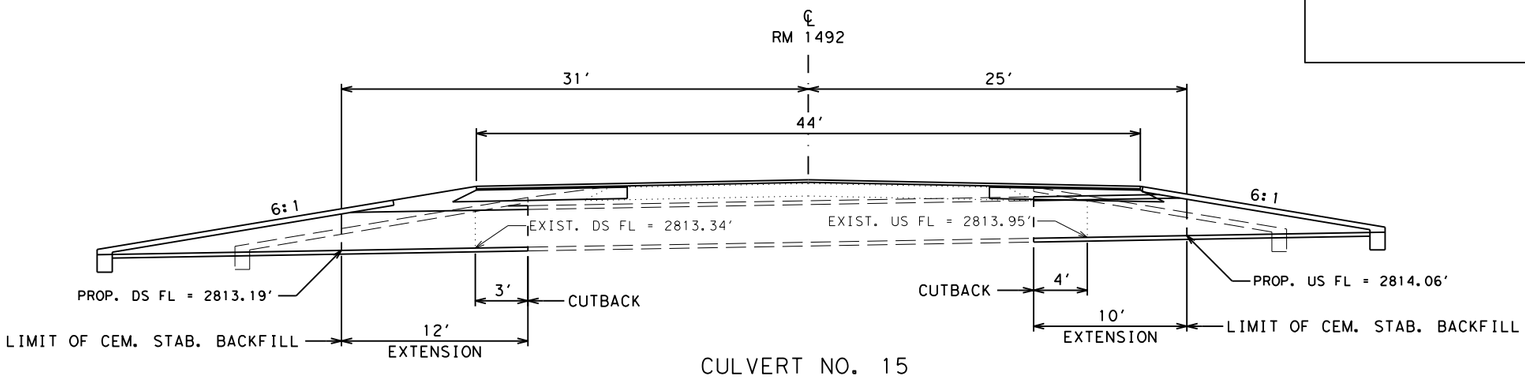
SHEET 7 OF 8

Texas Department of Transportation
©2022

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			86
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



CULVERT NO. 15 CEMENT STABILIZED BACKFILL DETAIL
(NOT TO SCALE)



CULVERT NO. 15

STA. 843+98.00
EXIST.: 4-30" X 41' RCP WITH SETP-CDs (LT AND RT)
PROP.: EXTEND 4 - 30" RCP 12' LT & 10' RT W/ 6:1LT & 6:1RT TYPE II SETP-CDs

CULVERT NO. 15			
ITEM	DESCRIPTION	UNIT	QUANTITY
0400 6005	CEM STABIL BKFL	CY	24
0464 6007	RC PIPE (CL III)(30 IN)	LF	88
0467 6422	SET (TY II) (30 IN) (RCP) (6: 1) (C)	EA	8
0496 6004	REMOV STR (SET)	EA	8
0496 6007	REMOV STR (PIPE)	LF	28
0658 6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	2

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
10/20/2022, PE
88BF61DF326A480...

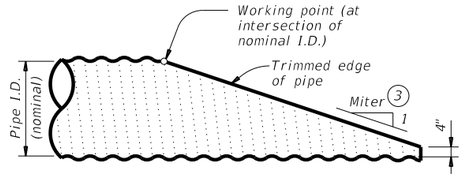
CULVERT CROSS SECTIONS

SHEET 8 OF 8

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			87
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

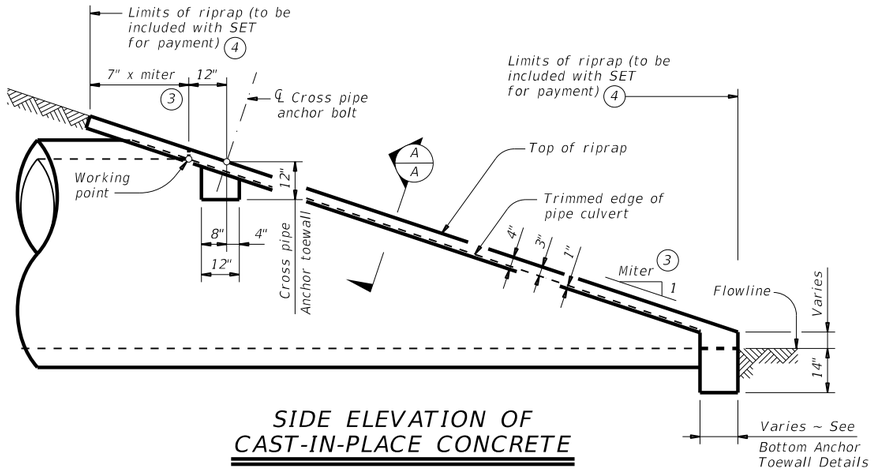
DATE:
FILE:



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

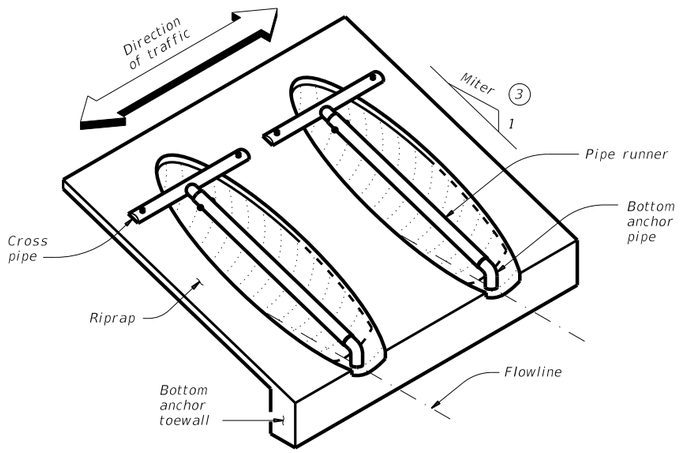
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

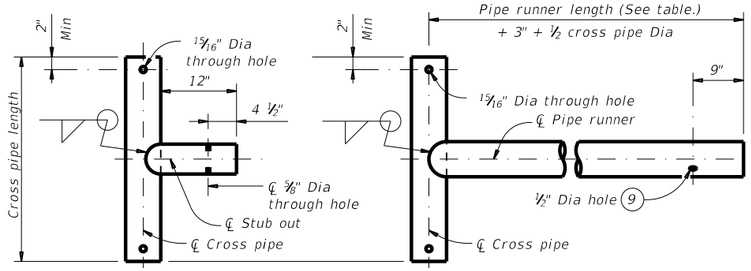
SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

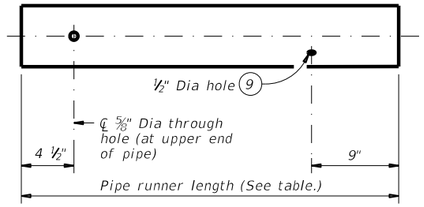
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		88

DATE:
FILE:



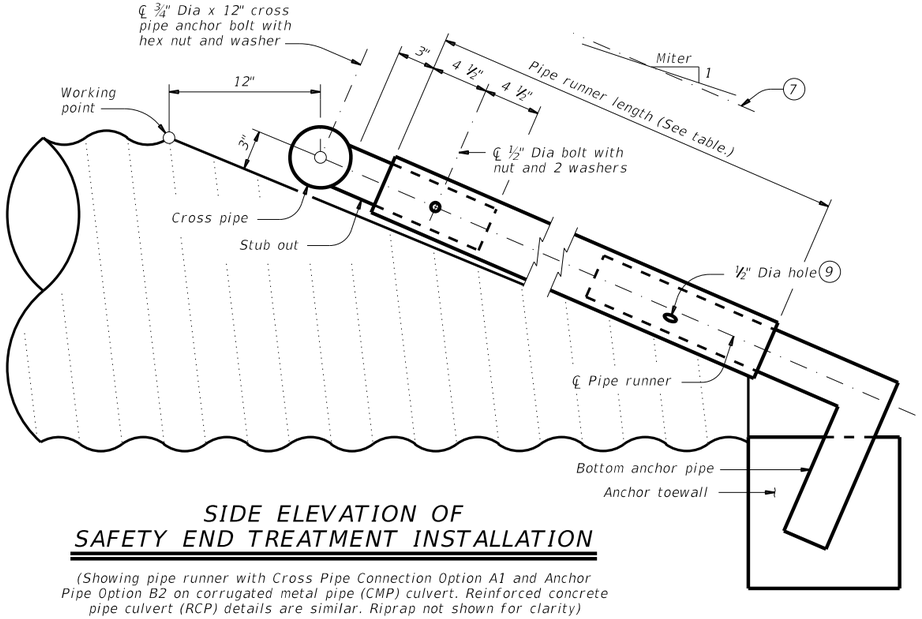
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



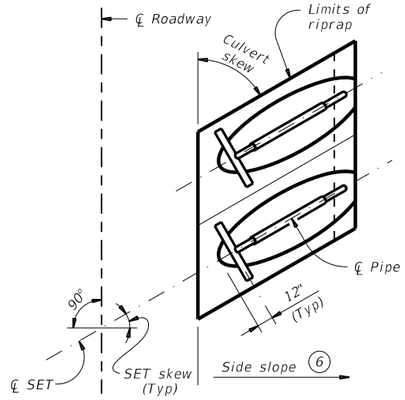
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

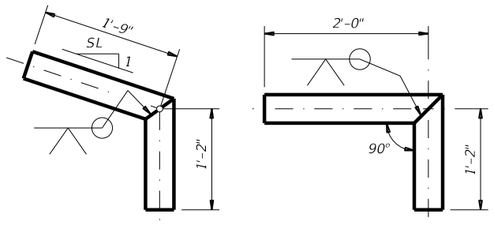


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

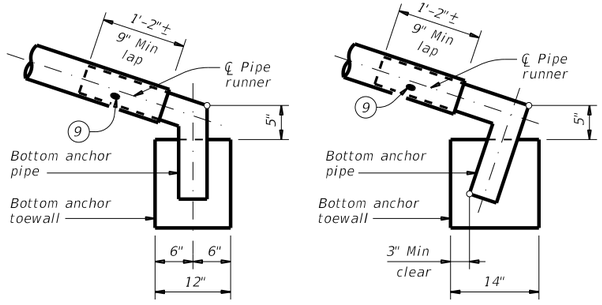


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

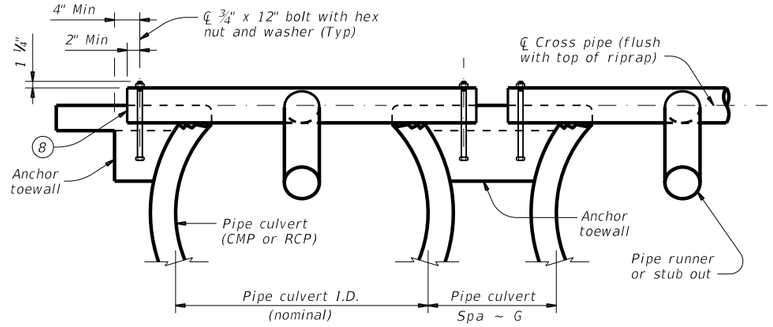
BOTTOM ANCHOR PIPE DETAILS (10)



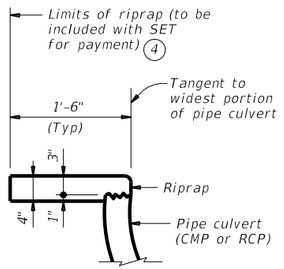
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

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

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation

Bridge Division Standard

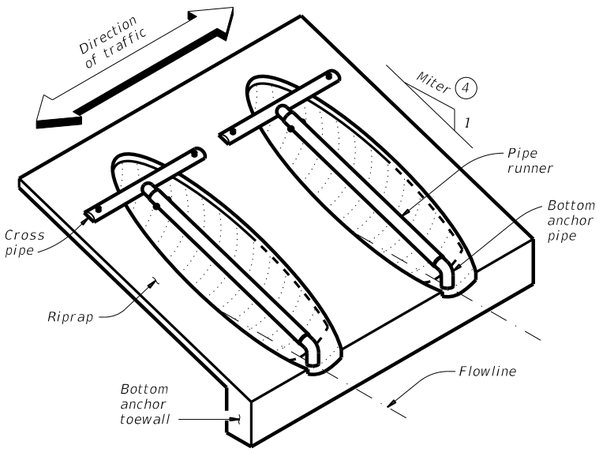
SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

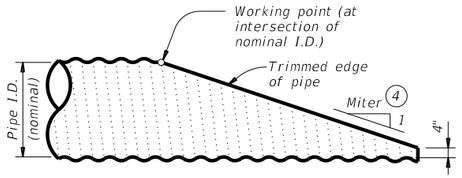
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		89

DATE:
FILE:



ISOMETRIC VIEW OF TYPICAL INSTALLATION

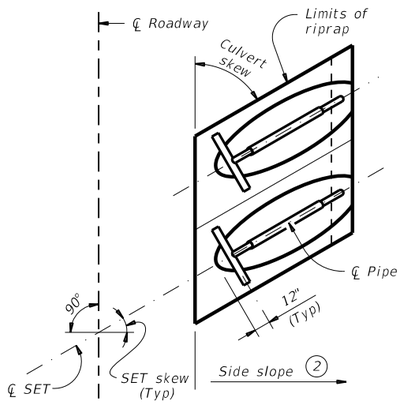
(Showing installation with no skew.)



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert. Details of reinforced concrete pipe (CMP) culvert are similar.)



PLAN OF SKEWED INSTALLATION

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (3)

Corrugated Metal Pipe (CMP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	17"	13"	1' – 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	21"	15"	1' – 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28"	20"	1' – 5"	3' – 9"	N/A	N/A	3' – 5"	4' – 7"	N/A	N/A	4' – 11"	6' – 5"	N/A	N/A	7' – 11"	10' – 2"
4	35"	24"	1' – 8"	4' – 4"	3' – 10"	4' – 0"	4' – 7"	6' – 0"	5' – 5"	5' – 8"	6' – 6"	8' – 4"	8' – 8"	9' – 1"	10' – 3"	12' – 11"
5	42"	29"	1' – 11"	4' – 11"	5' – 1"	5' – 4"	6' – 1"	7' – 10"	7' – 2"	7' – 5"	8' – 6"	10' – 9"	11' – 2"	11' – 8"	13' – 2"	16' – 6"
6	49"	33"	2' – 2"	5' – 6"	6' – 2"	6' – 5"	7' – 4"	N/A	8' – 6"	8' – 10"	10' – 0"	N/A	13' – 3"	13' – 9"	15' – 6"	N/A
7	57"	38"	2' – 5"	6' – 2"	7' – 6"	7' – 9"	N/A	N/A	10' – 2"	10' – 7"	N/A	N/A	15' – 9"	16' – 4"	N/A	N/A

Reinforced Concrete Pipe (RCP) Culverts

Design	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
					3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
					0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	22"	13 ½"	1' – 0"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	26"	15 ½"	1' – 2"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	28 ½"	18"	1' – 5"	3' – 9 ½"	N/A	N/A	2' – 10"	3' – 10"	N/A	N/A	4' – 2"	5' – 5"	N/A	N/A	6' – 9"	8' – 9"
4	36 ¼"	22 ½"	1' – 8"	4' – 5 ¼"	3' – 5"	3' – 7"	4' – 2"	5' – 6"	4' – 11"	5' – 1"	5' – 11"	7' – 7"	7' – 11"	8' – 3"	9' – 5"	11' – 11"
5	43 ¾"	26 ⅝"	1' – 11"	4' – 0 ¾"	4' – 6"	4' – 8"	5' – 5"	6' – 11"	6' – 4"	6' – 7"	7' – 6"	9' – 7"	10' – 0"	10' – 5"	11' – 9"	14' – 10"
6	51 ⅛"	31 5/16"	2' – 2"	5' – 8"	5' – 9"	6' – 0"	6' – 10"	N/A	7' – 11"	8' – 3"	9' – 4"	N/A	12' – 4"	12' – 10"	14' – 6"	N/A
7	58 ½"	36"	2' – 5"	6' – 3 ½"	6' – 11"	7' – 3"	N/A	N/A	9' – 6"	9' – 11"	N/A	N/A	14' – 9"	15' – 4"	N/A	N/A

TYPICAL PIPE CULVERT MITERS (4)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (3)

Design	Single Pipe Culvert	Multiple Pipe Culverts
1 and 2	Skews thru 45°	Skews thru 45°
3	Skews thru 35°	Skews thru 10°
4	Normal (no skew)	Always required
5 thru 7	Always required	Always required

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runners Lengths table.

(2) Recommended values of slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(3) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For Design 1 through 5 culvert pipe sizes, the skew must not exceed 45°.
For Design 6 culvert pipes, the skew must not exceed 30°.
For Design 7 culvert pipes, the skew must not exceed 15°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT "Roadway Design Manual".

(4) Miter = slope of mitered end of pipe culvert.

MATERIAL NOTES:

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

Provide pipe runners, cross pipes, and anchor pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

GENERAL NOTES:

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

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7 ARCH PIPE CULVERTS TYPE II ~ CROSS DRAINAGE

SETP-CD-A

FILE: setpcase-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		90

DATE:
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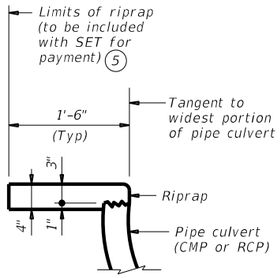
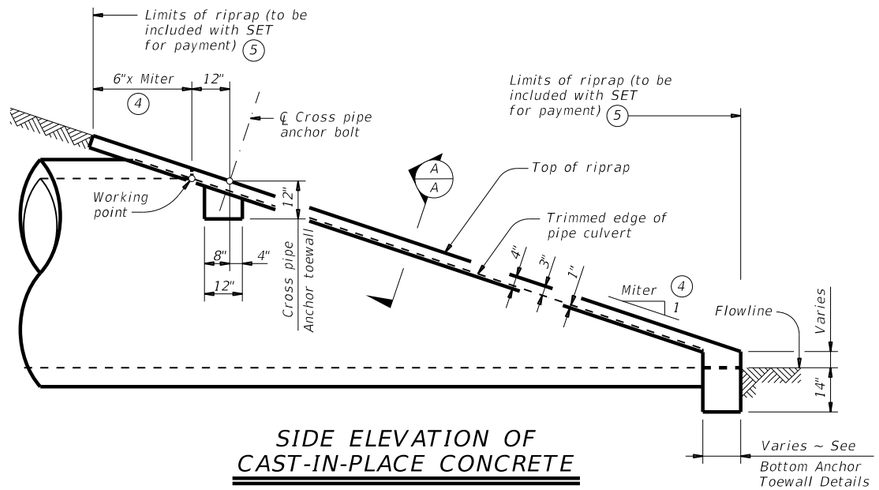


SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details of corrugated metal pipe (CMP) culvert are similar. Pipe runners not shown for clarity.)

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (6)

FOR BOTH CORRUGATED METAL PIPE CULVERTS AND CONCRETE PIPE CULVERTS

Design	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
1	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
2	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	1.0
3	0.6	0.6	0.7	0.8	0.7	0.7	0.8	0.9	0.9	1.0	1.0	1.2
4	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.4
5	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.2	1.3	1.3	1.4	1.7
6	0.9	1.0	1.0	N/A	1.1	1.1	1.2	N/A	1.4	1.5	1.6	N/A
7	1.0	1.1	N/A	N/A	1.3	1.3	N/A	N/A	1.7	1.7	N/A	N/A

(4) Miter = slope of mitered end of pipe culvert.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD-A

FILE: setpcase-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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REVISIONS	2906	01	006, ETC.	RM 1492
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	ODA	MIDLAND, ETC.		91

DATE:
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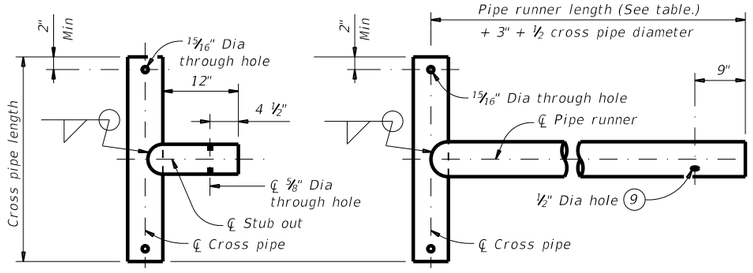
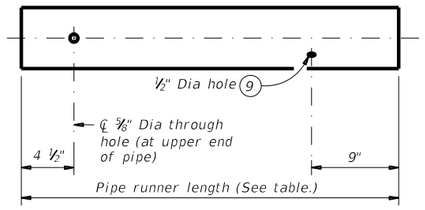


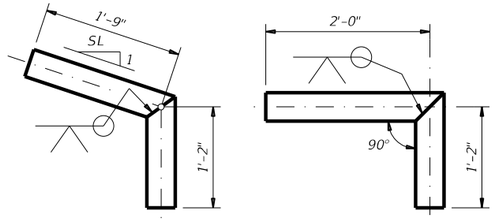
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



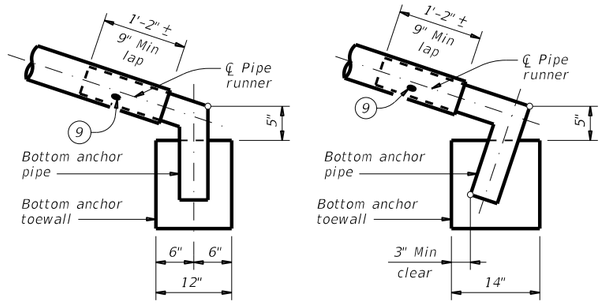
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS



OPTION B1 OPTION B2

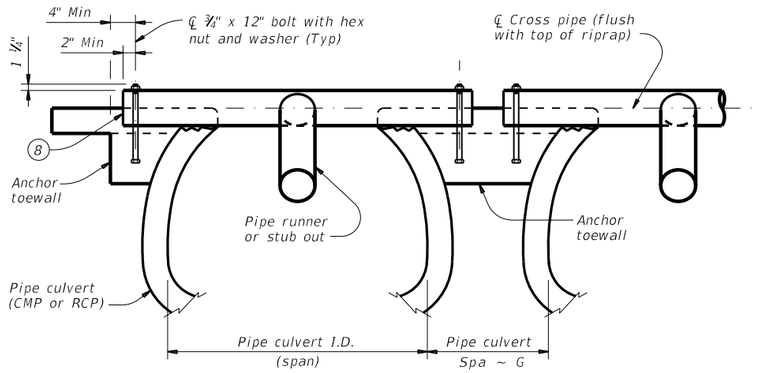
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

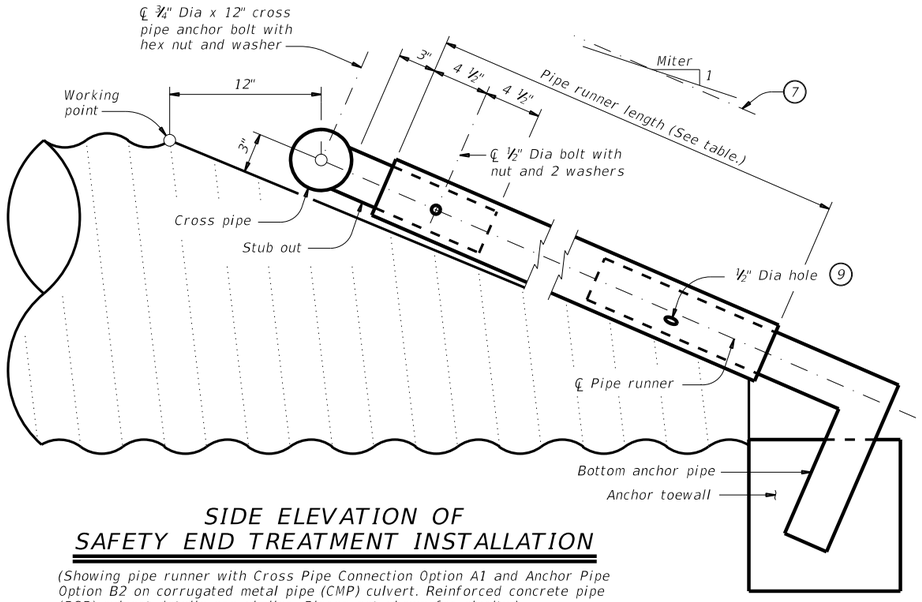
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL

SECTION A-A



SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Riprap not shown for clarity.)

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1#2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 7
ARCH PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

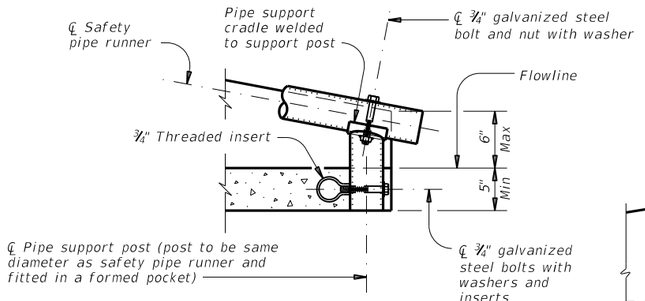
SETP-CD-A

FILE: setpcase-20.dgn	DN: GAF		CK: CAT	DW: JRP		CK: GAF	
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2906	01	006, ETC.		RM 1492		
	DIST	COUNTY				SHEET NO.	
	ODA	MIDLAND, ETC.				92	

DATE:
FILE:

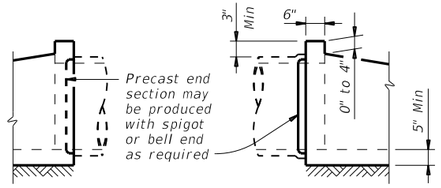
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' – 11"	≤ 45°	No	≤ 45°	No
				4:1	3' – 6"				
				6:1	4' – 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' – 8"	≤ 45°	No	≤ 45°	No
				4:1	4' – 7"				
				6:1	6' – 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' – 6"	≤ 45°	No	≤ 45°	No
				4:1	5' – 8"				
				6:1	8' – 0"				
24"	3"	1.95"	31.00"	3:1	6' – 2"	≤ 45°	No	= 30°	No
				4:1	7' – 10"			> 30°	Yes
				6:1	11' – 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' – 10"	= 15°	No	= 15°	No
				4:1	10' – 1"	> 15°	Yes	> 15°	Yes
				6:1	14' – 8"				
36"	4"	2.75"	45.50"	3:1	9' – 5"	= 0°	No	≥ 0°	Yes
				4:1	12' – 3"	> 0°	Yes		
				6:1	17' – 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' – 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' – 5"				
				6:1	21' – 2"				



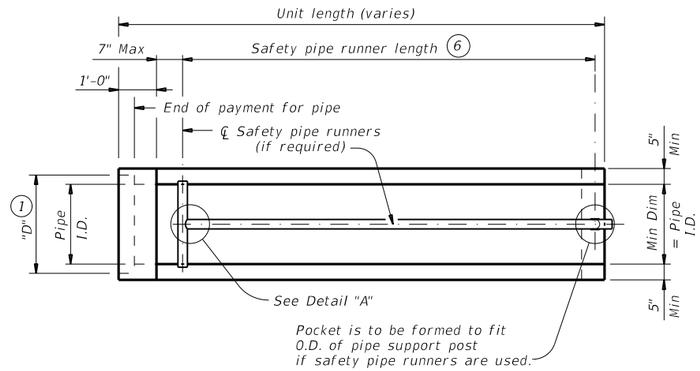
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



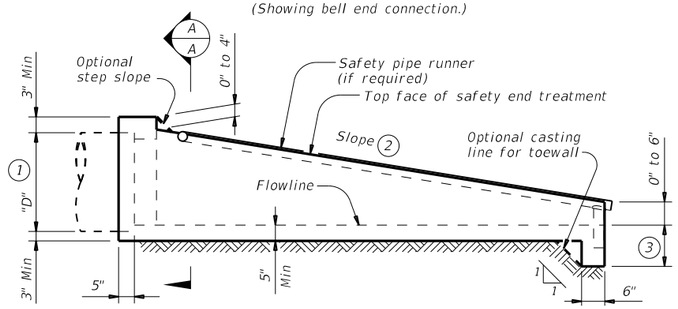
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



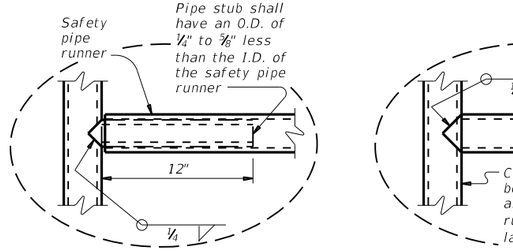
PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

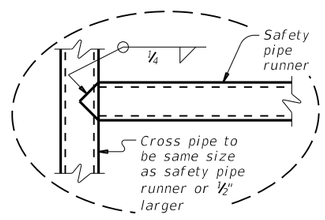
(Showing bell end connection.)



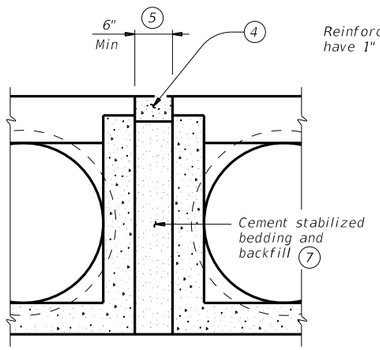
OPTION A

DETAIL A

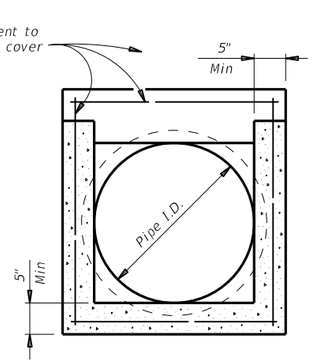
(If required)



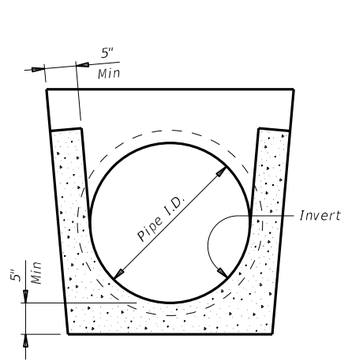
OPTION B



MULTIPLE PIPE INSTALLATION

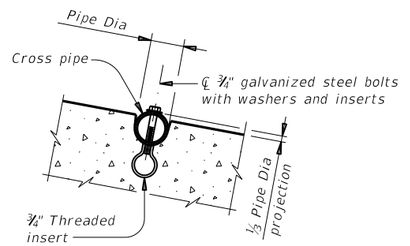


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

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

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

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

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

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

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

(6) Measured along slope.

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

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

GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	2906	01	006, ETC.	RM 1492
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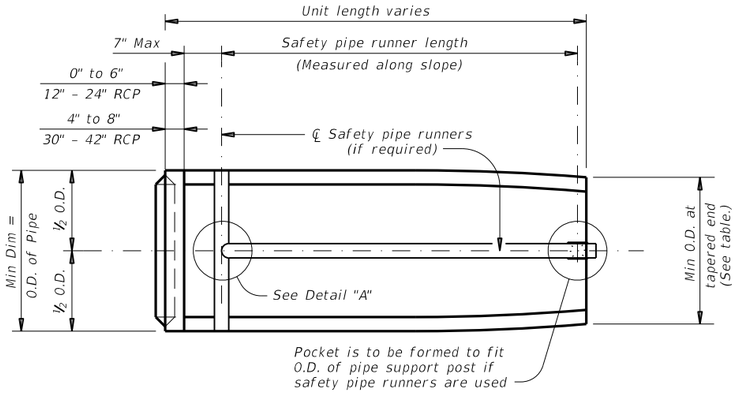
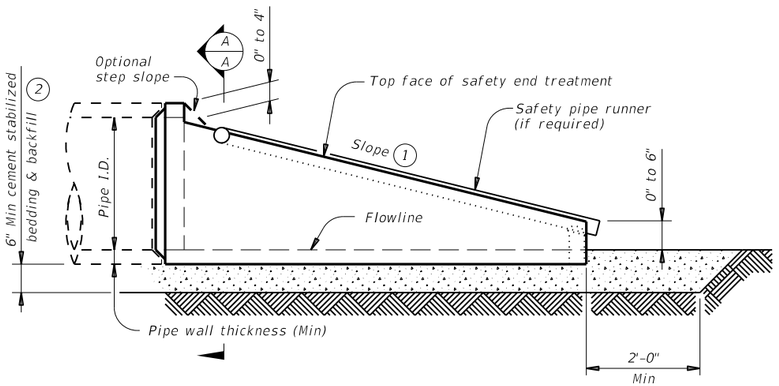


PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

(Showing spigot end connection.)

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

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

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

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

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

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

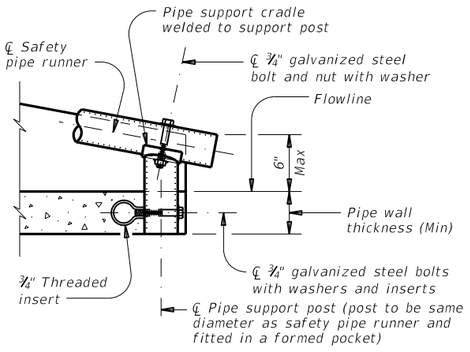
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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

OPTION A

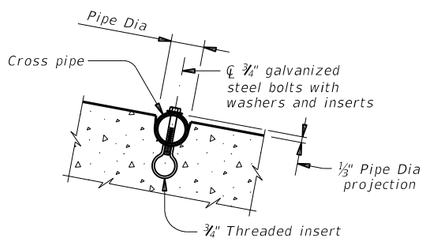
OPTION B

DETAIL A



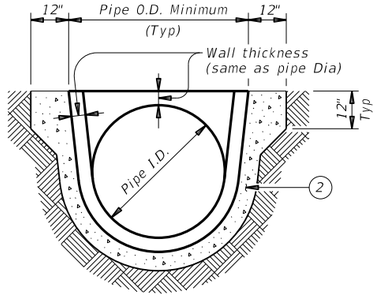
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

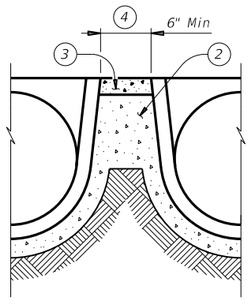


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

MATERIAL NOTES:

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

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

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

GENERAL NOTES:

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

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		94

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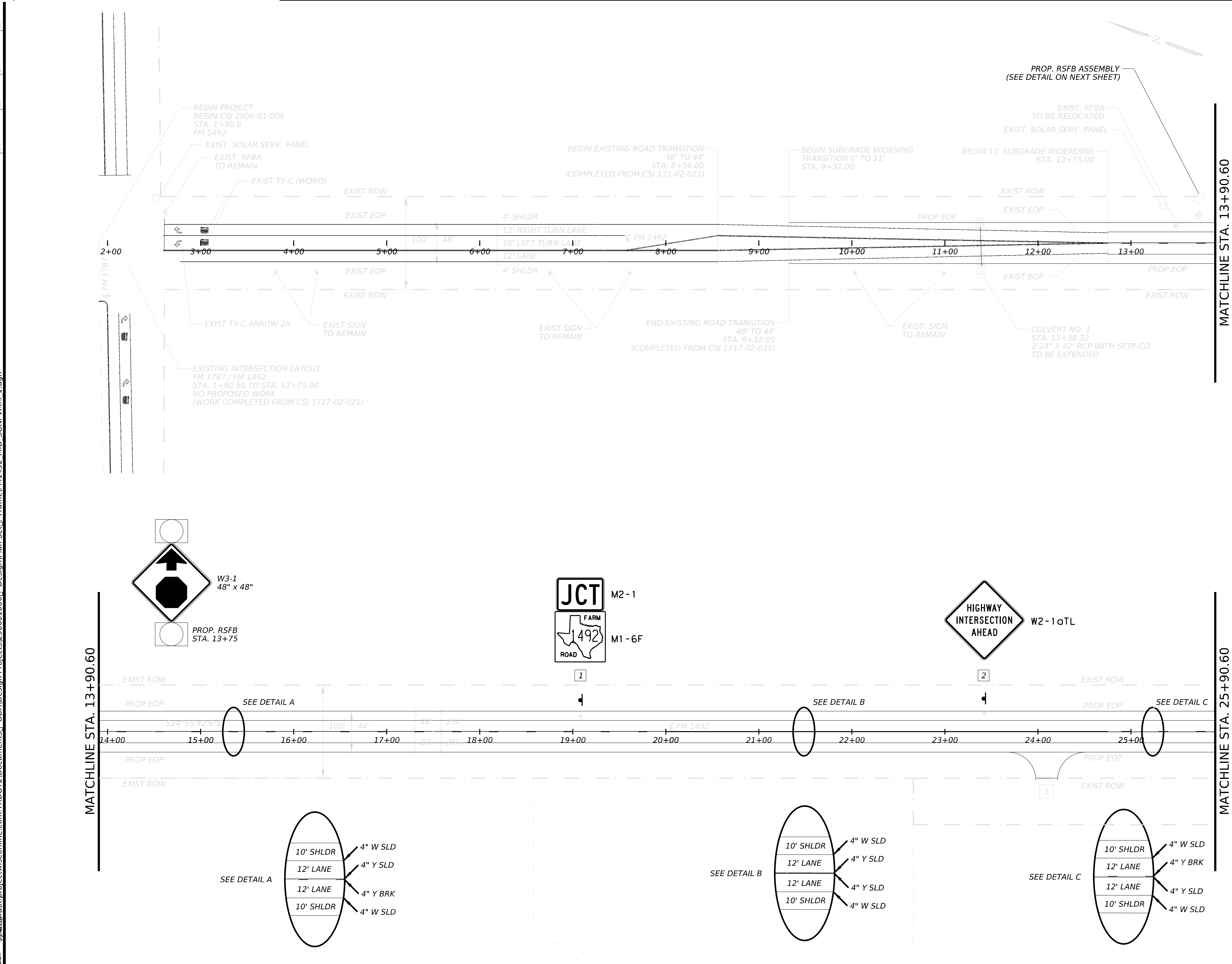

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SIGNING & PAVEMENT MARKING LAYOUT

SHEET 1 OF 40

CONT	SECT	JOB	HIGHWAY
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DIST		COUNTY	SHEET NO.
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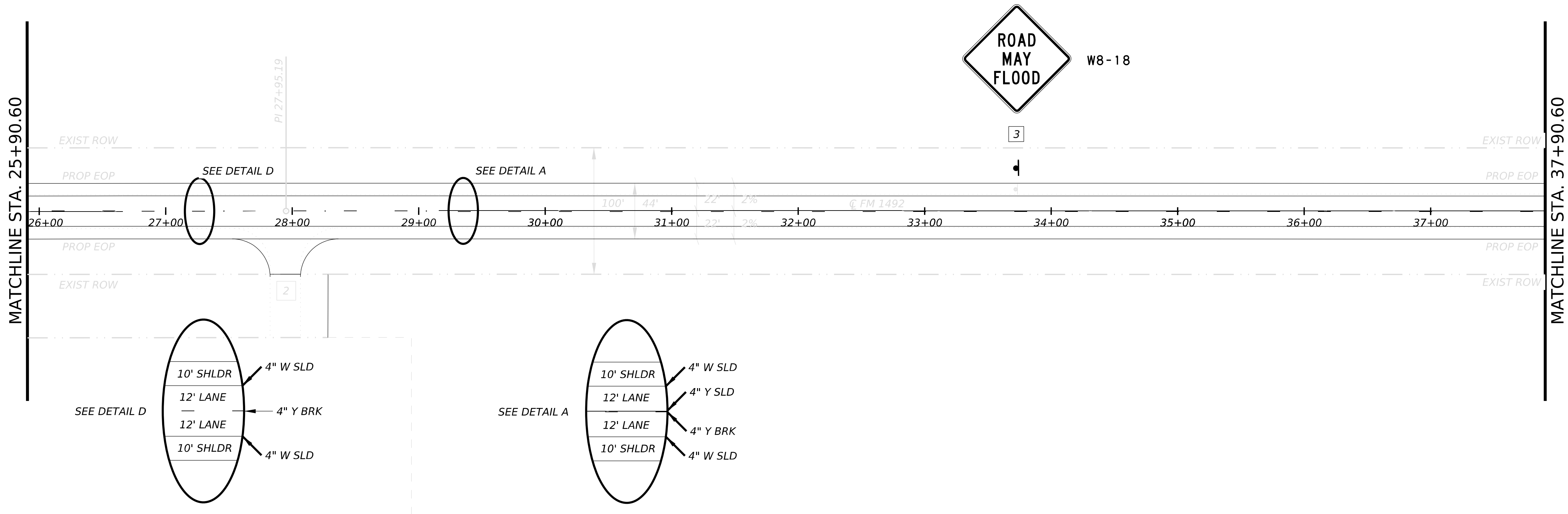

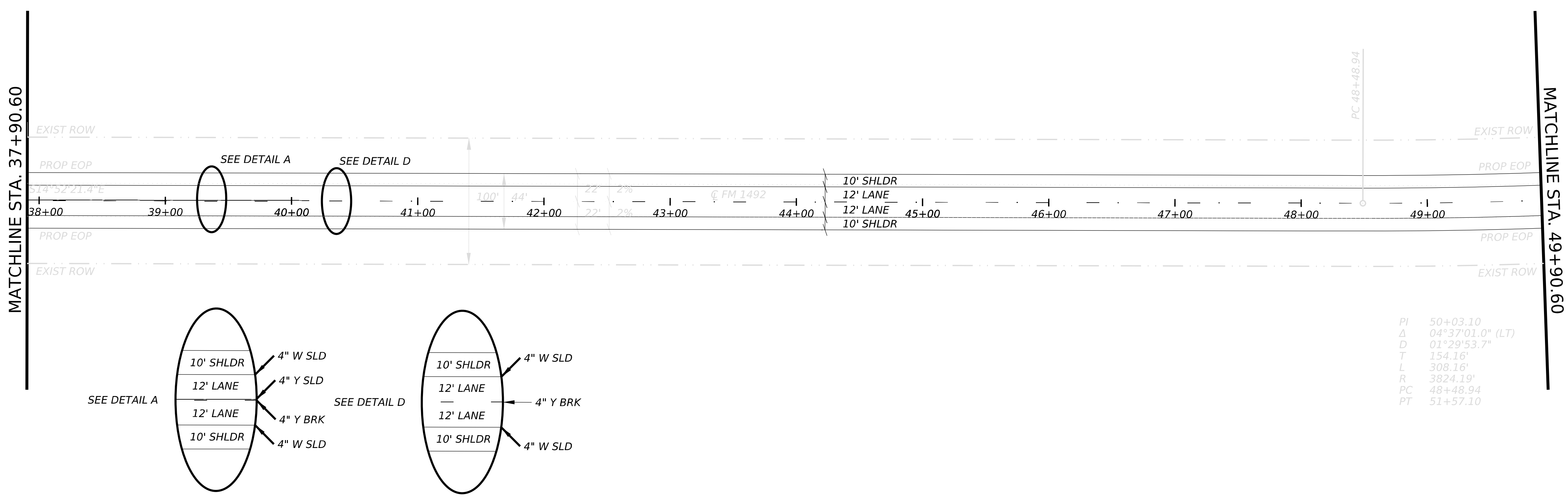

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SHEET 2 OF 40

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DIST	COUNTY		SHEET NO.
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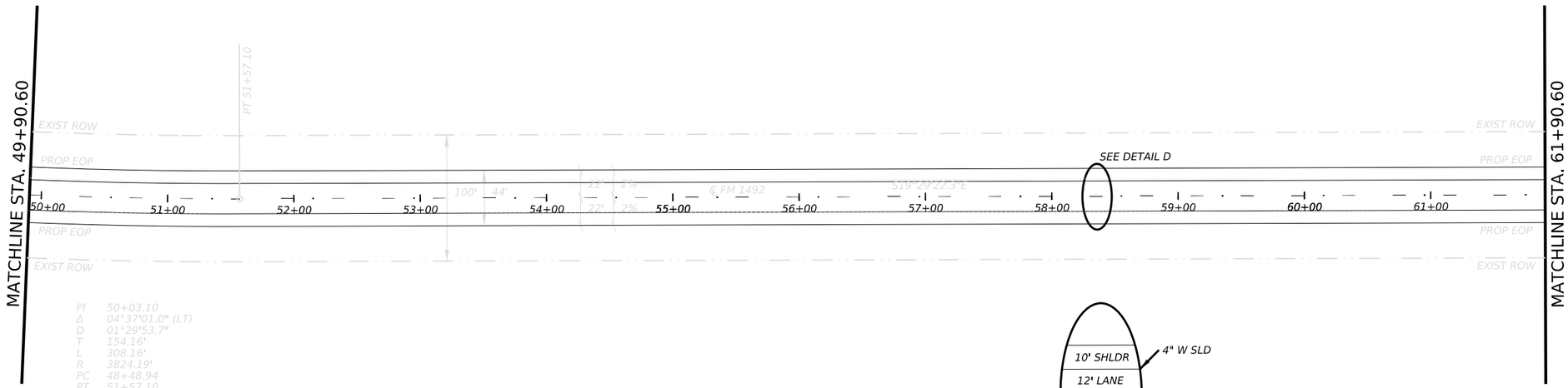

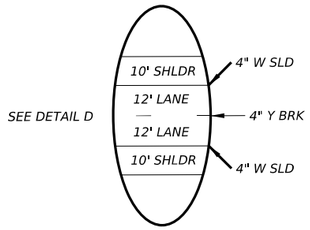

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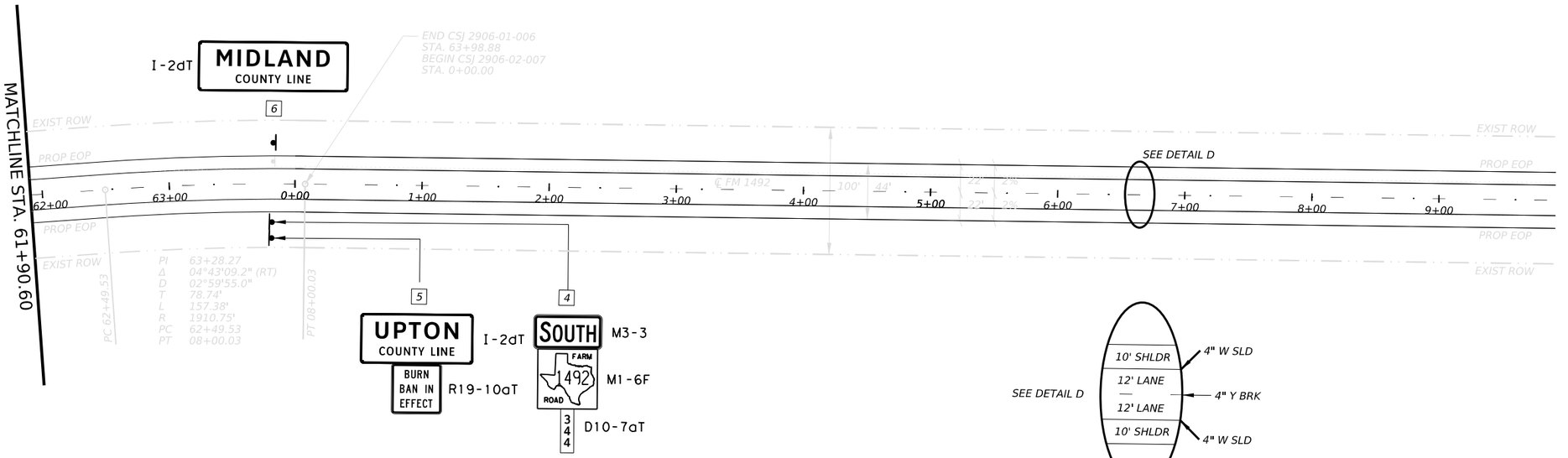

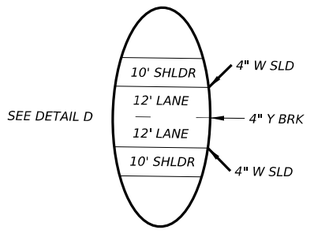

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SHEET 3 OF 40

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DIST	COUNTY		SHEET NO.
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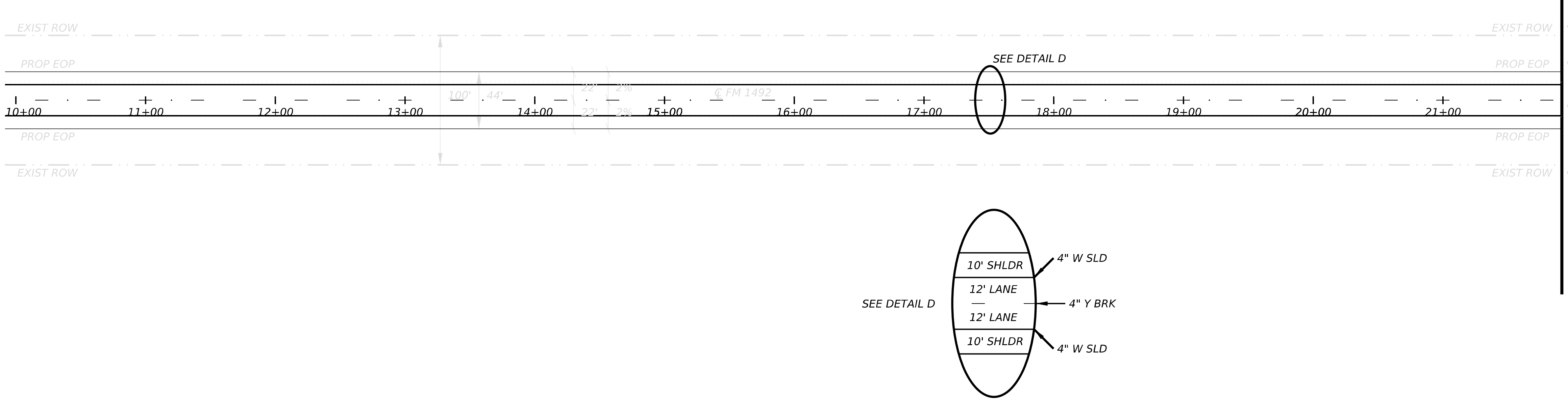

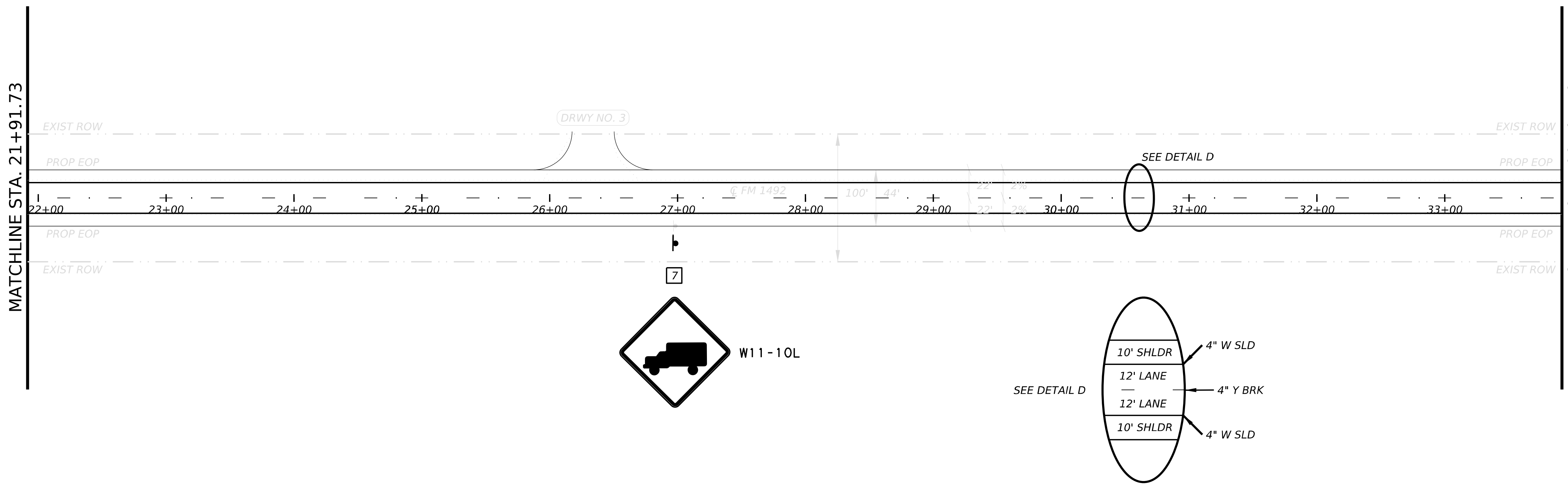

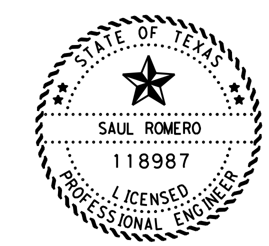

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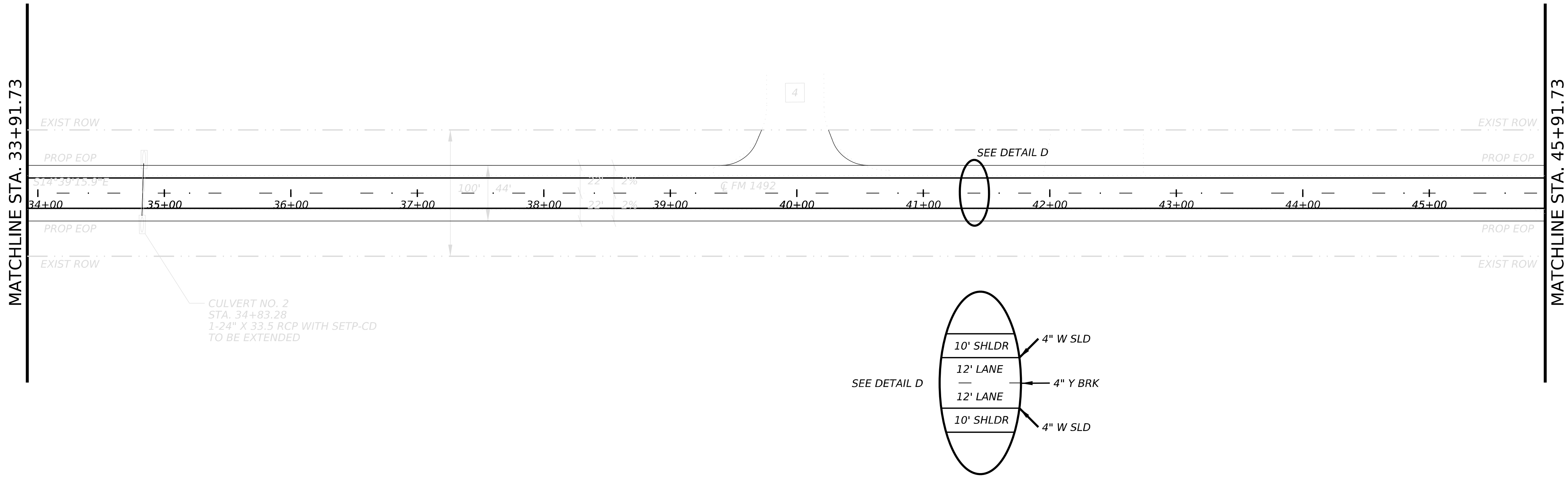

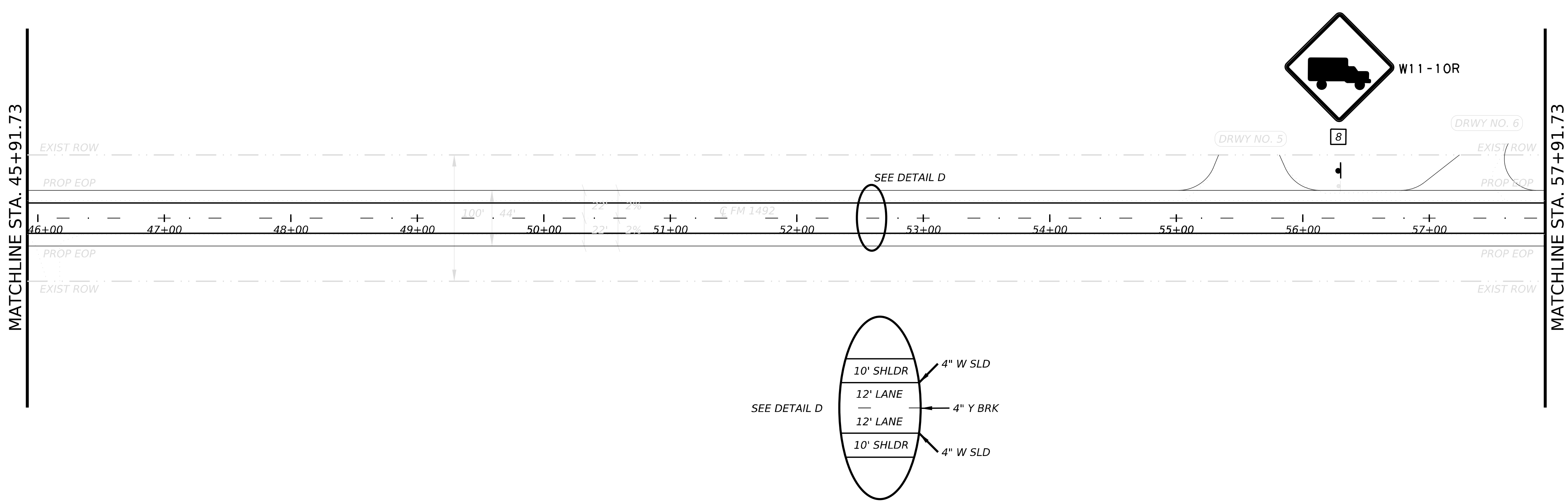

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SHEET 5 OF 40

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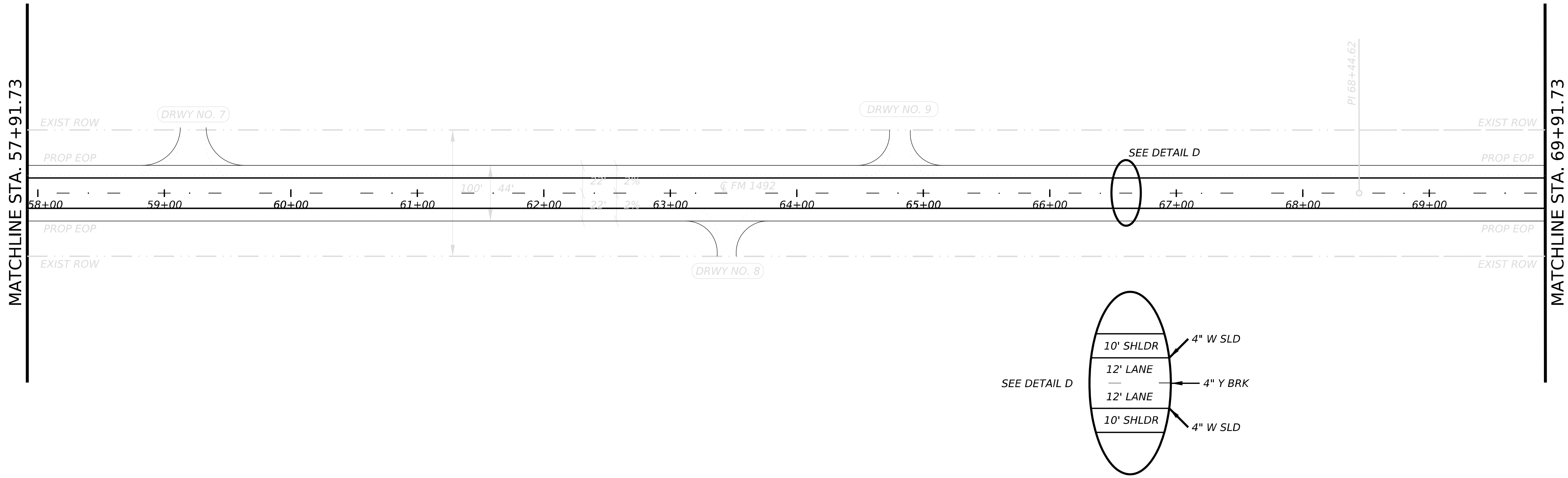

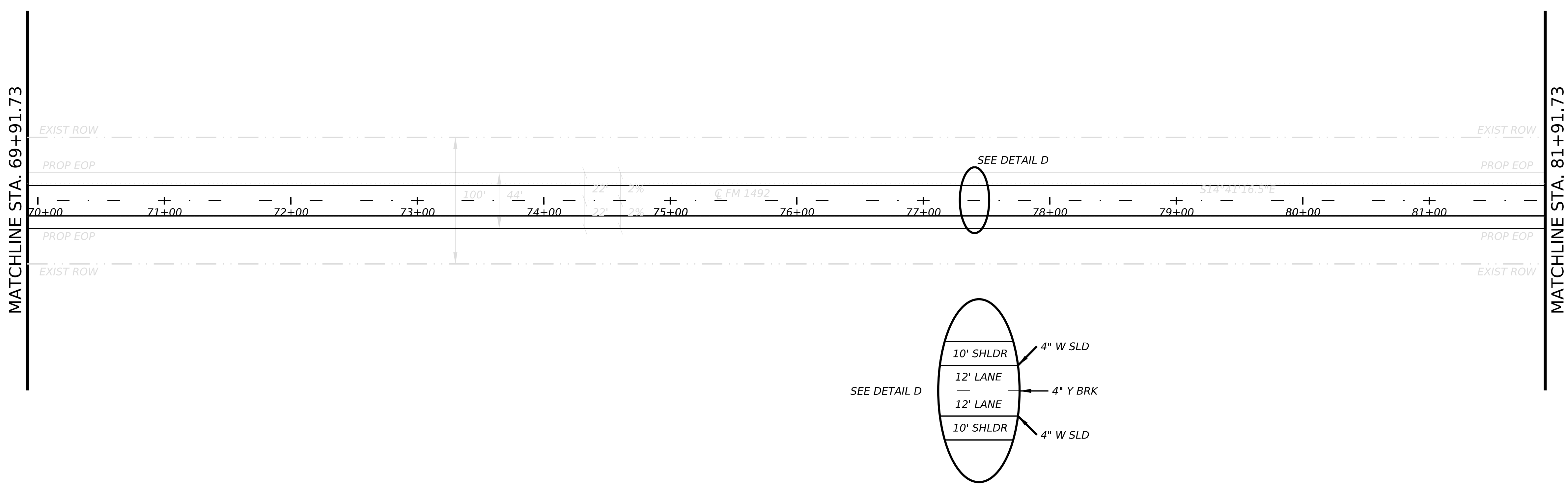

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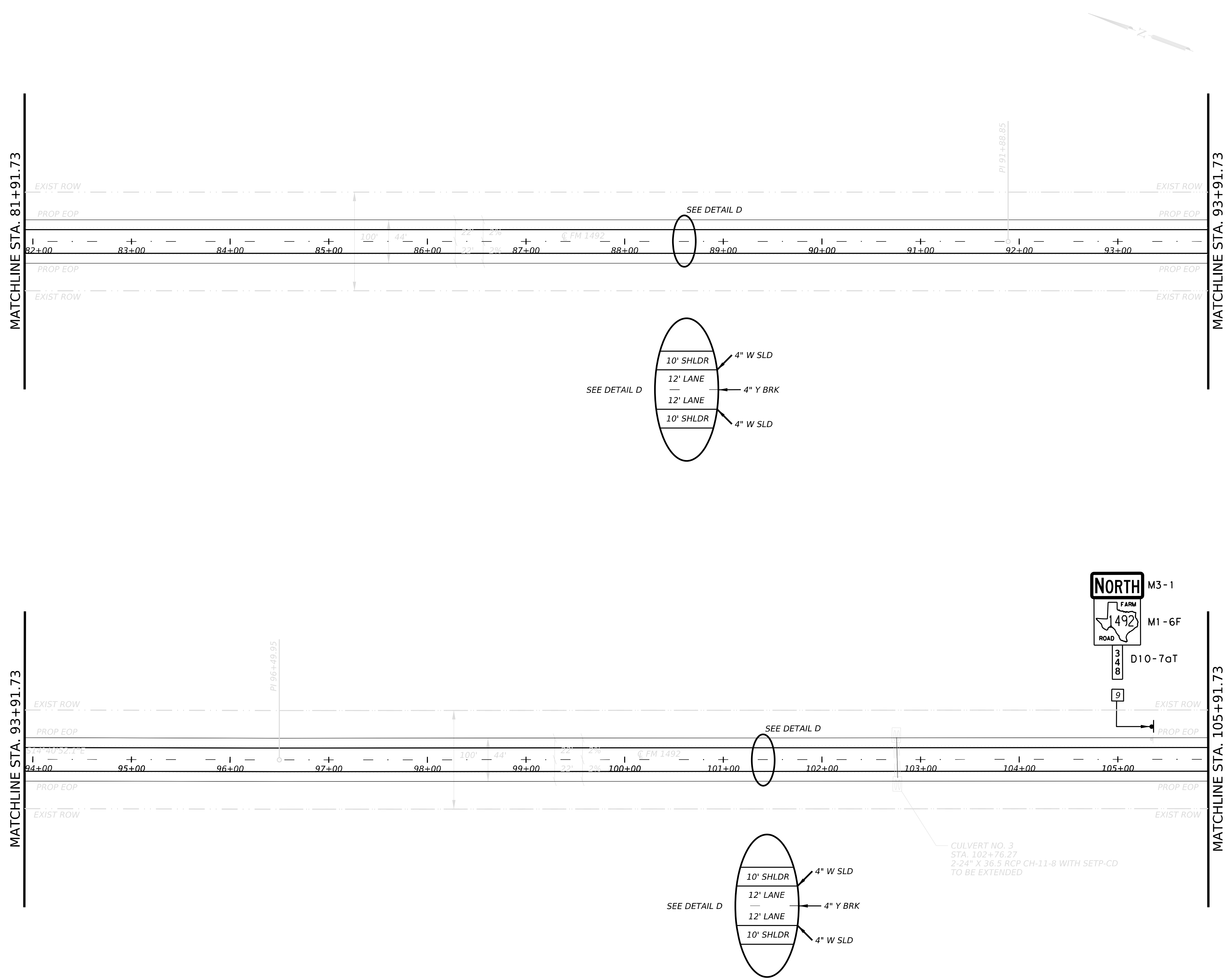

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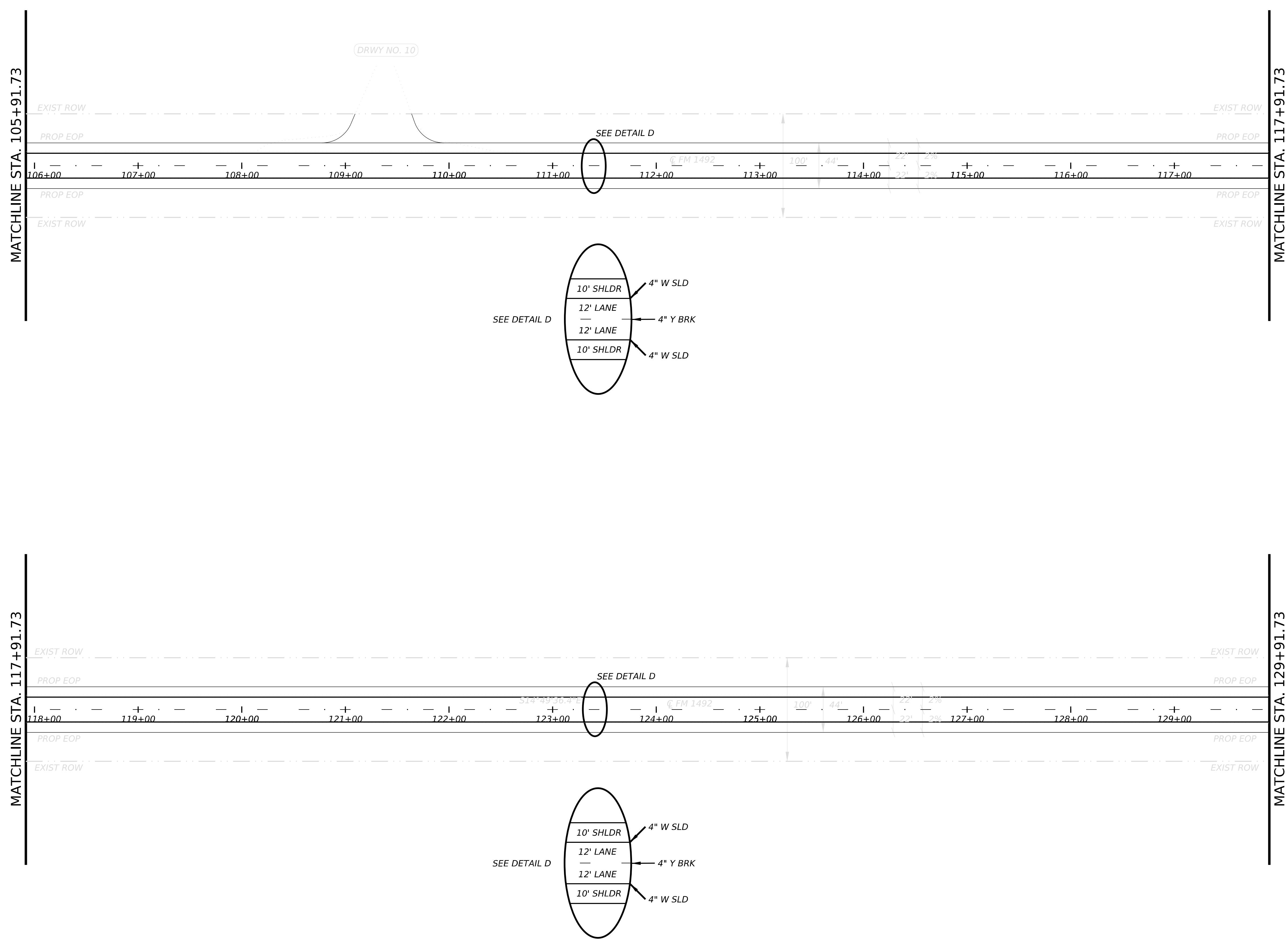

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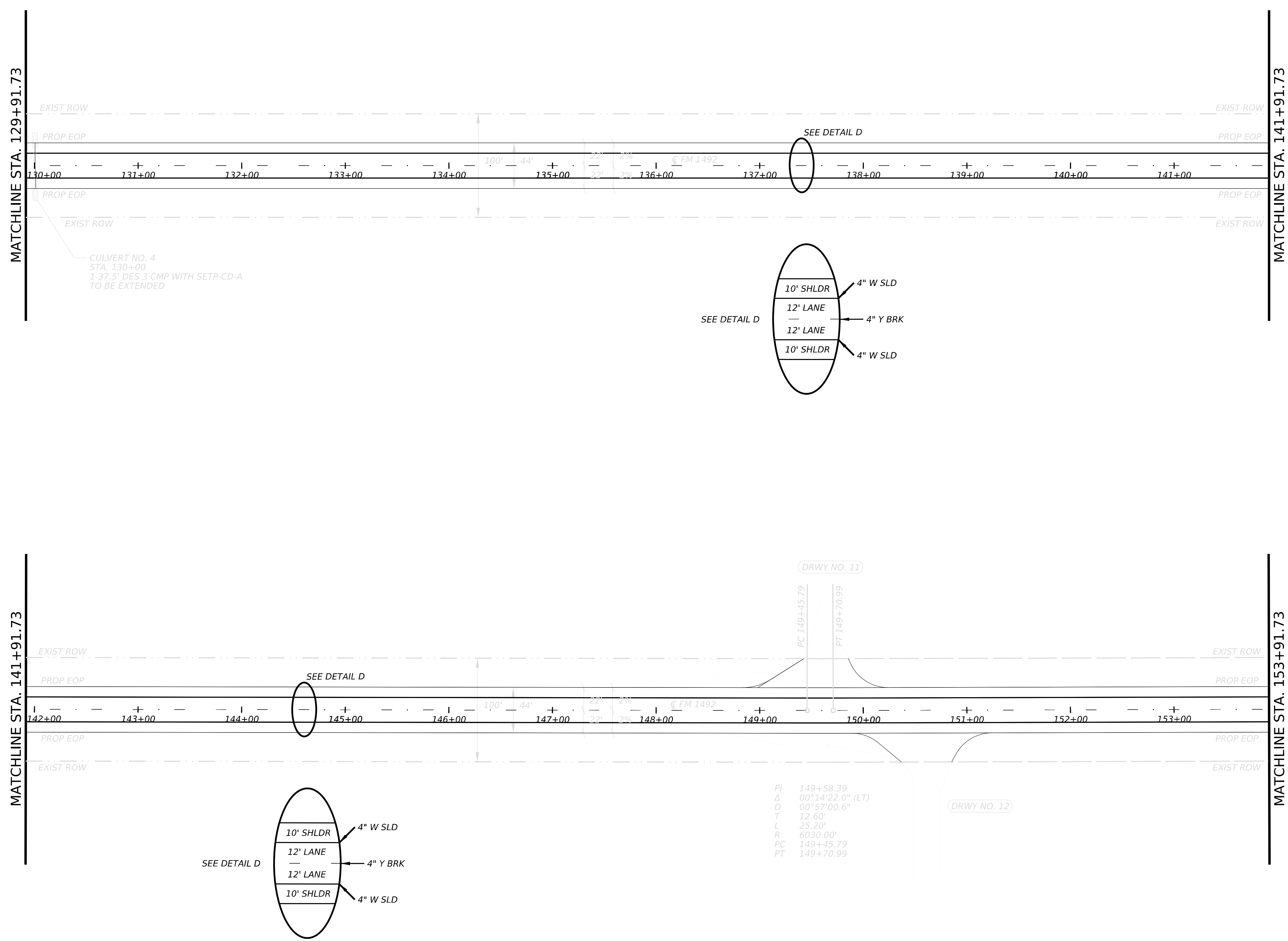

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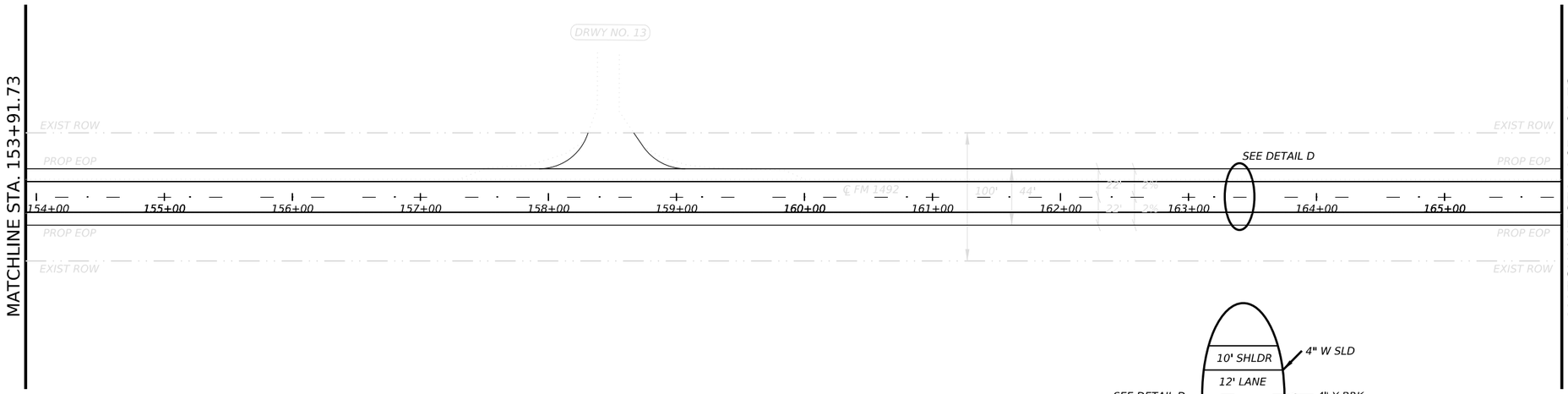

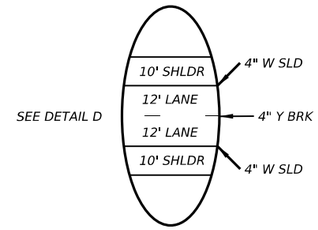

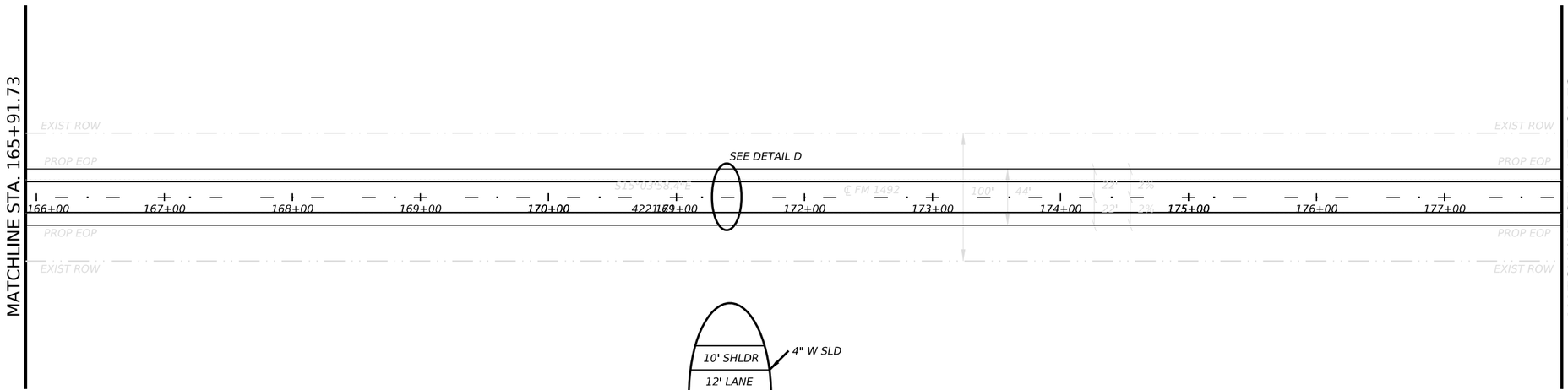

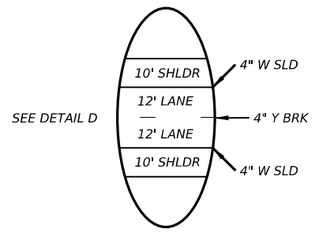

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SHEET 10 OF 40

CONT	SECT	JOB	HIGHWAY
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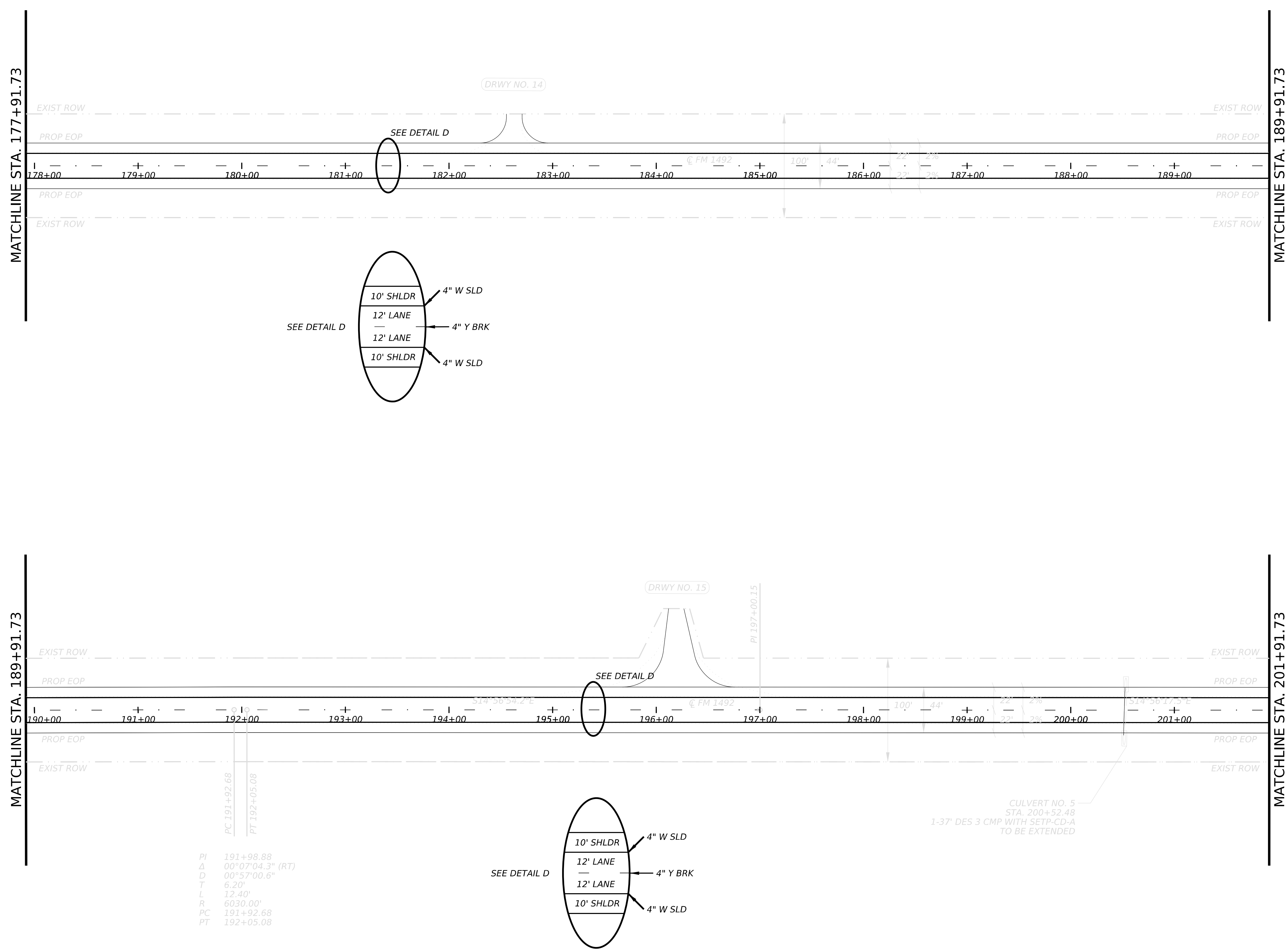

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SHEET 11 OF 40

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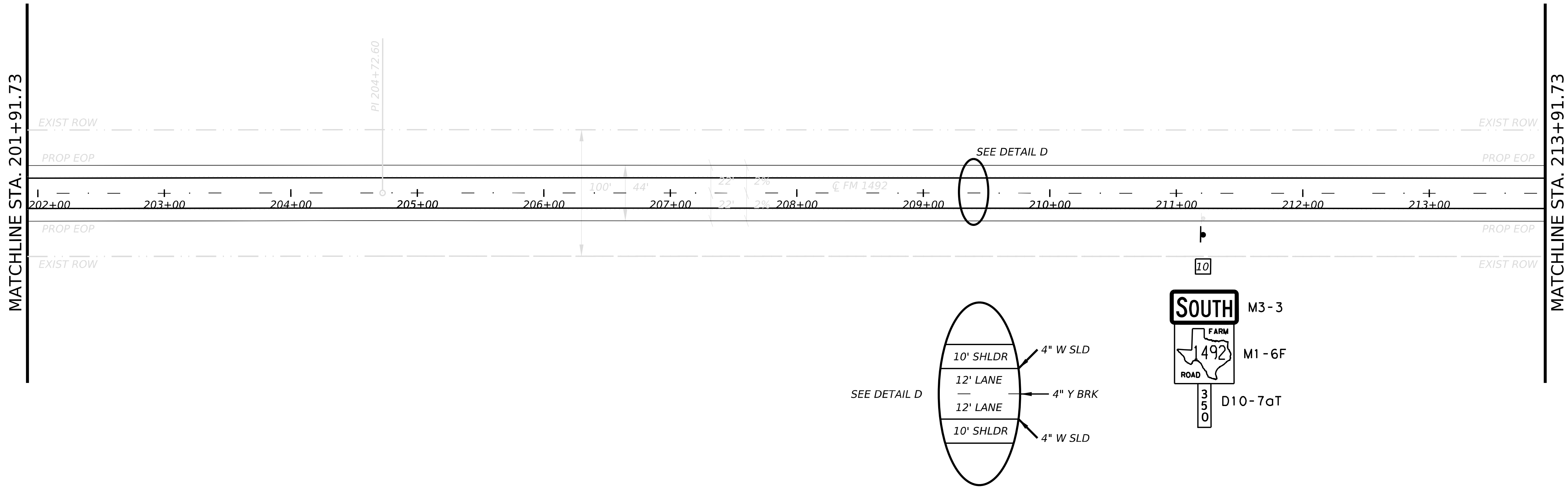

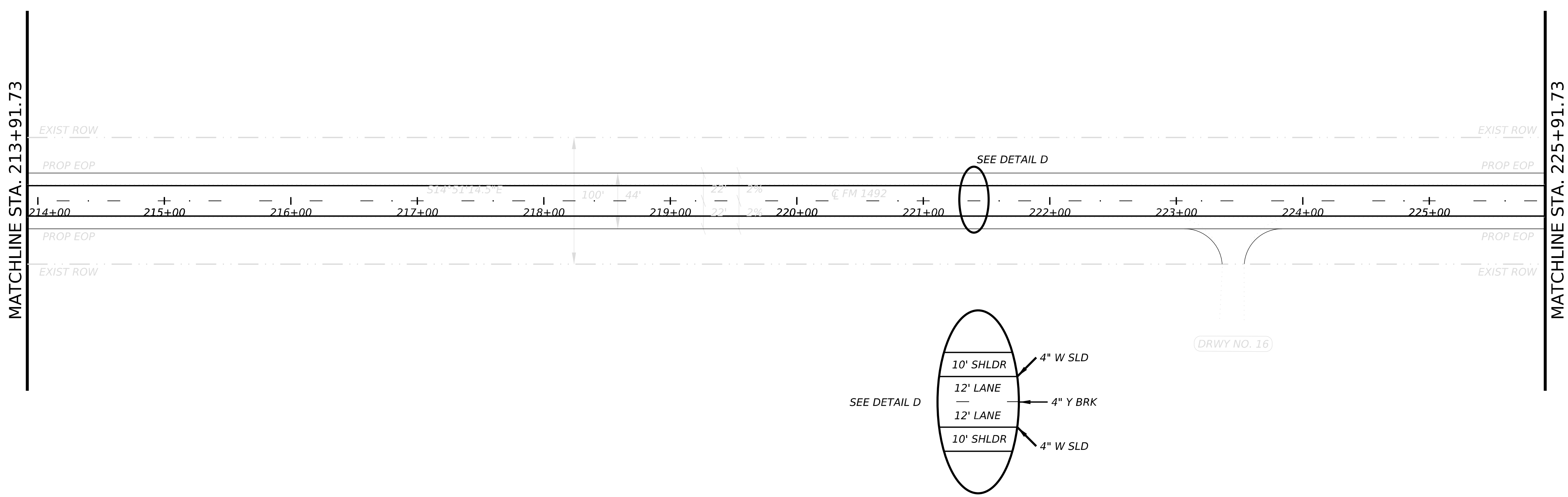

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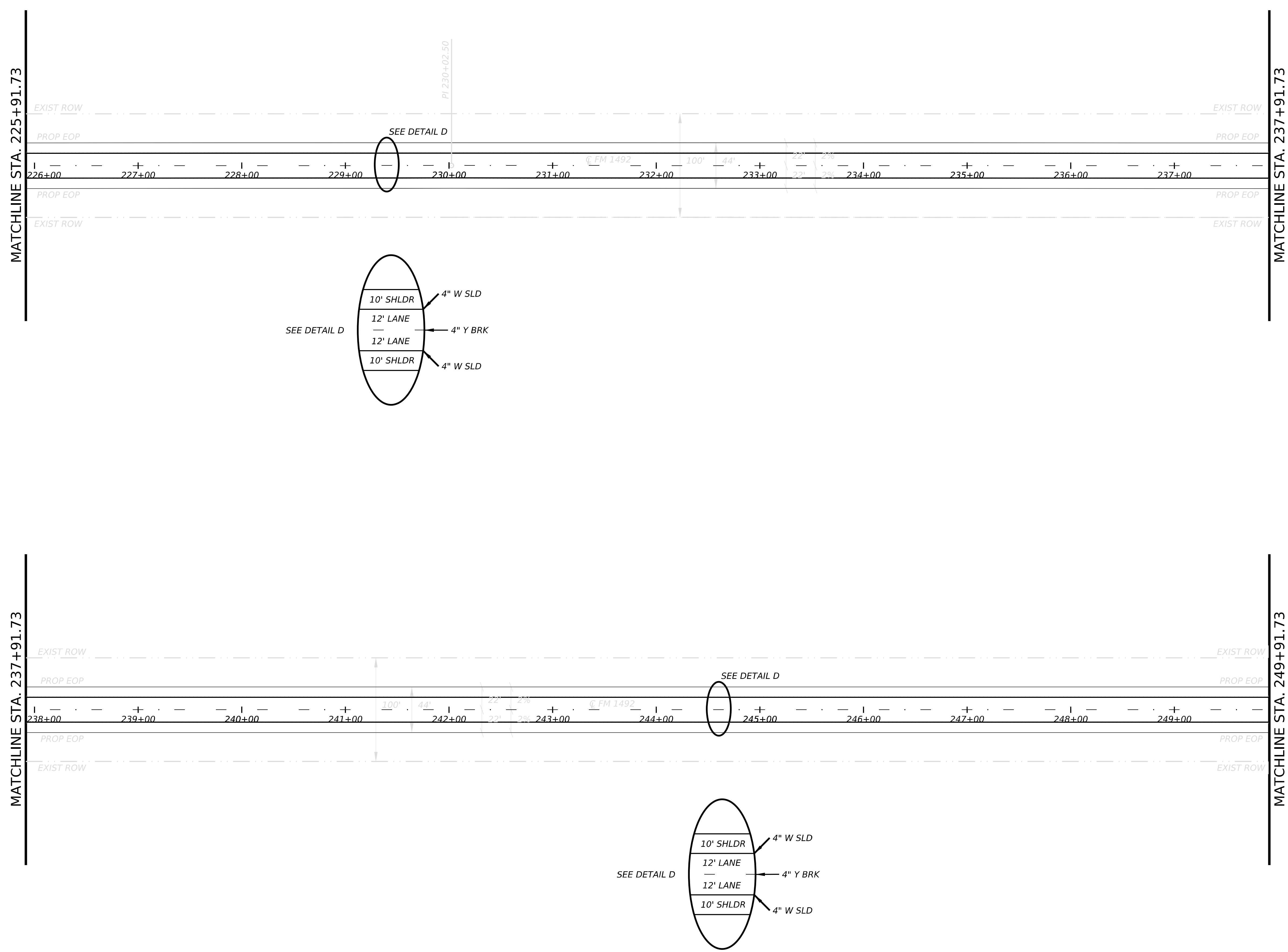

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ODA	MIDLAND		107

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LEGEND

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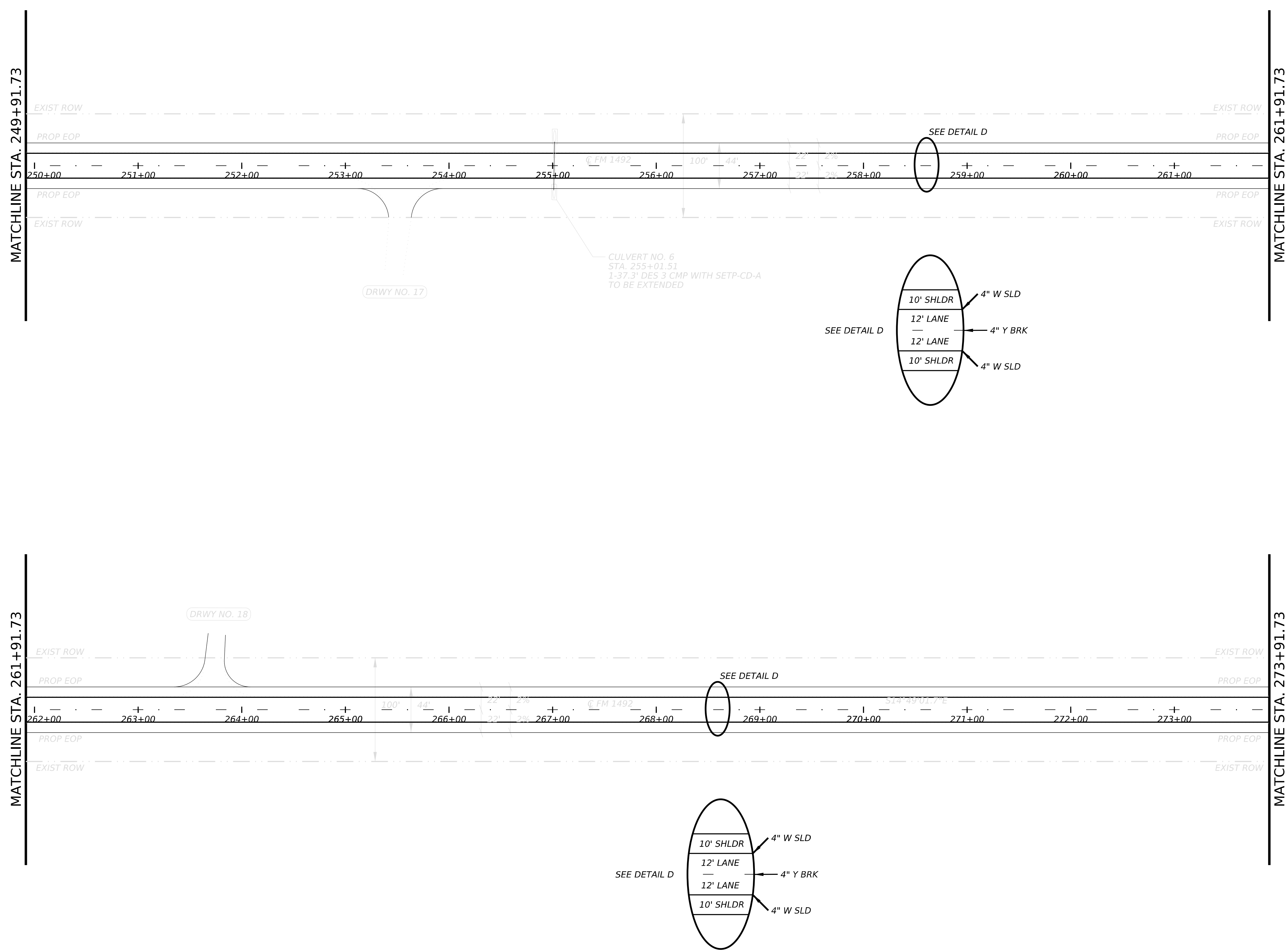

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SHEET 14 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		108

DATE: $DATE$
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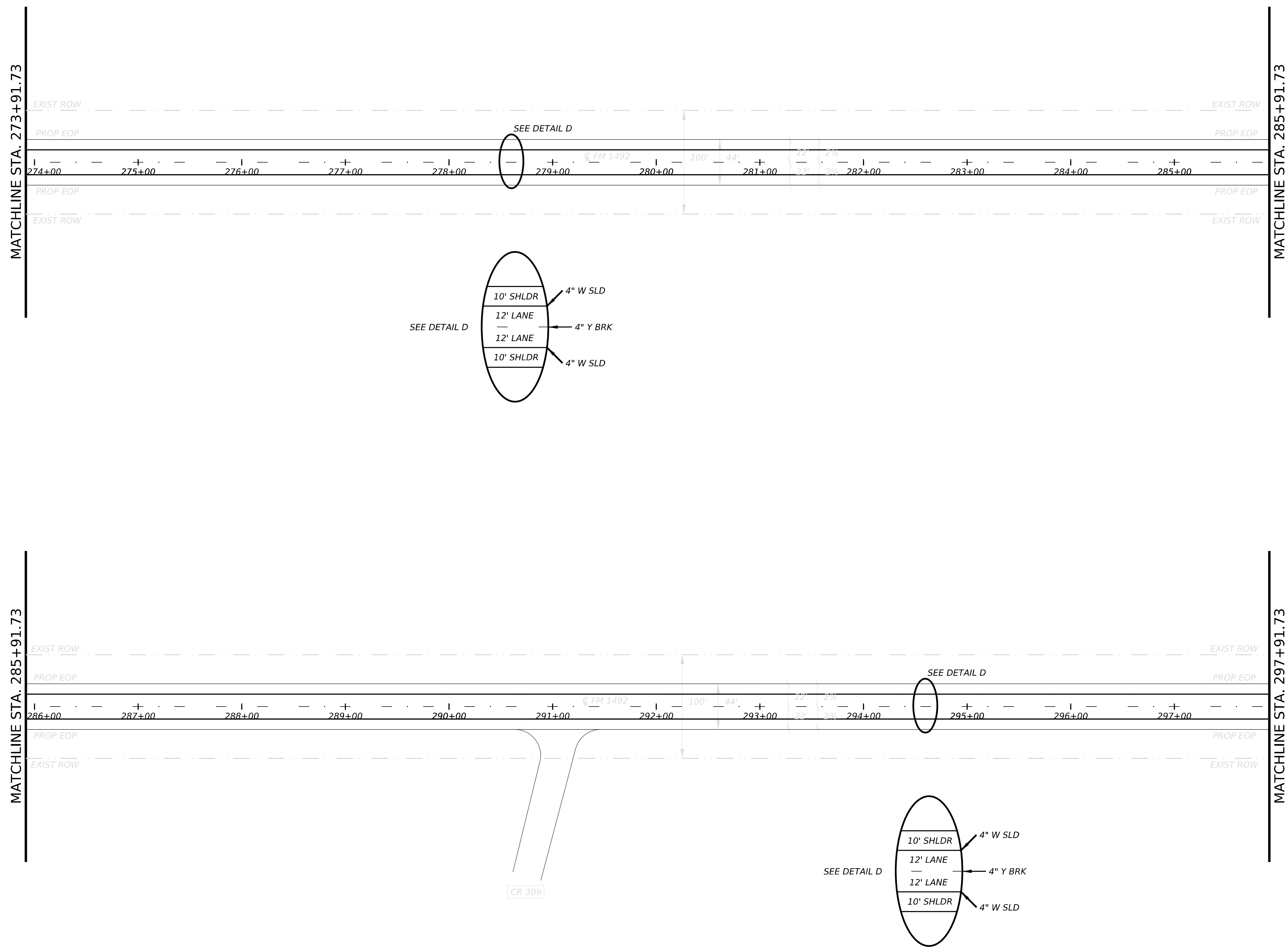

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SHEET 15 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		109

DATE: $DATE$
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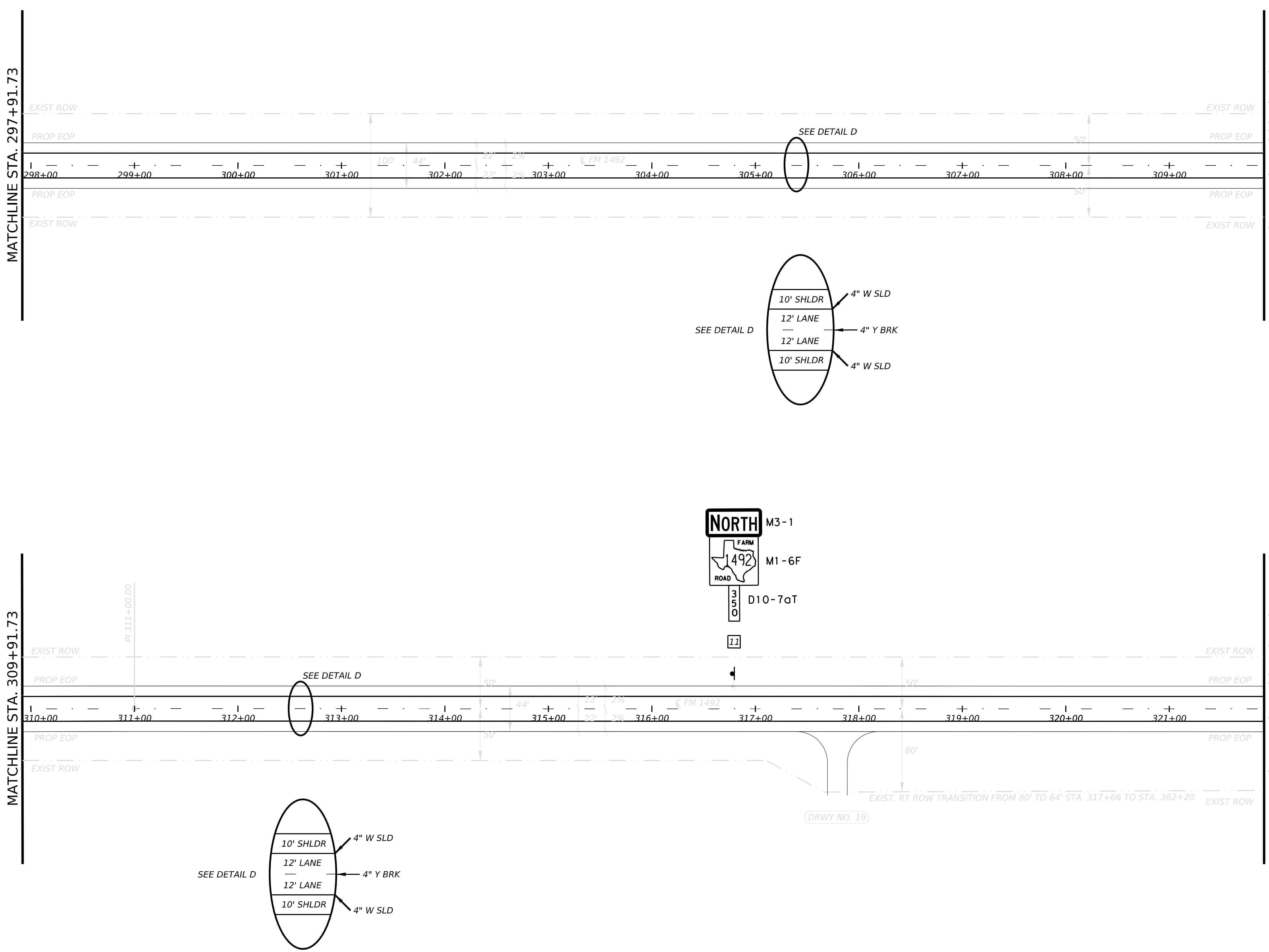

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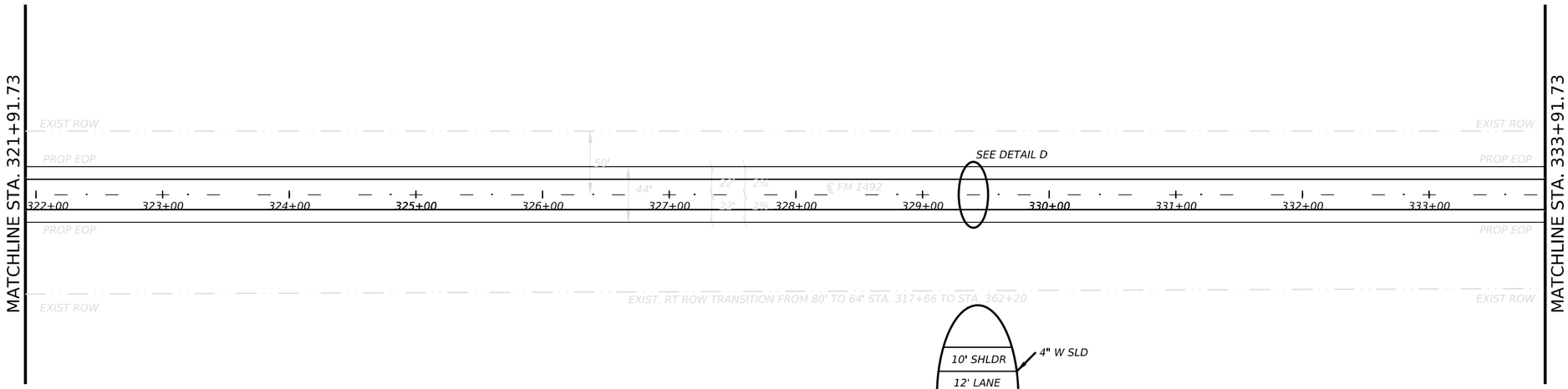
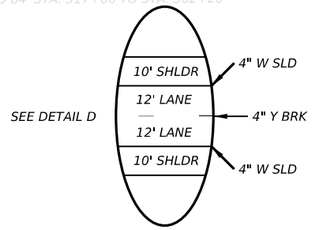
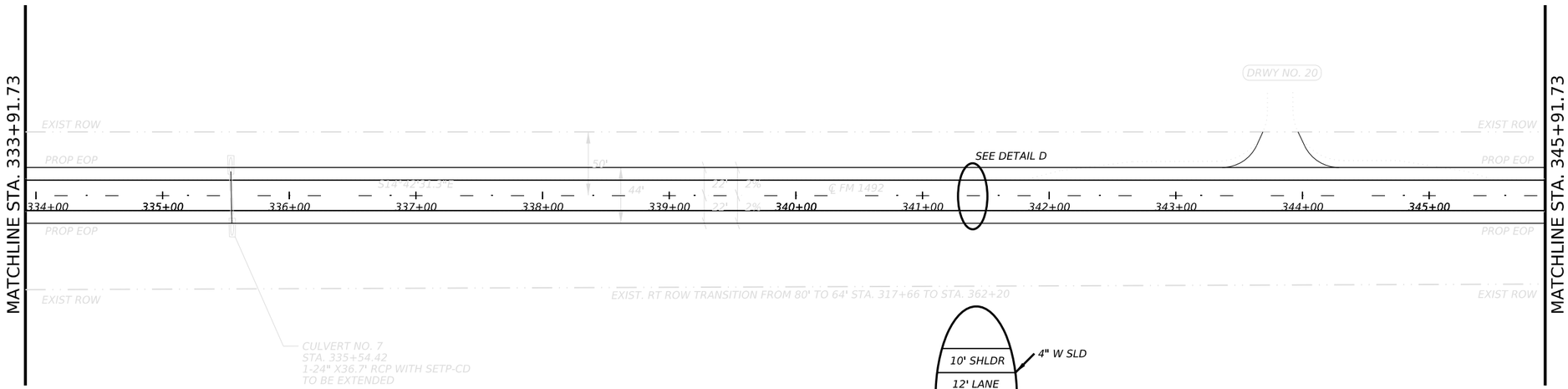
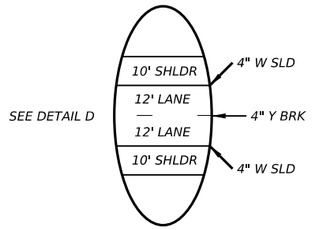
SHEET 16 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		110









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SIGNING & PAVEMENT MARKING LAYOUT

SHEET17 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		111

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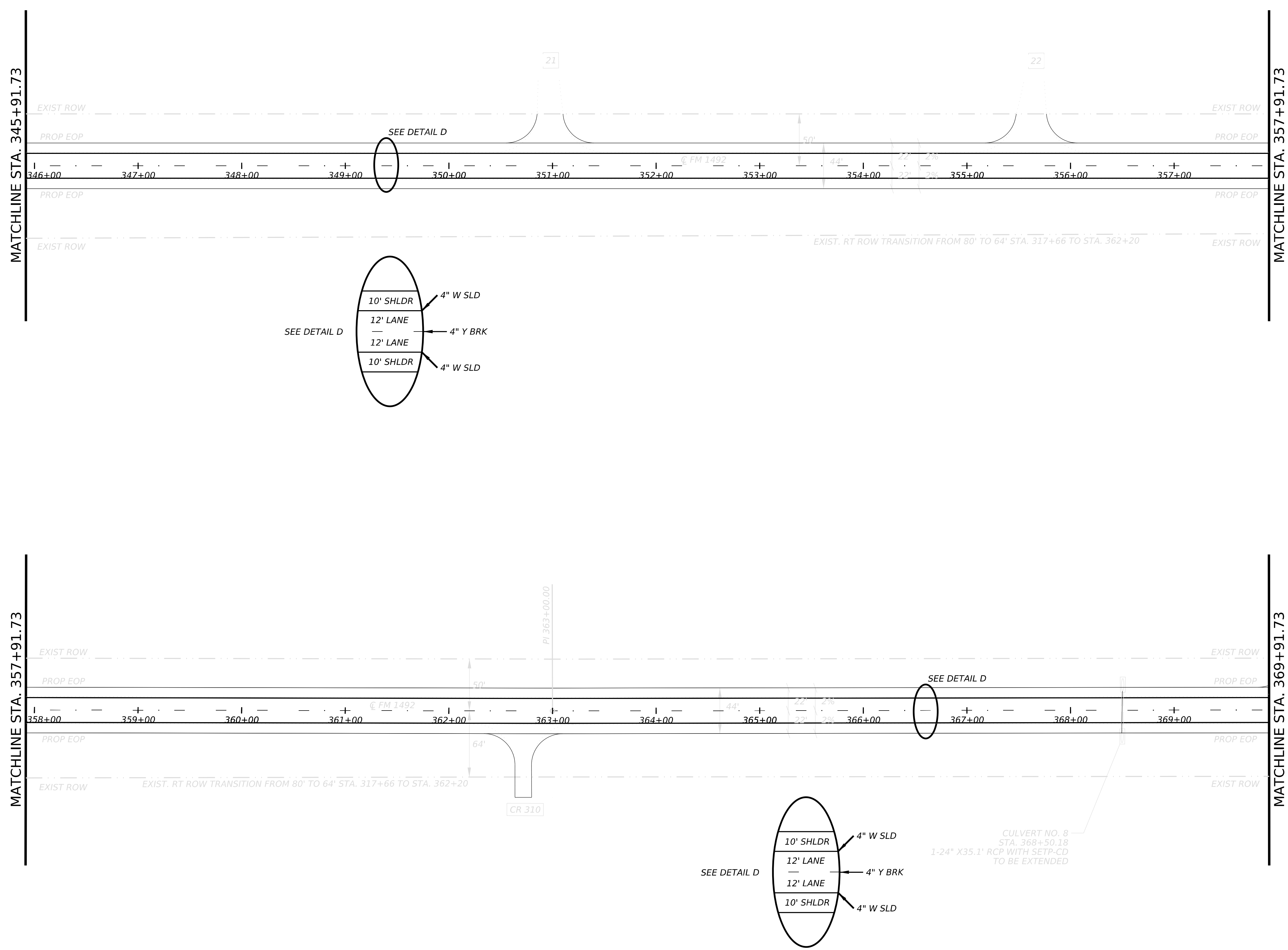

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SHEET18 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	112

DATE: 10/10/2022
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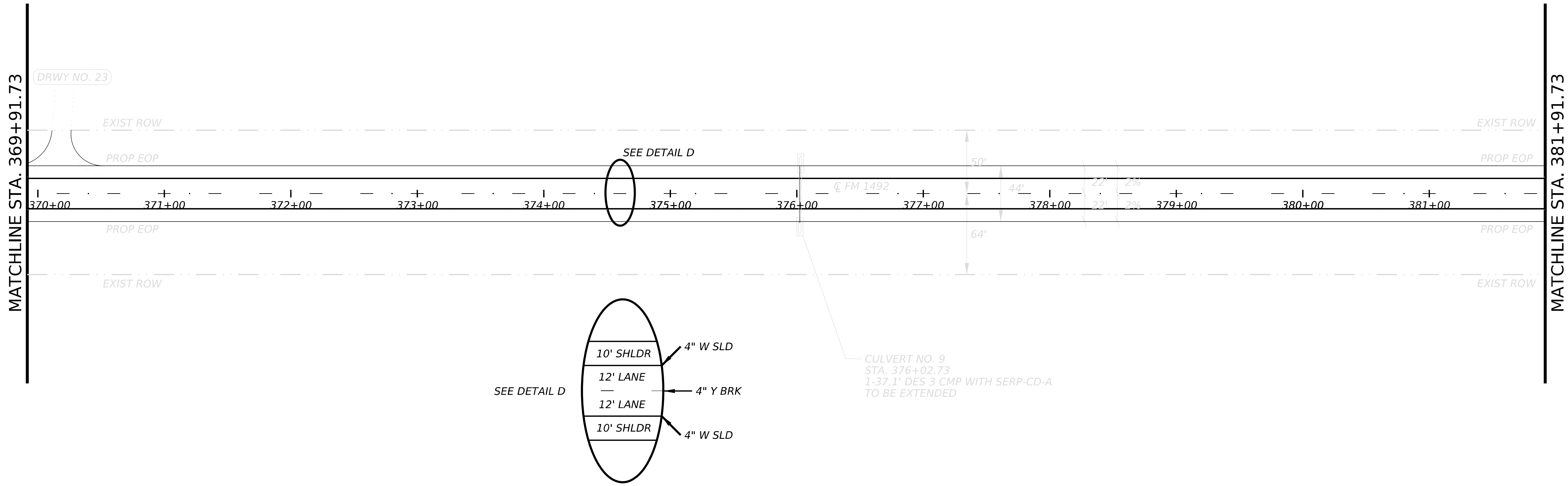

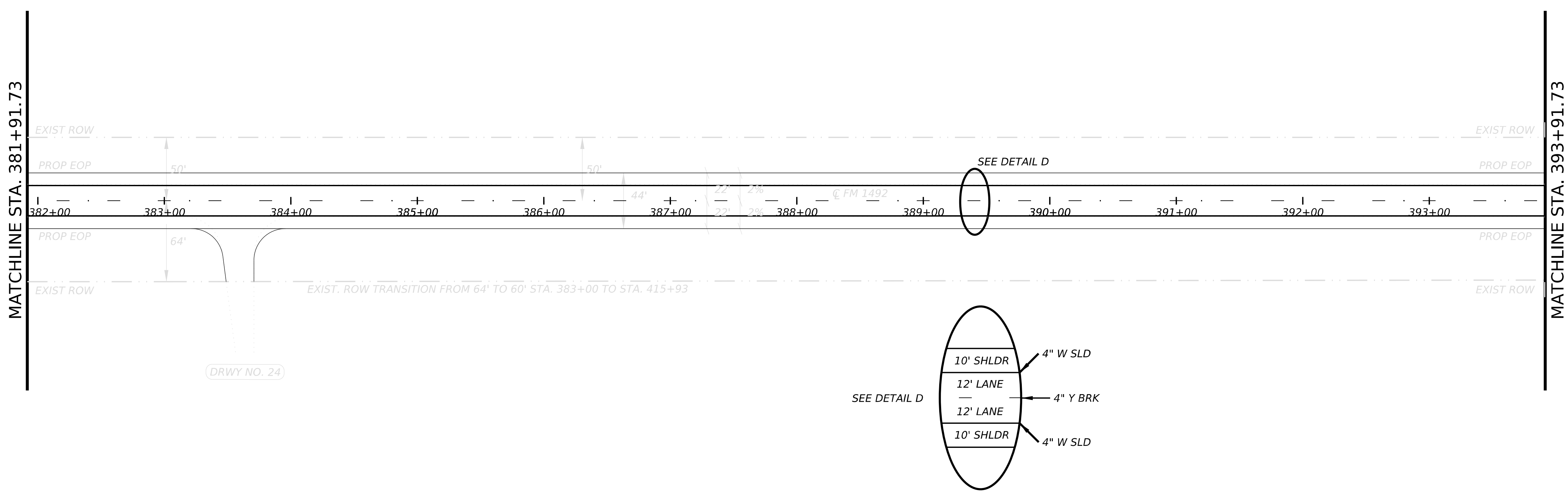

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SHEET19 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		113

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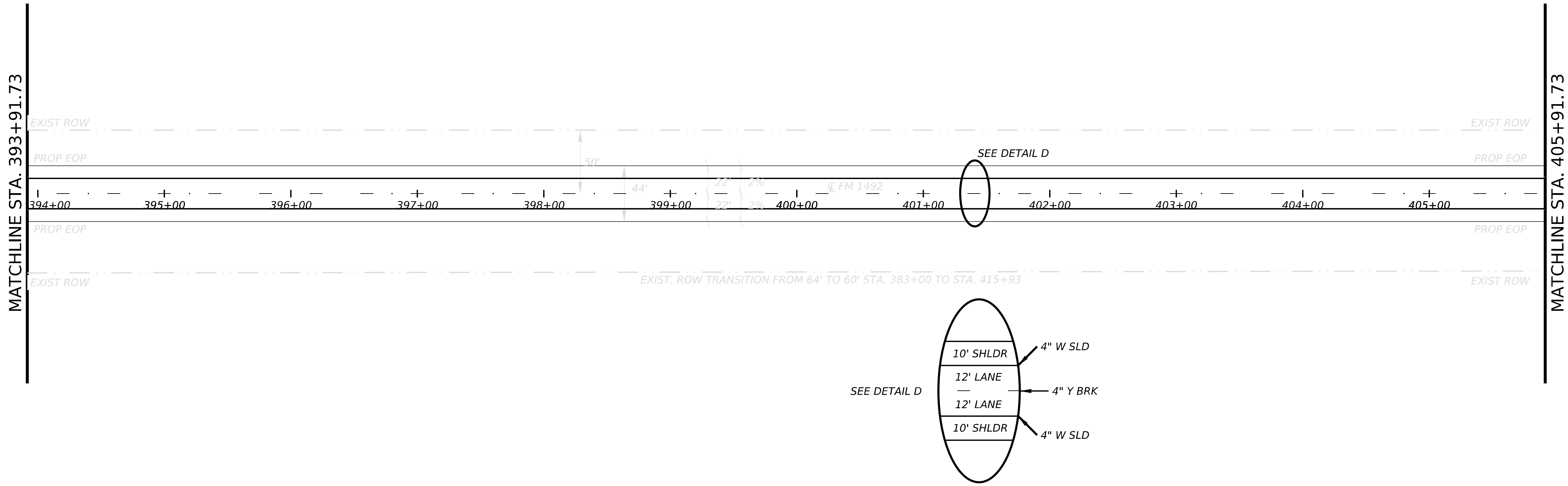

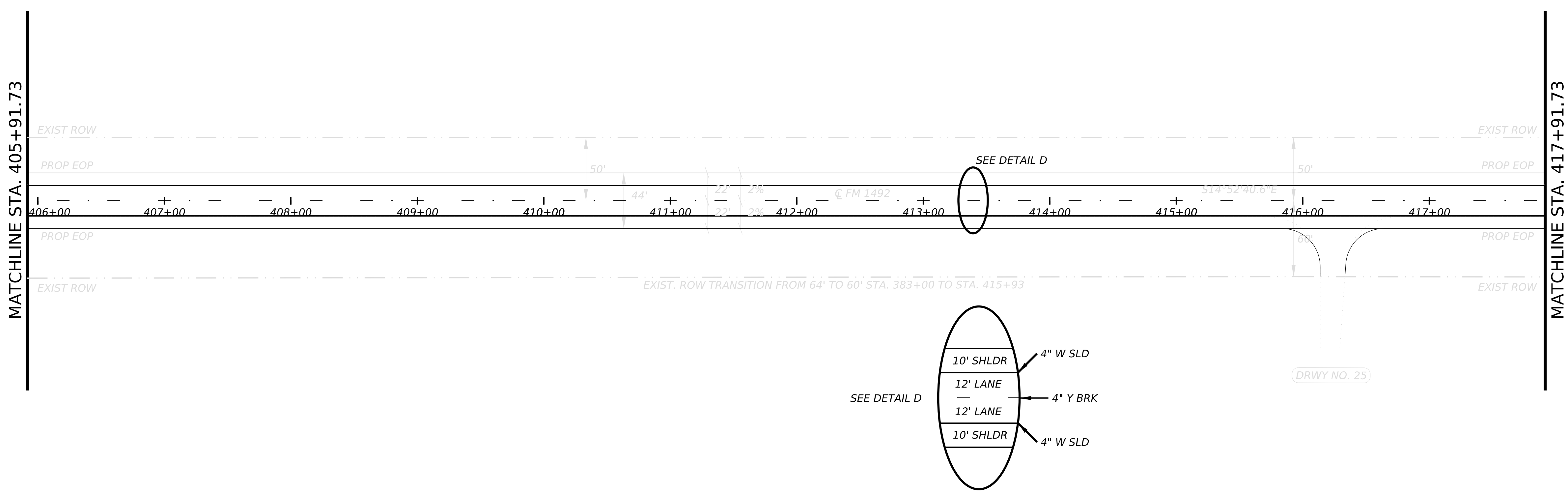

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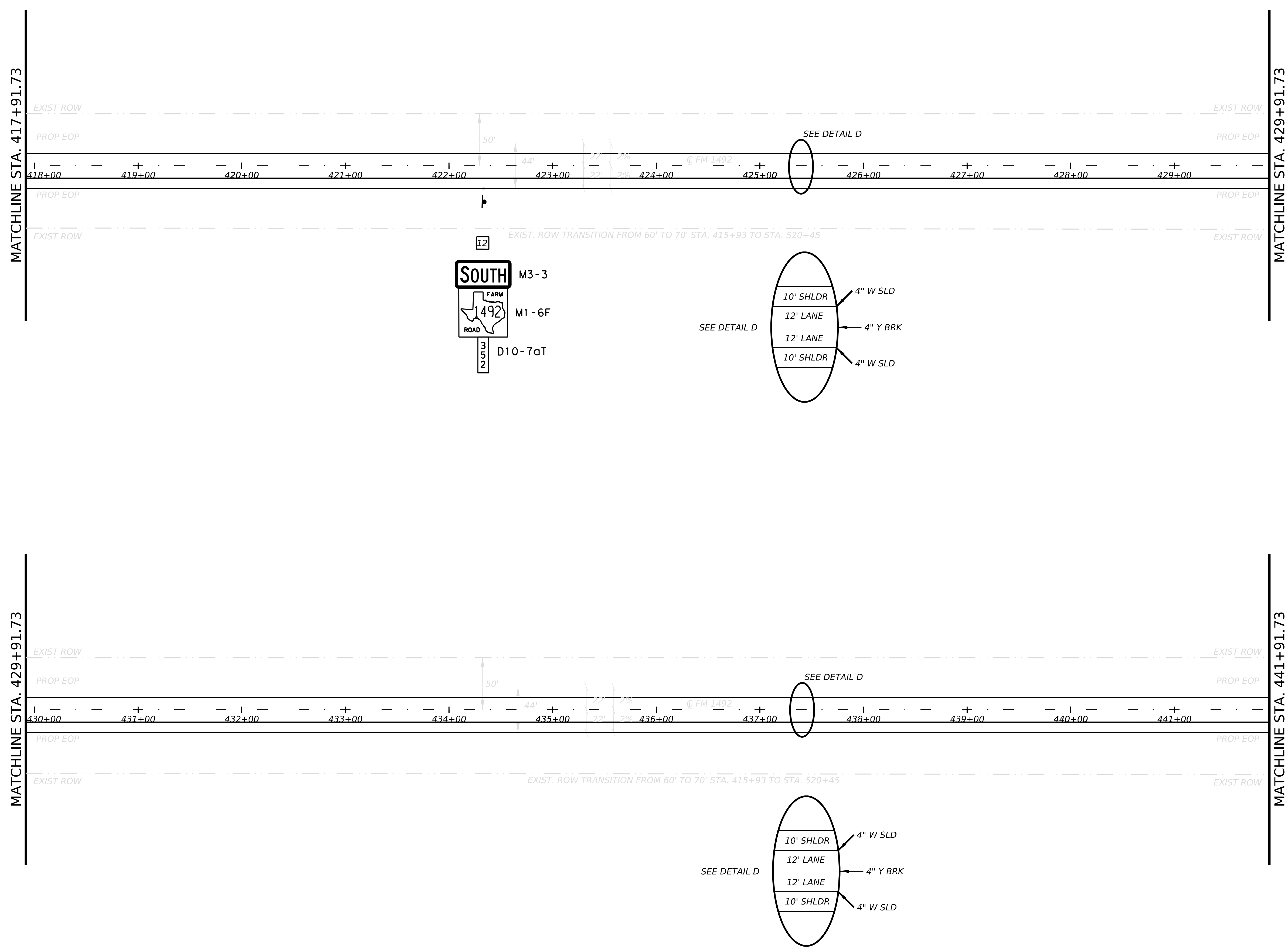
SHEET 20 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		114

FILE: pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\- Traffic\FM1492 UPT SGNPVMM-16.dgn



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SHEET 21 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		115

DATE: $DATE$
FILE: $FILE$

LEGEND

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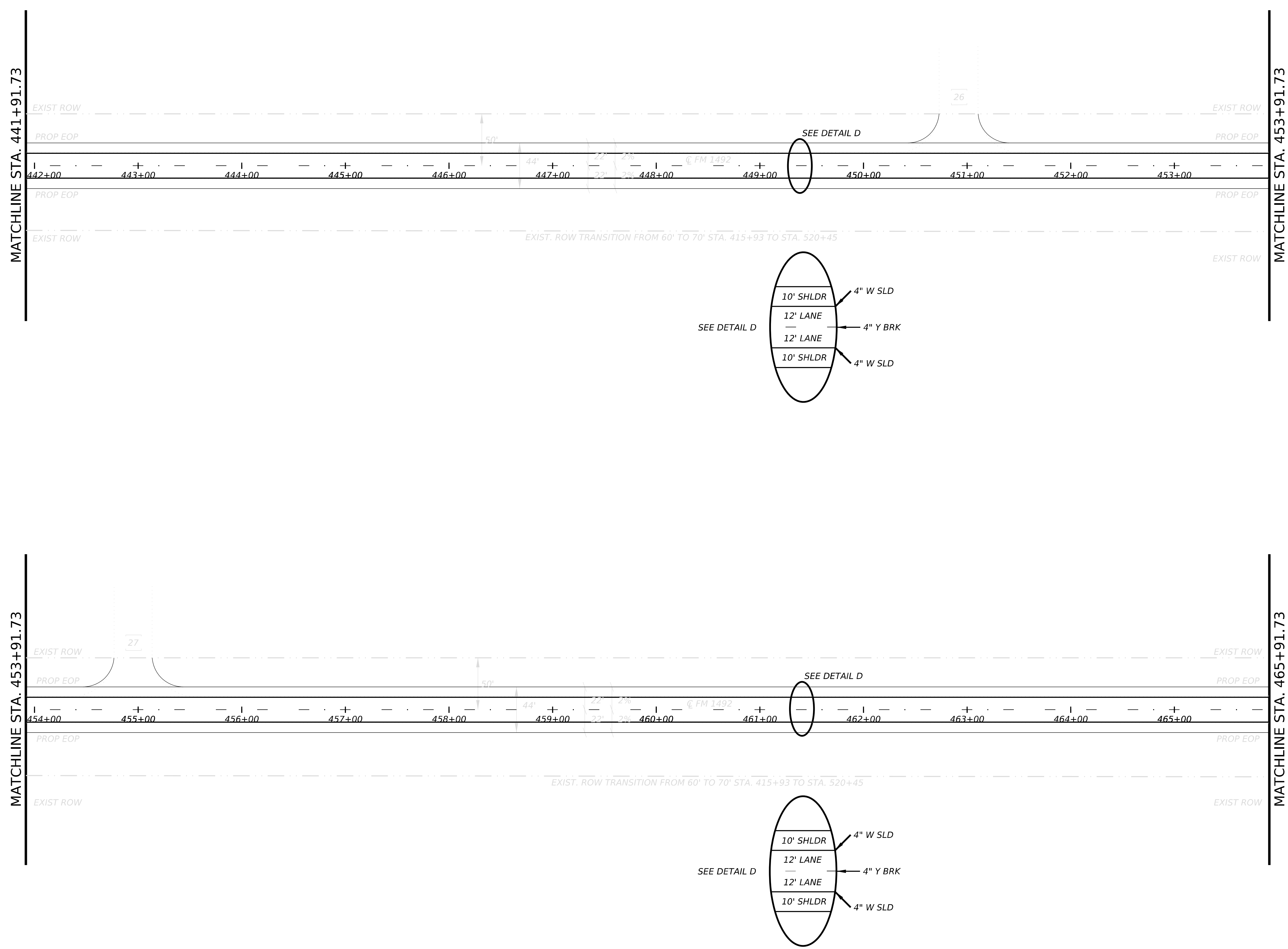

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SHEET 22 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		116

DATE: 10/7/2022
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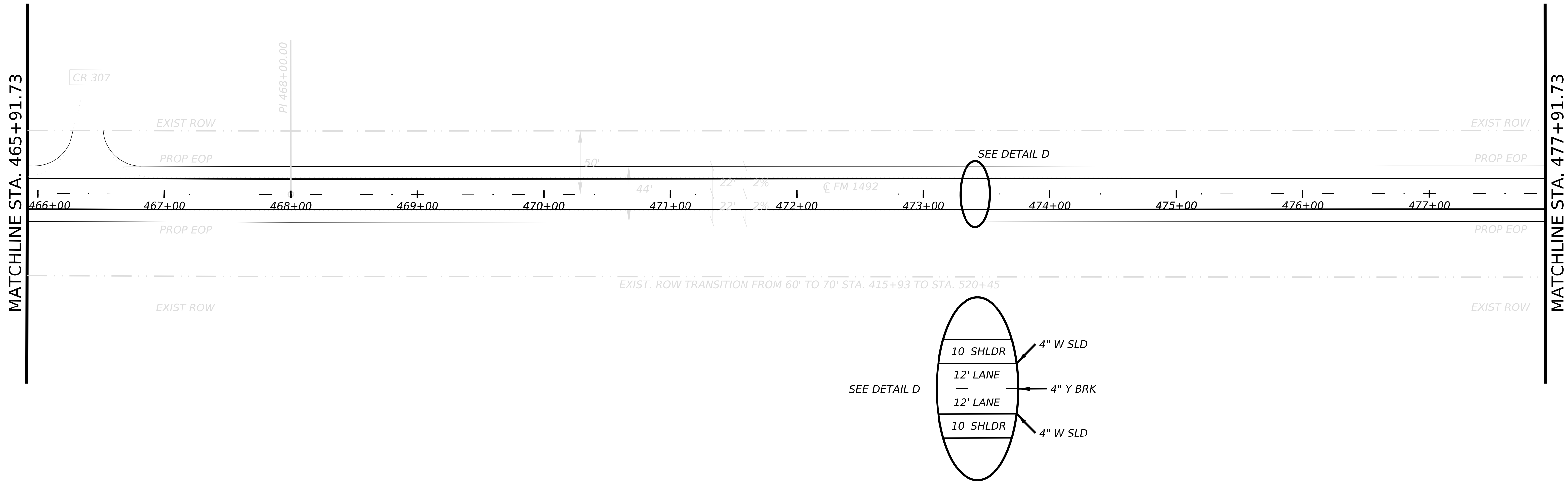

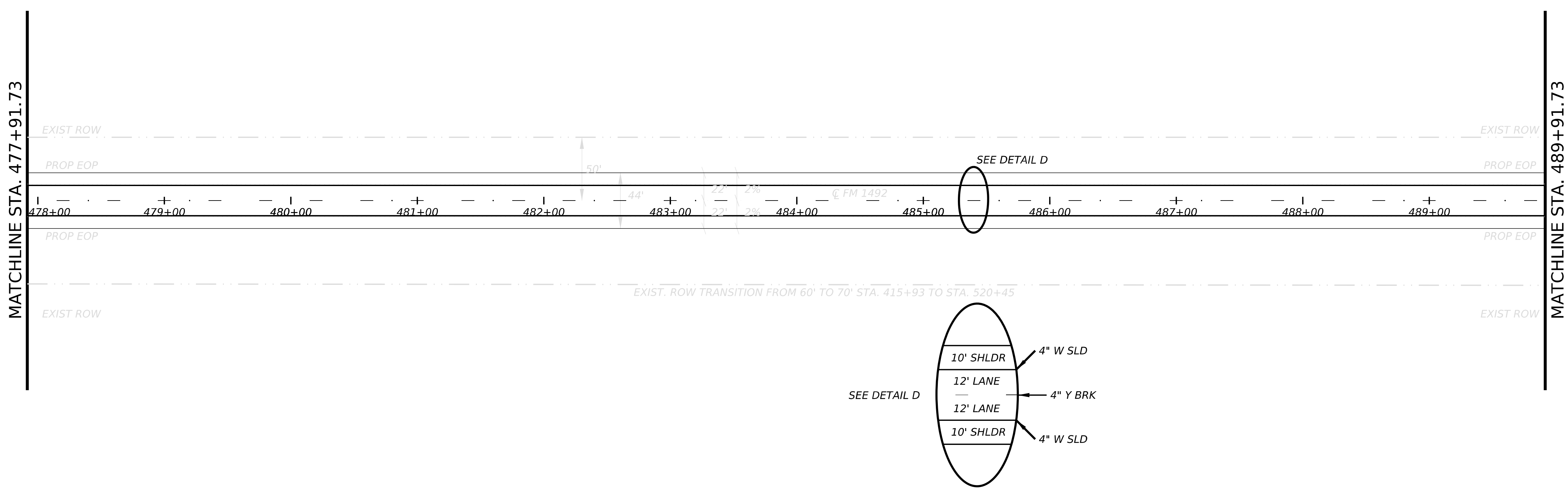

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SHEET 23 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	117

DATE: $DATE$ 10/14/2022
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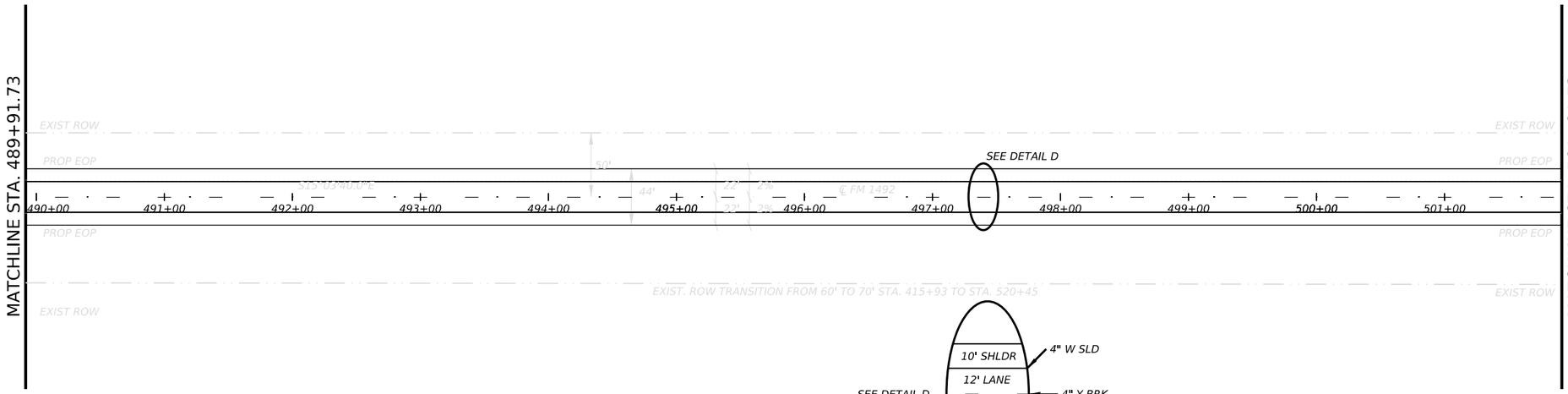

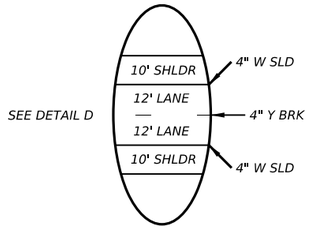

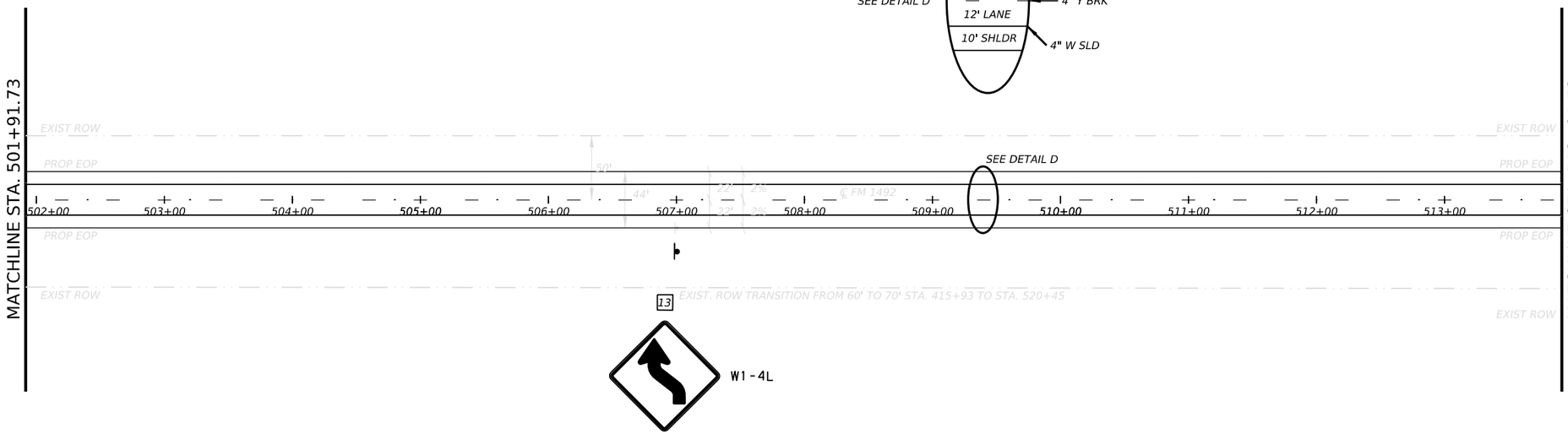

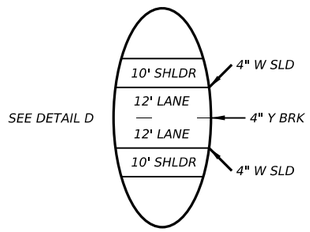

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SHEET 24 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		118

DATE: $DATE$ 10/7/2022
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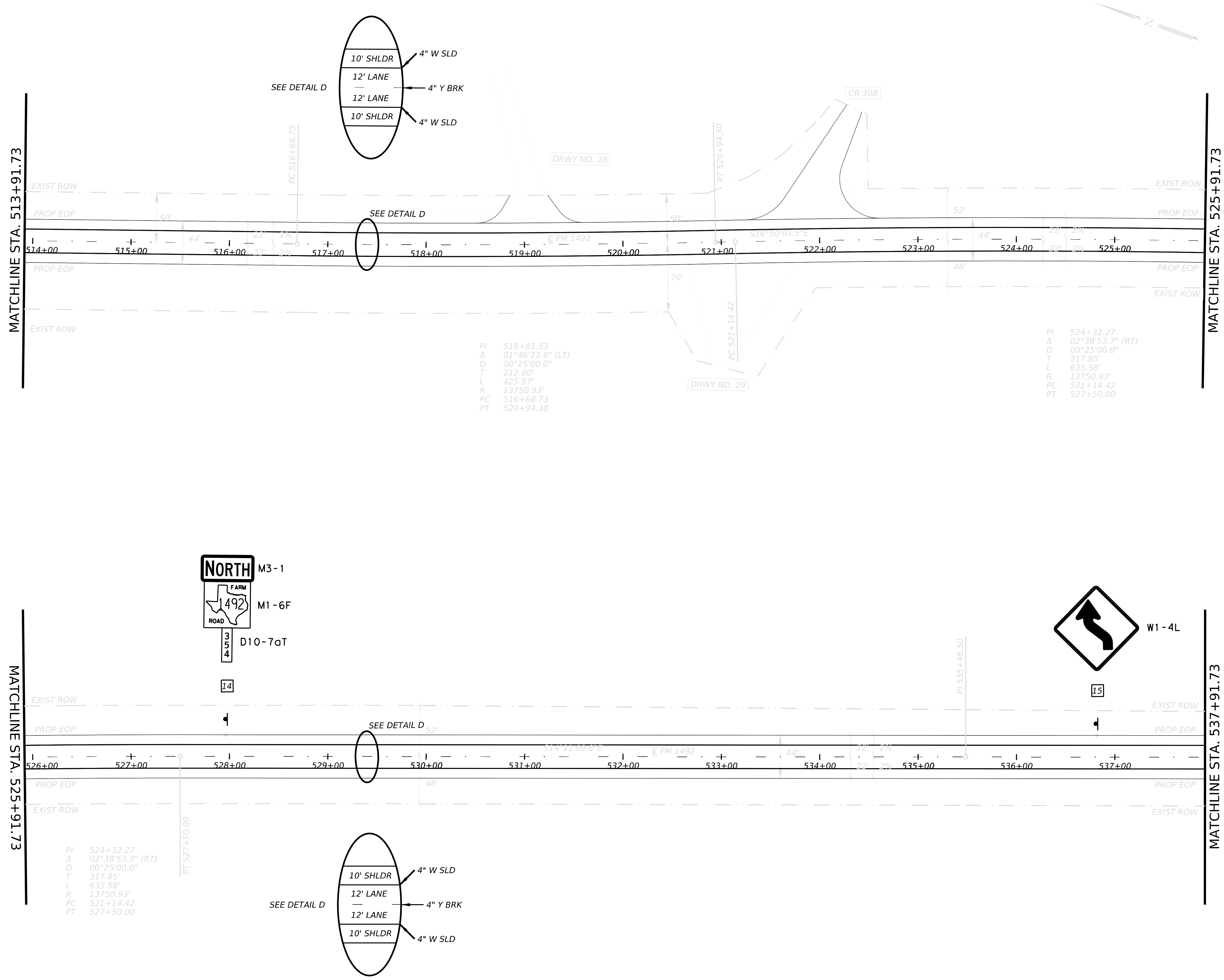

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- # PROP. SIGN NO.

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SHEET 25 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		119

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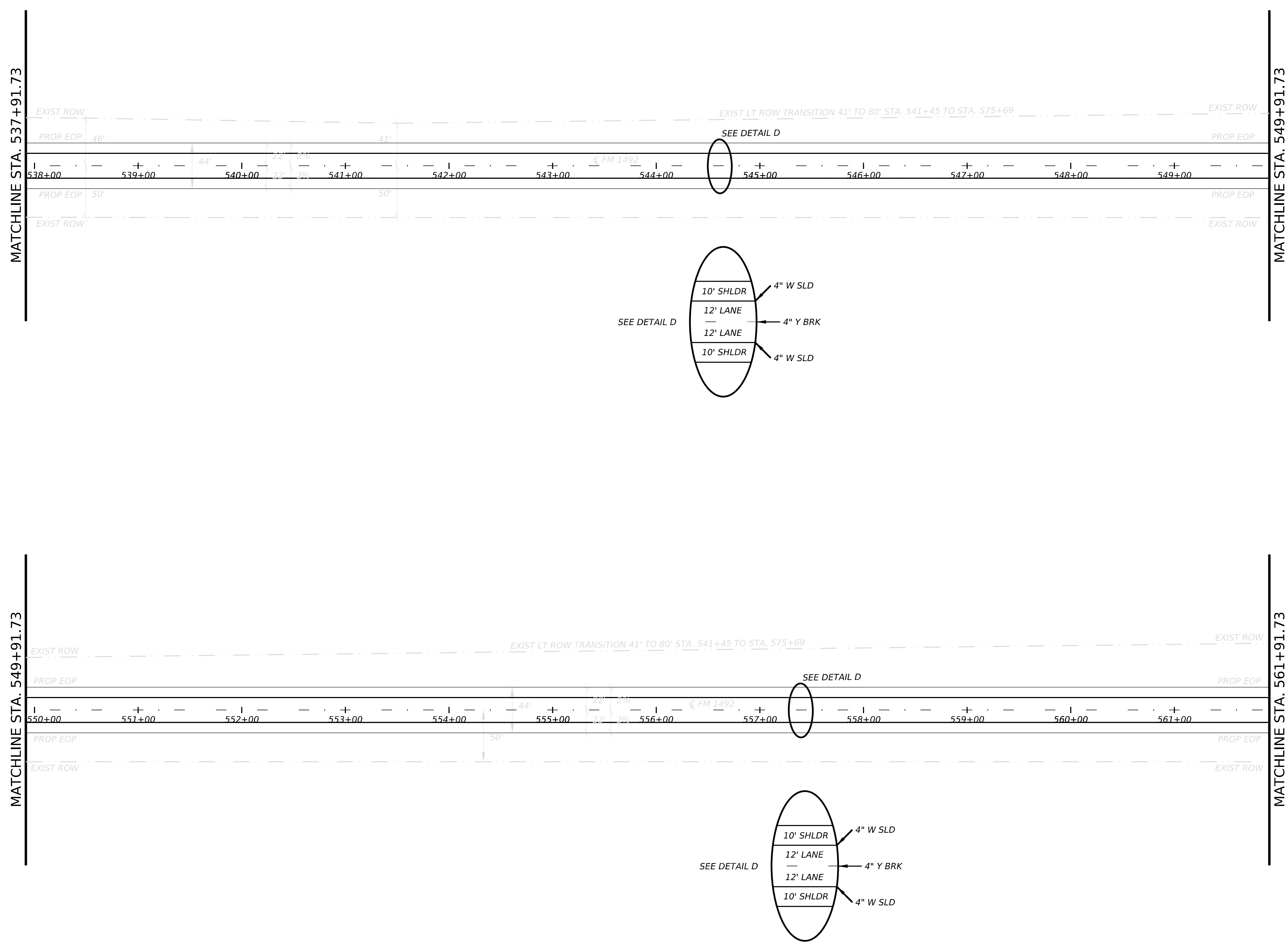

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SHEET 26 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		120

DATE: 10/7/2022
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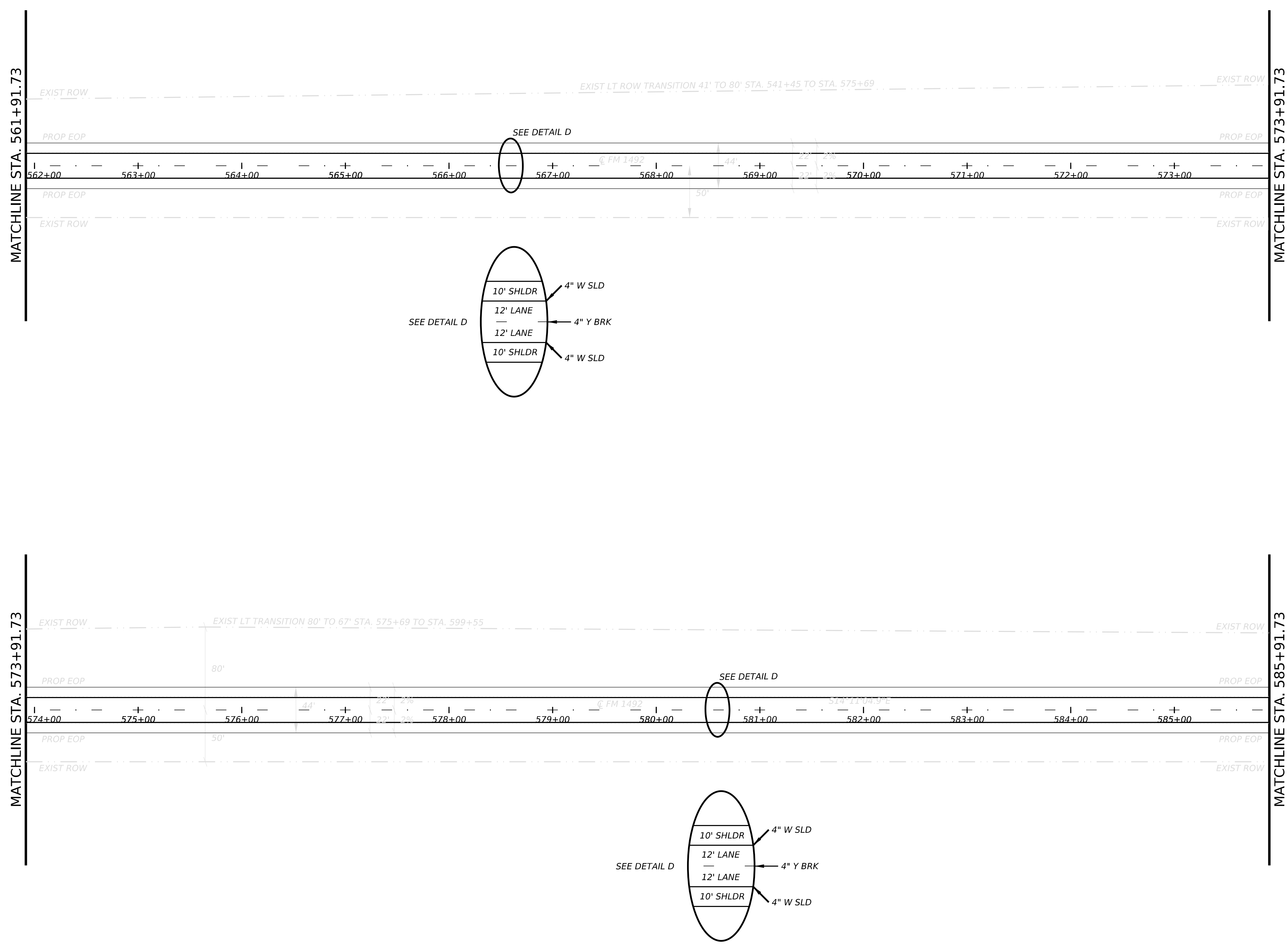

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- # PROP. SIGN NO.

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SHEET 27 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		121

DATE: $DATE$ 10/19/2022
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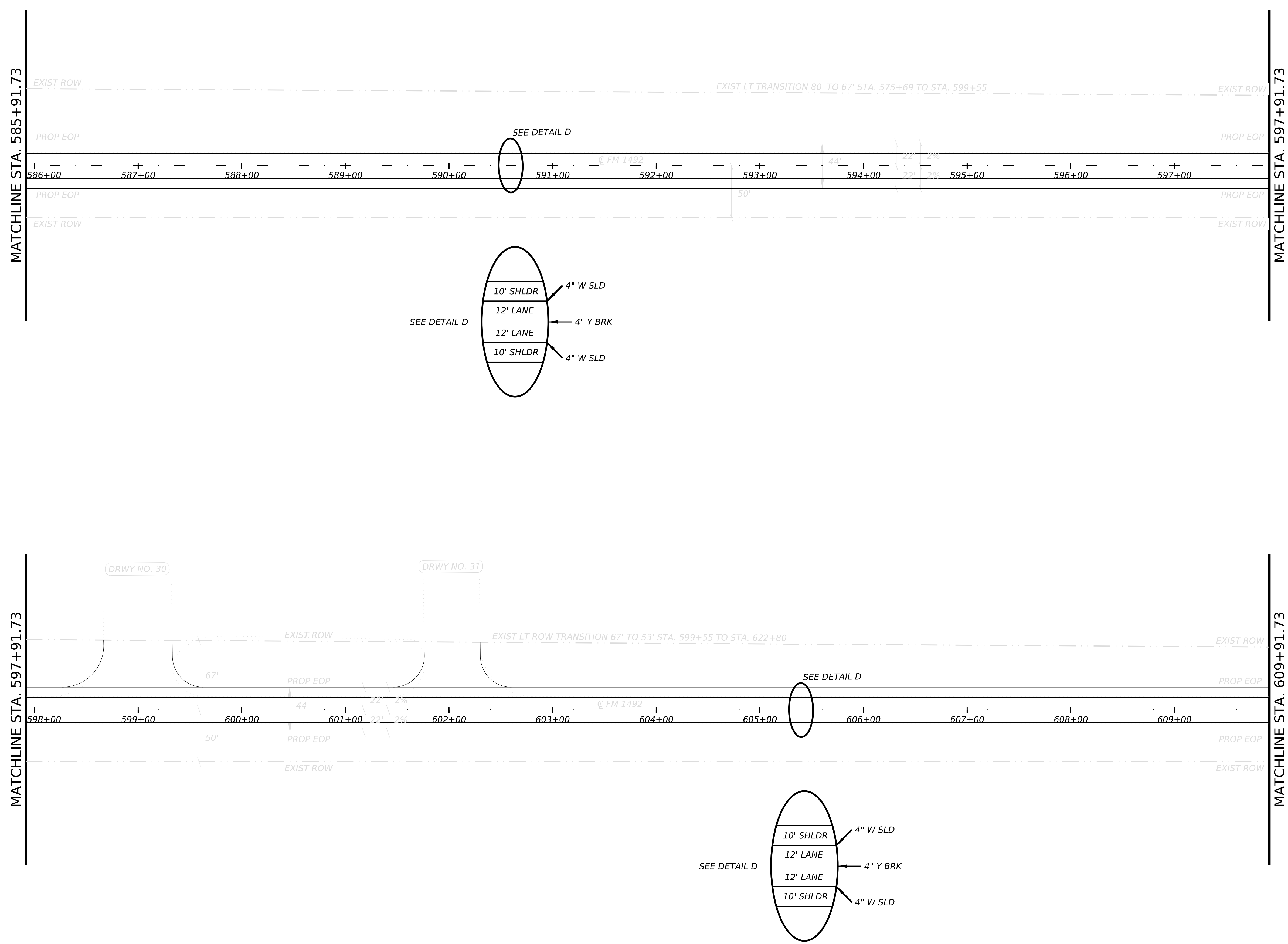

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SHEET 28 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		122

DATE: $DATE$ 10/4/2022
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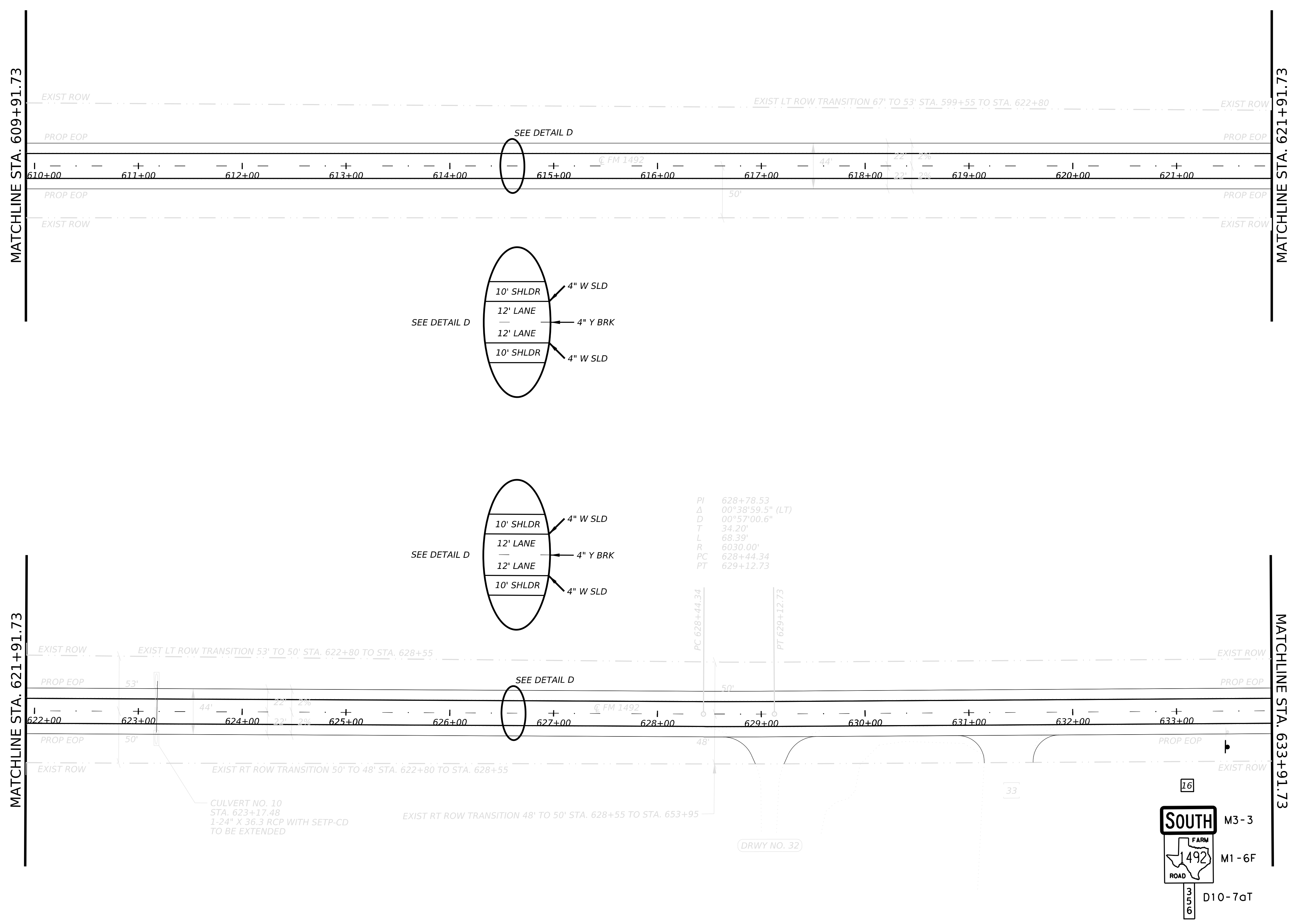

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SHEET 29 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		123

DATE: 10/11/2022
FILE: pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\- Traffic\FM1492 UPT SGNPVMM-25.dgn

LEGEND

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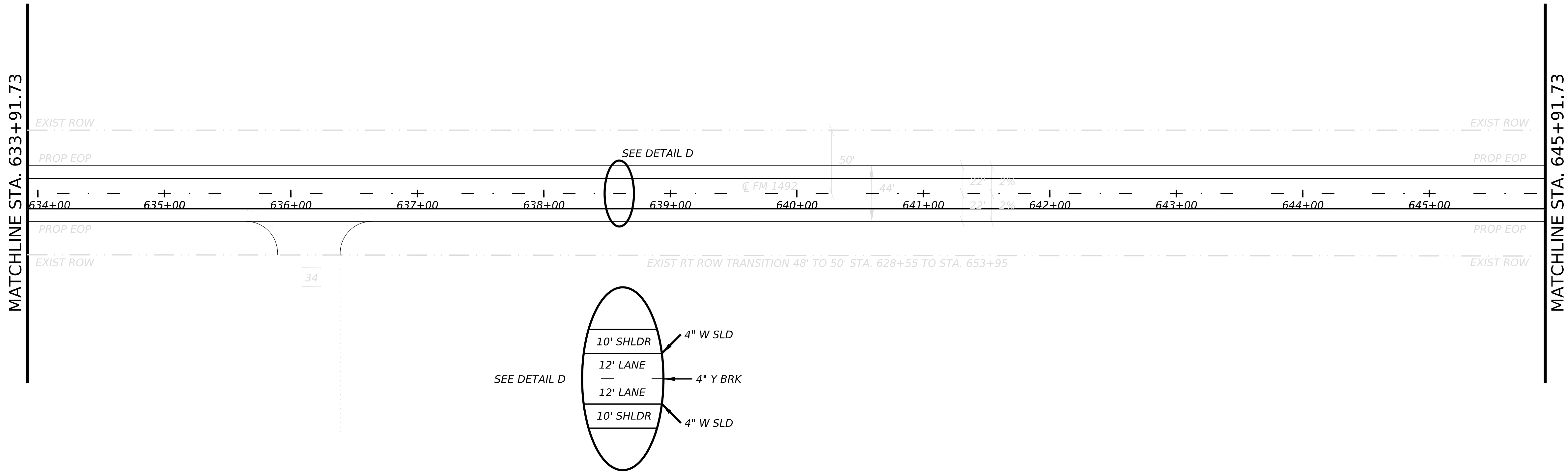

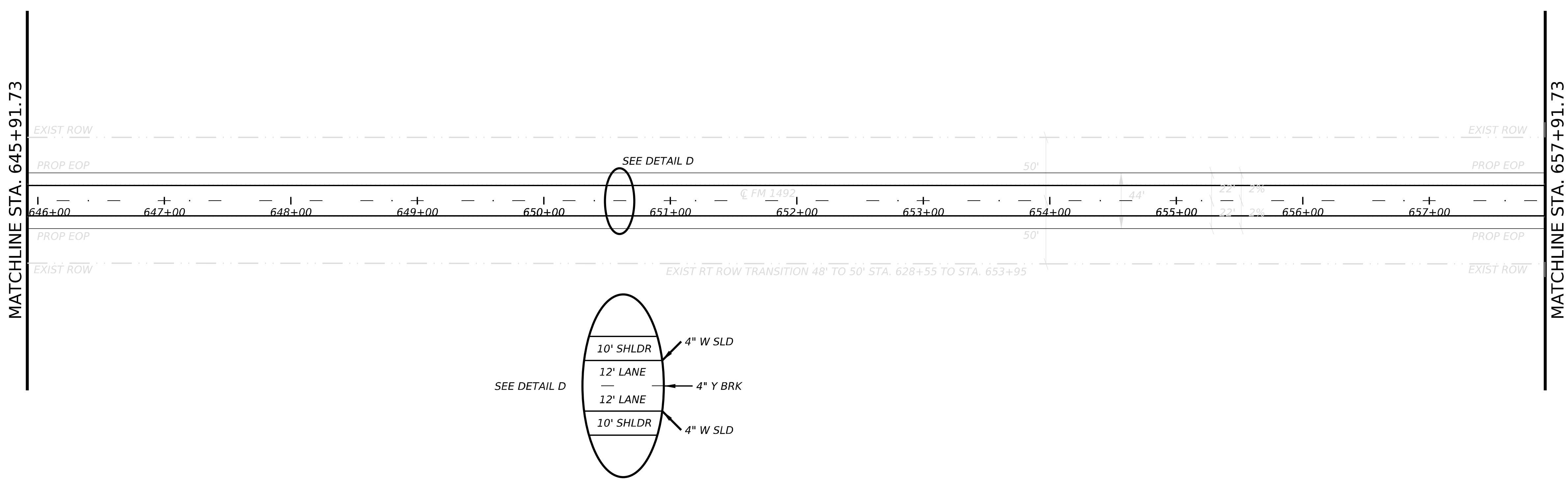

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SHEET 30 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		124

DATE: $DATE$
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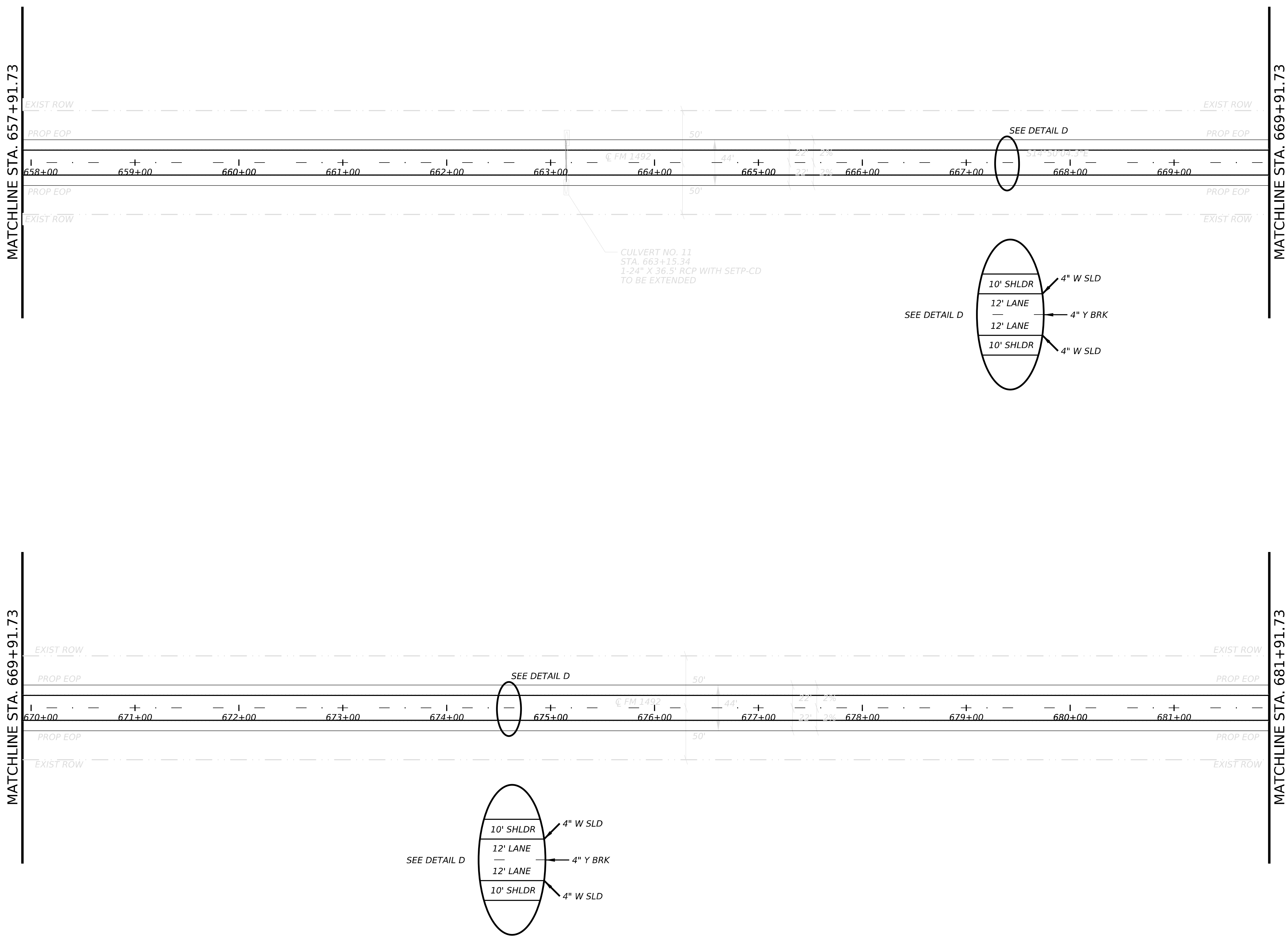

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MARKING LAYOUT

SHEET 31 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		125

DATE: $DATE$
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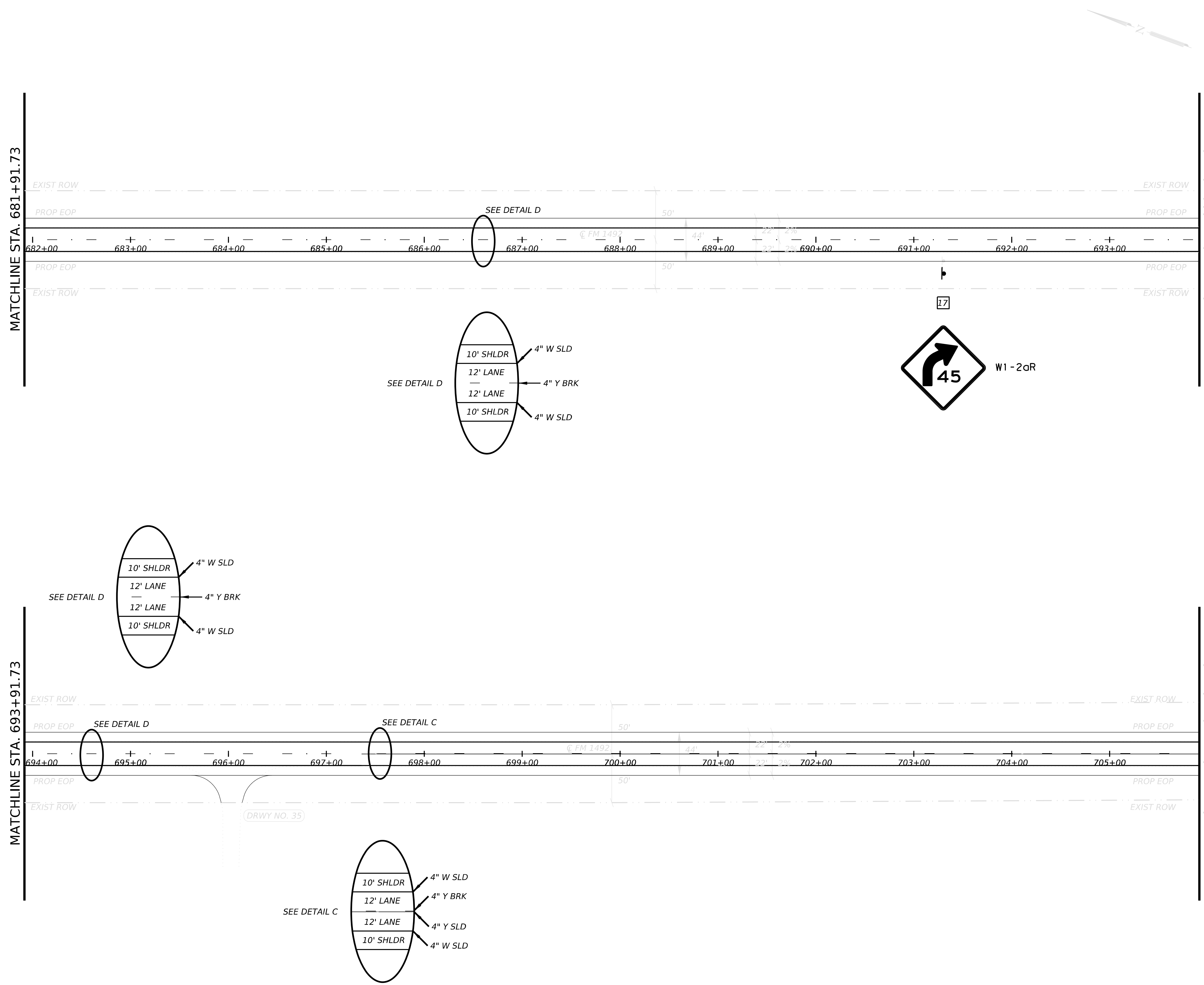

LEGEND

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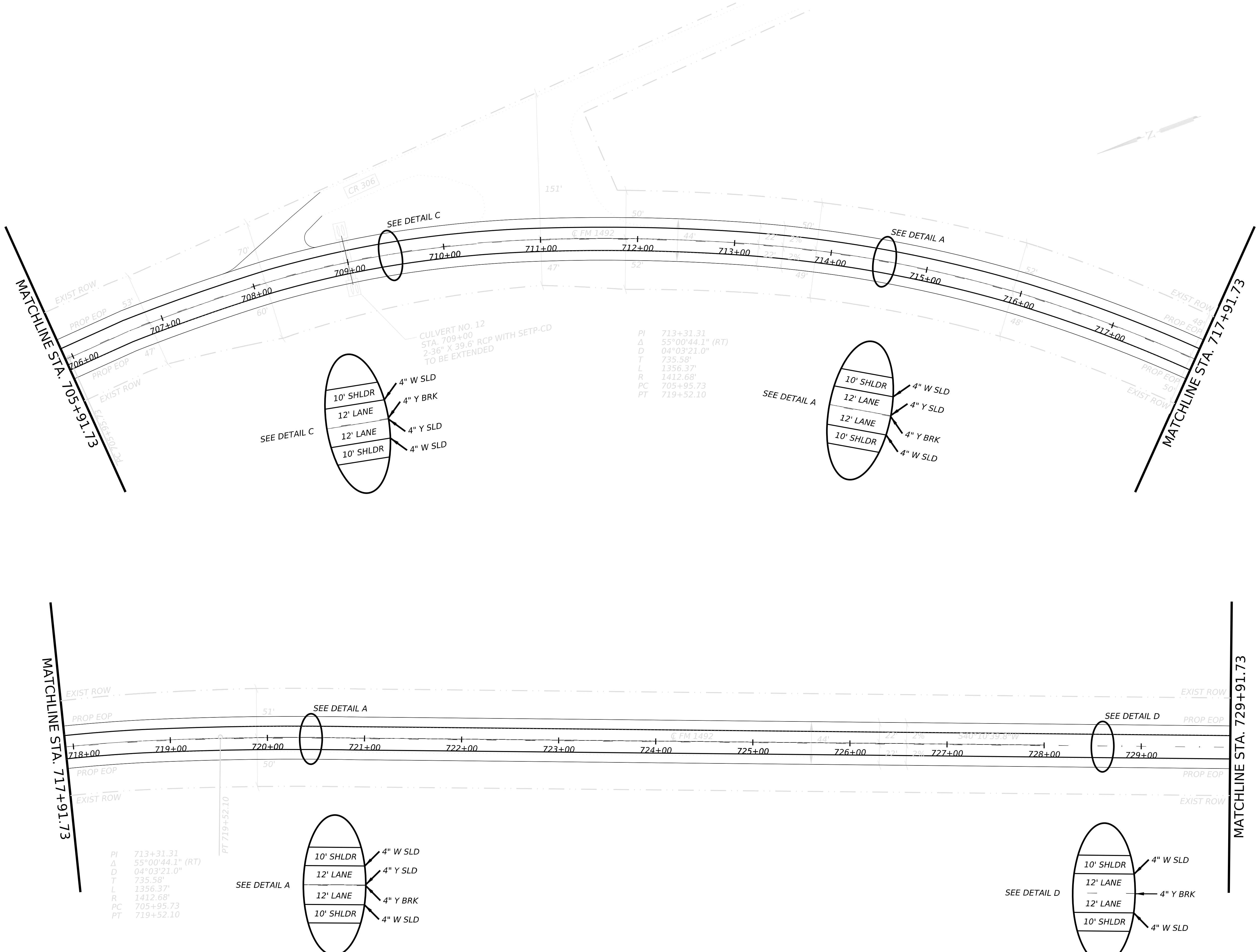
SIGNING & PAVEMENT MARKING LAYOUT

SHEET 32 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		126

DATE: $DATE$
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\- Traffic\FM1492 UPT SGNPVMM-28.dgn



LEGEND

- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- PROP. SIGN
- # PROP. SIGN NO.

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
10/20/2022
88BF61DF326A480...

Texas Department of Transportation

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 33 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		127

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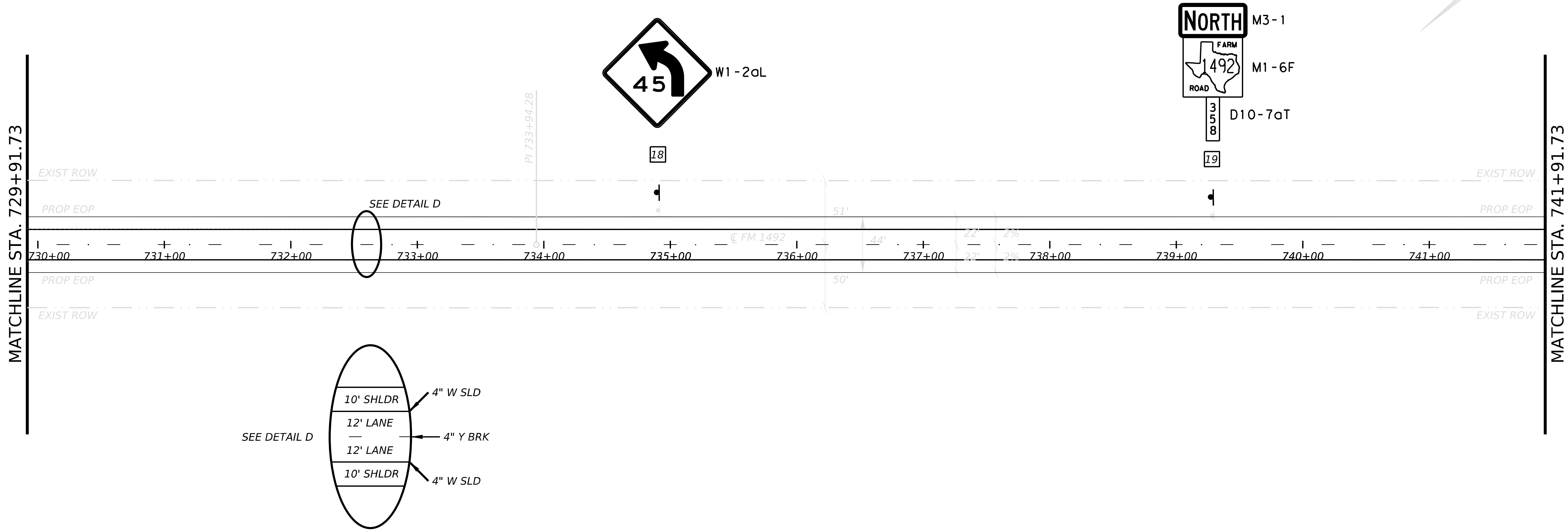

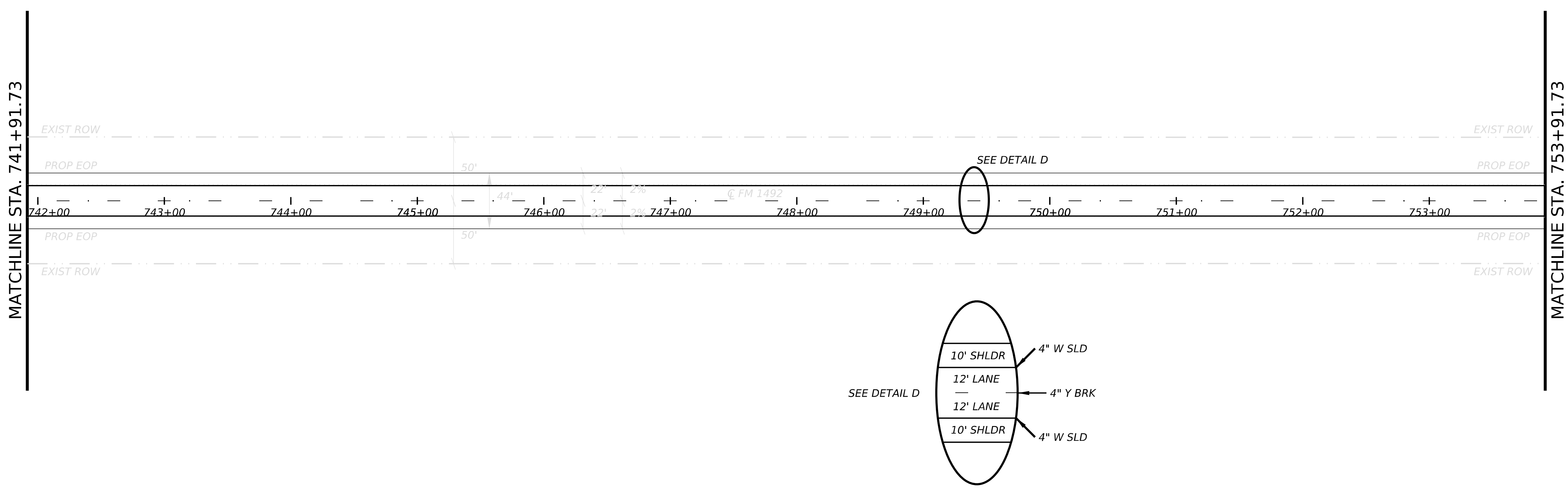

LEGEND

- EXIST. ROW
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- EXIST. RFBA
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SIGNING & PAVEMENT MARKING LAYOUT

SHEET 34 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		128

DATE: $DATE$ 10/3/2022 1:58:41 PM
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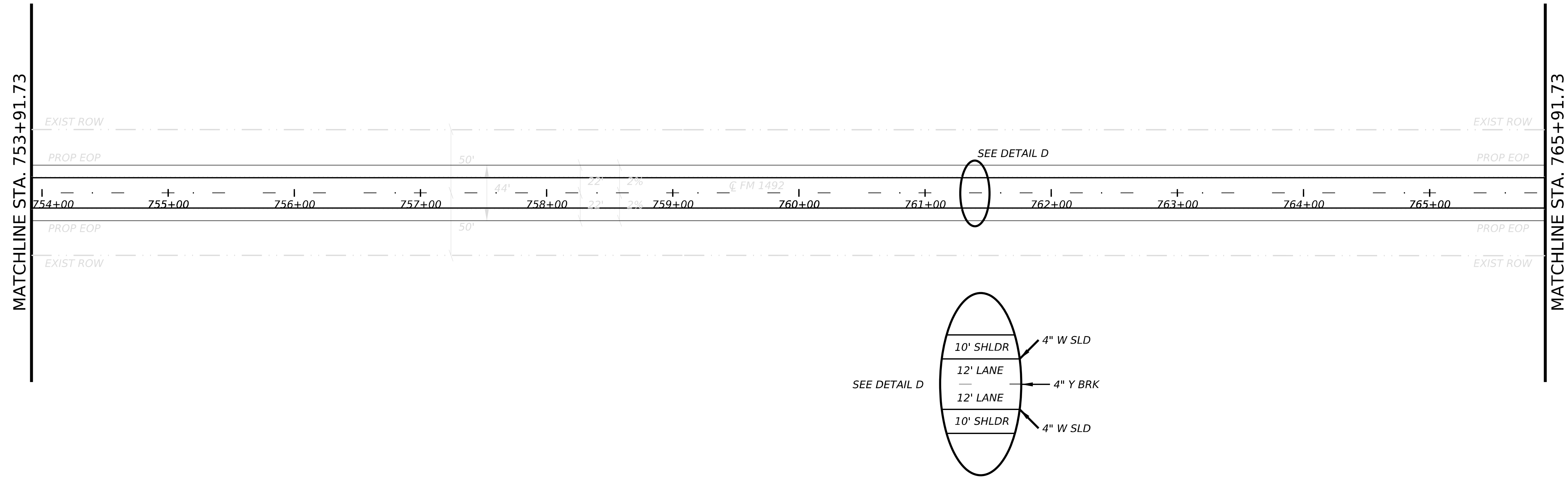

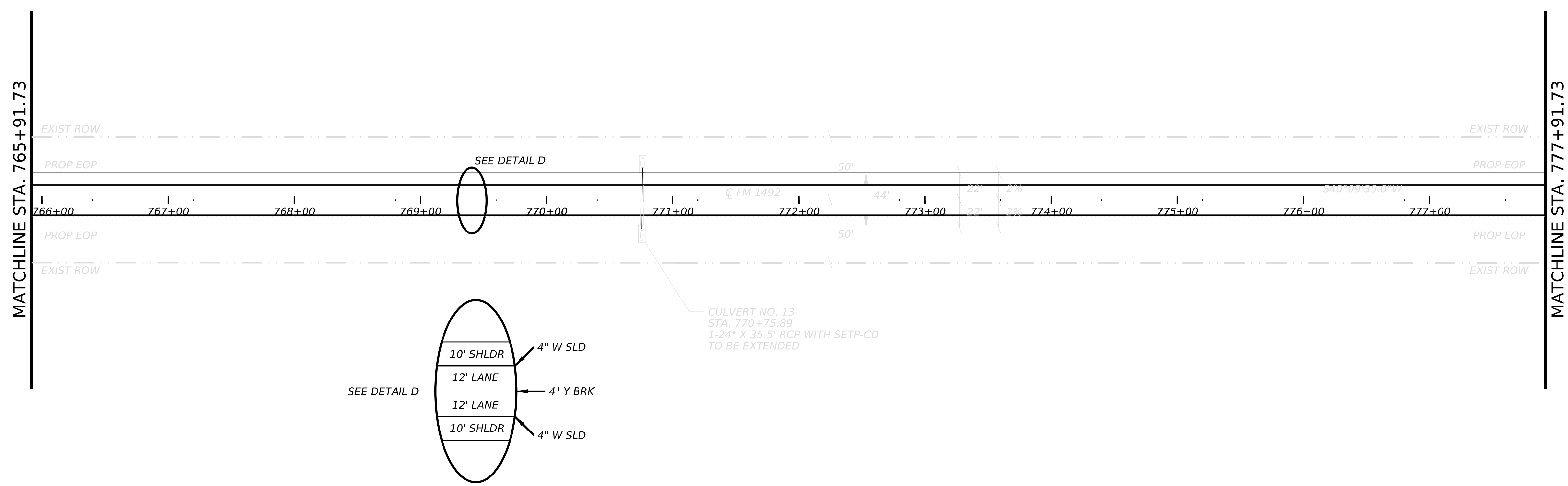

LEGEND

- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- PROP. SIGN
- # PROP. SIGN NO.

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PROFESSIONAL ENGINEER

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SIGNING & PAVEMENT
MARKING LAYOUT

SHEET 35 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		129

DATE: $DATE$
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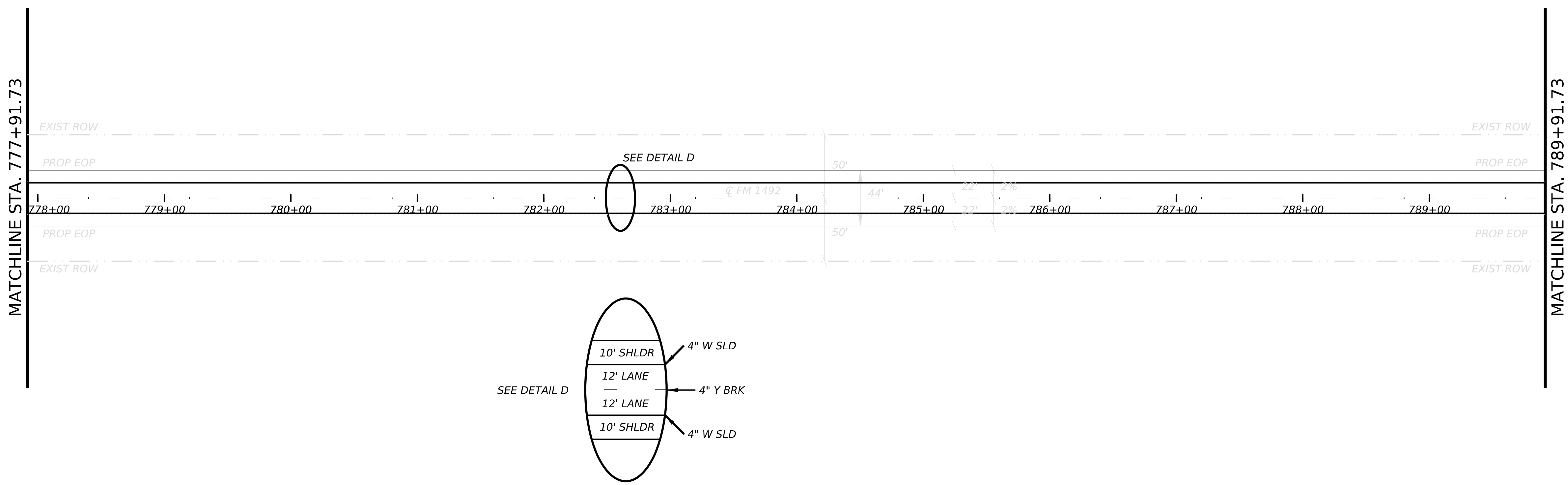

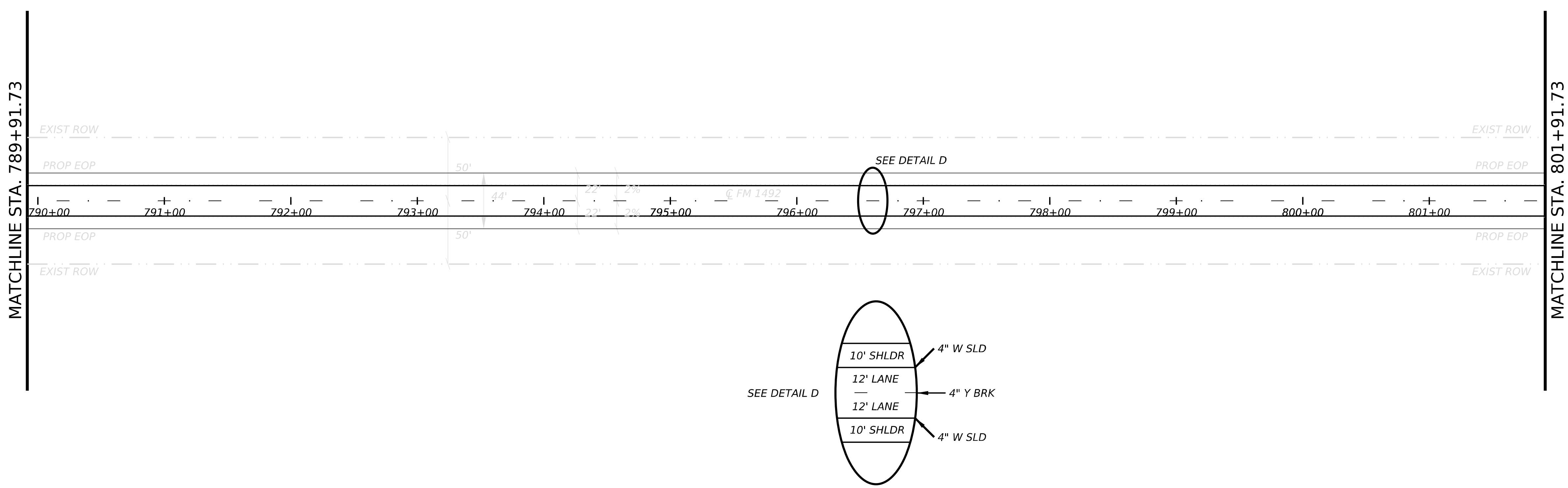

LEGEND

- EXIST. ROW
- EXIST. EOP
- EXIST. SOLAR SERVICE PANEL
- EXIST. RFBA
- EXIST. SIGN
- PROP. SIGN
- # PROP. SIGN NO.

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SIGNING & PAVEMENT MARKING LAYOUT

SHEET 36 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		130

DATE: $DATE$ 10/18/2022
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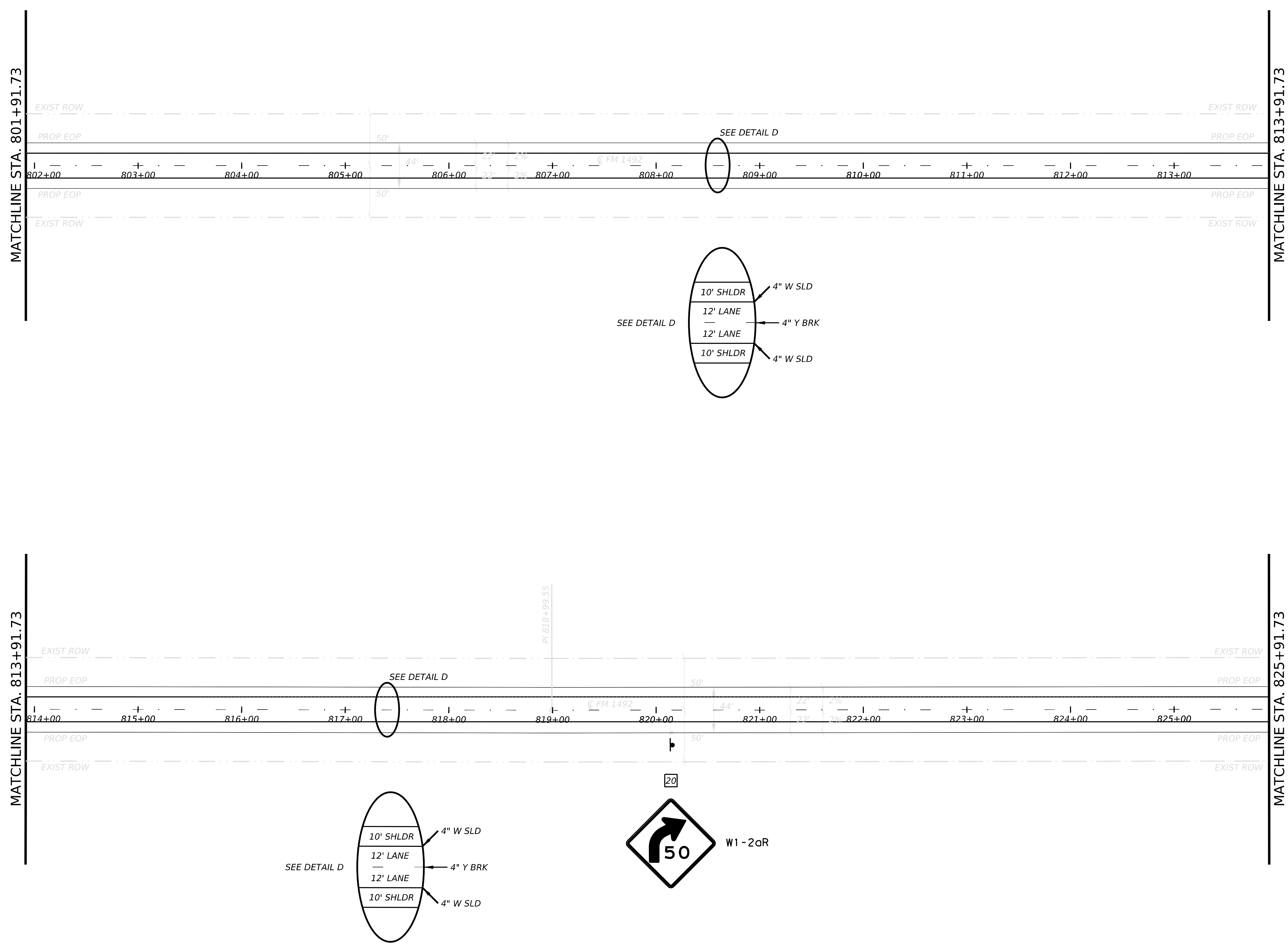

LEGEND

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

EXIST. SIGN

PROP. SIGN

PROP. SIGN NO.

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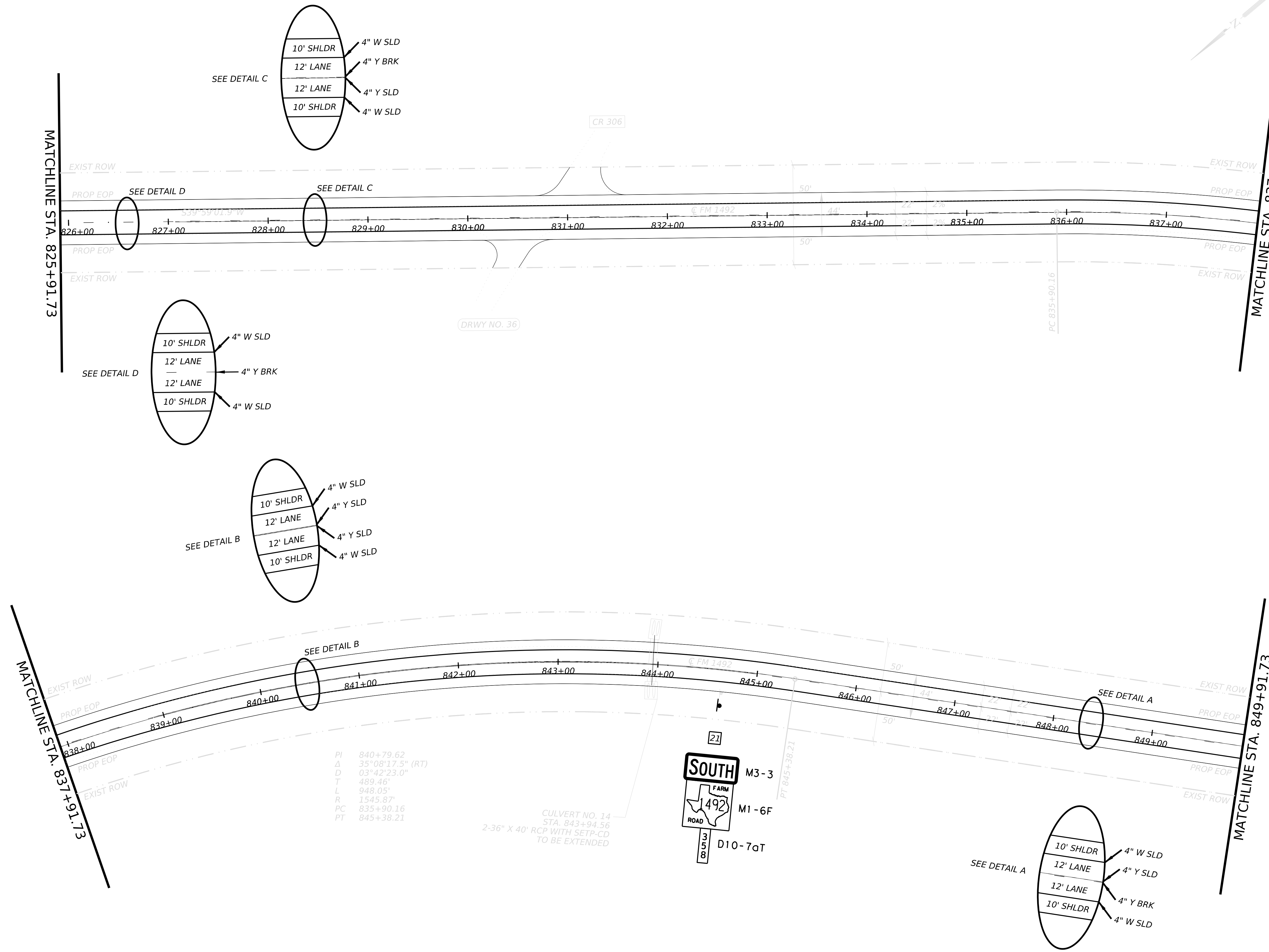
SIGNING & PAVEMENT MARKING LAYOUT

SHEET 37 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		131



LEGEND

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

EXIST. SIGN

PROP. SIGN

PROP. SIGN NO.

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SIGNING & PAVEMENT MARKING LAYOUT

SHEET 38 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		132

DATE: 10/11/2022
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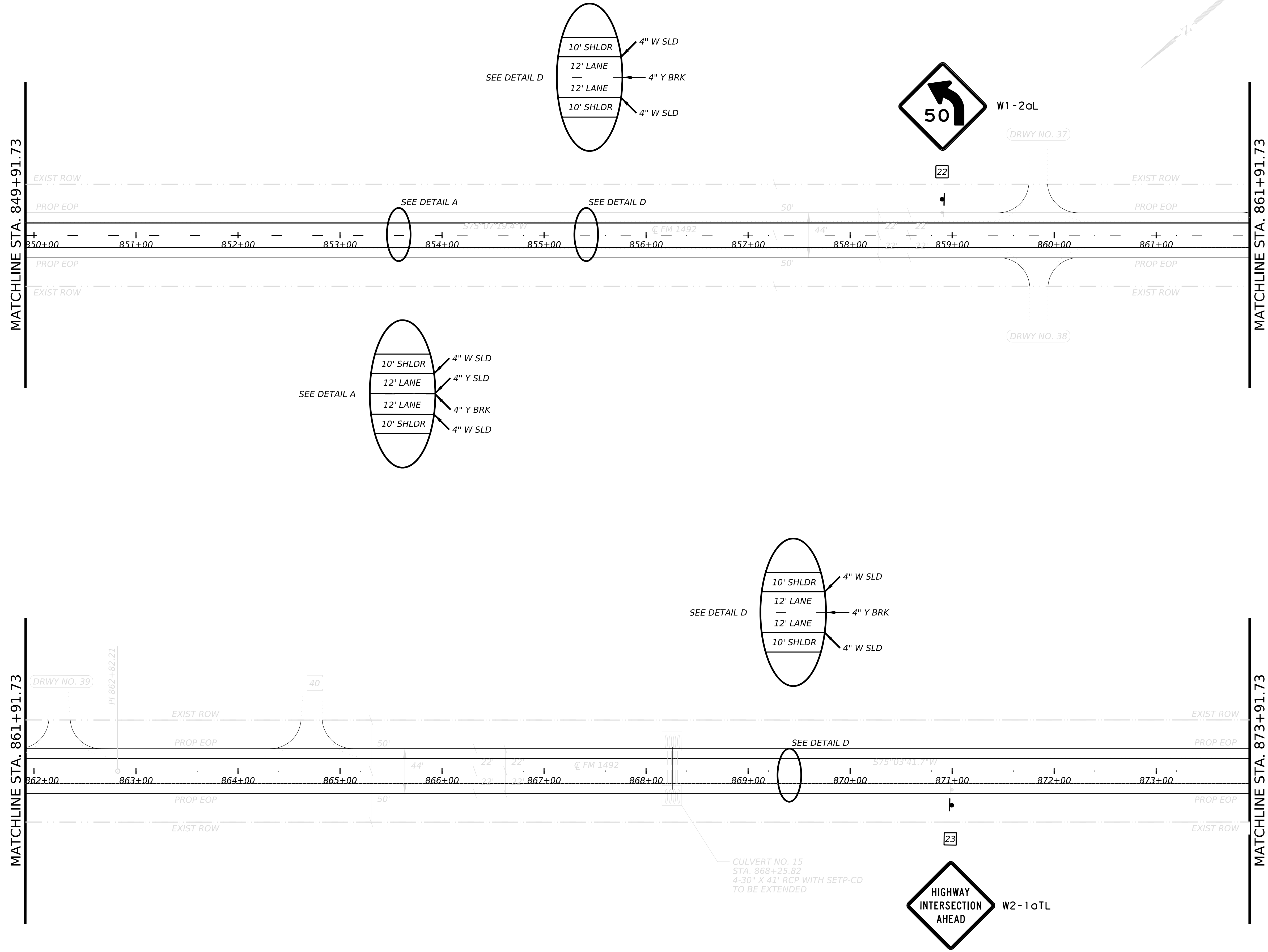

LEGEND

EXIST. ROW

EXIST. EOP

EXIST. SOLAR SERVICE PANEL

EXIST. RFBA

EXIST. SIGN

PROP. SIGN

PROP. SIGN NO.

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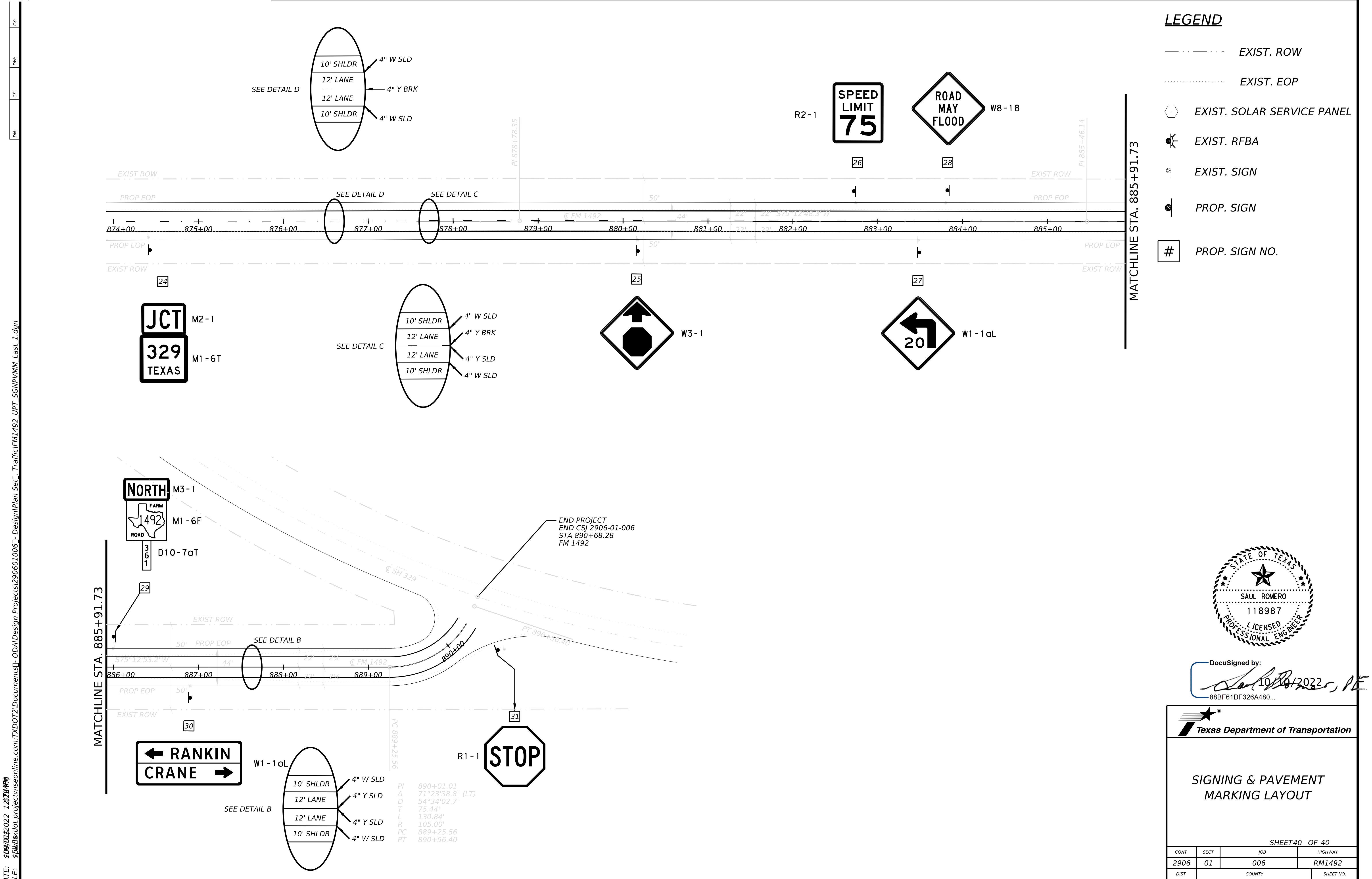
Texas Department of Transportation

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 39 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		133

DATE:
FILE: pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Set\. Traffic\FM1492 UPT SGNPVMM-35.dgn


LEGEND
EXIST. ROW
EXIST. EOP
EXIST. SOLAR SERVICE PANEL
EXIST. RFBA
EXIST. SIGN
PROP. SIGN
PROP. SIGN NO.
SEE DETAIL D
10' SHLDR
12' LANE
12' LANE
10' SHLDR
4" W SLD
4" Y BRK
4" W SLD
R2-1
SPEED LIMIT 75
ROAD MAY FLOOD
W8-18
26
28
MATCHLINE STA. 885+91.73
SEE DETAIL D
SEE DETAIL C
874+00
875+00
876+00
877+00
878+00
879+00
880+00
881+00
882+00
883+00
884+00
885+00
24
25
27
JCT
M2-1
329 TEXAS
M1-6T
SEE DETAIL C
10' SHLDR
12' LANE
12' LANE
10' SHLDR
4" W SLD
4" Y BRK
4" Y SLD
4" W SLD
W3-1
20
W1-1aL
NORTH
M3-1
FARM 1492 ROAD
M1-6F
3 6 1
D10-7aT
END PROJECT
END CSJ 2906-01-006
STA 890+68.28
FM 1492
29
MATCHLINE STA. 885+91.73
SEE DETAIL B
886+00
887+00
888+00
889+00
890+00
30
31
RANKIN
CRANE
W1-1aL
R1-1
STOP
SEE DETAIL B
10' SHLDR
12' LANE
12' LANE
10' SHLDR
4" W SLD
4" Y SLD
4" Y SLD
4" W SLD
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SIGNING & PAVEMENT MARKING LAYOUT

SHEET 40 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		134

PAVEMENT MARKING SUMMARY							
	0533 6001	0533 6002	0666 6303	0666 6312	0666 6315	0668 6076	0672 6009
	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	PREFAB PAV MRK TY C (W)(24")(SLD)	REFL PAV MRKR TY II-A-A
	LF	LF	LF	LF	LF	LF	EA
BEGIN 2906-01-006							
STA. 12+75 TO STA. 20+75	725	725	1,450	725	725		19
STA. 20+75 TO STA. 24+75	475	475	950	0	950		24
STA. 24+75 TO STA. 26+66	191	191	382	191	191		5
STA. 26+66 TO STA. 29+16	250	250	500	250	0		4
STA. 29+16 TO STA. 40+15	1,099	1,099	2,198	1,099	1,099		28
STA. 40+15 TO STA. 63+98.88	2,384	2,384	4,768	2,384	0		30
BEGIN 2906-02-007							
STA. 00+00 TO STA. 697+36	69,736	69,736	139,472	69,736	0		872
STA. 697+36 TO STA. 710+35	1,299	1,299	2,598	1,299	1,299		33
STA. 710+35 TO STA. 728+00	1,765	1,765	3,530	1,765	1,765		45
STA. 728+00 TO STA. 827+07	9,907	9,907	19,814	9,907	0		124
STA. 827+07 TO STA. 838+90	1,183	1,183	2,366	1,183	1,183		30
STA. 838+90 TO STA. 845+00	610	610	1,220	0	1,220		16
STA. 845+00 TO STA. 854+00	900	900	1,800	900	900		23
STA. 854+00 TO STA. 877+57	2,357	2,357	4,714	2,357	0		30
STA. 877+57 TO STA. 885+82	825	825	1,650	825	825		21
STA. 885+82 TO STA. 890+35	453	453	906	0	906	22	12
TOTAL	94,159	94,159	188,318	92,621	11,063	22	1,316

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PAVEMENT MARKING SUMMARY

SHEET 1 OF 1

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FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			135
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

SMALL SIGN REMOVAL SUMMARY

SIGN REMOVAL ID	REF. MRK.	LOCATION	SIGN TEXT/SYMBOL	0644 6076 REMOVE SM RD SN SUP & AM
2906-01-006 STA. 01+90.6 TO 63+98.88				
1	19+20.00	NB FM 1492	JCT FM 1787	1
2	23+40.00	NB FM 1492	HIGHWAY INTERSECTION AHEAD (W2-1aTL)	1
3	33+60.00	NB FM 1492	WATCH FOR WATER ON ROAD	1
4	63+75.00	SB FM 1492	SOUTH FM 1492 (RM 344)	1
5	63+75.00	SB FM 1492	UPTON COUNTY LINE BURN BAN IN EFFECT	1
6	63+80.00	NB FM 1492	MIDLAND COUNTY LINE	1
2906-02-007 STA. 0+00.00 TO 890+68.28				
7	27+00.00	SB FM 1492	TRUCK CROSSING	1
8	56+40.00	NB FM 1492	TRUCK CROSSING	1
9	105+40.00	NB FM 1492	NORTH FM 1492 (RM) 348	1
10	211+25.00	SB FM 1492	SOUTH FM 1492 (RM) 350	1
11	316+75.00	NB FM 1492	NORTH FM 1492 (RM) 350	1
12	422+40.00	SB FM 1492	SOUTH FM 1492 (RM) 352	1
13	507+00.00	SB FM 1492	W1-4L (LEFT REVERSE CURVE)	1
14	527+95.00	NB FM 1492	NORTH FM 1492 (RM) 354	1
15	536+80.00	NB FM 1492	W1-4L (LEFT REVERSE CURVE)	1
16	633+45.00	SB FM 1492	SOUTH FM 1492 (RM) 356	1
17	691+35.00	SB FM 1492	W1-2aR (45 MPH)	1
18	734+80.00	NB FM 1492	W1-2aL (45 MPH)	1
19	739+35.00	NB FM 1492	NORTH FM 1492 (RM) 358	1
20	820+25.00	SB FM 1492	W1-2aR (50 MPH)	1
21	844+60.00	SB FM 1492	SOUTH FM 1492 (RM) 358	1
22	858+90.00	NB FM 1492	W1-2aL (50 MPH)	1
23	871+00.00	SB FM 1492	HIGHWAY INTERSECTION AHEAD (W2-1aTL)	1
24	874+45.00	SB FM 1492	JCT SH 329	1
25	880+20.00	SB FM 1492	W3-1 (ADVANCE STOP AHEAD)	1
26	882+75.00	NB FM 1492	SPEED LIMIT (75 MPH)	1
27	883+45.00	SB FM 1492	W1-1aL (20 MPH) (LEFT TURN WITH VARIABLE SPEED LIMIT)	1
28	883+80.00	NB FM 1492	CAUTION ROAD MAY FLOOD NEXT 17 MILES	1
29	886+00.00	NB FM 1492	NORTH FM 1492 (RM) 361	1
30	886+80.00	SB FM 1492	RANKIN (LEFT) (D1-2) CRANE (RIGHT)	1
31	890+50.00	SB FM 1492	STOP	1

STATE OF TEXAS
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SIGN REMOVAL SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			136
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

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
	1	M2-1	JCT <AUXILIARY SIGN>	21 x 15		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
	2	W2-1aTL	HIGHWAY INTERSECTION AHEAD	48 x 48		X	10BWG	1	SA	T		
	3	W8-18	ROAD MAY FLOOD	36 x 36		X	10BWG	1	SA	T		
	4	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	5	I-2dT	(UPTON) COUNTY LINE	54 X 24		X	10BWG	1	SA	T		
		R19-10aT	BURN BAN IN EFFECT	24 x 24								
	6	I-2dT	(MIDLAND) COUNTY LINE	72 x 24		X	10BWG	1	SA	T		
	7	W11-10L	SYMBOL - BE ALERT FOR TRUCKS ENTERING LT	36 x 36		X	10BWG	1	SA	T		
	8	W11-10R	SYMBOL - BE ALERT FOR TRUCKS ENTERING RT	36 x 36		X	10BWG	1	SA	T		
	9	M3-1	NORTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	10	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	11	M3-1	NORTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	12	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	13	W1-4L	SYMBOL - REVERSE CURVE LEFT	36 x 36		X	10BWG	1	SA	T		
	14	M3-1	NORTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	15	W1-4L	SYMBOL - REVERSE CURVE LEFT	36 x 36		X	10BWG	1	SA	T		
	16	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	17	W1-2aR	SYMBOL - HORIZ CURVE RIGHT w/ (SPEED)	36 x 36		X	10BWG	1	SA	T		
	18	W1-2aL	SYMBOL - HORIZ CURVE LEFT w/ (SPEED)	36 x 36		X	10BWG	1	SA	T		
	19	M3-1	NORTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	20	W1-2aR	SYMBOL - HORIZ CURVE RIGHT w/ (SPEED)	36 x 36		X	10BWG	1	SA	T		
	21	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	22	W1-2aR	SYMBOL - HORIZ CURVE RIGHT w/ (SPEED)	36 x 36		X	10BWG	1	SA	T		
	23	W2-1aTL	HIGHWAY INTERSECTION AHEAD	48 x 48		X	10BWG	1	SA	T		
	24	M2-1	JCT <AUXILIARY SIGN>	21 x 15		X	10BWG	1	SA	P		
		M1-6T	(ROUTE #) TEXAS	24 x 24								
	25	W3-1	SYMBOL - STOP AHEAD	30 x 30		X	10BWG	1	SA	T		
	26	R2-1	SPEED LIMIT (SPEED)	30 x 36		X	10BWG	1	SA	P		
	27	W1-1aL	SYMBOL - HORIZ ALN TURN LEFT w/ (SPEED)	36 x 36		X	10BWG	1	SA	T		
	28	W8-18	ROAD MAY FLOOD	36 x 36		X	10BWG	1	SA	T		
	29	M3-1	NORTH <AUXILIARY SIGN>	24 x 12		X	10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24								
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10								
	30	D1-2	(DESTINATION - 2 LINE)	72 x 30		X	10BWG	1	SA	T		
	31	R1-1	STOP	36 x 36		x	10BWG	1	SA	T		

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).

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Saul Romero, PE
10/10/2022
88BF61DF326A480...

Texas Department of Transportation

Traffic Operations Division Standard

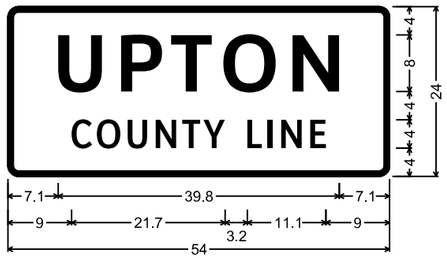
SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
4-16	DIST	COUNTY		SHEET NO.
8-16	ODA	MIDLAND, ETC.		137

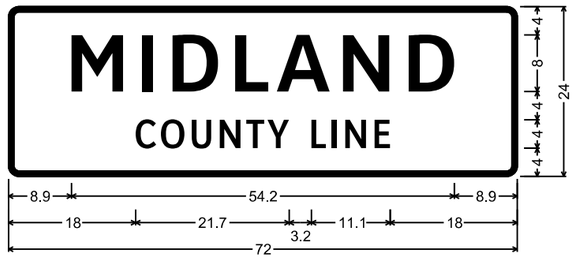
18

DATE:
FILE:



I-2dT 8in;
1.5" Radius, 0.8" Border, White on Green;
"UPTON", ClearviewHwy-5-W-R;
"COUNTY LINE", ClearviewHwy-3-W;

SIGN 5



I-2dT 8in;
1.5" Radius, 0.8" Border, White on Green;
"MIDLAND", ClearviewHwy-5-W-R;
"COUNTY LINE", ClearviewHwy-3-W;

SIGN 6

D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°;
"RANKIN", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"CRANE", ClearviewHwy-3-W;
Standard Arrow Custom 12.0" X 7.1" 0°;

SIGN 30

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED
PROFESSIONAL ENGINEER

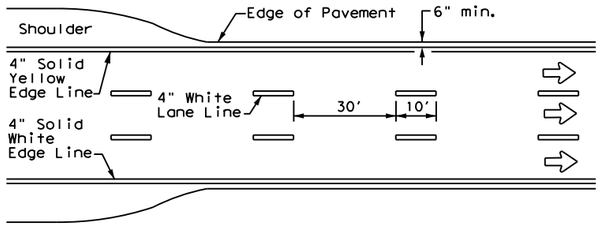
DocuSigned by:
10/20/2022
88BF61DF326A480...

SIGN DETAILS

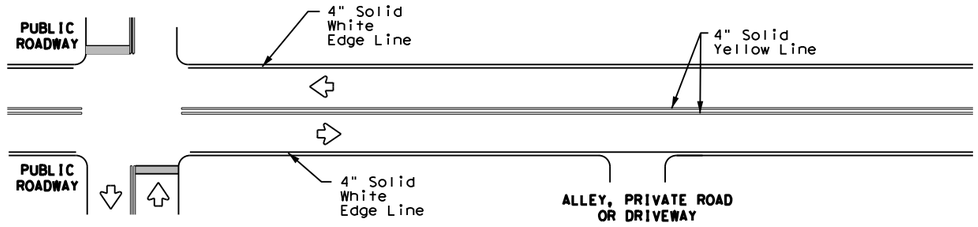
SHEET 1 OF 1

Texas Department of Transportation
©xxxx

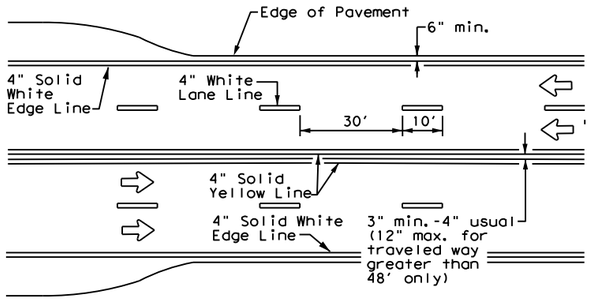
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			138
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492



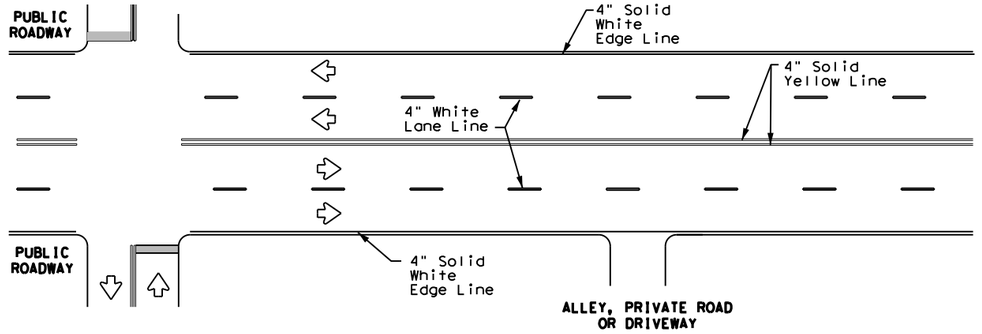
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



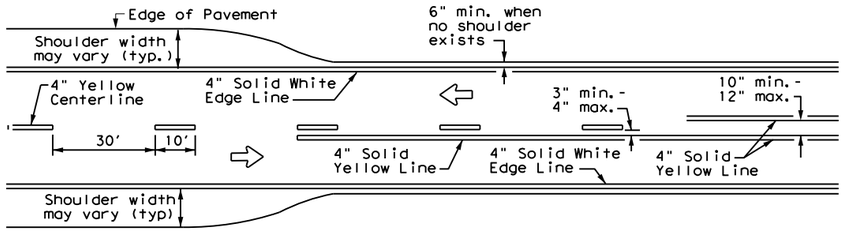
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



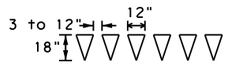
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



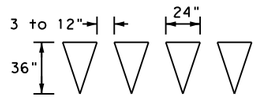
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

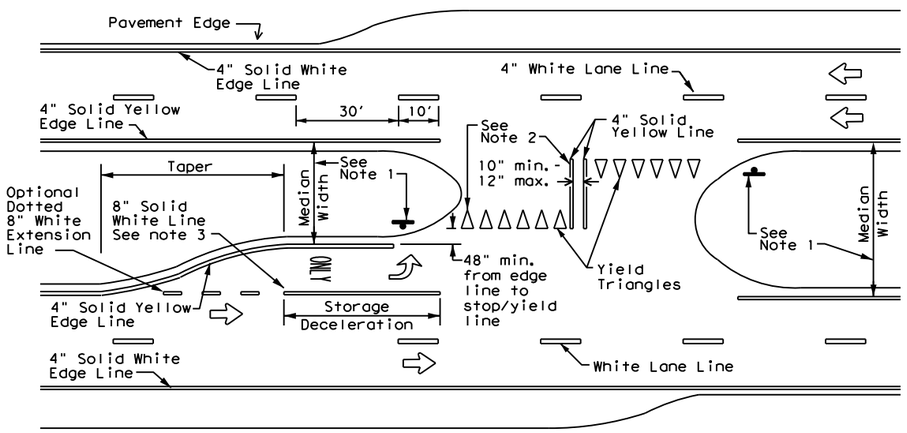


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

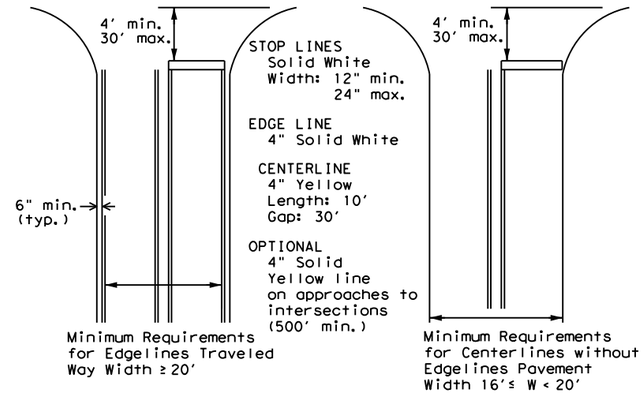
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

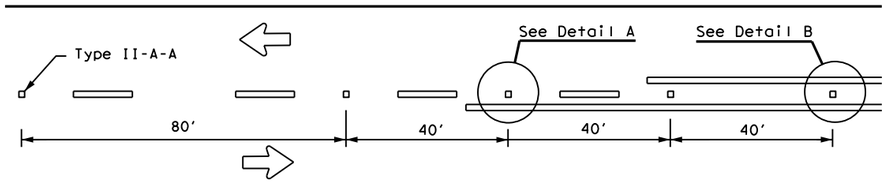
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	2906	01	006, ETC.	RM 1492
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	ODA	MIDLAND, ETC.		139

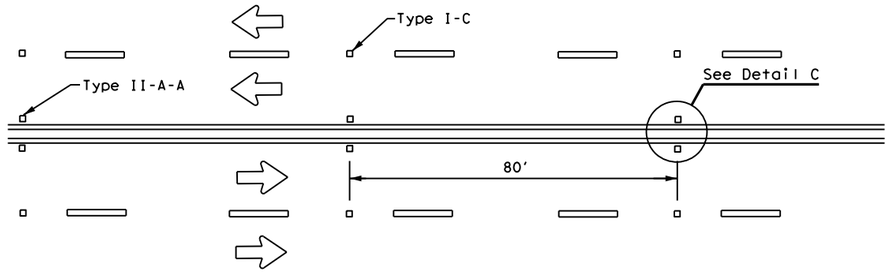
DATE:
FILE:

22A

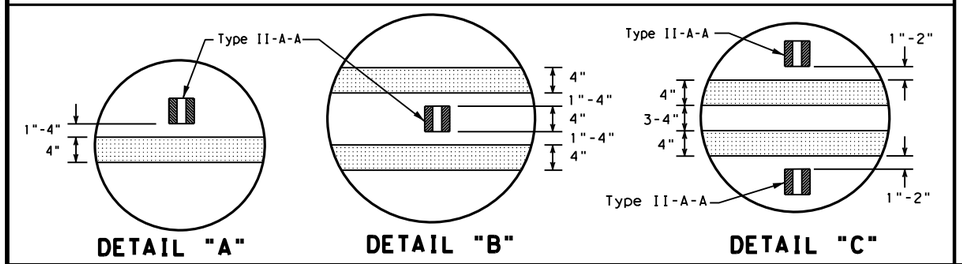
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



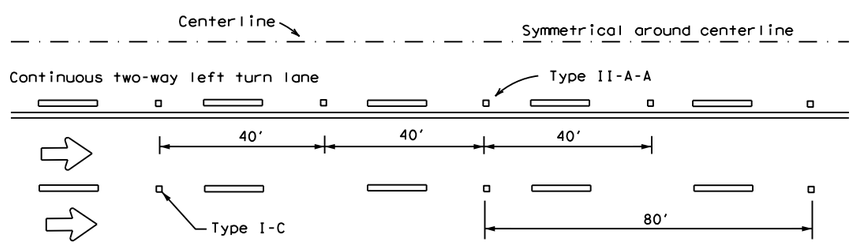
CENTERLINE FOR ALL TWO LANE ROADWAYS



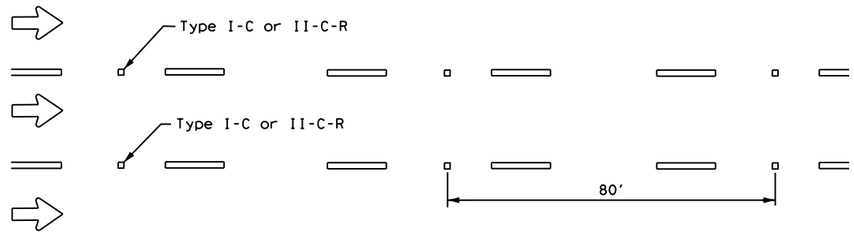
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

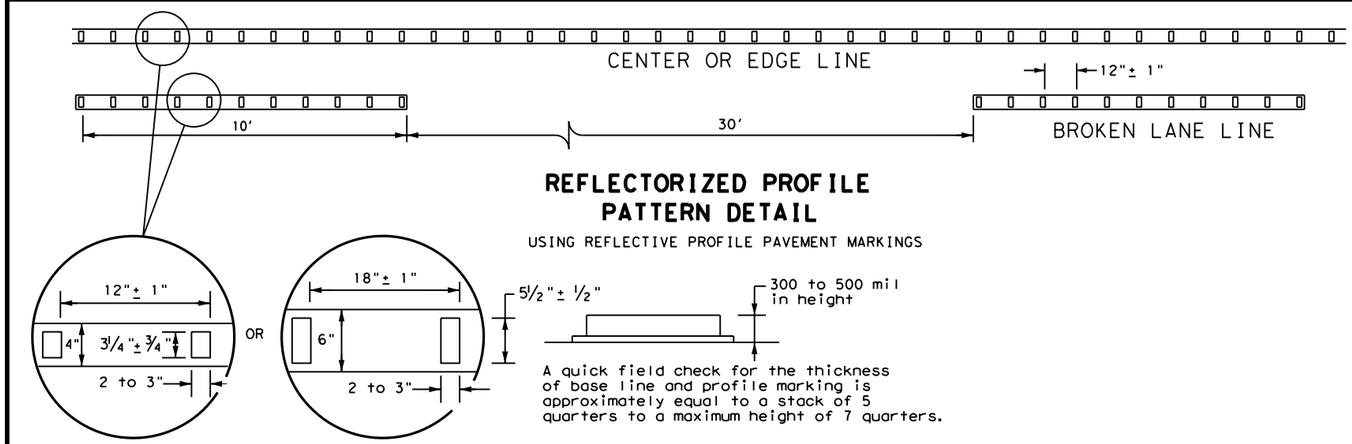


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

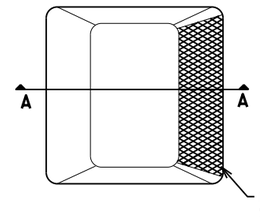
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

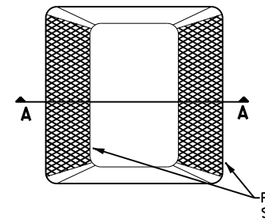
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

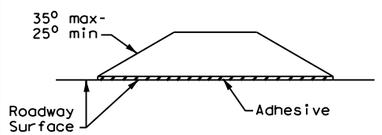
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

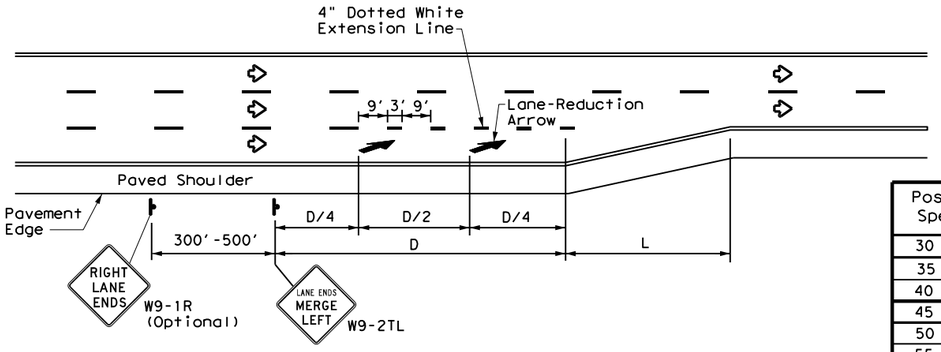
Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		140

22B

DATE:
FILE:

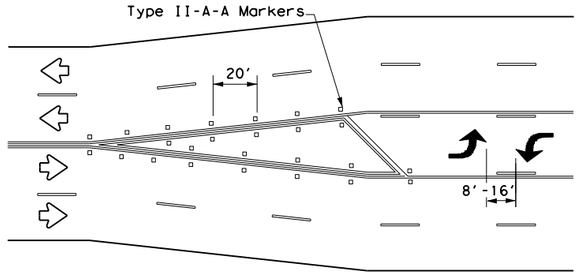


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

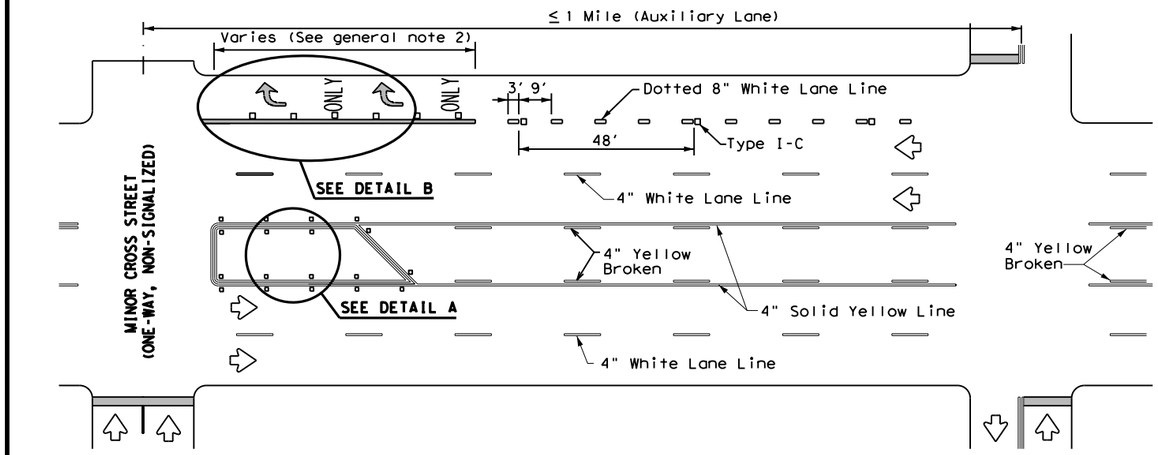
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

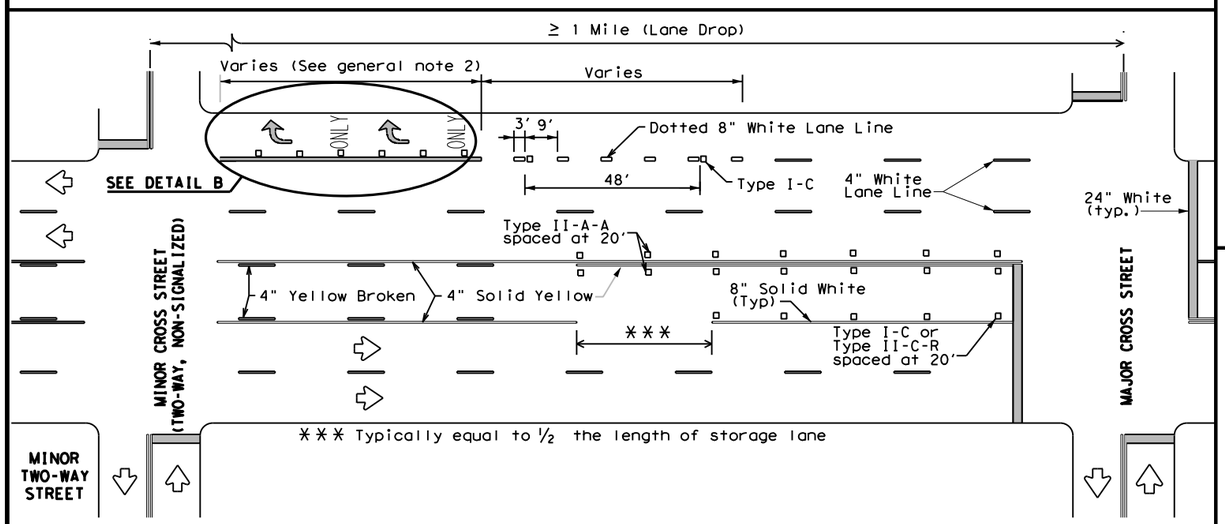
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

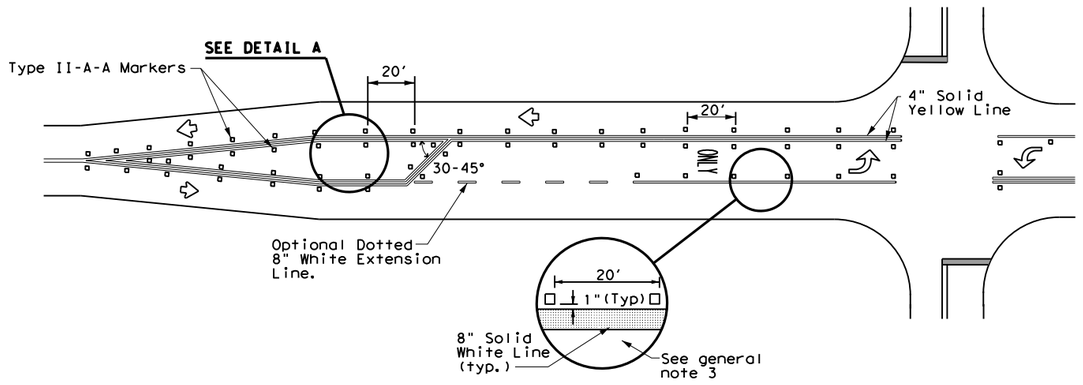
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



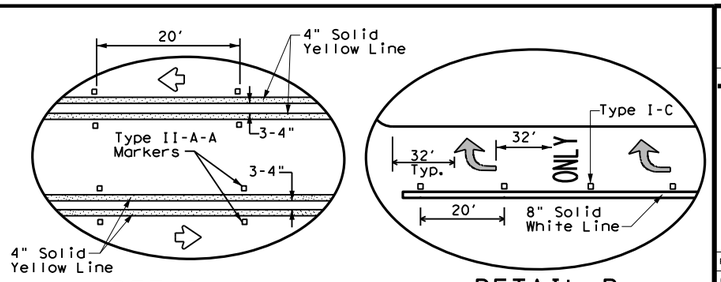
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

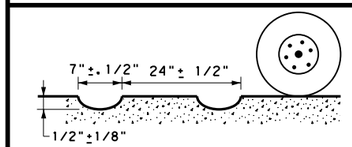
FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	ODA	MIDLAND, ETC.		141
3-03 6-20				

220

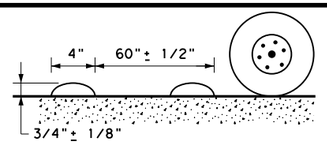
DATE:
FILE:

DATE:
FILE:

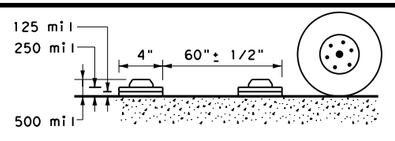
CENTERLINE RUMBLE STRIPS



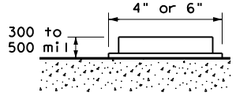
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

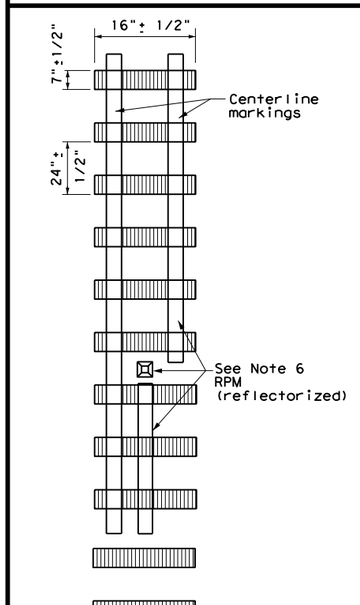


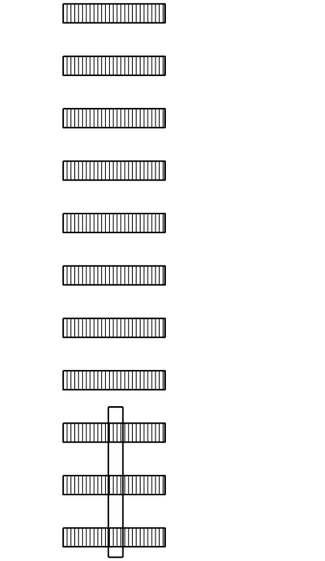
PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

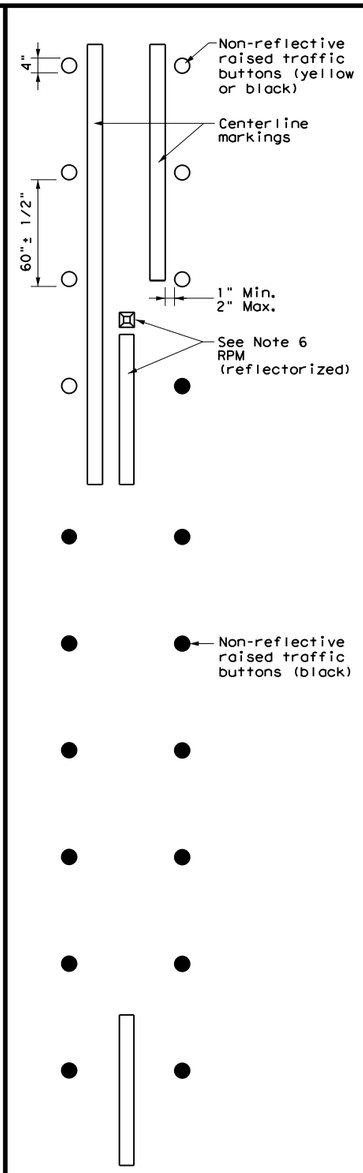
PROFILE VIEW





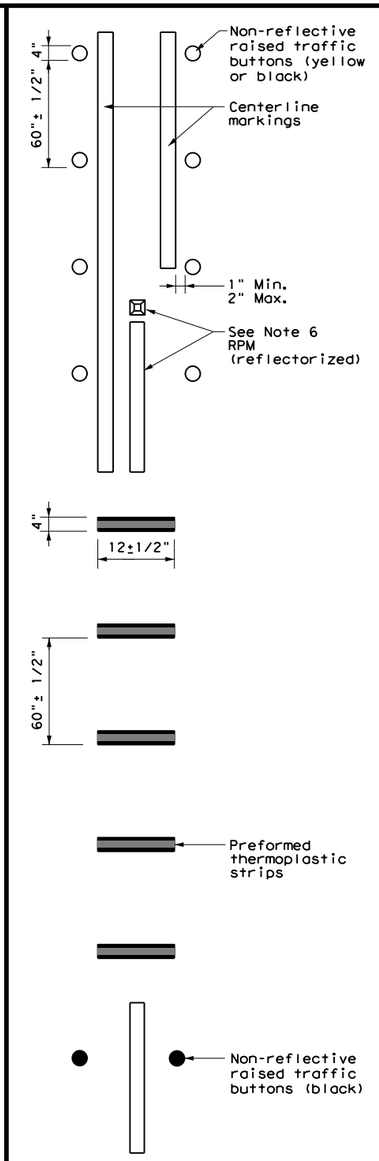
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



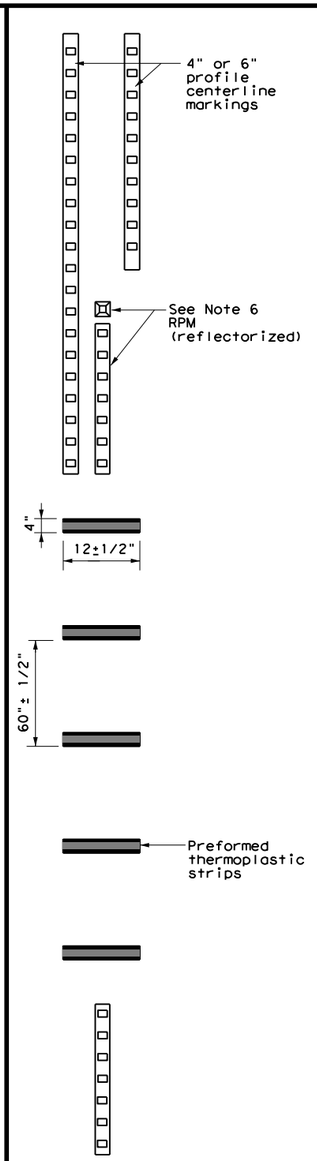
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



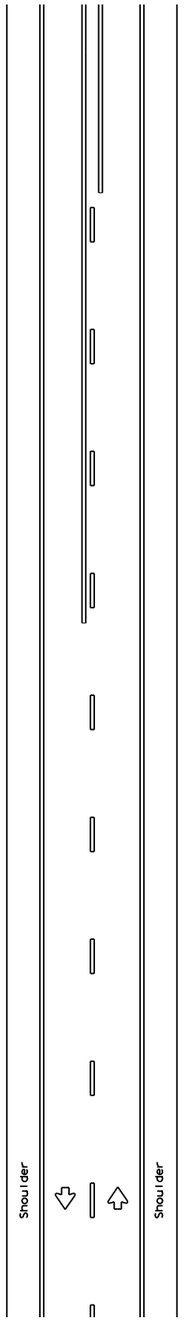
PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS



TWO LANE TWO-WAY ROADWAYS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

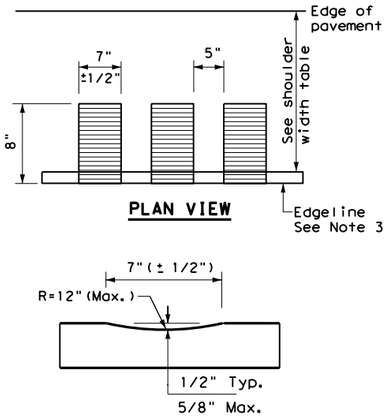
12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

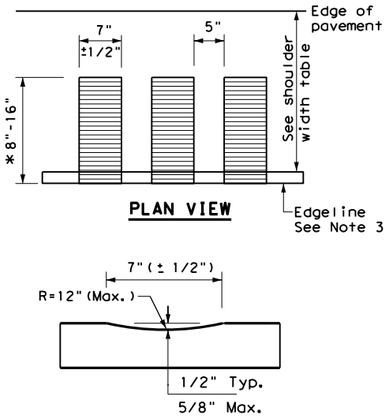
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		142



OPTION 1

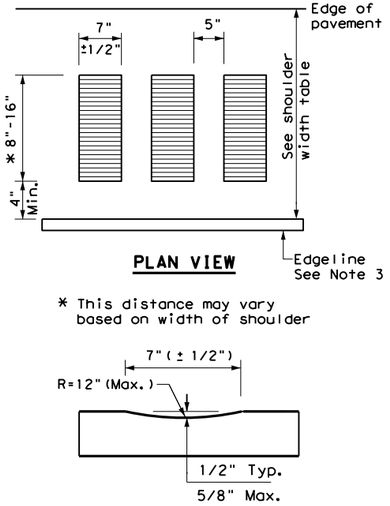
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

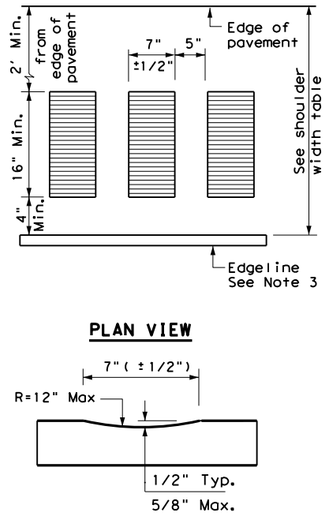
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



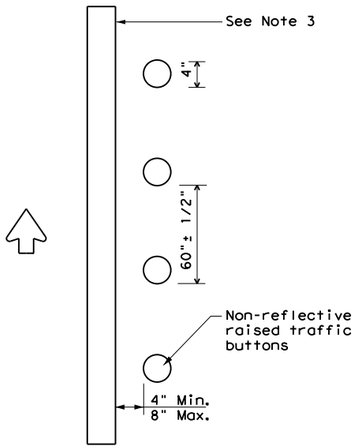
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



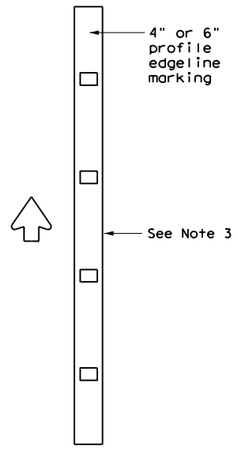
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



OPTION 5

RAISED EDGELINE RUMBLE STRIPS



OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE:	rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS		2906	01	006, ETC.	RM 1492
		DIST	COUNTY		SHEET NO.
		ODA	MIDLAND, ETC.		143

DATE:
FILE:

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)

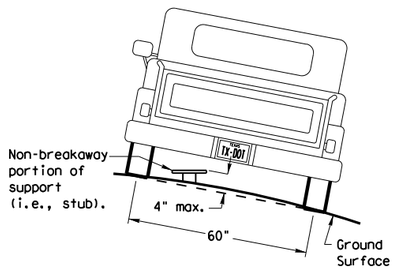
Anchor Type

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))

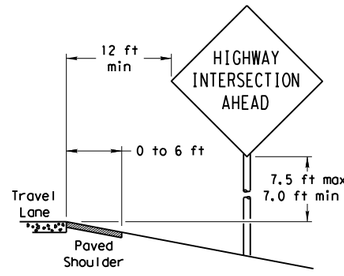
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

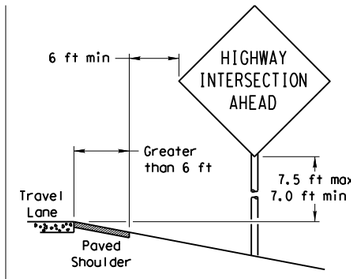
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

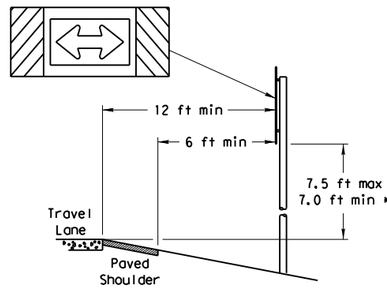
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



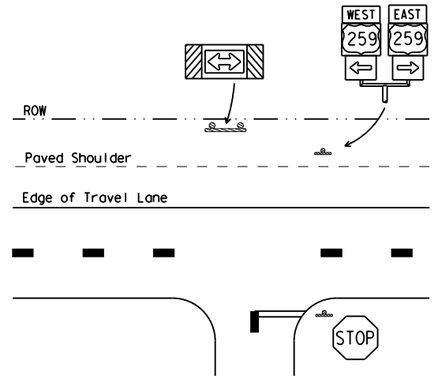
GREATER THAN 6 FT. WIDE

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.

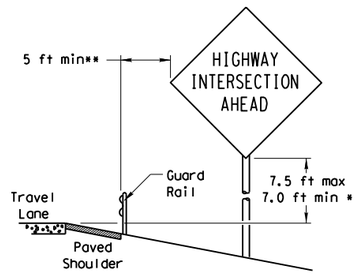
T-INTERSECTION



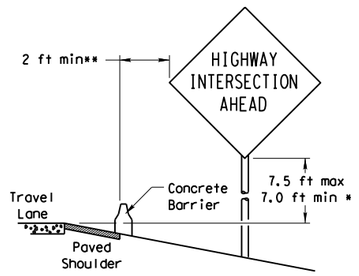
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



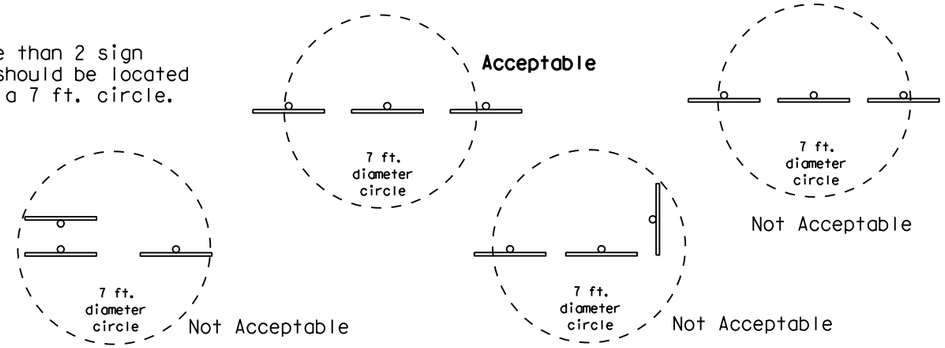
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

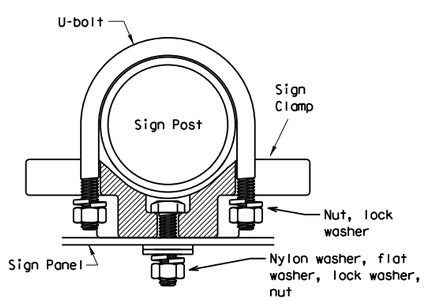
****Sign clearance based on distance required for proper guard rail or concrete barrier performance.**

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

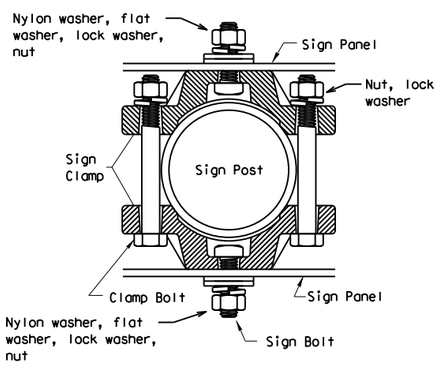


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

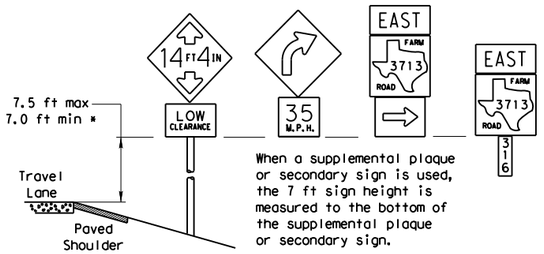
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



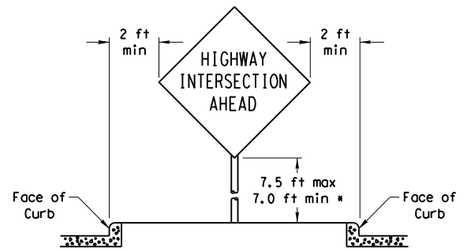
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



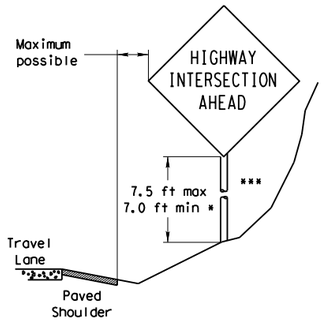
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

* 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

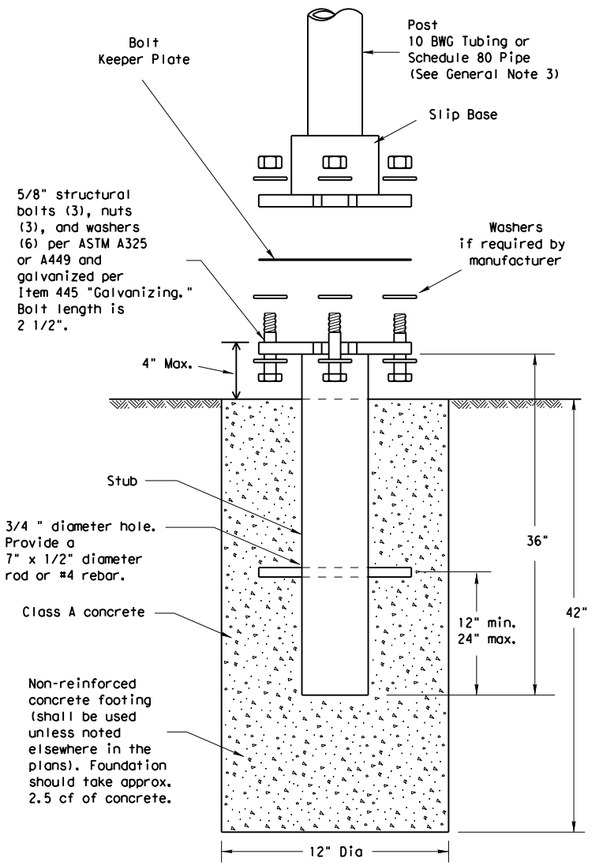
SMD(GEN)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		144

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

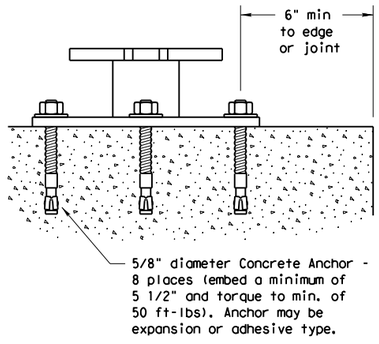
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

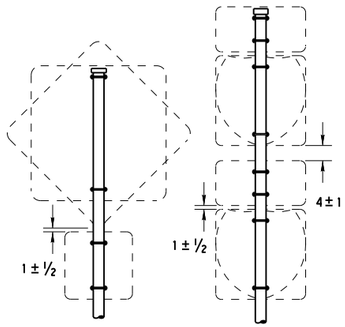
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

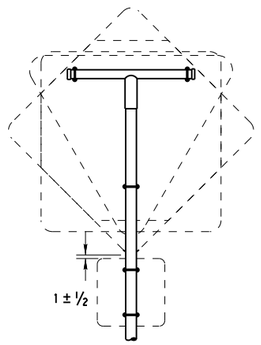
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		145

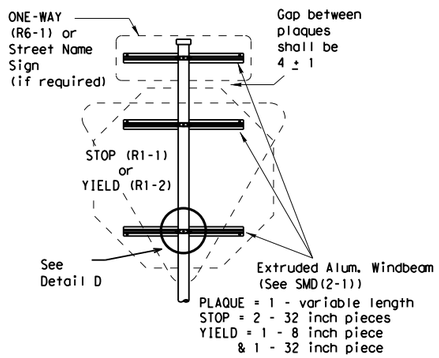
DATE:
FILE:



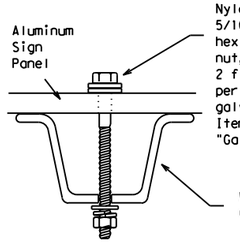
SM RD SGN ASSM TY XXXXX(1)XX(P)



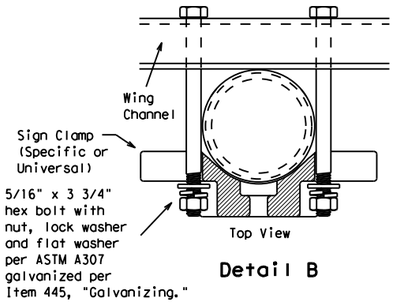
SM RD SGN ASSM TY XXXXX(1)XX(T)



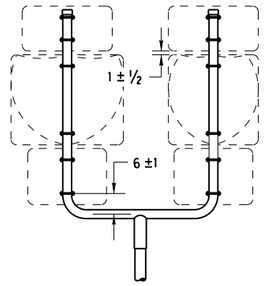
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



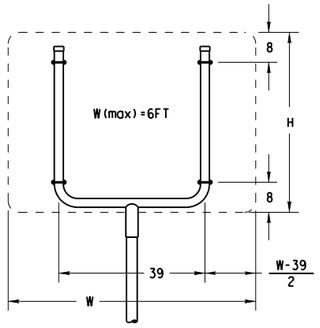
Detail A



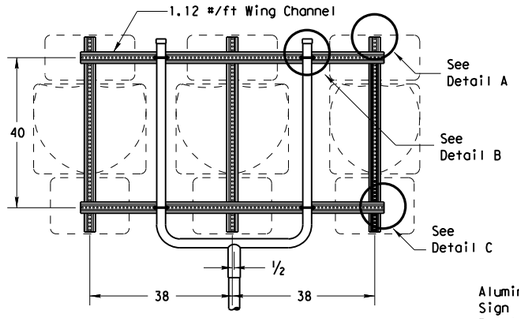
Detail B



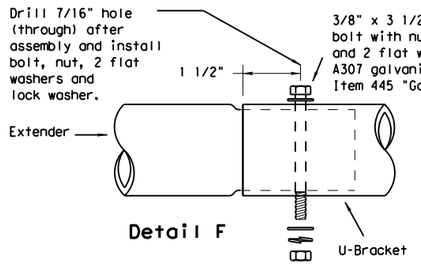
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

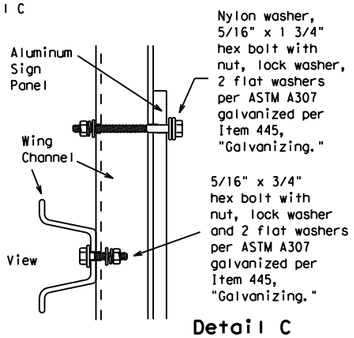


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

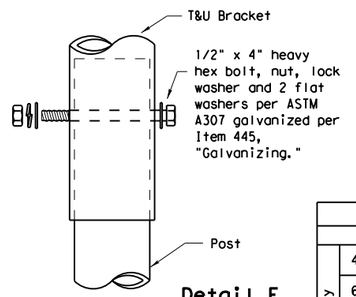


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



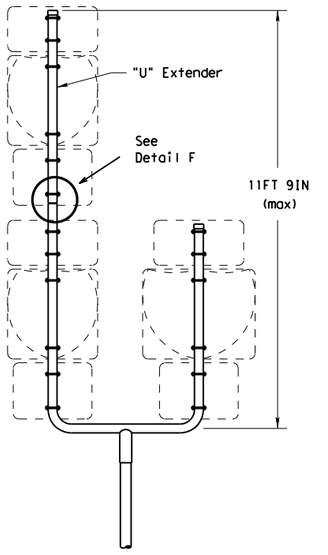
Detail E

GENERAL NOTES:

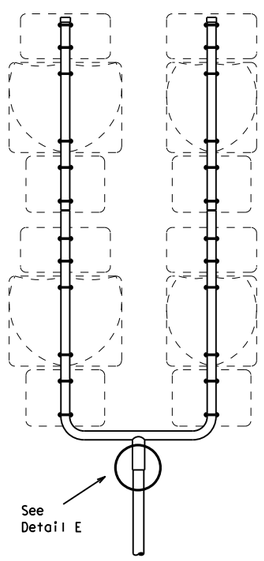
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

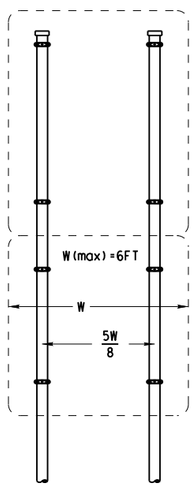
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



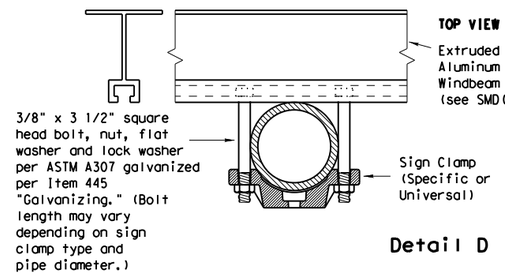
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



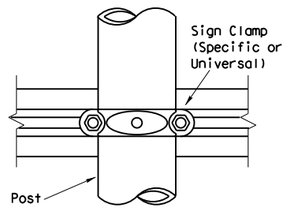
SM RD SGN ASSM TY S80(1)XX(U-2EXT)



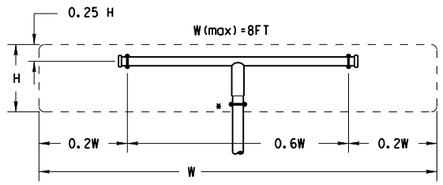
SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



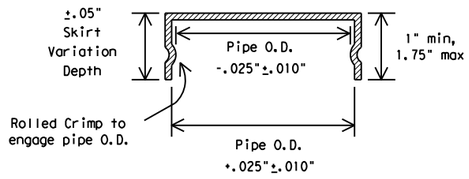
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		146

9-08 REVISIONS

DATE:
FILE:

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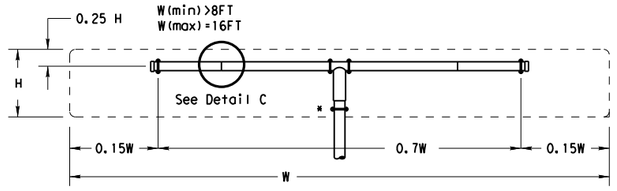
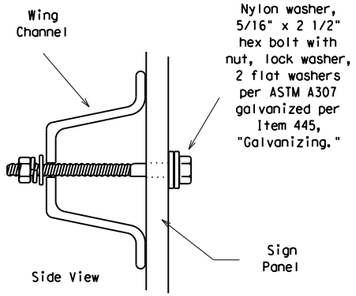
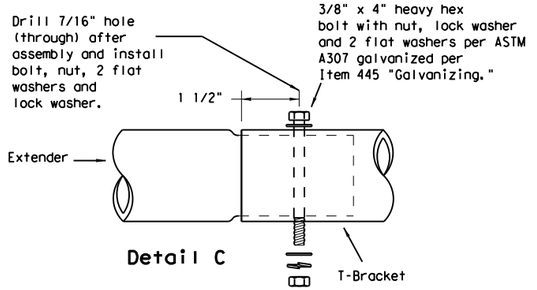


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



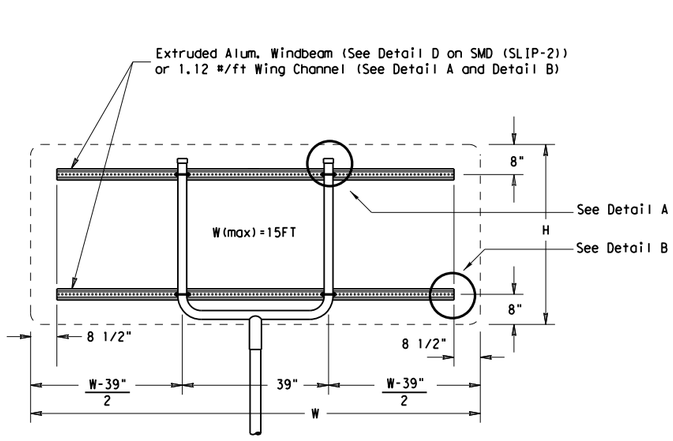
Detail C

Splices shall only be allowed behind the sign substrate.

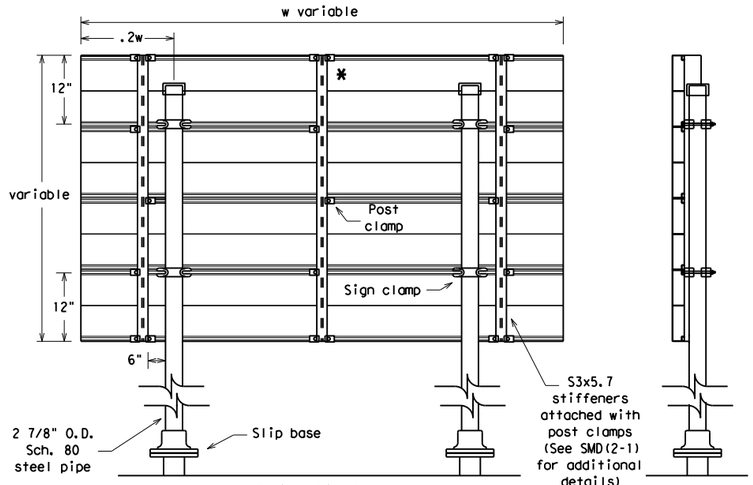
GENERAL NOTES:

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

1. See table above.
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.



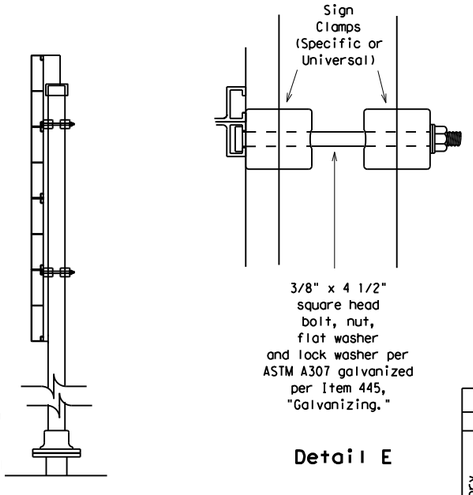
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Typical Sign Mount

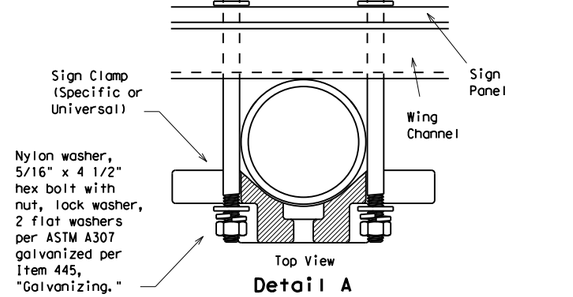
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



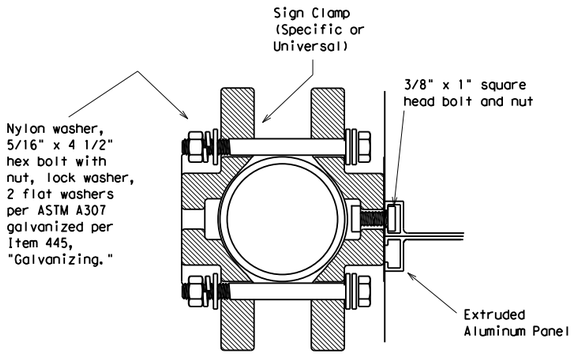
Detail E

See Detail E for clamp installation

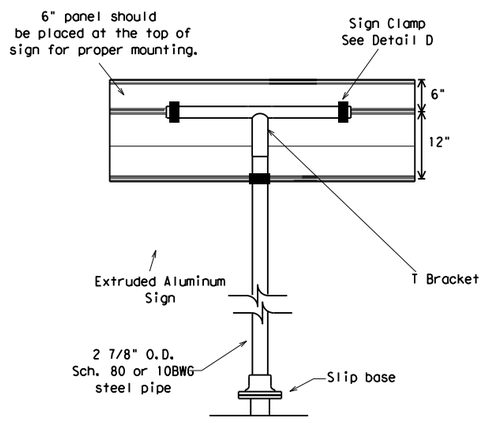


Top View

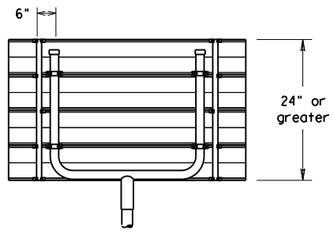
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



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

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
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		147

DATE:
FILE:

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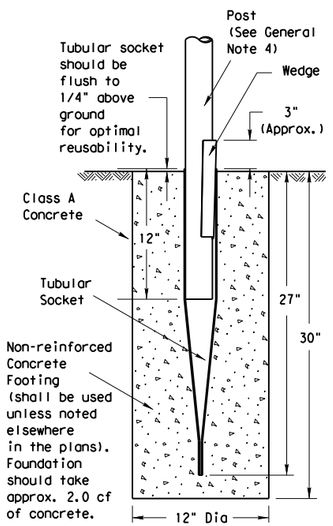
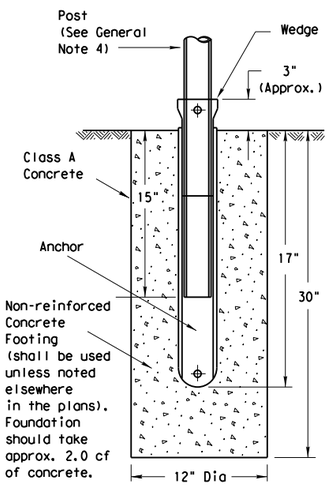
Wedge Anchor Steel System



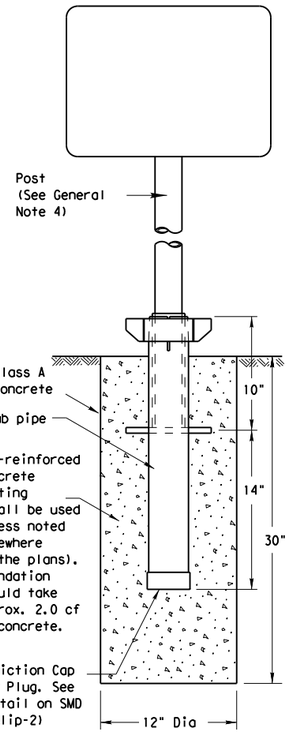
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

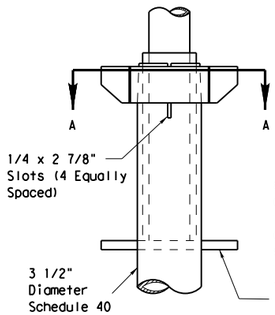


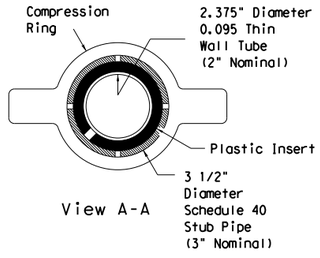
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



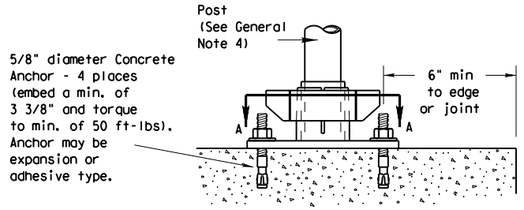
SM RD SGN ASSM TY TWT(X)UA(P)



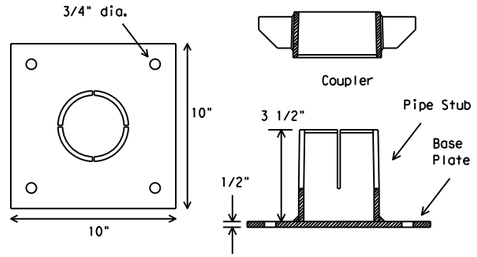


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

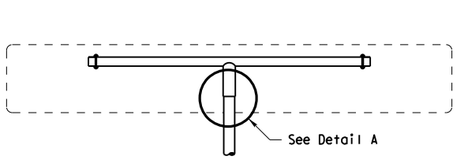


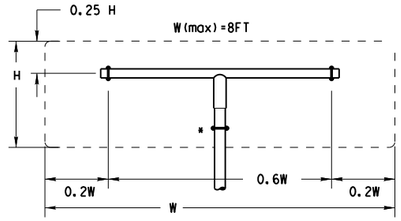
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



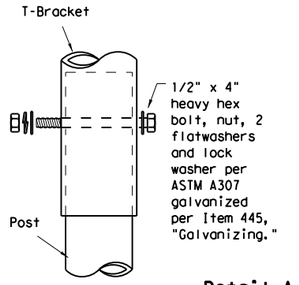
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

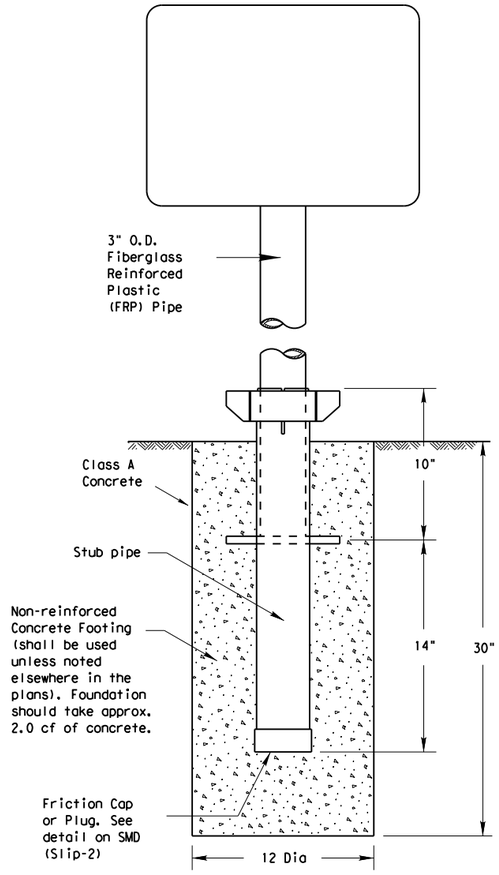
CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		148

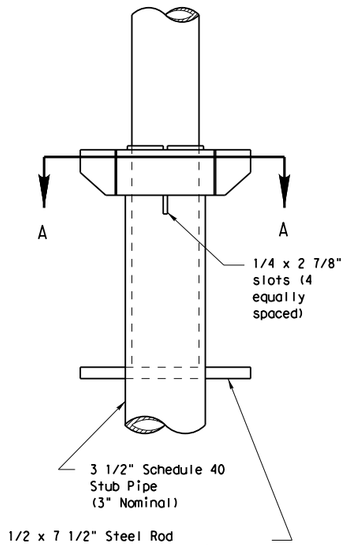
9-08 REVISIONS

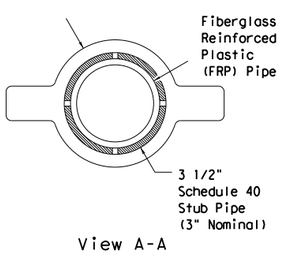
DATE:
FILE:

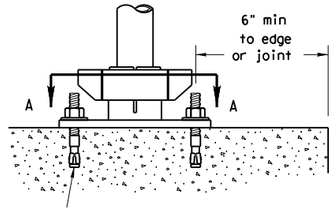
26E

Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post



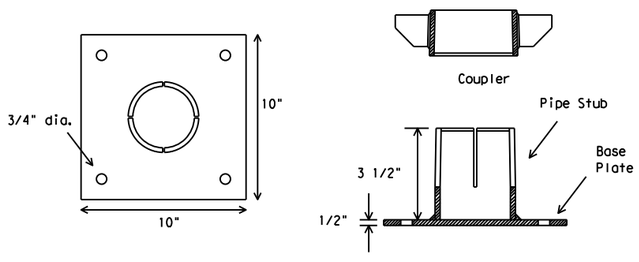






Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

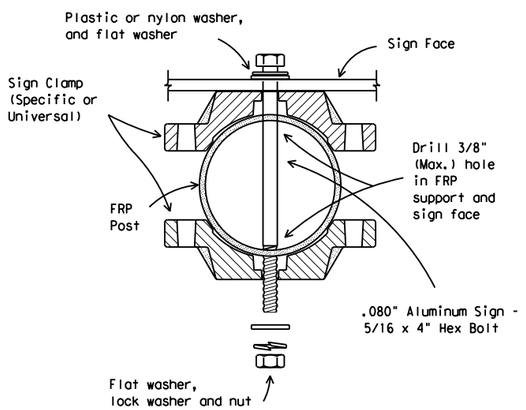
BOLT-DOWN DETAILS



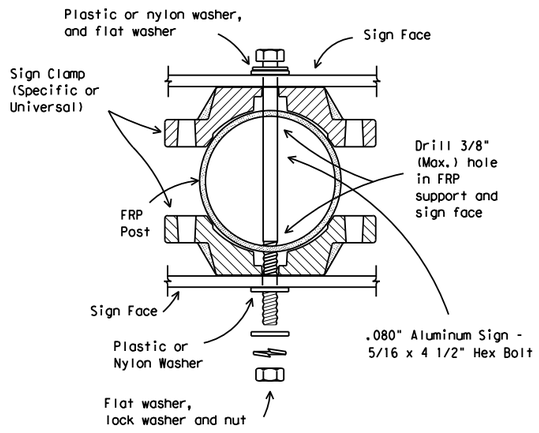
SM RD SGN ASSM TY FRP(X)UA(P)

SM RD SGN ASSM TY FRP(X)UB(P)

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



GENERAL NOTES:

1. FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
2. All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
3. See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: http://www.txdot.gov/publications/traffic.htm

FRP POST REQUIREMENTS

1. Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
2. Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
3. FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
   Texas Department of Transportation
   Traffic Operations Division
   125 East 11th Street
   Austin, Texas 78701-2483

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
4. Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
5. Attach sign to FRP post.
6. Insert sign post into base post. Lower until the post comes to rest on the steel rod.
7. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
8. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

BOLT DOWN SIGN SUPPORT

1. Position base plate with coupler on existing concrete.
2. Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
3. Attach sign to FRP post.
4. Insert bottom of sign post into pipe stub.
5. Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
6. Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD(FRP)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS

9-08

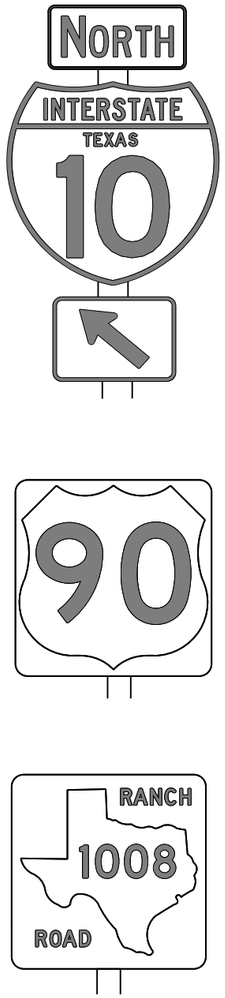
CONT	SECT	JOB	HIGHWAY
2906	01	006, ETC.	RM 1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND, ETC.		149

DATE:
FILE:

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

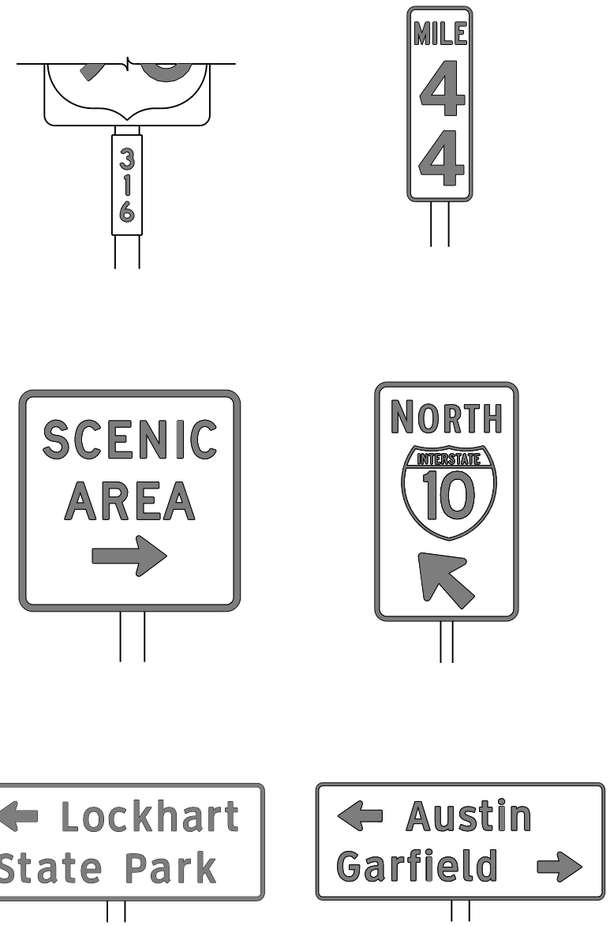
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

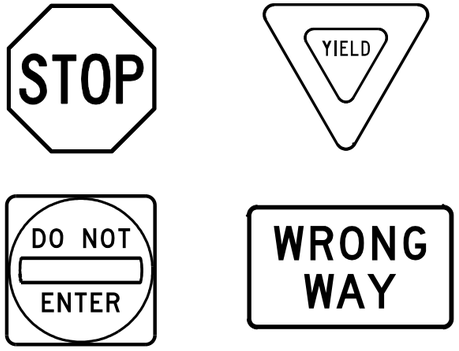
TSR(3)-13

FILE:	tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS		2906	01	006, ETC.	RM 1492
12-03 7-13		DIST	COUNTY		SHEET NO.
9-08		ODA	MIDLAND, ETC.		150

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

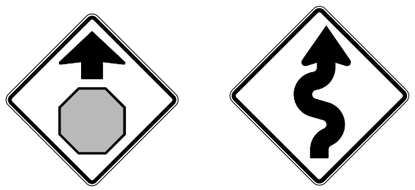
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

Texas Department of Transportation

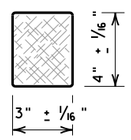
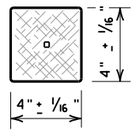
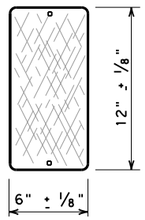
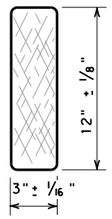
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

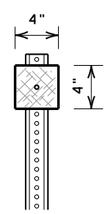
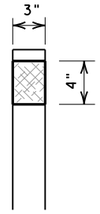
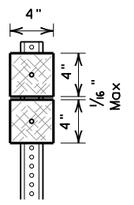
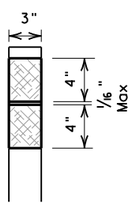
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	ODA	MIDLAND, ETC.		151

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

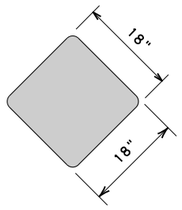
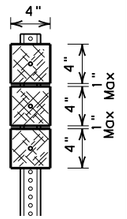
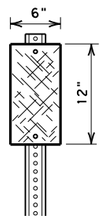
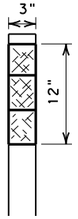
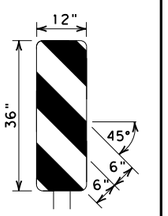
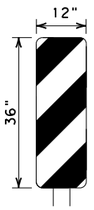
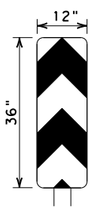
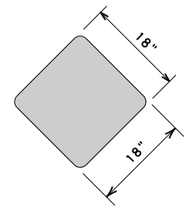
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

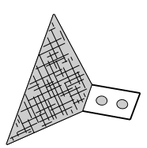
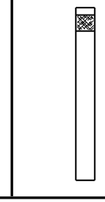
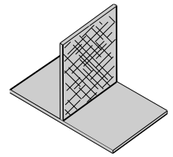
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

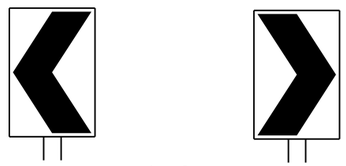
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



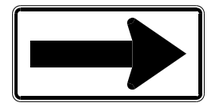
W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	MIDLAND, ETC.		152

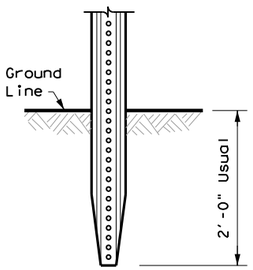
20A

DATE:
FILE:

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

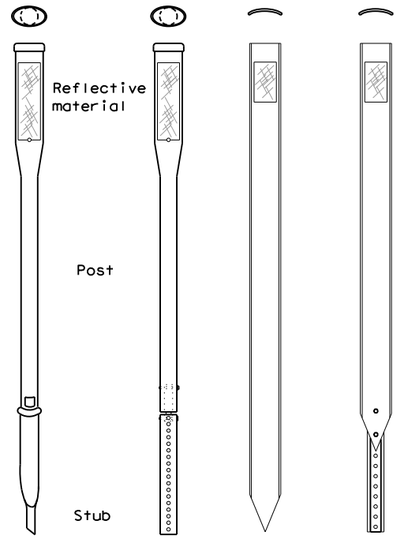


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

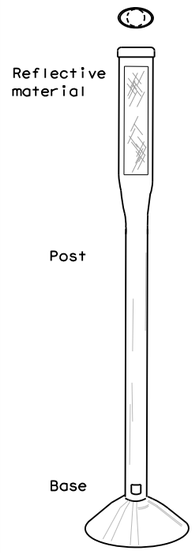
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



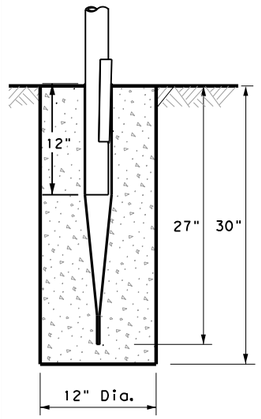
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

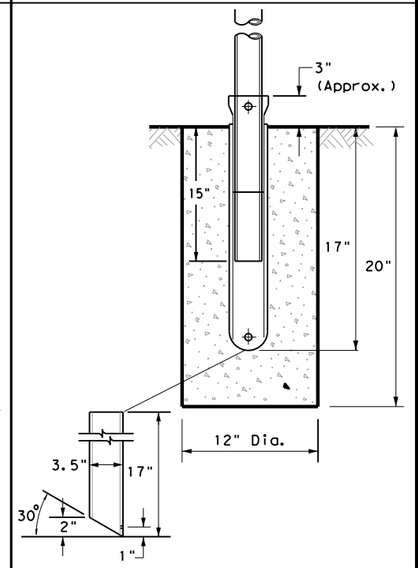
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

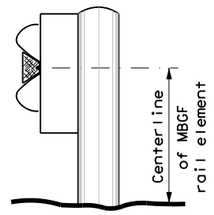
NOTE

1. Install per manufacturer's recommendations.

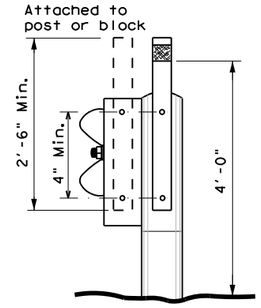
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

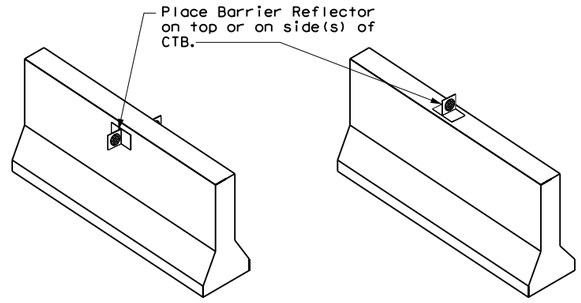
GF1



GF2



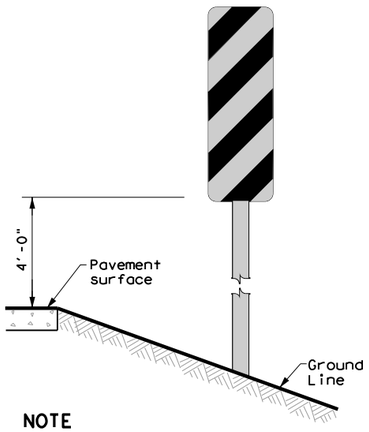
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

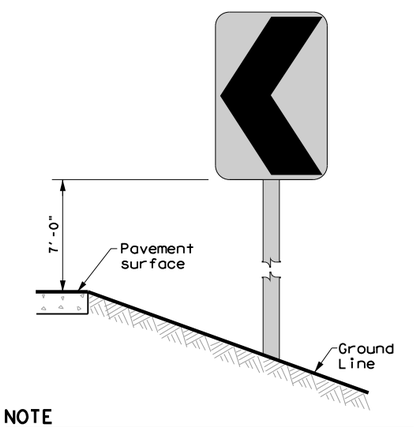
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

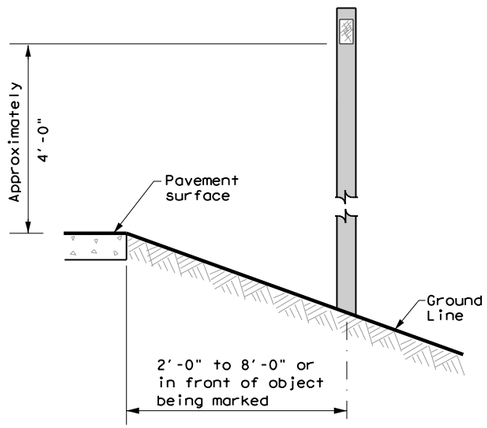
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	MIDLAND, ETC.		153

20B

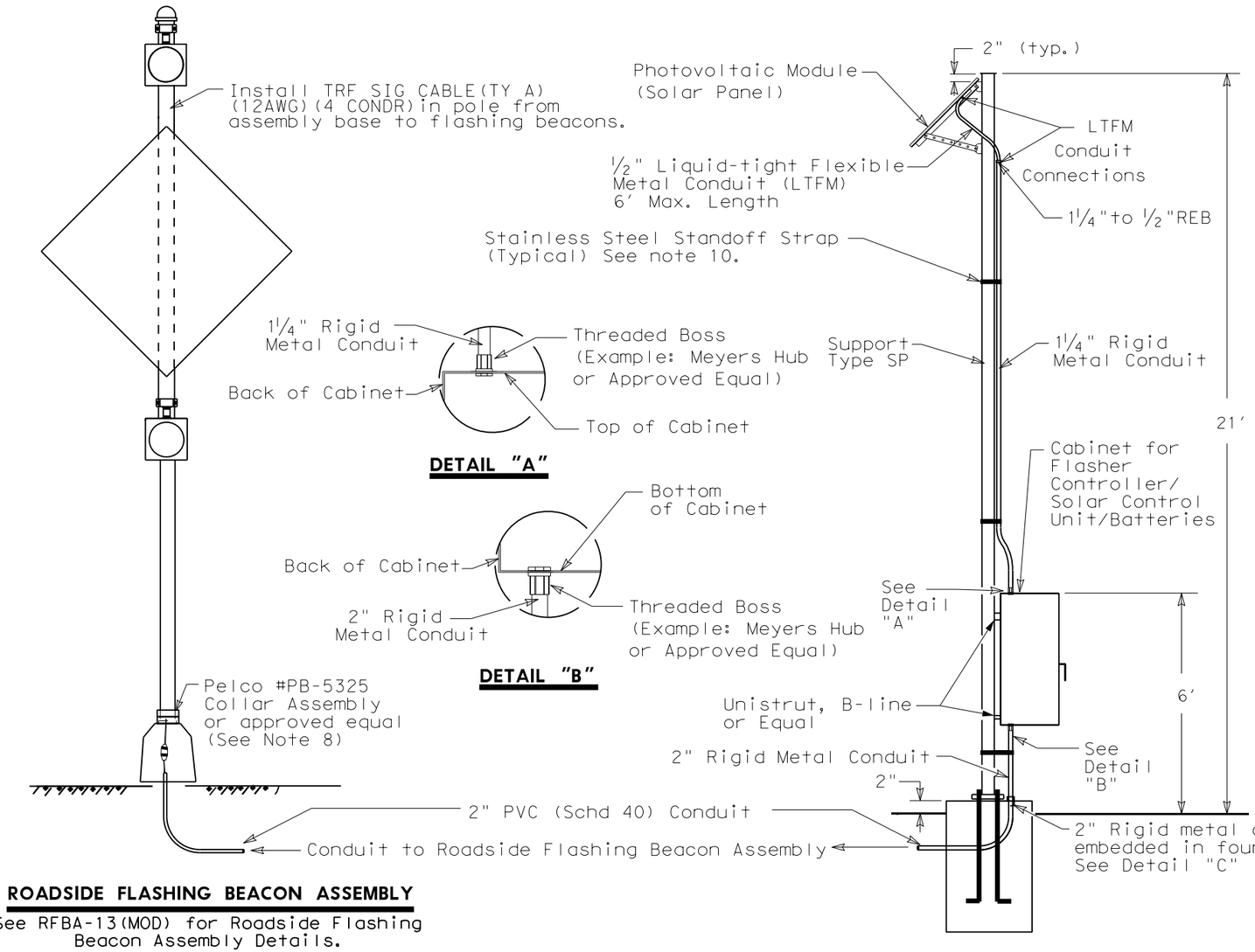
DATE:
FILE:

LEVELS DISPLAYED

	1	2	3	4	5	6	7	8	9	10	11	12	13	41	51	61
ACC:	7	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	49	50	51	52	53	54	55	56	57	58	59	60	61	62		

SOLAR PANEL CABINET POLE.dgn

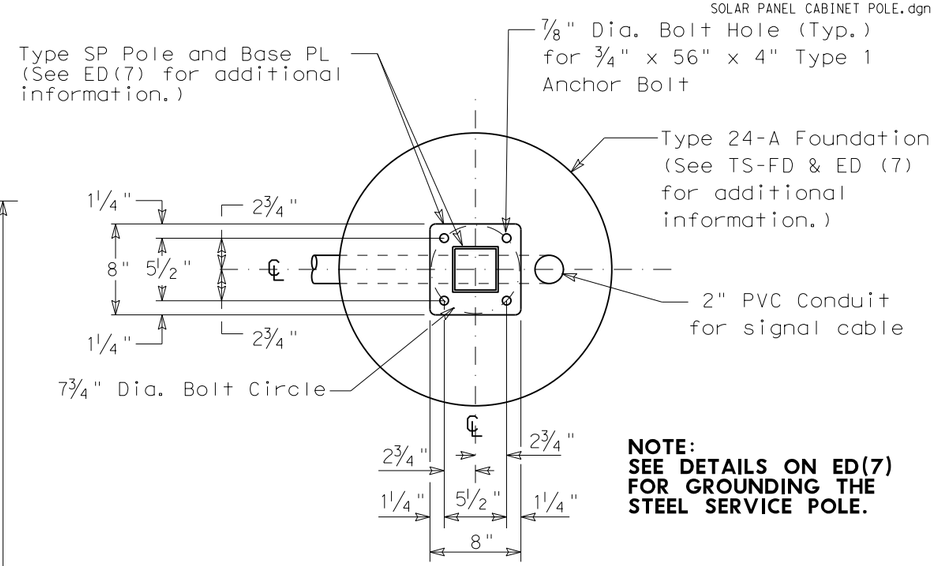
Orient solar panel for optimal exposure to sunlight (Face to the South). Prior to installation, check the location to insure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Mount 21′ above grade (typical), 14′ (minimum).



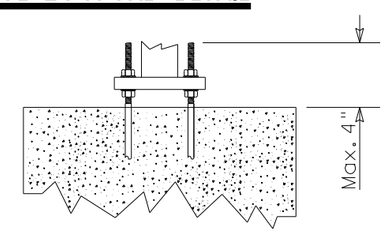
ROADSIDE FLASHING BEACON ASSEMBLY

See RFBA-13(MOD) for Roadside Flashing Beacon Assembly Details.

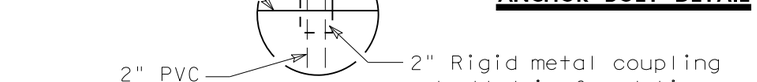
SOLAR PANEL AND CABINET POLE ASSEMBLY



TYPE SP BASE PLATE/TYPE 24-A FND DETAIL



ANCHOR BOLT DETAIL



DETAIL "C"

NOTES:

1. The Solar Powered (Photovoltaic) Roadside Flashing Beacon Assembly is designed for small signs where electrical power is needed with a breakaway sign pole and power service is not available.
2. Providing and installing the Type SP pole assembly and foundation required to support the cabinet and solar panel will be considered subsidiary to Item 685, "Roadside Flashing Beacon Assemblies".
3. Conduit in foundation and within 6 in. of foundation is subsidiary to Item 685, "Roadside Flashing Beacon Assemblies".
4. See RFBA-13(MOD) for additional information.
5. The foundation for the assembly shall be Foundation Type 24-A, see standard sheet TS-FD for additional information.
6. All hardware and materials provided for mounting cabinets, solar panels, etc., shall be suitable for the purpose of attaching equipment to steel poles.
7. Install batteries in the flasher cabinet. Place the batteries on a 3/16" thick rubber mat. Provide the number of batteries as required on the plans. Wire batteries according to manufacturer's recommendations.
8. Threaded Connector, all T-Base threads must be engaged onto pipe or the pipe shall be fully seated into base as per manufacturer's recommendations. A pole and base collar assembly shall be used to add strength and prevent loosening on connection in high winds.
9. Mount the stainless steel standoff straps 3′ from each terminating end and use 5′ spacing between straps, unless otherwise called for by the utility.
10. Use TRF SIG CABLE (TY A)(12 AWG)(4 CONDR) in roadside flashing beacon poles.

Distance from Cabinet to Assembly Base (ft.)	Minimum Required Wire Size (AWG)
0 - 35	#14
35 - 60	#12
60 - 100	#10
> 100	#8

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Saul Romero, PE 10/10/2022
88BF61DF326A480...

SOLAR PANEL/CABINET POLE ASSEMBLY DETAILS

Texas Department of Transportation®

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			154
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

DATE: 10/05/2022 05:11 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\06 - ODA\Design Projects\290690106\4 Design\RFBA-13 (MOD).dgn

GENERAL NOTES:

1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.

2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.

3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.

4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.

5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".

6. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.

7. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."

8. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.

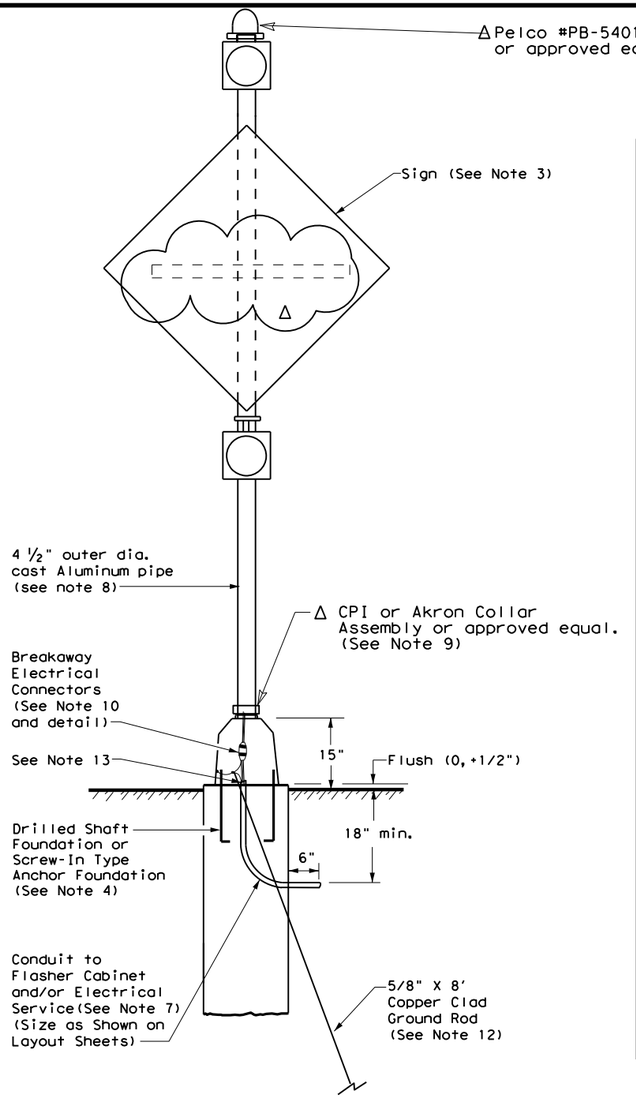
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.

10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

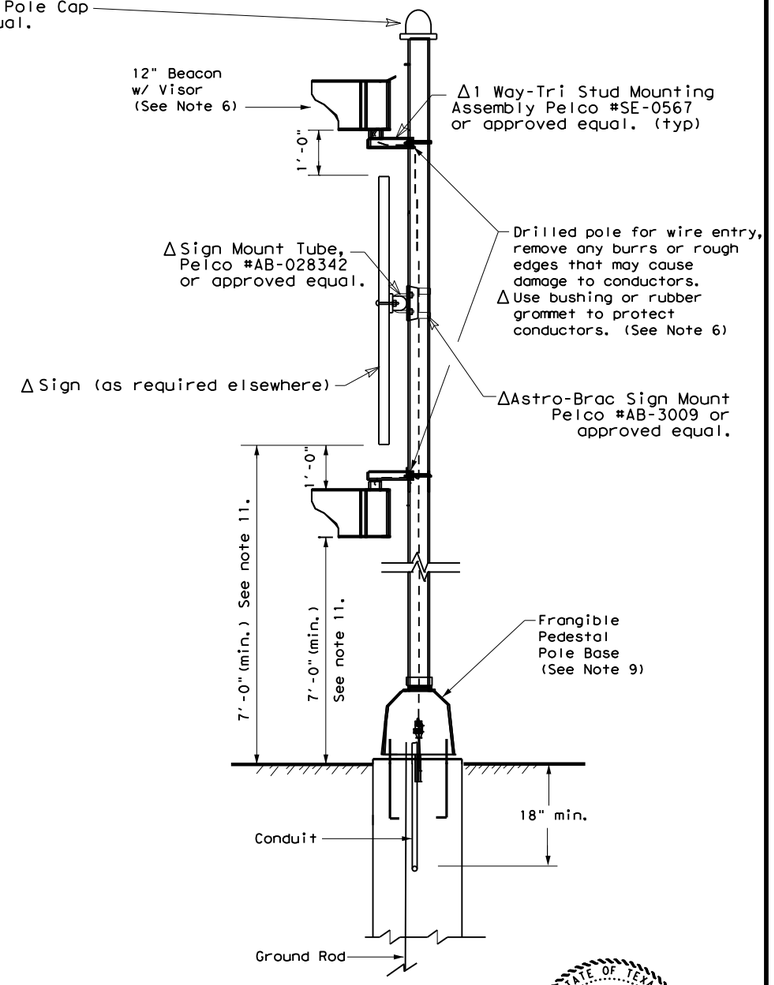
11. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.

12. Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.

13. Ensure height of conduit and ground rod is below top of anchor bolts.

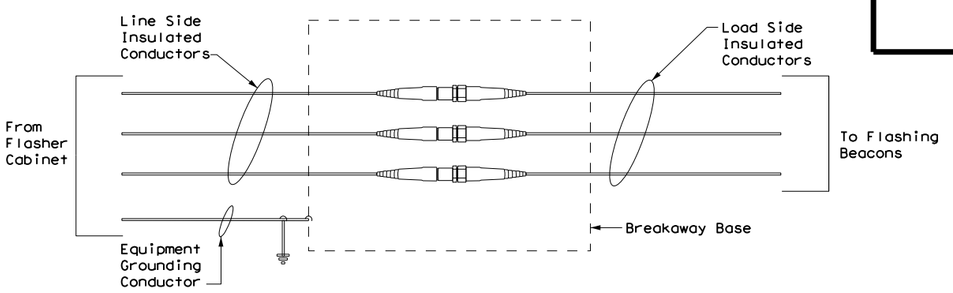


FRONT

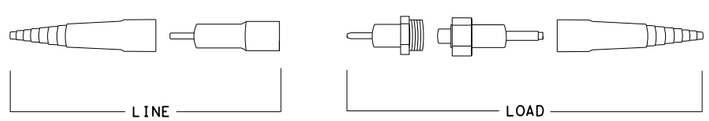


SIDE

Δ Modifications from original standard



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS EXPLODED VIEW

SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

DocuSigned by:
10/10/2022
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Texas Department of Transportation

Traffic Operations Division Standard

ROADSIDE FLASHING BEACON ASSEMBLY

RFBA-13 (MOD)

FILE: rfba-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS 5-93 12-04 10-93 3-13 4-98	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		155

DATE:
FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
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REVISIONS		2906	01	006, ETC.	RM 1492
		DIST	COUNTY		SHEET NO.
		ODA	MIDLAND, ETC.		156

DATE:
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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.

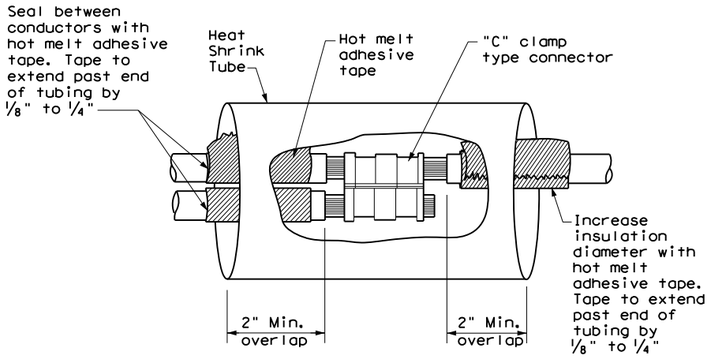
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

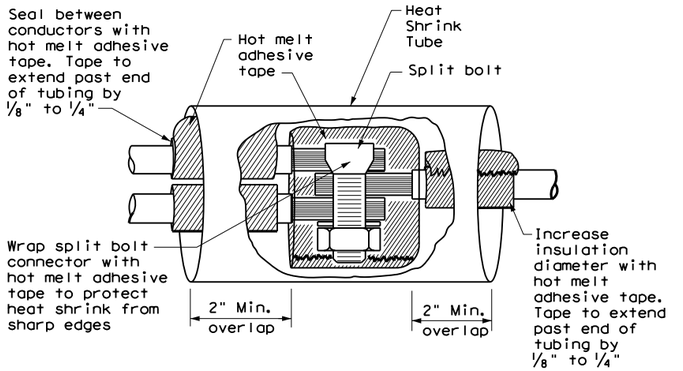
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

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.

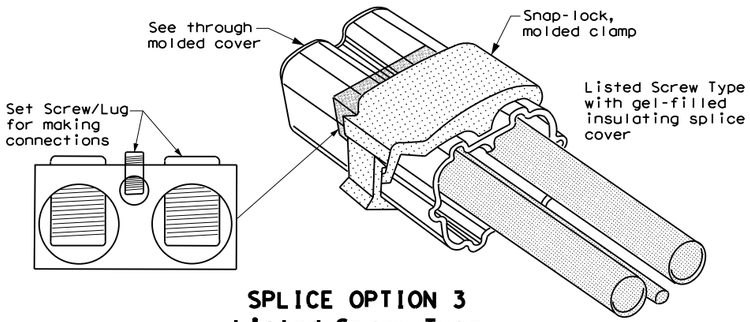
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

FILE: ed3-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
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	ODA	MIDLAND, ETC.		157

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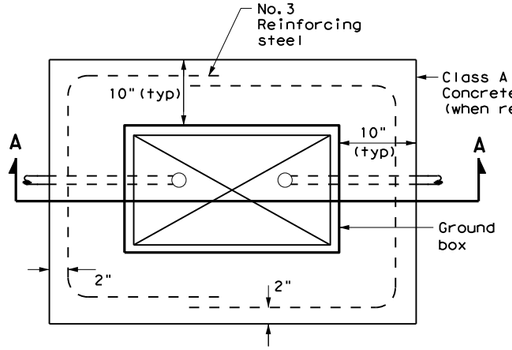
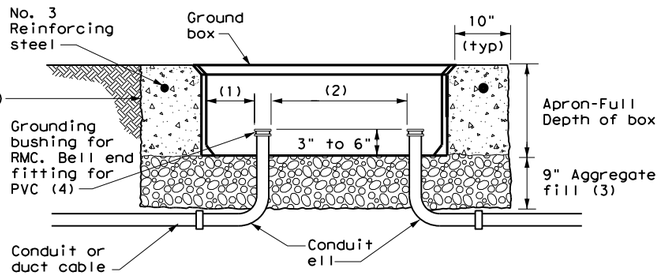


PLAN VIEW



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.

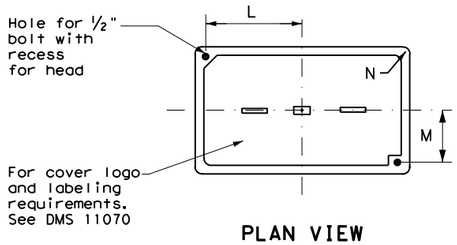
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

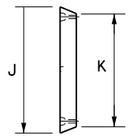
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

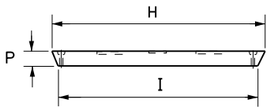
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



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

FILE: ed4-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		158

DATE:
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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

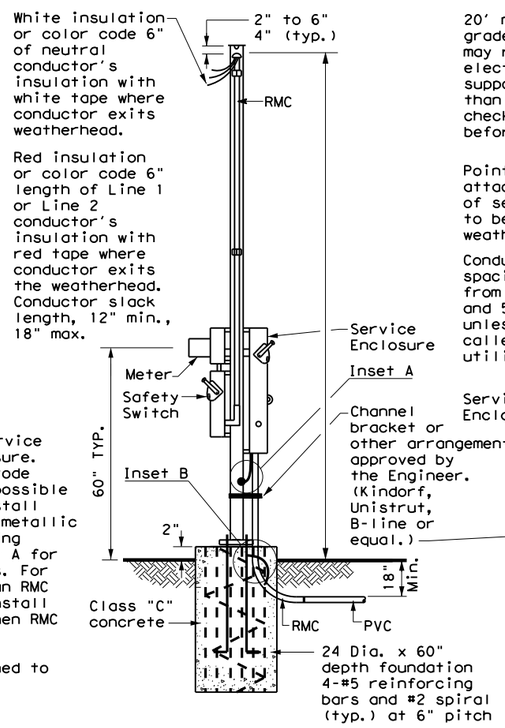
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

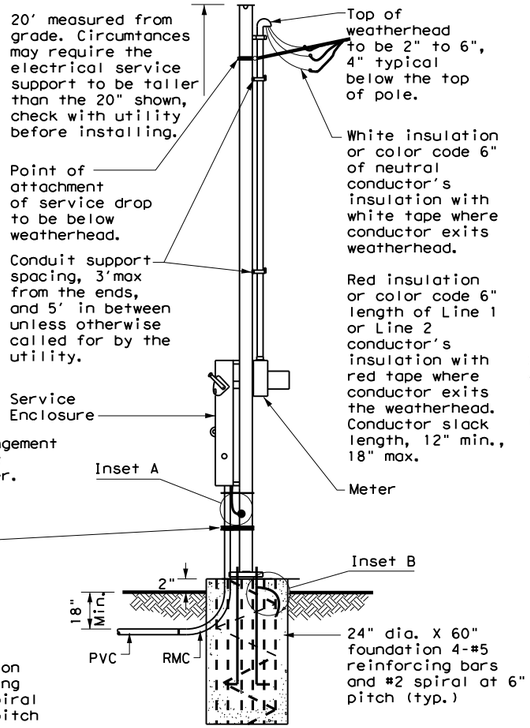
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

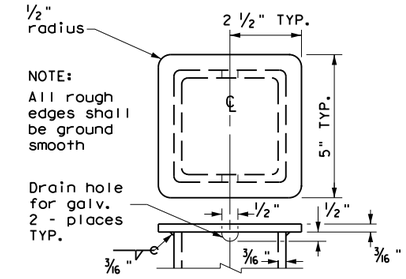


WITH SAFETY SWITCH

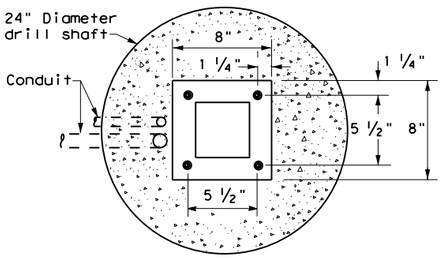


WITHOUT SAFETY SWITCH

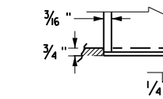
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

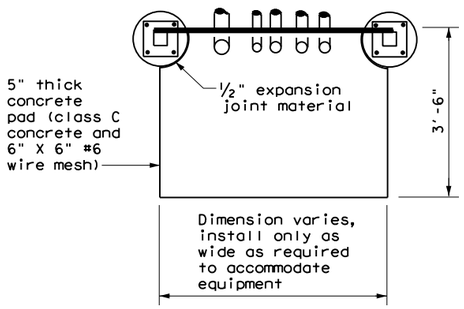


BASE PLATE DETAIL



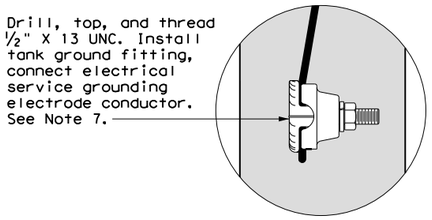
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



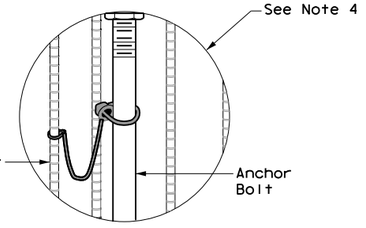
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

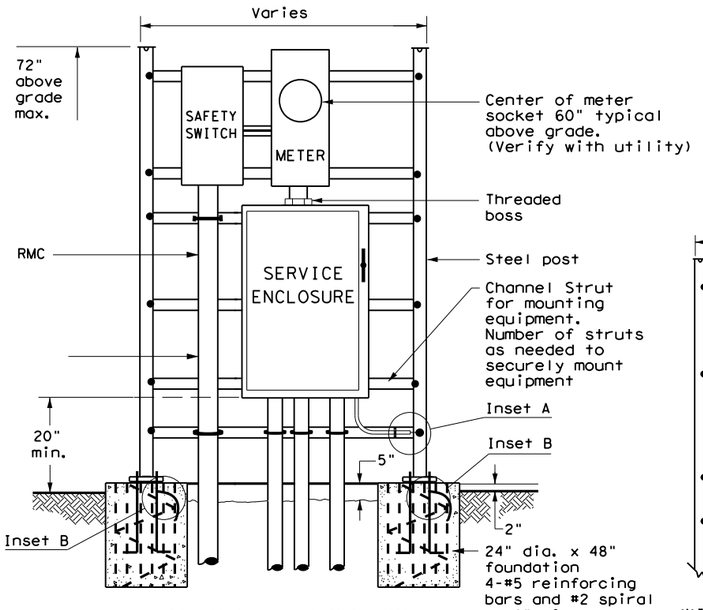


FRONT VIEW

INSET A

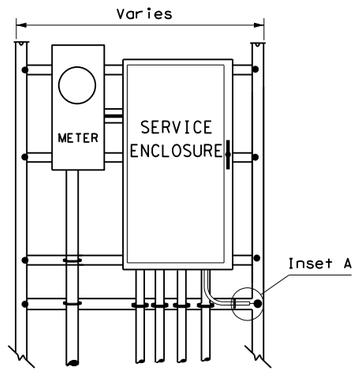


INSET B



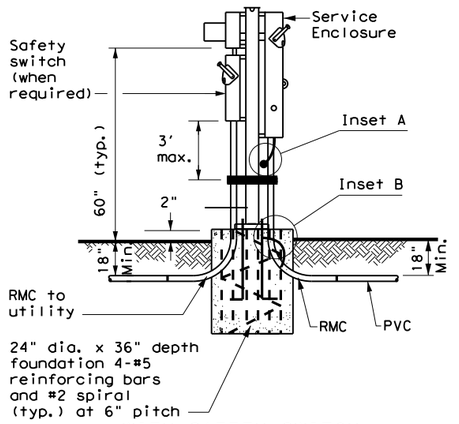
WITH SAFETY SWITCH

FRONT VIEW

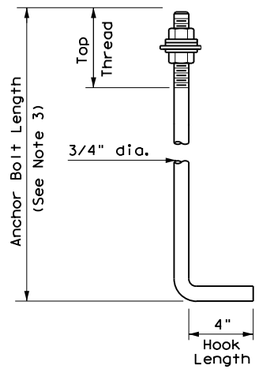


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

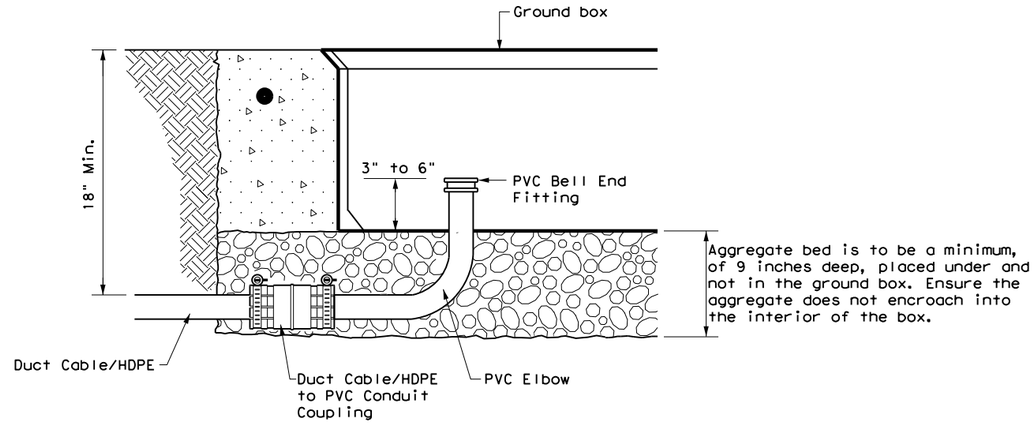
ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	2906	01	006, ETC.	RM 1492
	DIST	COUNTY		SHEET NO.
	ODA	MIDLAND, ETC.		159

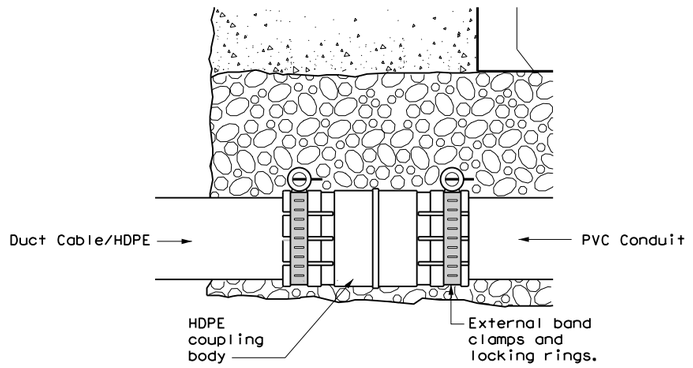
DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.
3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.
4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.
7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

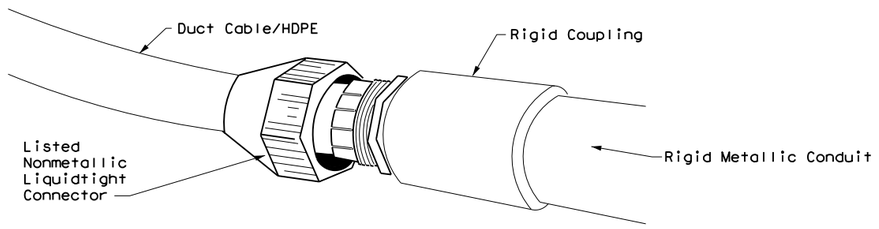


DUCT CABLE/HDPE AT GROUND BOX

When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.

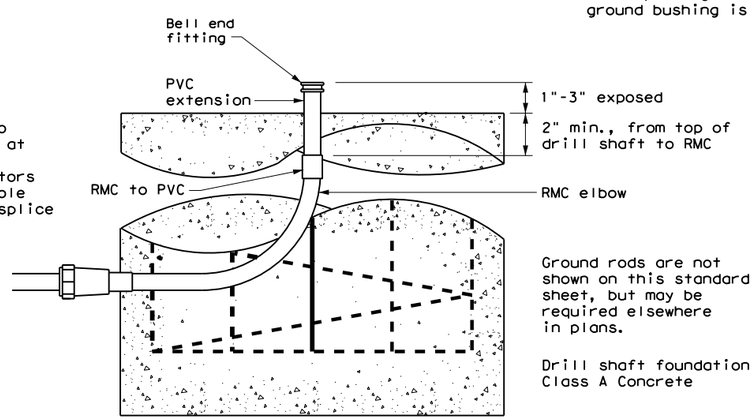


DUCT CABLE/HDPE TO PVC

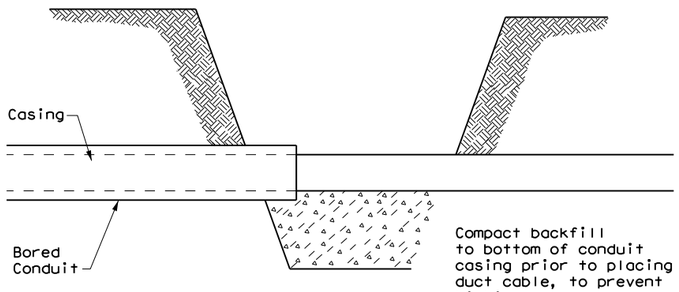


DUCT CABLE/HDPE TO RMC

Couple duct to conduit elbow at foundations. Ensure conductors extend into pole base. Do not splice conductors in conduit.



DUCT CABLE / HDPE AT FOUNDATION



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

FILE: ed11-14.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
©TxDOT October 2014		CONT	SECT	JOB	HIGHWAY		
REVISIONS		2906	01	006, ETC.	RM 1492		
		DIST	COUNTY		SHEET NO.		
		ODA	MIDLAND, ETC.		160		

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DATE:
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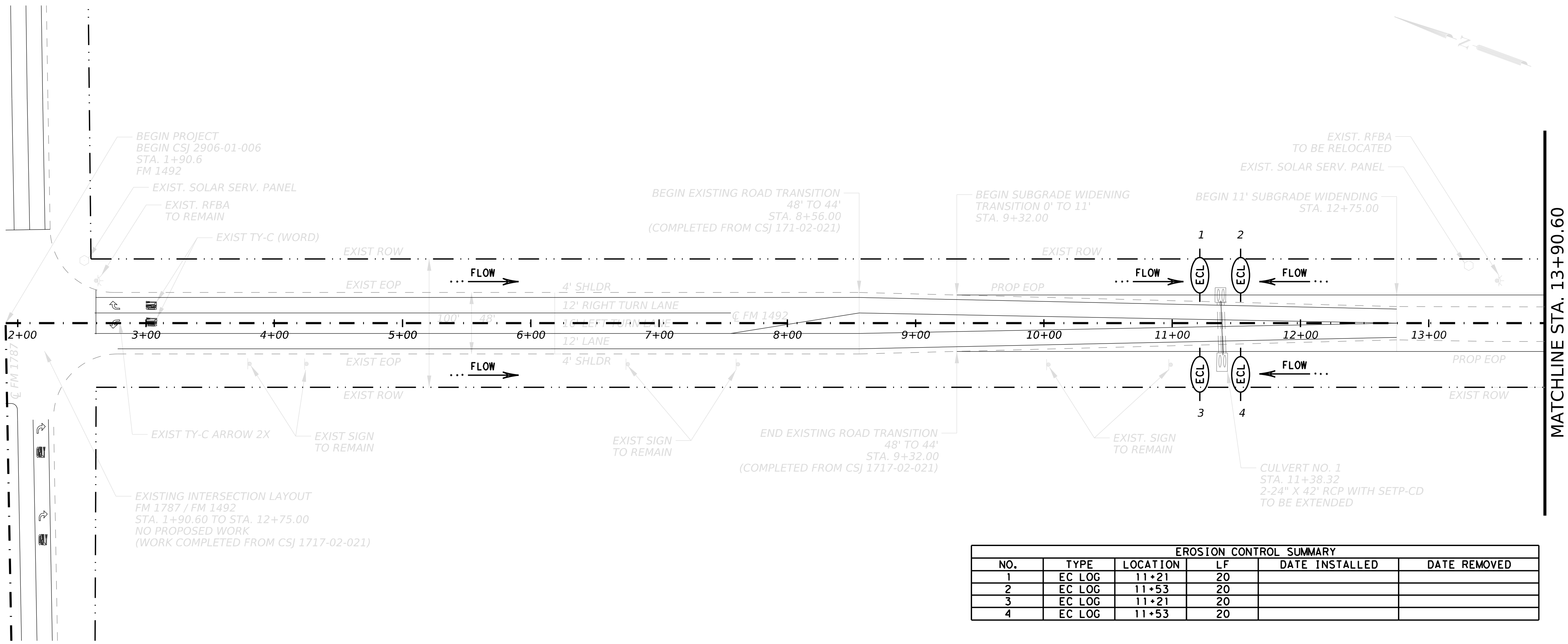

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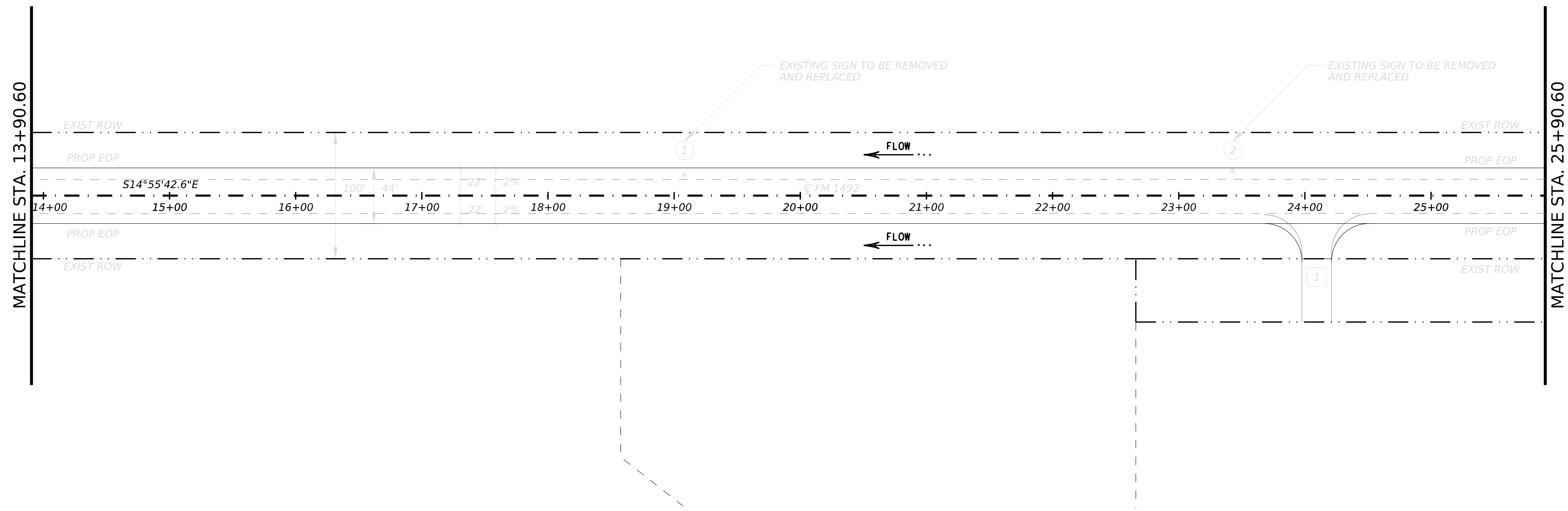

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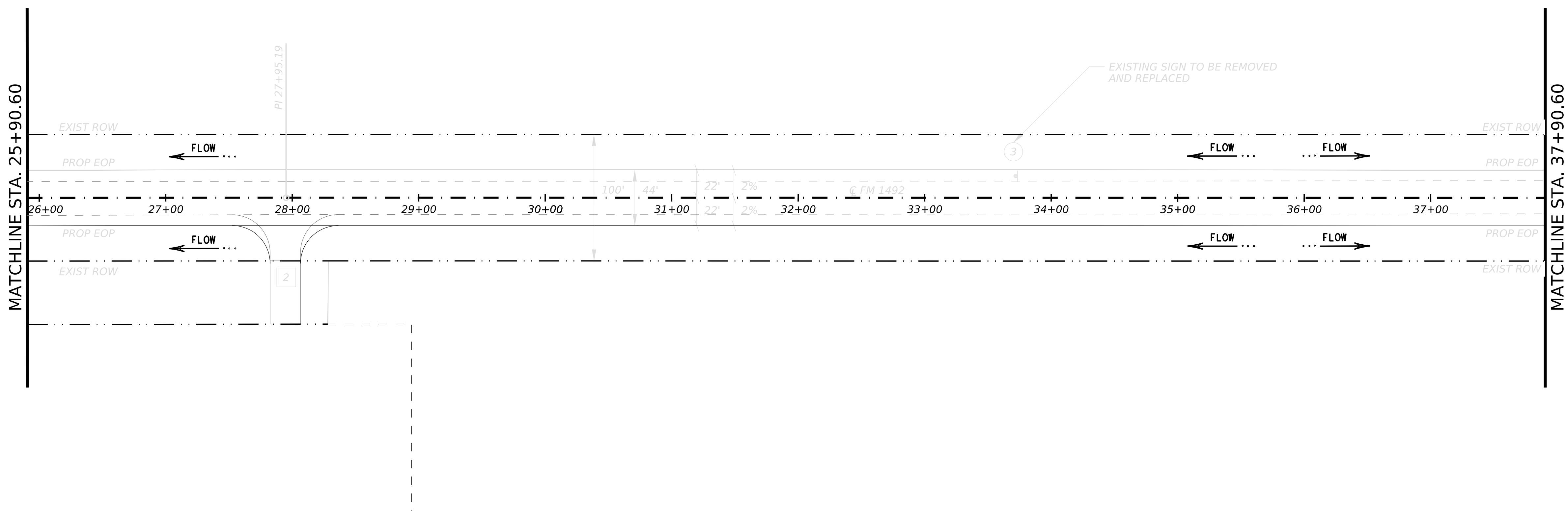
SW3P SITE PLAN

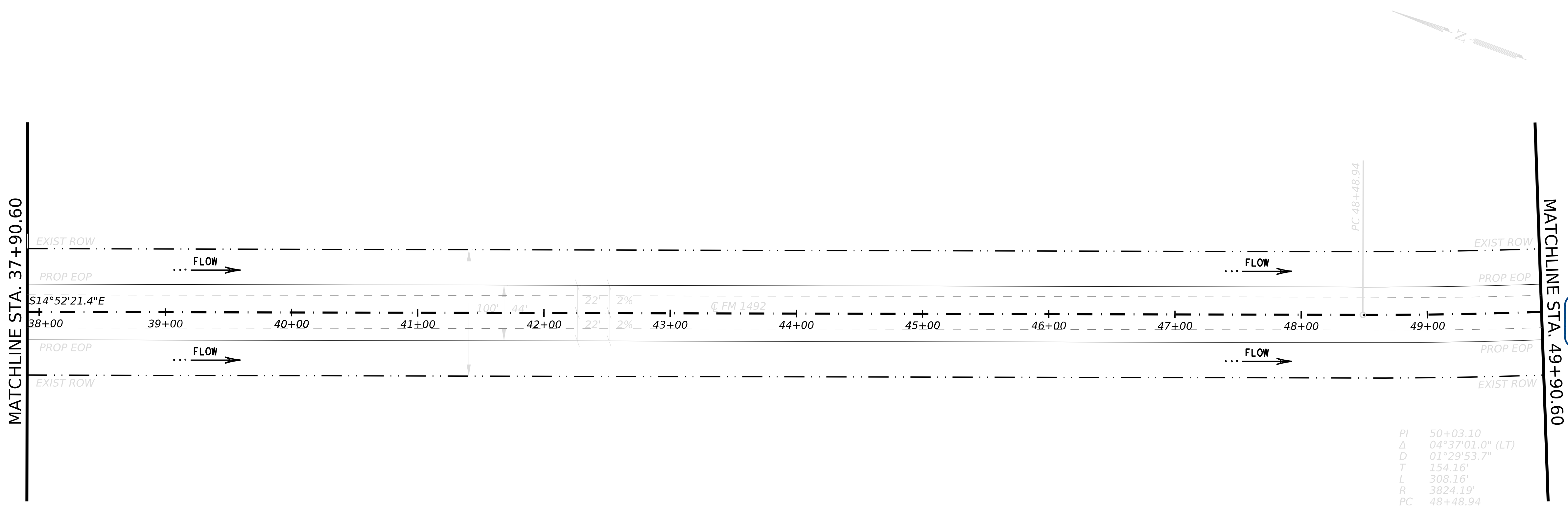
SHEET 1 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	161

DATE: $DATE$ 10/4/2022
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\1- ODA\Design Projects\2906010061- Design\Plan Review\a.100 Percent\DES Comment Revisions\DES Comment Revision (10-5)\FM1492 MID ENV 1.dgn





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SW3P SITE PLAN

SHEET 2 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		162

DATE: $DATE$
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\- ODA\Design Projects\290601006\- Design\Plan Review\a.100 Percent\DES Comment Revisions\DES Comment Revision (10-5)\FM1492 MID ENV 2.dgn

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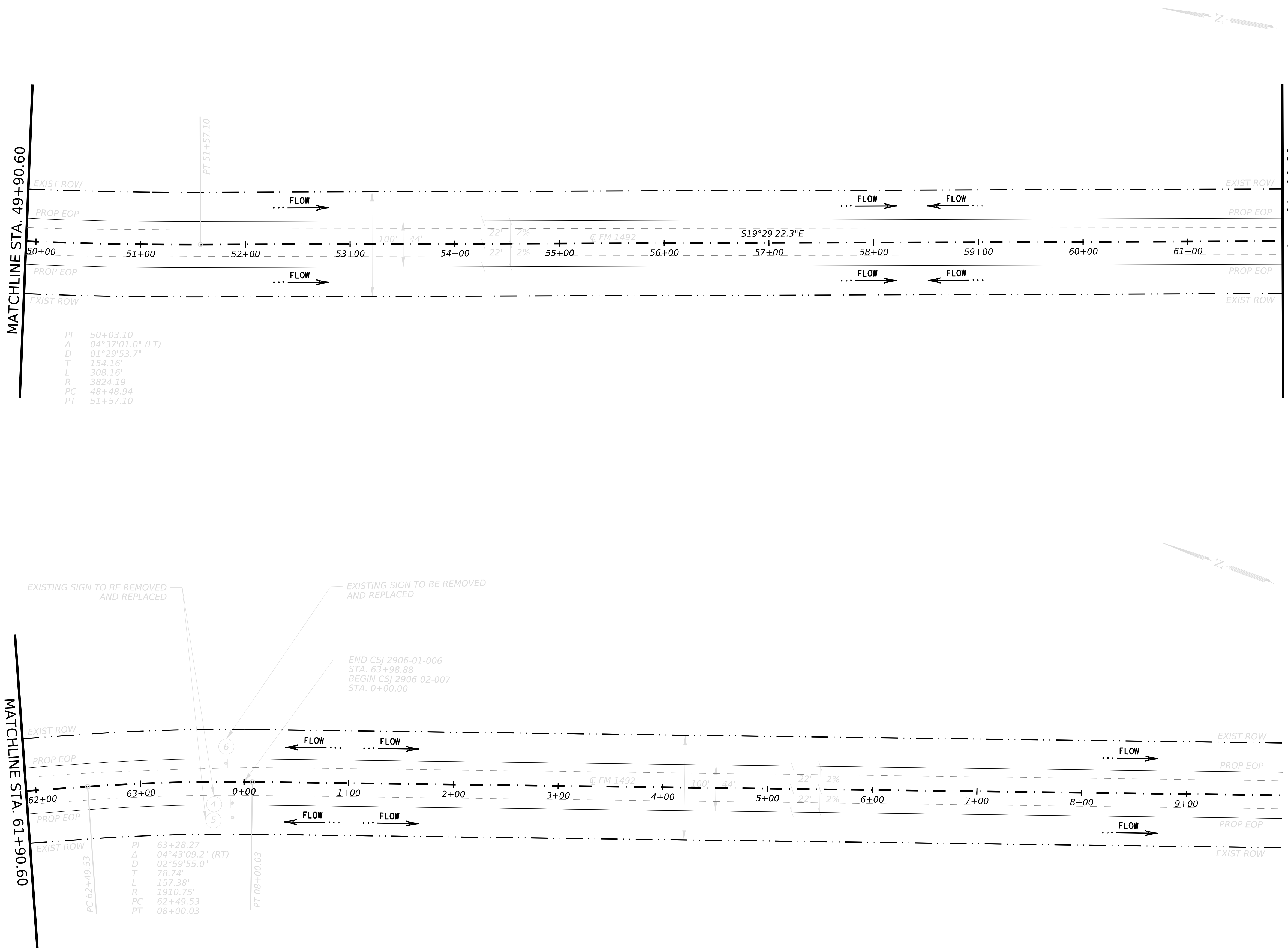

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SW3P SITE PLAN

SHEET 3 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		163

DATE: $DATE$ 10/4/2022
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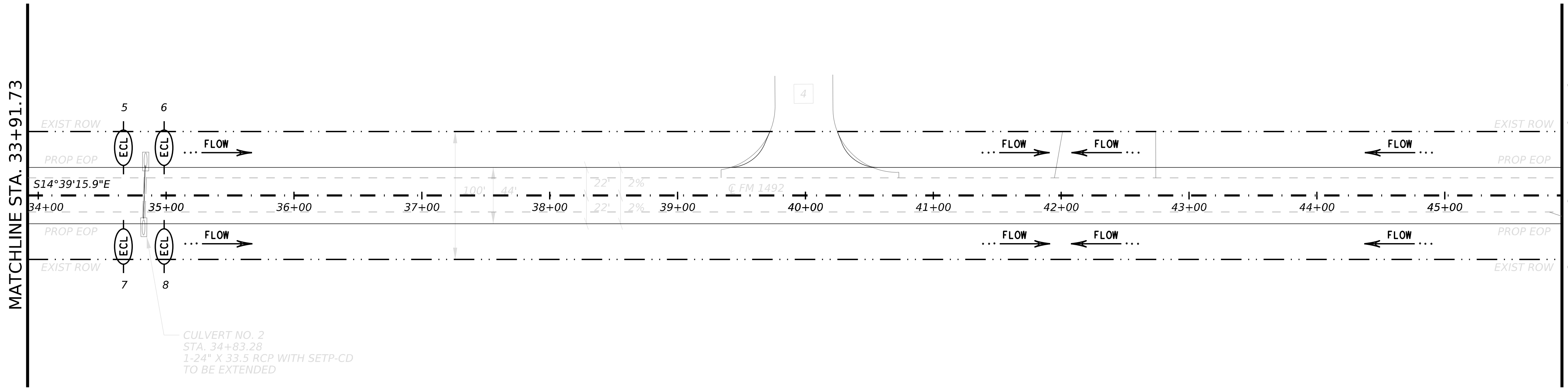
SW3P SITE PLAN

SHEET 4 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	164



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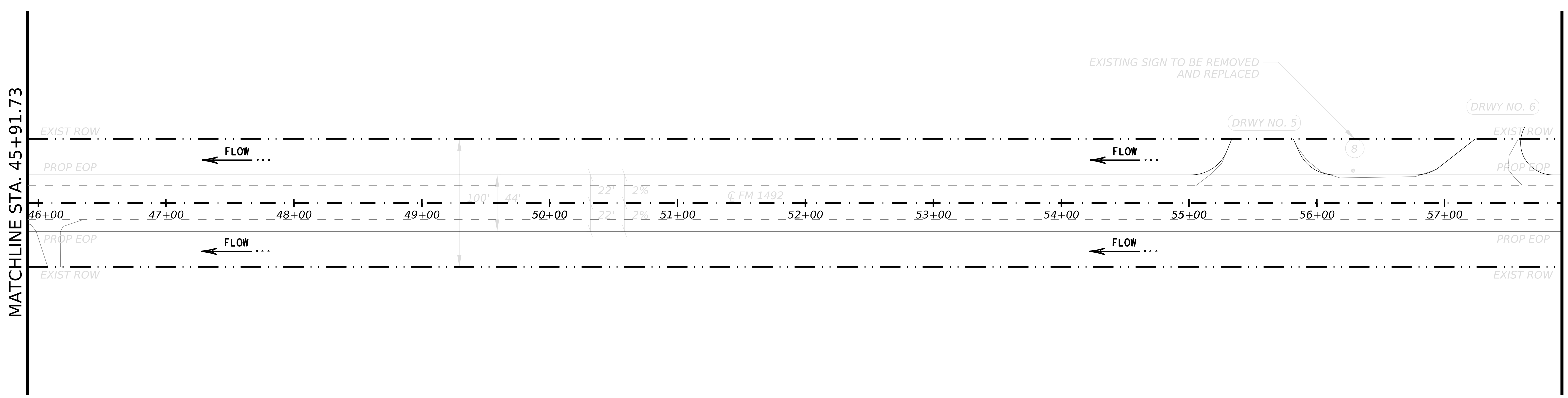

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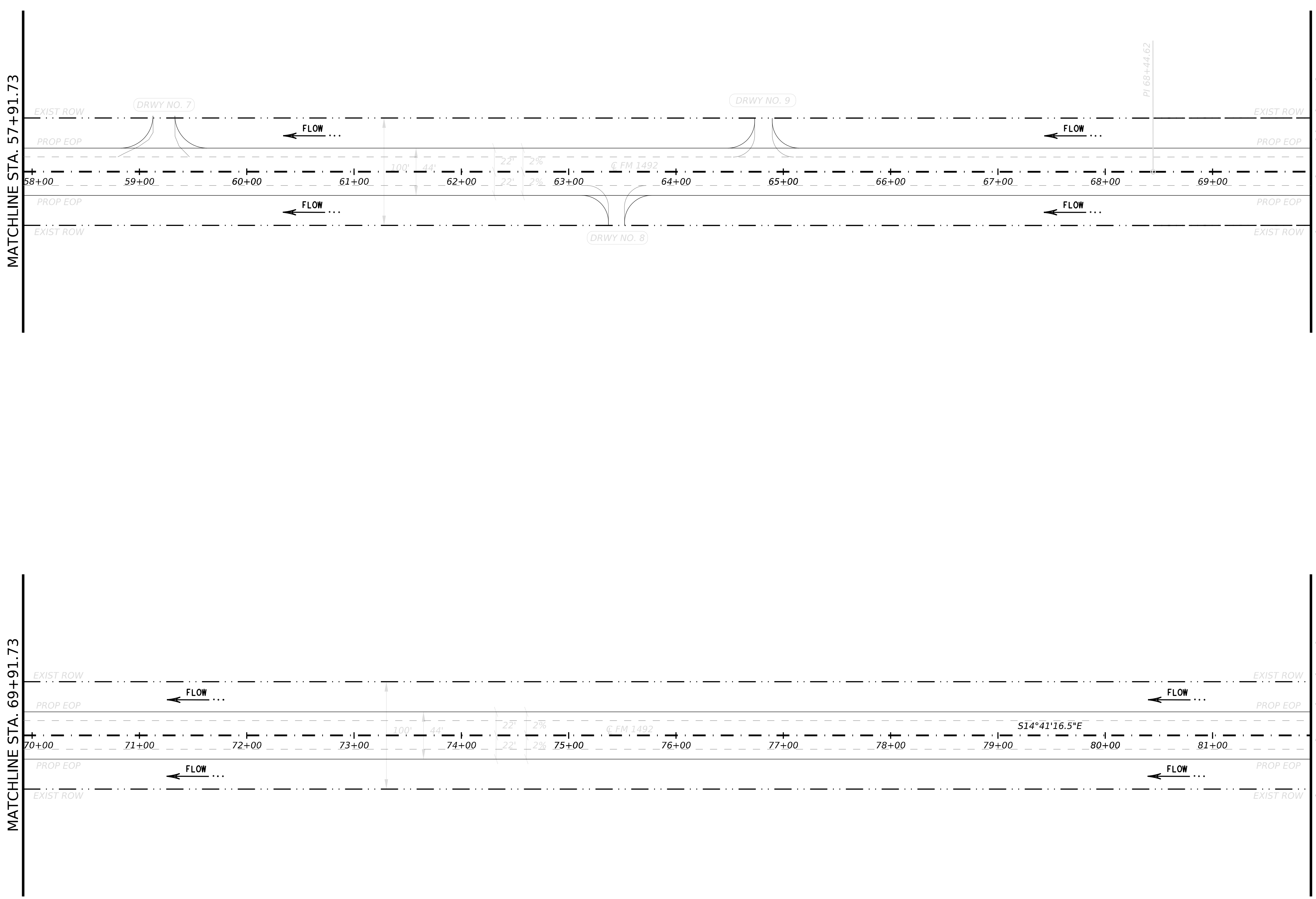
SW3P SITE PLAN

SHEET 5 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		165



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SW3P SITE PLAN

SHEET 6 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		166

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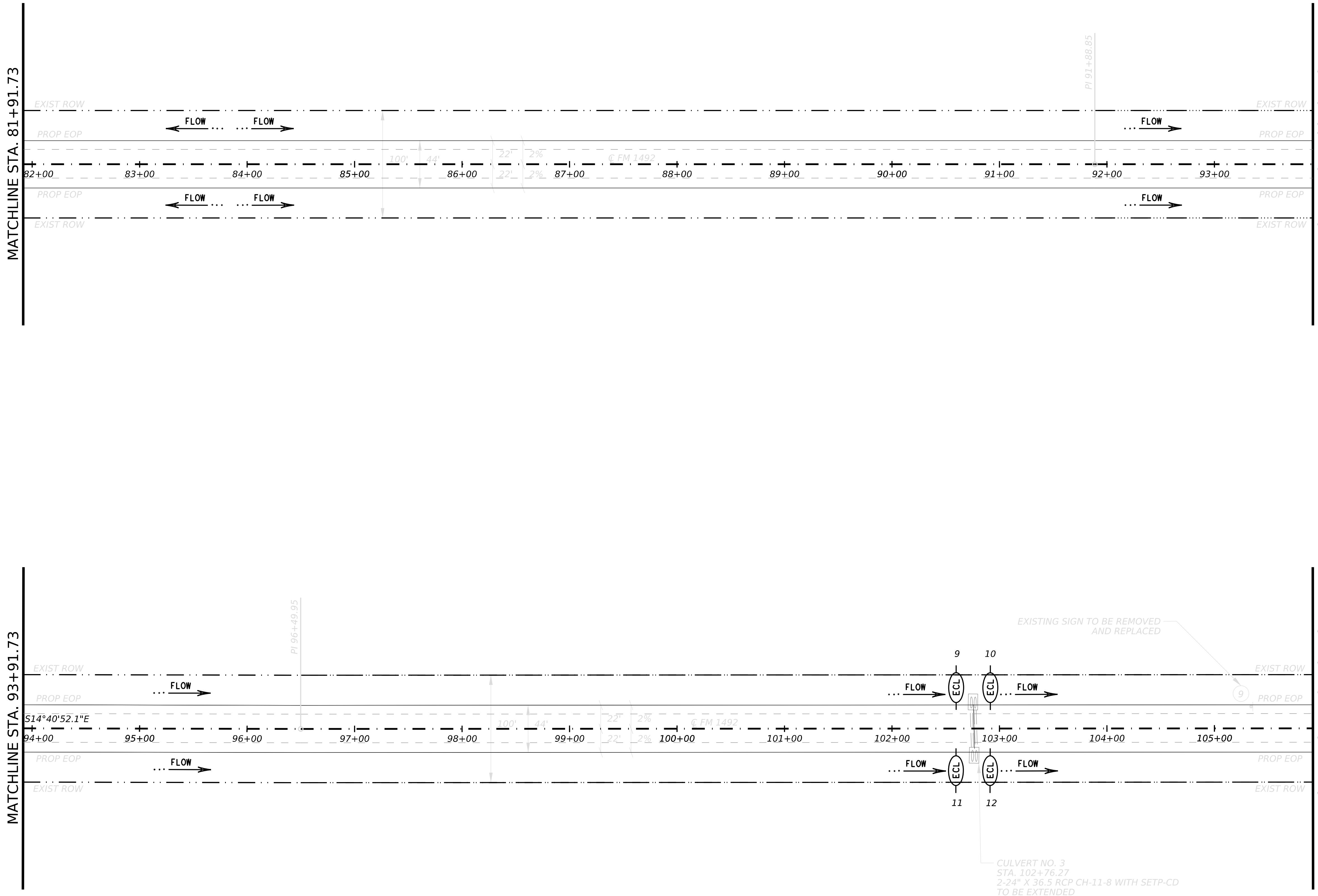

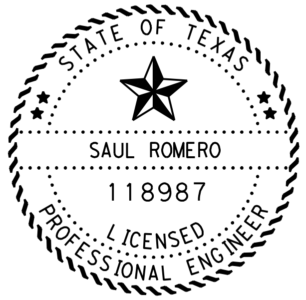

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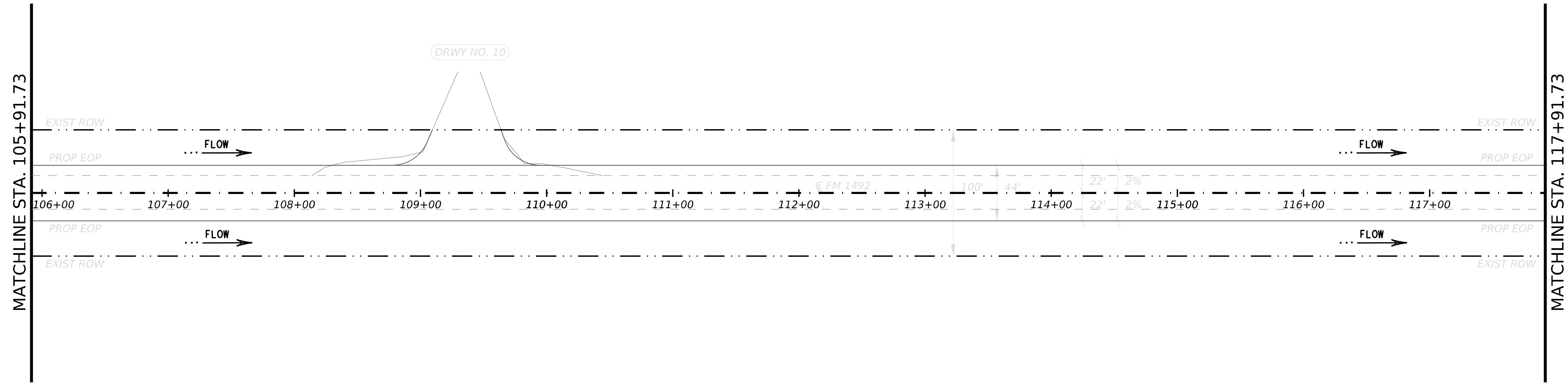
Texas Department of Transportation

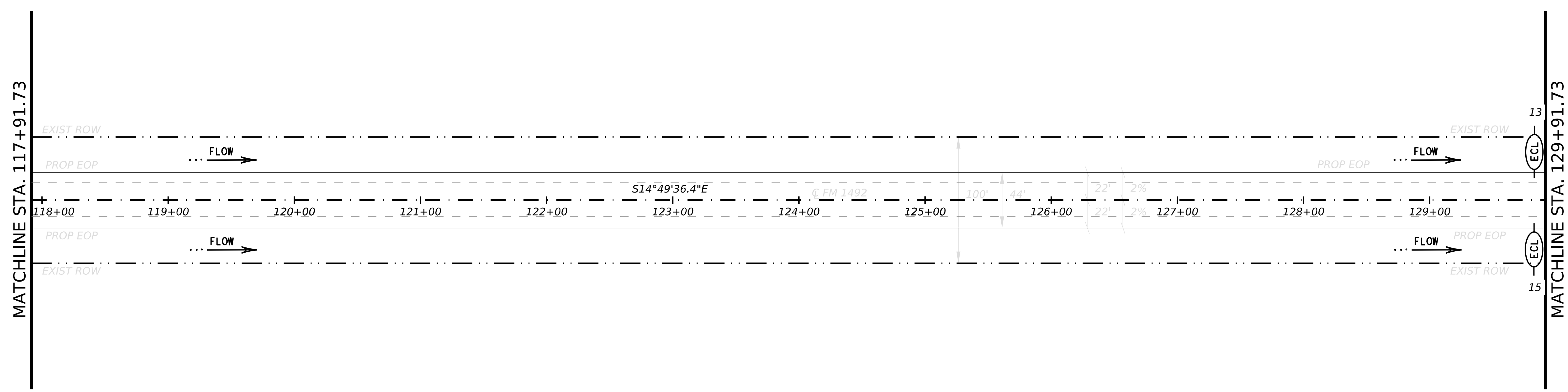
SW3P SITE PLAN

SHEET 7 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	167





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SW3P SITE PLAN

SHEET 8 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	168

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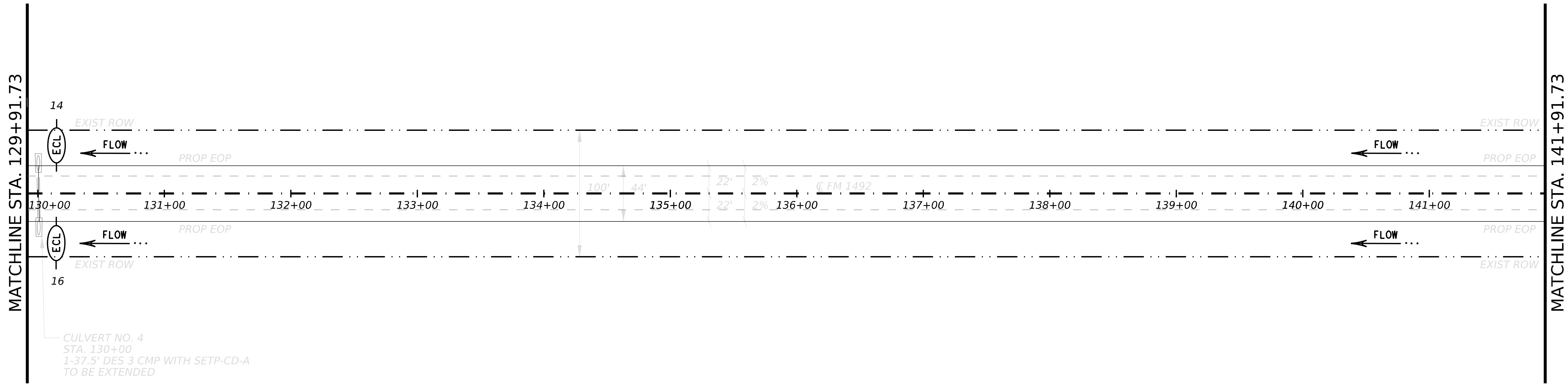

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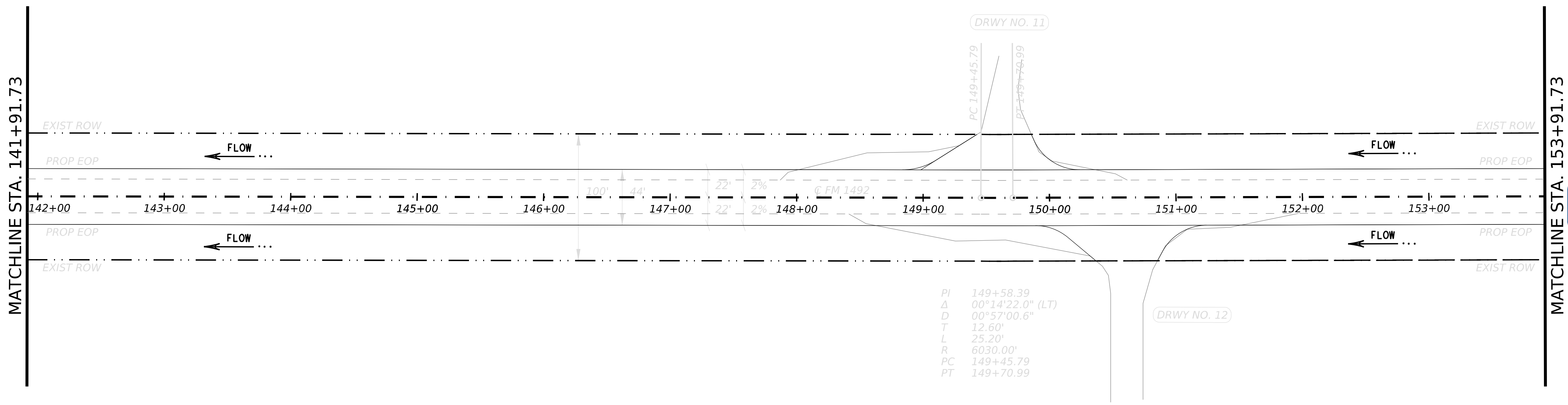

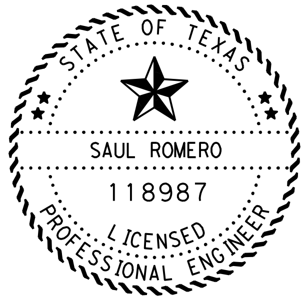

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SW3P SITE PLAN

SHEET 9 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		169

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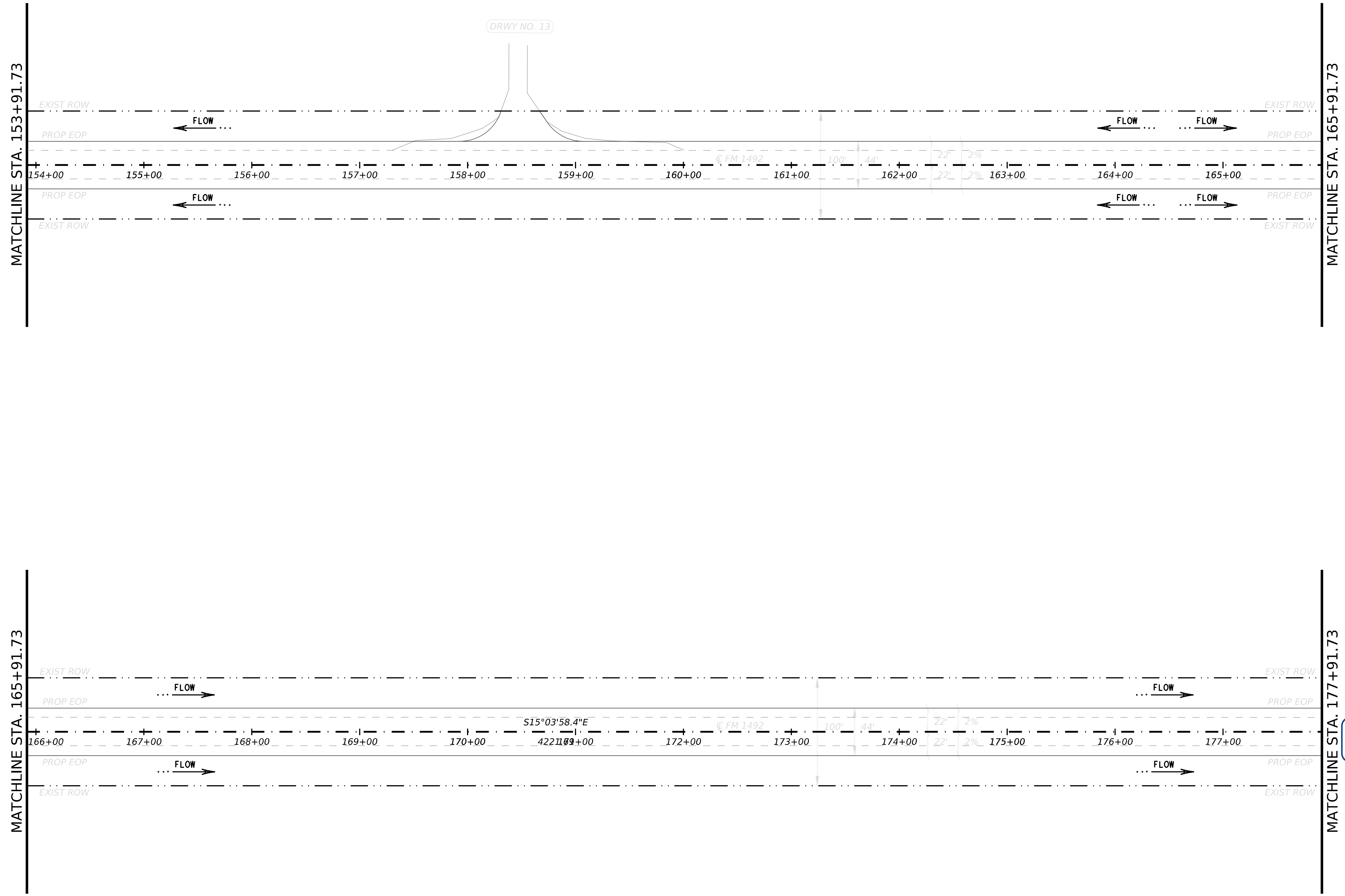

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SW3P SITE PLAN

SHEET 10 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	170

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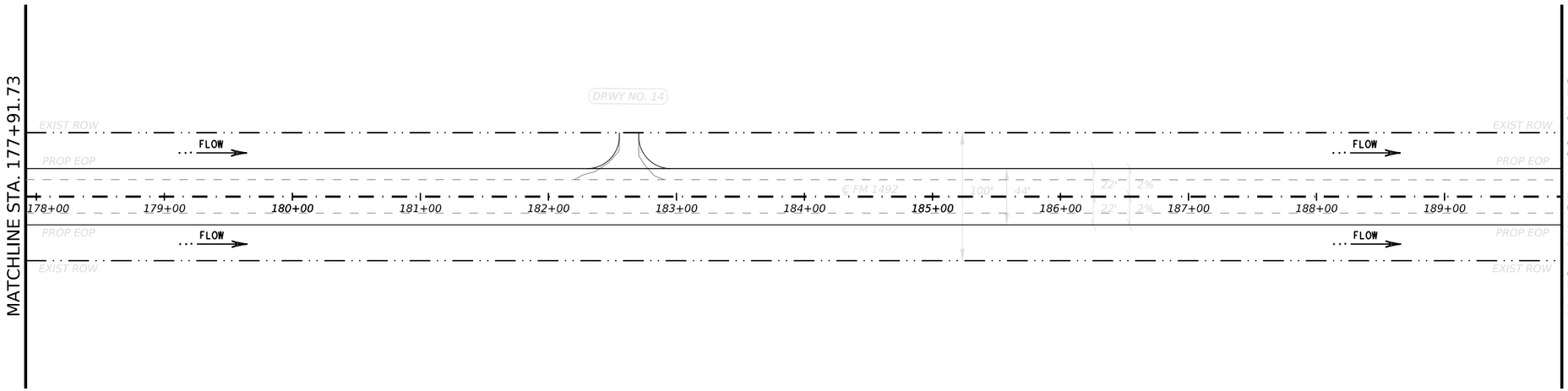

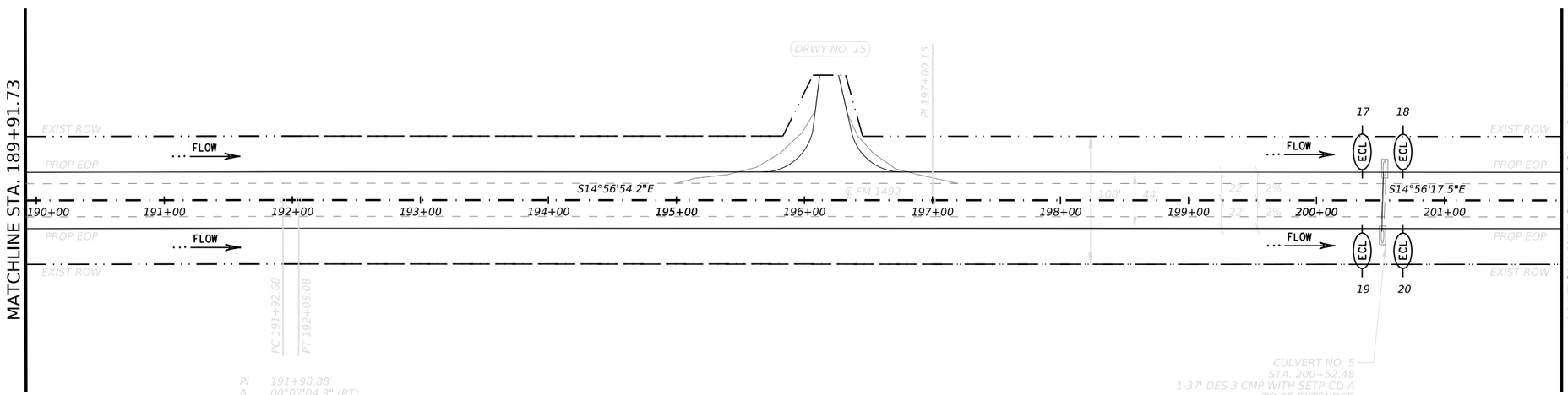

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PT 192+05.08

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SW3P SITE PLAN

SHEET 11 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		171

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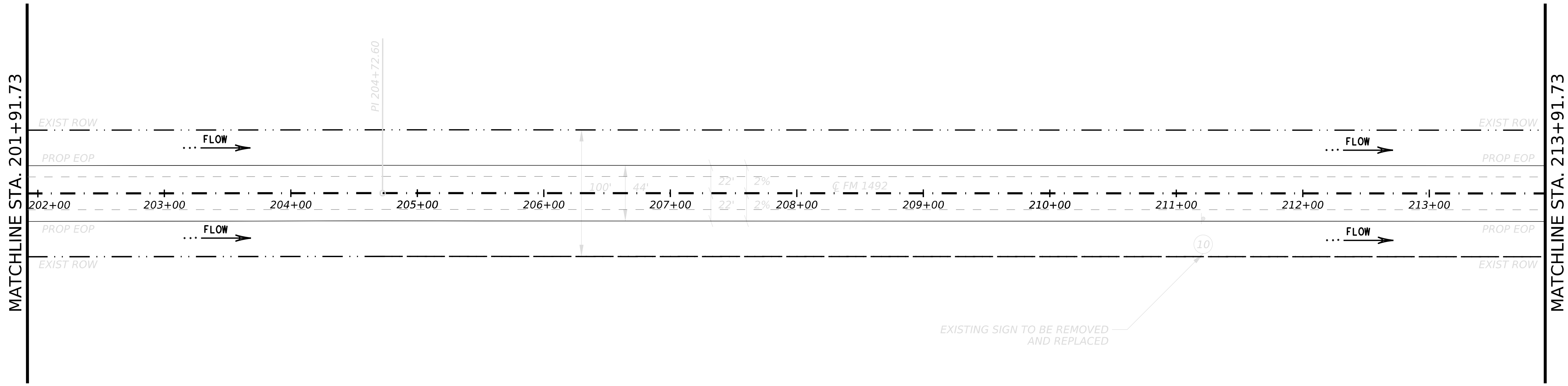

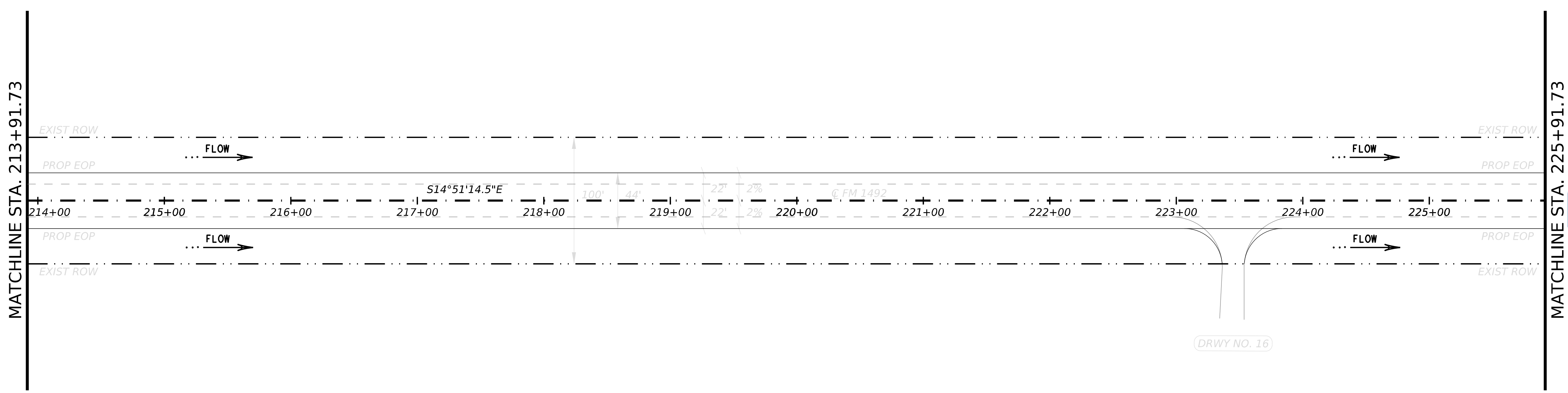

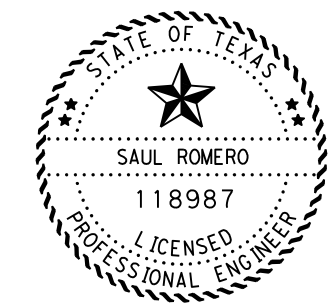

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SW3P SITE PLAN

SHEET12 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		172

DATE: $DATE$ 10/4/2022
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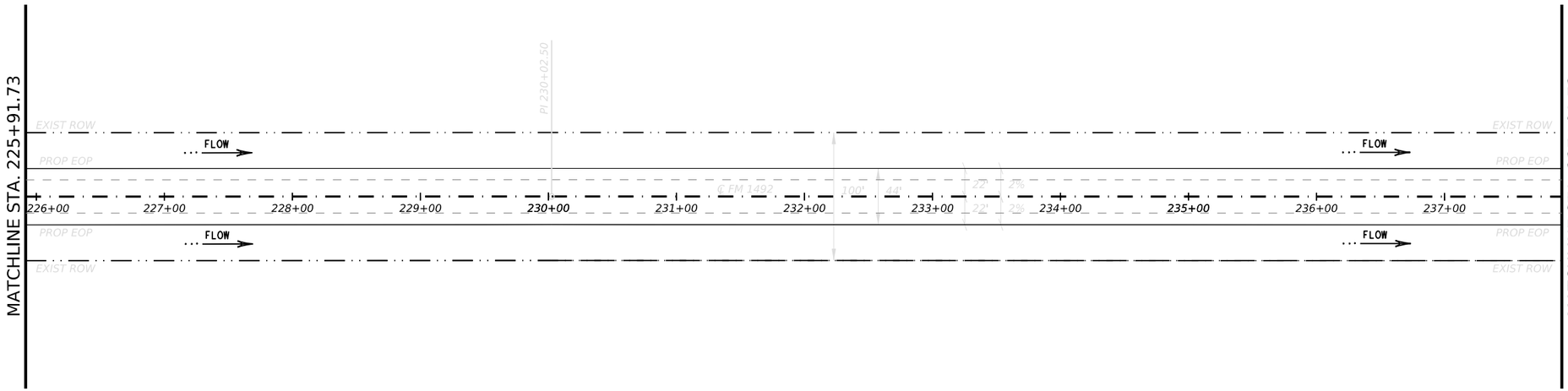

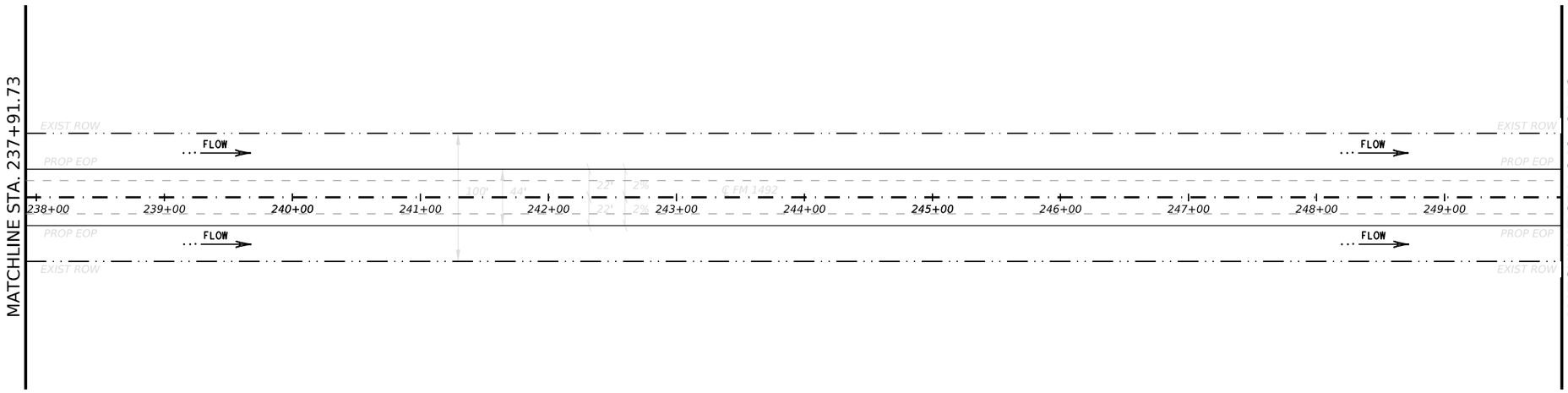

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SW3P SITE PLAN

SHEET13 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		173

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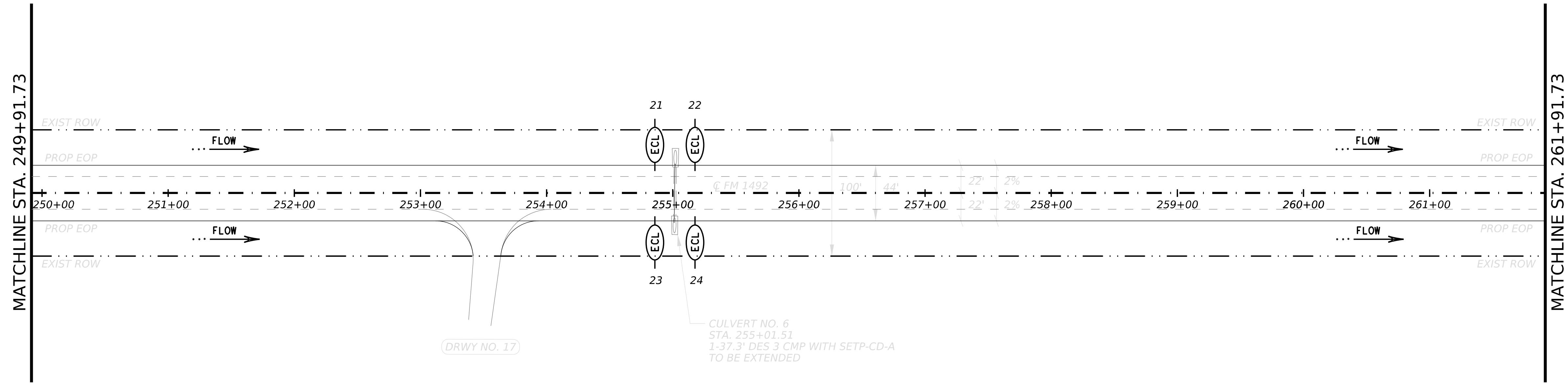

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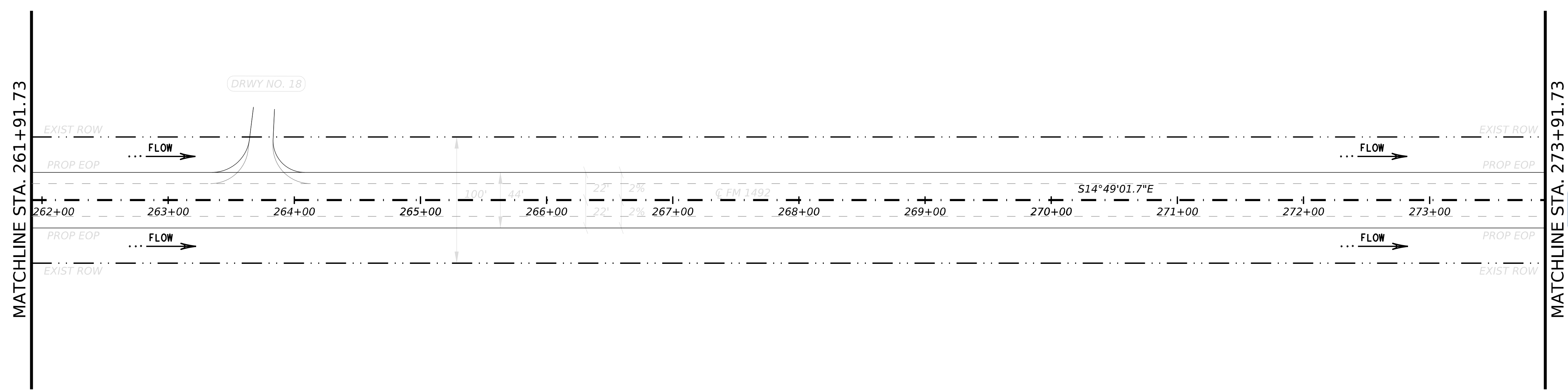

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SW3P SITE PLAN

SHEET 14 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		174

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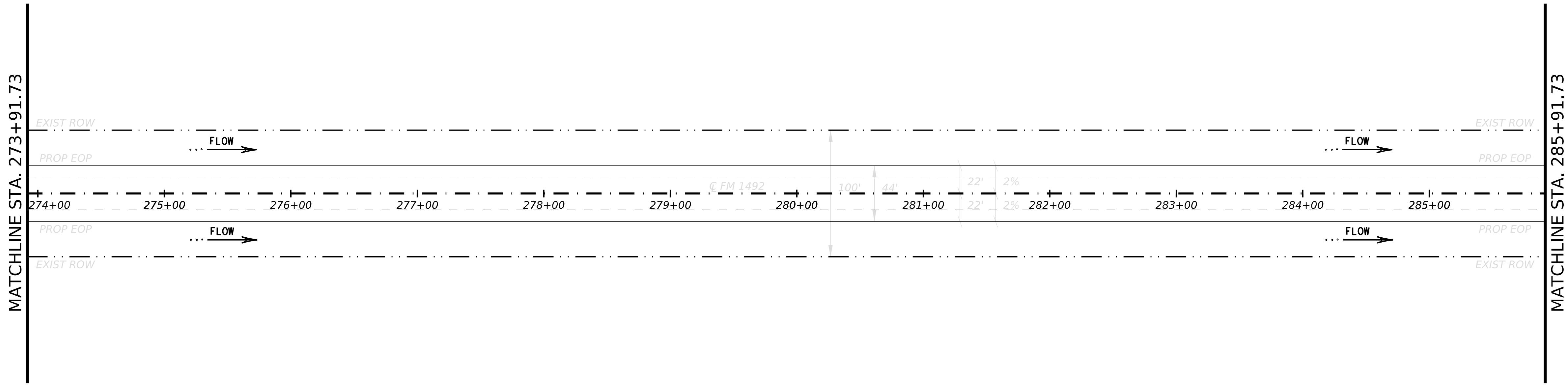

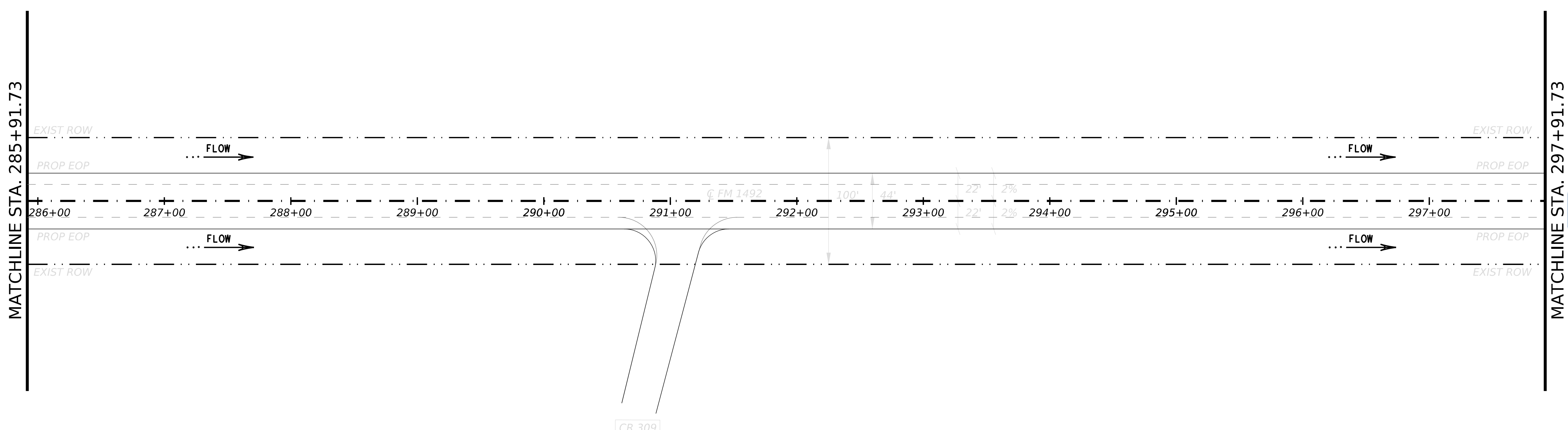

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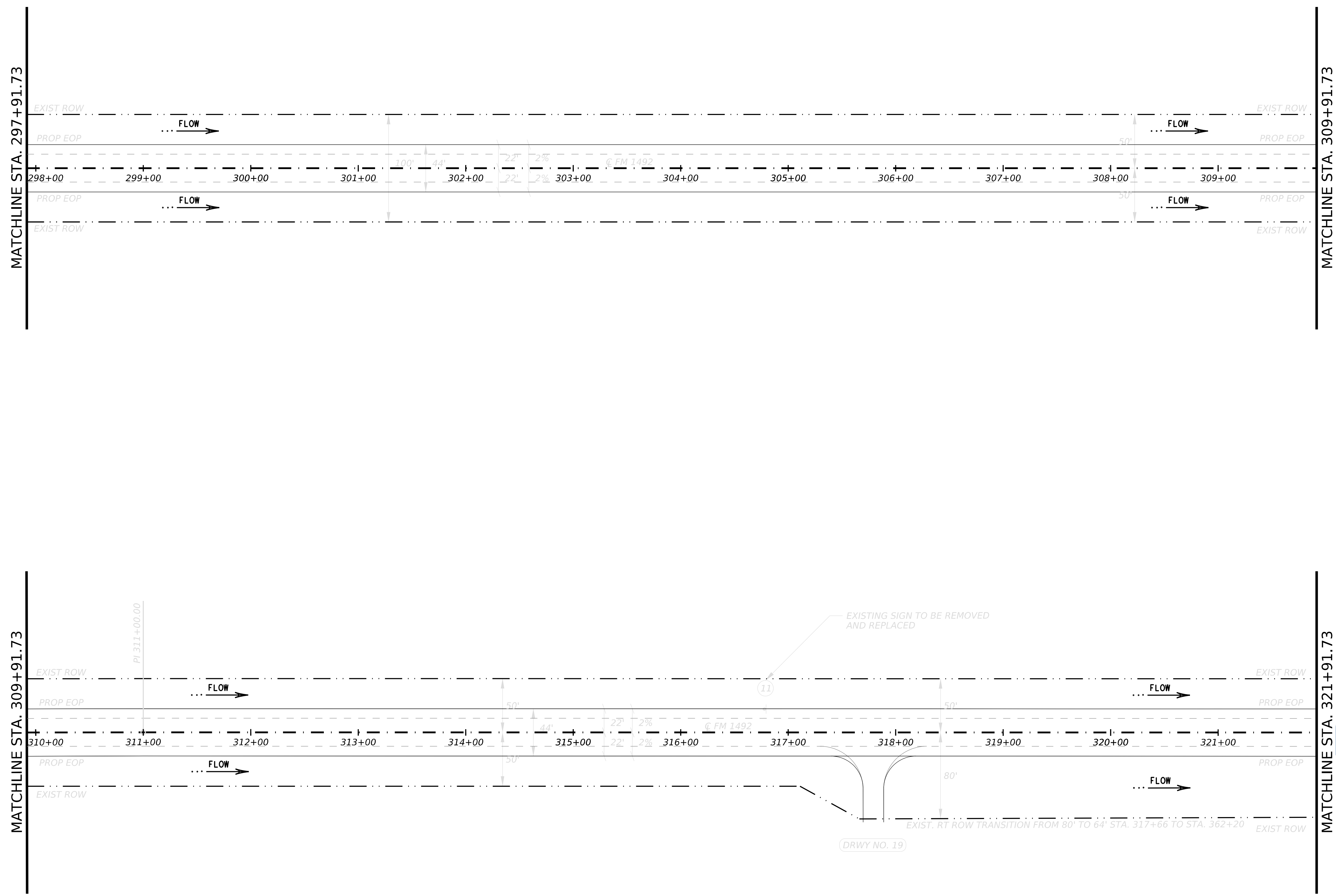
SW3P SITE PLAN

SHEET 15 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	175

DATE: $DATE$
FILE: $FILE$ pw:\\txdot.projectwiseonline.com:TXDOT2\Documents\1- ODA\Design Projects\290601006\1- Design\Plan Review\a.100 Percent\DES Comment Revisions\DES Comment Revision (10-5)\FM1492 UPT ENV 12.dgn



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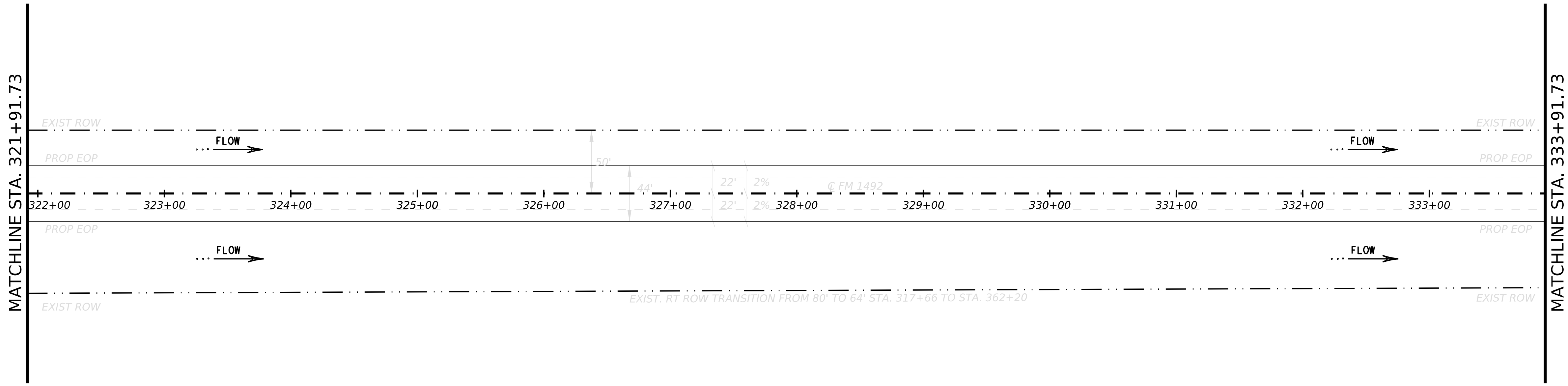
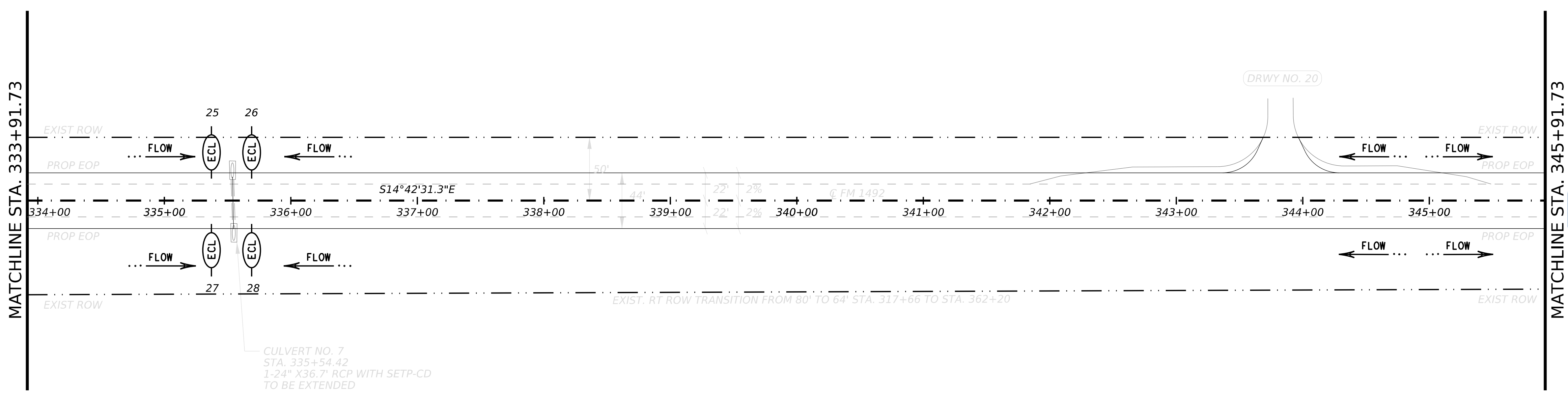
SW3P SITE PLAN

SHEET16 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	176





EROSION CONTROL SUMMARY					
NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
25	EC LOG	335+38	20		
26	EC LOG	335+70	20		
27	EC LOG	335+38	20		
28	EC LOG	335+70	20		

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SW3P SITE PLAN

SHEET17 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		177

DATE: $DATE$
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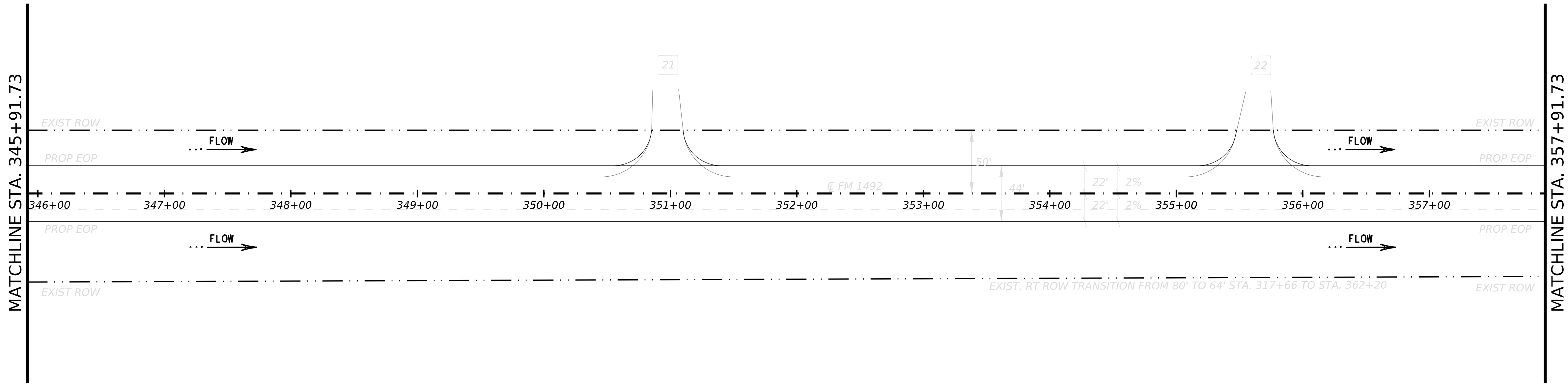

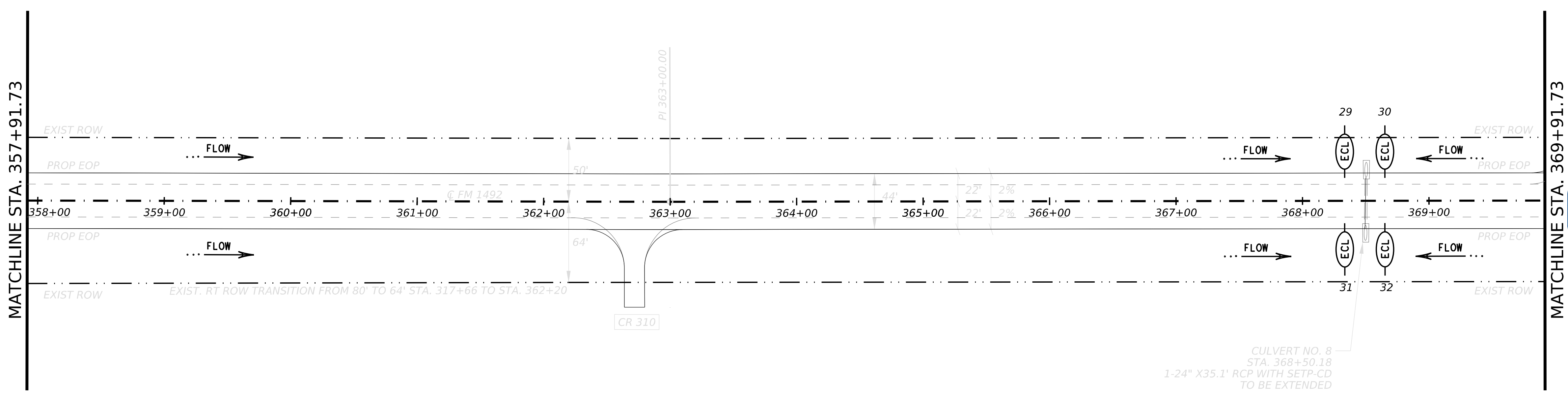

EROSION CONTROL SUMMARY					
NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
29	EC LOG	368+34	20		
30	EC LOG	368+65	20		
31	EC LOG	368+34	20		
32	EC LOG	368+65	20		

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SW3P SITE PLAN

SHEET18 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		178

DATE: $DATE$ 10/5/2022
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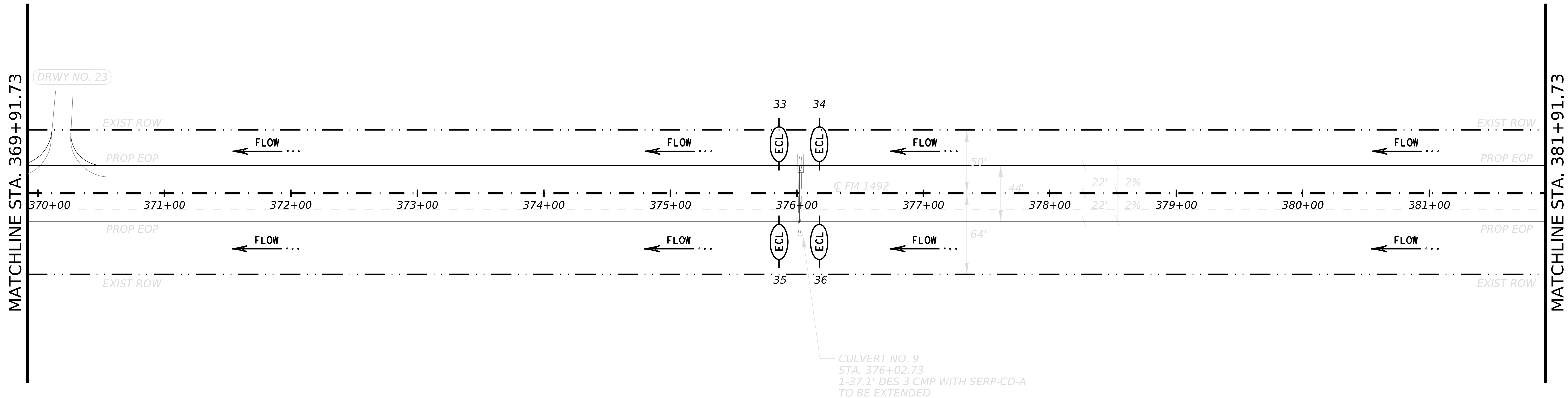

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NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
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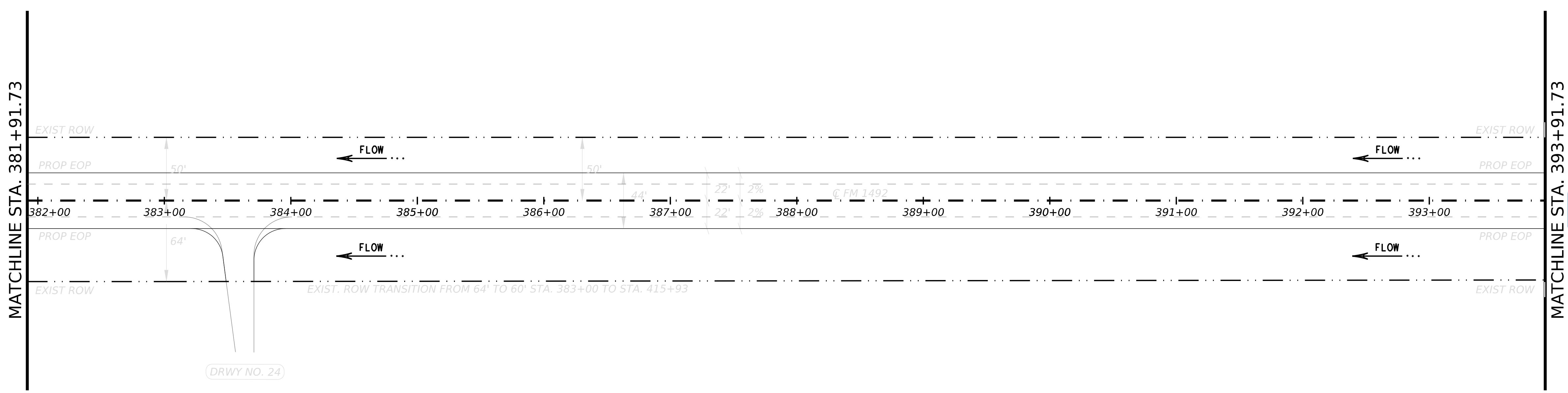
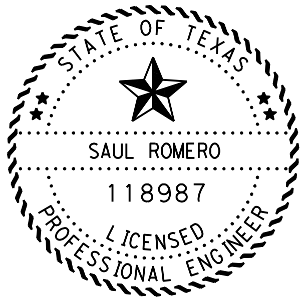
35	EC LOG	375+86	20		
36	EC LOG	376+18	20		





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SW3P SITE PLAN

SHEET19 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		179

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SW3P SITE PLAN

SHEET 20 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		180

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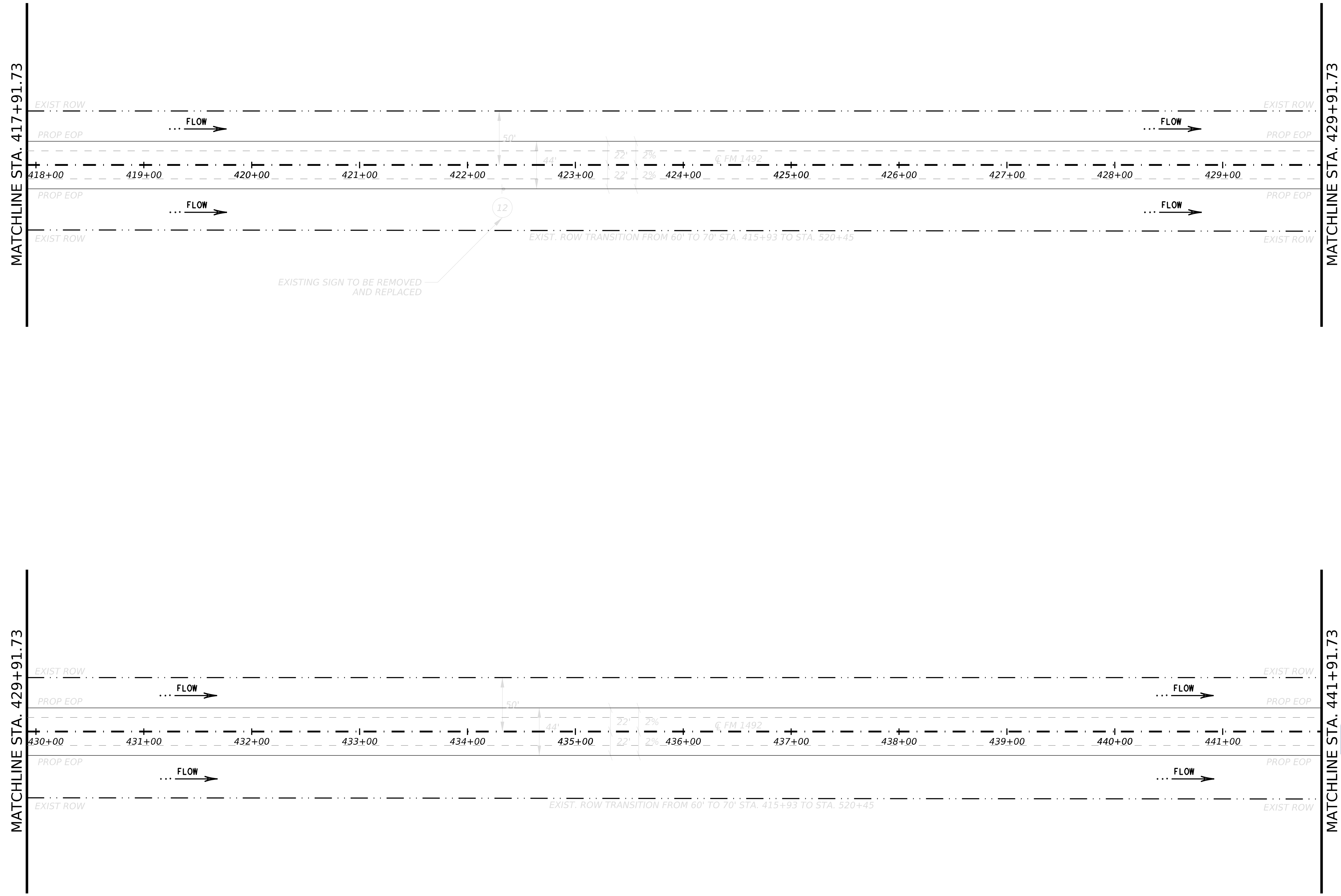

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SW3P SITE PLAN

SHEET 21 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		181

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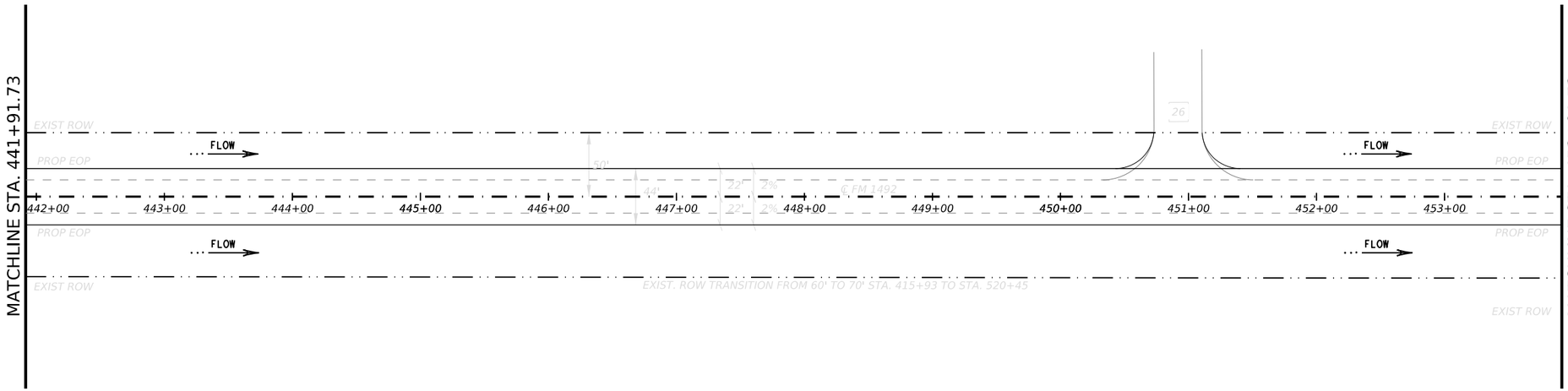

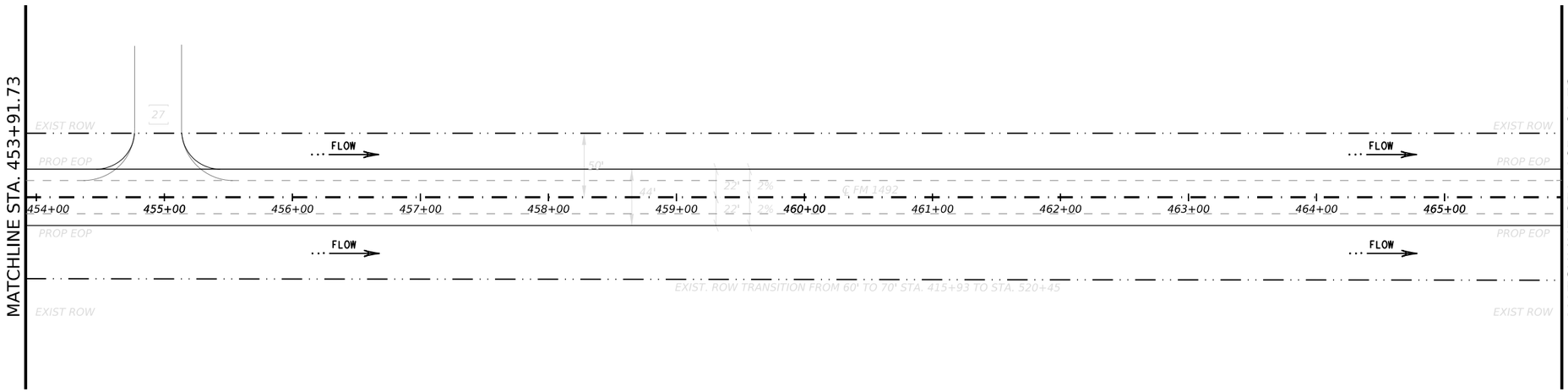

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SW3P SITE PLAN

SHEET 22 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		182

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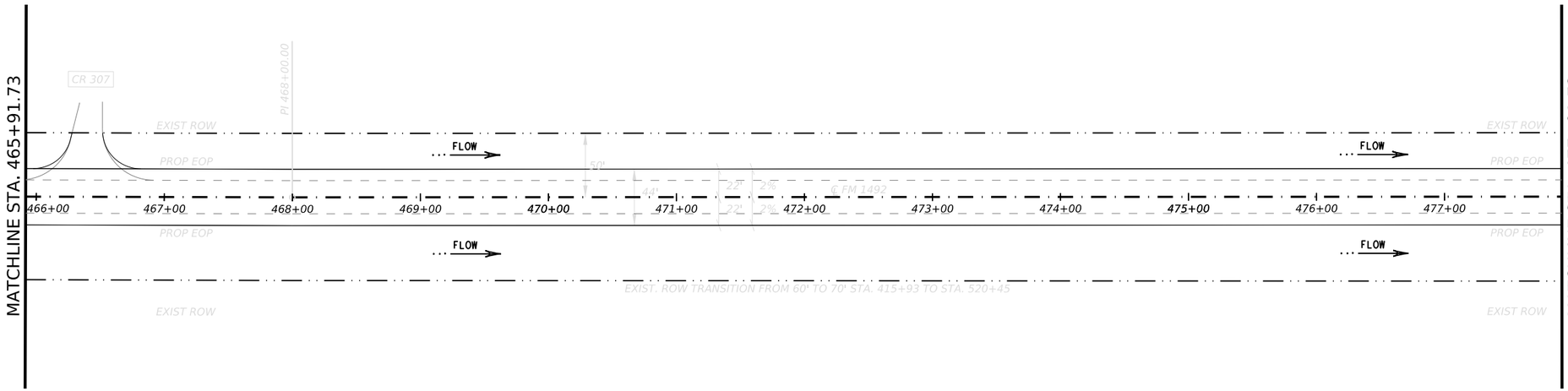

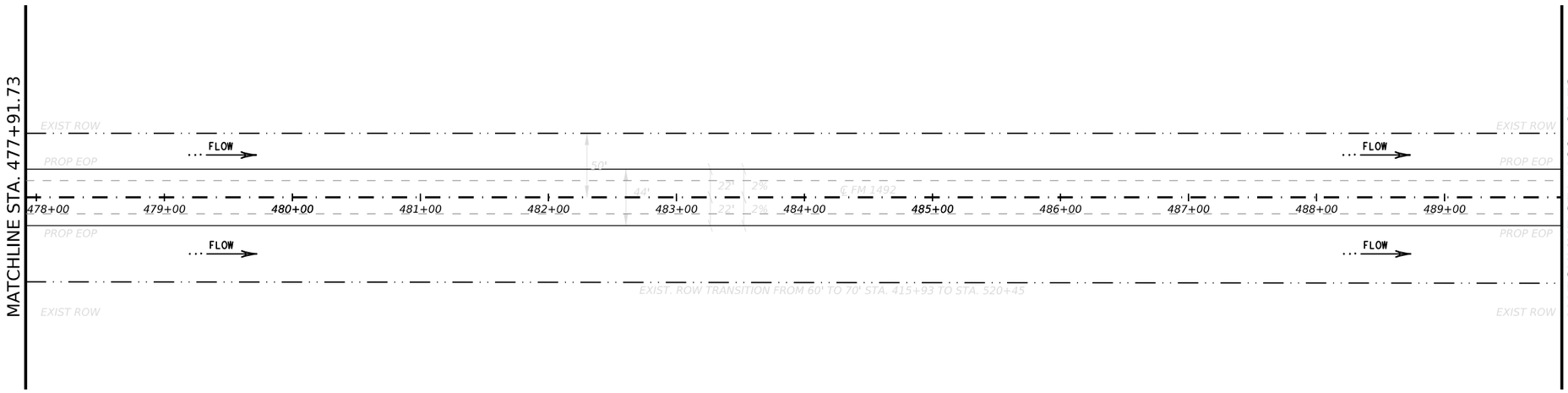

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SW3P SITE PLAN

SHEET 23 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		183

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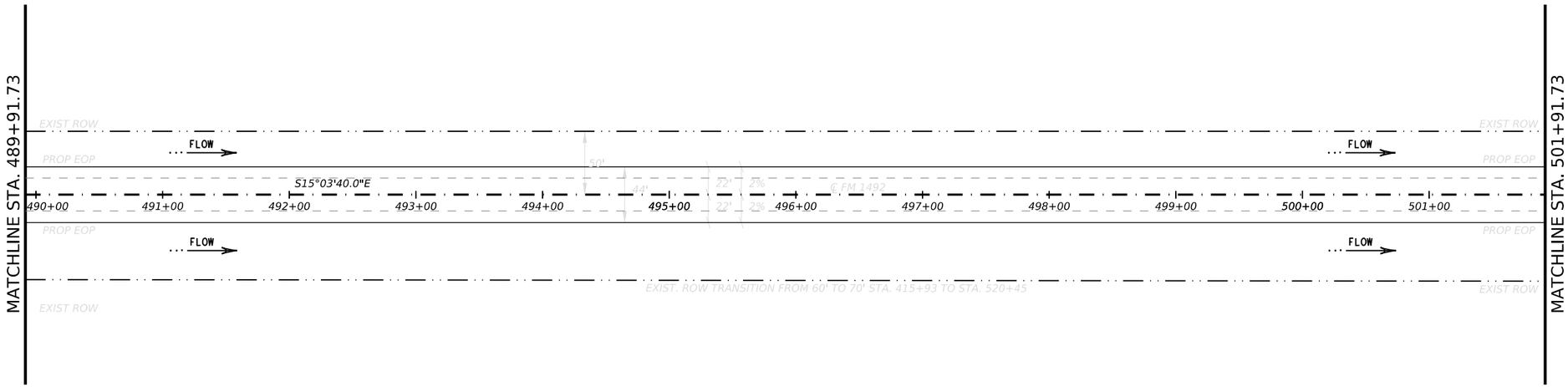

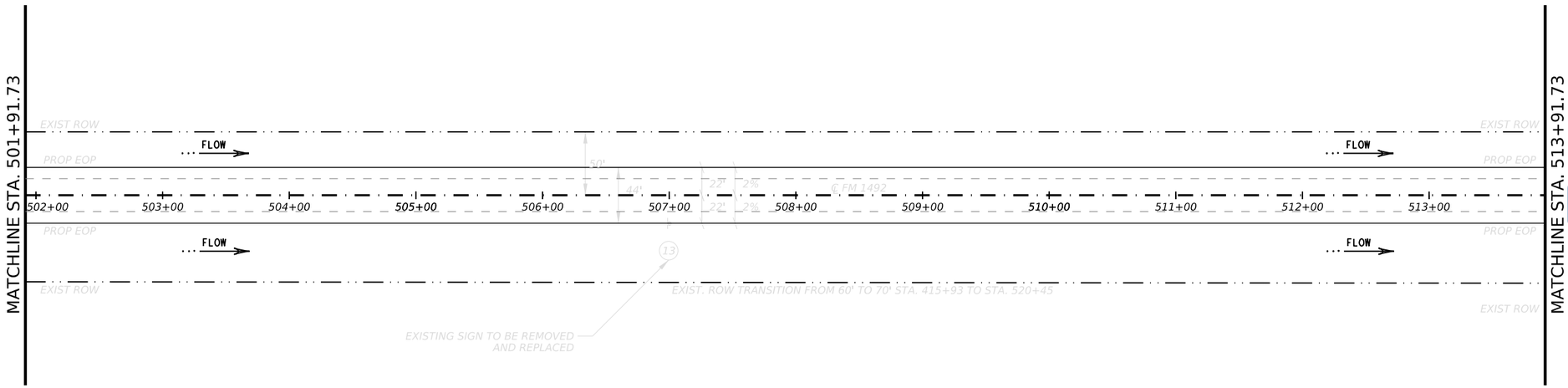

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SW3P SITE PLAN

SHEET 24 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		184

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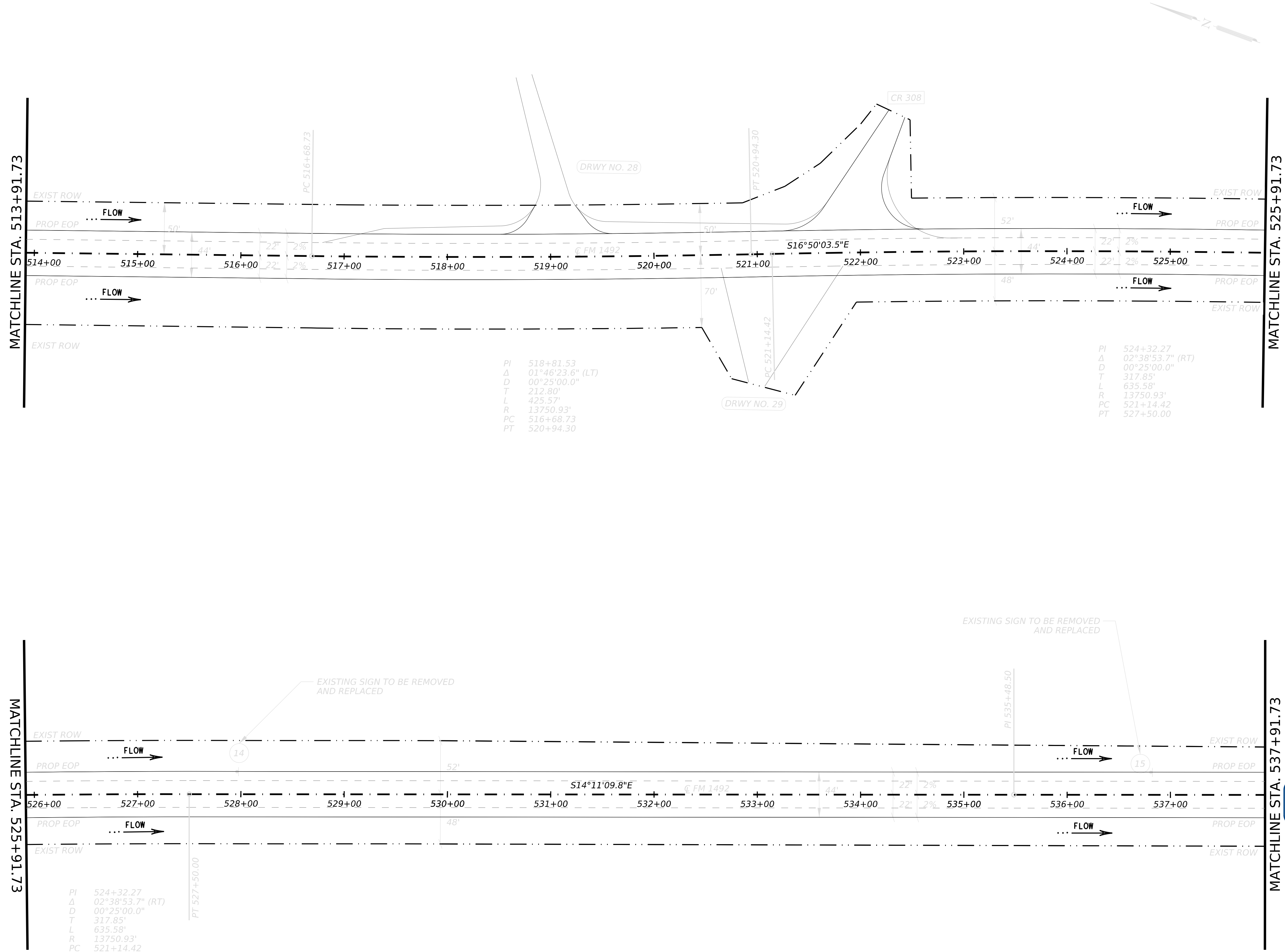

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SW3P SITE PLAN

SHEET 25 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		185

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SW3P SITE PLAN

SHEET 26 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		186

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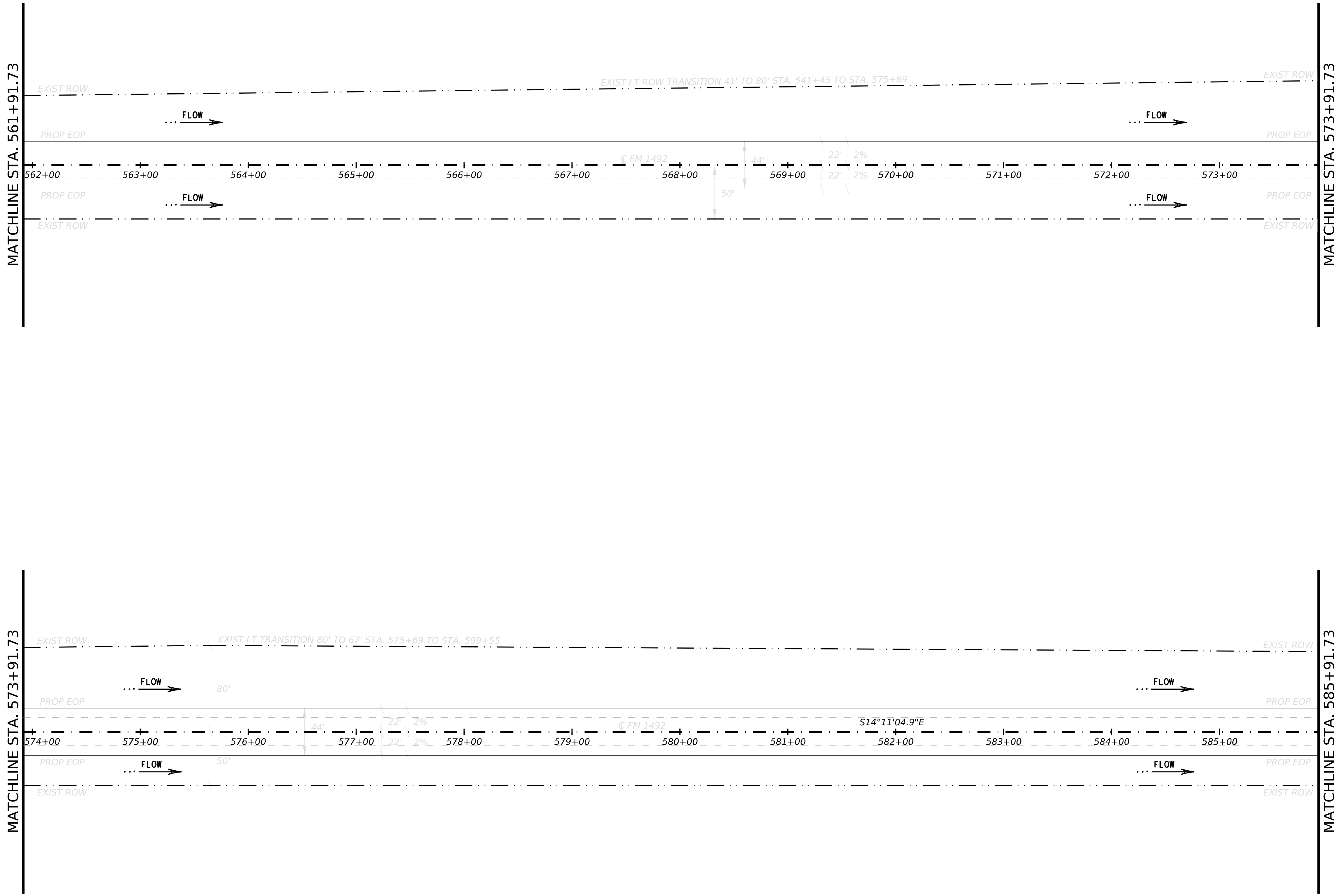

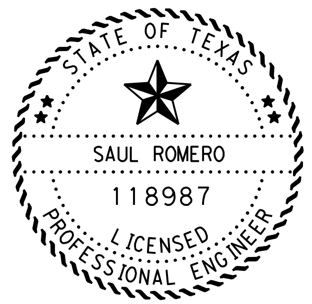

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SW3P SITE PLAN

SHEET 27 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	187

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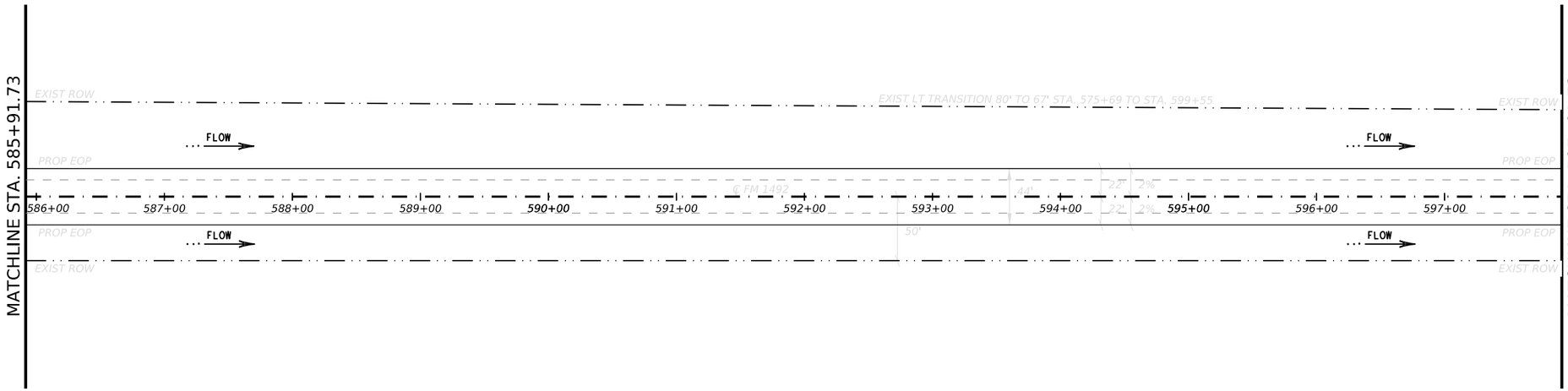

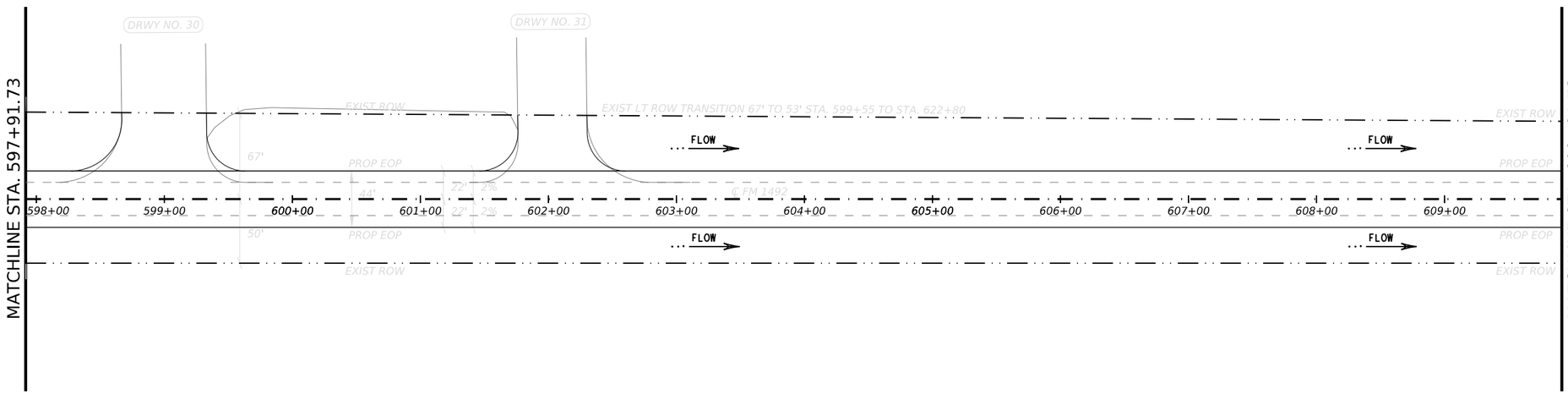

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SW3P SITE PLAN

SHEET 28 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		188

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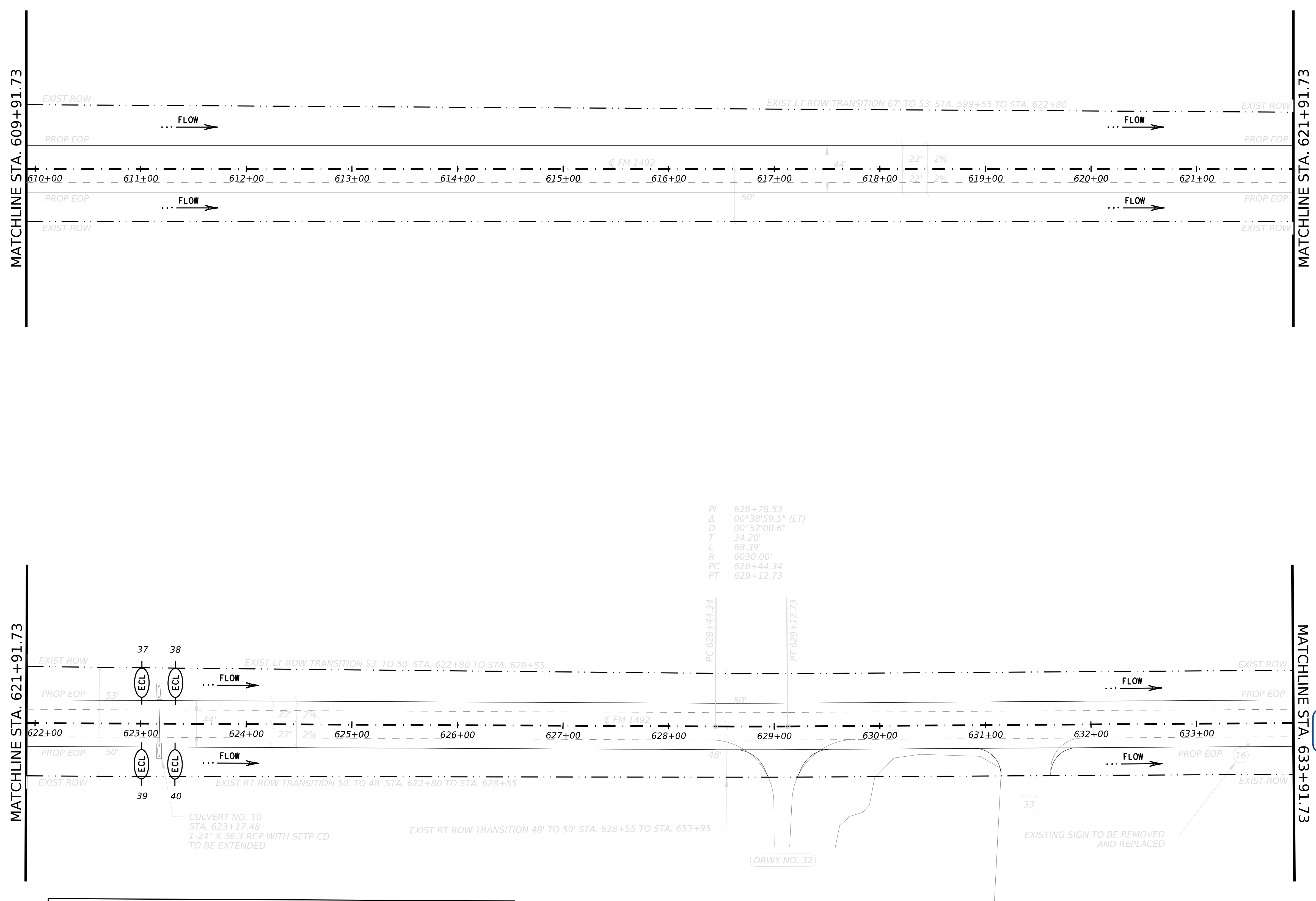

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EROSION CONTROL SUMMARY					
NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
37	EC LOG	623+00	20		
38	EC LOG	623+33	20		
39	EC LOG	623+00	20		
40	EC LOG	623+33	20		

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SW3P SITE PLAN

SHEET 29 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		189

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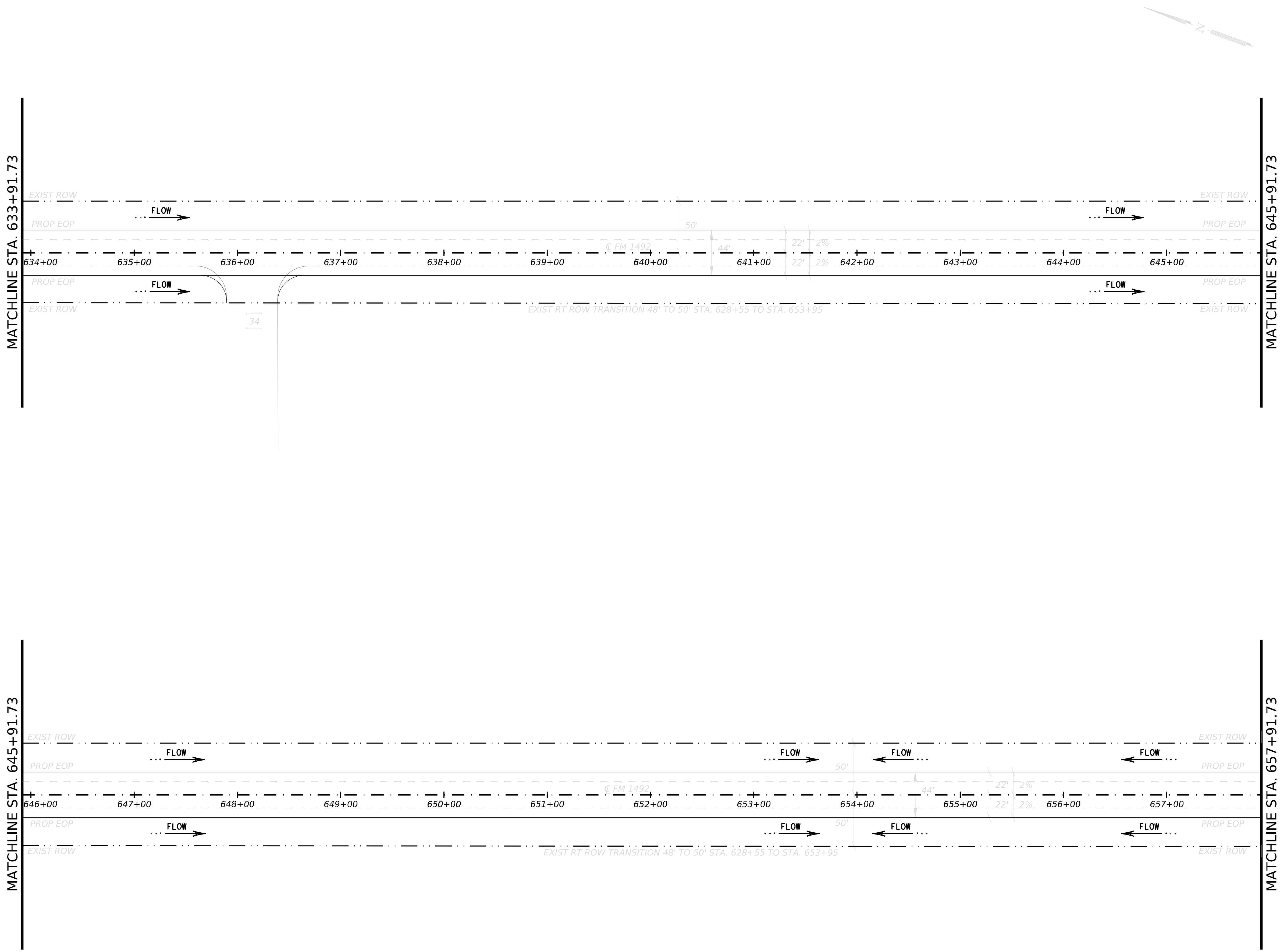

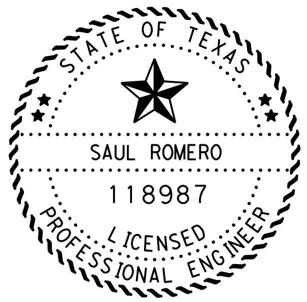

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SW3P SITE PLAN

SHEET 30 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	190

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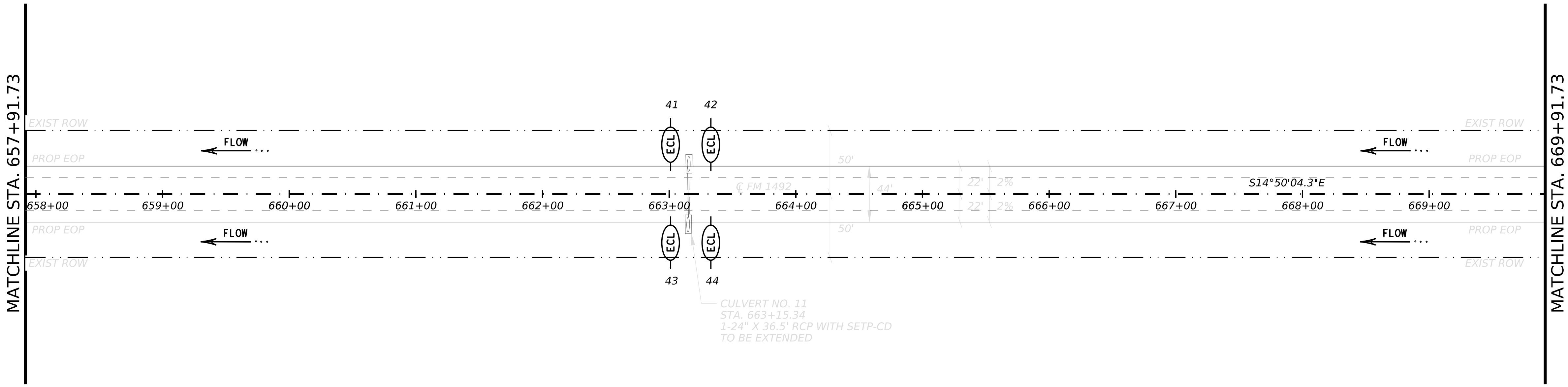

EROSION CONTROL SUMMARY					
NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
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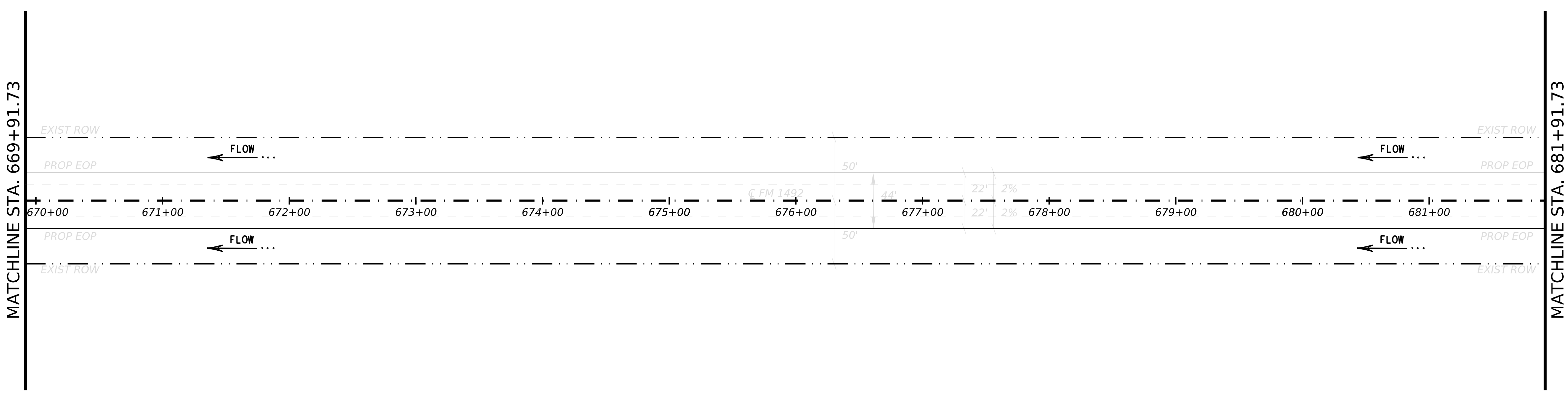
42	EC LOG	663+33	20		
43	EC LOG	663+00	20		
44	EC LOG	663+33	20		



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SW3P SITE PLAN

SHEET 31 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	191

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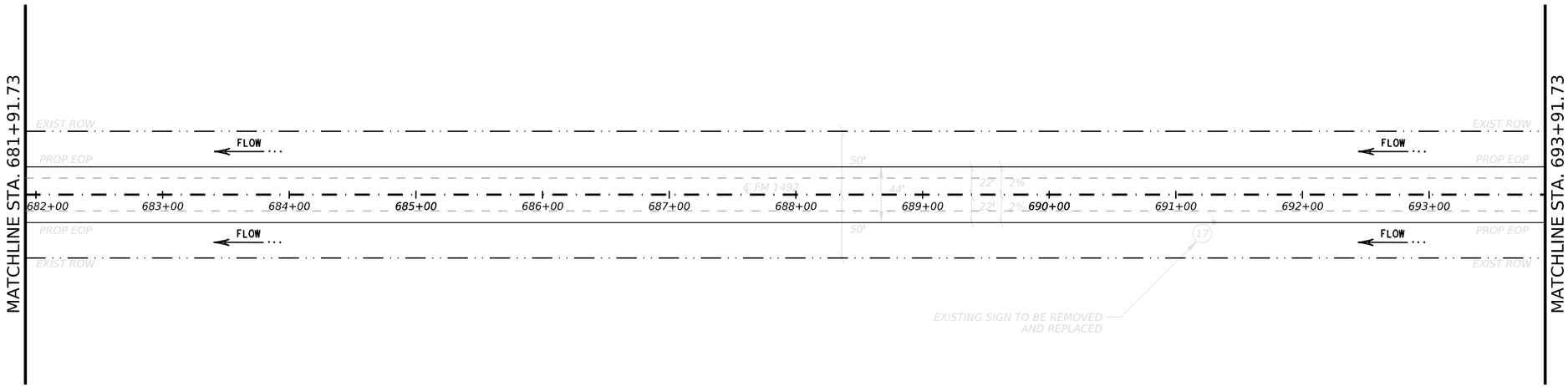

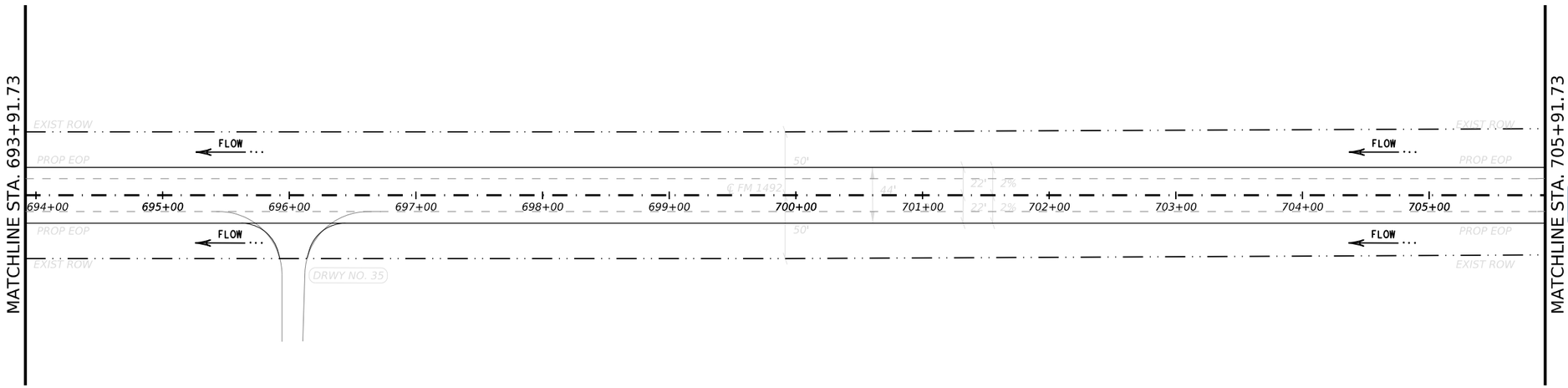

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SW3P SITE PLAN

SHEET 32 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		192

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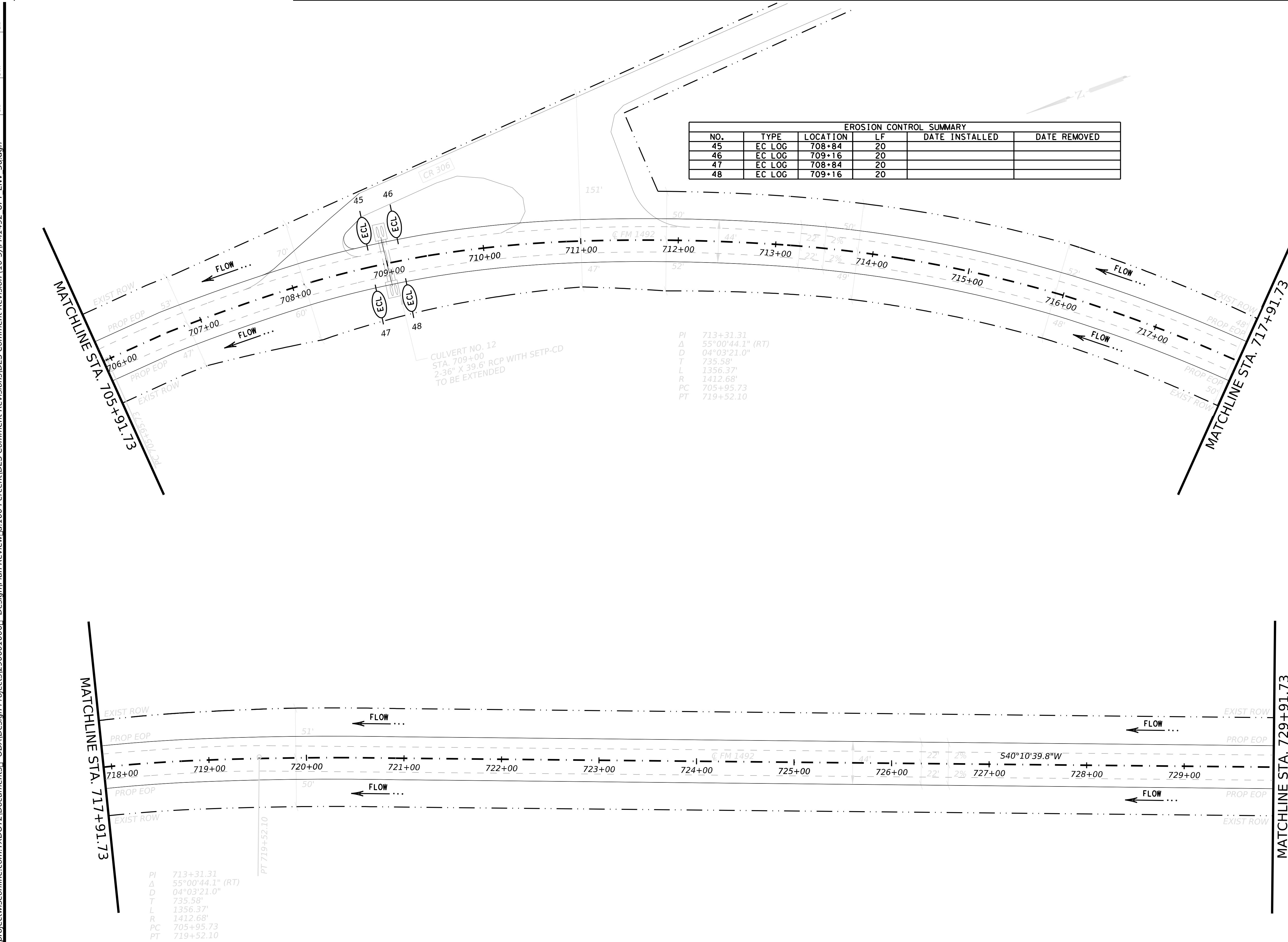

EROSION CONTROL SUMMARY

NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
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46	EC LOG	709+16	20		
47	EC LOG	708+84	20		
48	EC LOG	709+16	20		

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SW3P SITE PLAN

SHEET 33 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		193

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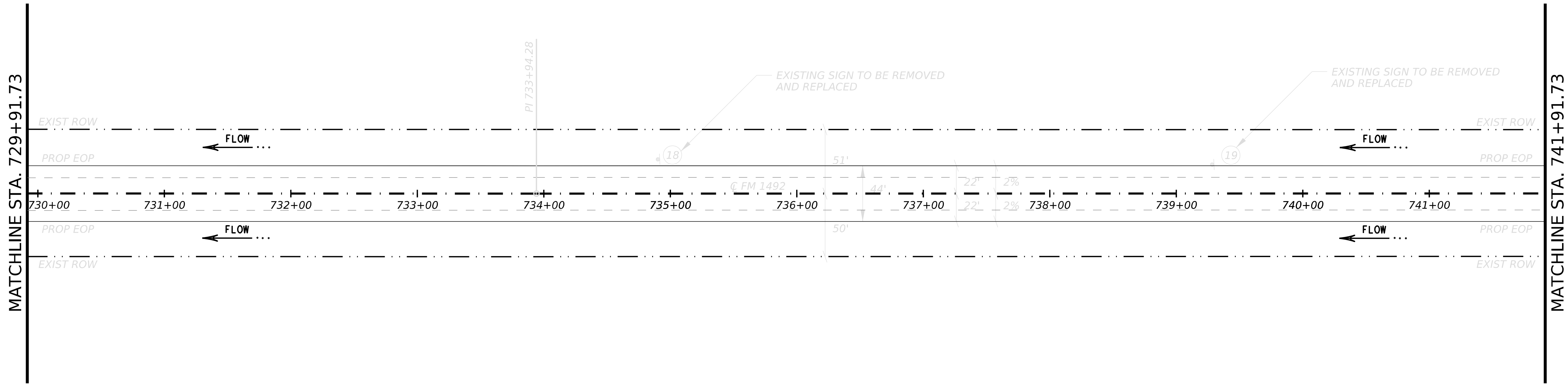

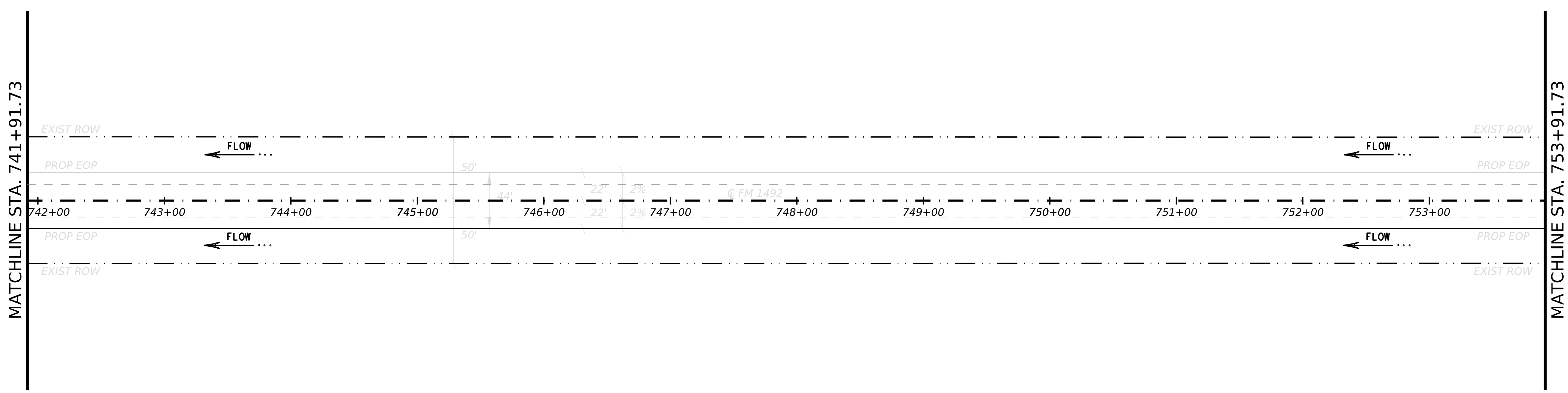

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SW3P SITE PLAN

SHEET 34 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	194

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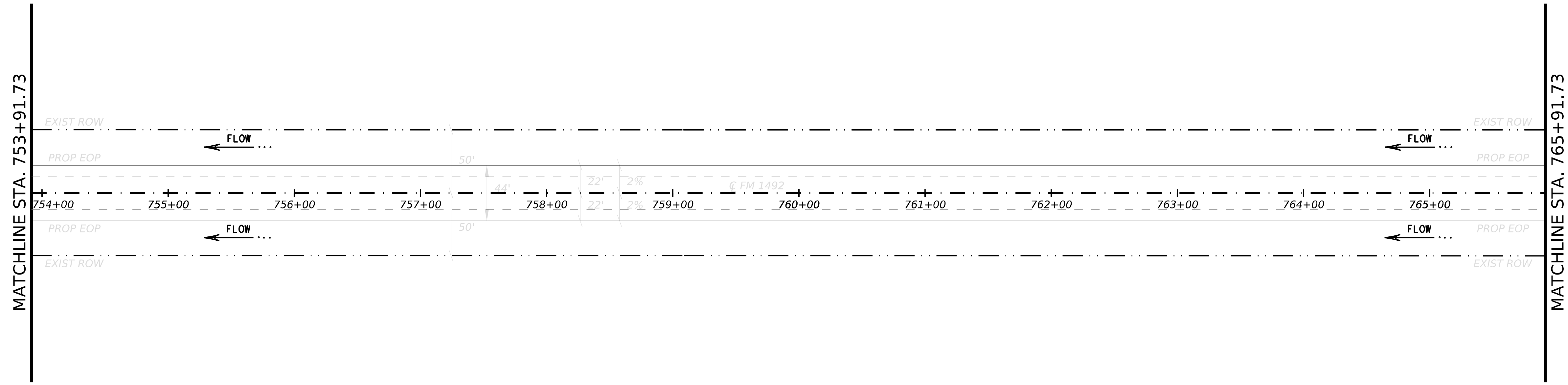

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51	EC LOG	770+60	20		
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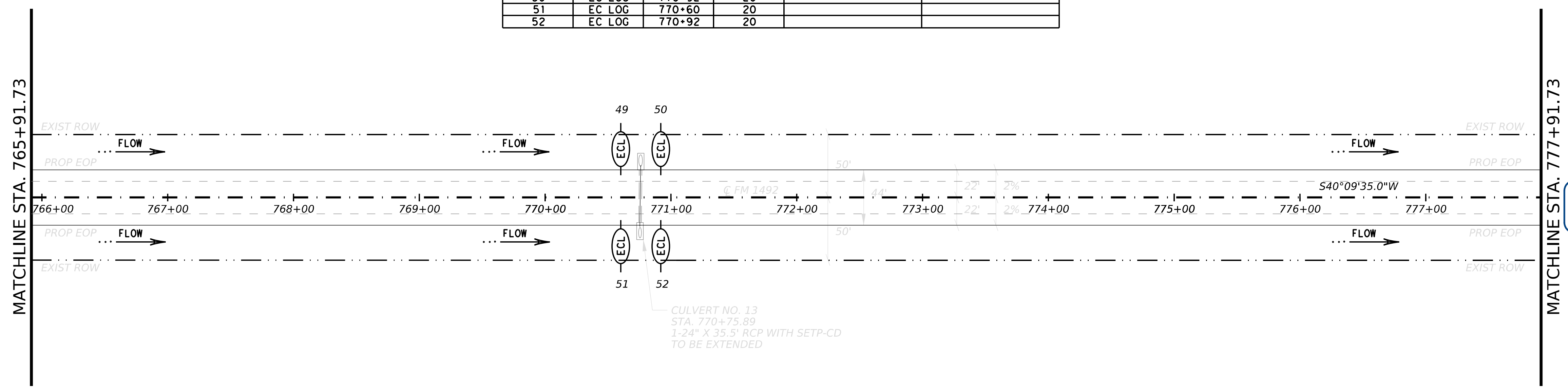


SAUL ROMERO
118987
STATE OF TEXAS
LICENSED PROFESSIONAL ENGINEER

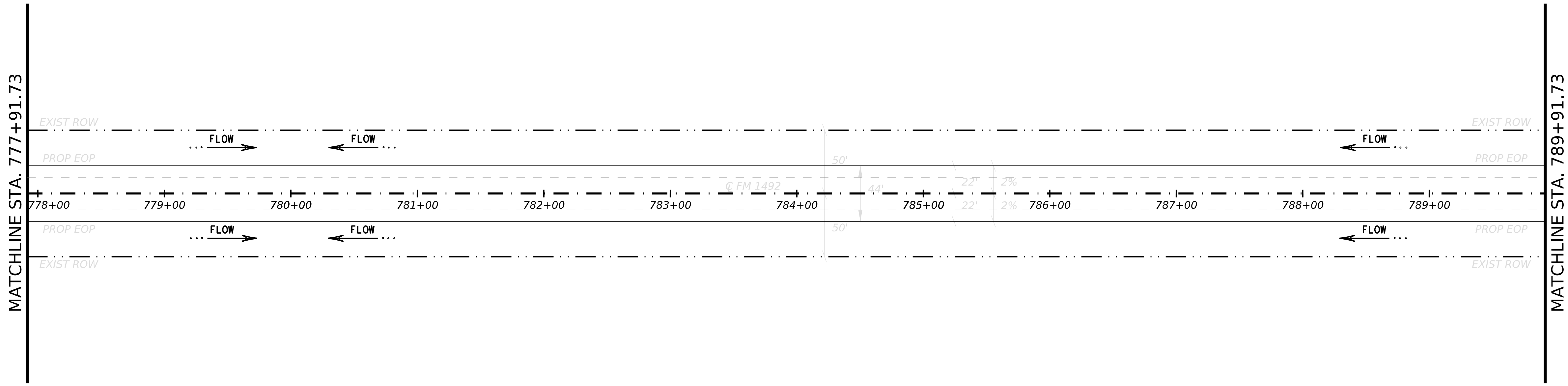
DocuSigned by:
10/10/2022
88BF61DF326A480...

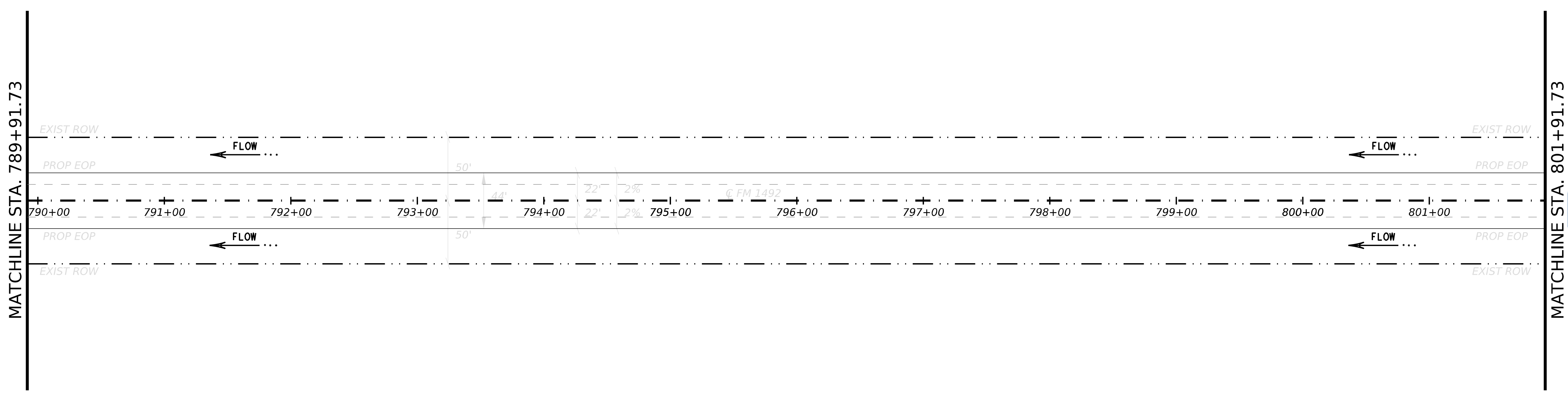
Texas Department of Transportation

SW3P SITE PLAN

SHEET 35 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		195





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SAUL ROMERO
118987
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PROFESSIONAL ENGINEER

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10/10/2022

Texas Department of Transportation

SW3P SITE PLAN

SHEET 36 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492

DIST	COUNTY	SHEET NO.
ODA	MIDLAND	196

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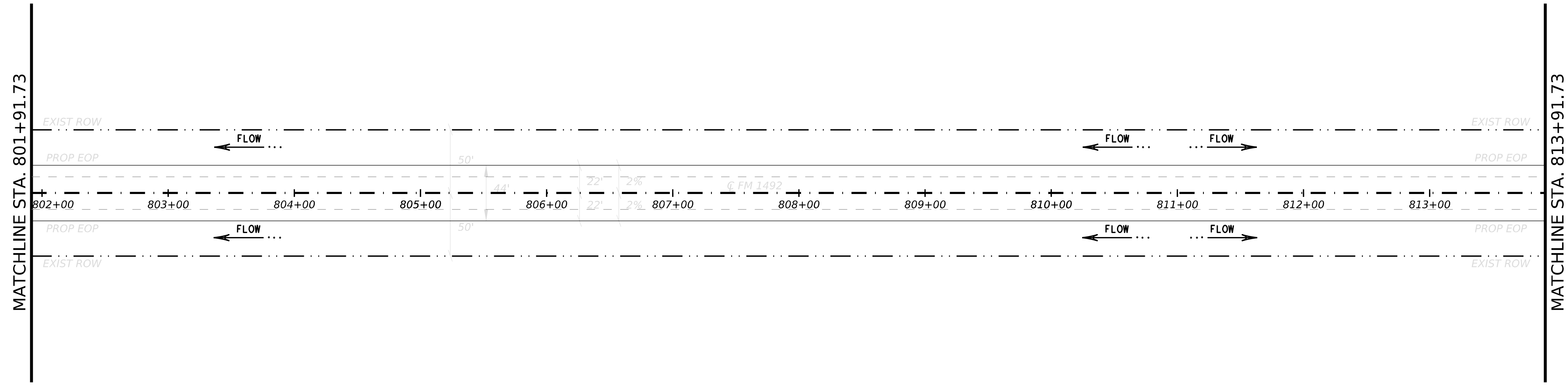

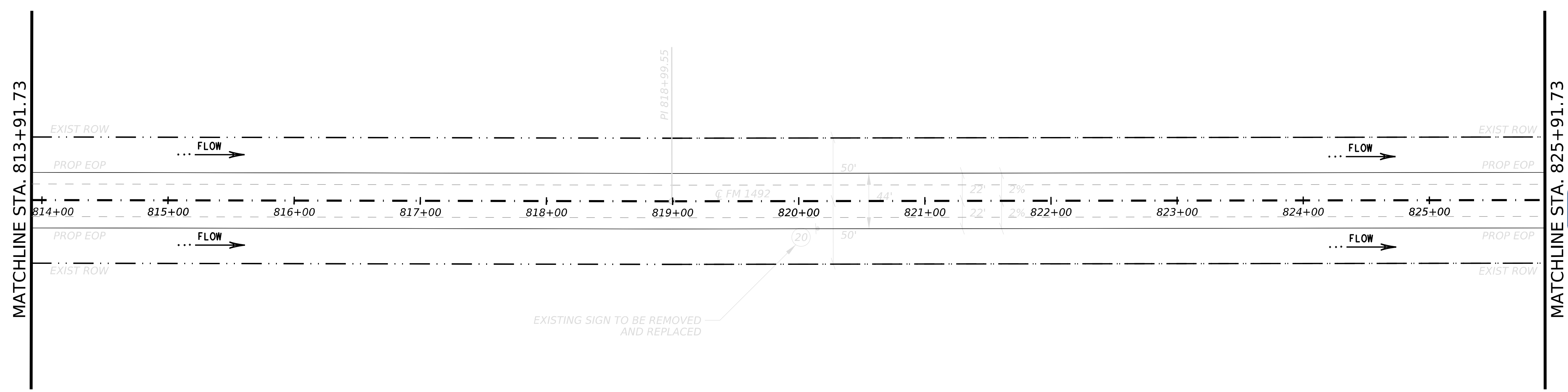

STATE OF TEXAS
SAUL ROMERO
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10/10/2022

Texas Department of Transportation

SW3P SITE PLAN

SHEET37 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		197

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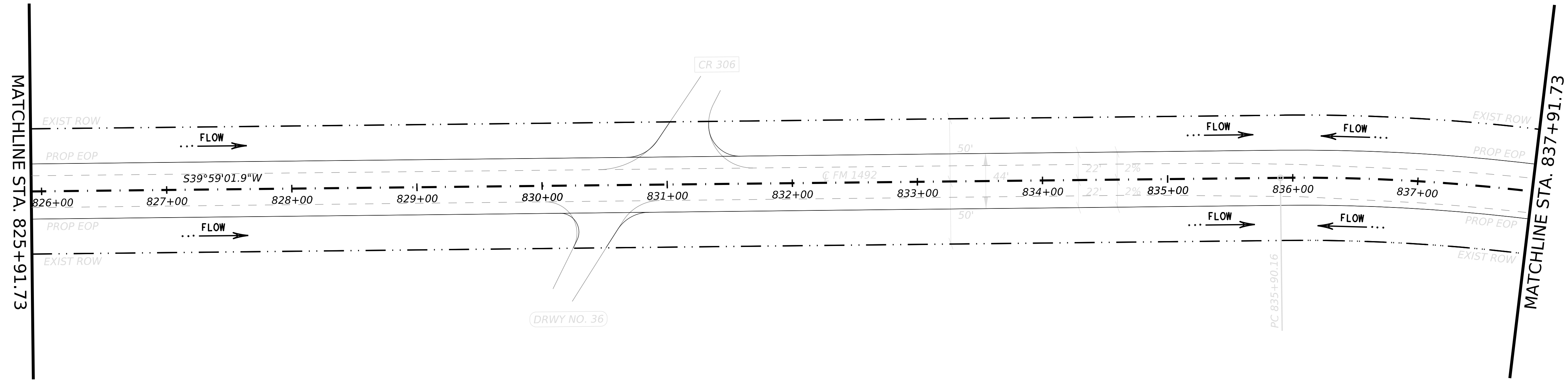

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55	EC LOG	843+80	20		
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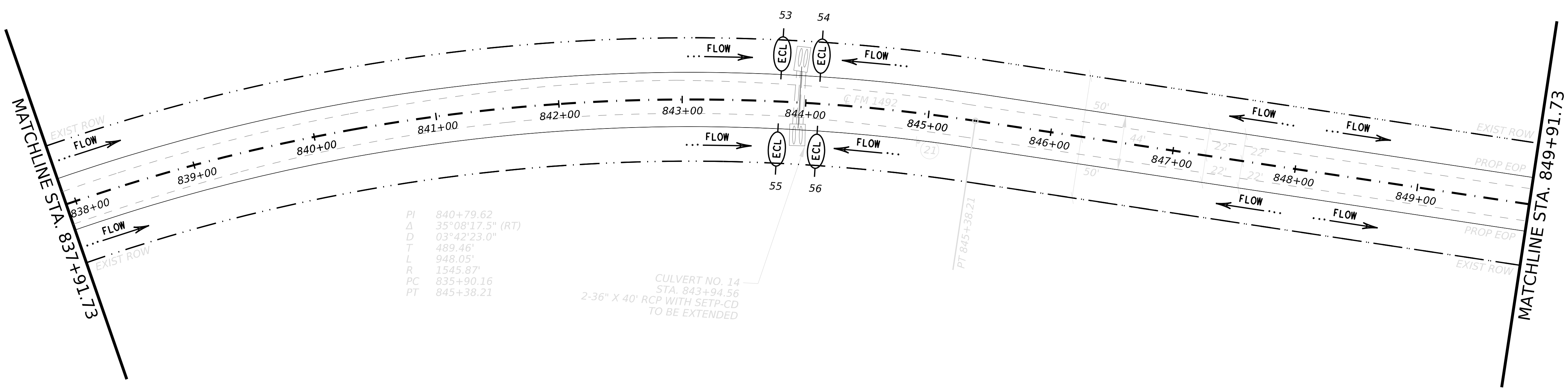

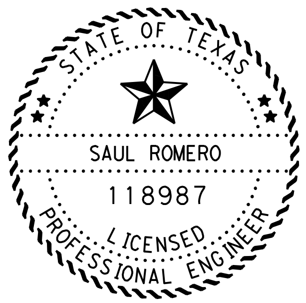

DocuSigned by:
88BF61DF326A480...
10/10/2022

Texas Department of Transportation

SW3P SITE PLAN

SHEET 38 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST		COUNTY	SHEET NO.
ODA		MIDLAND	198

DATE: $DATE$
FILE: $FILE$

EROSION CONTROL SUMMARY					
NO.	TYPE	LOCATION	LF	DATE INSTALLED	DATE REMOVED
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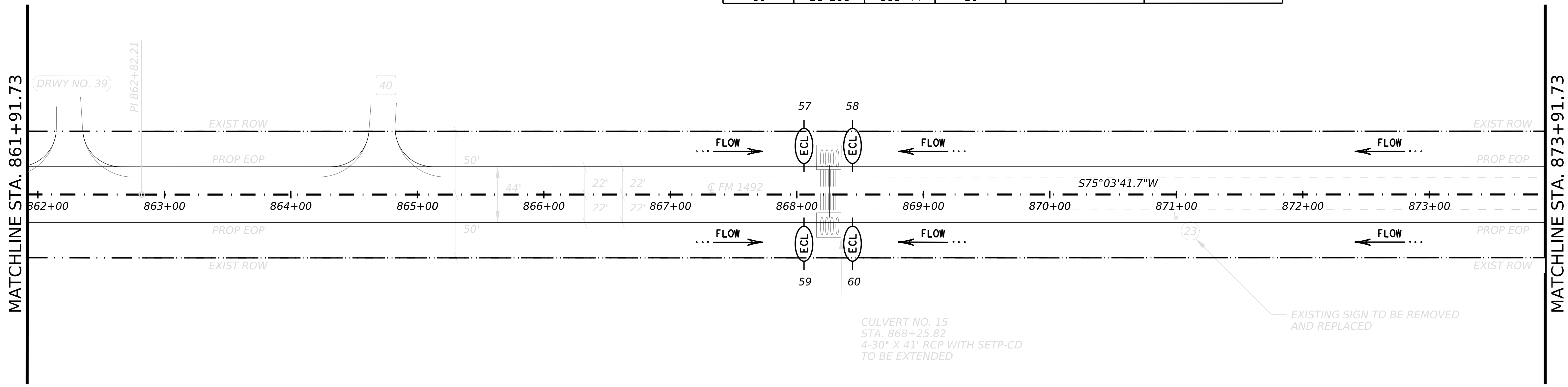

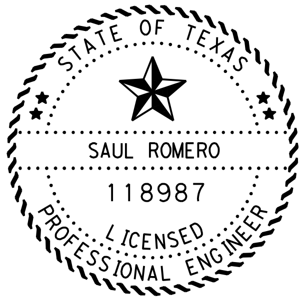

DocuSigned by:
88BF61DF326A480...
10/10/2022

Texas Department of Transportation

SW3P SITE PLAN

SHEET 39 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		199

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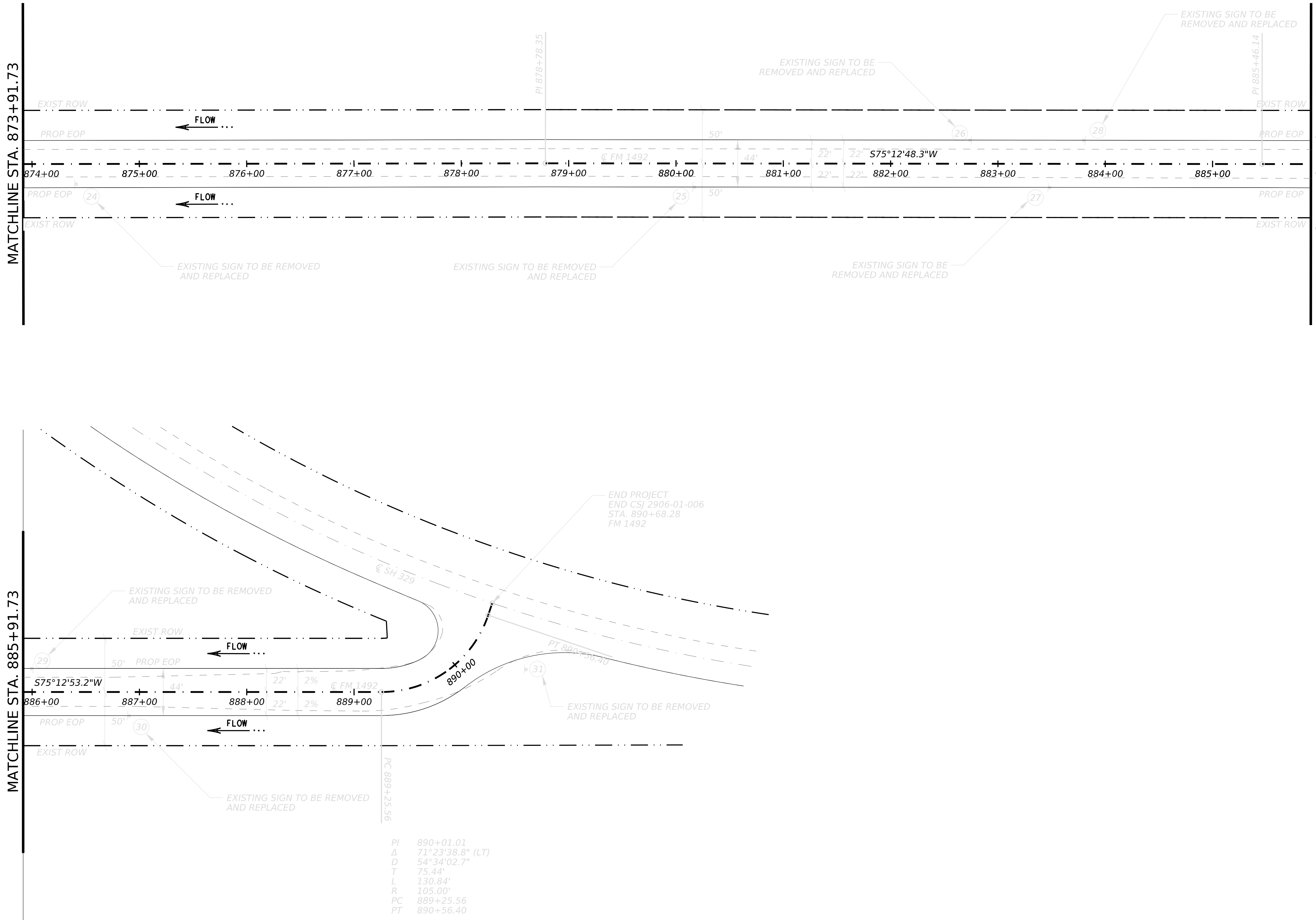

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10/10/2022

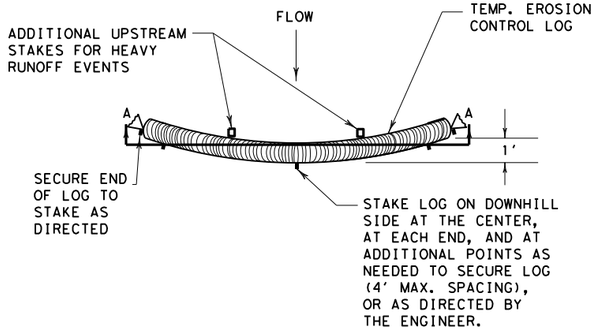
Texas Department of Transportation

SW3P SITE PLAN

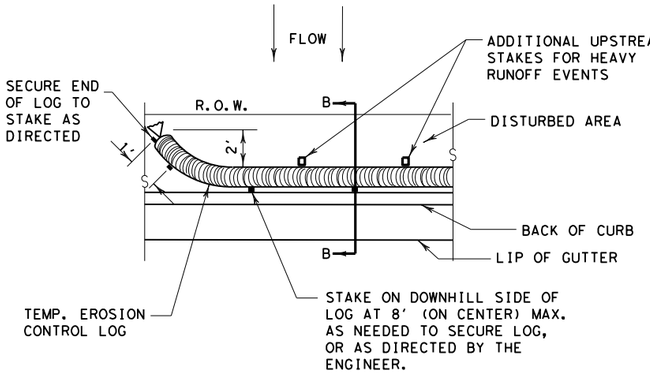
SHEET 40 OF 40

CONT	SECT	JOB	HIGHWAY
2906	01	006	RM1492
DIST	COUNTY		SHEET NO.
ODA	MIDLAND		200

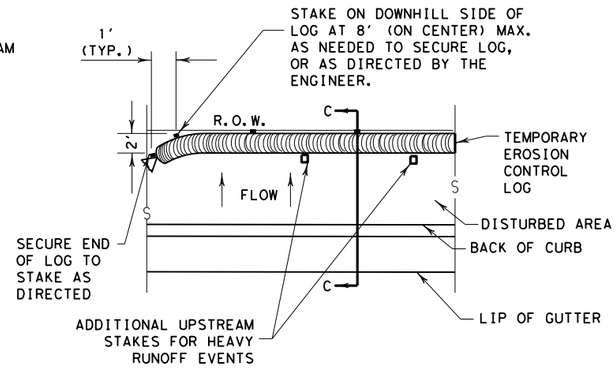
DATE:
FILE:



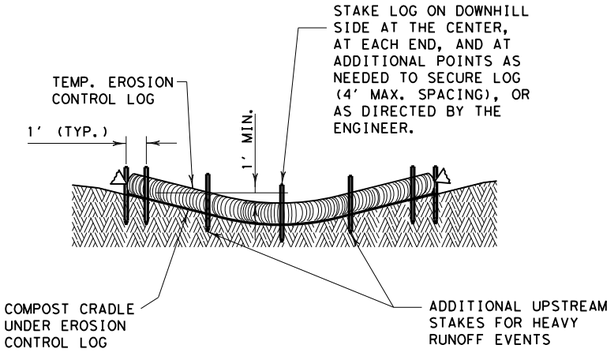
PLAN VIEW



PLAN VIEW



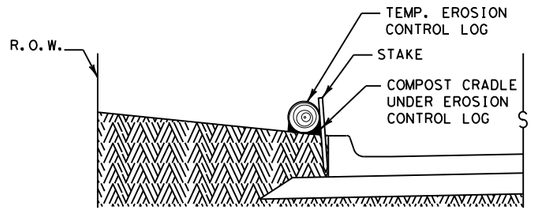
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

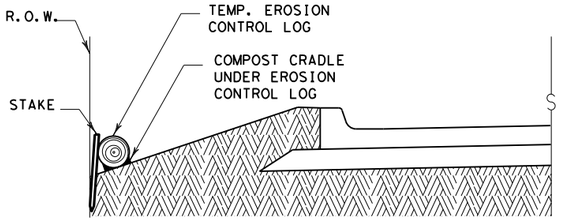
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

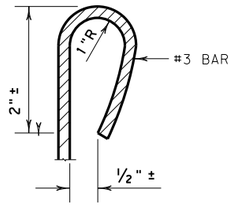
CL-BOC



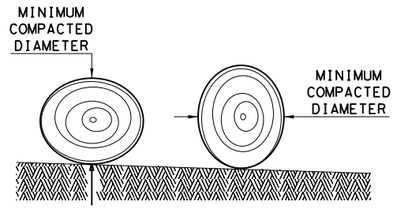
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

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.

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

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:
1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

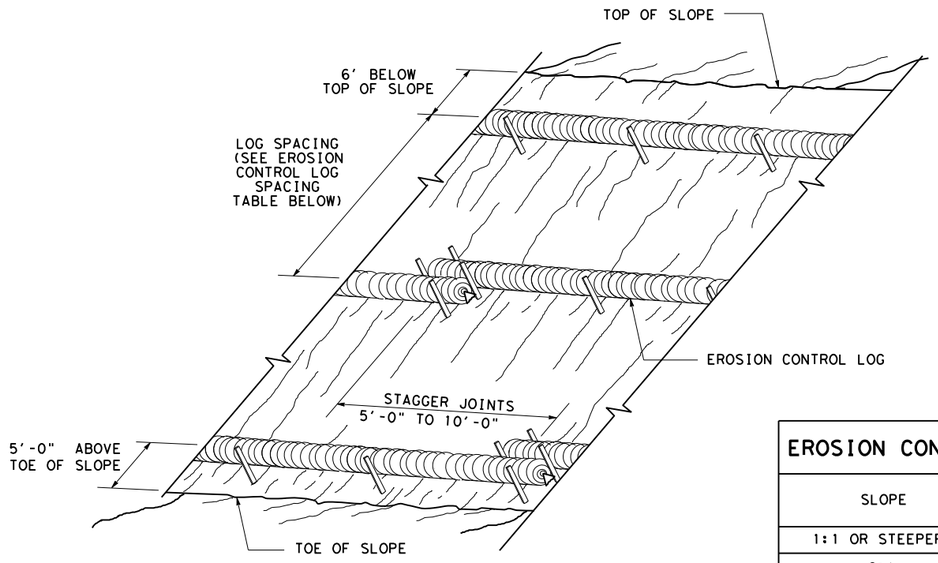
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

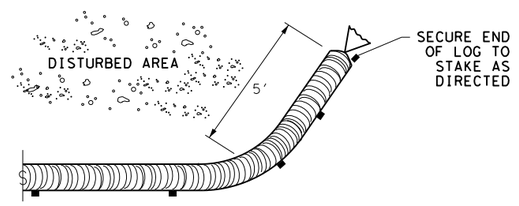
FILE: ec916		DN: TxDOT	CK: KM	DW: LS/PT	CK: LS		
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY			
REVISIONS	2906	01	006, ETC.	RM 1492			
	DIST	COUNTY		SHEET NO.			
	ODA	MIDLAND, ETC.		201			

DATE:
FILE:



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

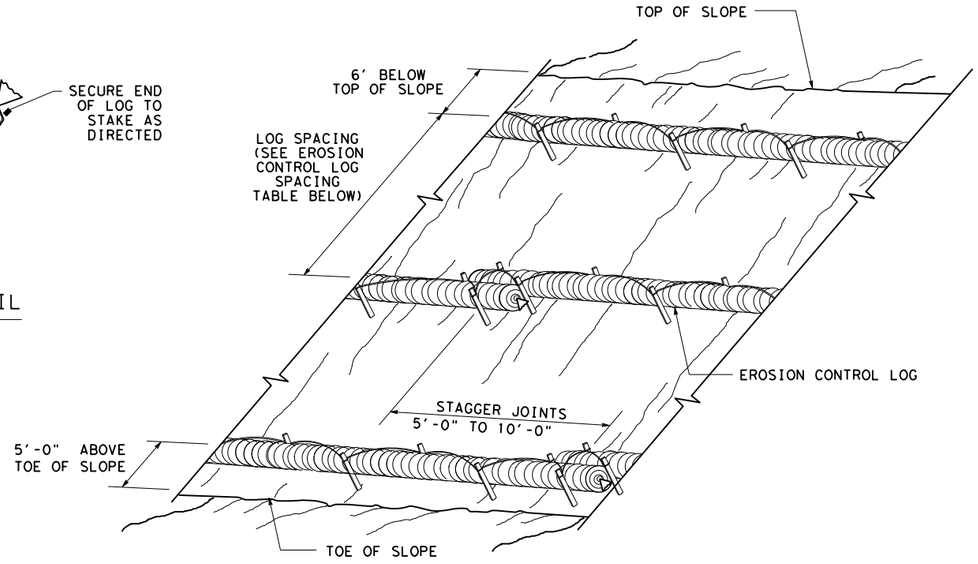
CL-SST



END SECTION RAP DETAIL

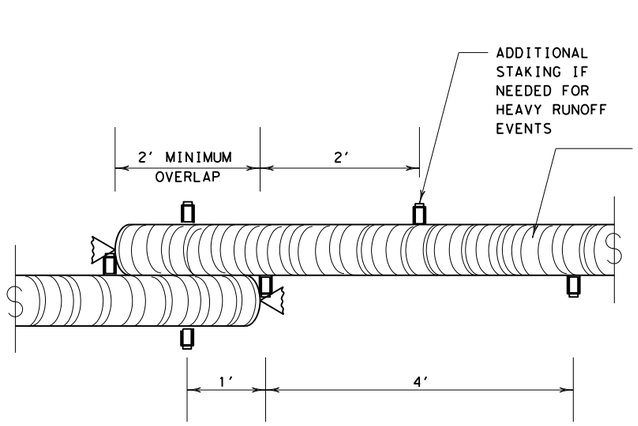
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

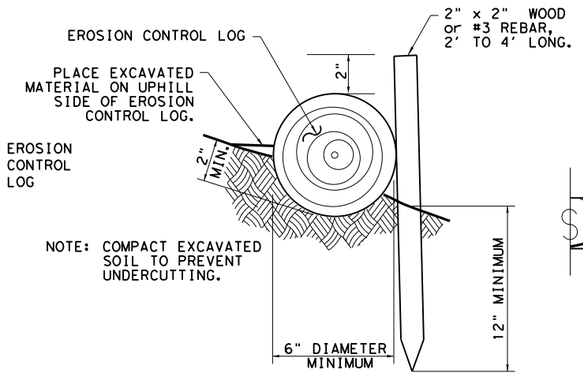
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

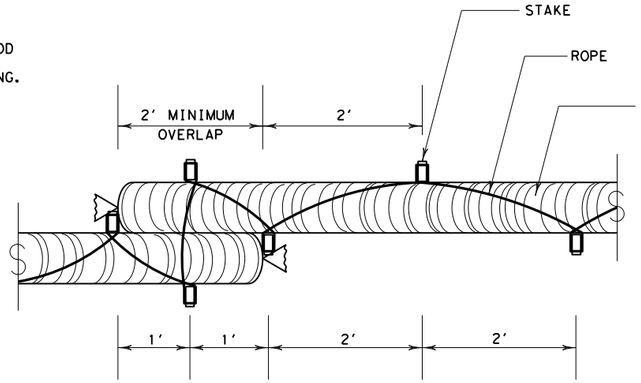


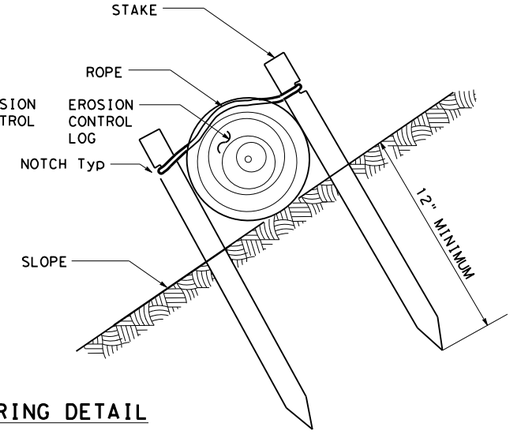


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

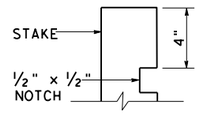
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

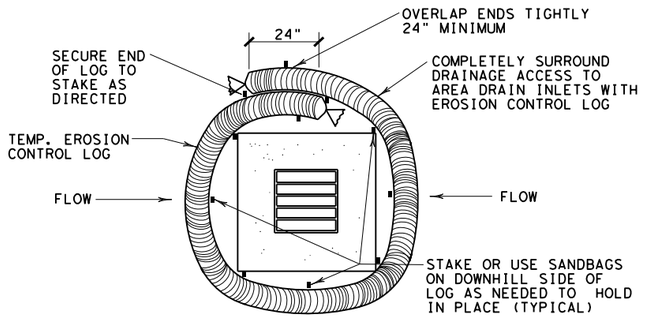
Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

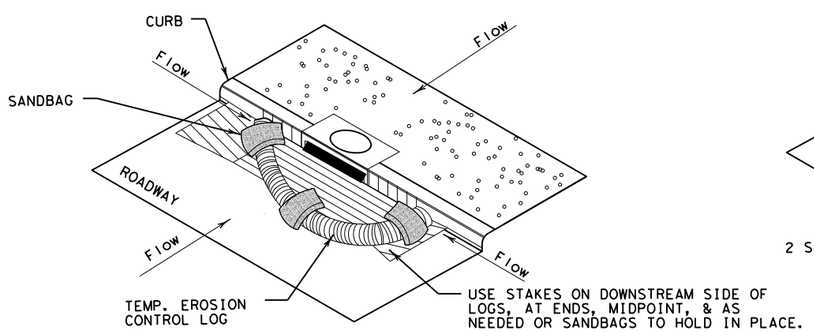
FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2906	01	006, ETC.		RM 1492	
	DIST	COUNTY			SHEET NO.	
	ODA	MIDLAND, ETC.			202	

DATE:
FILE:



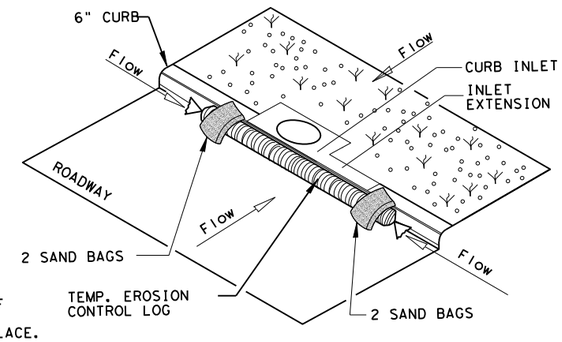
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

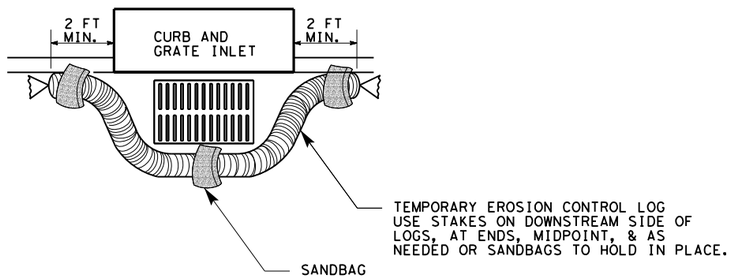
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

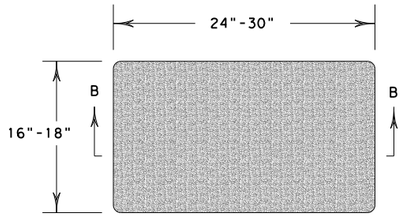
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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	2906	01	006, ETC.		RM 1492	
	DIST	COUNTY			SHEET NO.	
	ODA	MIDLAND, ETC.			203	

STORM WATER POLLUTION PREVENTION PLAN (SW3P):

This SW3P has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SW3P within the times specified in the SW3P or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

1. SITE OR PROJECT DESCRIPTION:

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS AND SOURCES:

Sediment laden storm water	*Storm water conveyance over disturbed areas*
Fuels, oils, and lubricants	*Construction vehicles and storage areas*
Transported soil	*Off site vehicle tracking*
Construction debris and waste	*Various construction activities*
Sanitary waste	
Trash	

SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:

1. *Blading for subgrade widening*
2. *Grading operations*
3. *Remove existing culverts and proposed extensions*
4. *Rework slopes, grade ditches*
5.
6.
7.
8.

AREAS:

TOTAL AREA OF PROJECT: 140.87 ACRES

TOTAL AREA OF SOIL DISTURBANCE: 45.38 ACRES

TOTAL AREA OFF-SITE: N/A

DATA DESCRIBING THE SOIL: *Example: Description of soils located within the project limits from the United States Department of Agriculture Soil Conservation Service SOIL SURVEYS of the applicable County (if available). Include information pertinent to storm water such as infiltration rates and/or other information, especially if it effected the storm water design.*

GENERAL LOCATION MAP: SEE TITLE SHEET

DETAILED SITE MAP: SEE SW3P SITE MAP/S SHEET/S

THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:

Supporting Concrete Plant Facilities shall be located off site. See note DEDICATED CONCRETE PLANTS.

Supporting Asphalt Plant Facilities shall be located off site. See note DEDICATED ASPHALT PLANTS.

NAME OF RECEIVING WATERS:

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SW3P FILE.

REMARKS:

401 WATER QUALITY CERTIFICATION: YES____ NO__X__

2. BEST MANAGEMENT PRACTICES (BMPs):

EROSION AND SEDIMENT CONTROLS: Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM(INT), PERMANENT(PER), AND 401 CERTIFICATION BMP'S:

EROSION CONTROLS:	401	INT	PER
☐ *Blankets and Matting*	__	__	__
☐ *Sod*	__	__	__
☐ *Preserve Existing Vegetation*	__	__	X
☐ *Soil Stabilization*	__	__	__
☐ *Permanent Vegetation*	__	__	__
☐ *No Erosion Controls are Required.*			

SEDIMENT CONTROLS:	401	INT	PER
☐ *Silt Fence*	__	__	__
☐ *Rock Berm*	__	__	__
☐ *Buffer Zones*	__	__	__
☐ *Vegetative Filter Strips*	__	__	__
☐ *Ditch Block*	__	__	__
☐ ***Erosion Control Logs***	X	__	__
☐ *No Sediment Controls are Required.*			

POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):

- ☐ *Vegetation Lined Drainage Ditch*
- ☐ *Retention/Irrigation*
- ☐ *Erosion Control Compost*
- ☐ *Grassy Swales*
- ☐ *Vegetative Filter Strips*
- ☒ *No Post Construction TSS Control Required.*

SEQUENCE OR SCHEDULE OF IMPLEMENTATION:

1. *Install Erosion Control Logs*
2.
3.
4.
5.
6.
7.
8.

The dates of major grading activities, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization practices are initiated, are available in the project diary or SW3P. Stabilization measures must be initiated as soon as practicable in portions of the site where construction has temporarily or permanently ceased. The Odessa District is located in a semi-arid area and the 14 and 21 day requirements are not applicable except, as directed by the Engineer.

3. STRUCTURAL CONTROL PRACTICES:

Structural control practices for this project are listed elsewhere herein.

4. PERMANENT STORM WATER CONTROLS:

Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed; riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

5. OTHER CONTROLS:

OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. Stabilized Construction Entrances and Exits shall be constructed per the plans or as directed by the Project Engineer. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

CONSTRUCTION AND WASTE MATERIALS: The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. 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 stream bed.

POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION: Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

5. OTHER CONTROLS (CONT):

DEDICATED ASPHALT PLANTS: Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

DEDICATED CONCRETE PLANTS: Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be wasted or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

HAZARDOUS MATERIALS AND SPILL REPORTING: The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

OFF SITE PSLs: All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

SANITARY FACILITIES: All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the laboratory and construction site or as directed by the Project Engineer.

VELOCITY DISSIPATION DEVICES: Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

6. APPROVED STATE AND LOCAL PLANS:

This SW3P is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

7. MAINTENANCE:

Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

8. INSPECTION OF CONTROLS:

A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SW3P will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every month and within 24 hours after the end of a storm event of 0.5 inches or greater. The SW3P will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SW3P and implemented as soon as practicable. Rain gages will be maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SW3P file.

9. NON-STORM WATER COMPONENTS:

The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.

STATE OF TEXAS
SAUL ROMERO
118987
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Saul Romero, PE 10/19/2022
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SW3P NOTES

Texas Department of Transportation

REV: 10-25-16

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			204
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	MIDLAND, ETC.	
CONT.	SECT.	JOB	HIGHWAY NO.
2906	01	006, ETC.	RM 1492

DATE:
FILE:

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. Unnamed tributary to Mayfield Draw

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☐ Silt Fence	☒ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☒ Compost Filter Berm and Socks	☒ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. Contractors would be advised to avoid this species if encountered in the project area and to avoid harvester ant mounds where feasible.
2. Contractors will avoid harm to migratory birds, eggs, and active nests. Inactive nests and/or vegetation suspected to contain nests should be removed outside of nesting season. Nesting season is typically March 15 to September 15.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☐ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation

Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	2906	01	006, ETC.	RM 1492	
	DIST	COUNTY		SHEET NO.	
	ODA	MIDLAND, ETC.		205	