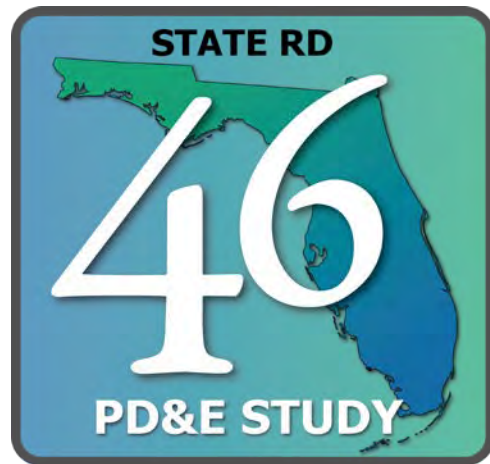


LOCATION HYDRAULICS REPORT



SR 46 PD&E Study
from SR 415 to CR 426

Seminole County, Florida

FPN 240216-4-28-01

April 2014



PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with URS Corporation, a corporation, authorized to operate as an engineering business, Certificate of Authorization No. 000002, by the State of Florida, Department of Business and Professional Regulation, Board of Professional Engineers, and that I have reviewed or approved the evaluation, findings, opinions, conclusions, or technical advice hereby reported for:

Project: SR 46 PD&E Study from SR 415 to CR 426

FPN: 240216-4-28-01

Location: Seminole County, Florida

Client: Seminole County and FDOT – District Five

This Location Hydraulics Report includes a summary of data collection efforts and conceptual drainage analyses prepared for conceptual analyses for the SR 46 PD&E Study from SR 415 to CR 426. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of civil engineering as applied through design standards and criteria set forth by the federal, state, and local regulatory agencies as well as professional judgment and experience.

Name: Danh Lee, P.E.

Signature: 

P.E. Number: 68228

Date: 04/02/2014

Address: URS Corporation
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Suite 245
Orlando, FL 32801

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Exhibit 3	Typical Sections
Exhibit 4	Build Alternatives Table
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APPENDICES

Appendix A	Pond Alternatives Location Plans
Appendix B	FDOT Straight Line Diagram of Road Inventory
Appendix C	Cross Drain Photos
Appendix D	Cross Drains Analysis
Appendix E	100-Year Floodplain Analysis
Appendix F	Correspondence

1.0 INTRODUCTION

Seminole County and the Florida Department of Transportation (FDOT) District 5 have initiated a Project Development and Environment (PD&E) Study to widen State Road 46 (SR 46) from a two lane rural roadway to a four lane divided facility from East of SR 415 to CR 426 in Seminole County, Florida. The purpose of the proposed improvements is to improve the mobility in the SR 46 corridor to accommodate future projected traffic demand in the Design Year (2035) safely and efficiently. Exhibit 1 shows the project location and study limits.

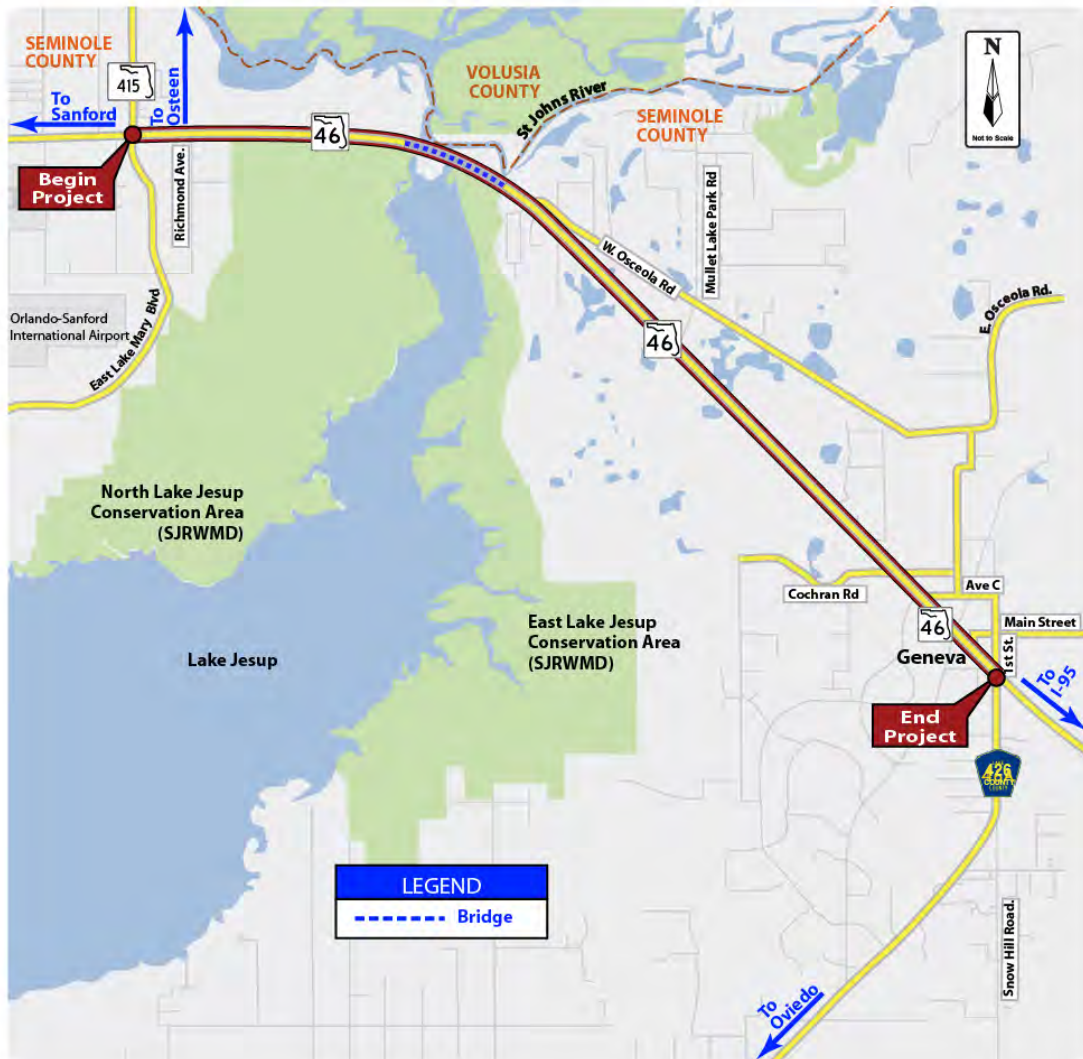


Exhibit 1 – Project Location Map

2.0 PURPOSE

According to the executive order 11988 “Floodplain Management”, USDOT Order 5650.2 “Floodplain Management and Protection” and Federal Aid Policy Guide 23 CFR 650A, floodplains and floodways protection is required. The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains where practicable and to avoid supporting land use development, which is incompatible with floodplain values. Where encroachment is unavoidable, the regulations require the FDOT to take appropriate measures to minimize impacts.

This Location Hydraulics Report has been prepared for Seminole County and the FDOT District 5 to assess potential impacts as a result of widening SR 46 on base floodplains and regulatory floodways if any to comply with the above regulations and 23 CFR 771.

This report is consistent with the FDOT guideline and procedure identified in the FDOT Drainage Manual, Storm Water Management Facility Handbook, Drainage Handbook of Hydrology, Storm Drains, and Cross Drains and FDOT PD&E Manual, and also the St. Johns River Water Management District (SJRWMD) Manual.

Information concerning floodplains, basin delineation, basin area, culvert data and locations used in the preparation of this report were obtained from the following sources:

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Seminole County
- United State Geological Survey (USGS) Maps (Osteen and Geneva)
- USDA Natural Resources Conservation Service (NRCS) Soil Survey of Seminole County and Volusia County
- FDOT Construction Plans of SR 46, Financial Project ID No(s). 240163-1-52-01, 240216-2-52-01, 417178-1-52-01, and 7704-105.
- FDOT Construction Plans of SR 415, Financial Project ID No(s). 407355-1-52-0
- FDOT Straight Line Diagram of Road Inventory (Appendix B)
- Centex Homes Construction Plans of Sterling Meadows, SJRWMD Permit No. 4-117-51666-2
- Seminole County GIS Lidar Data, 1 foot contours
- Field investigation

3.0 PROJECT DESCRIPTION

SR 46 is classified as a Rural Principal Arterial within the project limits. The portion of SR 46 included in this Location Hydraulic Report (LHR) has limits from SR 415 to CR 426 in Seminole County, a distance of approximately 7.4 miles. The project limits encompass USGS quad maps T19S-R31E, T20S-R31E, and T20S-R32E (See Exhibit 2A & 2B).

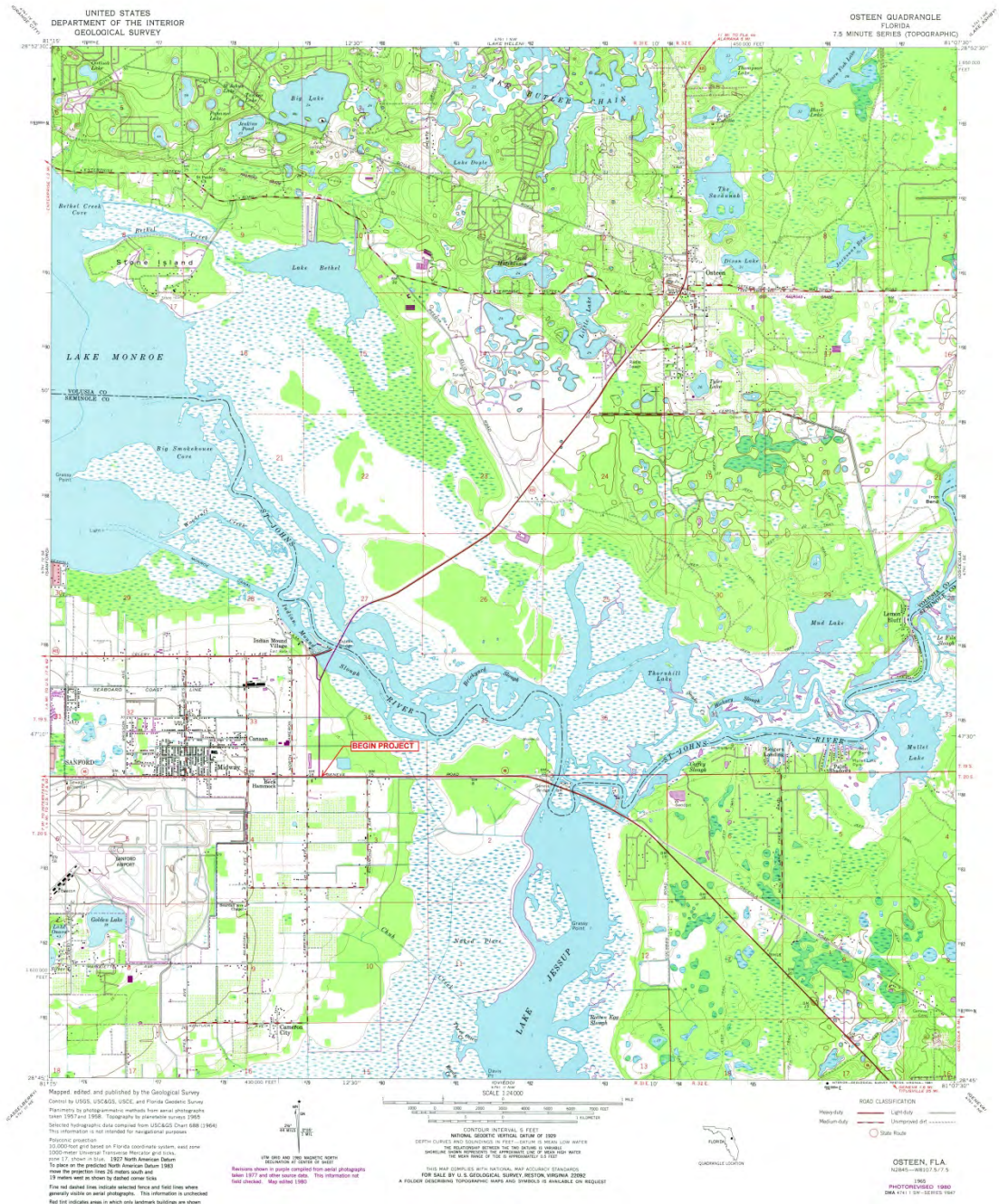


Exhibit 2A – USGS Quad Map Osteen FL 1980

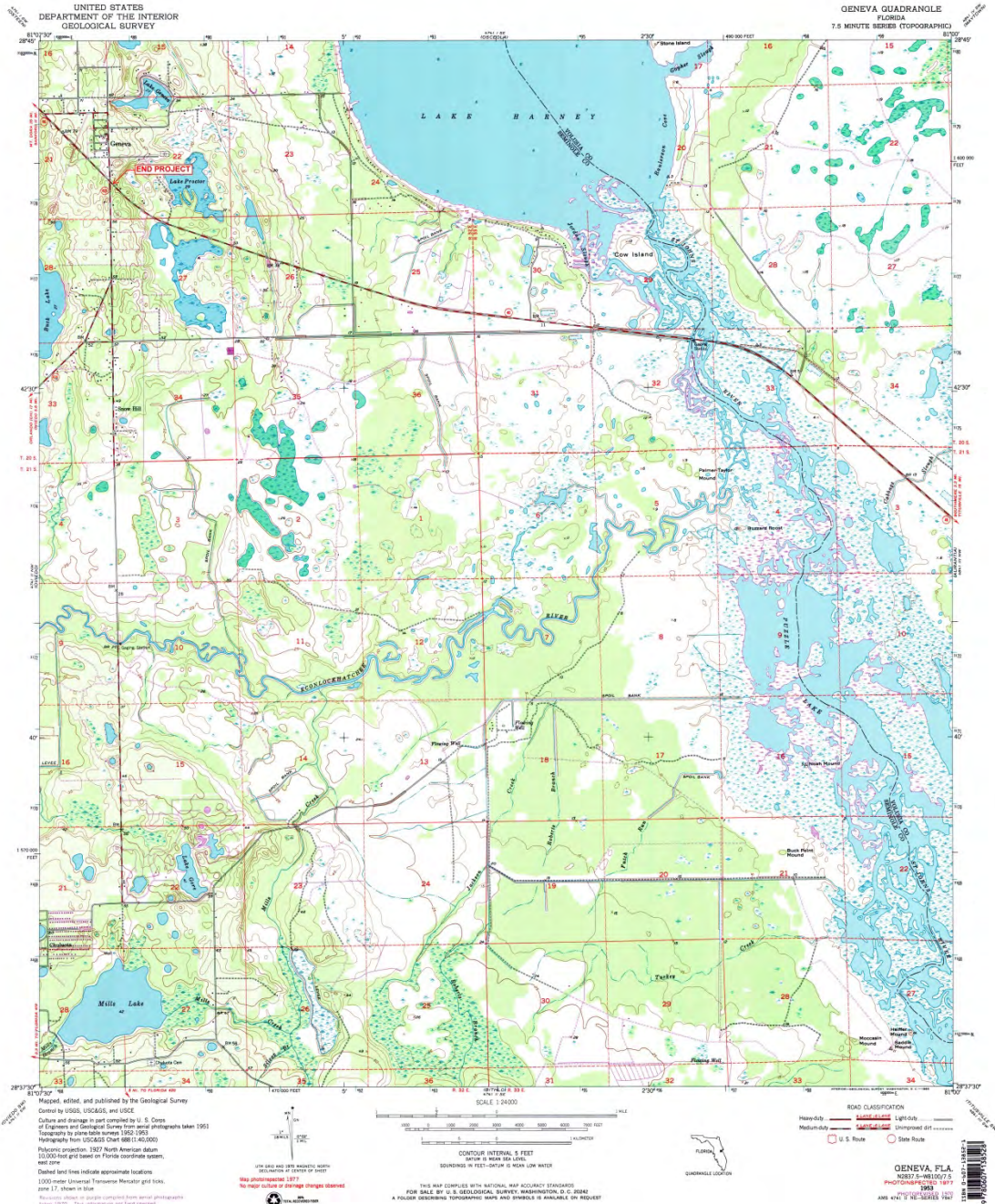


Exhibit 2B – USGS Quad Map Geneva FL 1977

Within the project limits, the existing typical roadway section of SR 46 (See Exhibit 3A) consists of a rural section with two 12-foot lanes and 6-foot (4-foot paved) outside shoulders.

For the purposes of analyzing build alternatives, the project was split into four segments as follows:

- Segment 1 – SR 415 to the west end of the Lake Jesup/St. Johns River Bridge

- Segment 2 – The Lake Jesup/St. Johns River Bridge
- Segment 3 – The east end of the Lake Jesup/St. Johns River Bridge to Hart Rd
- Segment 4 – Hart Road to CR 426

Two typical sections, rural and suburban, were analyzed for the widening of SR 46 between SR 415 and Hart Road and an urban typical section is proposed for the widening of SR 46 from Hart Road to CR 426. For the rural and suburban typical sections, a widen north and a widen south option was explored.

The rural typical section includes two 12-foot lanes in each direction with eight-foot (two-foot paved) inside shoulders and 10-foot (five foot paved) outside shoulders, which serve as undesignated bicycle lanes. A 40-foot median separates the travel lanes. Conveyance swales are provided on each side of the roadway within the 36-foot clear zone. The design speed of the rural typical section is 60 mph and it requires a minimum of 188 feet of right-of-way (See Exhibits 3B and 3C).

The suburban typical section includes two 12-foot lanes in each direction with four-foot inside shoulders and 6.5-foot outside shoulders, which serve as undesignated bicycle lanes. A 30-foot median separates the travel lanes and type E curb and gutter is proposed on both the inside and outside edges of pavement. Within the 30-foot clear zone are a 10-foot asphalt shared-use-path on the north side of the roadway and a five-foot concrete sidewalk on the south side. The design speed of the suburban typical section is 55 mph and it requires a minimum of 148 feet of right-of-way (See Exhibits 3D and 3E).

The urban typical section includes one 12-foot lane and one 11-foot lane in each direction with four-foot outside shoulders, which serve as designated bicycle lanes. A 22-foot median separates the travel lanes with type E curb and gutter proposed on the inside edge of pavement and type F curb and gutter proposed on the outside edge of pavement. Within the 12-foot border width is an eight-foot sidewalk on the north side of the roadway and a six-foot concrete sidewalk on the south side. The design speed of the suburban typical section is 45 mph and it requires a minimum of 100 feet of right-of-way (See Exhibit 3F).

In addition to the three proposed alternative typical sections, there will also be construction of a new bridge, parallel to the existing bridge over Lake Jesup. Two bridge typical sections were developed, one with a shared use path and one without. Both bridge typical sections retain the existing bridge as the future eastbound lanes. The proposed westbound lanes, to be built upon the alignment of the old bridge and causeway that was removed during the construction of the existing bridge, provides two 12-foot lanes, a six-foot inside shoulder and a 10-foot outside shoulder. The typical section without the shared-use path is intended for use with the rural roadway typical section, and maintains the 40-foot median (See Exhibit 3G). The typical section with the shared-use path is intended for use with the suburban typical section, and maintains a 30-foot median (See Exhibit

3H). The shared use path is barrier-separated from the travel lanes and is 10 feet wide.

The existing and proposed typical sections are shown in Exhibit 3A thru Exhibit 3H.

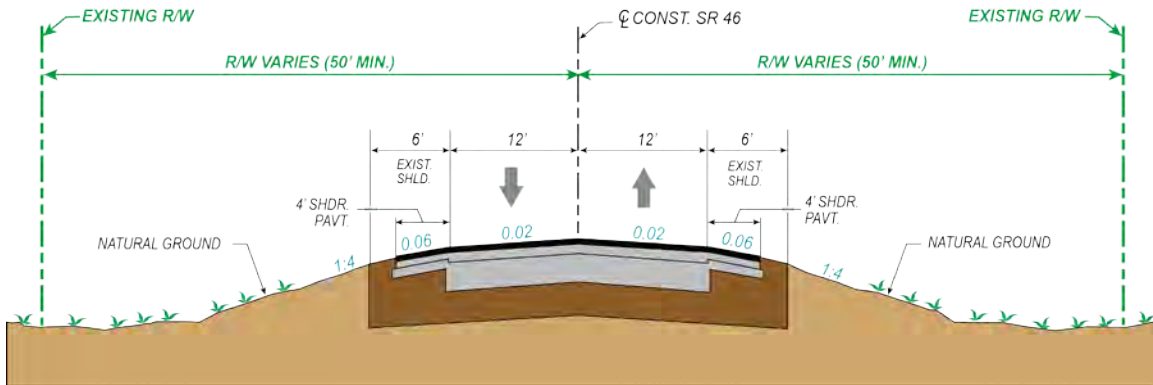


Exhibit 3A - Existing Typical Section

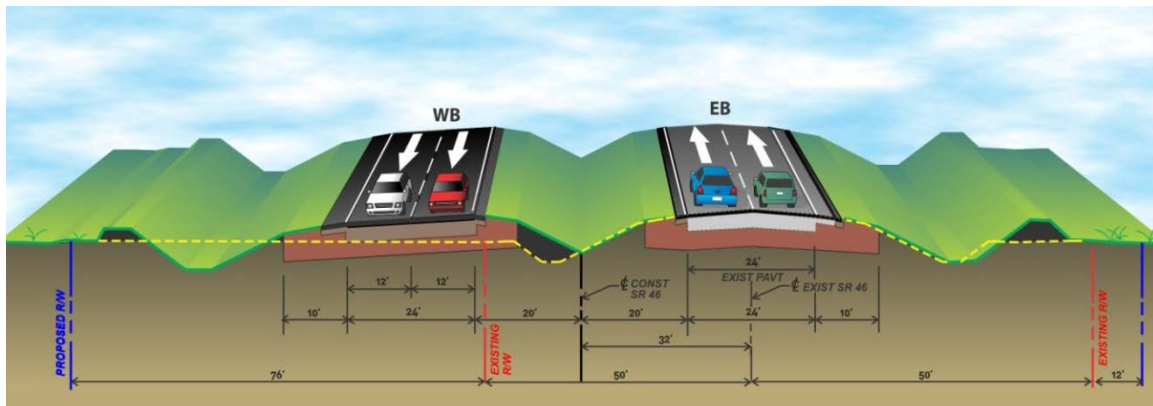


Exhibit 3B-Rural Typical Section-Widen to the North

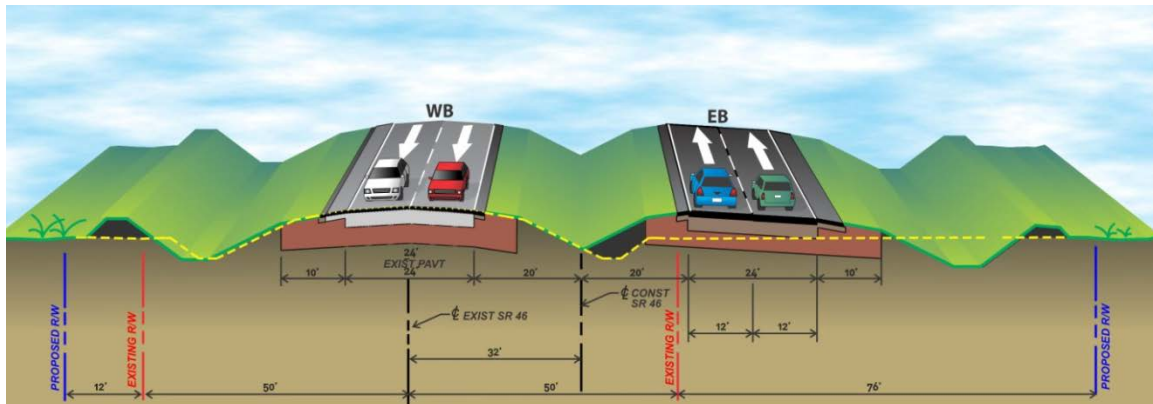


Exhibit 3C-Rural Typical Section-Widen to the South

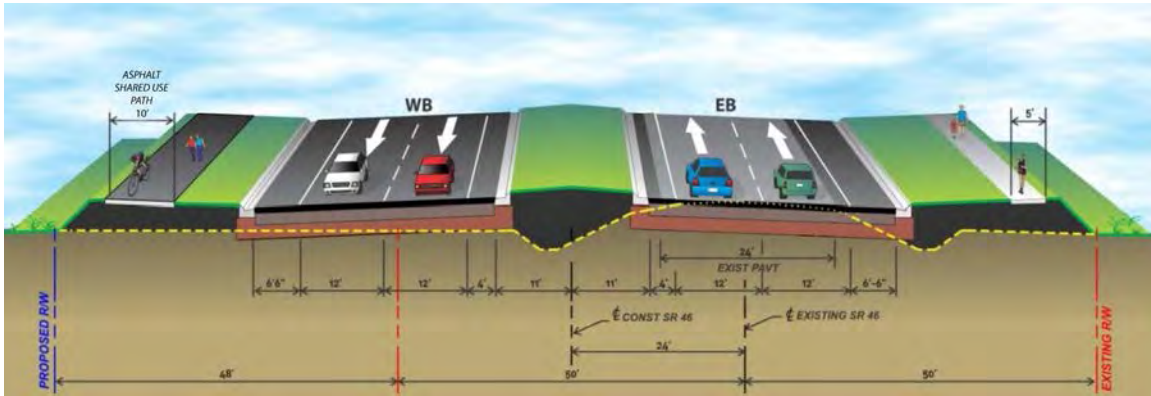


Exhibit 3D-Suburban Typical Section-Widen to the North

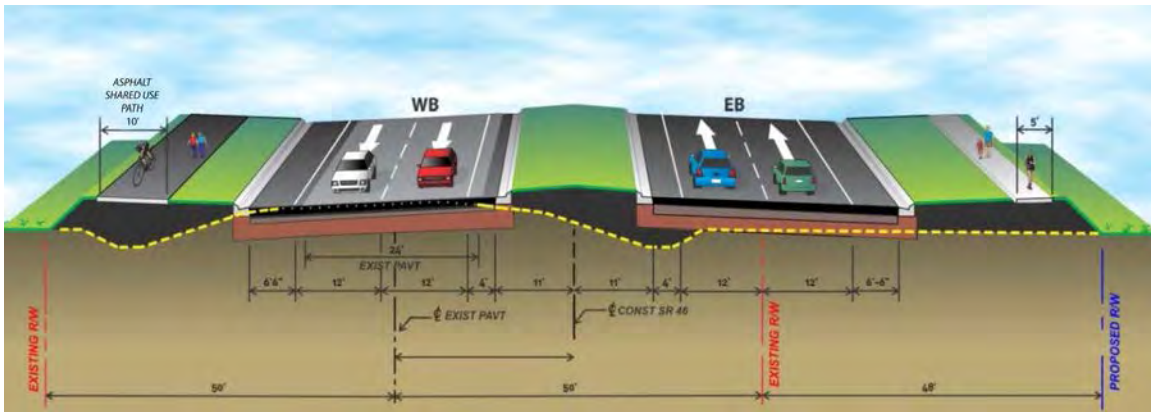


Exhibit 3E-Suburban Typical Section-Widen to the South

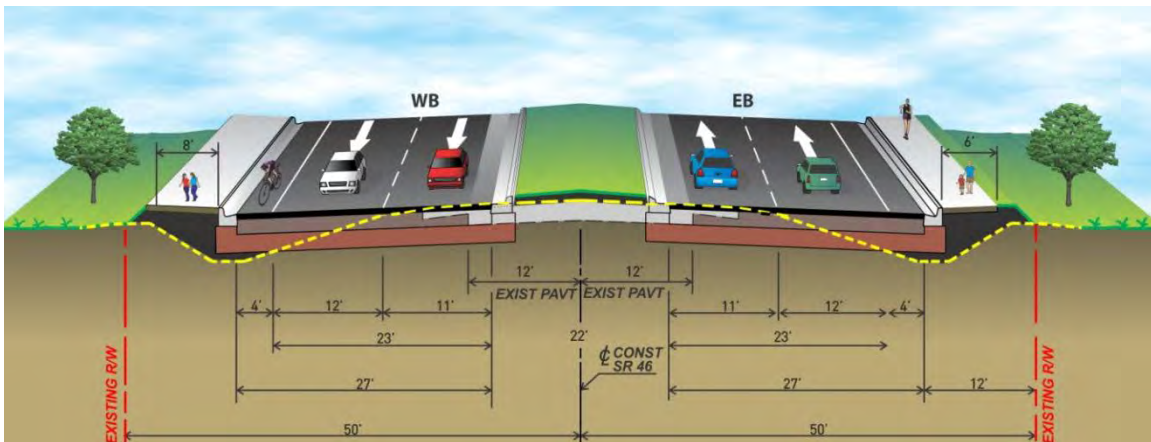


Exhibit 3F-Urban Typical Section-Centered Widening

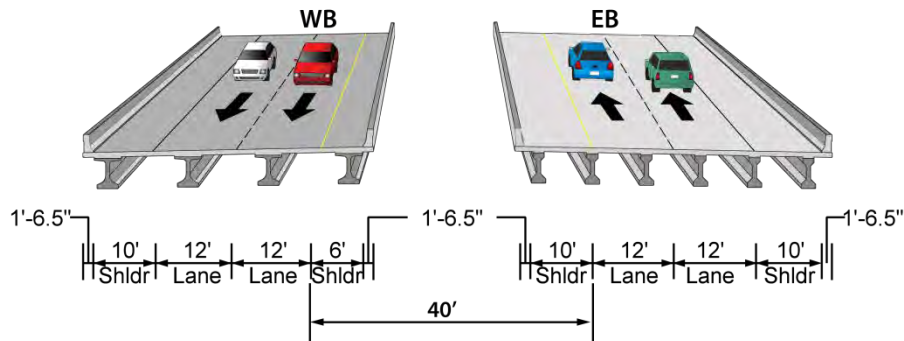


Exhibit 3G-Bridge Typical Section without Shared Use Path

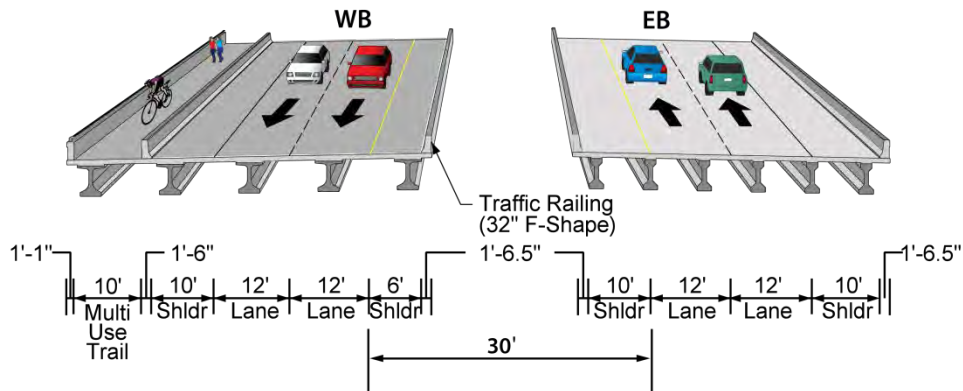


Exhibit 3H-Bridge Typical Section with Shared Use Path

Once the typical sections were identified, typical section alternatives were selected by segment.

Segment 1

In order to minimize impacts to existing conservation easements both north and south of SR 46 within this segment, only the suburban typical sections will be considered for Segment 1. Alternative 1 uses the Suburban – Widen North typical section and Alternative 2 uses the Suburban – Widen South typical section.

Segment 2

Segment 2 is the bridge typical section and is dependent on the typical section selected for Segment 3 as indicated above. The Bridge with Shared Use Path typical section is compatible with the suburban typical section and the Bridge without Shared Use Path is compatible with the rural typical section.

Segment 3

Both the rural and suburban typical sections are appropriate for use within Segment 3. Both typical sections will be evaluated and vary between north and south widening in order to minimize impacts to both the natural, physical and social environments. These combinations of north and south widening are known as the Rural Best Fit and Suburban Best Fit alternatives.

Segment 4

Only the urban typical section is being analyzed for Segment 4 in order to minimize right-of-way acquisition to the commercial land uses in the downtown Geneva area.

Full Build Alternatives can be developed from the alternatives listed for each segment. The bridge with the shared use path is compatible with the Suburban Best Fit Alternative, and the bridge without the shared use path is compatible with the Rural Best Fit Alternative. The Segment 1 typical section alternatives are interchangeable and the Segment 4 typical section alternative works with either the Suburban or Rural Best Fit alternatives. Exhibit 4 lists the potential Build Alternatives and associated pond right-of-way acreage for the widening of SR 46.

Build Alternative	Segment 1	Segment 2	Segment 3	Segment 4	Required Pond R/W (ac)
1	Suburban North	Bridge with Path	Suburban Best Fit	Urban	65.7
2	Suburban South	Bridge with Path	Suburban Best Fit	Urban	65.7
3	Suburban North	Bridge without Path	Rural Best Fit	Urban	59.0
4	Suburban South	Bridge without Path	Rural Best Fit	Urban	59.0

Exhibit 4 – Build Alternatives Table

4.0 EXISTING DRAINAGE CHARACTERISTICS

SR 46 is located within the jurisdiction of the SJRWMD. According to the USGS quadrangle maps, the approximate ground surface elevation within the project limits range from as low as approximately +5 feet to high as approximately +75 feet. The elevations are based on 1929 National Geodetic Vertical Datum (NGVD). The project limits lie within the Middle St. Johns River Basin of which Lake Jesup is a tributary. The Middle St. Johns River Basin is considered an open basin that discharges to the St. Johns River, which is not considered an Outstanding Florida Waters (OFW). However, the Florida Department of Environmental Protection (FDEP) has adopted Total Maximum Daily Loads (TMDL) for both nitrogen and phosphorus for any basin discharging to the St. Johns River above Lake Monroe, Lake Jesup near St. Johns River, and the St. Johns River above Lake Jesup. Also, 100-year floodplains are found within the project limits with the majority being located around the bridge over Lake Jesup.

In general, stormwater discharged from SR 46 is not treated within the project limits. The existing typical section of SR 46 is crowned and the travel lanes and outside shoulders slope to the outside into existing roadside ditches. The roadside ditches then convey the stormwater runoff to several existing cross drains. The cross drains then conveys the runoff into various wetland areas found within the project limits, which ultimately discharge to the St. Johns River.

The only area currently treated is within the limits of the bridge replacement project, over Lake Jesup, which was constructed in 2009. The new bridge and approaches are being treated by existing stormwater treatment wet detention pond(s) 1 and 2. The ponds are located west and east of the bridge, respectively. Stormwater runoff from the high point of the bridge to the west end of the project is collected and conveyed to existing Pond 1 by a series of shoulder gutter inlets and ditch bottom inlets. Stormwater runoff from the high point of the bridge to the east end of the project is collected and conveyed to existing Pond 2 by a series of bridge scuppers, shoulder gutter inlets, and ditch bottom inlets. The bridge scuppers are connected to fiber reinforced concrete pipes that hang beneath the south side of the bridge.

5.0 PROPOSED DRAINAGE DESIGN

The same four design segments were used to analyze the proposed drainage design as follows:

- Segment 1 – SR 415 to the west end of the Lake Jesup/St. Johns River Bridge
- Segment 2 – The Lake Jesup/St. Johns River Bridge
- Segment 3 – The east end of the Lake Jesup/St. Johns River Bridge to Hart Rd
- Segment 4 – Hart Road to CR 426

Segment 1

In order to minimize impacts to existing conservation easements both north and south of SR 46 within this segment, only the suburban typical sections will be considered for Segment 1. The stormsewer system will be designed to collect stormwater runoff from the new lanes by a series of curb and gutter inlets and convey it to proposed Pond A for both the widen north and widen south typical sections. If the widen north alternative is selected, existing Pond 1 will be impacted; therefore, the pond will be modified to accommodate the reduction in treatment volume within this pond. Also, Floodplain Compensation Pond 1 is proposed within this segment to compensate for 100-year floodplain impacts. The ponds have been designed to provide water quality, quantity and compensation for any loss of floodplain volumes.

Segment 2

Segment 2 is the bridge typical section and is dependent on the typical section selected for Segment 3. Both existing Pond 1 and Pond 2 will be modified to provide additional treatment and attenuation of stormwater runoff from the new parallel bridge. The basin limits for existing Pond 1 and Pond 2 will remain the same as delineated in the bridge replacement project. The Pond 1 stormsewer system will be designed to collect stormwater runoff from Station 75+40 to the high point of the new and existing bridge by a series of curb and gutter inlets. The Pond 2 stormsewer system will be designed to collect stormwater runoff from the high point of the new and existing bridge to Station 158+15 by a series of bridge scuppers and curb and gutter inlets, if a suburban typical section is selected for Segment 3. Shoulder gutter inlets and ditch bottom inlets will replace the curb and gutter inlets, if a rural typical section is selected for Segment 3. Also, 100-year floodplain impacts within this segment will be compensated by Floodplain Compensation Pond 1, mentioned previously, and Floodplain Compensation Pond 2, which will be mentioned in Segment 3.

Segment 3

Both the suburban and rural typical sections are appropriate for use within Segment 3. If the suburban typical section is selected, stormwater runoff will be treated and attenuated by modified existing Pond 2 and proposed Pond(s) B through G. The stormsewer system will be designed to collect stormwater runoff from the new lanes by a series of curb and gutter inlets and convey it to the proposed Ponds within this segment. If a rural typical section is selected, roadside treatment swales will replace proposed Pond(s) E through G. Also, the curb and gutter inlets proposed for the stormsewer system will be replaced with ditch bottom inlets for conveyance. In addition, 100-year floodplain impacts within this segment will be compensated by Floodplain Compensation Pond 2 and proposed ditches.

Segment 4

Only the urban typical section is being analyzed for Segment 4 in order to minimize right-of-way acquisition to the commercial land uses in the downtown Geneva area. The stormsewer system will be designed to collect stormwater runoff from the new lanes by a series of curb and gutter inlets and convey it to proposed Pond H for this segment.

6.0 CROSS DRAINS

There are a total of 9 cross drains within the limits of this project ranging from 18" RCP to double 8' X 3' CBC (See Exhibit 5). All the existing cross drains have been numbered and are shown on the Pond Alternatives Location Plans (See Appendix A). There is also one existing bridge over Lake Jesup that was recently constructed in 2009. As part of the proposed roadway improvements, a parallel bridge will be constructed on the north side of the existing bridge.

According to the FDOT Maintenance Department, all of the cross drains are in good physical condition; however, there are two locations where there has been record of flooding problems on the downstream side of the cross drains. The first location being in the vicinity of CD-4, north of SR 46 and east of Mullet Lake Park Road. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located through downstream private properties and the ultimate outfall of the conveyance system leading into the St. Johns River. The second location being in the vicinity of CD-5, north of SR 46 and east of Mockingbird Lane. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located within the downstream private property into which the cross drain discharges before entering the wetland located within this property. The FDOT Maintenance Department does not believe that the existing cross drains are undersized in these locations, but the problems exist due to the lack of positive drainage grading within downstream private properties and that the problems cannot be fixed without some type of drainage easement. (Appendix F shows records of telephone conversations). The fact that the flooding occurs on the downstream side of the existing cross drains would indicate that the size of the existing cross drains are most likely not the cause of the flooding.

Field investigation was also conducted for all the existing cross drains within the project limits. Field inspection revealed a discrepancy with the FDOT Straight Line Diagram of Road Inventory for CD-4. The inventory shows this cross drain as a double 8' X 2' CBC, but field measurements indicate this cross drain is actually a double 8' X 3' CBC (Appendix C show photos of all cross drains). Several of the cross drains contain PVC liners due to minor leaking at the joints according to the FDOT Maintenance Department. The FDOT Maintenance Department also stated that replacement of the existing cross drains should be examined to meet the design service life projected within this PD&E Study.

West of the St. Johns River Bridge, in Segment 1, there is only one cross drain (CD-1) which will be eliminated once the proposed improvements are complete at the intersection of SR 415 and SR 46 under the FDOT FPID 240216-2-52-01 project.

East of the St. Johns River Bridge, in Segment 3, the existing cross drains (CD-2 thru CD-8) were analyzed based on the worst case scenario only, which is the Rural Best Fit Option. The Rural Best Fit Option will require a greater extension length of the cross drains as compared to the Suburban Best Fit Option. The rural typical section will require the proposed length of the cross drains to be approximately 170 feet in length and will also result in a lower outside edge of pavement elevation due to the widening of SR 46. As a result, several of the cross drains will need to be upsized to maintain an allowable headwater elevation. The remaining cross drains, in Segment 3, will be replaced in kind to meet the design service life projected within this PD&E Study.

Between Hart Road to CR 426, in Segment 4, there is only one cross drain (CD-9) that was analyzed based on the urban typical section. The urban typical section will require the proposed length of the cross drains to be approximately 104 feet in length and will also result in a lower outside edge of pavement elevation due to the widening of SR 46. As a result, this cross drain will need to be upsized to maintain an allowable headwater elevation.

All proposed cross drains will be sized to ensure an allowable headwater elevation. The allowable headwater elevation was determined from an evaluation of land use upstream of the culvert and the proposed roadway elevation. The following factors were also considered in determining the allowable headwater elevation:

- Non-damaging or permissible upstream flooding elevations (e.g. existing buildings or Flood Insurance Regulations).
- State Regulatory Constraints (e.g. Water Management District).
- No encroachment into the proposed elevation of the outside edge of travel lane.

The cross drains were analyzed using FHWA's HY-8 program and the discharges were calculated using FDOT's velocity method. A summary of existing cross drains are shown in Exhibit 5 and Appendix D shows the cross drain analysis for both existing and proposed structures.

SUMMARY OF EXISTING CROSS DRAINS						
Structure No.	Station	Type	Size	Flow Line Left (ft) NAVD	Flow Line Right (ft) NAVD	Comments
CD-1	9+24	RCP	24"	12.56	10.72	Removed
CD-2	188+62	RCP w/ PVC Liner	24"	13.70	13.00	
CD-3	201+61	RCP w/ PVC Liner	24"	14.00	13.80	
CD-4	226+60	CBC	(2) 8'x3'	13.00	13.20	
CD-5	276+60	RCP w/ PVC Liner	(2) 24"	20.20	20.40	
CD-6	296+64	RCP w/ PVC Liner	24"	20.50	20.00	
CD-7	310+52	RCP w/ PVC Liner	24"	20.00	20.10	
CD-8	326+73	RCP w/ PVC Liner	24"	25.10	31.60	
CD-9	384+60	RCP w/ PVC Liner	18"	58.50	58.40	

Exhibit 5-Summary of Cross Drains

7.0 LAND USE

Existing land use along the project corridor west of the bridge and north of SR 46, the Bergmann Tract land is zoned vacant (other). West of the bridge and south of SR 46, the land is zoned agricultural, residential, and conservation. Existing land use along the project corridor east of the bridge is primarily residential single family. The parcels owned by the City of Sanford (Site 10) east of the bridge and south of SR 46 are zoned agricultural. Commercial land uses are clustered around the intersections of SR 46 with SR 415 and CR 426. Existing land use is shown on Exhibit 6A. The future land use for the project area is shown on Exhibit 6B. This project is consistent with the future land use identified in the Seminole County Comprehensive Plan.

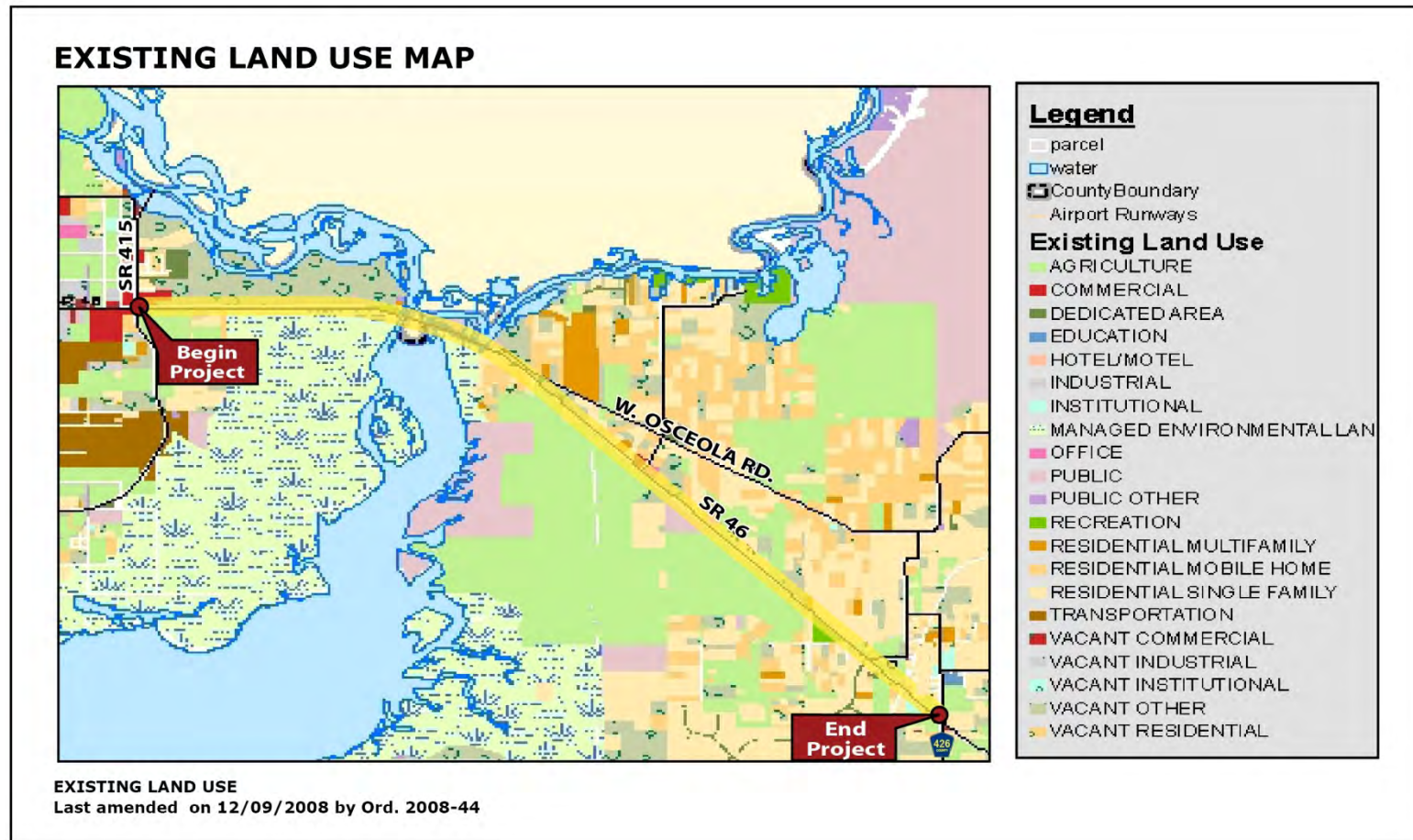
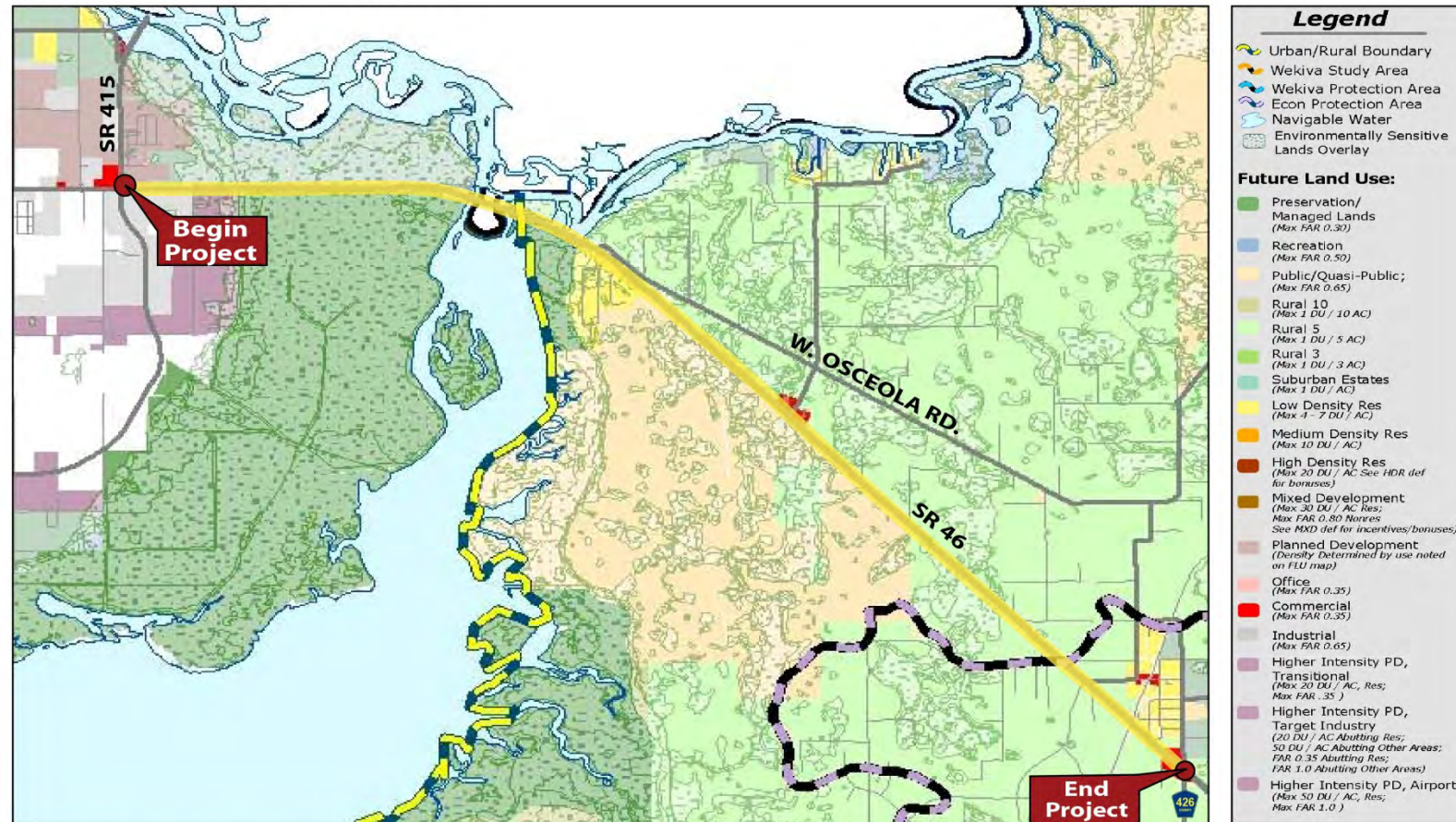


Exhibit 6A – Existing Land Use

FLU SERIES – FUTURE LAND USE MAP



FUTURE LAND USE
Last amended on 12/09/2008 by Ord. 2008-44

Exhibit 6B – Future Land Use

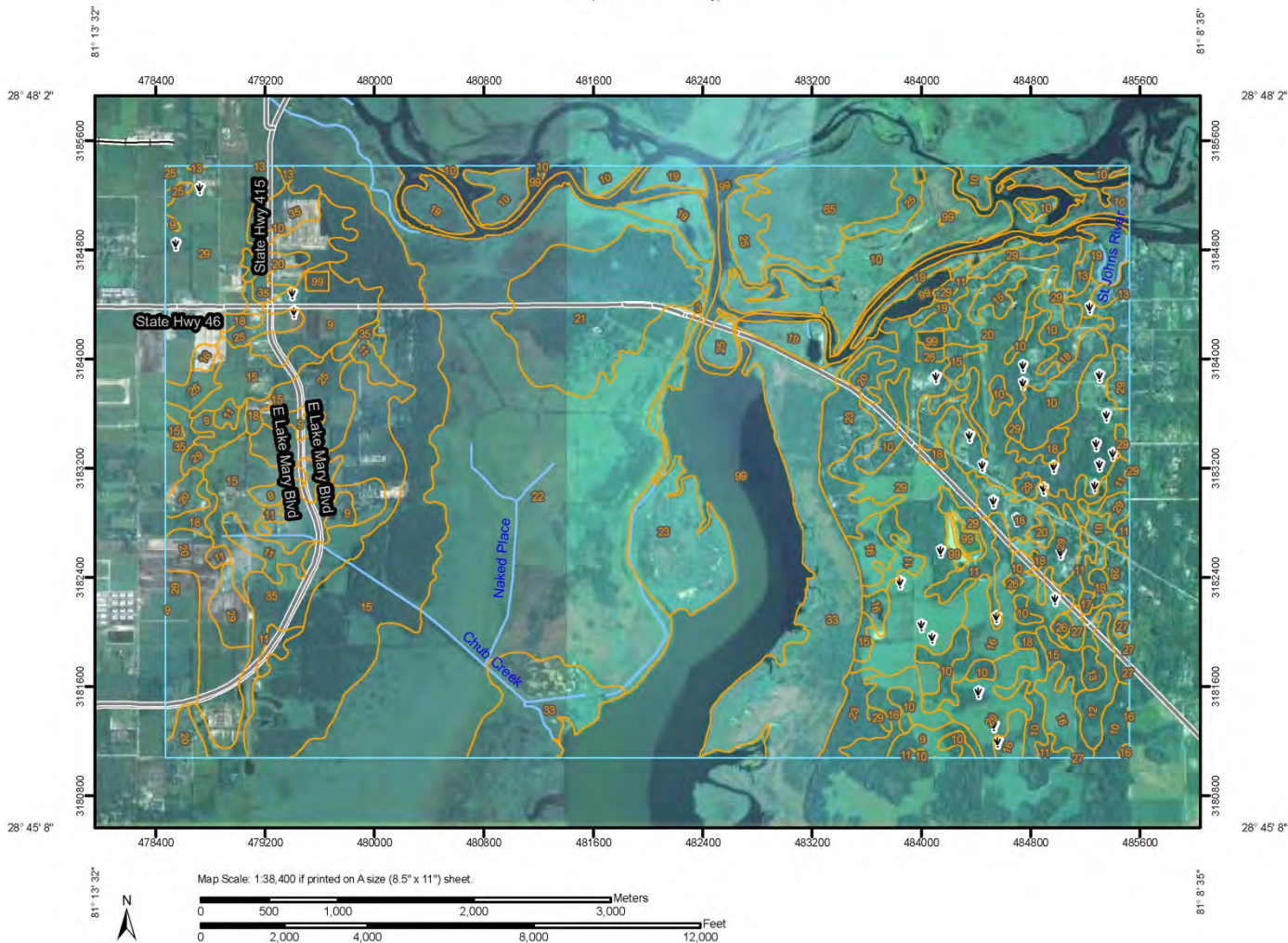
8.0 SOILS

Geotechnical information reviewed for this report included the 1990 Soil Survey for Seminole County, Florida, as prepared by the U.S. Department of Agriculture Natural Resources Conservation Service. Exhibit 7A lists the soils present in the project area and corresponds to the figures presented in Exhibits 7B and 7C.

Symbol	Soil Type
3	Arents, 0 to 5% slopes
9	Basinger and Delray fine sands
10	Basinger, Samsula and Hontoon soils, depressional
11	Basinger and Smyrna fine sands, depressional
12	Canova and Terra Ceia mucks
13	EauGallie and Immokalee fine sands
15	Felda and manatee mucky fine sands, depressional
16	Immokalee sand
17	Brighton, Samsula and Sanibel mucks
18	Malabar fine sand
19	Manatee, Floridana and Holopaw soils, frequently flooded
20	Myakka and EauGallie fine sands
21	Nittaw mucky fine sand, depressional
22	Nittaw muck, occasionally flooded
23	Nittaw, Okeelanta and Basinger soils, frequently flooded
25	Pineda fine sand
26	Udorthents, excavated
27	Pomello fine sand, 0 to 5% slopes
29	St. Johns and EauGallie fine sands
33	Terra Ceia muck, frequently flooded
35	Wabasso fine sand
99	Water

Exhibit 7A – Existing Soils Table

Soil Map—Seminole County, Florida, and Volusia County, Florida
(SR 46 PD&E Study)



USDA Natural Resources Conservation Service

Web Soil Survey National Cooperative Soil Survey

10/6/2011 Page 1 of 3

Exhibit 7B-Existing Soils Map (1 of 2)

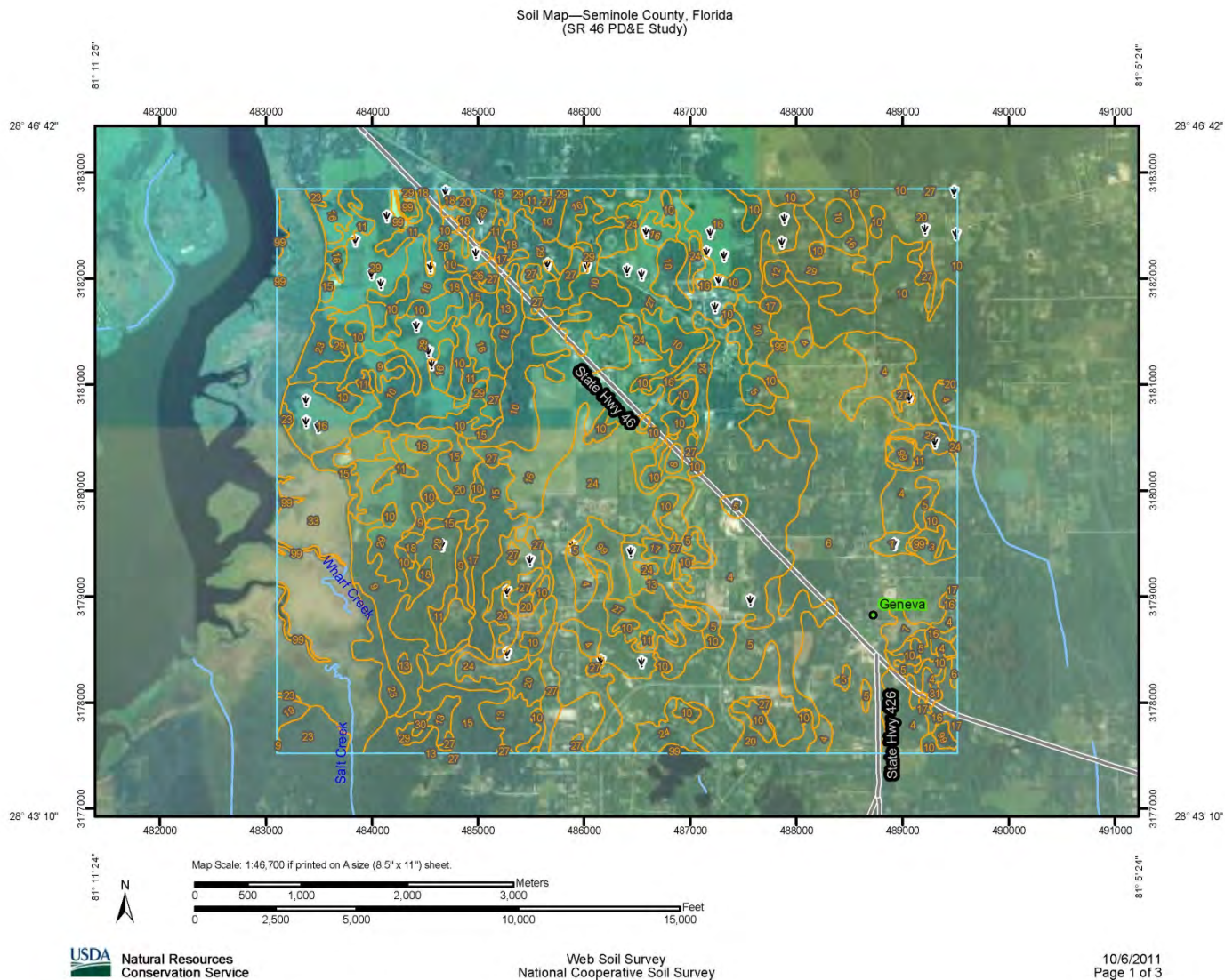


Exhibit 7C-Existing Soils Map (2 of 2)

9.0 FLOODPLAINS ANALYSIS

The original construction of SR 46 crosses several floodplain areas longitudinally. The floodplain locations were determined using the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for Seminole County, Florida and incorporated areas. The following Community-Panel Numbers were used in reference:

- 12117C0090F
- 12117C0095F
- 12177C0185F
- 12117C0205F

FEMA FIRM identified three floodplain zones present within the limits of this project. These zones are defined as follows:

- Zone AE – Base flood elevation determined (Elev. 9.0 ft, NAVD)
- Zone AE – Base flood elevation determined (Elev. 29.0 ft , NAVD)
- Zone A – No base flood elevation determined

Effective dates of these panels are September 28, 2007 (See Exhibit 8).

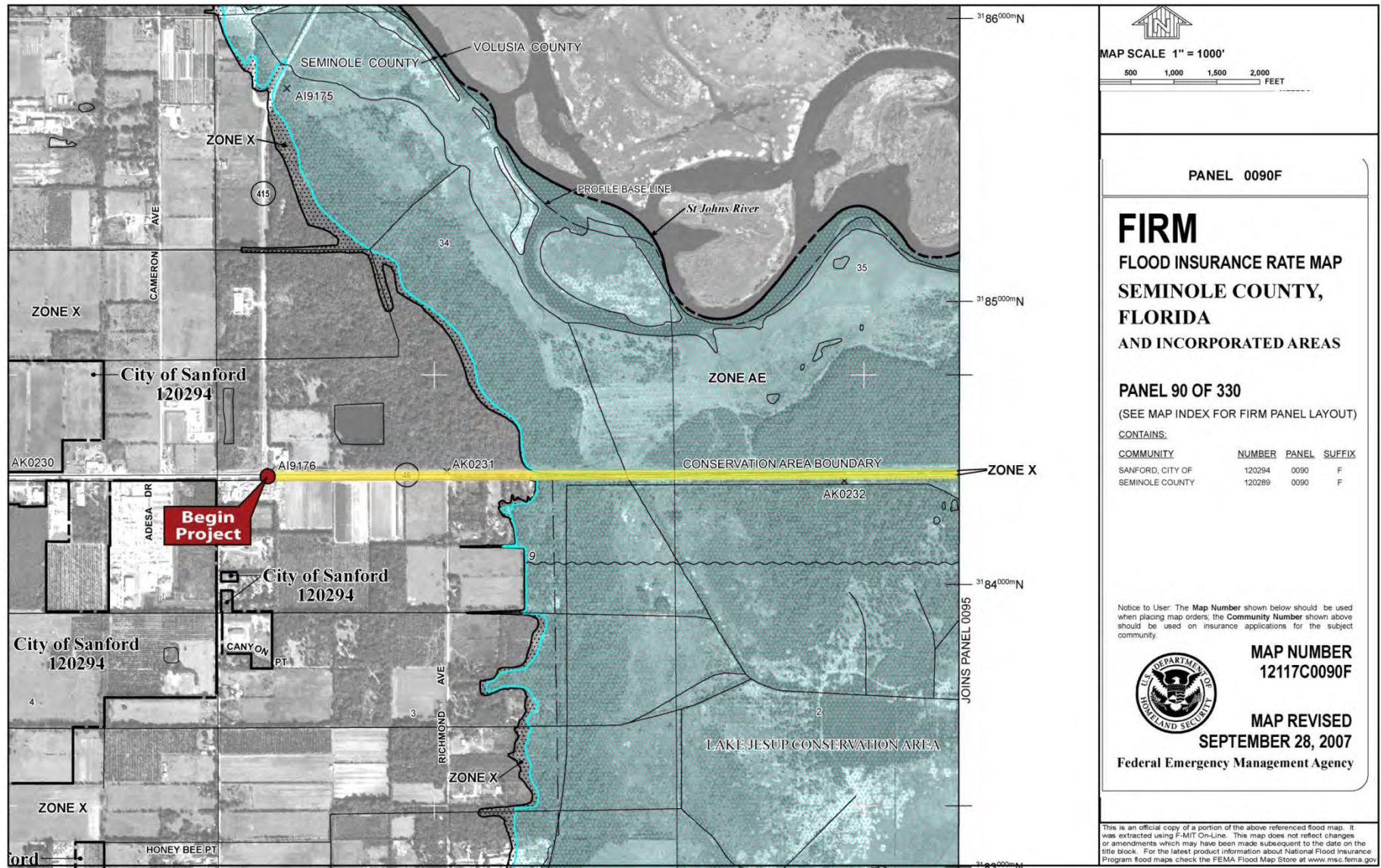


Exhibit 8 – FEMA FIRM Maps (1 of 5)

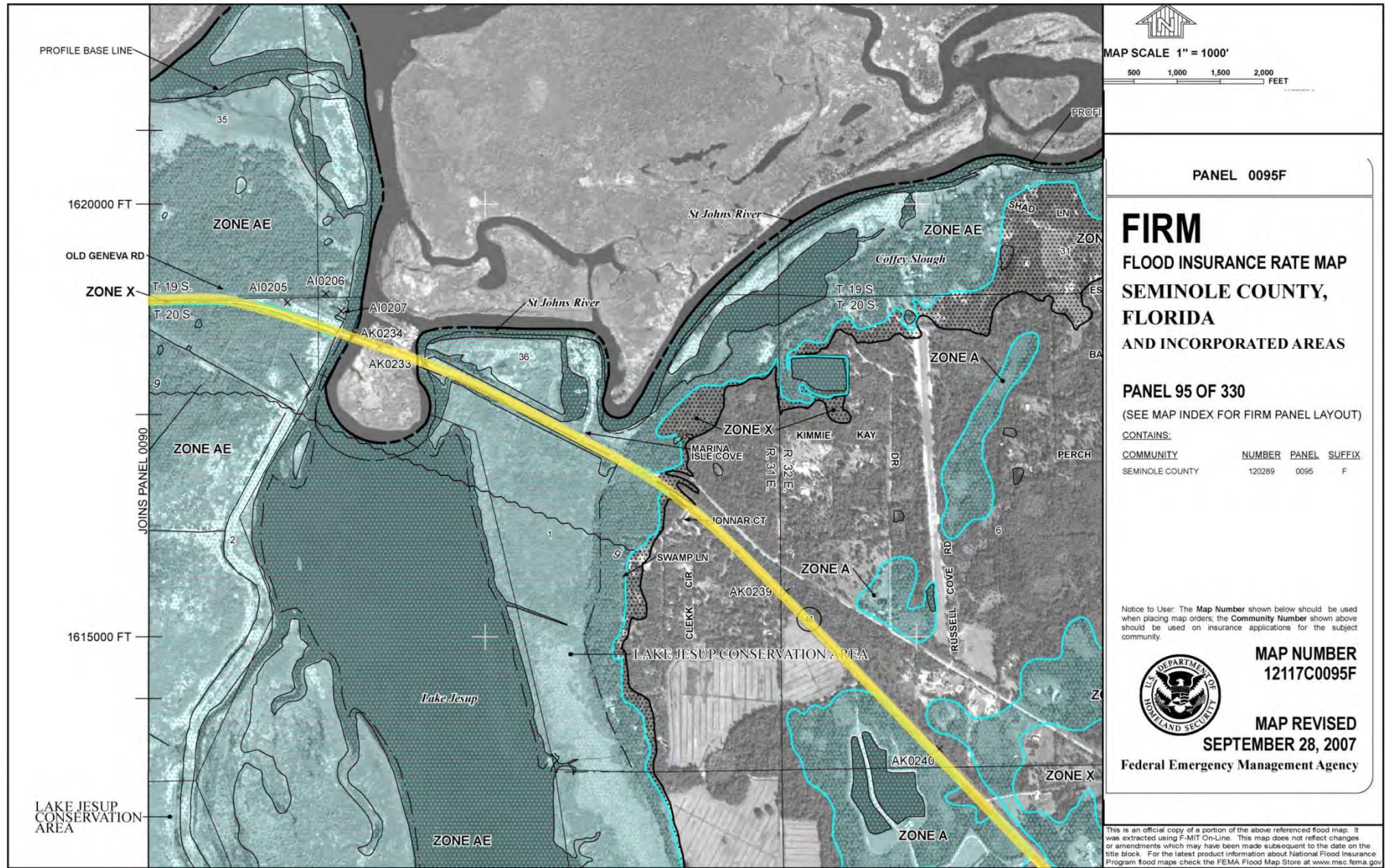


Exhibit 8-FEMA FIRM Maps (2 of 5)

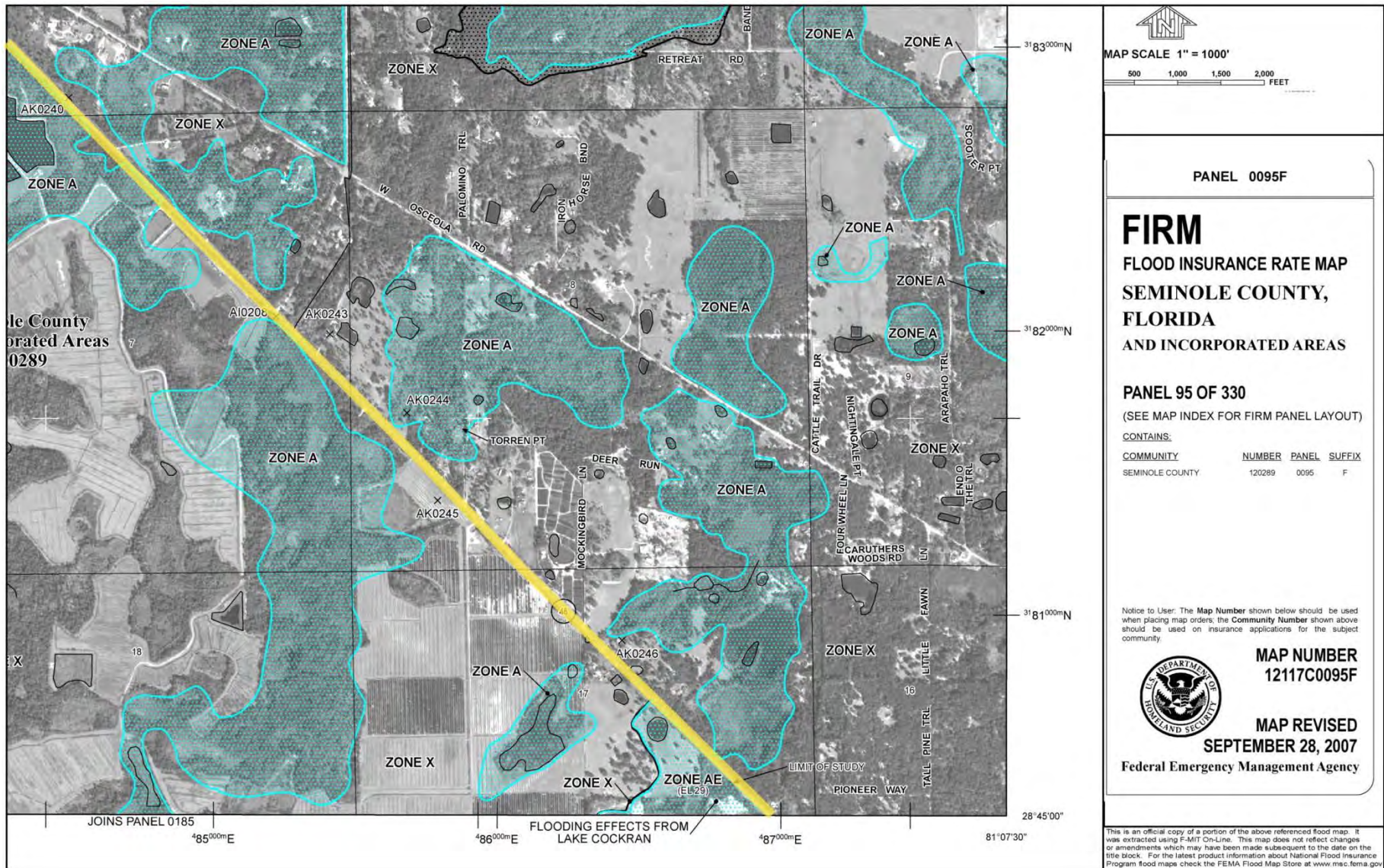


Exhibit 8 – FEMA FIRM Maps (3 of 5)

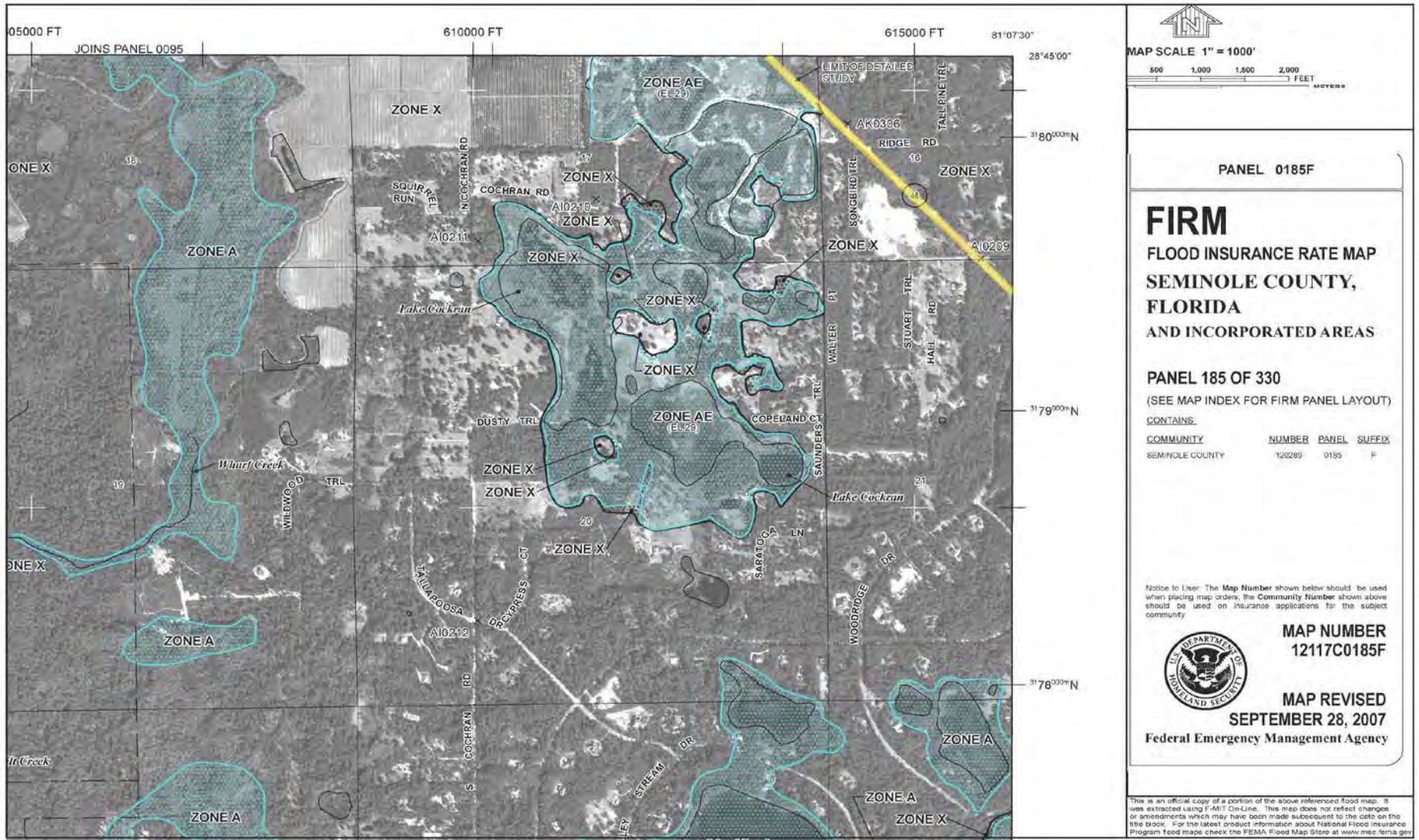


Exhibit 8 – FEMA FIRM Maps (4 of 5)

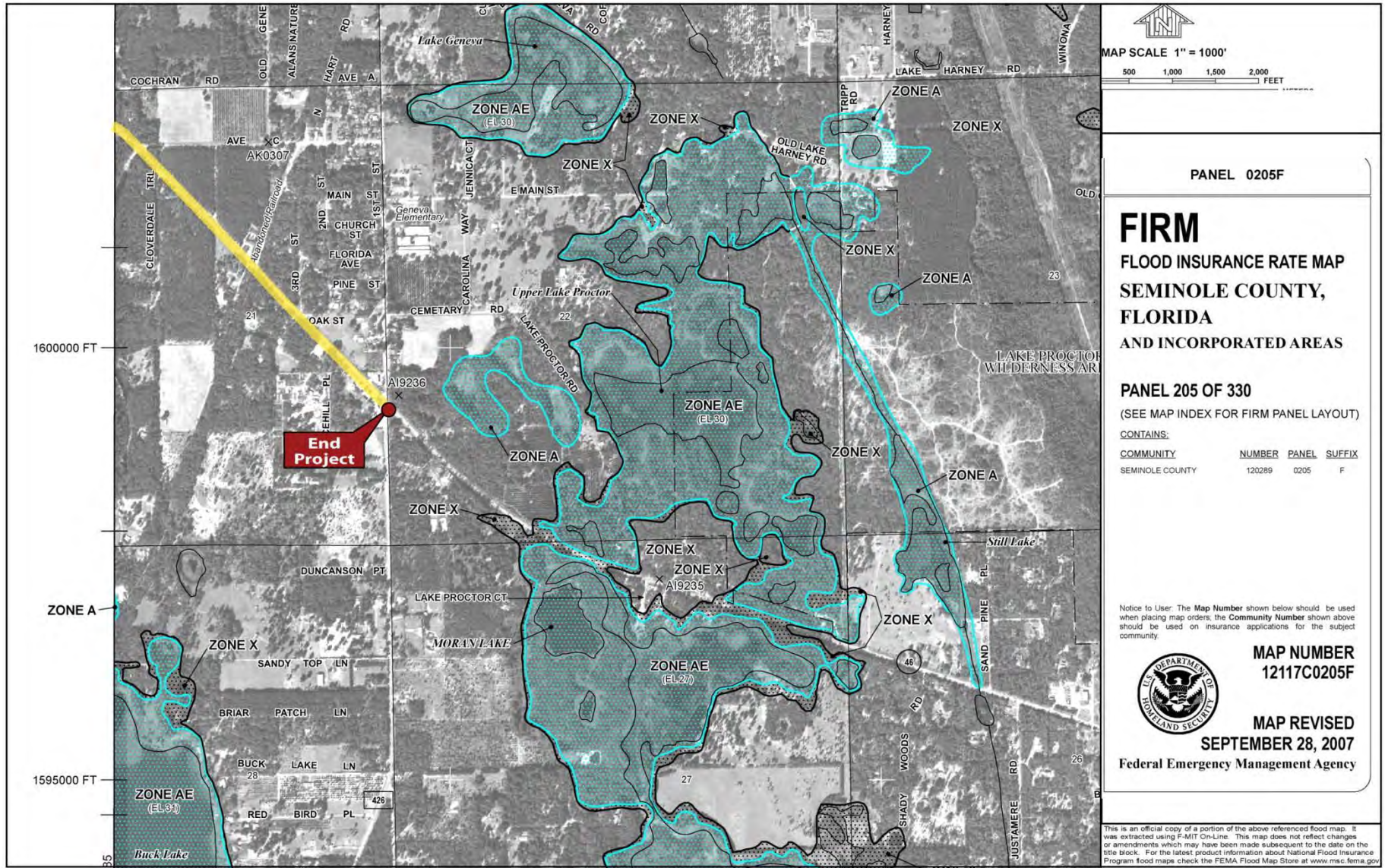


Exhibit 8 – FEMA FIRM Maps (5 of 5)

SR 46 within the limits of this project was constructed on fill and according to available information it appears that the highway is above the 100-year floodplain. An evaluation of 100-year floodplain conditions for this project has been performed to determine the impacts from the embankment required for the proposed widening and proposed ponds. By superimposing the FEMA FIRM maps onto the preferred roadway build alternative, the 100- year floodplain encroachment locations have been determined.

The 100-year floodplain impacts and compensation analysis will be based on the preferred roadway alternative and preferred stormwater treatment ponds. The analysis identified five floodplain boundary encroachments within the project limits. The following provides details regarding floodplain impact locations, conditions, and the method used for floodplain calculations are discussed below.

Floodplain No. 1

According to the FEMA FIRM maps, the limits of Floodplain No. 1 begin at STA 30+32 and ends at STA 143+21. This floodplain is classified as Zone AE, where the base floodplain elevation has been determined to be 9.0 ft NAVD. The roadway embankment required for the proposed widening of SR 46, construction of the new bridge, and proposed ponds will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESHWT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

In order to quantify volumetric floodplain impacts due to the proposed widening of SR 46, preliminary roadway cross sections have been developed using the proposed Suburban Typical Section (widen south and best fit) and Lidar data for Seminole County was used to determine existing ground conditions. In addition, estimated seasonal high water table (ESHWT) elevations from the Bridge Replacement project were used to establish ground water conditions, from STA 77+00 to STA 148+00. The Bridge Replacement project datum is NGVD, therefore a conversion factor of 1 foot has been used to convert from NGVD to NAVD, with NAVD elevations being lower. From STA 22+00 to STA 30+00, a conservative approach will be used to define volumetric floodplain impacts as any fill above the existing ground elevation to the 100-year floodplain elevation. From STA 31+00 to STA 76+00, the ESHWT elevation will be based on the highest existing ground elevation on the north side of SR 46. This approach is conservative and consistent with typical ESHWT elevations that occur within wetlands as well as the preliminary pond boring taken for proposed Pond A.

Based on the preliminary roadway cross sections, floodplain impact (fill) area(s) were quantified per cross section and the average end method was used to determine the volumetric floodplain impacts due to the proposed widening of SR 46.

Floodplain impacts due to the construction of the new bridge were considered minimal and were not calculated as part of this floodplain analysis.

Floodplain impacts due to the construction of the ponds were determined by calculating the average fill height between the 100-year floodplain elevation and the ESHWT elevation per location. Then the pond area required to tie down the proposed pond berm elevation to the ESHWT elevation was measured in CADD. However, in some cases only a portion of the pond is within the floodplain boundary. In such cases, only those areas were measured to determine the floodplain impacts. In order to determine the volumetric floodplain impact created by the pond berms, the impact area(s) were multiplied by the average fill height.

Floodplain compensation for Floodplain No. 1 will be achieved by the construction of Floodplain Compensation Pond(s) 1 and 2. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation at each pond location.

Floodplain Compensation Pond 1 is located north of SR 46, adjacent to the Sterling Meadows subdivision. Once wetland delineation was performed by EMD, the original pond area was revised to avoid impacts to the wetland. However, the preliminary pond boring performed by Ardaman & Associates, Inc. was taken within the limits of this wetland and showed the ESHWT elevation at the ground surface. Additional borings are recommended to be performed within the revised pond location during the design phase of this project. For the purposes of this study, the geotechnical boring information from the Sterling Meadows subdivision Pond 101 (SJRWMD Permit No. 4-117-51666-2), was used to establish the ESHWT elevation for Floodplain Compensation Pond 1. The borings indicate that the average ESHWT elevation is 1.5 ft below the existing ground surface elevation. According to Lidar data, the ESHWT elevation would be approximately 7.5 ft NAVD. The Sterling Meadows subdivision Pond 101 is located just west of proposed Floodplain Compensation Pond 1. The northeast corner of this pond creates minor floodplain impacts and has been calculated by the method described above.

Floodplain Compensation Pond 2 is located east of Lake Jesup and north of SR 46, adjacent to modified Pond 2. The preliminary pond boring performed by Ardaman & Associates, Inc. indicates that the ESHWT elevation is 1 ft below the existing ground surface elevation. According to Lidar data, the ESHWT elevation from Ardaman & Associates, Inc. would be approximately 11.5 ft NAVD which appears to be relatively high considering the 100-year floodplain elevation is 9.0 ft NAVD and the permitted ESWHT elevation used for adjacent Pond 2, constructed during the bridge replacement project, is 8.0 ft NGVD which converts to 7.0 ft NAVD. Therefore an estimate of 8.0 ft NAVD will be used as the ESHWT elevation within the proposed pond area for the floodplain compensation

calculations. The northwest corner of this pond creates minor floodplain impacts and has been calculated by the method described above.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 1. For detailed calculations of the values shown, please refer to Appendix E.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	29.17	NA
Floodplain Comp Pond 1	0.04	11.09
Pond A3	2.14	NA
Modified Pond 1	0.82	NA
Floodplain Comp Pond 2	0.08	24.27
Floodplain No. 1 Project Total:	32.25	35.36

Floodplain No. 2

According to the FEMA FIRM maps, the limits of Floodplain No. 2 begin at STA 199+59 and ends at STA 211+48 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the north side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 16.5 ft NAVD. Due to the proximity and similar soil type, the ESWHT elevation from the preliminary pond boring for proposed Pond B will be used to establish the ESWHT elevation for Floodplain No. 2 calculations. According to Lidar Data, the existing ground elevation at the boring is 15.0 ft NAVD, which puts the ESWHT elevation at 14.5 ft NAVD. The roadway embankment required for the proposed widening of SR 46 will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESWHT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

Floodplain compensation for Floodplain No. 2 will be achieved by the construction of roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESWHT elevation.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 2. For detailed calculations of the values shown, please refer to Appendix E.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	0.69	0.69
Floodplain No. 2 Project Total:	0.69	0.69

Floodplain No. 3

According to the FEMA FIRM maps, the limits of Floodplain No. 3 begin at STA 198+77 and ends at STA 204+99 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the south side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 16.5 ft NAVD. Due to the proximity and similar soil type, the ESWHT elevation from the preliminary pond boring for proposed Pond B will be used to establish the ESHWT elevation for Floodplain No. 3 calculations. According to Lidar Data, the existing ground elevation at the boring is 15.0 ft NAVD, which puts the ESHWT elevation at 14.5 ft NAVD. The roadway embankment required for the proposed widening of SR 46 will result in impacts to this floodplain. Floodplain impacts will be based on any fill volume above the ESHWT elevation or natural ground, whichever is higher, to the 100-year floodplain elevation.

Floodplain compensation for Floodplain No. 3 will be achieved by the construction of roadside ditches. Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation.

The following table summarizes the 100-year floodplain impacts and compensation associated with Floodplain No. 3. For detailed calculations of the values shown, please refer to Appendix E.

Proposed Condition	Floodplain Impact Volume (ac-ft)	Floodplain Compensation Volume (ac-ft)
SR 46 Widening	0.19	0.22
Floodplain No. 3 Project Total:	0.19	0.22

Floodplain No. 4

According to the FEMA FIRM maps, the limits of Floodplain No. 4 begin at STA 295+18 and ends at STA 313+10. This floodplain is located on the south side of SR 46 and is classified as Zone AE, where the base floodplain elevation has been determined to be 29.0 ft NAVD.

The existing roadway profile within this area ranges from 25.0 ft to 28.5 ft NAVD. By digitizing the FEMA floodplain area and overlaying it upon the proposed roadway alignment, it appears as though the widening would encroach upon this floodplain. However, while developing preliminary roadway cross sections with use of one-foot Lidar contours for this area, there appears to be an existing land berm which contains the 100-year floodplain from encroaching into SR 46. The fact that there has been no record of flooding issues in this area would further reinforce this assumption.

During the design phase of this project, it would be prudent to gather additional survey to define the limits of the existing land berm to ensure that the 100-year floodplain would not encroach into the proposed widening of SR 46. In addition, if any proposed improvements impact the existing land berm, replacement of the berm at an elevation higher than 29.0 ft NAVD will be required.

Floodplain No. 5

According to the FEMA FIRM maps, the limits of Floodplain No. 5 begin at STA 295+35 and ends at STA 296+32 within the proposed right-of-way required for the proposed widening of SR 46. This floodplain is located on the north side of SR 46 and is classified as Zone A, where the base floodplain elevation has not been determined. In order to establish the 100-year floodplain elevation, the FEMA floodplain area was digitized and overlaid upon the one-foot Lidar contours and compared to one another. Through this process, a preliminary estimate for the 100-year floodplain elevation was determined to be 22.5 ft NAVD.

The limits of Floodplain No. 5 only encroach into the proposed 10-foot shared-use-path on the north side of the roadway. Since this encroachment area is so minor, during the design phase of this project the horizontal and vertical placement of the proposed 10-foot shared-use-path should be adjusted to avoid any impacts to Floodplain No. 5.

10.0 PROJECT CLASSIFICATION

The floodplains are located in a low density, non-urbanized area, and the encroachments are classified as “minimal”. Minimal encroachments on floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying the Department’s drainage design standards and following the Water Management District’s procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

11.0 RISK EVALUATION

There is no change in flood “Risk” associated with this project. The floodplains are located in a low density, non-urbanized area, and the encroachments are classified as “minimal”. Minimal encroachments on floodplain occur when there is a floodplain involvement, but the impacts on human life, transportation facilities, and natural and beneficial floodplain values are not significant and can be resolved with minimal efforts. Normally, these minimal efforts to address the impacts will consist of applying the Department’s drainage design standards and following the Water Management District’s procedures to achieve results that will not increase or significantly change the flood elevations and/or limits.

12.0 PD&E MANUAL REQUIREMENTS WITH MINIMAL ENCROACHMENTS

Chapter 24 Floodplains of the FDOT's PD&E Manual, Part 2, defines four categories of encroachments as they pertain to the base floodplain involvement; significant, minimal, none and no involvement, and also lists the report criteria corresponding to these encroachment categories. The FDOT has different requirements based on the category of the encroachment. The proposed SR 46 widening project was determined to have minimal encroachments and as a result the requirements for this category are listed as follows:

1. The history of flooding of the existing facility and/or measures to minimize any impacts due to the proposed project improvements.

Response: According to the FDOT Maintenance Department, there are two locations where flooding problems have occurred at the downstream side of the existing cross drains. In both locations, the flooding occurs outside of FDOT right-of-way and within private properties.

The first location being in the vicinity of CD-4, north of SR 46 and east of Mullet Lake Park Road. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located within some private properties and the ultimate outfall of the conveyance system leading into the St. Johns River. Currently, Seminole County is evaluating the drainage concerns in this area and maybe developing roadway and drainage plans that may include a stormwater management facility as well as upsizing the conveyance system/pipes which convey stormwater runoff to the St. Johns River.

The second location being in the vicinity of CD-5, north of SR 46 and east of Mockingbird Lane. The FDOT Maintenance Department believes that the flooding problem exists in this area due to the lack of positive drainage grading located within the private property into which the cross drain discharges before entering the wetland located within this property. Currently, the proposed location of alternative stormwater treatment Pond D1 is within this property. If this alternative is selected as the preferred alternative, additional right-of-way will be purchased to ensure positive drainage is achieved from the outfall of the existing cross drain to the wetland by regarding the ditch.

In addition, two floodplain compensation areas will be constructed to mitigate loss of storage in the floodplain due to the project improvements. The project will have no adverse impacts on the existing floodplain conditions.

2. Determination of whether the encroachment is longitudinal or transverse, and if it is a longitudinal encroachment an evaluation and discussion of practicable avoidance alternatives.

Response: The proposed increase in the number of travel lanes will result in both longitudinal and transverse impacts to the floodplain. Longitudinal impacts will be minimized by utilizing the maximum allowable roadway embankment slope.

The transverse floodplain impacts from the project occur due to the extension and/or replacement of the existing cross drains and construction of the new bridge. Cross Drain Analysis, found in Appendix D, will show that there will be no net increase in the existing backwater elevations at each proposed cross drain. The Bridge Hydraulic Report (BHR) will show both pre-development and post-development Design High Water (DHW) elevations for construction of the new bridge.

The existing roadway bisects the floodplain. There are no economically feasible avoidance alternatives.

3. The practicability of avoidance alternatives and/or measures to minimize impacts.

Response: This project will take every effort to minimize the floodplain impacts resulting from roadway fill. The maximum allowable roadway embankment slope will be used within the floodplain area to minimize the floodplain impacts. The floodplain impacts will be mitigated by constructing floodplain compensation areas. There are two (2) floodplain compensation ponds identified by this project to mitigate for the floodplain impacts to Floodplain No. 1 and construction of roadside ditches will mitigate for floodplain impacts to Floodplain No.(s) 2 and 3.

4. Impact of the proposed improvement on emergency services and evacuation.

Response: The proposed cross drains and floodplain compensation areas will perform hydraulically in a manner equal to or greater than the existing conditions, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk, and there will not be a significant change in the potential for interruption or termination of emergency service or in emergency evacuation routes.

5. Impacts of proposed improvement on the base flood, likelihood of flood risk, overtopping, location of overtopping, backwater, etc.

Response: The proposed cross drains and floodplain compensation areas will perform hydraulically in a manner equal to or greater than the existing conditions, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk or overtopping.

6. Determination of the impact to the proposed improvements on regulatory floodways, if any, and documentation of coordination with FEMA and local agencies to determine the project's consistency with regulatory floodway.

Response: According to the FEMA FIRM Maps, there are no regulatory floodways along the proposed improvements.

7. The impacts on natural and beneficial floodplain values, and measures to restore and preserve these values (this information may also be addressed as part of the wetland impact evaluation and recommendations).

Response: There will not be any impact on natural and beneficial values. Also, please refer to the Wetlands Evaluation Report.

8. Consistency of the proposed improvements with the local floodplain development plan or the land use elements in Comprehensive Plan, and the potential of encouraging development in the 100 year base floodplain.

Response: The project will remain consistent with local floodplain development plans. The project will not support base floodplain development that is incompatible with existing floodplain management programs.

9. A map showing project, location, and impacted floodplains. Provide copies of applicable FIRM maps should be included within the final LHR report appendix.

Response: Please refer to the SR 46 PD&E Location Hydraulic Report.

10. Results of any risk assessments performed.

Response: No risk assessments were performed; however, the proposed cross drains and floodplain compensation areas will perform hydraulically in a manner equal to or greater than the existing conditions, and backwater surface elevations are not expected to increase. As a result, there will be no significant change in flood risk.

13.0 CONCLUSION


The modifications to drainage structures included in this project will result in no change in their capacity to carry floodwater. The proposed structures will perform hydraulically in a manner equal to or greater than the existing structure and backwater surface elevations are not expected to increase. Floodplain compensation areas will mitigate for all floodplain impacts associated with the proposed roadway improvements. As a result, there will be no significant adverse impacts on natural and beneficial floodplain values or any significant change in flood risks or damage. There will not be a significant change in the potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant.

APPENDIX A
Pond Alternatives Location Plans



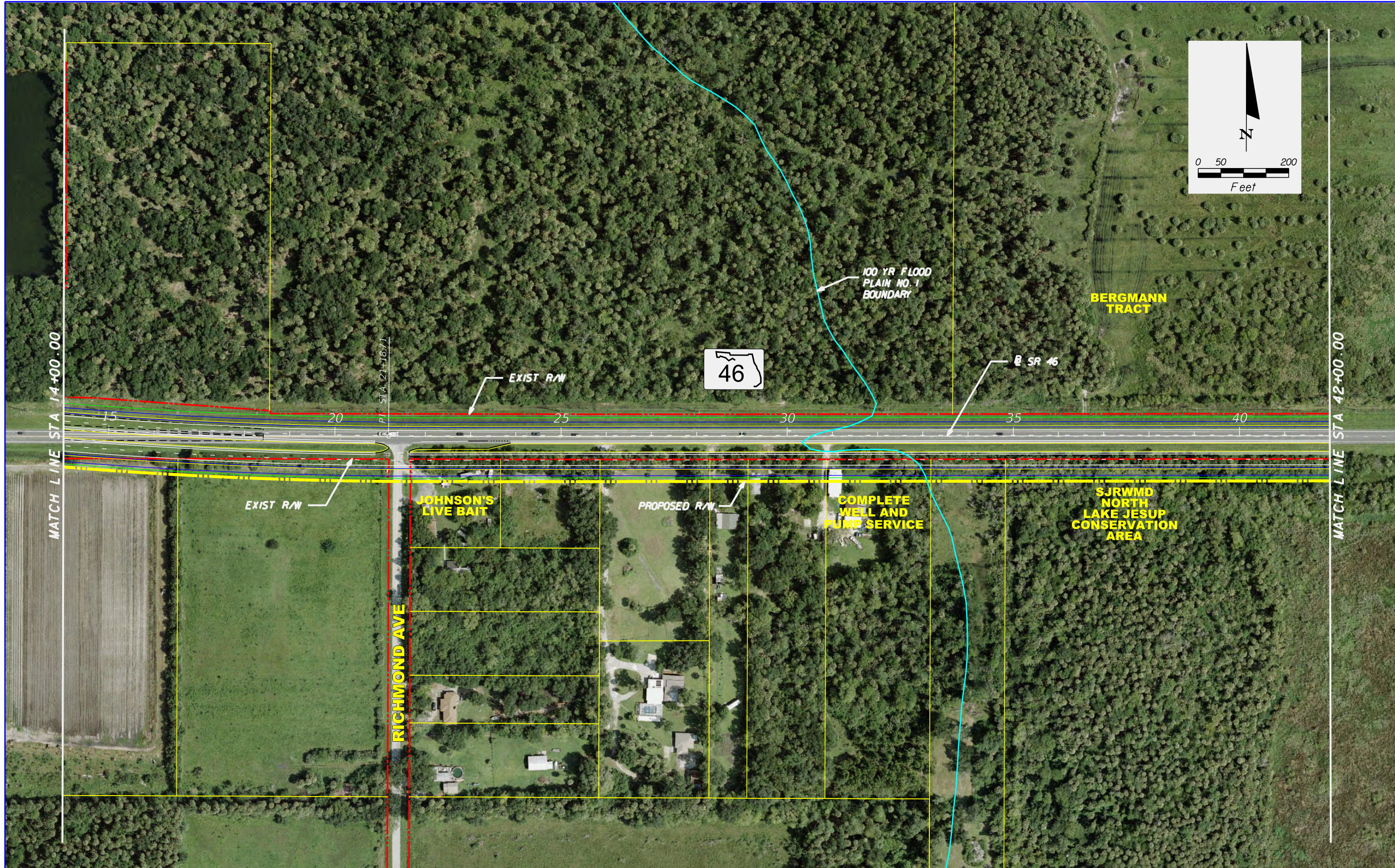
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
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URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 0000002

 SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01


**POND ALTERNATIVES
LOCATION PLANS**

SHEET
NO.



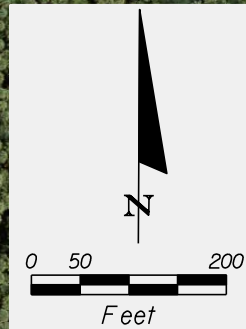
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SHEET NO.



BERGMANN TRACT



SR 46

EXIST R/W

45

50

55

60

65

70

MATCH LINE STA 42+00.00

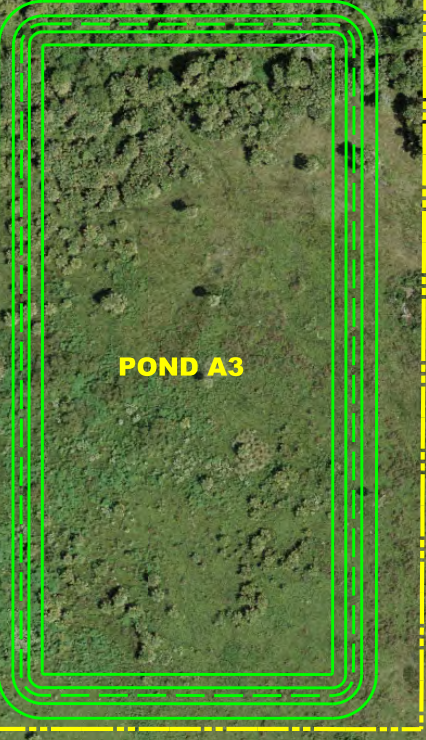
MATCH LINE STA 70+00.00

EXIST R/W

PROPOSED R/W

**SJRWMD
NORTH
LAKE JESUP
CONSERVATION
AREA**


**SJRWMD
NORTH
LAKE JESUP
CONSERVATION
AREA**



POND A3

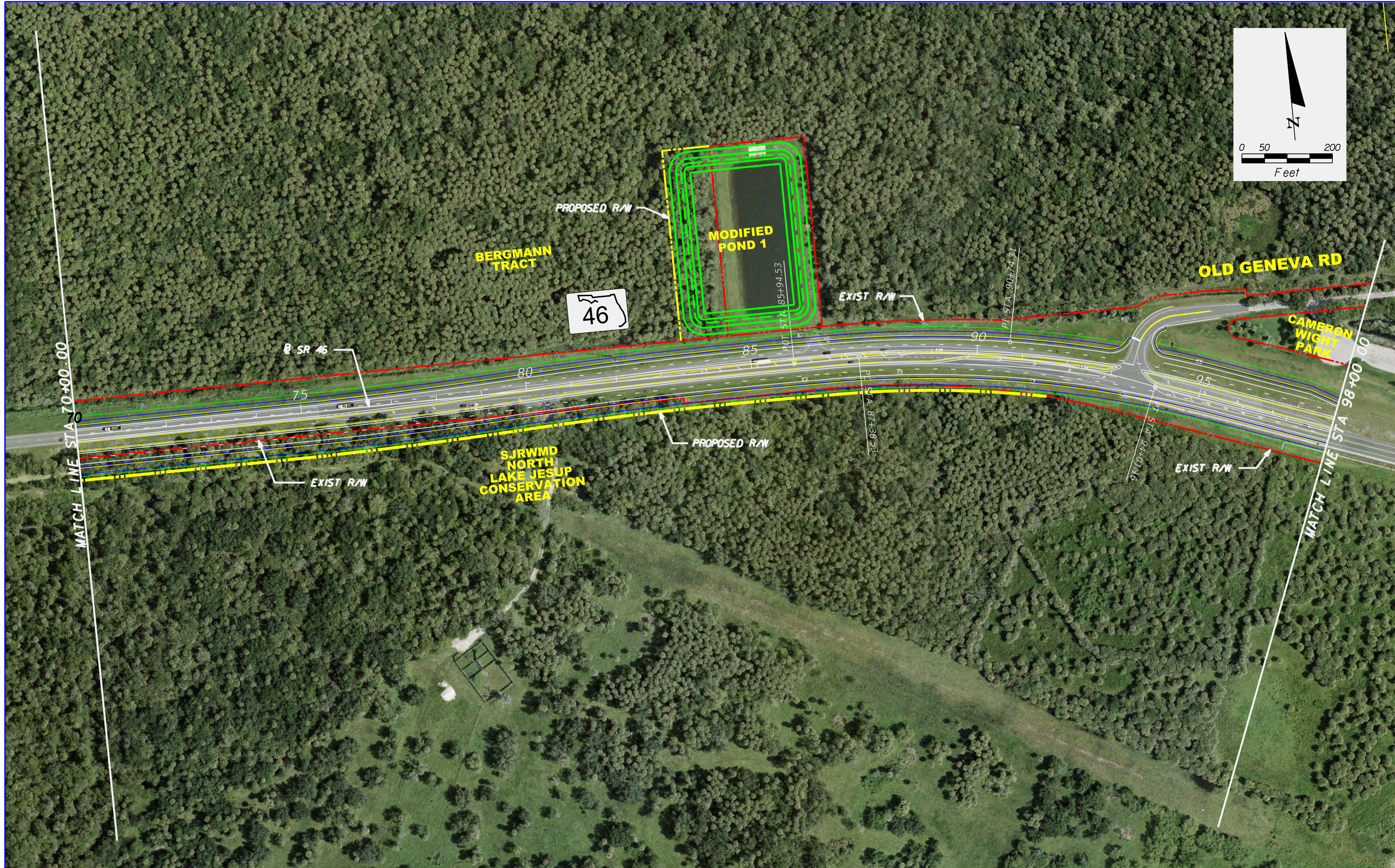
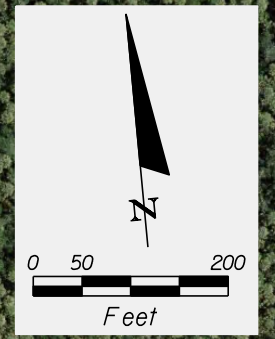
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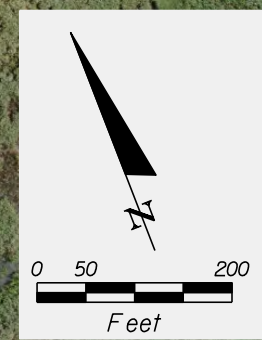
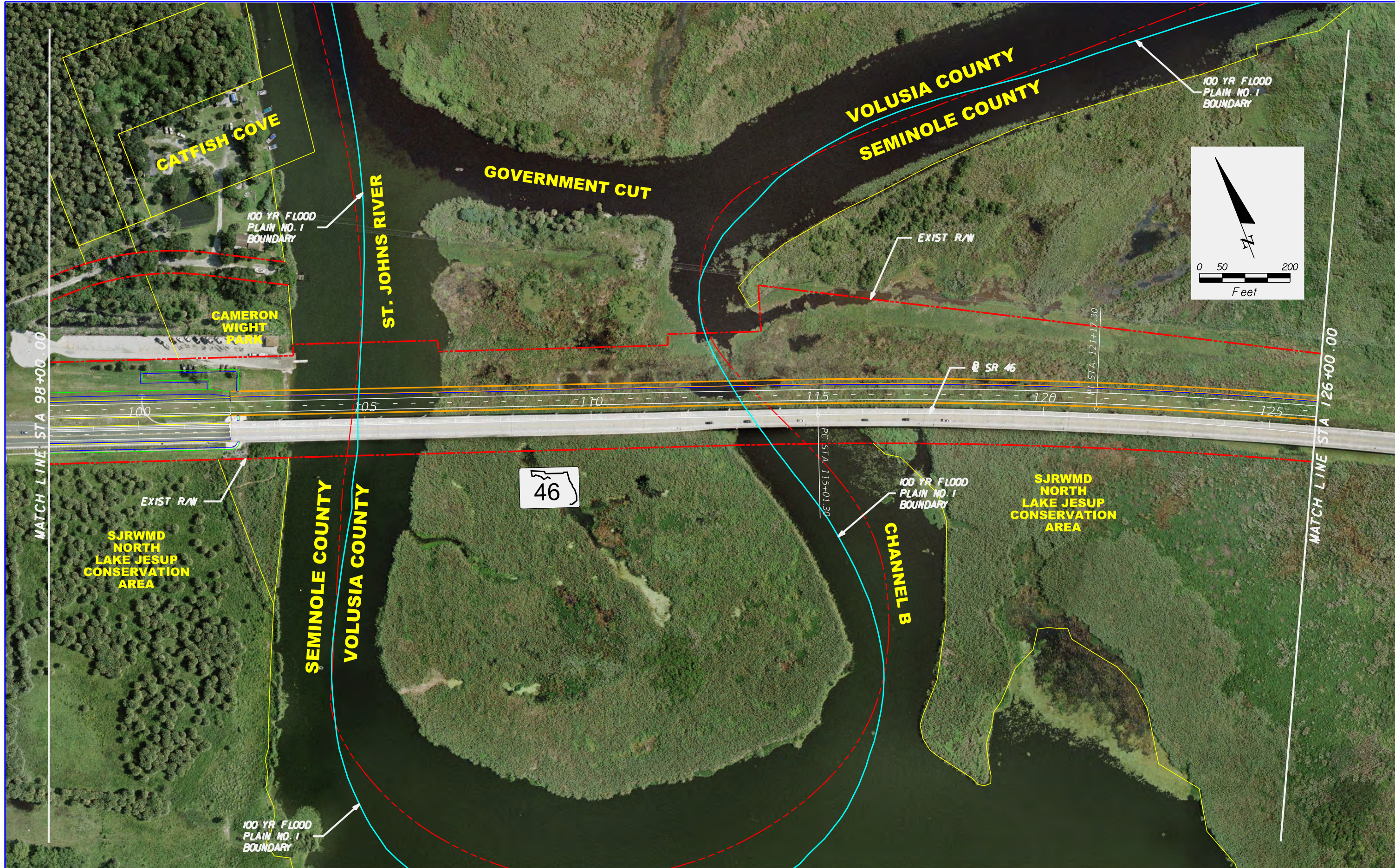
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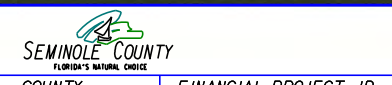
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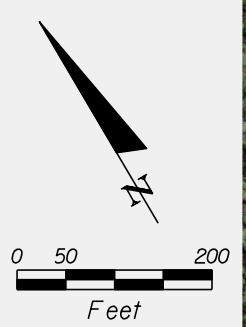
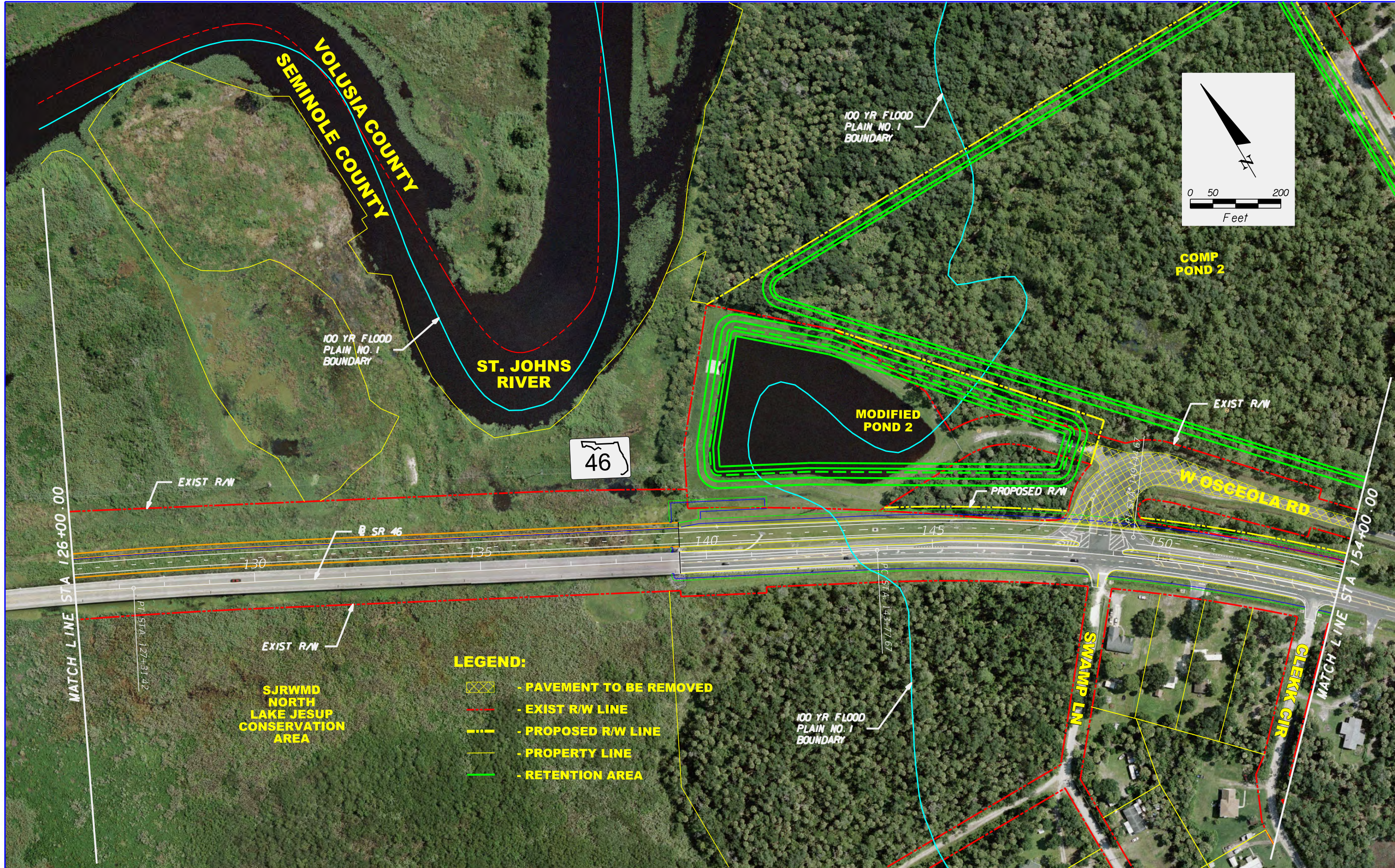


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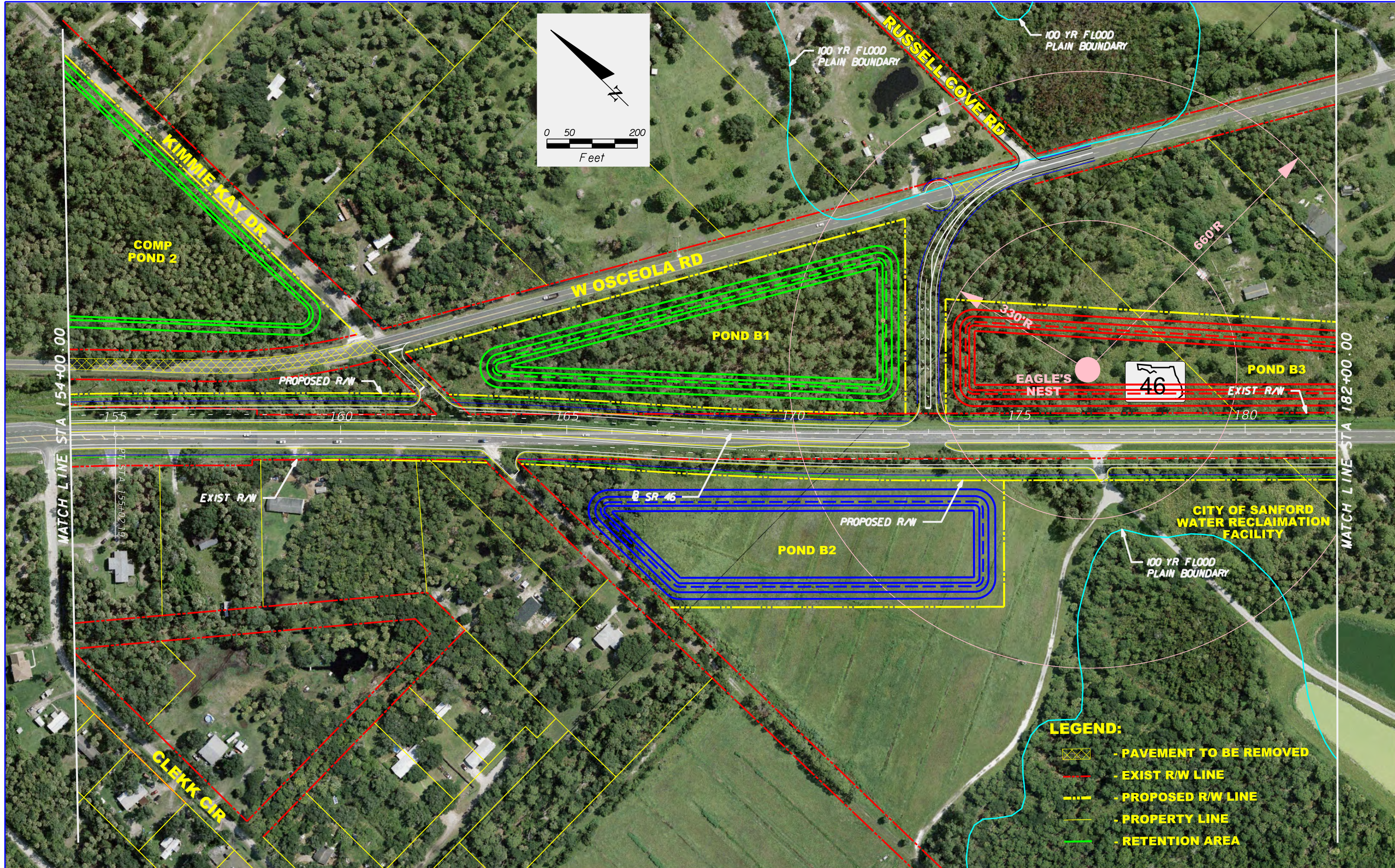
**POND ALTERNATIVES
 LOCATION PLANS**



- LEGEND:**
- PAVEMENT TO BE REMOVED
 - EXIST R/W LINE
 - PROPOSED R/W LINE
 - PROPERTY LINE
 - RETENTION AREA

**SJRWMD
NORTH
LAKE JESUP
CONSERVATION
AREA**

REVISIONS		DESCRIPTION		CHRISTOPHER RIZZOLO, P.E. P.E. LICENSE NO. 54078 URS CORPORATION 315 E. ROBINSON STREET, SUITE 245 ORLANDO, FL 32801-1949 PH (407) 422-0353 FAX (407) 423-2695 CERTIFICATE OF AUTHORIZATION NO. 000002	SEMINOLE COUNTY <small>FLORIDA'S NATURAL CHOICE</small>		POND ALTERNATIVES LOCATION PLANS	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY		
					SR 46	SEMINOLE	240216-4-28-01	



- LEGEND:**
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 SEMINOLE COUNTY <small>FLORIDA'S NATURAL CHOICE</small>		
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**POND ALTERNATIVES
 LOCATION PLANS**

SHEET NO.



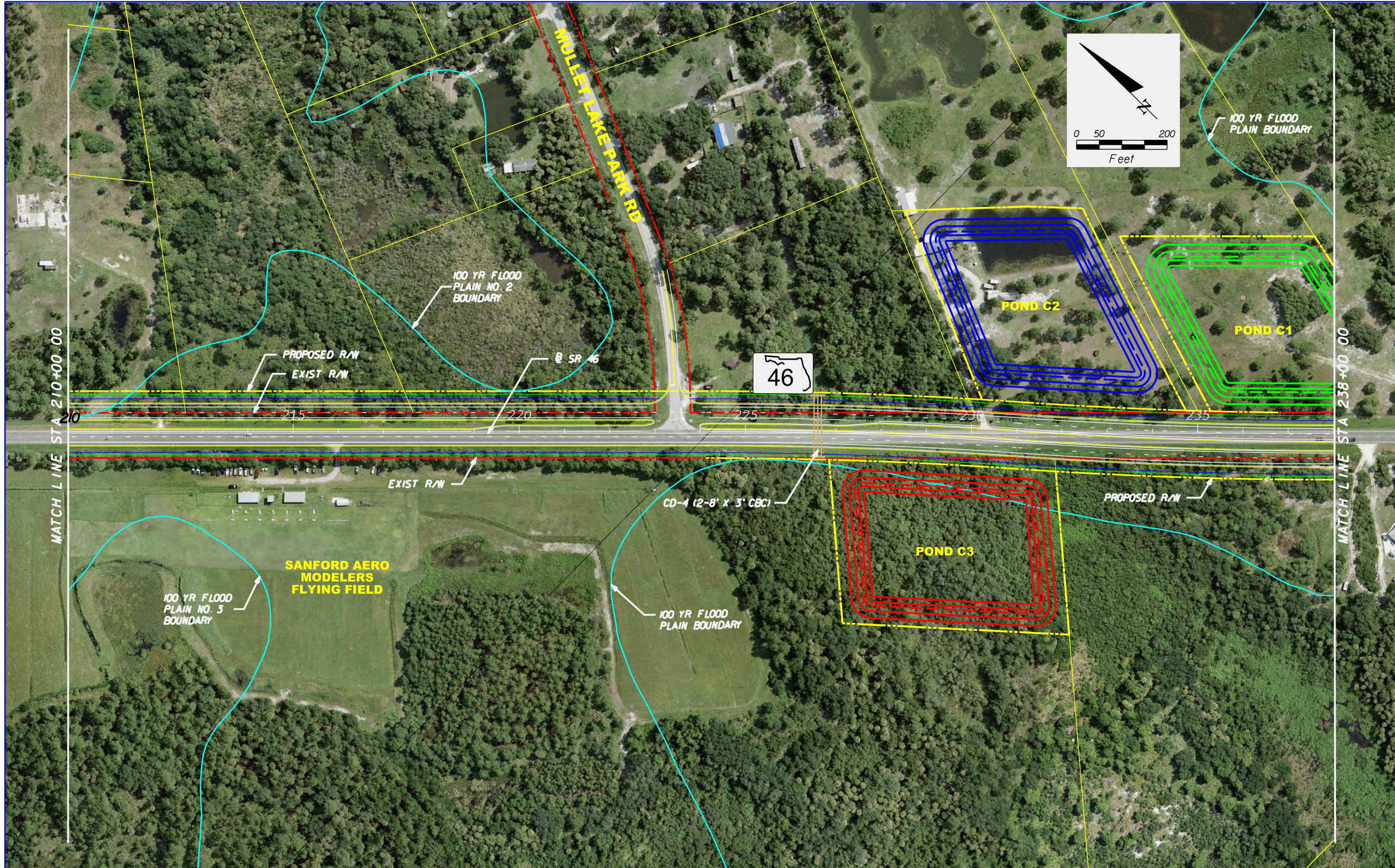
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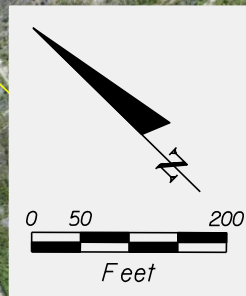
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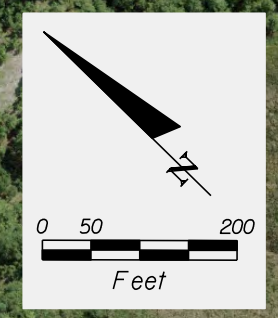
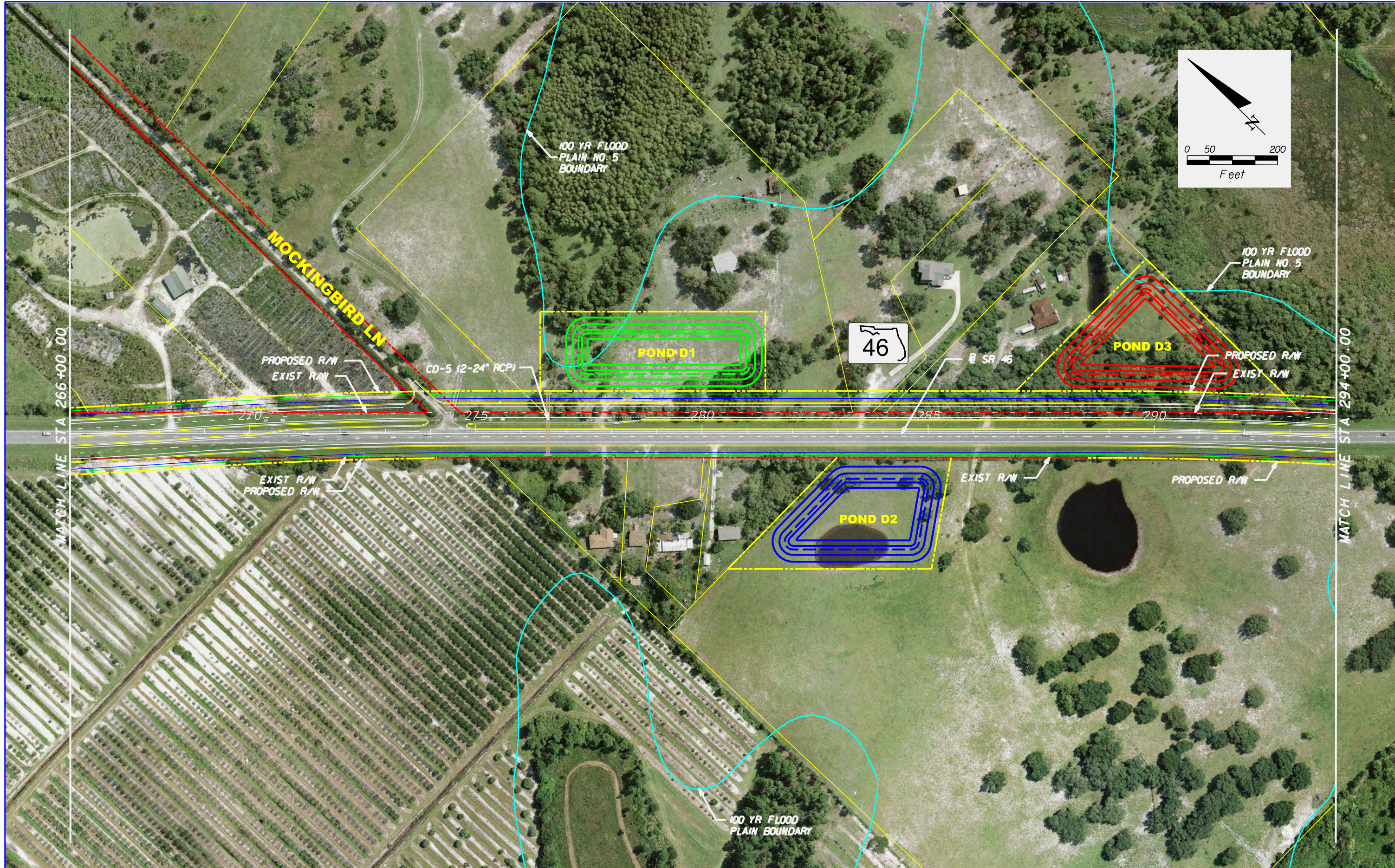
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 PH (407) 422-0353 FAX (407) 423-2695
 CERTIFICATE OF AUTHORIZATION NO. 000002

		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01


**POND ALTERNATIVES
 LOCATION PLANS**

SHEET NO.



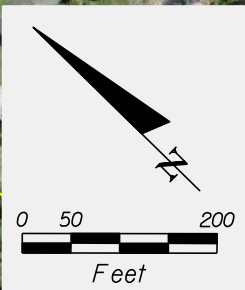
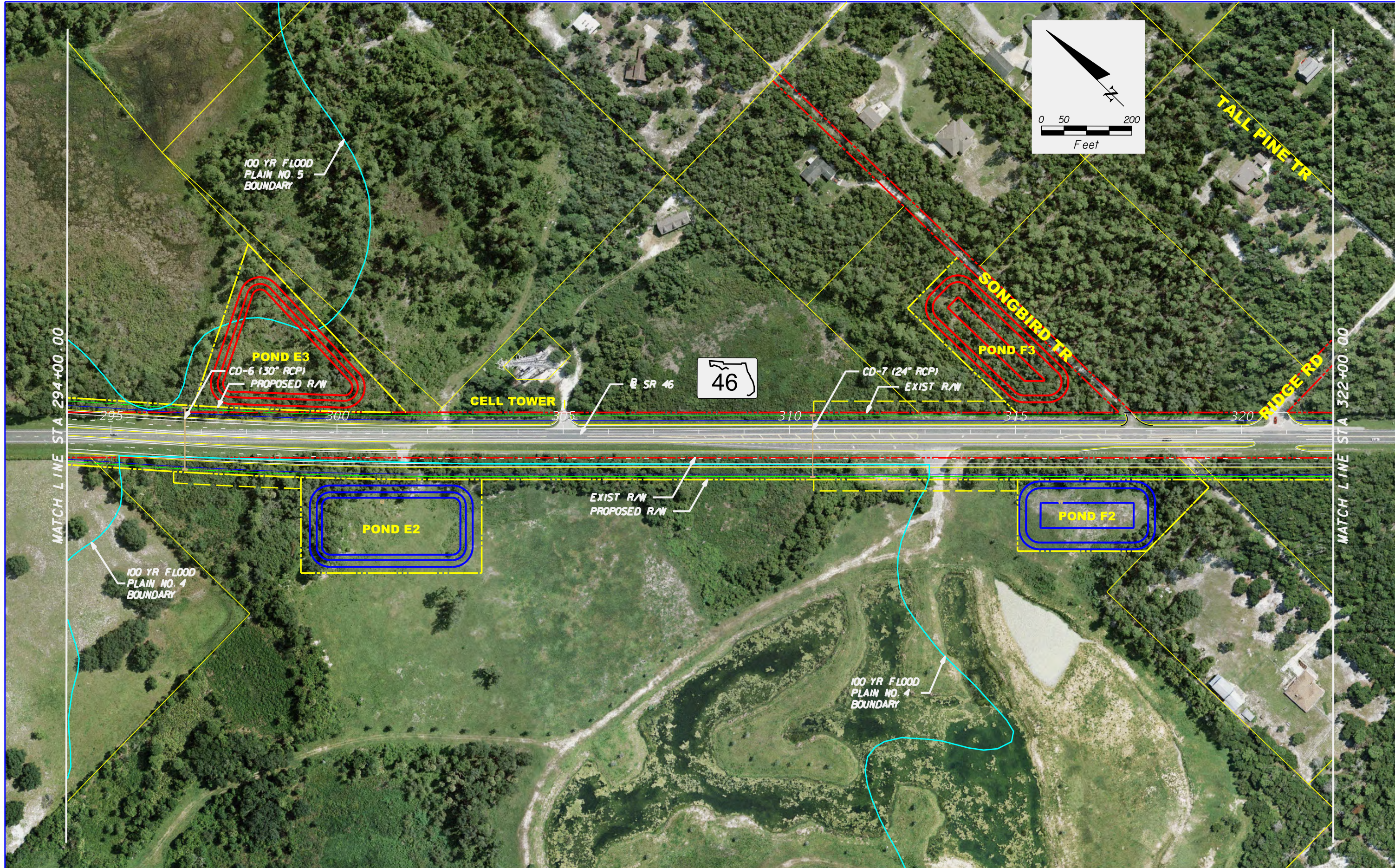
REVISIONS	
DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 0000002

 SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

**POND ALTERNATIVES
LOCATION PLANS**

SHEET NO.




REVISIONS		REVISIONS		CHRISTOPHER RIZZOLO, P.E. P.E. LICENSE NO. 54078 URS CORPORATION 315 E. ROBINSON STREET, SUITE 245 ORLANDO, FL 32801-1949 PH (407) 422-0353 FAX (407) 423-2695 CERTIFICATE OF AUTHORIZATION NO. 000002	 SEMINOLE COUNTY <small>FLORIDA'S NATURAL CHOICE</small>		POND ALTERNATIVES LOCATION PLANS	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY		
					SR 46	SEMINOLE	240216-4-28-01	



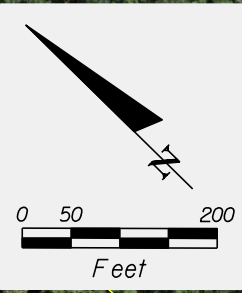
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION


CHRISTOPHER RIZZOLO, P.E.
P.E. LICENSE NO. 54078
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
CERTIFICATE OF AUTHORIZATION NO. 000002

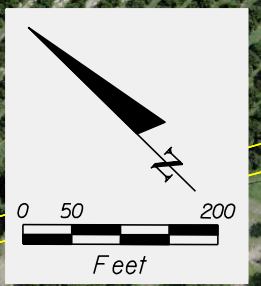
 SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

**POND ALTERNATIVES
LOCATION PLANS**

SHEET NO.



REVISIONS		DESCRIPTION		CHRISTOPHER RIZZOLO, P.E. P.E. LICENSE NO. 54078 URS CORPORATION 315 E. ROBINSON STREET, SUITE 245 ORLANDO, FL 32801-1949 PH (407) 422-0353 FAX (407) 423-2695 CERTIFICATE OF AUTHORIZATION NO. 000002	 SEMINOLE COUNTY <small>FLORIDA'S NATURAL CHOICE</small>		POND ALTERNATIVES LOCATION PLANS	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY		
					SR 46	SEMINOLE	240216-4-28-01	



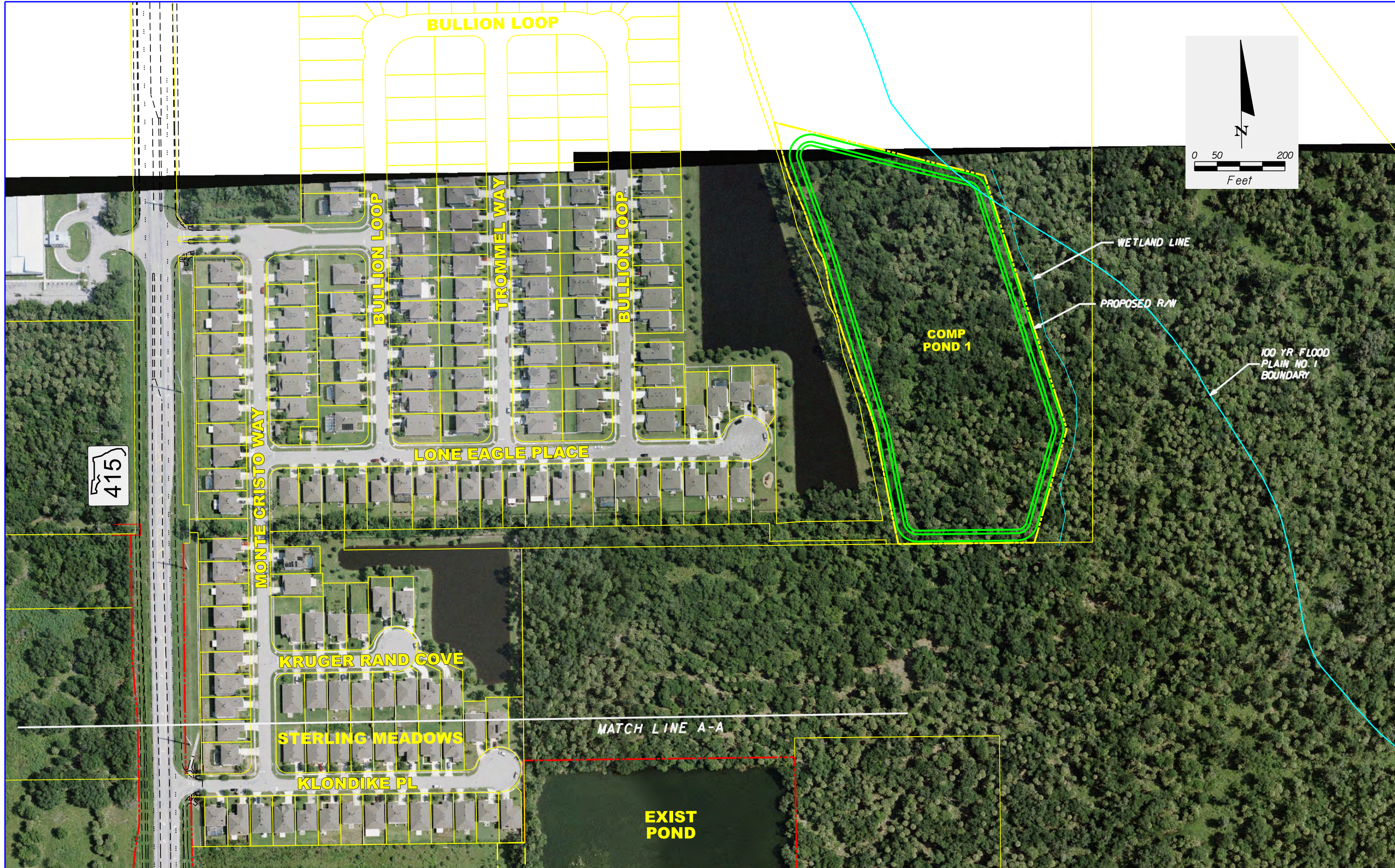
REVISIONS	
DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
 P.E. LICENSE NO. 54078
 URS CORPORATION
 315 E. ROBINSON STREET, SUITE 245
 ORLANDO, FL 32801-1949
 PH (407) 422-0353 FAX (407) 423-2695
 CERTIFICATE OF AUTHORIZATION NO. 0000002

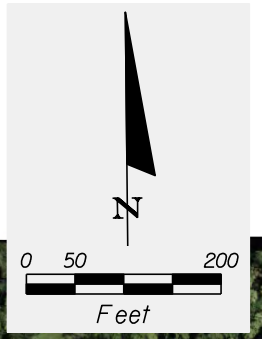
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

**POND ALTERNATIVES
 LOCATION PLANS**

SHEET NO.



415



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

CHRISTOPHER RIZZOLO, P.E.
 P.E. LICENSE NO. 54078
 URS CORPORATION
 315 E. ROBINSON STREET, SUITE 245
 ORLANDO, FL 32801-1949
 PH (407) 422-0353 FAX (407) 423-2695
 CERTIFICATE OF AUTHORIZATION NO. 000002

 SEMINOLE COUNTY <small>FLORIDA'S NATURAL CHOICE</small>		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 46	SEMINOLE	240216-4-28-01

**POND ALTERNATIVES
 LOCATION PLANS**

SHEET NO.

APPENDIX B

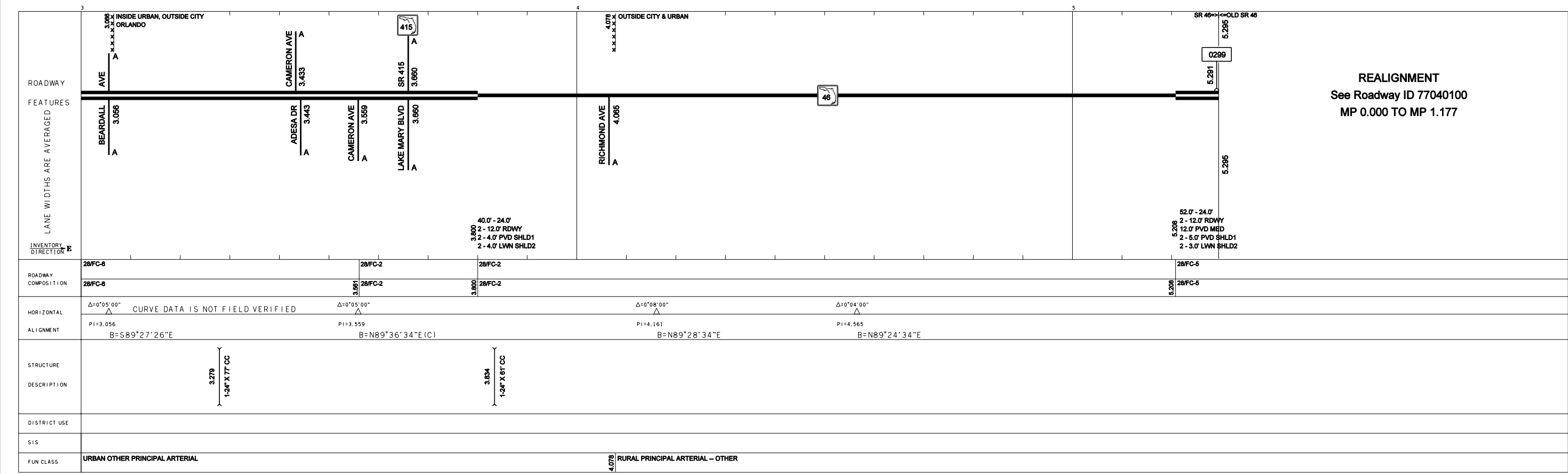
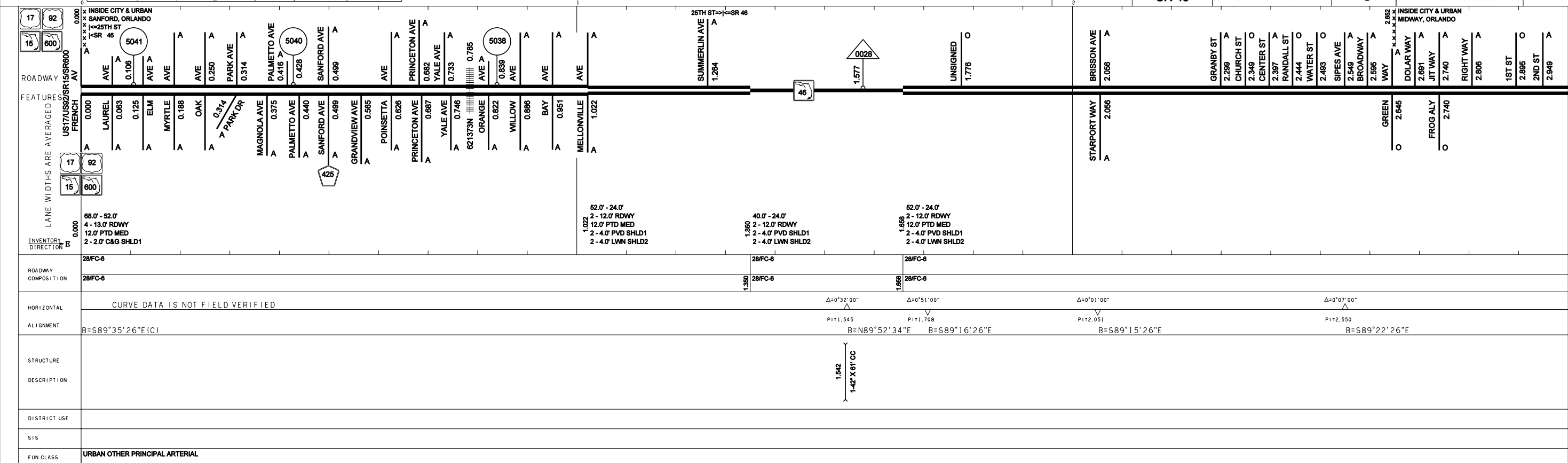
FDOT Straight Line Diagram of Road Inventory

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 000	1 of 3

DATE		5 YR INV	S/D REV	BMP	EMP	INV	S/D REV
02/08/08		KA	03/24/08	000.000	016.100	06/04/10	KA
BY							
URS				000.000	016.000	07/07/09	KA
						18/04/09	URS



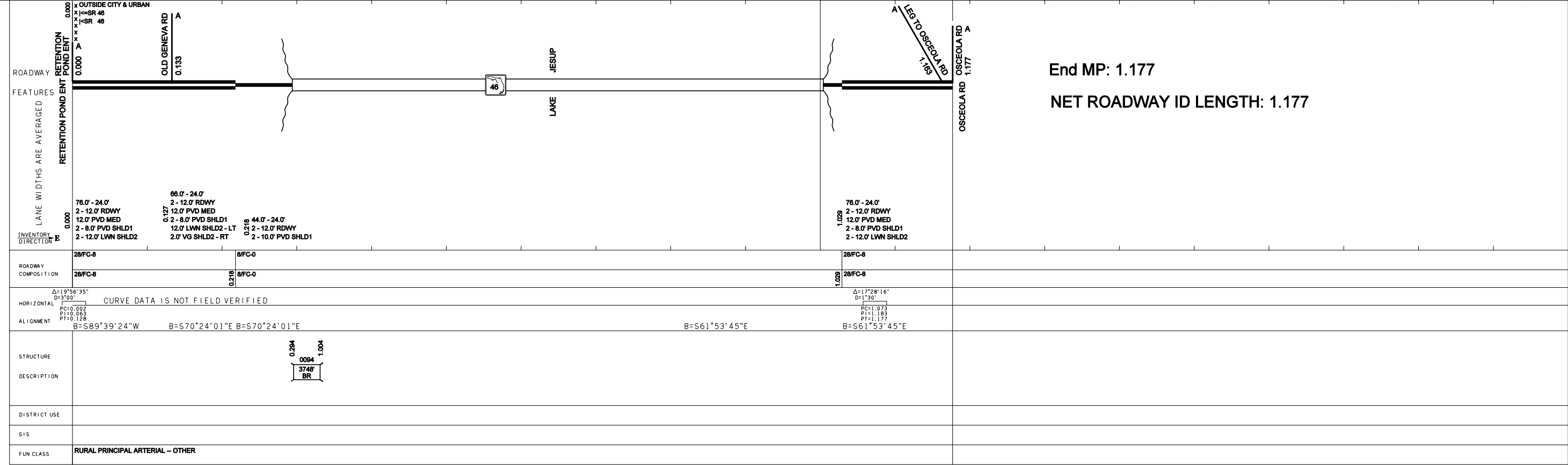
REALIGNMENT
See Roadway ID 77040100
MP 0.000 TO MP 1.177

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 100	1 OF 1

5 YR INV		SLD REV		INTERIM REVISIONS	
DATE	BY	DATE	BY	DATE	BY
06/04/10	KA	06/21/10	URS		



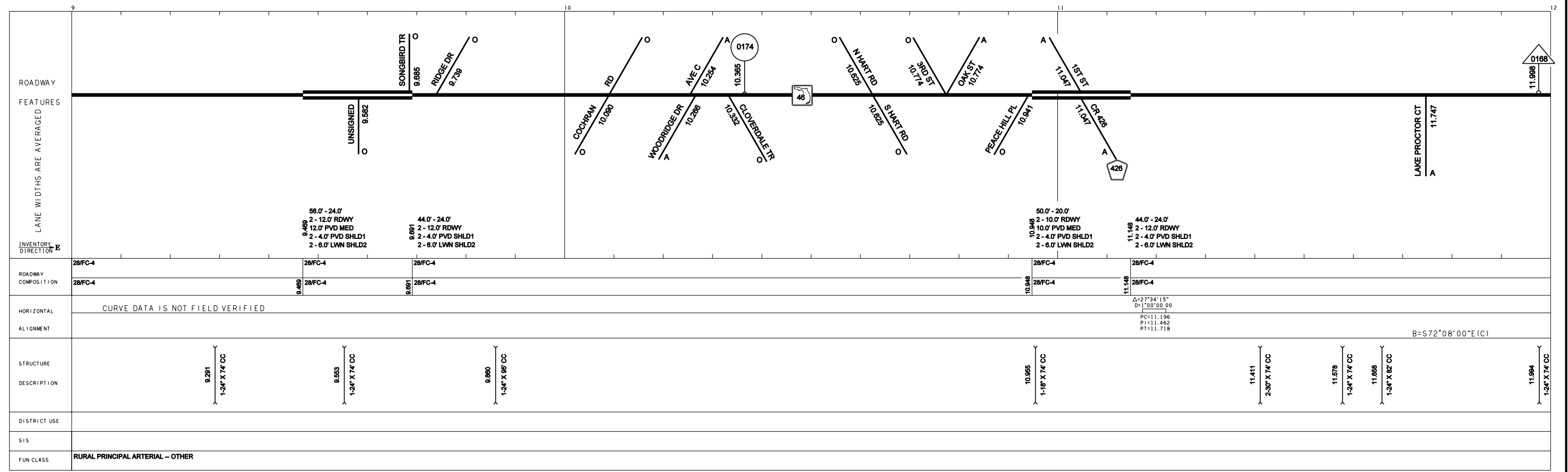
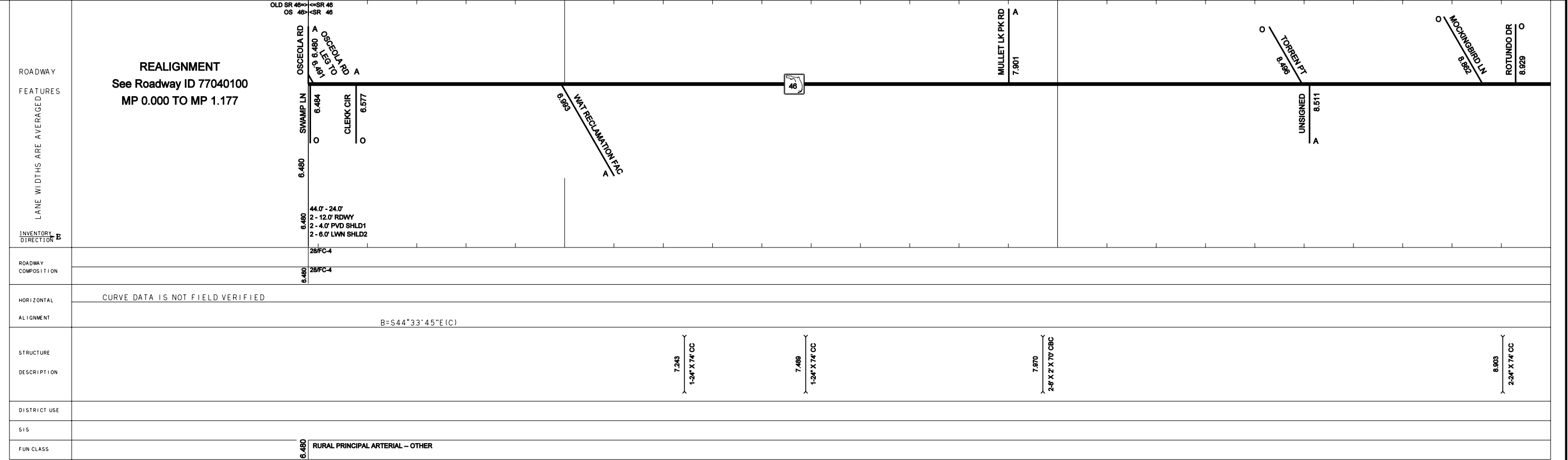
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5 YR INV		SLO REV		BMP		EMP		INTERIM REVISIONS		SLO REV	
DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
02/08/08	KA	03/24/08	URS	000.000	016.100	06/04/10	KA	06/21/10	URS	07/07/09	KA
				000.000	016.000			18/04/09	URS		

STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

FLORIDA DEPARTMENT OF TRANSPORTATION

INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO.:
	SR 46	SEMINOLE	5	77 040 000	2 of 3



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APPENDIX C
Cross Drain Photos



Cross Drain No. 1 – Looking North



Cross Drain No. 1 – Looking South



Cross Drain No. 2 – Looking North



Cross Drain No. 2 – Looking South



Cross Drain No. 3 – Looking North



Cross Drain No. 3 – Looking South



Cross Drain No. 4 – Looking North



Cross Drain No. 4 – Looking South



Cross Drain No. 5 – Looking North



Cross Drain No. 5 – Looking South



Cross Drain No. 6 – Looking North



Cross Drain No. 6 – Looking South



Cross Drain No. 7 – Looking North



Cross Drain No. 7 – Looking South



Cross Drain No. 8 – Looking North



Cross Drain No. 8 – Looking South



Cross Drain No. 9 – Looking North



Cross Drain No. 9 – Looking South

APPENDIX D
Cross Drain Analysis

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 9/25/2012
FIN No.: 240216-4-28-01	Checked by: DTL	Date: 9/25/12
Subject: CD-1: 24" RCP (Sta 9+23.76)		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of problems associated with CD-1. Based on the URS site visit conducted on Feb. 12th, 2012 there are no apparent erosion problems. Existing plans were not consistent on the size or type of the pipe, for the purpose of the PD&E evaluation the pipe was estimated to be a 24" RCP.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u>	
No of culverts:	<u>1</u>	Material: <u>RCP</u>
Exist culvert length:	<u>62.5 ft</u>	
Avg flowline elev upstream:	<u>12.56'</u>	(NAVD)
Avg flowline elev downstream:	<u>10.72'</u>	(NAVD)
Longitudinal slope:	0.029440	= <u>2.9440%</u>
Tailwater:	<u>12.20</u>	(NAVD) <u>High Water Mark Stain on D/S End</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.50 (Note 1)	15.89	N/A
100	1.4	26.4	16.21	N/A
500	1.7	44.8	16.24	N/A

Overtopping		
	Existing	Proposed
Elev (NAVD)	16.2	N/A
Q* (cfs)	24.15	N/A
Freq (yr)	71	N/A

* From HY 8 culvert analysis

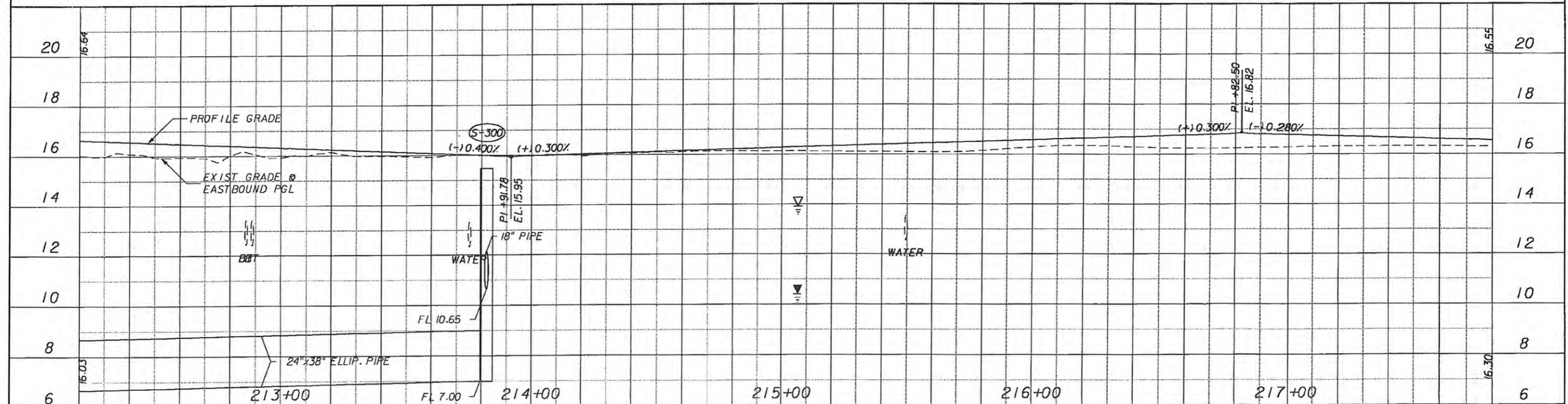
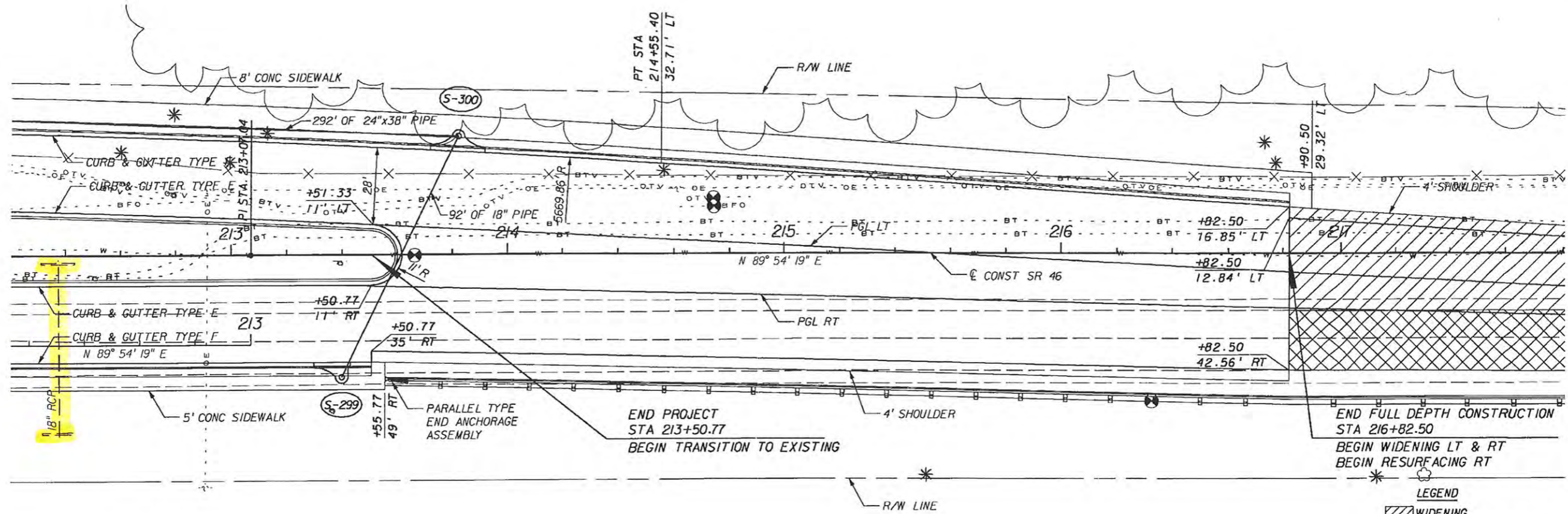
Note 1: Interpolated from Discharge vs Frequency graph (existing)

Note 2: Values obtained from HY 8 model of existing Culvert

Note 3: Values obtained from HY 8 model of proposed extension Culvert

Proposed Culvert

No proposed Culvert, this culvert is scheduled for removal under FPID 240216-2-52-01 By Earthtech
No replacement Culvert has been shown in the proposed plans.



REVISIONS		DESCRIPTION		ENGINEER OF RECORD <small>A tyco International Ltd. Company</small> LLOYD K GURR, PE - FL PS NO 40187 <small>CERTIFICATE OF AUTHORIZATION NO 8115</small> <small>30 SOUTH KELLER ROAD, SUITE 200</small> <small>ORLANDO, FL 32810</small>	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PLAN AND PROFILE	SHEET NO. 64
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 46	SEMINOLE	240216-2-52-01		

NOTICE: THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 68G05-23.003, F.A.C.

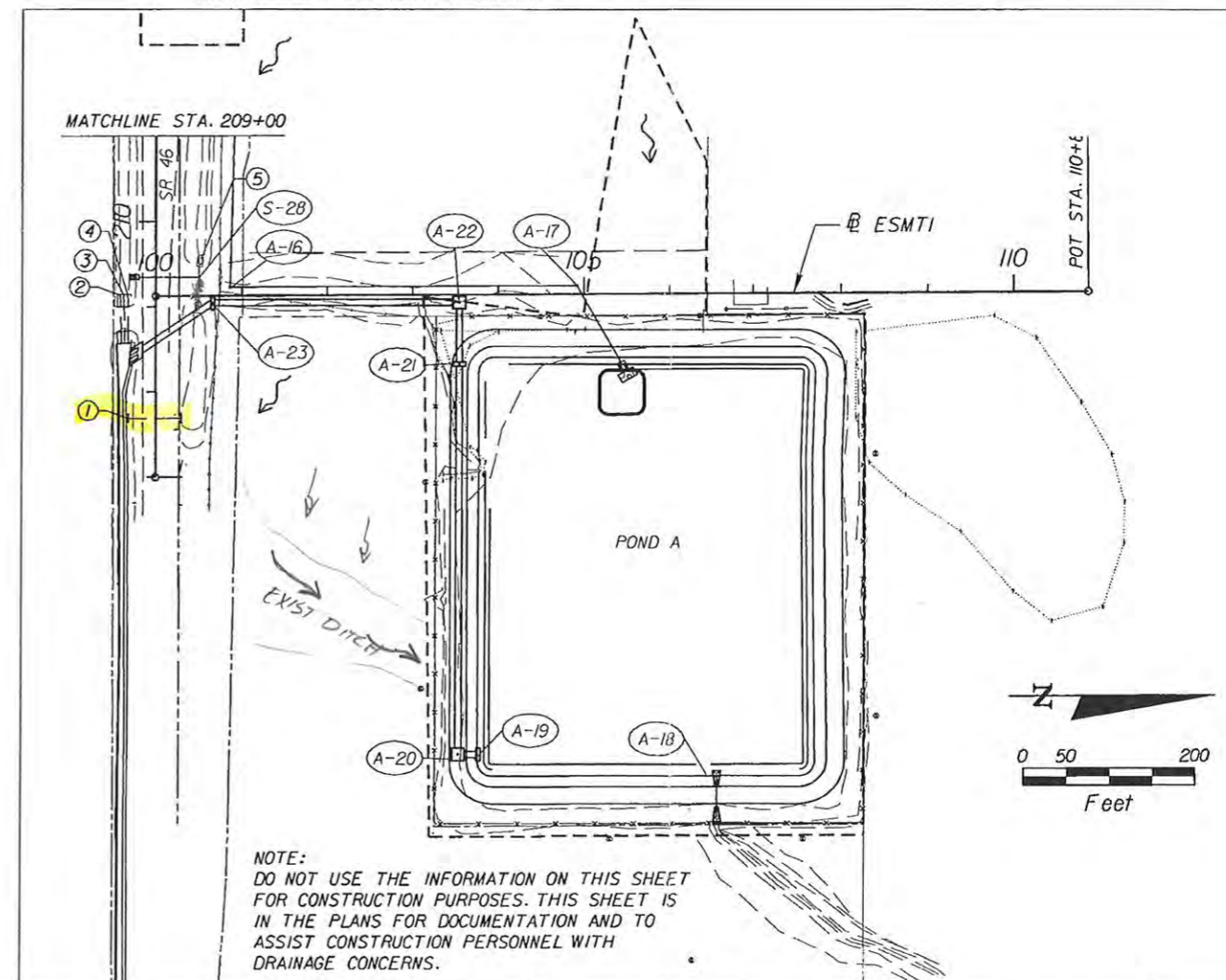
EXISTING DRAINAGE STRUCTURES

- ① 20" METAL PIPE
N INV 12.56 (HW)
S INV 10.72 (HW)
- ② 36" RCP
W INV 11.19 (MES)
E INV 10.27 (MES)
- ③ 36" RCP
W INV 11.11 (MES)
E INV 10.40 (MES)
- ④ 36" RCP
W INV 11.42 (MES)
E INV 10.38 (MES)
- ⑤ 28" RCP (ASSUMED AS 30" RCP)
W INV 11.65 (MES)
E INV 11.28 (MES)
- ⑥ 2 - 15" MES
E INV 11.43 (N 15" MES)
E INV 11.53 (S 15" MES)
- ⑦ DBI
GRATE 15.25
W INV 11.53 (N 24" RCP)
W INV 11.51 (S 24" RCP)
E INV 11.30 (N 15" RCP)
E INV 11.56 (S 15" RCP)
N INV 11.79 (15" RCP)
- ⑧ DBI
GRATE 15.95
S INV 11.90 (15" RCP)
- ⑨ 24" MES
N INV 13.92
- ⑩ DBI
GRATE 16.42
S INV 15.51 (24" RCP)
- ⑪ 30" RCP
W INV 11.86 (MES)
E INV 12.10 (MES)
- ⑫ 30" RCP
W INV 11.68 (MES)
E INV 12.06 (MES)
- ⑬ 30" RCP
W INV 11.76 (MES)
E INV 12.12 (MES)
- ⑭ 2 - 24" MES
E INV 12.58 (N 24" RCP)
E INV 12.51 (S 24" RCP)
- ⑮ 24" MES
E INV 14.11 (24" RCP)
- ⑯ DBI
GRATE 16.49
W INV 15.46 (24" RCP)
- ⑰ 15" RCP
N INV 12.66 (MES)
S INV 12.63 (MES)
- ⑱ 18" RCP
N INV 12.84
S INV 12.77 (MES)
- ⑲ 2 - 24" MES
S INV 13.04 (W 15" RCP)
S INV 13.01 (E 15" RCP)
- ⑳ 2 - 24" MES
W INV 12.87 (N 15" RCP)
W INV 13.13 (S 15" RCP)
- ㉑ STORM MH
RIM 17.31
N INV 13.12 (18" RCP)
W INV 13.13 (N 24" RCP)
W INV 13.17 (S 24" RCP)
S INV 13.11 (W 24" RCP)
S INV 13.11 (E 24" RCP)
- ㉒ 18" MES
N INV 13.62
- ㉓ 10'x3' CBC
W INV 10.92 (HW)
E INV 10.94 (HW)
- ㉔ 24" RCP
W INV 12.08 (HW)
E INV 11.59 (MES)
- ㉕ 24" RCP
S INV 13.83 (MES)
N INV 13.40 (MES)
- ㉖ 12" PVC
W INV 14.72 (MES)
E INV 14.14 (MES)
- ㉗ 15" RCP
S INV 14.07 (MES)
N INV 14.04 (MES)
- ㉘ 12" PVC
W INV 14.75 (MES)
E INV 13.91 (MES)
- ㉙ DBI
GRATE 16.47
E INV 12.44 (12" PVC)
12" PVC OUTFALL, W INV 12.44
- ㉚ 8'x4' CBC
W INV 7.41 (HW)
E INV 6.96 (HW)
- ㉛ 18" RCP
S INV 13.40 (MES)
N INV 12.54 (MES)
- ㉜ 18" CMP
S INV 12.42 (MES)
N INV 12.82 (MES)
- ㉝ 24" RCP
W INV 11.08 (HW)
E INV 10.85 (HW)
- ㉞ 18" RCP
S INV 10.10 (MES)
N INV 10.09 (MES)

STRUCTURE NO.	STATION	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD (B)				GREATEST FLOOD			
		2% PROB. DISCHARGE	50 YR. FREQ. STAGE	1% PROB. DISCHARGE	100 YR. FREQ. STAGE	DISCHARGE	STAGE	PROB. %	FREQ. YR.	DISCHARGE	STAGE	PROB. %	FREQ. YR.
CD-1	466+15			100	15.77	104	15.54	10	10				
CD-2	478+99			189	14.31	140	12.13	10	10				

NOTE: THE HYDRAULIC DATA IS SHOWN FOR INFORMATIONAL PURPOSES ONLY, TO INDICATE THE FLOOD DISCHARGES AND WATER SURFACE ELEVATIONS WHICH MAY BE ANTICIPATED IN ANY GIVEN YEAR. THIS DATA WAS GENERATED USING HIGHLY VARIABLE FACTORS DETERMINED BY A STUDY OF THE WATERSHED. MANY JUDGEMENTS AND ASSUMPTIONS ARE REQUIRED TO ESTABLISH THESE FACTORS. THE RESULTANT HYDRAULIC DATA IS SENSITIVE TO CHANGES, PARTICULARLY OF ANTECEDENT CONDITIONS, URBANIZATION, CHANNELIZATION, AND LAND USE. USERS OF THIS DATA ARE CAUTIONED AGAINST THE ASSUMPTION OF PRECISION WHICH CAN NOT BE ATTAINED. DISCHARGES ARE IN CUBIC FEET PER SECOND AND STAGES ARE IN FEET, NAVD, 1988.

DEFINITIONS:
 DESIGN FLOOD: THE FLOOD SELECTED BY F.D.O.T. TO BE UTILIZED TO ASSURE A STANDARD LEVEL OF HYDRAULIC PERFORMANCE.
 BASE FLOOD: THE FLOOD HAVING A 1% CHANCE OF BEING EXCEEDED IN ANY YEAR. (100 YR. FREQUENCY)
 OVERTOPPING FLOOD: THE FLOOD WHERE FLOW OCCURS (A) OVER THE HIGHWAY (B) OVER A WATERSHED DIVIDE OR (C) THRU EMERGENCY RELIEF STRUCTURES.
 GREATEST FLOOD: THE MOST SEVERE FLOOD WHICH CAN BE PREDICTED WHERE OVERTOPPING IS NOT PRACTICABLE, NORMALLY ONE WITH A 0.2% CHANCE OF BEING EXCEEDED IN ANY YEAR. (500 YR. FREQUENCY)



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

HORIZON
engineering group, inc.

2500 Mallard Center Pkwy., Suite 300 Mallard, Florida 32751
 Certificate of Authorization No.: 00009544 Phone: 407.644.7155
 LISA M. H. OLIVERA, P.E. NO. 56256 Fax: 407.644.7855

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

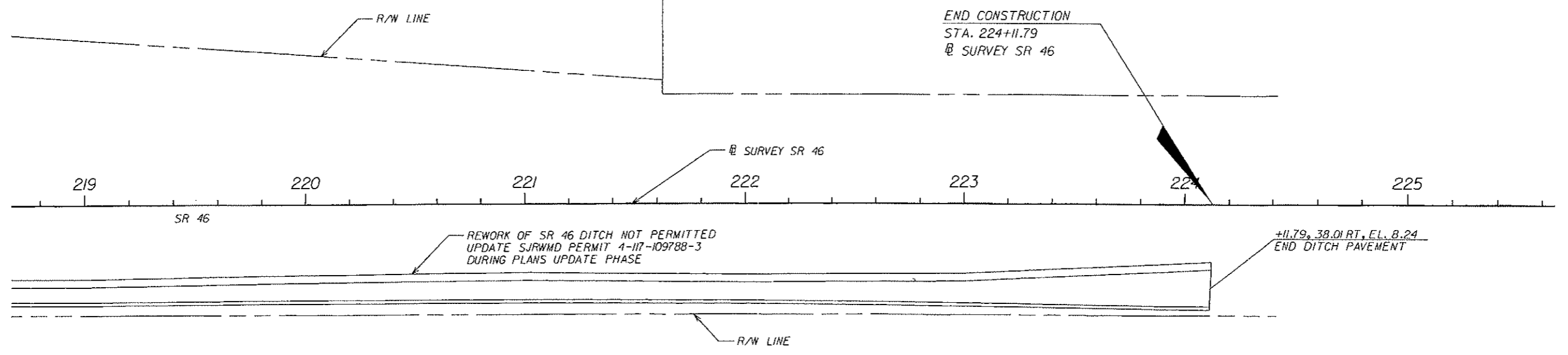
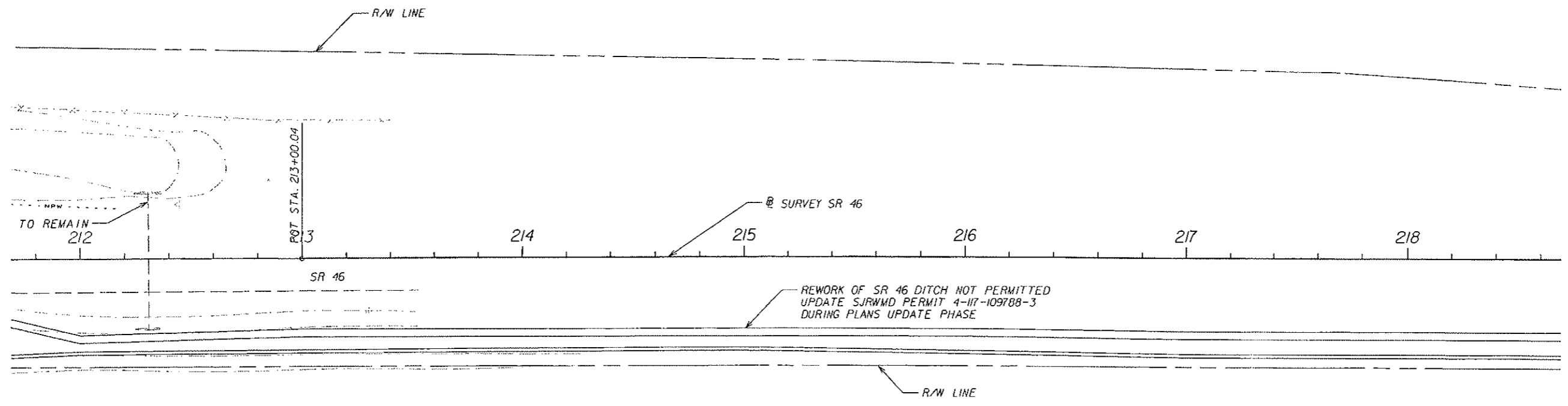
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
415	SEMINOLE	407355-1-52-01

DRAINAGE MAP

SHEET NO. 3

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

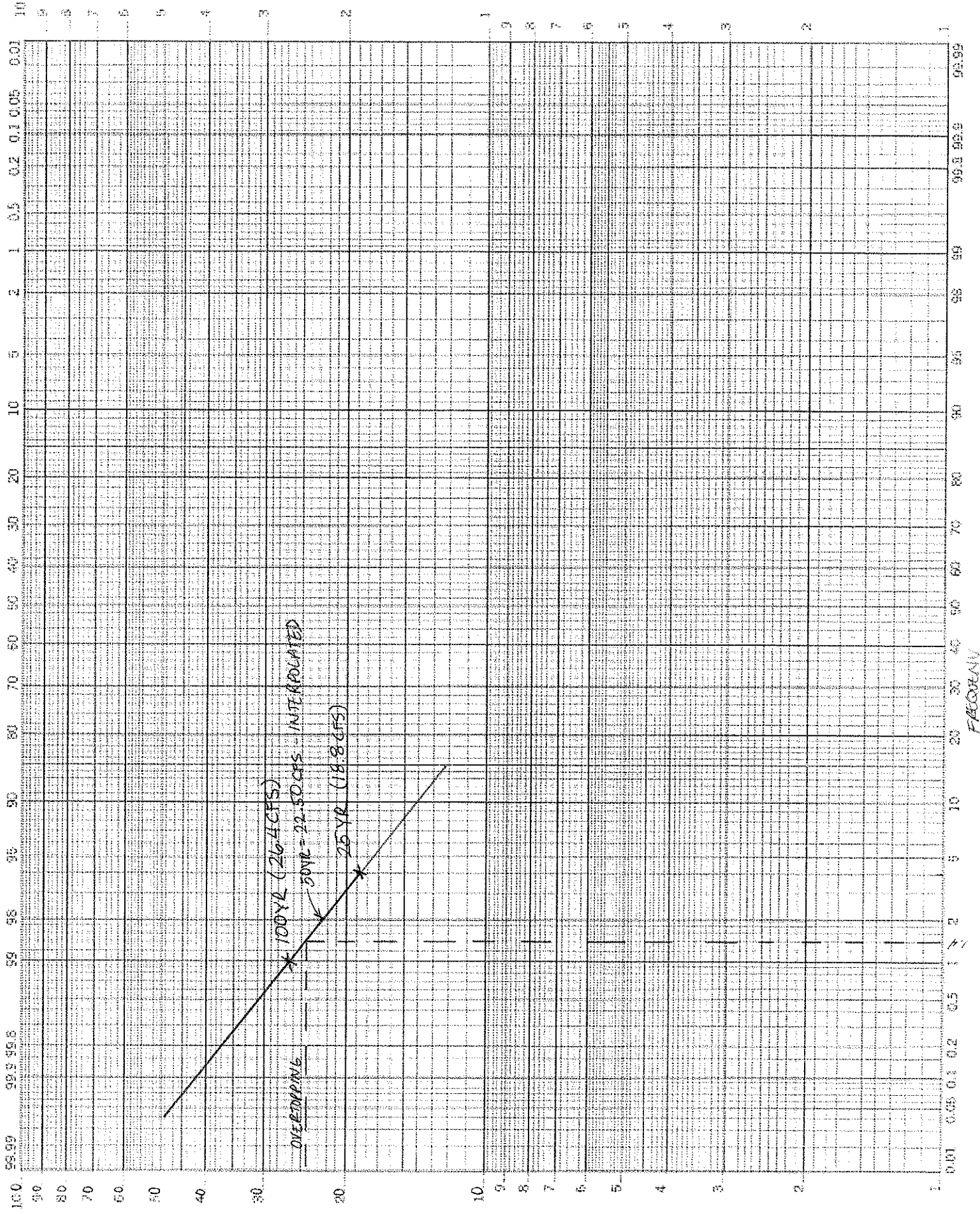
WALTER V. KLOSS
 P.E. LICENSE NUMBER 42625
 GHYABI & ASSOCIATES, INC.
 255 PRIMERA BLVD., SUITE 432
 LAKE MARY, FL 32746
 CERTIFICATE OF AUTHORIZATION 7311

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
415	SEMINOLE	407355-1-52-01

SR 46
ROADWAY PLAN

SHEET NO. 40

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CFS

FACTORY

**HY-8 Culvert Analysis Report
CD-1 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
15.89	22.50	22.50	0.00	1
16.17	24.73	23.99	0.00	50
16.21	26.40	24.20	1.96	12
16.22	29.19	24.24	4.71	4
16.22	31.42	24.26	7.05	4
16.23	33.65	24.28	9.15	3
16.23	35.88	24.30	11.39	3
16.23	38.11	24.32	13.65	3
16.24	40.34	24.34	15.90	3
16.24	42.57	24.36	18.14	3
16.24	44.80	24.38	20.04	2

Rating Curve Plot for Crossing: CD-1

Total Rating Curve

Crossing: CD-1

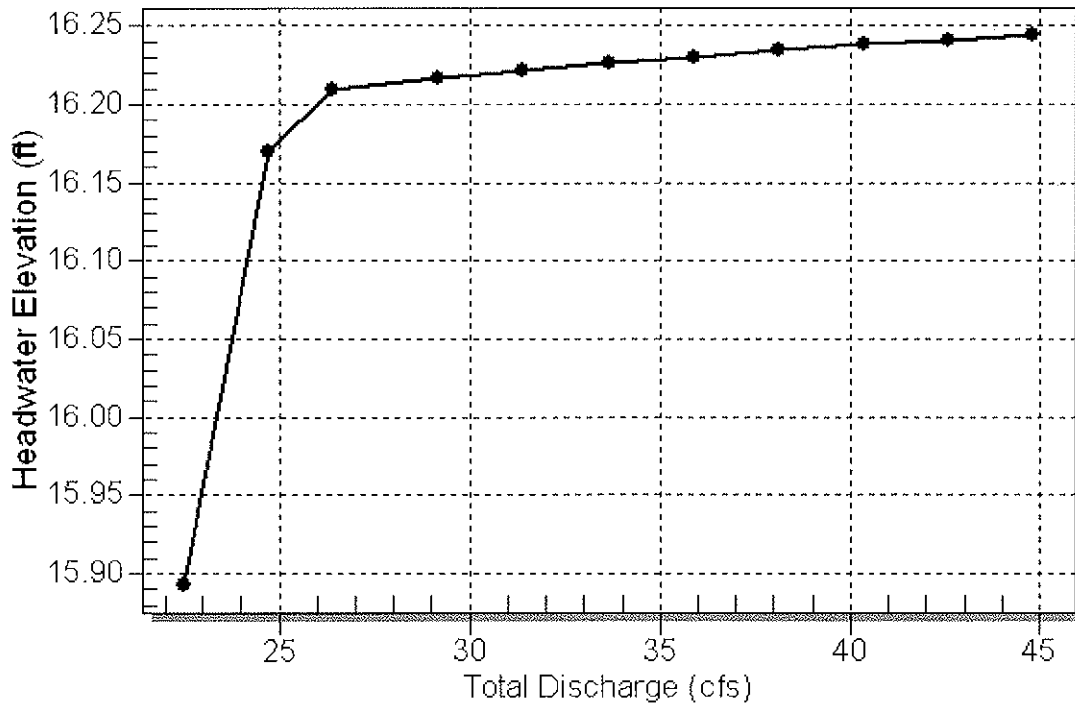


Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	15.89	3.333	3.333	5-S2n	1.040	1.678	1.135	1.420	12.229	0.000
24.73	23.99	16.17	3.610	3.610	5-S2n	1.081	1.722	1.181	1.420	12.423	0.000
26.40	24.20	16.21	3.649	3.649	5-S2n	1.086	1.728	1.188	1.420	12.439	0.000
29.19	24.24	16.22	3.657	3.657	5-S2n	1.088	1.730	1.190	1.420	12.444	0.000
31.42	24.26	16.22	3.662	3.662	5-S2n	1.088	1.730	1.190	1.420	12.448	0.000
33.65	24.28	16.23	3.666	3.666	5-S2n	1.089	1.731	1.191	1.420	12.451	0.000
35.88	24.30	16.23	3.670	3.670	5-S2n	1.089	1.732	1.192	1.420	12.454	0.000
38.11	24.32	16.23	3.674	3.674	5-S2n	1.090	1.732	1.192	1.420	12.457	0.000
40.34	24.34	16.24	3.678	3.678	5-S2n	1.090	1.733	1.193	1.420	12.459	0.000
42.57	24.36	16.24	3.681	3.681	5-S2n	1.091	1.733	1.193	1.420	12.462	0.000
44.80	24.38	16.24	3.684	3.684	5-S2n	1.091	1.734	1.194	1.420	12.464	0.000

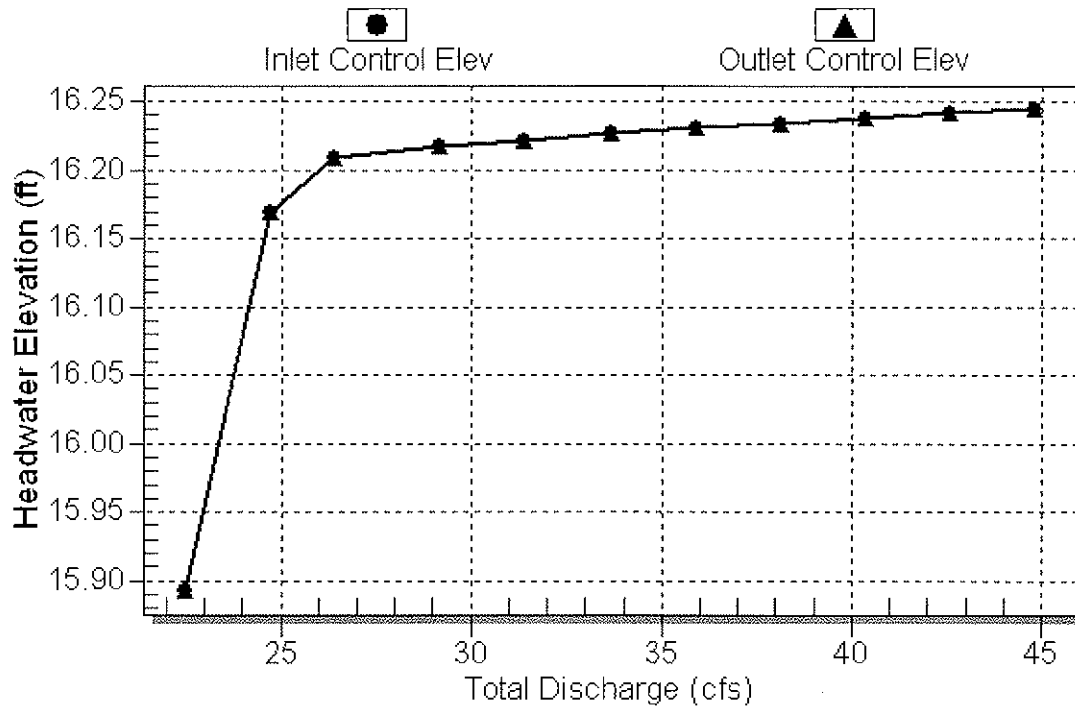
Inlet Elevation (invert): 12.56 ft, Outlet Elevation (invert): 10.72 ft

Culvert Length: 62.53 ft, Culvert Slope: 0.0294

Culvert Performance Curve Plot: Culvert 1

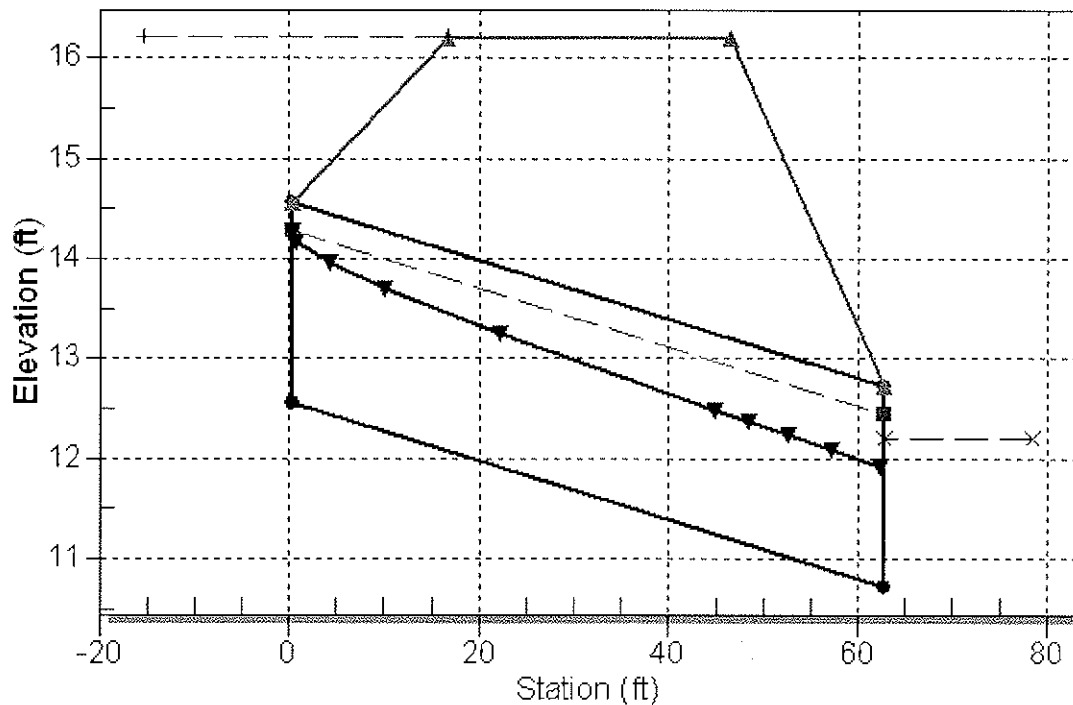
Performance Curve

Culvert: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1

Crossing - CD-1, Design Discharge - 26.4 cfs
Culvert - Culvert 1, Culvert Discharge - 24.2 cfs



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 12.56 ft

Outlet Station: 62.50 ft

Outlet Elevation: 10.72 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-1)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	12.20	1.42
24.73	12.20	1.42
26.40	12.20	1.42
29.19	12.20	1.42
31.42	12.20	1.42
33.65	12.20	1.42
35.88	12.20	1.42
38.11	12.20	1.42
40.34	12.20	1.42
42.57	12.20	1.42
44.80	12.20	1.42

Tailwater Channel Data - CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 12.20 ft

Roadway Data for Crossing: CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 740.00 ft

Crest Elevation: 16.20 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 8/7/2012
FIN No.: 240216-4-28-01	Checked by: DTL	Date: 9/25/12
Subject: CD-2: 24" RCP (Sta 188+61.8)		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-2. Based on the URS site visit conducted on Feb 12th, 2012 there are no apparent erosion problems. The existing concrete culvert has been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. Approximate historical drainage area is 33.79 acres per existing SR 46 Plans. Due to no record of flooding, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u> ✓		
No of culverts:	<u>1</u>		Material: <u>RCP</u>
Exist culvert length:	<u>73.7 ft</u>		
Avg flowline elev upstream:	<u>13.70</u> ✓ (NAVD)	(14.7 NGVD)	Per Existing SR 46 Plans
Avg flowline elev downstream:	<u>13.00</u> ✓ (NAVD)	(14.0 NGVD)	Per Existing SR 46 Plans
Longitudinal slope:	0.009498	=	<u>0.9498%</u>
Tailwater:	<u>15.00</u> (NAVD)		High Water Mark Stain on D/S End (Approximately @ Crown)

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.5 (Note 1)	17.05	15.92
100	1.4	26.4	17.21	16.27
500	1.7	44.8	17.24	17.22

Overtopping		
	Existing	Proposed
Elev (NAVD)	17.2	17.20
Q* (cfs)	23.3	34.74
Freq (yr)	59	364

* From HY 8 culvert analysis

Note 1: Interpolated from Discharge vs Frequency graph (existing)

Note 2: Values obtained from HY 8 model of existing Culvert

Note 3: Values obtained from HY 8 model of proposed extension Culvert

Proposed Culvert

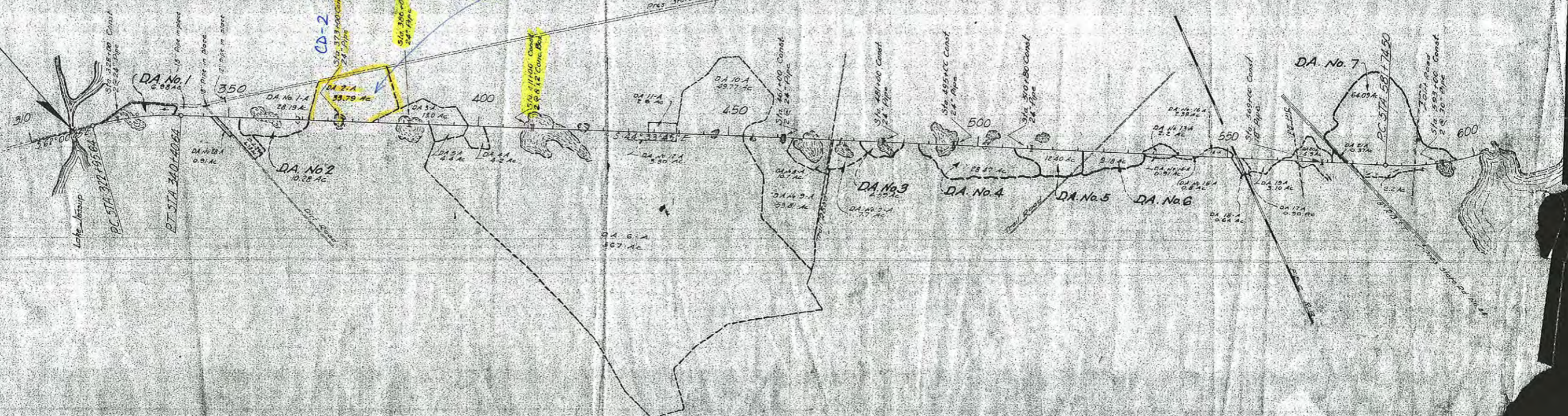
Note: Culvert Replacement to be 30" RCP
Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 16.70

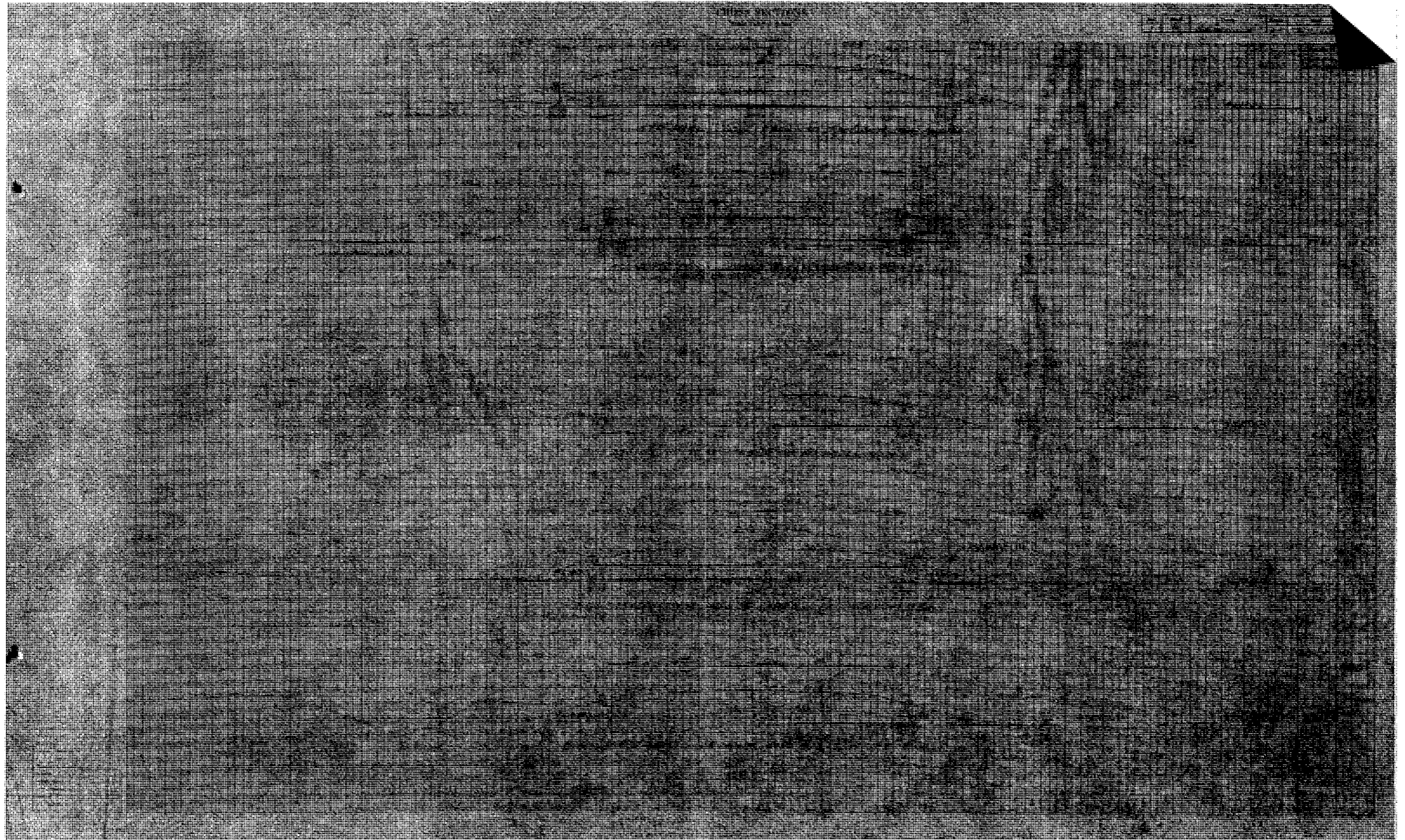
Proposed Information

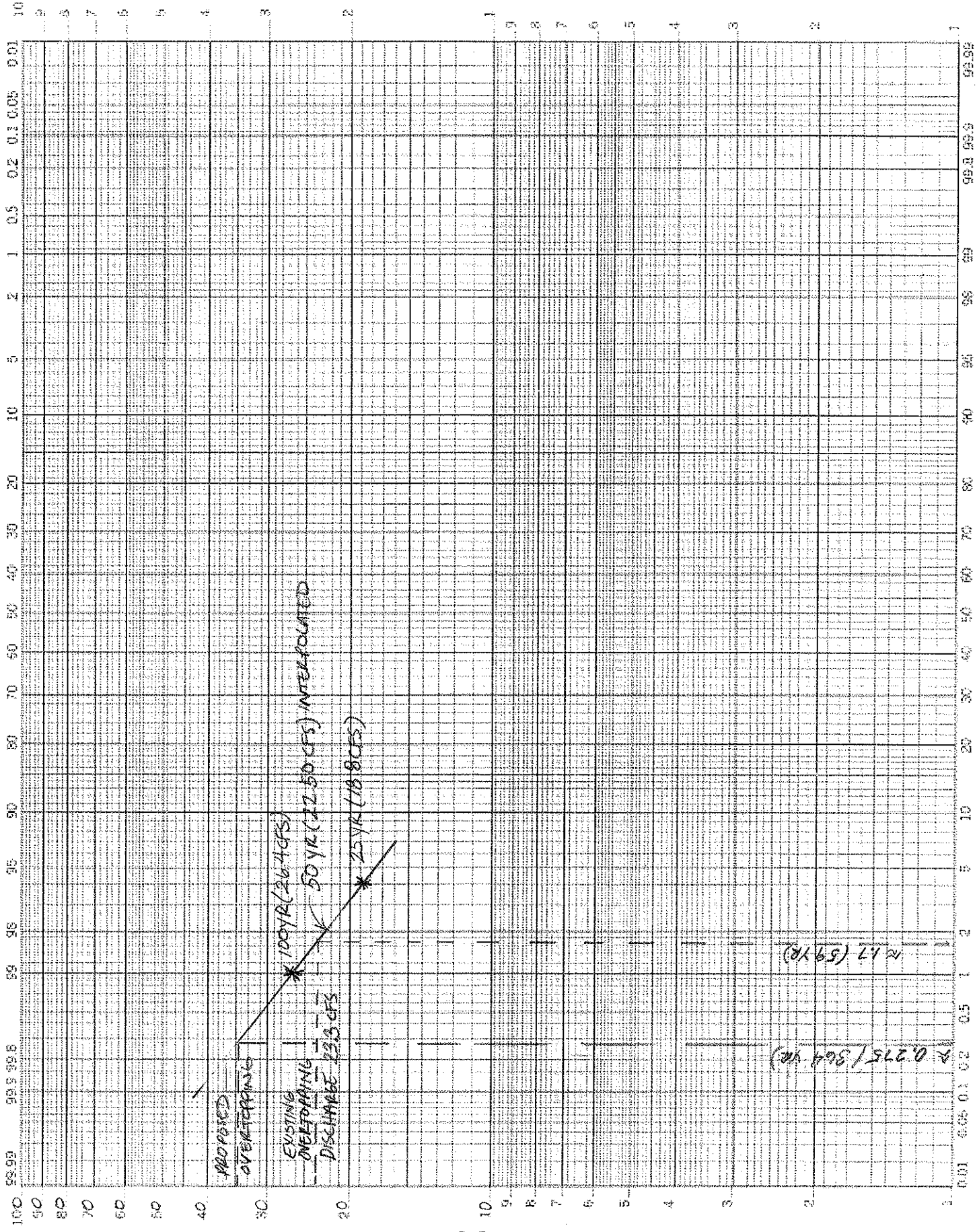
	Extension Length	Invert (NAVD)
Upstream:	49.9 ft	13.20
Downstream:	46.4 ft	12.50
Total length of proposed culvert:	170.0 ft	

2011 Regression Limitations:
Min: 0.44 mi² D.A.
Min: 0.18 % STORAGE

BEGIN PROJECT
STA. 318+31.95







CFS

FATIGUE

**HY-8 Culvert Analysis Report
CD-2 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-2 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-2 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.05	22.50	22.50	0.00	1
17.21	24.73	23.33	1.20	37
17.21	26.40	23.36	2.79	4
17.22	29.19	23.39	5.61	4
17.22	31.42	23.41	7.73	3
17.22	33.65	23.43	9.99	3
17.23	35.88	23.45	12.26	3
17.23	38.11	23.46	14.53	3
17.23	40.34	23.48	16.77	3
17.23	42.57	23.49	19.01	3
17.24	44.80	23.50	20.94	2

Rating Curve Plot for Crossing: CD-2 Existing

Total Rating Curve
Crossing: CD-2 Existing

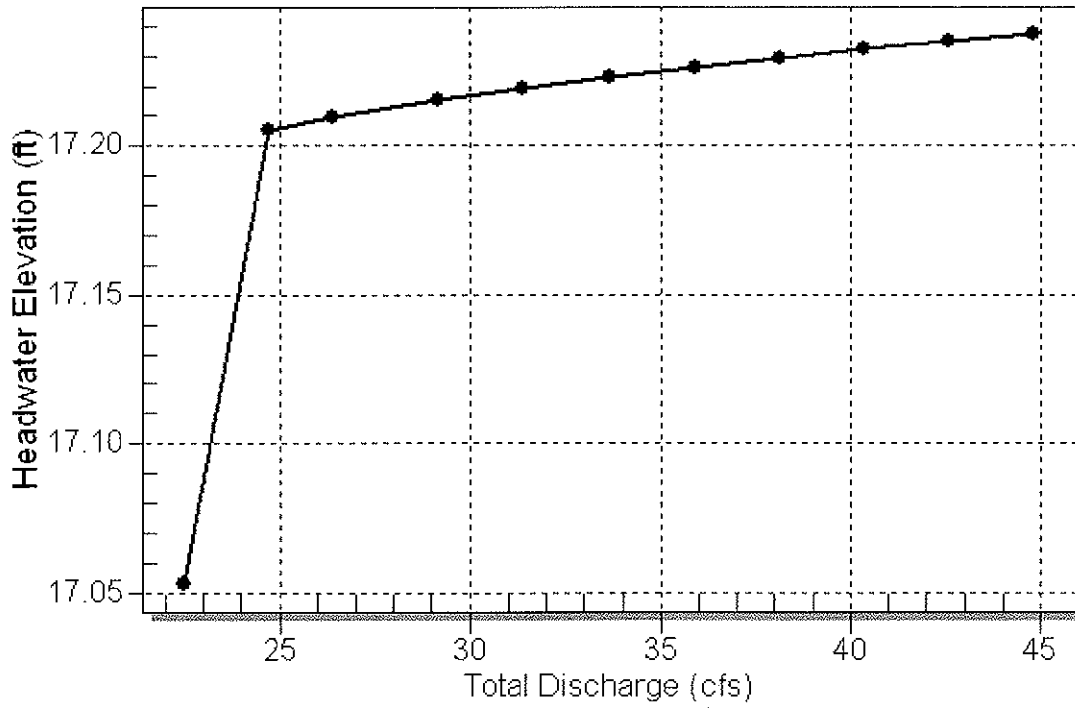


Table 2 - Culvert Summary Table: CD-2 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	17.05	3.353	3.112	4-FFf	1.547	1.678	1.547	2.000	8.646	0.000
24.73	23.33	17.21	3.505	3.249	4-FFf	1.597	1.703	1.597	2.000	8.680	0.000
26.40	23.36	17.21	3.510	3.253	4-FFf	1.598	1.704	1.598	2.000	8.681	0.000
29.19	23.39	17.22	3.515	3.258	4-FFf	1.600	1.705	1.600	2.000	8.682	0.000
31.42	23.41	17.22	3.519	3.262	4-FFf	1.601	1.705	1.601	2.000	8.680	0.000
33.65	23.43	17.22	3.523	3.265	4-FFf	1.603	1.706	1.603	2.000	8.677	0.000
35.88	23.45	17.23	3.526	3.268	4-FFf	1.605	1.706	1.605	2.000	8.675	0.000
38.11	23.46	17.23	3.529	3.271	4-FFf	1.606	1.707	1.606	2.000	8.672	0.000
40.34	23.48	17.23	3.532	3.273	4-FFf	1.608	1.707	1.608	2.000	8.670	0.000
42.57	23.49	17.23	3.535	3.276	4-FFf	1.609	1.708	1.609	2.000	8.667	0.000
44.80	23.50	17.24	3.537	3.278	4-FFf	1.611	1.708	1.611	2.000	8.665	0.000

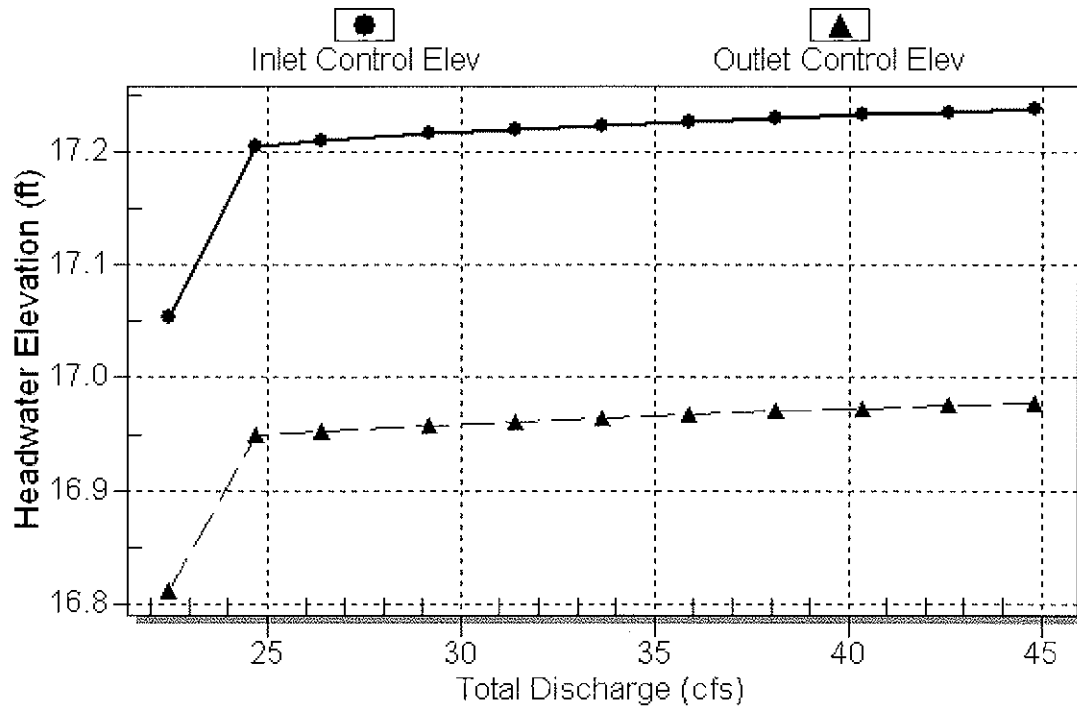
Inlet Elevation (invert): 13.70 ft, Outlet Elevation (invert): 13.00 ft

Culvert Length: 73.70 ft, Culvert Slope: 0.0095

Culvert Performance Curve Plot: CD-2 Existing

Performance Curve

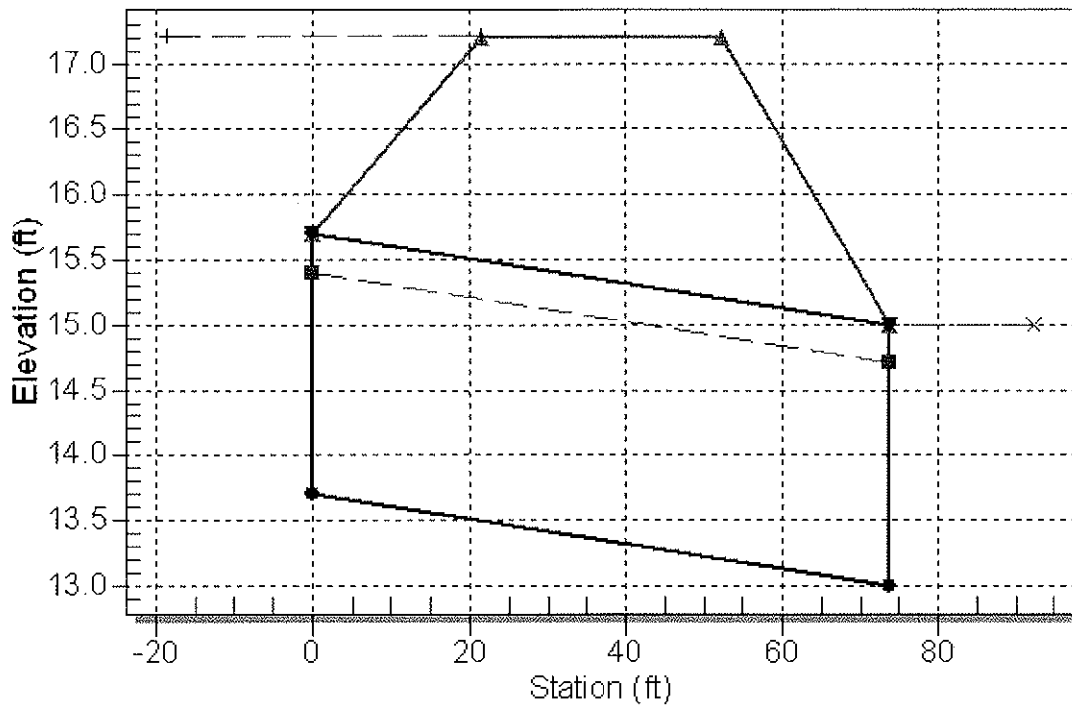
Culvert: CD-2 Existing



Water Surface Profile Plot for Culvert: CD-2 Existing

Crossing - CD-2 Existing, Design Discharge - 26.4 cfs

Culvert - CD-2 Existing, Culvert Discharge - 23.4 cfs



Site Data - CD-2 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.70 ft

Outlet Station: 73.70 ft

Outlet Elevation: 13.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-2 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-2 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	15.00	2.00
24.73	15.00	2.00
26.40	15.00	2.00
29.19	15.00	2.00
31.42	15.00	2.00
33.65	15.00	2.00
35.88	15.00	2.00
38.11	15.00	2.00
40.34	15.00	2.00
42.57	15.00	2.00
44.80	15.00	2.00

Tailwater Channel Data - CD-2 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 15.00 ft

Roadway Data for Crossing: CD-2 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 17.20 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-2 (Proposed 30" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-2 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-2 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
15.92	22.50	22.50	0.00	1
16.11	24.73	24.73	0.00	1
16.27	26.40	26.40	0.00	1
16.55	29.19	29.19	0.00	1
16.80	31.42	31.42	0.00	1
17.06	33.65	33.65	0.00	1
17.20	35.88	34.78	0.85	39
17.21	38.11	34.82	2.95	4
17.21	40.34	34.86	5.30	4
17.22	42.57	34.89	7.39	3
17.22	44.80	34.92	9.64	3

Rating Curve Plot for Crossing: CD-2 Proposed

Total Rating Curve
Crossing: CD-2 Proposed

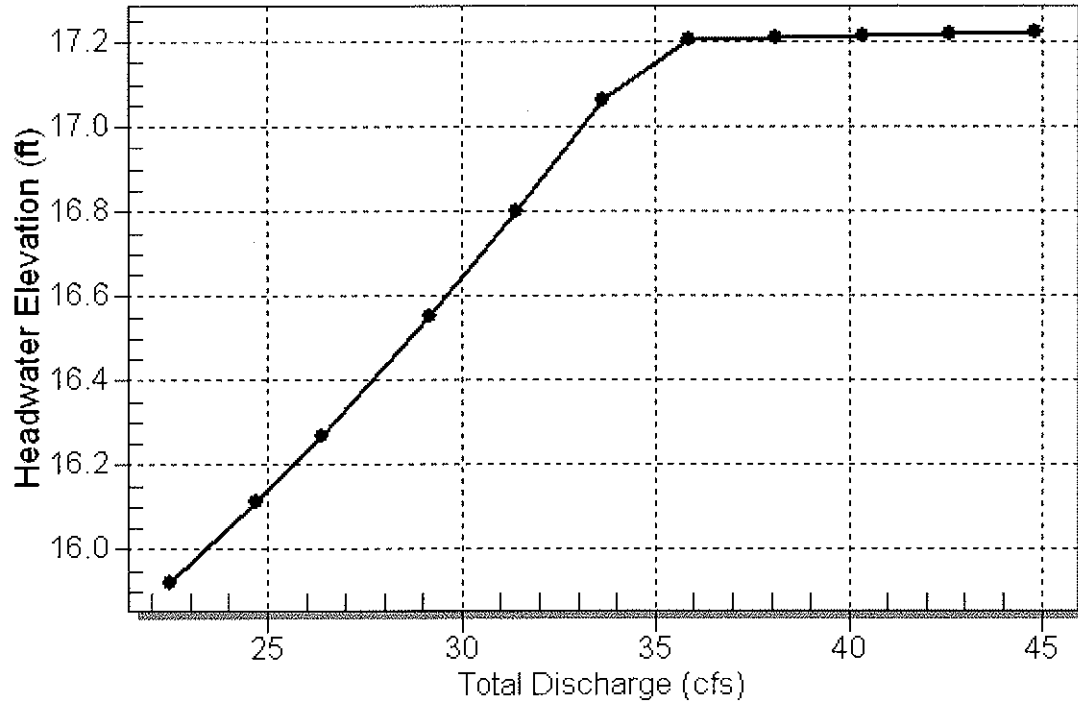


Table 2 - Culvert Summary Table: CD-2 Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	15.92	2.515	2.723	4-FFf	1.675	1.608	2.500	2.500	4.584	0.000
24.73	24.73	16.11	2.694	2.915	4-FFf	1.800	1.690	2.500	2.500	5.038	0.000
26.40	26.40	16.27	2.835	3.070	4-FFf	1.905	1.751	2.500	2.500	5.378	0.000
29.19	29.19	16.55	3.085	3.353	4-FFf	2.125	1.835	2.500	2.500	5.947	0.000
31.42	31.42	16.80	3.301	3.599	4-FFf	2.500	1.902	2.500	2.500	6.401	0.000
33.65	33.65	17.06	3.533	3.864	4-FFf	2.500	1.970	2.500	2.500	6.855	0.000
35.88	34.78	17.20	3.656	4.004	4-FFf	2.500	2.002	2.500	2.500	7.084	0.000
38.11	34.82	17.21	3.661	4.010	4-FFf	2.500	2.003	2.500	2.500	7.094	0.000
40.34	34.86	17.21	3.665	4.015	4-FFf	2.500	2.004	2.500	2.500	7.101	0.000
42.57	34.89	17.22	3.669	4.019	4-FFf	2.500	2.005	2.500	2.500	7.107	0.000
44.80	34.92	17.22	3.672	4.022	4-FFf	2.500	2.005	2.500	2.500	7.113	0.000

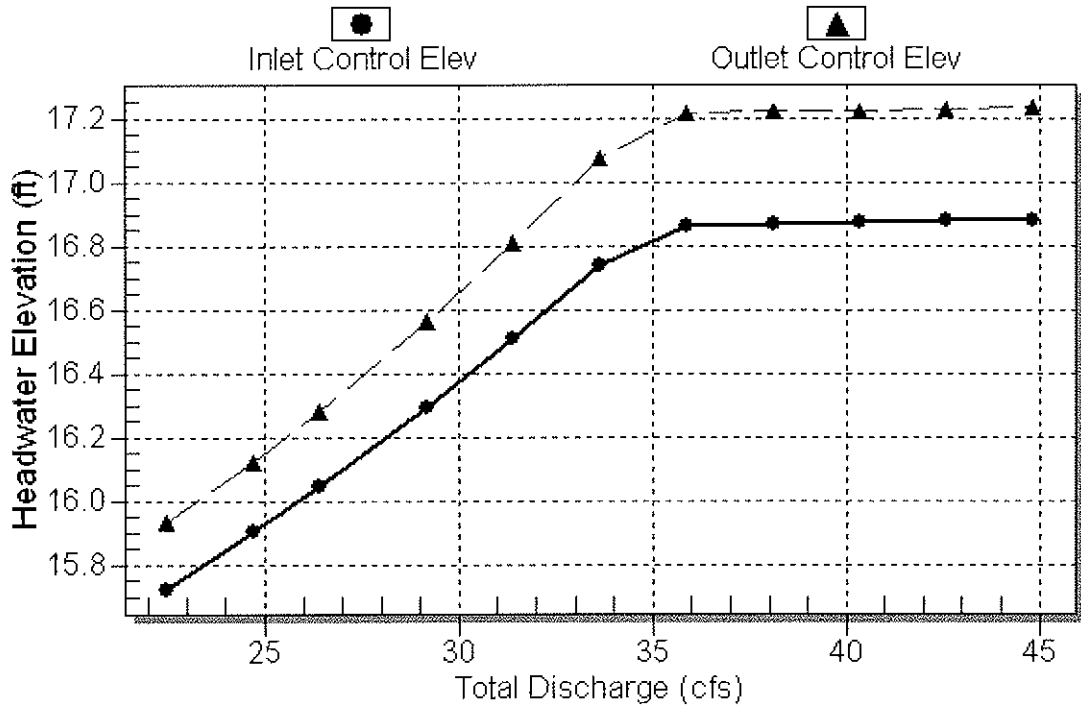
Inlet Elevation (invert): 13.20 ft, Outlet Elevation (invert): 12.50 ft

Culvert Length: 170.00 ft, Culvert Slope: 0.0041

Culvert Performance Curve Plot: CD-2 Proposed

Performance Curve

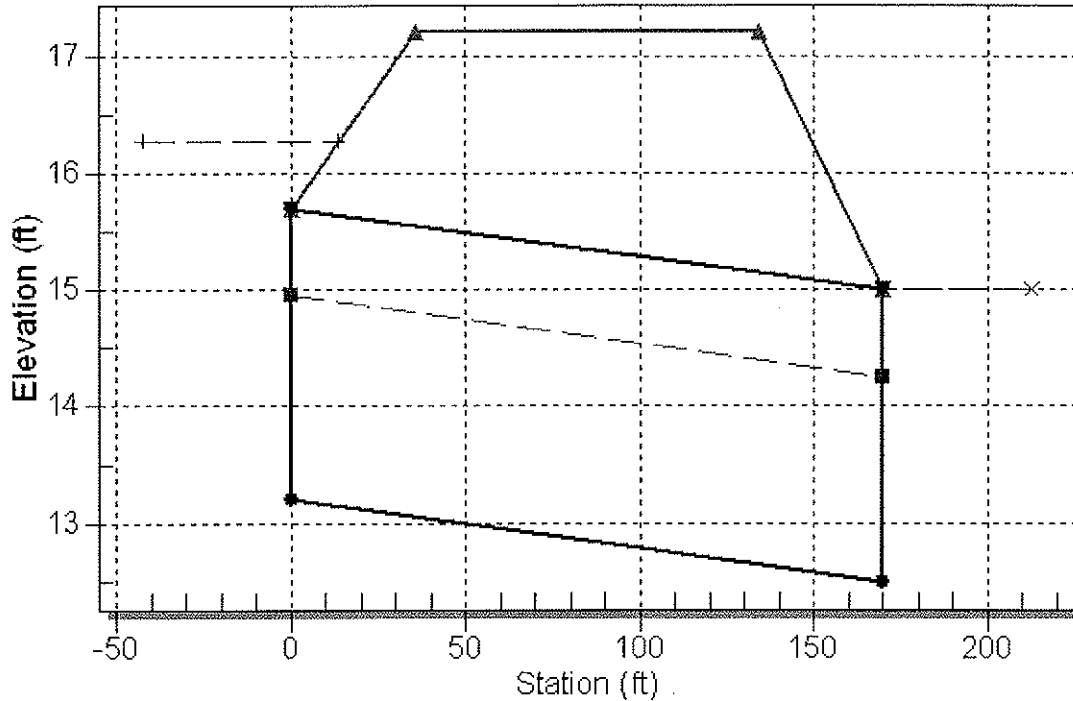
Culvert: CD-2 Proposed



Water Surface Profile Plot for Culvert: CD-2 Proposed

Crossing - CD-2 Proposed, Design Discharge - 26.4 cfs

Culvert - CD-2 Proposed, Culvert Discharge - 26.4 cfs



Site Data - CD-2 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.20 ft

Outlet Station: 170.00 ft

Outlet Elevation: 12.50 ft

Number of Barrels: 1

Culvert Data Summary - CD-2 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-2 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	15.00	2.50
24.73	15.00	2.50
26.40	15.00	2.50
29.19	15.00	2.50
31.42	15.00	2.50
33.65	15.00	2.50
35.88	15.00	2.50
38.11	15.00	2.50
40.34	15.00	2.50
42.57	15.00	2.50
44.80	15.00	2.50

Tailwater Channel Data - CD-2 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 15.00 ft

Roadway Data for Crossing: CD-2 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 17.20 ft

Roadway Surface: Paved

Roadway Top Width: 98.00 ft

Project: <u>SR 46 PD&E Study (SR 415 to CR 426)</u>	Design By: <u>DEP</u>	Date: <u>8/6/2012</u>
FIN No.: <u>240216-4-28-01</u>	Checked by: <u>DTL</u>	Date: <u>9/25/12</u>
Subject: <u>CD-3: 24" RCP (Sta 201+60.80) /</u>		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-3. Based on the URS site visit conducted on Feb. 12th, 2012 there are no apparent erosion problems. The pipe was halfway submerged and was heavily vegetated with aquatic vegetation and maintenance clipping waste. The existing concrete culvert has been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. Approximate historical drainage area is 13 acres per existing SR 46 Plans. Due to no record of flooding, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u>		
No of culverts:	<u>1</u>		Material: <u>RCP</u>
Exist culvert length:	<u>74.0 ft</u>		
Avg flowline elev upstream:	<u>14.00</u>	(NAVD)	(15.0 NGVD) Per Existing SR 46 Plans
Avg flowline elev downstream:	<u>13.80</u>	(NAVD)	(14.8 NGVD) Per Existing SR 46 Plans
Longitudinal slope:	<u>0.002703</u>	=	<u>0.2703%</u>
Tailwater:	<u>16.13</u>	(NAVD)	<u>High Water Mark Stain on D/S End</u> <u>(Approximately 4" above Crown)</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.5 (Note 1)	17.94	17.05
100	1.4	26.4	18.01	17.40
500	1.7	44.8	18.04	18.03

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing CBC
 Note 3: Values obtained from HY 8 model of proposed extension CBC

Overtopping		
	Existing	Proposed
Elev (NAVD)	18.00	18.00
Q* (cfs)	22.84	32.03
Freq (yr)	53	286

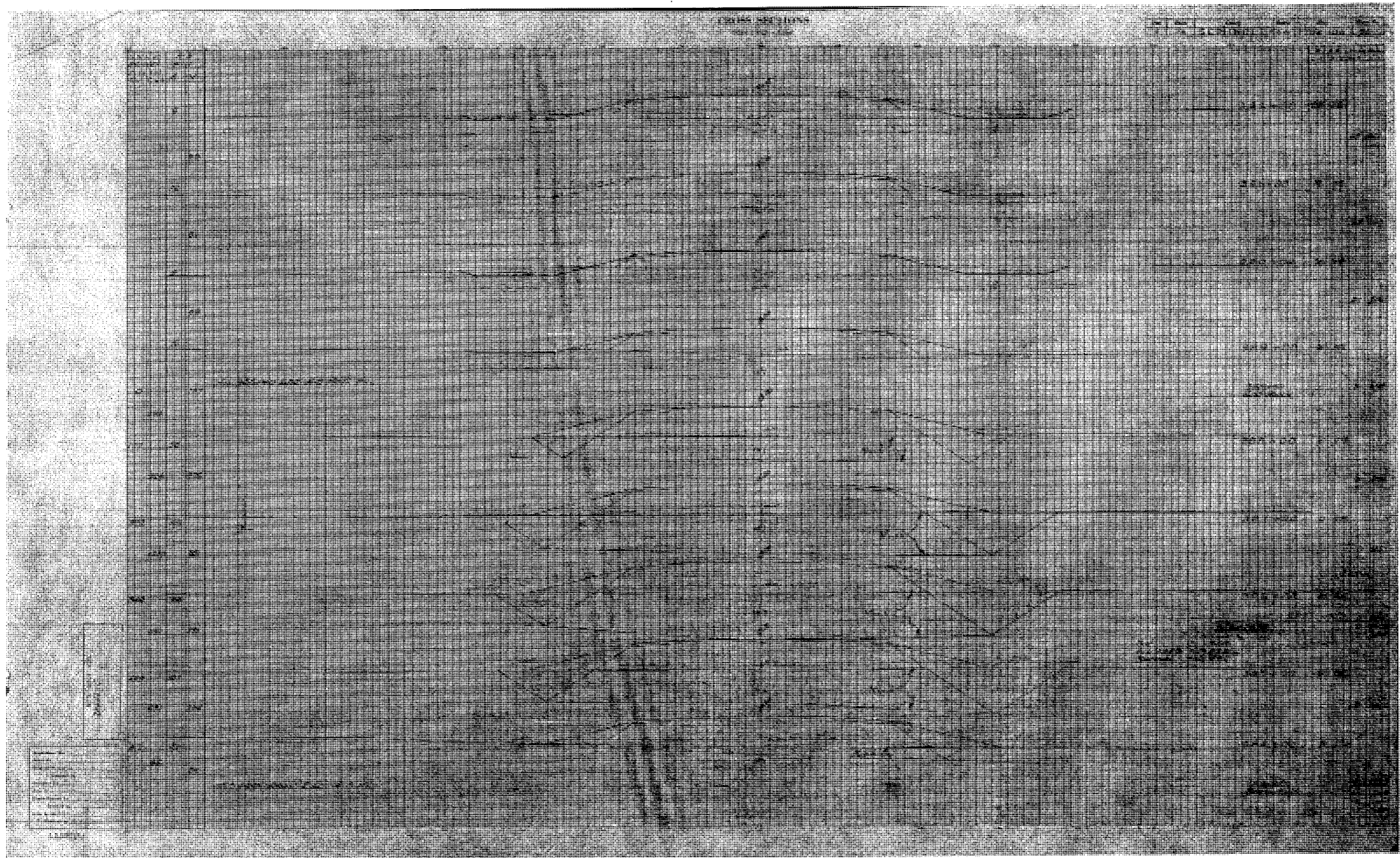
* From HY 8 culvert analysis

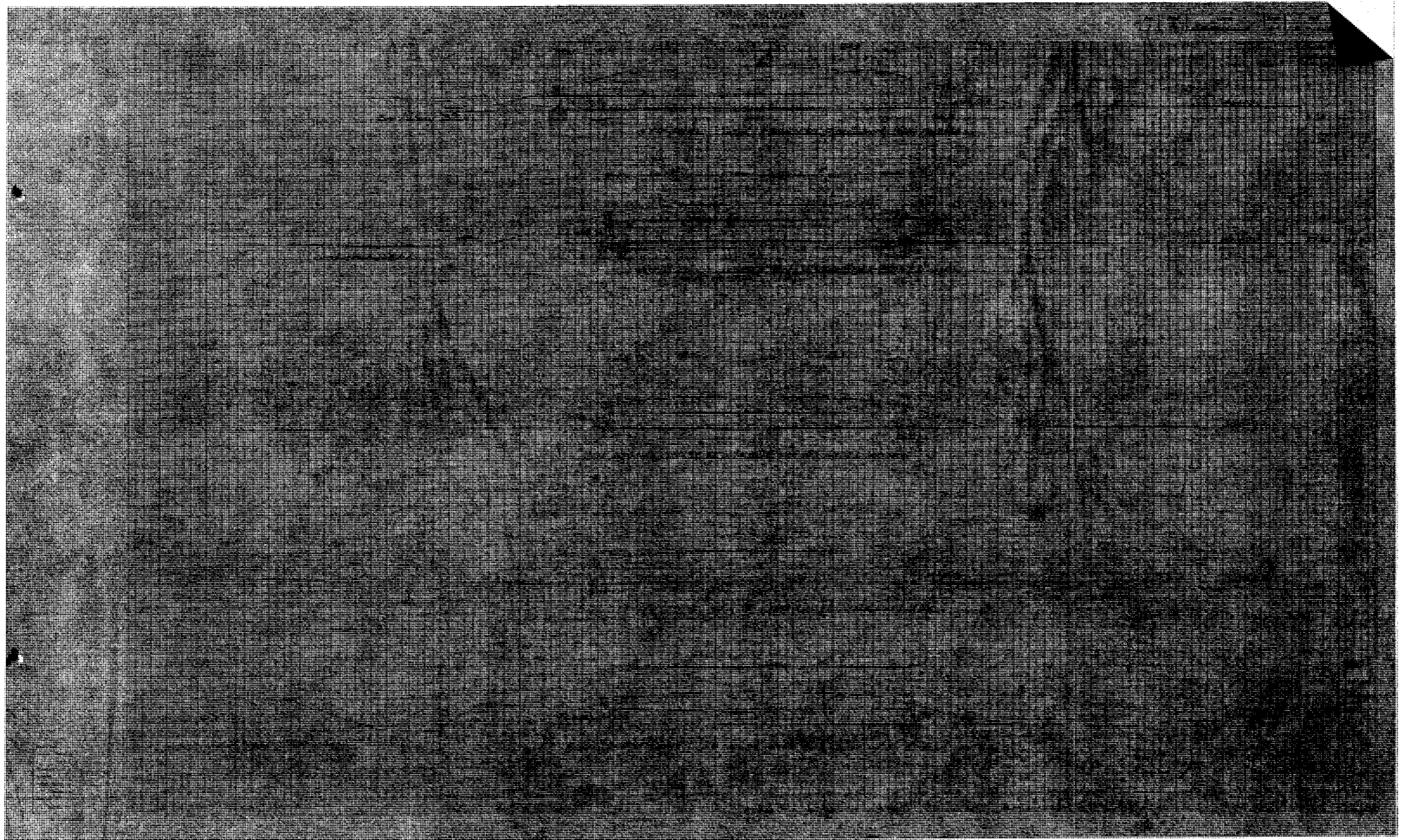
Proposed Culvert

Note: Culvert Replacement to be 30" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 17.5

Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	<u>80.0 ft</u>	13.50
Downstream:	<u>16.0 ft</u>	13.30
Total length of proposed culvert:	<u>170.0 ft</u>	

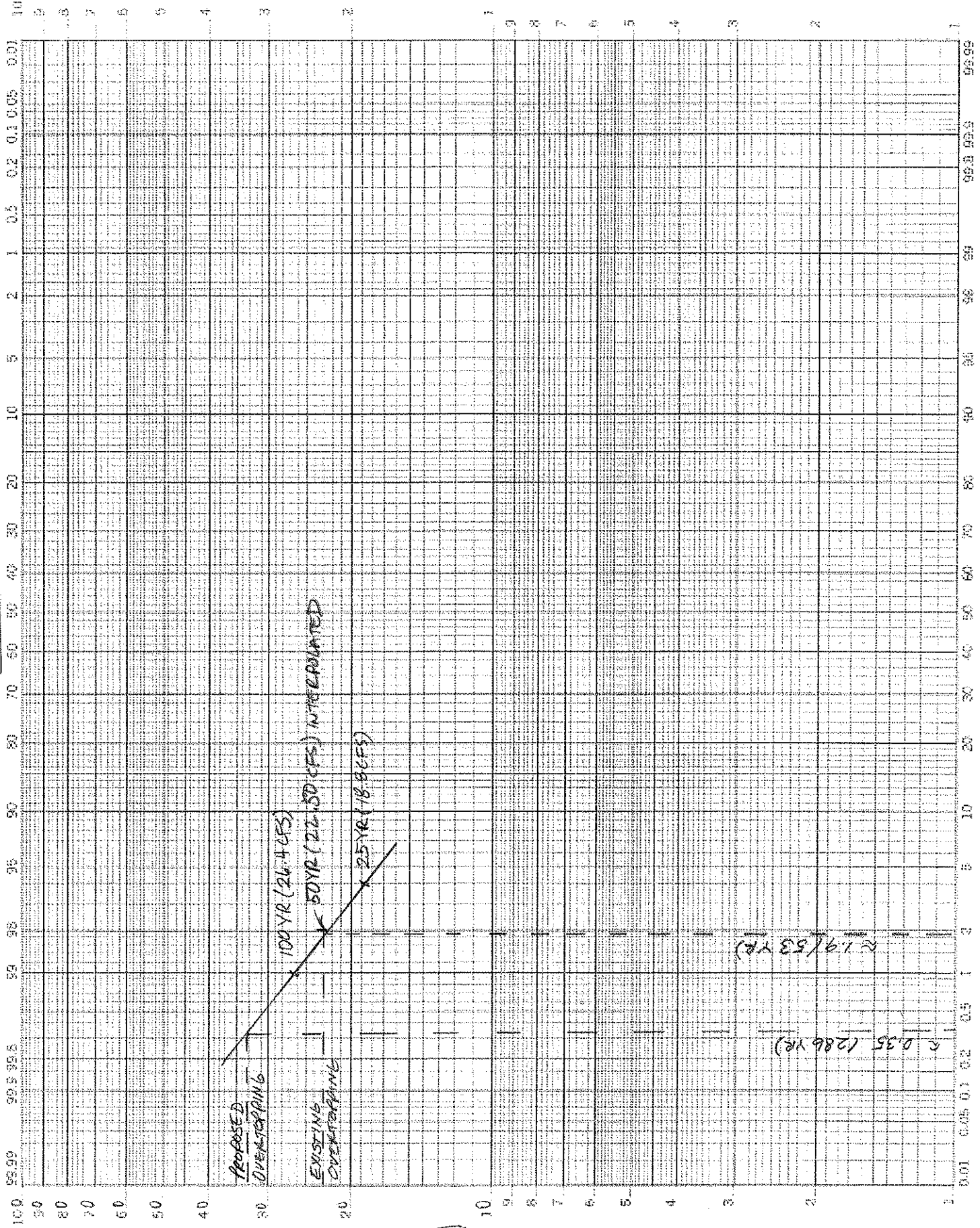




CD-3

PROPOSED OVERSTAPING

FREQUENCY



GFS

**HY-8 Culvert Analysis Report
CD-3 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-3 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-3 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.94	22.50	22.50	0.00	1
18.01	24.73	22.88	1.71	20
18.01	26.40	22.90	3.30	4
18.02	29.19	22.94	6.09	4
18.02	31.42	22.96	8.20	3
18.02	33.65	22.98	10.45	3
18.03	35.88	23.00	12.72	3
18.03	38.11	23.02	14.98	3
18.03	40.34	23.04	17.22	3
18.04	42.57	23.05	19.11	2
18.04	44.80	23.07	21.65	3

Rating Curve Plot for Crossing: CD-3 Existing

Total Rating Curve

Crossing: CD-3 Existing

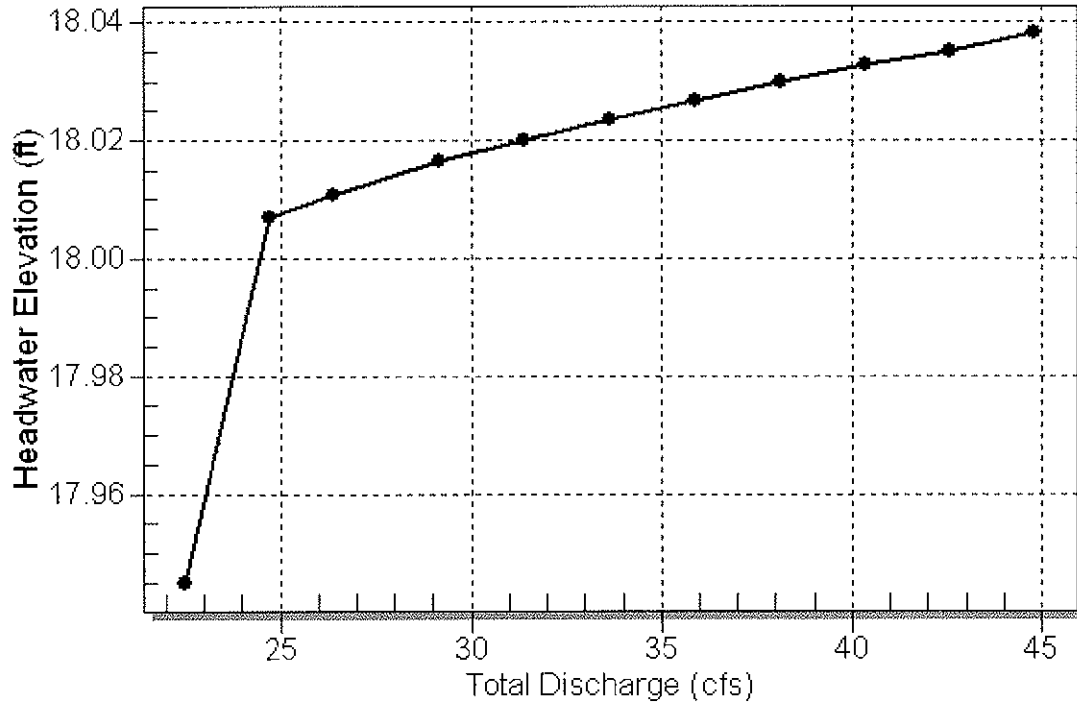


Table 2 - Culvert Summary Table: CD-3 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	17.94	3.360	3.945	4-FFf	2.000	1.678	2.000	2.330	7.162	0.000
24.73	22.88	18.01	3.429	4.007	4-FFf	2.000	1.690	2.000	2.330	7.283	0.000
26.40	22.90	18.01	3.433	4.011	4-FFf	2.000	1.690	2.000	2.330	7.291	0.000
29.19	22.94	18.02	3.439	4.016	4-FFf	2.000	1.691	2.000	2.330	7.301	0.000
31.42	22.96	18.02	3.443	4.020	4-FFf	2.000	1.692	2.000	2.330	7.308	0.000
33.65	22.98	18.02	3.447	4.023	4-FFf	2.000	1.693	2.000	2.330	7.315	0.000
35.88	23.00	18.03	3.451	4.027	4-FFf	2.000	1.693	2.000	2.330	7.322	0.000
38.11	23.02	18.03	3.454	4.030	4-FFf	2.000	1.694	2.000	2.330	7.327	0.000
40.34	23.04	18.03	3.457	4.033	4-FFf	2.000	1.694	2.000	2.330	7.333	0.000
42.57	23.05	18.04	3.460	4.035	4-FFf	2.000	1.695	2.000	2.330	7.338	0.000
44.80	23.07	18.04	3.463	4.038	4-FFf	2.000	1.695	2.000	2.330	7.343	0.000

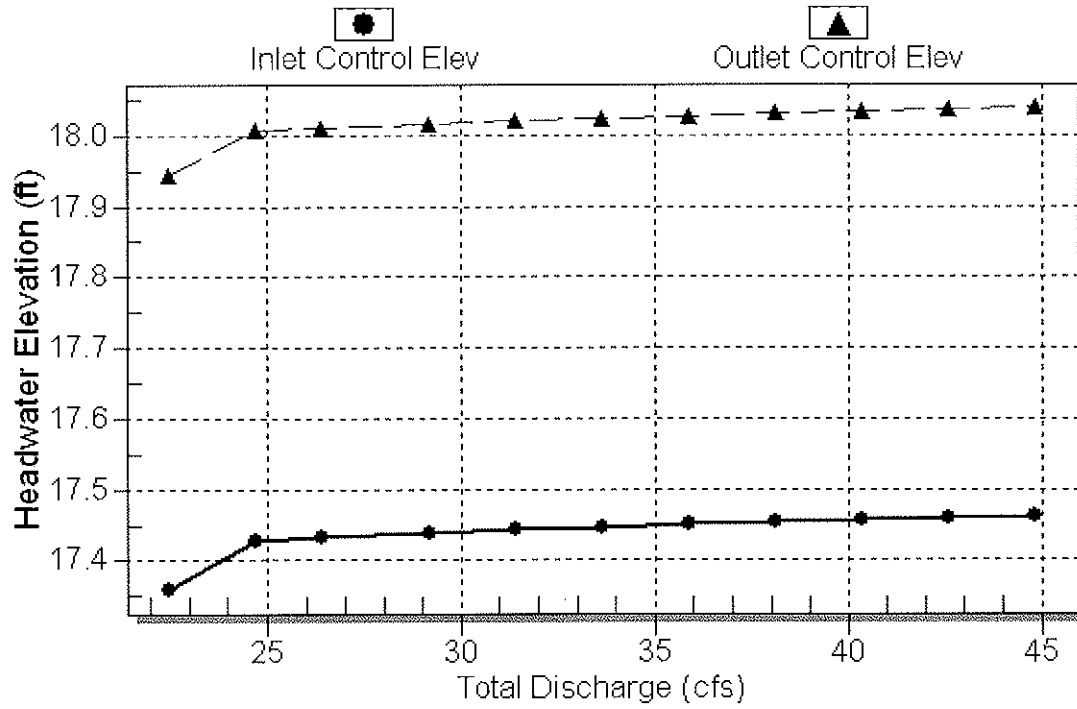
Inlet Elevation (invert): 14.00 ft, Outlet Elevation (invert): 13.80 ft

Culvert Length: 74.00 ft, Culvert Slope: 0.0027

Culvert Performance Curve Plot: CD-3 Existing

Performance Curve

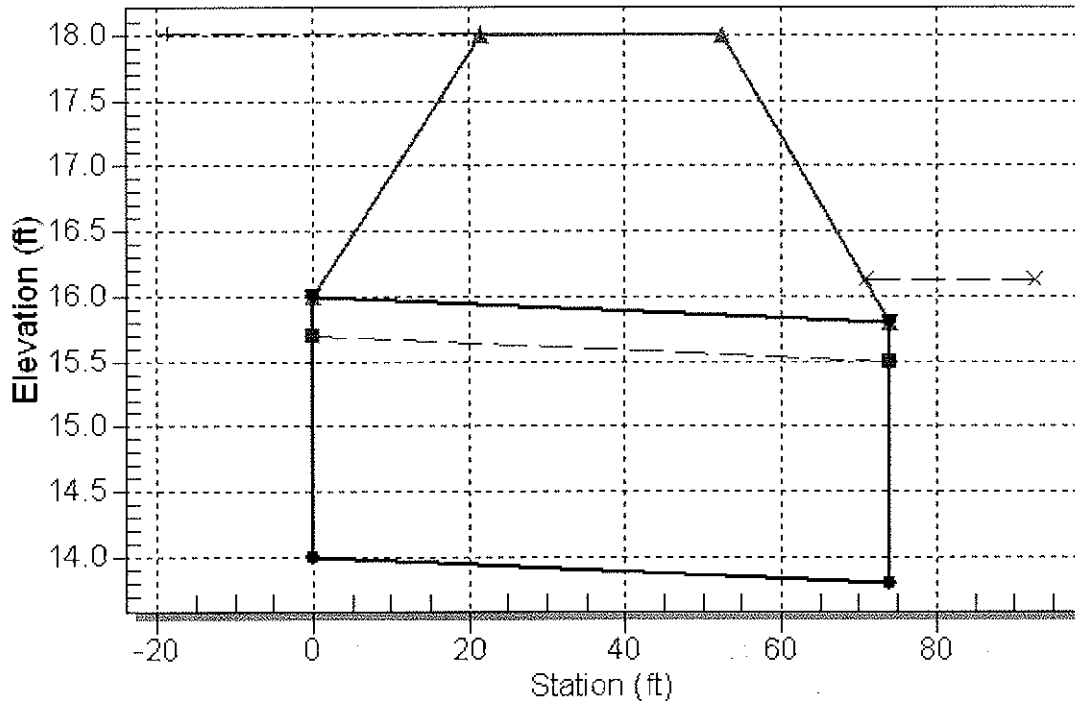
Culvert: CD-3 Existing



Water Surface Profile Plot for Culvert: CD-3 Existing

Crossing - CD-3 Existing, Design Discharge - 26.4 cfs

Culvert - CD-3 Existing, Culvert Discharge - 22.9 cfs



Site Data - CD-3 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 14.00 ft

Outlet Station: 74.00 ft

Outlet Elevation: 13.80 ft

Number of Barrels: 1

Culvert Data Summary - CD-3 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-3 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	16.13	2.33
24.73	16.13	2.33
26.40	16.13	2.33
29.19	16.13	2.33
31.42	16.13	2.33
33.65	16.13	2.33
35.88	16.13	2.33
38.11	16.13	2.33
40.34	16.13	2.33
42.57	16.13	2.33
44.80	16.13	2.33

Tailwater Channel Data - CD-3 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 16.13 ft

Roadway Data for Crossing: CD-3 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 18.00 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-3 (Proposed 30" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-3 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-3 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.05	22.50	22.50	0.00	1
17.24	24.73	24.73	0.00	1
17.40	26.40	26.40	0.00	1
17.68	29.19	29.19	0.00	1
17.93	31.42	31.42	0.00	1
18.01	33.65	32.08	1.28	23
18.01	35.88	32.13	3.46	4
18.02	38.11	32.17	5.79	4
18.02	40.34	32.20	7.88	3
18.02	42.57	32.23	10.12	3
18.03	44.80	32.25	12.38	3

Rating Curve Plot for Crossing: CD-3 Proposed

Total Rating Curve
Crossing: CD-3 Proposed

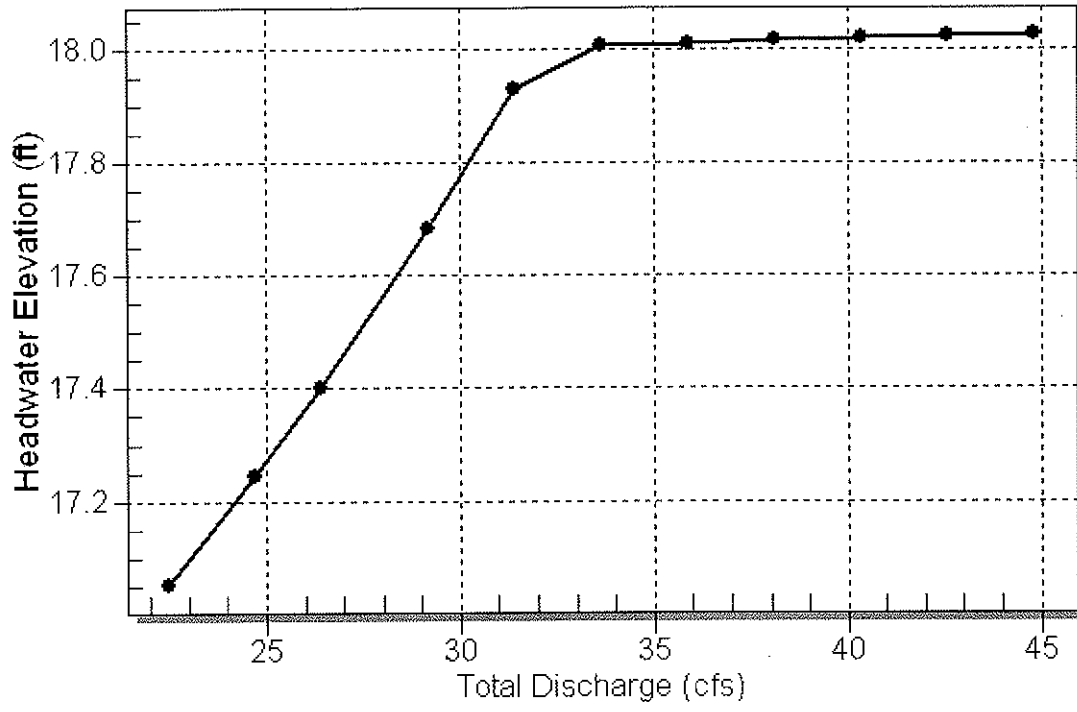


Table 2 - Culvert Summary Table: CD-3 Proposed

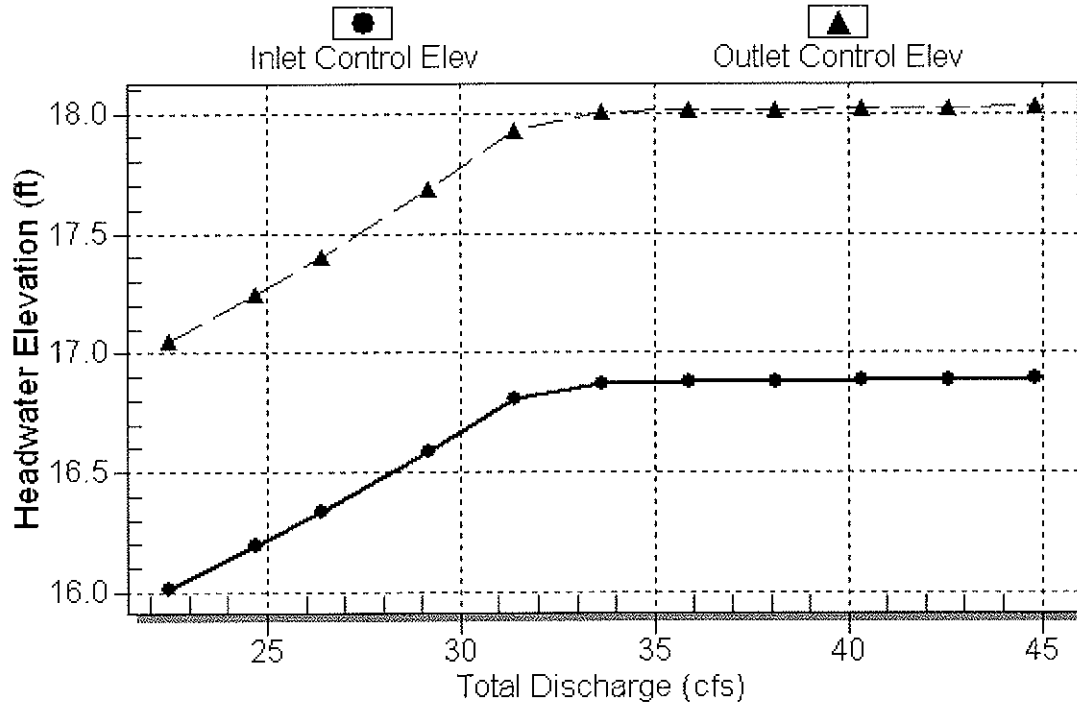
Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	17.05	2.518	3.553	4-FFf	2.500	1.608	2.500	2.330	4.584	0.000
24.73	24.73	17.24	2.698	3.745	4-FFf	2.500	1.690	2.500	2.330	5.038	0.000
26.40	26.40	17.40	2.839	3.900	4-FFf	2.500	1.751	2.500	2.330	5.378	0.000
29.19	29.19	17.68	3.089	4.183	4-FFf	2.500	1.835	2.500	2.330	5.947	0.000
31.42	31.42	17.93	3.305	4.429	4-FFf	2.500	1.902	2.500	2.330	6.401	0.000
33.65	32.08	18.01	3.372	4.506	4-FFf	2.500	1.922	2.500	2.330	6.535	0.000
35.88	32.13	18.01	3.376	4.511	4-FFf	2.500	1.924	2.500	2.330	6.545	0.000
38.11	32.17	18.02	3.381	4.516	4-FFf	2.500	1.925	2.500	2.330	6.553	0.000
40.34	32.20	18.02	3.384	4.519	4-FFf	2.500	1.926	2.500	2.330	6.559	0.000
42.57	32.23	18.02	3.387	4.523	4-FFf	2.500	1.927	2.500	2.330	6.565	0.000
44.80	32.25	18.03	3.390	4.526	4-FFf	2.500	1.928	2.500	2.330	6.571	0.000

Inlet Elevation (invert): 13.50 ft, Outlet Elevation (invert): 13.30 ft

Culvert Length: 170.00 ft, Culvert Slope: 0.0012

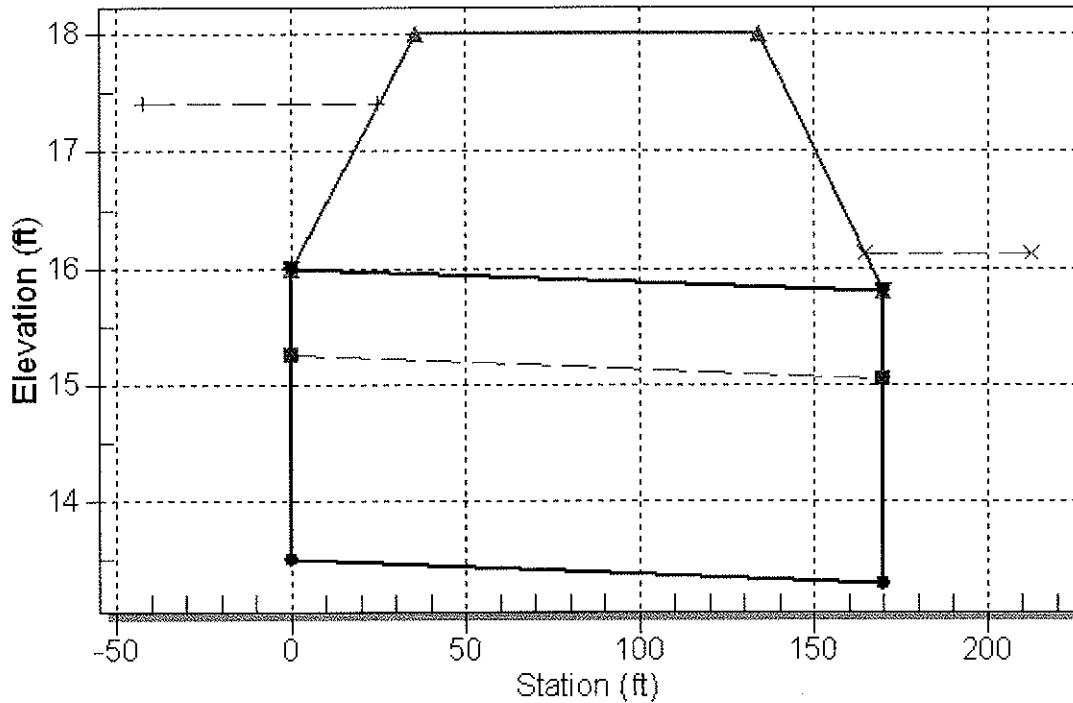
Culvert Performance Curve Plot: CD-3 Proposed

Performance Curve
Culvert: CD-3 Proposed



Water Surface Profile Plot for Culvert: CD-3 Proposed

Crossing - CD-3 Proposed, Design Discharge - 26.4 cfs
Culvert - CD-3 Proposed, Culvert Discharge - 26.4 cfs



Site Data - CD-3 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.50 ft

Outlet Station: 170.00 ft

Outlet Elevation: 13.30 ft

Number of Barrels: 1

Culvert Data Summary - CD-3 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-3 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	16.13	2.33
24.73	16.13	2.33
26.40	16.13	2.33
29.19	16.13	2.33
31.42	16.13	2.33
33.65	16.13	2.33
35.88	16.13	2.33
38.11	16.13	2.33
40.34	16.13	2.33
42.57	16.13	2.33
44.80	16.13	2.33

Tailwater Channel Data - CD-3 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 16.13 ft

Roadway Data for Crossing: CD-3 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 18.00 ft

Roadway Surface: Paved

Roadway Top Width: 98.00 ft

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 12/20/2013
FIN No.: 240216-4-28-01	Checked by: DTL	Date: 12/20/13
Subject: CD-4: Double 8' X 3' (Sta 226+59.46)		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-4. Based on the URS site visit conducted on Feb. 12th, 2012 both the upstream and downstream vertical faces of the toewalls have been exposed due to long term flow conditions of the culvert. Erosion protection may be considered in the proposed design based on velocities in the culvert extension. Approximate historical drainage area is 567 acres per existing SR 46 Plans. Due to no record of flooding, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Box Culvert Rise:	<u>3 ft</u>	
Box Culvert Span:	<u>8 ft</u>	<i>Note:</i> Culvert size field verified.
No of culverts:	<u>2</u>	Material: <u>Concrete</u>
Exist culvert length:	<u>72.0 ft</u>	
Avg flowline elev upstream:	<u>13.20</u>	(NAVD) (14.2 NGVD) Per Existing SR 46 Plans
Avg flowline elev downstream:	<u>13.00</u>	(NAVD) (14.0 NGVD) Per Existing SR 46 Plans
Longitudinal slope:	0.002778	= <u>0.2778%</u>
Tailwater:	<u>14.50</u>	(NAVD) <u>High Water Mark Stain on D/S End</u>

Estimate discharge & Overlapping & HW for existing and proposed:

Area of culvert (A): 48.0 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		288.0		
50		<u>340 (Note 1)</u>	17.55	17.60
100	1.4	403.2	18.04	18.04
500	1.7	685.4	18.21	18.22

Overtopping		
	Existing	Proposed
Elev (NAVD)	18	18
Q* (cfs)	375.57	371.79
Freq (yr)	72	72

* From HY 8 culvert analysis

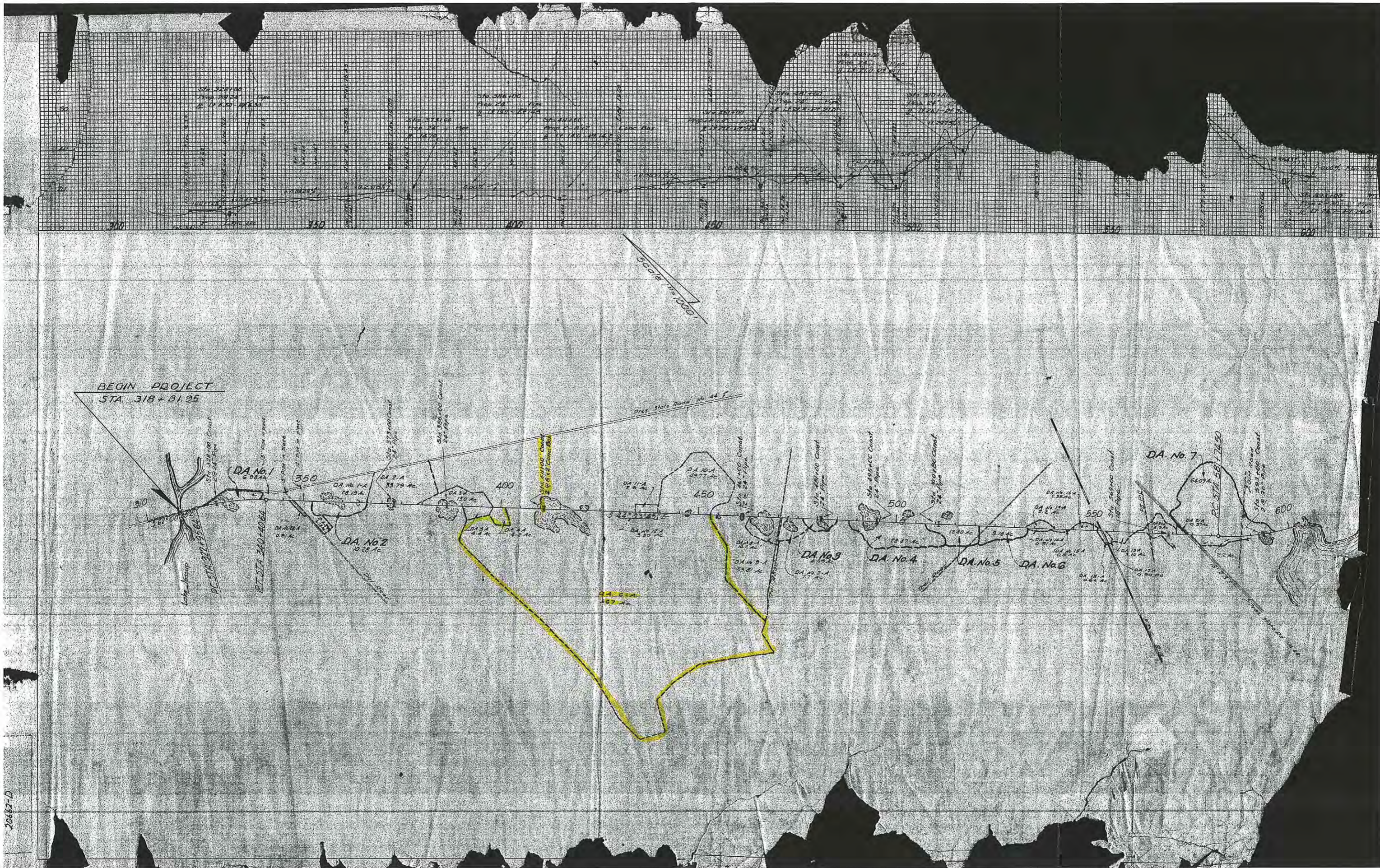
Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing C8C
 Note 3: Values obtained from HY 8 model of proposed extension C8C

Proposed Culvert

Note: Culvert extension span and rise to match existing
 Culvert U/S Invert Proposed at existing elevation

Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	17.0 ft	13.25
Downstream:	81.0 ft	12.78
Total length of proposed culvert:	170.0 ft	



BEGIN PROJECT
STA 318+81.95

Scale 1" = 100'

Over State Road No. 48 F

DA No. 1
6.88 Ac

DA No. 2
10.28 Ac

DA No. 1-A
28.19 Ac

DA 2-A
39.79 Ac

DA 3
13.0 Ac

DA 11-A
2.6 Ac

DA 10-A
29.77 Ac

DA 10-B
38.2 Ac

DA No. 3
6.57 Ac

DA No. 4

DA No. 5

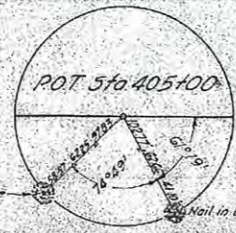
DA No. 6

DA No. 7

PC STA 587+28.50

20882-D

FED. ROAD DIST. No.	STATE	PROJ. No.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
8	FLA.	7704-05	44	8	



Nail in battle Cap in 4" Pine
Nail in battle Cap in 6" Pine

Pine & Palmetto

Sta. 408+00 Const Turnout
16.58' 120' EXTERIOR POINT
CONST. 24' - 24' PIPE

Sta. 411+00 Const Double 8' x 8' 30" Const Box
INDEX NO. 1628-E

Sta. 408+00 Const Turnout
16.58' 120' EXTERIOR POINT
CONST. 24' - 24' PIPE

Saw Grass Pond

Pond

Pine & Palmetto

Const
P/W Markers 1/4" x 1/4"

Const
P/W Markers 1/4" x 1/4"

Scrub

Oak

Pine & Palmetto

Pine & Palmetto

B.M. No. 8
2" D. Stake in 6" Cabbage Palm
28.17' 121' 121.91 70
Elev. 77.16

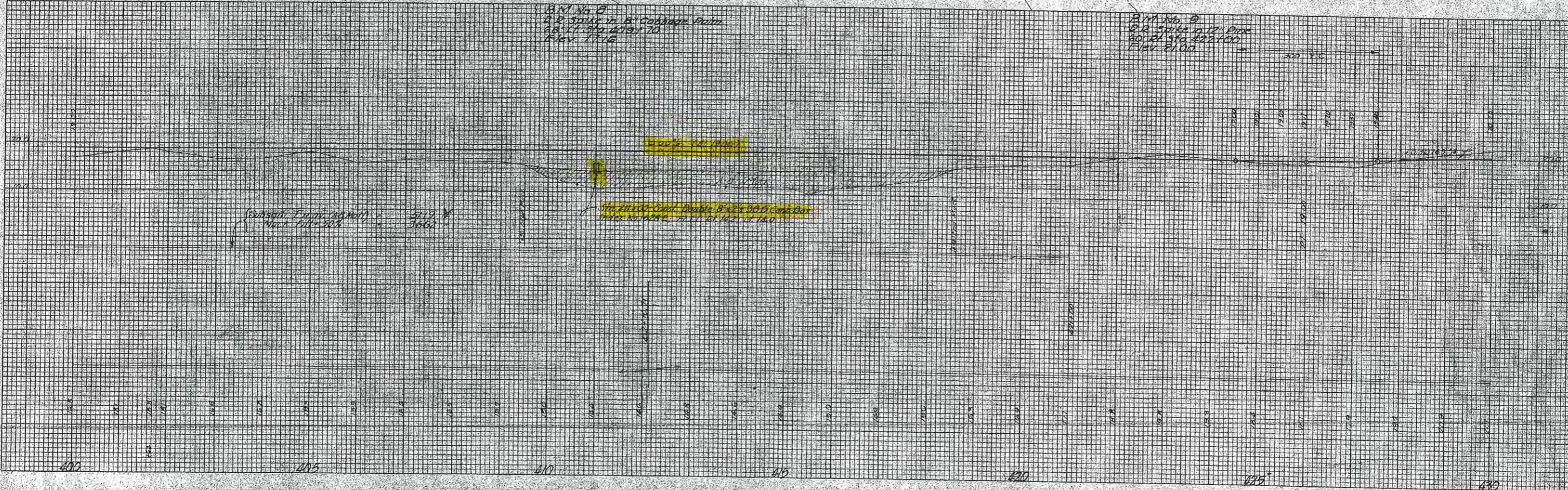
B.M. No. 9
2" D. Stake in 4" Pine
30.21' 121' 422+00
Elev. 81.00

Const. 24' - 24' PIPE

Sta. 411+00 Const Double 8' x 8' 30" Const Box
INDEX NO. 1628-E

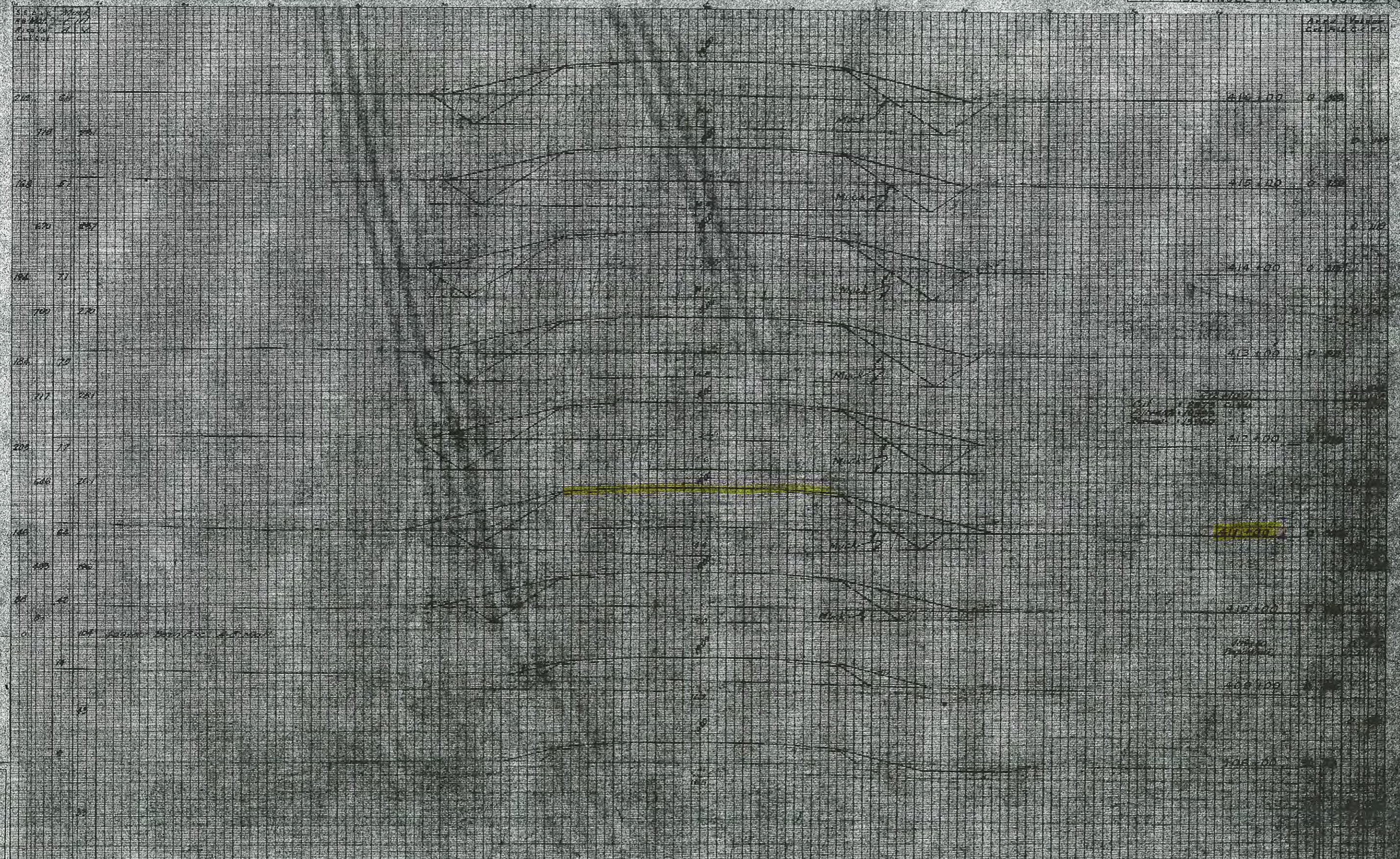
(Subgrade Elevation 120.00)
March 1971-1974

5112
3662



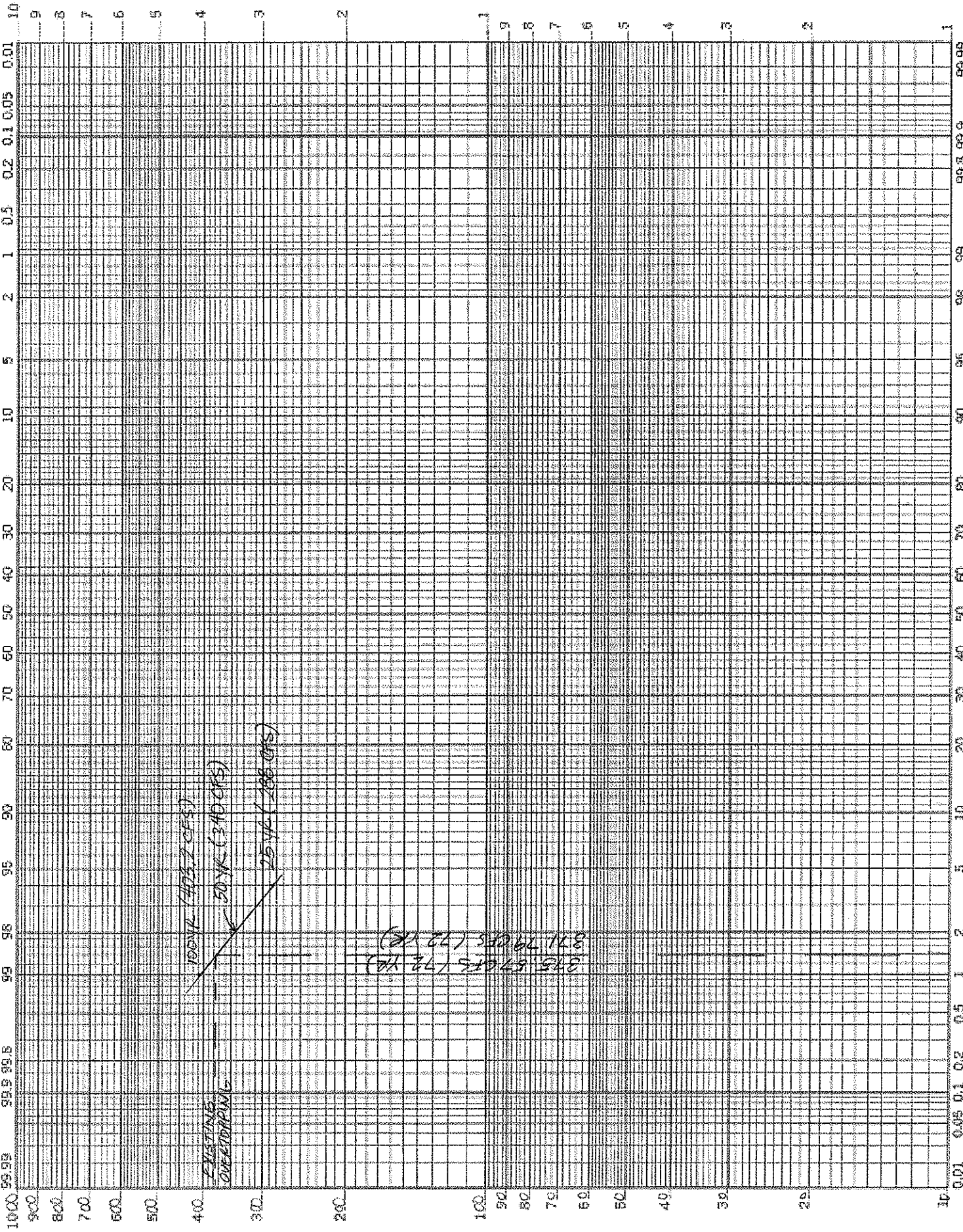
Scale 1 inch = 5 feet

Dist.	State	County	Block	Tract	Acres
8	Fla	SEMINOLE	44	770-1-105	62



20662-C

Prepared by	
Checked by	
Drawn by	
Scale	
Date	
Project	
Area	
Checked by	
Date	



**HY-8 Culvert Analysis Report
CD-4 (Existing Double 8'x3' CBC)**

Table 1 - Summary of Culvert Flows at Crossing: CD-4 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-4 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.55	340.00	340.00	0.00	1
17.99	374.54	374.54	0.00	1
18.04	403.20	378.64	23.25	8
18.08	443.62	381.32	60.74	5
18.10	478.16	383.17	93.25	4
18.12	512.70	384.85	126.78	4
18.14	547.24	386.37	160.23	4
18.16	581.78	387.72	192.16	3
18.18	616.32	389.05	225.55	3
18.20	650.86	390.32	259.22	3
18.21	685.40	391.53	292.90	3

Rating Curve Plot for Crossing: CD-4 Existing

Total Rating Curve

Crossing: CD-4 Existing

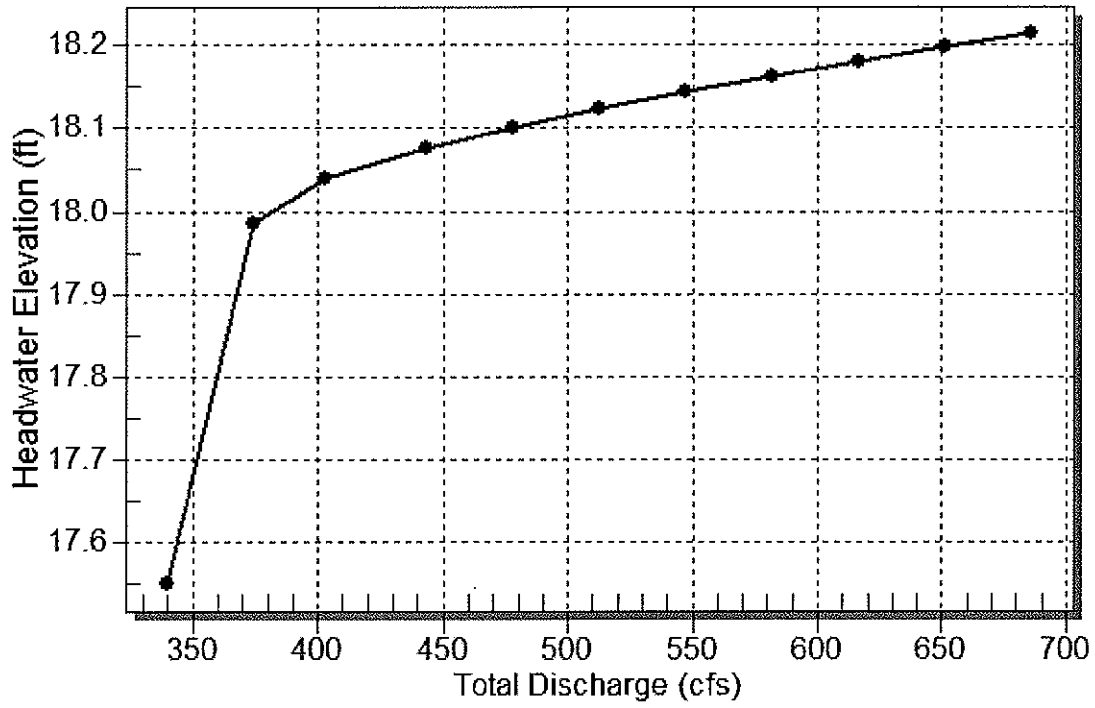


Table 2 - Culvert Summary Table: CD-4 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
340.00	340.00	17.55	4.351	4.199	2-M2c	2.455	2.417	2.417	1.500	8.793	0.000
374.54	374.54	17.99	4.786	4.474	2-M2c	2.630	2.578	2.578	1.500	9.081	0.000
403.20	378.64	18.04	4.840	4.506	2-M2c	2.651	2.596	2.596	1.500	9.114	0.000
443.62	381.32	18.08	4.876	4.527	2-M2c	2.664	2.609	2.609	1.500	9.136	0.000
478.16	383.17	18.10	4.900	4.541	2-M2c	2.674	2.617	2.617	1.500	9.151	0.000
512.70	384.85	18.12	4.923	4.554	2-M2c	2.682	2.625	2.625	1.500	9.164	0.000
547.24	386.37	18.14	4.943	4.566	2-M2c	2.690	2.632	2.632	1.500	9.176	0.000
581.78	387.72	18.16	4.962	4.577	2-M2c	2.697	2.638	2.638	1.500	9.187	0.000
616.32	389.05	18.18	4.980	4.587	2-M2c	3.000	2.644	2.644	1.500	9.197	0.000
650.86	390.32	18.20	4.997	4.597	2-M2c	3.000	2.650	2.650	1.500	9.207	0.000
685.40	391.53	18.21	5.014	4.606	2-M2c	3.000	2.655	2.655	1.500	9.217	0.000

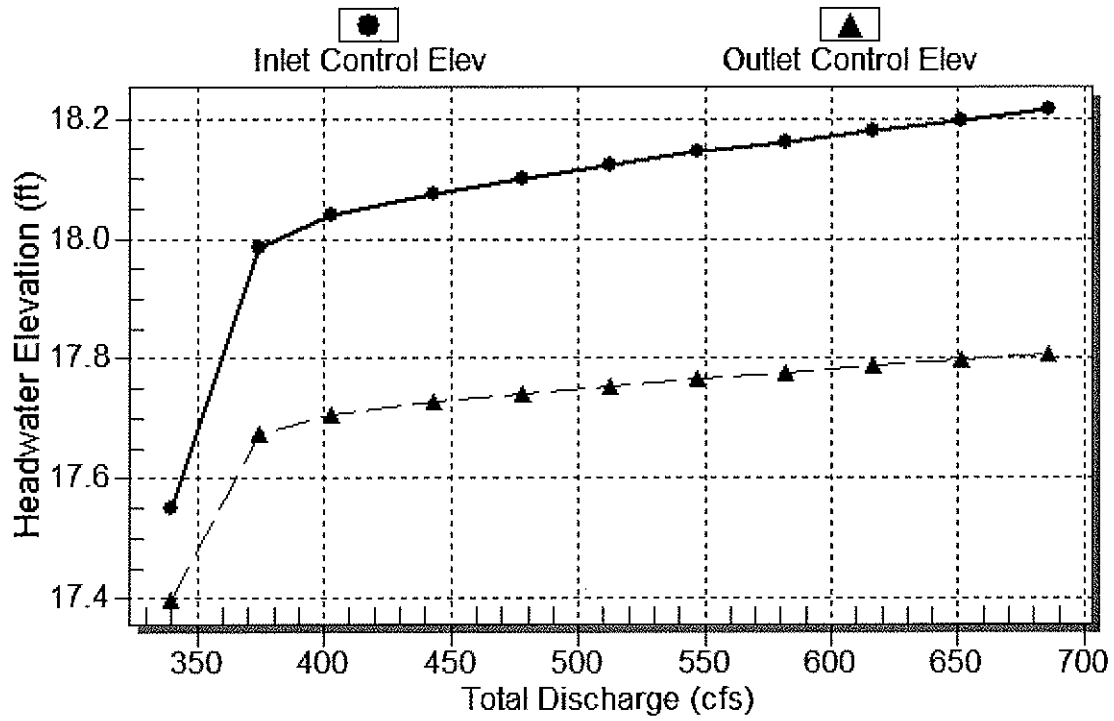
 Inlet Elevation (invert): 13.20 ft, Outlet Elevation (invert): 13.00 ft

Culvert Length: 72.00 ft, Culvert Slope: 0.0028

Culvert Performance Curve Plot: CD-4 Existing

Performance Curve

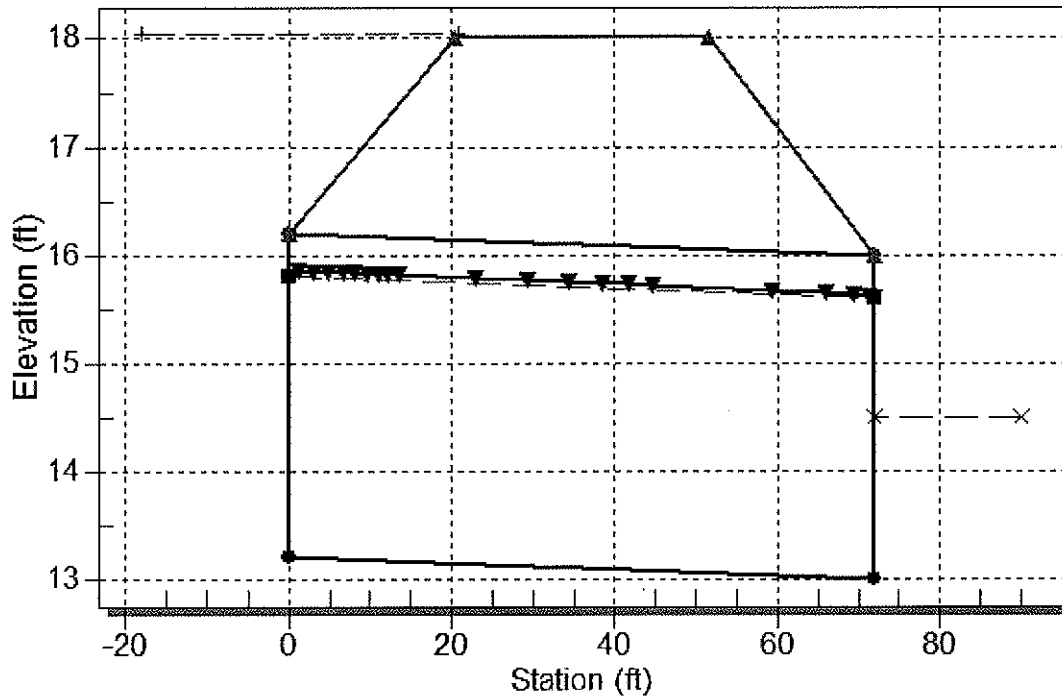
Culvert: CD-4 Existing



Water Surface Profile Plot for Culvert: CD-4 Existing

Crossing - CD-4 Existing, Design Discharge - 403.2 cfs

Culvert - CD-4 Existing, Culvert Discharge - 378.6 cfs



Site Data - CD-4 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.20 ft

Outlet Station: 72.00 ft

Outlet Elevation: 13.00 ft

Number of Barrels: 2

Culvert Data Summary - CD-4 Existing

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90°) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-4 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
340.00	14.50	1.50
374.54	14.50	1.50
403.20	14.50	1.50
443.62	14.50	1.50
478.16	14.50	1.50
512.70	14.50	1.50
547.24	14.50	1.50
581.78	14.50	1.50
616.32	14.50	1.50
650.86	14.50	1.50
685.40	14.50	1.50

Tailwater Channel Data - CD-4 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 14.50 ft

Roadway Data for Crossing: CD-4 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 18.00 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-4 (Proposed Double 8'x'3 CBC)**

Table 1 - Summary of Culvert Flows at Crossing: CD-4 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-4 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
17.60	340.00	340.00	0.00	1
18.00	374.54	371.89	0.13	50
18.04	403.20	375.13	26.74	7
18.08	443.62	377.78	64.43	5
18.10	478.16	379.62	96.93	4
18.13	512.70	381.29	130.41	4
18.15	547.24	382.81	163.83	4
18.16	581.78	384.16	195.77	3
18.18	616.32	385.50	229.16	3
18.20	650.86	386.77	262.82	3
18.22	685.40	387.98	296.48	3

Rating Curve Plot for Crossing: CD-4 Proposed

Total Rating Curve
Crossing: CD-4 Proposed

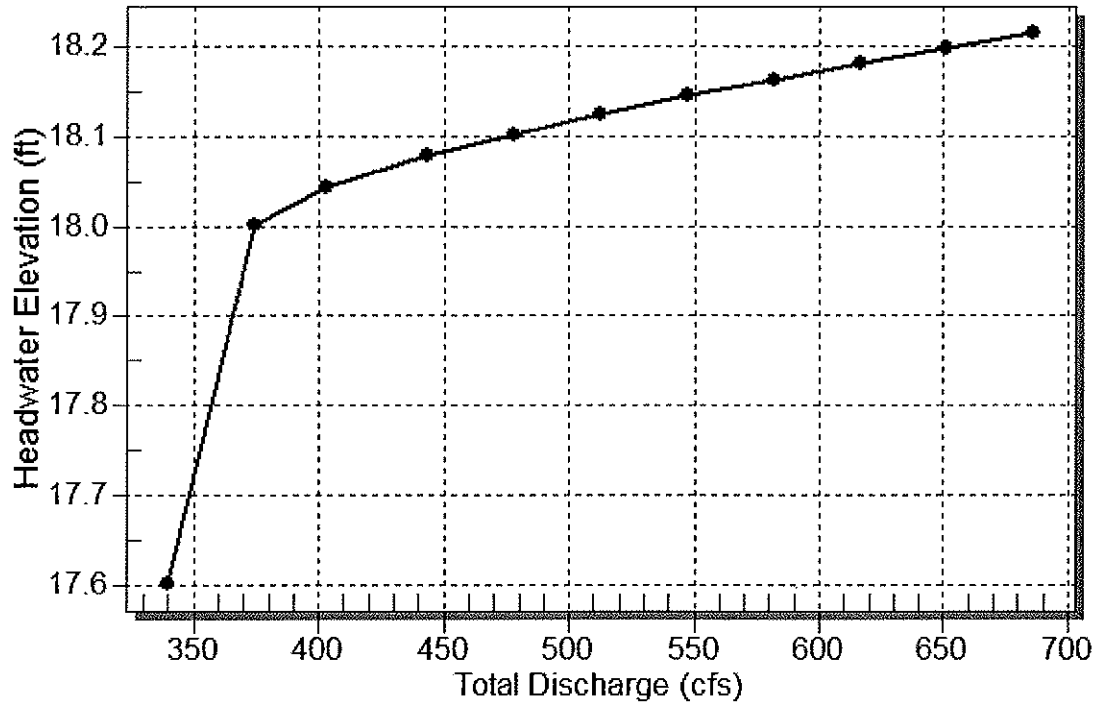


Table 2 - Culvert Summary Table: CD-4 Proposed

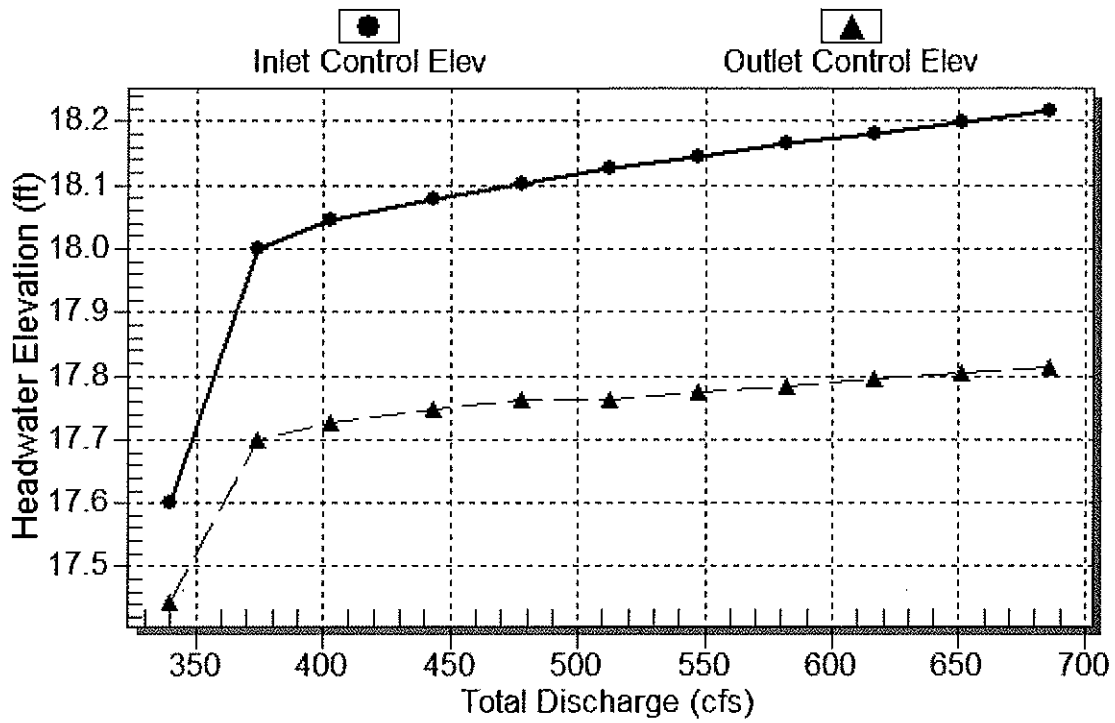
Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
340.00	340.00	17.60	4.351	4.195	2-M2c	2.459	2.417	2.417	1.720	8.793	0.000
374.54	371.89	18.00	4.751	4.451	2-M2c	2.621	2.565	2.565	1.720	9.060	0.000
403.20	375.13	18.04	4.794	4.477	2-M2c	2.637	2.580	2.580	1.720	9.086	0.000
443.62	377.78	18.08	4.829	4.497	2-M2c	2.651	2.593	2.593	1.720	9.107	0.000
478.16	379.62	18.10	4.853	4.512	2-M2c	2.660	2.601	2.601	1.720	9.122	0.000
512.70	381.29	18.13	4.875	4.512	2-M2c	2.669	2.609	2.609	1.720	9.136	0.000
547.24	382.81	18.15	4.896	4.524	2-M2c	2.676	2.615	2.615	1.720	9.148	0.000
581.78	384.16	18.16	4.914	4.534	2-M2c	2.683	2.622	2.622	1.720	9.158	0.000
616.32	385.50	18.18	4.932	4.545	2-M2c	2.690	2.628	2.628	1.720	9.169	0.000
650.86	386.77	18.20	4.949	4.555	2-M2c	2.696	2.633	2.633	1.720	9.179	0.000
685.40	387.98	18.22	4.965	4.565	2-M2c	3.000	2.639	2.639	1.720	9.189	0.000

 Inlet Elevation (invert): 13.25 ft, Outlet Elevation (invert): 12.78 ft
 Culvert Length: 170.00 ft, Culvert Slope: 0.0028

Culvert Performance Curve Plot: CD-4 Proposed

Performance Curve

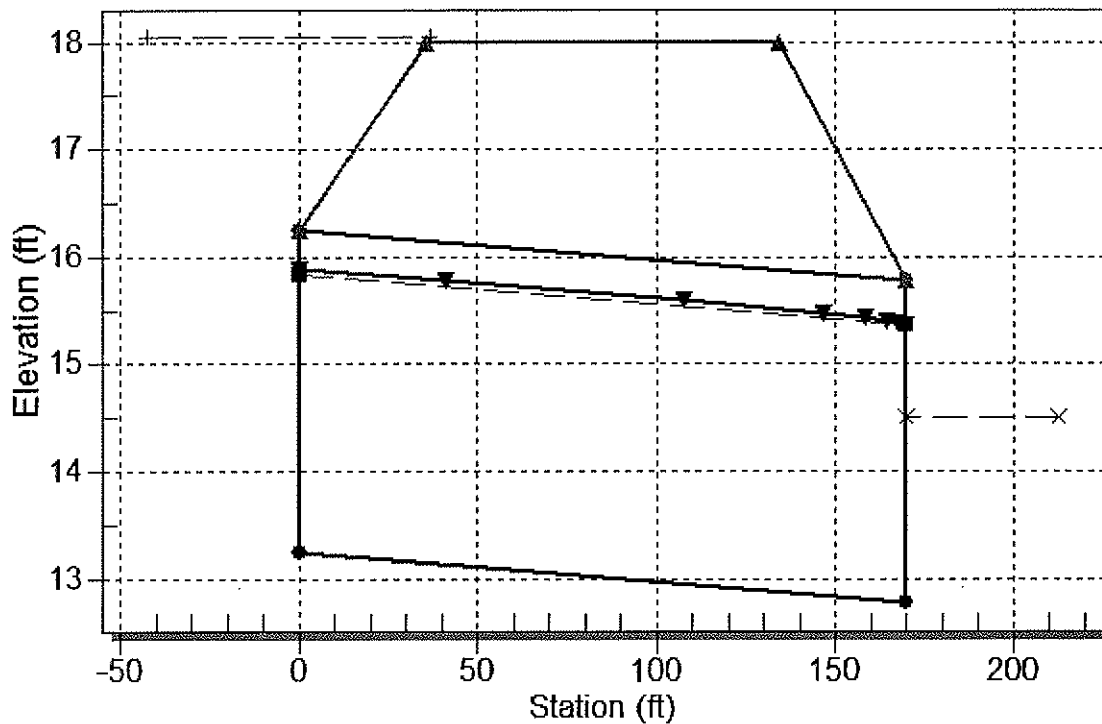
Culvert: CD-4 Proposed



Water Surface Profile Plot for Culvert: CD-4 Proposed

Crossing - CD-4 Proposed, Design Discharge - 403.2 cfs

Culvert - CD-4 Proposed, Culvert Discharge - 375.1 cfs



Site Data - CD-4 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 13.25 ft

Outlet Station: 170.00 ft

Outlet Elevation: 12.78 ft

Number of Barrels: 2

Culvert Data Summary - CD-4 Proposed

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 3.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge (90°) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-4 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
340.00	14.50	1.72
374.54	14.50	1.72
403.20	14.50	1.72
443.62	14.50	1.72
478.16	14.50	1.72
512.70	14.50	1.72
547.24	14.50	1.72
581.78	14.50	1.72
616.32	14.50	1.72
650.86	14.50	1.72
685.40	14.50	1.72

Tailwater Channel Data - CD-4 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 14.50 ft

Roadway Data for Crossing: CD-4 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 18.00 ft

Roadway Surface: Paved

Roadway Top Width: 98.00 ft

Project: <u>SR 46 PD&E Study (SR 415 to CR 426)</u>	Design By: <u>DEP</u>	Date: <u>8/7/2012</u>
FIN No.: <u>240216-4-28-01</u>	Checked by: <u>DTL</u>	Date: <u>9/25/12</u>
Subject: <u>CD-5: Double 24" RCP (Sta 276+59.84)</u>		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-5. Jim Wood did indicate residents in the area have expressed a concern about positive grading in the ditches outside the FDOT R/W. Based on the URS site visit conducted on Feb. 12th, 2012 there are no apparent erosion problems. The existing concrete culverts have been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. Approximate historical drainage area is 53.81 acres per existing SR 46 Plans. Due to no record of flooding at CD-5, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u>			
No of culverts:	<u>2</u>			Material: <u>RCP</u>
Exist culvert length:	<u>74.0 ft</u>			
Avg flwline elev upstream:	<u>20.40</u>	(NAVD)	(21.4 NGVD)	<u>Per Existing SR 46 Plans</u>
Avg flwline elev downstream:	<u>20.20</u>	(NAVD)	(21.2 NGVD)	<u>Per Existing SR 46 Plans</u>
Longitudinal slope:	<u>0.002703</u>	=	<u>0.2703%</u>	
Tailwater:	<u>21.95</u>	(NAVD)		<u>High Water Mark Stain on D/S End</u> <u>(Approximately 3" below Crown)</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 6.3 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		37.7		
50		45.5 (Note 1)	23.93	24.76
100	1.4	52.8	24.62	25.73
500	1.7	89.7	25.84	25.85

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing Culvert
 Note 3: Values obtained from HY 8 model of proposed replacement Culvert

Overtopping		
	Existing	Proposed
Elev (NAVD)	25.8	25.80
Q* (cfs)	63.45	53.33
Freq (yr)	308	105

* From HY 8 culvert analysis

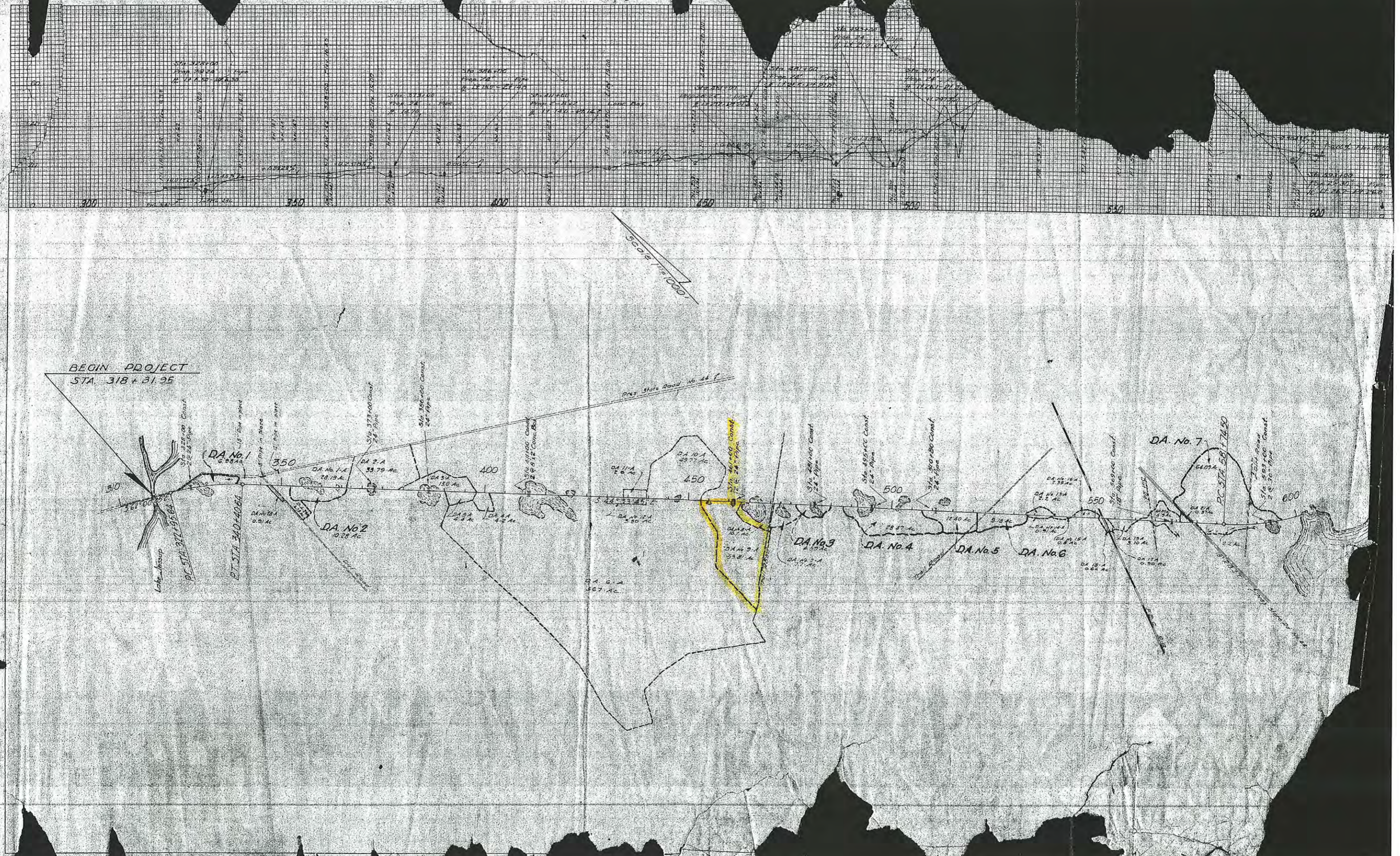
Proposed Culvert

Note: Culvert Replacement to be double 24" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 25.3

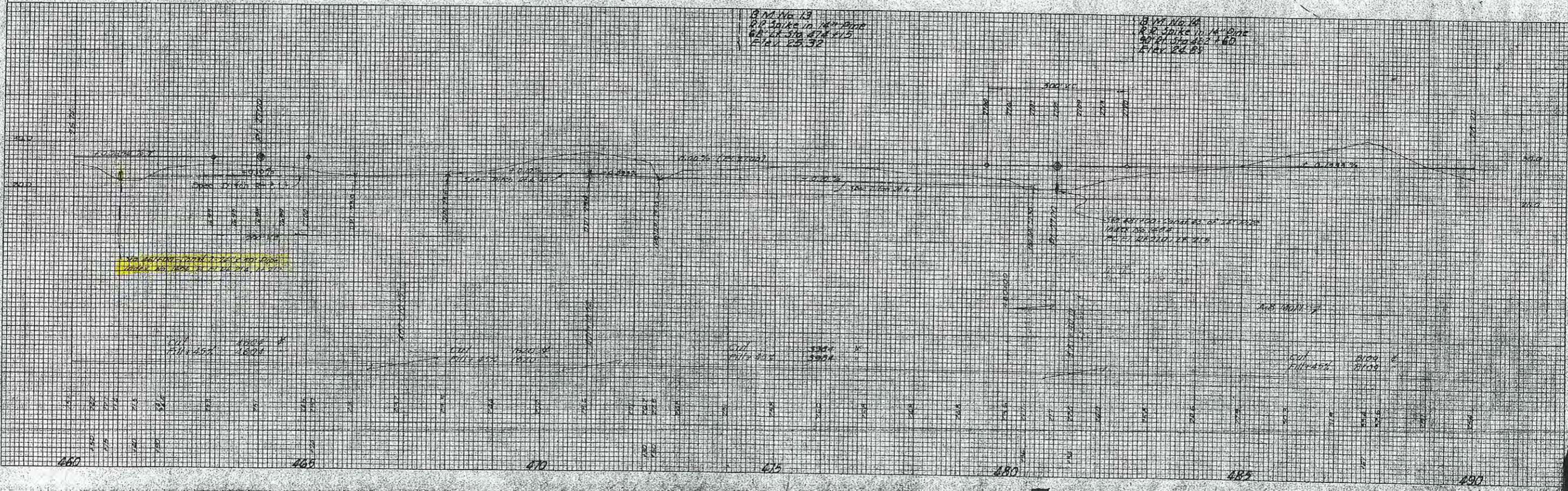
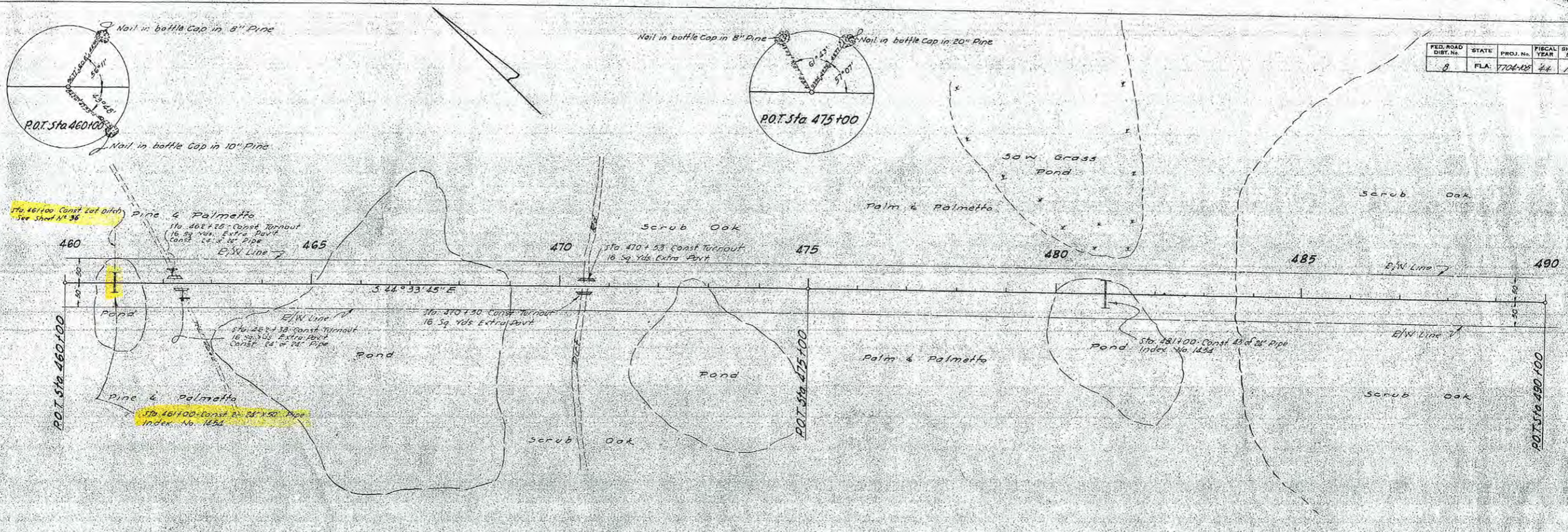
Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	<u>14.0 ft</u>	20.40
Downstream:	<u>82.0 ft</u>	20.20
Total length of proposed culvert:	<u>170.0 ft</u>	

20662-D



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
8	FLA.	7704-125	44	10	

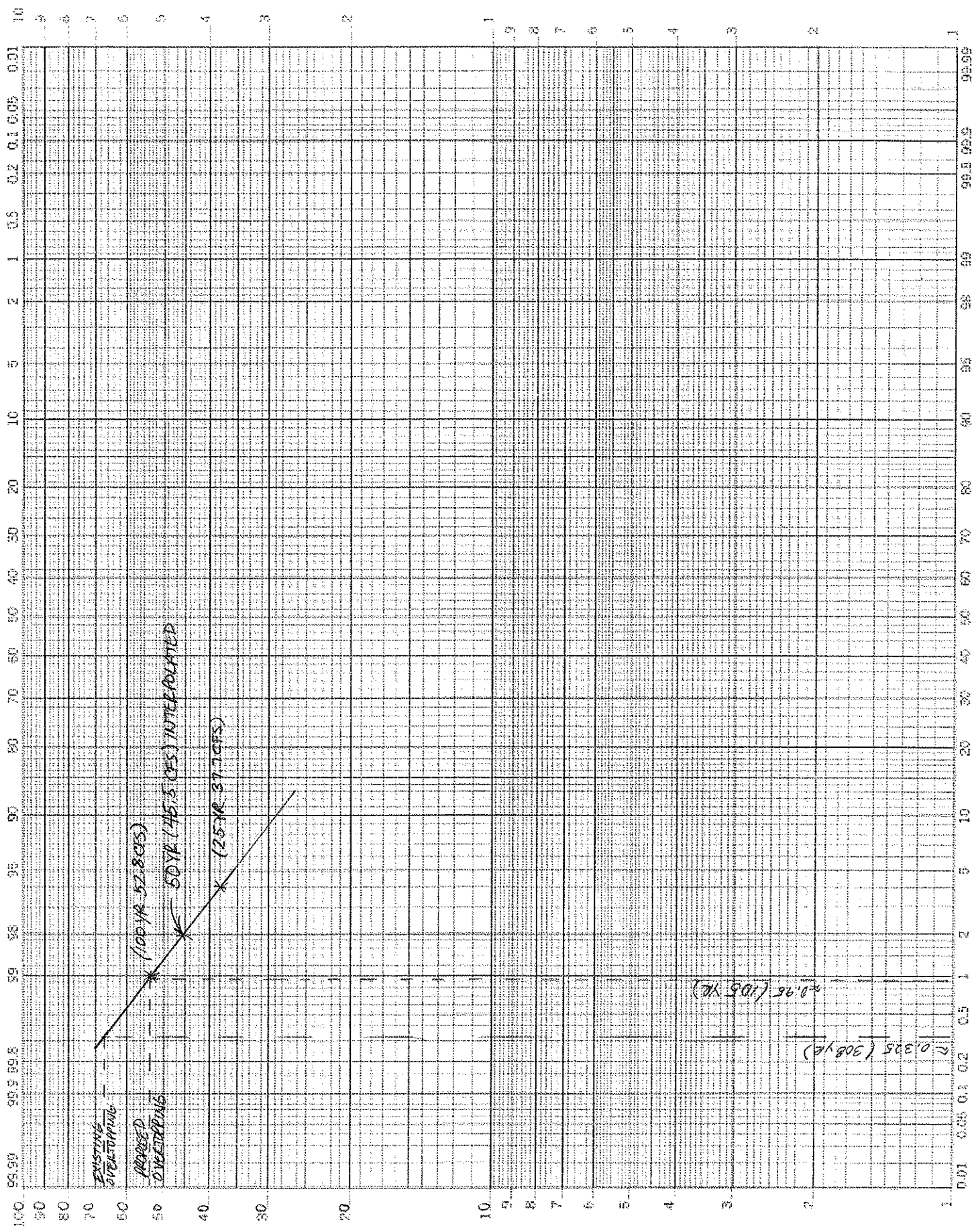


20662A 20662C

A. B. CORNWELL
REGISTERED P.E.

CD-5

FREQUENCY



CFS

**HY-8 Culvert Analysis Report
CD-5 (Existing Double 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-5 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-5 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.93	45.50	45.50	0.00	1
24.34	49.92	49.92	0.00	1
24.62	52.80	52.80	0.00	1
25.26	58.76	58.76	0.00	1
25.77	63.18	63.18	0.00	1
25.81	67.60	63.54	3.53	11
25.82	72.02	63.61	7.92	4
25.83	76.44	63.67	12.51	4
25.83	80.86	63.72	16.65	3
25.84	85.28	63.76	21.09	3
25.84	89.70	63.81	25.58	3

Rating Curve Plot for Crossing: CD-5 Existing

Total Rating Curve
Crossing: CD-5 Existing

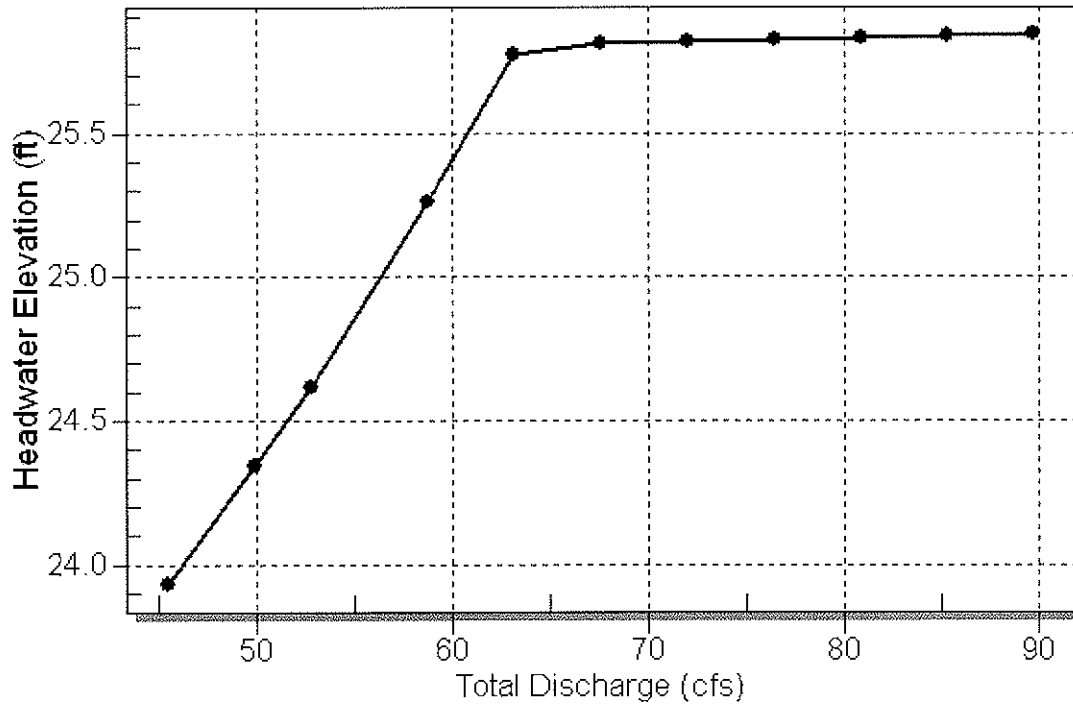


Table 2 - Culvert Summary Table: CD-5 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
45.50	45.50	23.93	3.405	3.534	7-M2t	2.000	1.686	1.750	1.750	7.826	0.000
49.92	49.92	24.34	3.827	3.941	7-M2c	2.000	1.751	1.751	1.750	8.582	0.000
52.80	52.80	24.62	4.126	4.217	7-M2c	2.000	1.793	1.793	1.750	8.893	0.000
58.76	58.76	25.26	4.801	4.862	7-M2c	2.000	1.881	1.881	1.750	9.650	0.000
63.18	63.18	25.77	5.350	5.369	7-M2c	2.000	1.946	1.946	1.750	10.197	0.000
67.60	63.54	25.81	5.397	5.411	7-M2c	2.000	1.952	1.952	1.750	10.241	0.000
72.02	63.61	25.82	5.406	5.419	7-M2c	2.000	1.953	1.953	1.750	10.250	0.000
76.44	63.67	25.83	5.413	5.426	7-M2c	2.000	1.954	1.954	1.750	10.257	0.000
80.86	63.72	25.83	5.419	5.432	7-M2c	2.000	1.954	1.954	1.750	10.263	0.000
85.28	63.76	25.84	5.425	5.437	7-M2c	2.000	1.955	1.955	1.750	10.268	0.000
89.70	63.81	25.84	5.431	5.442	7-M2c	2.000	1.956	1.956	1.750	10.273	0.000

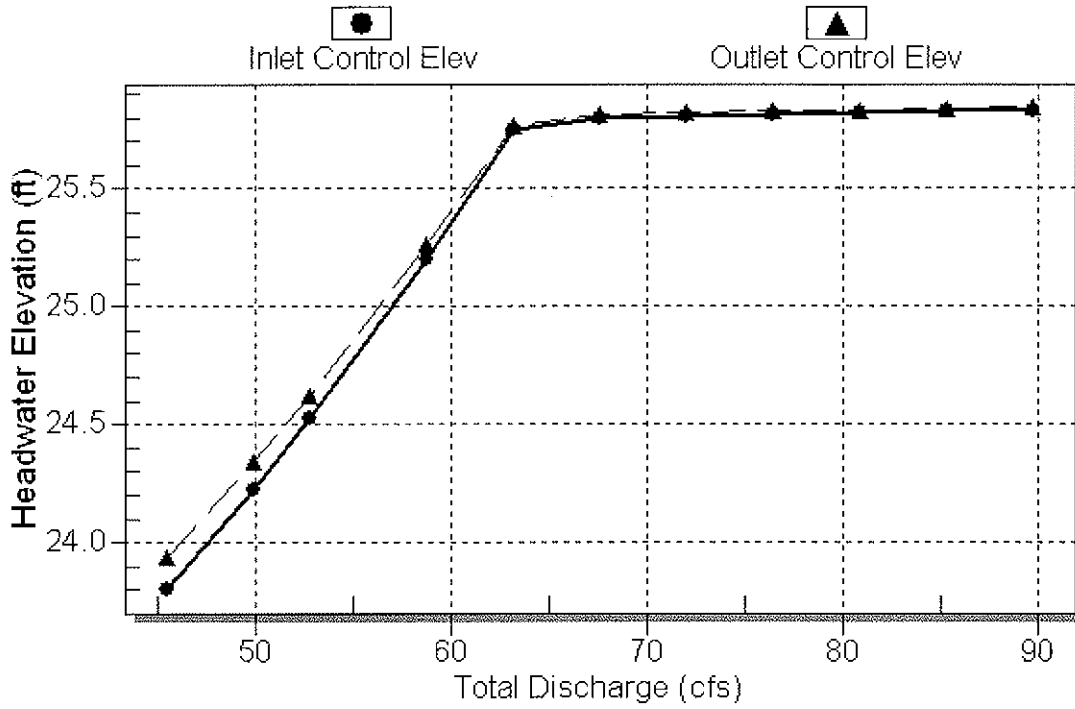
Inlet Elevation (invert): 20.40 ft, Outlet Elevation (invert): 20.20 ft

Culvert Length: 74.00 ft, Culvert Slope: 0.0027

Culvert Performance Curve Plot: CD-5 Existing

Performance Curve

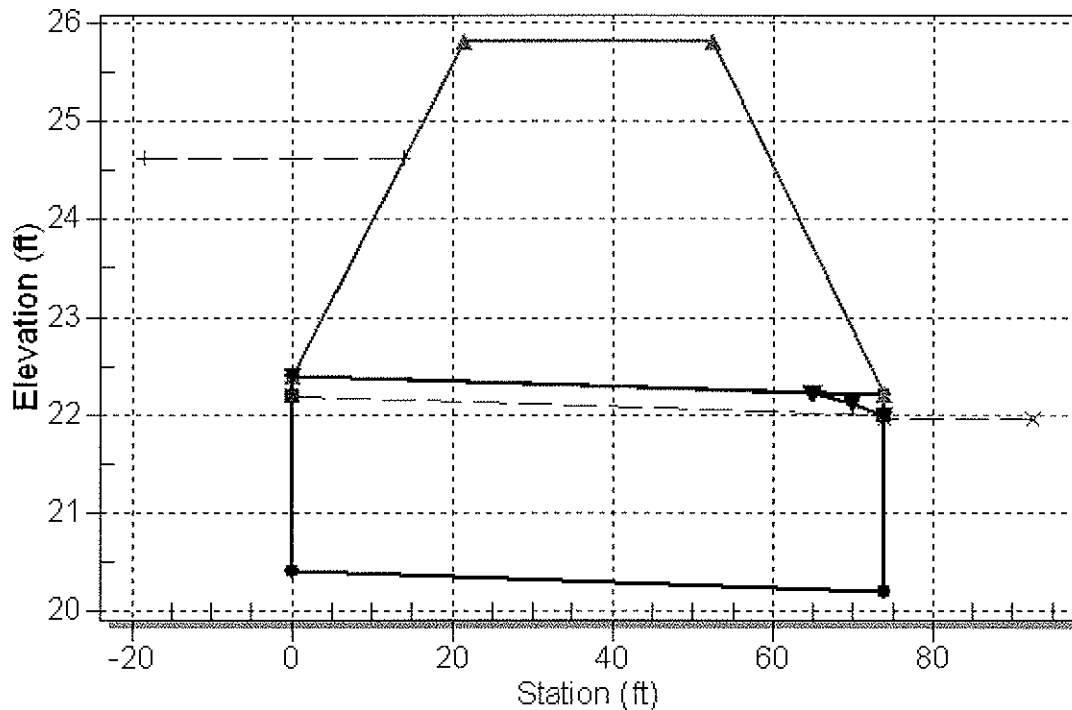
Culvert: CD-5 Existing



Water Surface Profile Plot for Culvert: CD-5 Existing

Crossing - CD-5 Existing, Design Discharge - 52.8 cfs

Culvert - CD-5 Existing, Culvert Discharge - 52.8 cfs



Site Data - CD-5 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.40 ft

Outlet Station: 74.00 ft

Outlet Elevation: 20.20 ft

Number of Barrels: 2

Culvert Data Summary - CD-5 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-5 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
45.50	21.95	1.75
49.92	21.95	1.75
52.80	21.95	1.75
58.76	21.95	1.75
63.18	21.95	1.75
67.60	21.95	1.75
72.02	21.95	1.75
76.44	21.95	1.75
80.86	21.95	1.75
85.28	21.95	1.75
89.70	21.95	1.75

Tailwater Channel Data - CD-5 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 21.95 ft

Roadway Data for Crossing: CD-5 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 25.80 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-5 (Proposed Double 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-5 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-5 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
24.76	45.50	45.50	0.00	1
25.33	49.92	49.92	0.00	1
25.73	52.80	52.80	0.00	1
25.81	58.76	53.43	4.84	14
25.82	63.18	53.48	9.30	4
25.83	67.60	53.52	13.41	3
25.83	72.02	53.57	17.89	3
25.84	76.44	53.60	22.42	3
25.84	80.86	53.64	26.93	3
25.85	85.28	53.67	31.40	3
25.85	89.70	53.71	35.84	3

Rating Curve Plot for Crossing: CD-5 Proposed

Total Rating Curve

Crossing: CD-5 Proposed

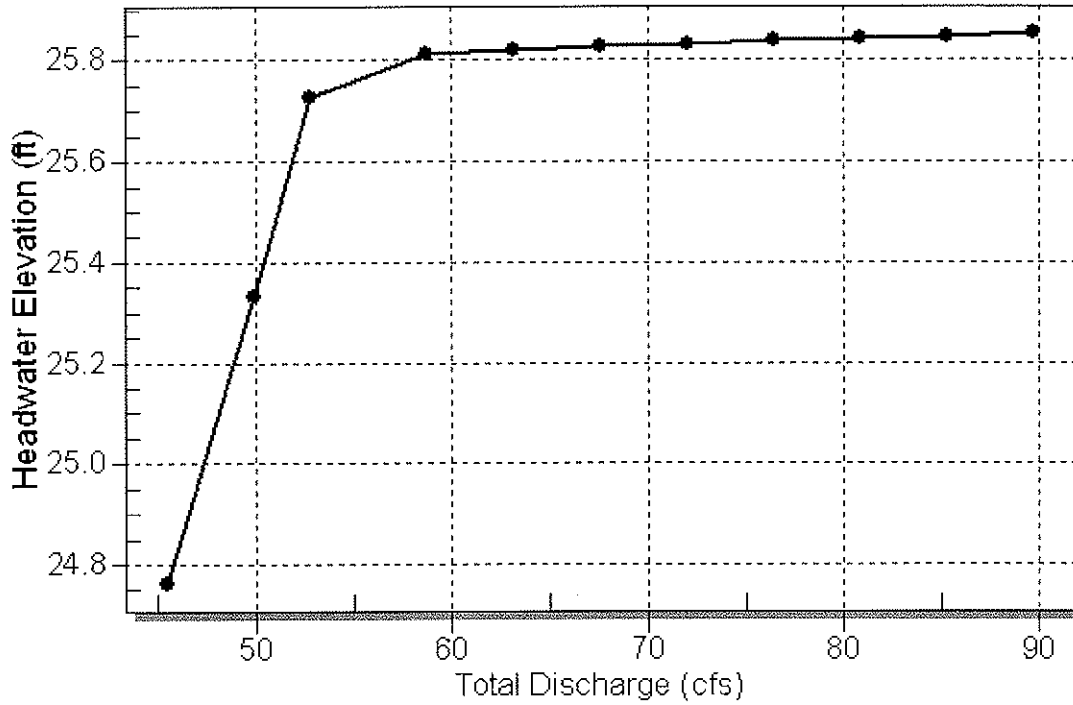


Table 2 - Culvert Summary Table: CD-5 Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
45.50	45.50	24.76	3.406	4.363	7-M2i	2.000	1.686	1.750	1.750	7.826	0.000
49.92	49.92	25.33	3.828	4.933	7-M2c	2.000	1.751	1.751	1.750	8.582	0.000
52.80	52.80	25.73	4.127	5.326	7-M2c	2.000	1.793	1.793	1.750	8.893	0.000
58.76	53.43	25.81	4.195	5.413	7-M2c	2.000	1.803	1.803	1.750	8.958	0.000
63.18	53.48	25.82	4.200	5.421	7-M2c	2.000	1.803	1.803	1.750	8.964	0.000
67.60	53.52	25.83	4.205	5.427	7-M2c	2.000	1.804	1.804	1.750	8.969	0.000
72.02	53.57	25.83	4.210	5.433	7-M2c	2.000	1.805	1.805	1.750	8.973	0.000
76.44	53.60	25.84	4.214	5.438	7-M2c	2.000	1.805	1.805	1.750	8.977	0.000
80.86	53.64	25.84	4.218	5.443	7-M2c	2.000	1.806	1.806	1.750	8.981	0.000
85.28	53.67	25.85	4.221	5.448	7-M2c	2.000	1.806	1.806	1.750	8.984	0.000
89.70	53.71	25.85	4.226	5.453	7-M2c	2.000	1.807	1.807	1.750	8.988	0.000

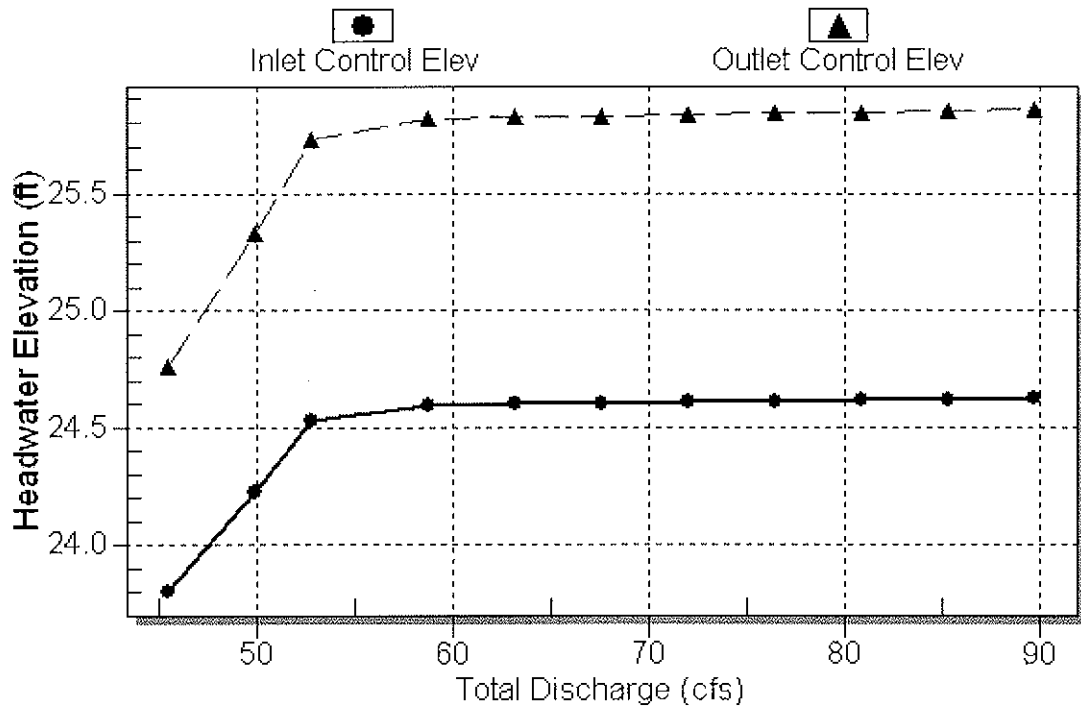
Inlet Elevation (invert): 20.40 ft, Outlet Elevation (invert): 20.20 ft

Culvert Length: 170.00 ft, Culvert Slope: 0.0012

Culvert Performance Curve Plot: CD-5 Proposed

Performance Curve

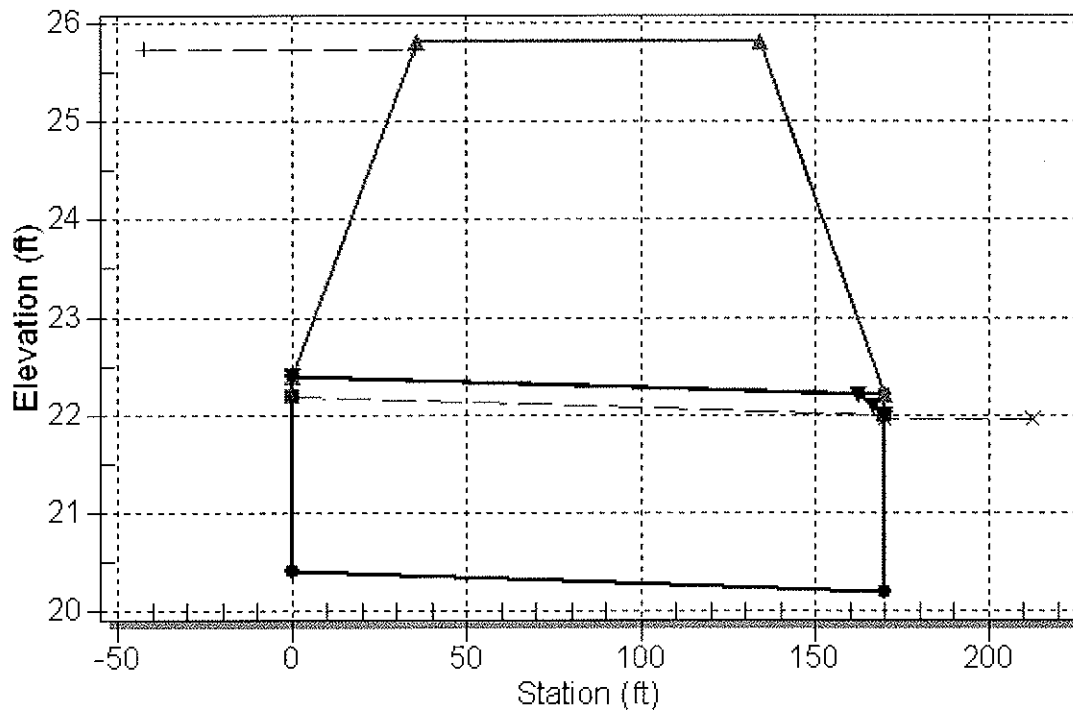
Culvert: CD-5 Proposed



Water Surface Profile Plot for Culvert: CD-5 Proposed

Crossing - CD-5 Proposed, Design Discharge - 52.8 cfs

Culvert - CD-5 Proposed, Culvert Discharge - 52.8 cfs



Site Data - CD-5 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.40 ft

Outlet Station: 170.00 ft

Outlet Elevation: 20.20 ft

Number of Barrels: 2

Culvert Data Summary - CD-5 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-5 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
45.50	21.95	1.75
49.92	21.95	1.75
52.80	21.95	1.75
58.76	21.95	1.75
63.18	21.95	1.75
67.60	21.95	1.75
72.02	21.95	1.75
76.44	21.95	1.75
80.86	21.95	1.75
85.28	21.95	1.75
89.70	21.95	1.75

Tailwater Channel Data - CD-5 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 21.95 ft

Roadway Data for Crossing: CD-5 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 25.80 ft

Roadway Surface: Paved

Roadway Top Width: 98.00 ft

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 8/7/2012
FIN No.: 240216-4-28-01	Checked by: BTL	Date: 9/25/12
Subject: CD-6: 24" RCP (Sta 296+63.64) ✓		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-6. Based on the URS site visit conducted on Feb. 12th, 2012 there are no apparent erosion problems. The existing concrete culverts have been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. Approximate historical drainage area is 4.59 acres per existing SR 46 Plans. Due to no record of flooding at CD-6, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u>		
No of culverts:	<u>1</u>		Material: <u>RCP</u>
Exist culvert length:	<u>76.0 ft</u>		
Avg flowline elev upstream:	<u>20.50'</u>	(NAVD)	(21.5 NGVD) <u>Per Existing SR 46 Plans</u>
Avg flowline elev downstream:	<u>20.00'</u>	(NAVD)	(21.0 NGVD) <u>Per Existing SR 46 Plans</u>
Longitudinal slope:	<u>0.006579</u>	=	<u>0.6579%</u>
Tailwater:	<u>23.00</u>	(NAVD)	<u>High Water Mark Stain on D/S End</u> <u>(Approximately 12" above Crown)</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.5 (Note 1)	24.83	23.92
100	1.4	26.4	25.52	24.27
500	1.7	44.8	26.03	26.01

Overtopping		
	Existing	Proposed
Elev (NAVD)	26.00	26.00
Q* (cfs)	28.79	40.56
Freq (yr)	143	>500

* From HY 8 culvert analysis

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing Culvert
 Note 3: Values obtained from HY 8 model of proposed replacement Culvert

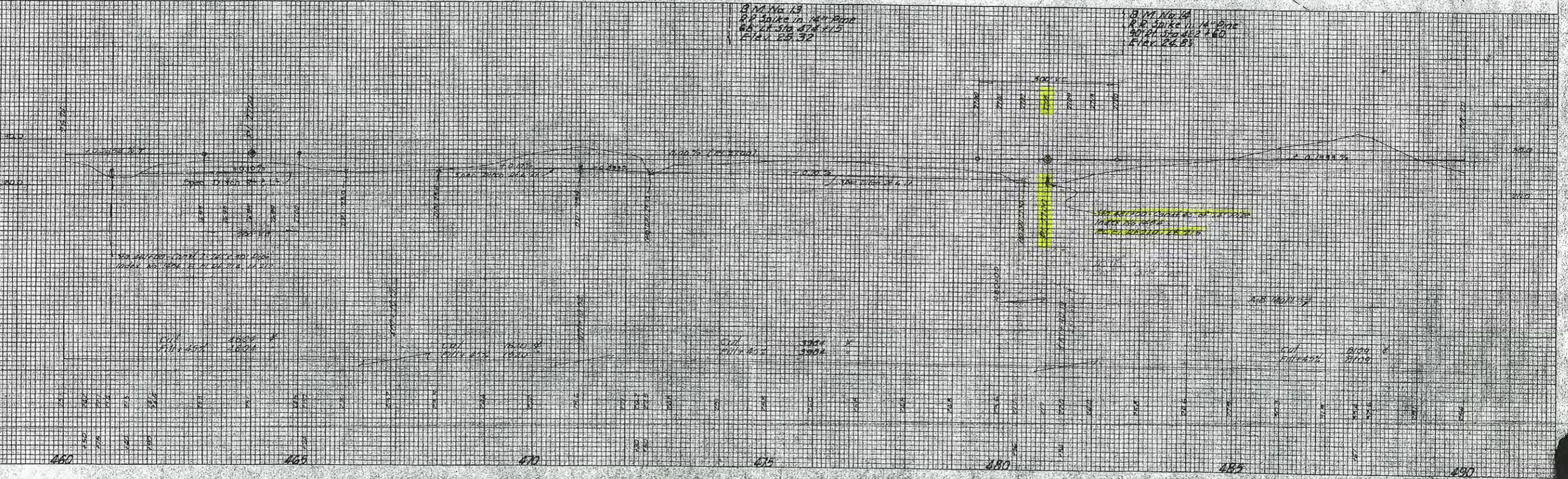
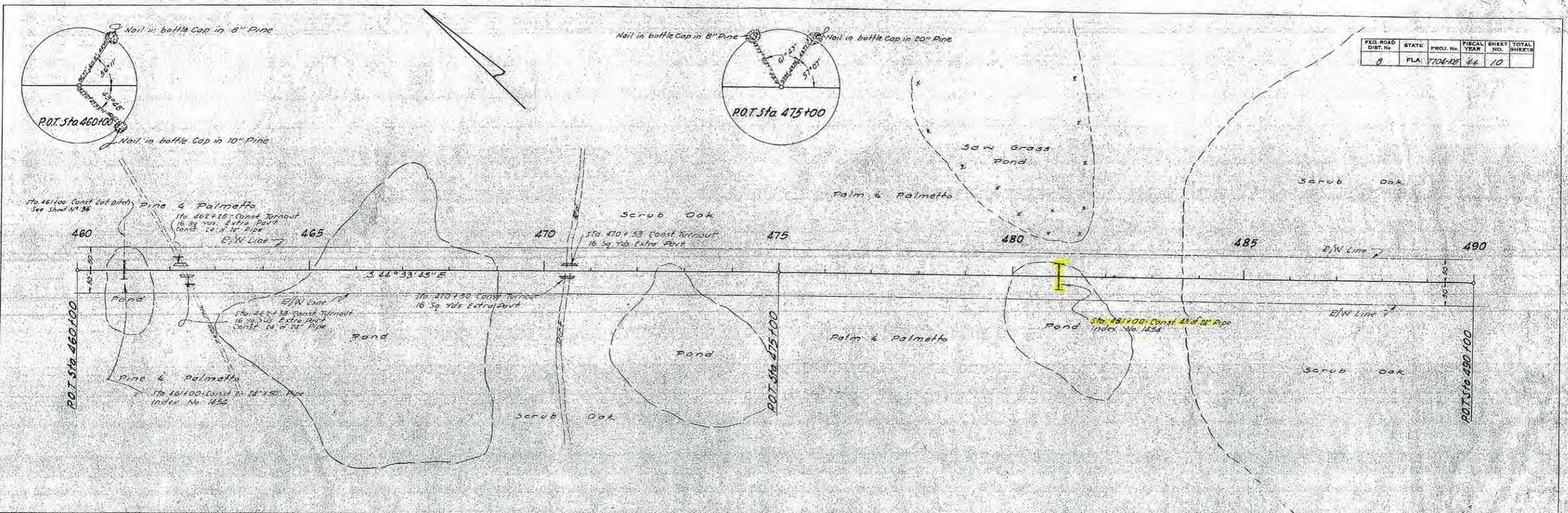
Proposed Culvert

Note: Culvert Replacement to be 30" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 25.5 -

Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	<u>64.5 ft</u>	20.00
Downstream:	<u>29.5 ft</u>	19.50
Total length of proposed culvert:	<u>170.0 ft</u>	

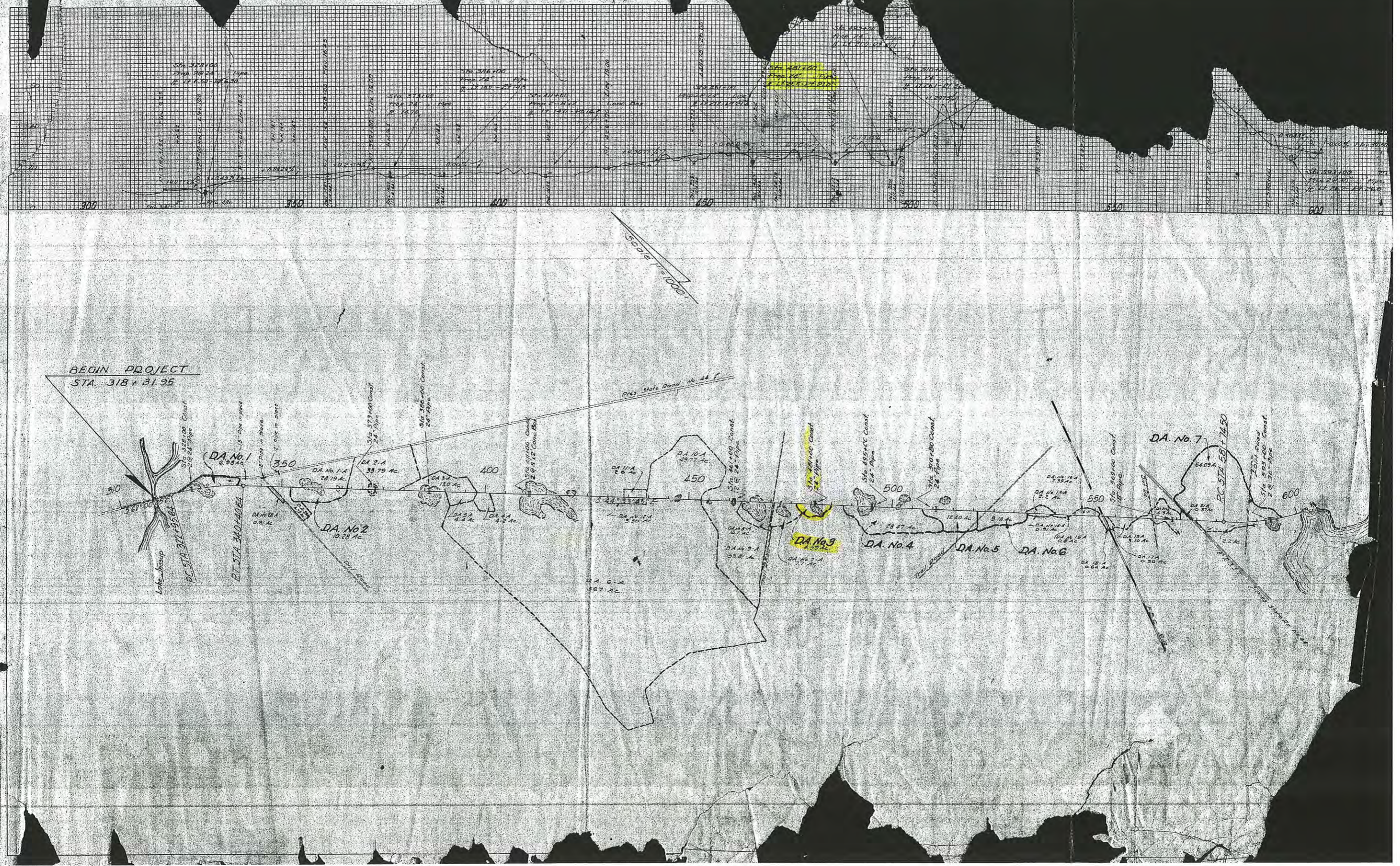
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8	FLA.	7704-125	44	10	



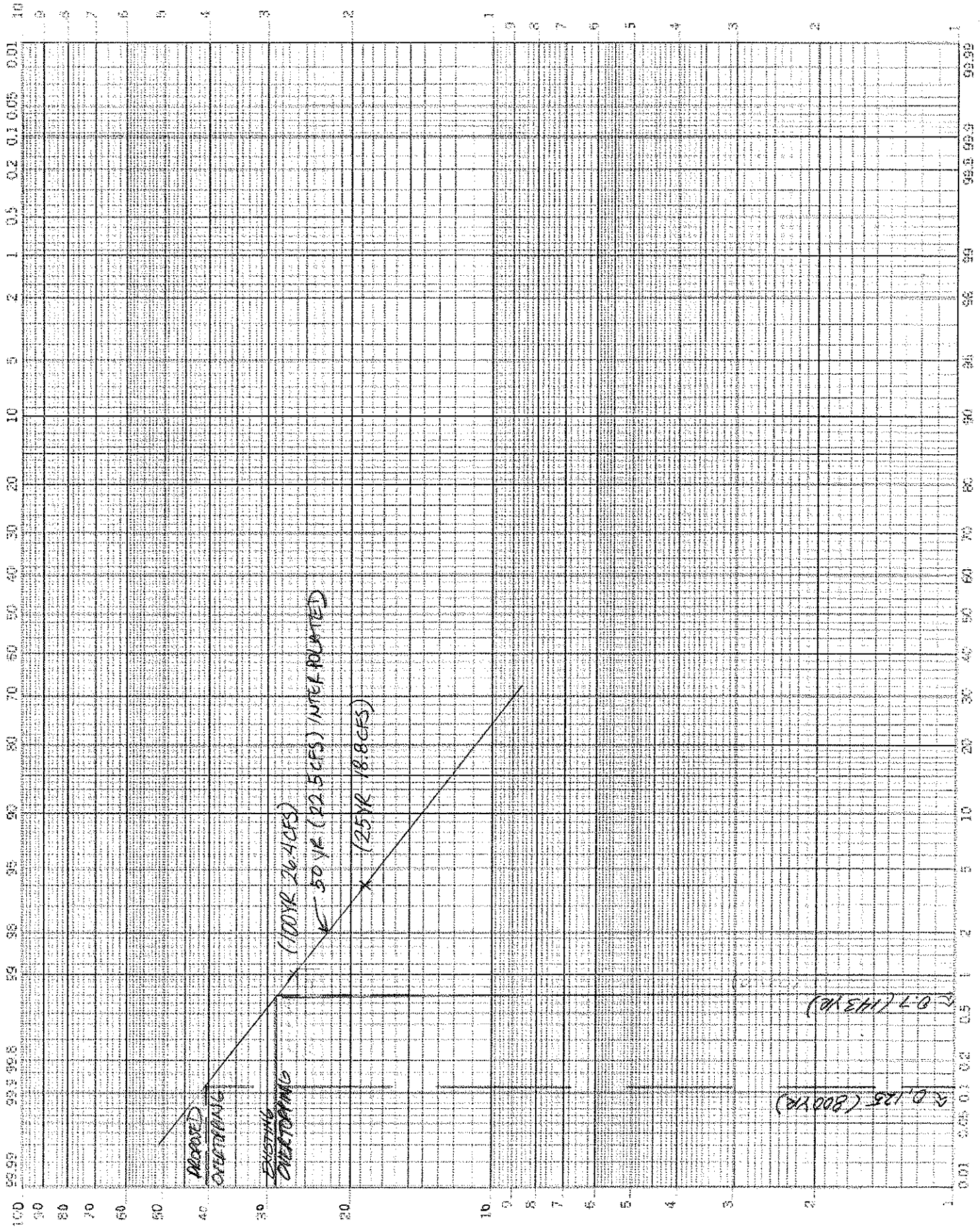
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A. R. CORWELL
MEMPHIS, TENN.

20482-D



FREQUENCY



CFS

**HY-8 Culvert Analysis Report
CD-6 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-6 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-6 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
24.83	22.50	22.50	0.00	1
25.21	24.73	24.73	0.00	1
25.52	26.40	26.40	0.00	1
25.93	29.19	28.46	0.00	50
26.01	31.42	28.84	2.42	18
26.01	33.65	28.86	4.61	4
26.02	35.88	28.88	6.68	3
26.02	38.11	28.90	8.93	3
26.02	40.34	28.91	11.22	3
26.03	42.57	28.93	13.50	3
26.03	44.80	28.94	15.76	3

Rating Curve Plot for Crossing: CD-6 Existing

Total Rating Curve

Crossing: CD-6 Existing

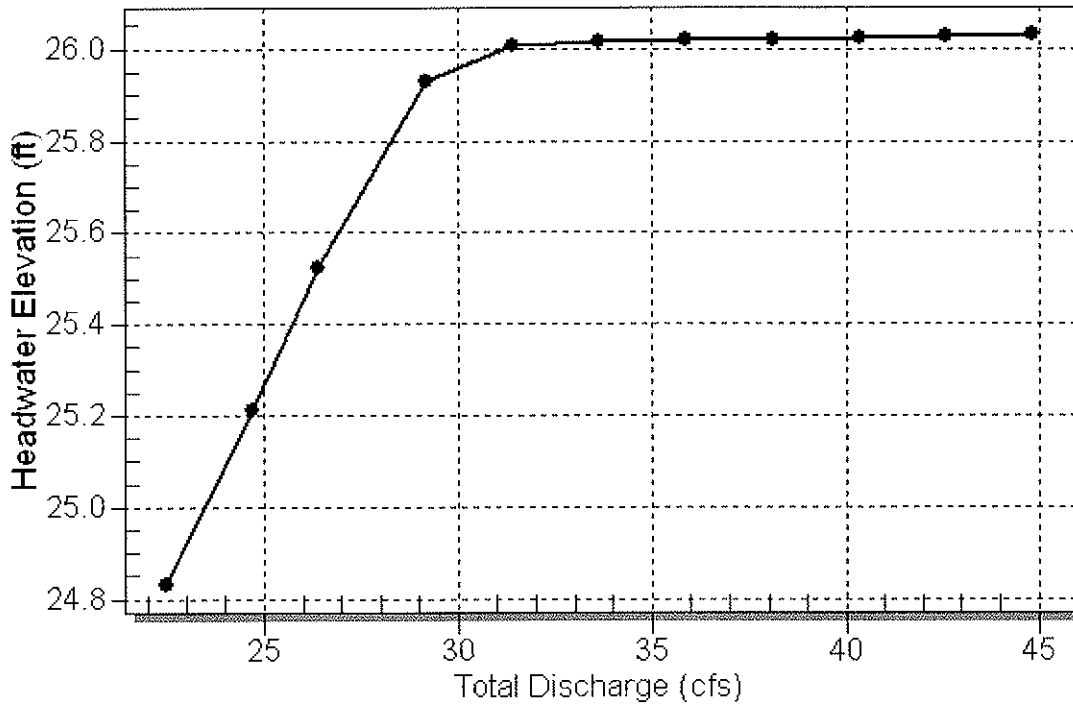


Table 2 - Culvert Summary Table: CD-6 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	24.83	3.356	4.332	4-FFf	2.000	1.678	2.000	3.000	7.162	0.000
24.73	24.73	25.21	3.777	4.713	4-FFf	2.000	1.744	2.000	3.000	7.872	0.000
26.40	26.40	25.52	4.122	5.022	4-FFf	2.000	1.793	2.000	3.000	8.403	0.000
29.19	28.46	25.93	4.580	5.430	4-FFf	2.000	1.854	2.000	3.000	9.059	0.000
31.42	28.84	26.01	4.669	5.509	4-FFf	2.000	1.865	2.000	3.000	9.179	0.000
33.65	28.86	26.01	4.674	5.514	4-FFf	2.000	1.866	2.000	3.000	9.186	0.000
35.88	28.88	26.02	4.678	5.517	4-FFf	2.000	1.867	2.000	3.000	9.192	0.000
38.11	28.90	26.02	4.683	5.521	4-FFf	2.000	1.867	2.000	3.000	9.198	0.000
40.34	28.91	26.02	4.687	5.525	4-FFf	2.000	1.868	2.000	3.000	9.203	0.000
42.57	28.93	26.03	4.690	5.528	4-FFf	2.000	1.868	2.000	3.000	9.208	0.000
44.80	28.94	26.03	4.694	5.531	4-FFf	2.000	1.868	2.000	3.000	9.213	0.000

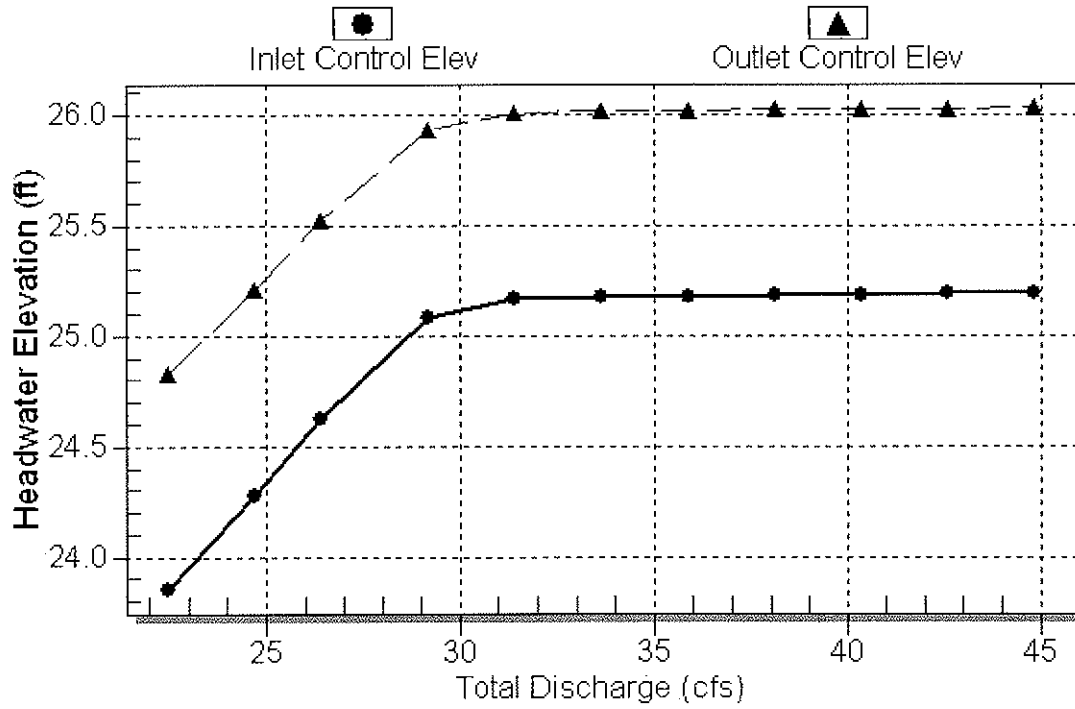
Inlet Elevation (invert): 20.50 ft, Outlet Elevation (invert): 20.00 ft

Culvert Length: 76.00 ft, Culvert Slope: 0.0066

Culvert Performance Curve Plot: CD-6 Existing

Performance Curve

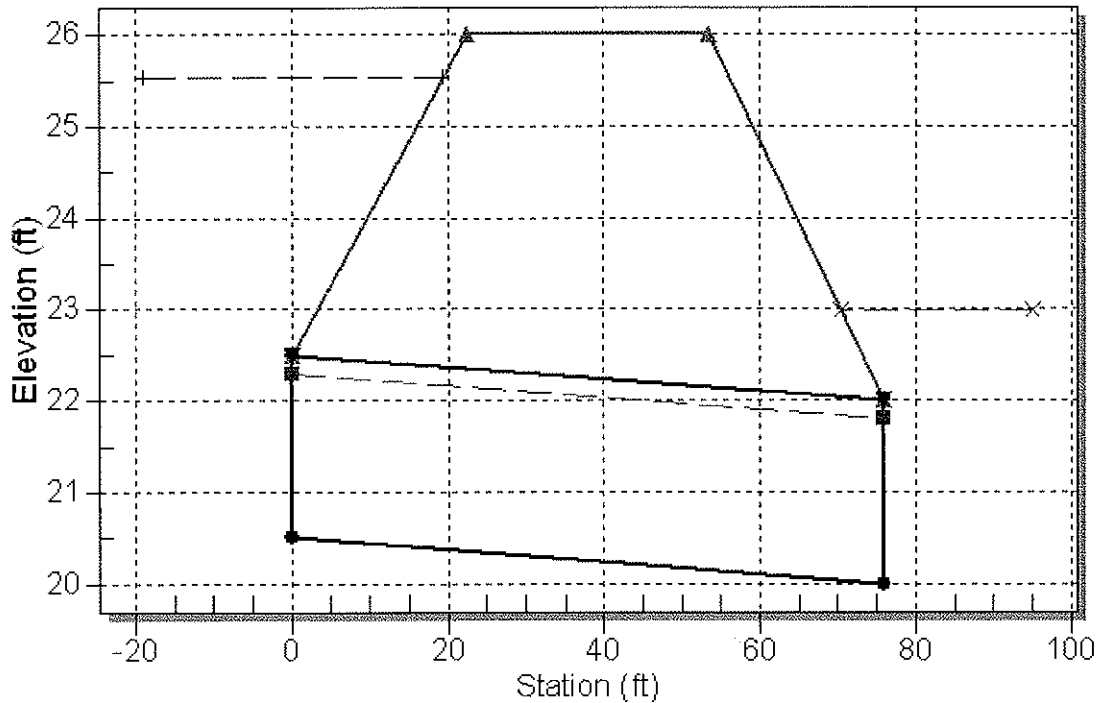
Culvert: CD-6 Existing



Water Surface Profile Plot for Culvert: CD-6 Existing

Crossing - CD-6 Existing, Design Discharge - 26.4 cfs

Culvert - CD-6 Existing, Culvert Discharge - 26.4 cfs



Site Data - CD-6 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.50 ft

Outlet Station: 76.00 ft

Outlet Elevation: 20.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-6 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-6 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	23.00	3.00
24.73	23.00	3.00
26.40	23.00	3.00
29.19	23.00	3.00
31.42	23.00	3.00
33.65	23.00	3.00
35.88	23.00	3.00
38.11	23.00	3.00
40.34	23.00	3.00
42.57	23.00	3.00
44.80	23.00	3.00

Tailwater Channel Data - CD-6 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 23.00 ft

Roadway Data for Crossing: CD-6 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 26.00 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-6 (Proposed 30" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-6 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-6 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.92	22.50	22.50	0.00	1
24.11	24.73	24.73	0.00	1
24.27	26.40	26.40	0.00	1
24.55	29.19	29.19	0.00	1
24.80	31.42	31.42	0.00	1
25.06	33.65	33.65	0.00	1
25.35	35.88	35.88	0.00	1
25.65	38.11	38.11	0.00	1
25.97	40.34	40.34	0.00	1
26.01	42.57	40.61	1.64	14
26.01	44.80	40.65	3.89	4

Rating Curve Plot for Crossing: CD-6 Proposed

Total Rating Curve
Crossing: CD-6 Proposed

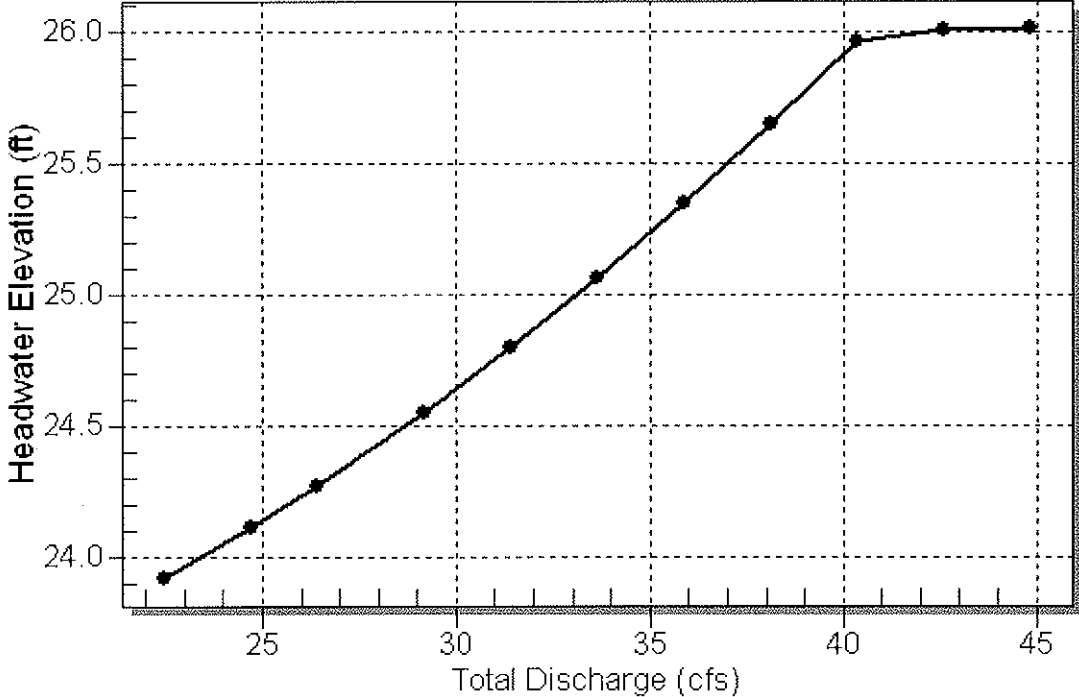


Table 2 - Culvert Summary Table: CD-6 Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	23.92	2.516	3.923	4-FFf	1.919	1.608	2.500	3.000	4.584	0.000
24.73	24.73	24.11	2.696	4.115	4-FFf	2.132	1.690	2.500	3.000	5.038	0.000
26.40	26.40	24.27	2.837	4.270	4-FFf	2.500	1.751	2.500	3.000	5.378	0.000
29.19	29.19	24.55	3.087	4.553	4-FFf	2.500	1.835	2.500	3.000	5.947	0.000
31.42	31.42	24.80	3.303	4.799	4-FFf	2.500	1.902	2.500	3.000	6.401	0.000
33.65	33.65	25.06	3.534	5.064	4-FFf	2.500	1.970	2.500	3.000	6.855	0.000
35.88	35.88	25.35	3.783	5.347	4-FFf	2.500	2.026	2.500	3.000	7.309	0.000
38.11	38.11	25.65	4.049	5.647	4-FFf	2.500	2.073	2.500	3.000	7.764	0.000
40.34	40.34	25.97	4.334	5.966	4-FFf	2.500	2.120	2.500	3.000	8.218	0.000
42.57	40.61	26.01	4.369	6.006	4-FFf	2.500	2.126	2.500	3.000	8.273	0.000
44.80	40.65	26.01	4.375	6.012	4-FFf	2.500	2.126	2.500	3.000	8.281	0.000

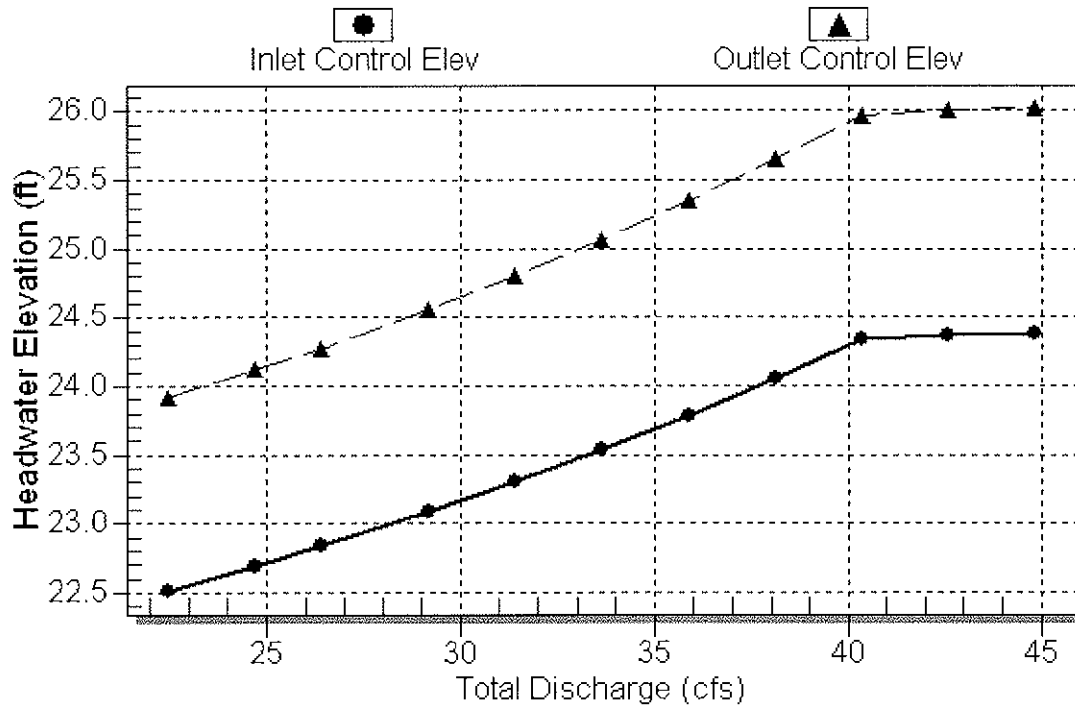
Inlet Elevation (invert): 20.00 ft, Outlet Elevation (invert): 19.50 ft

Culvert Length: 170.00 ft, Culvert Slope: 0.0029

Culvert Performance Curve Plot: CD-6 Proposed

Performance Curve

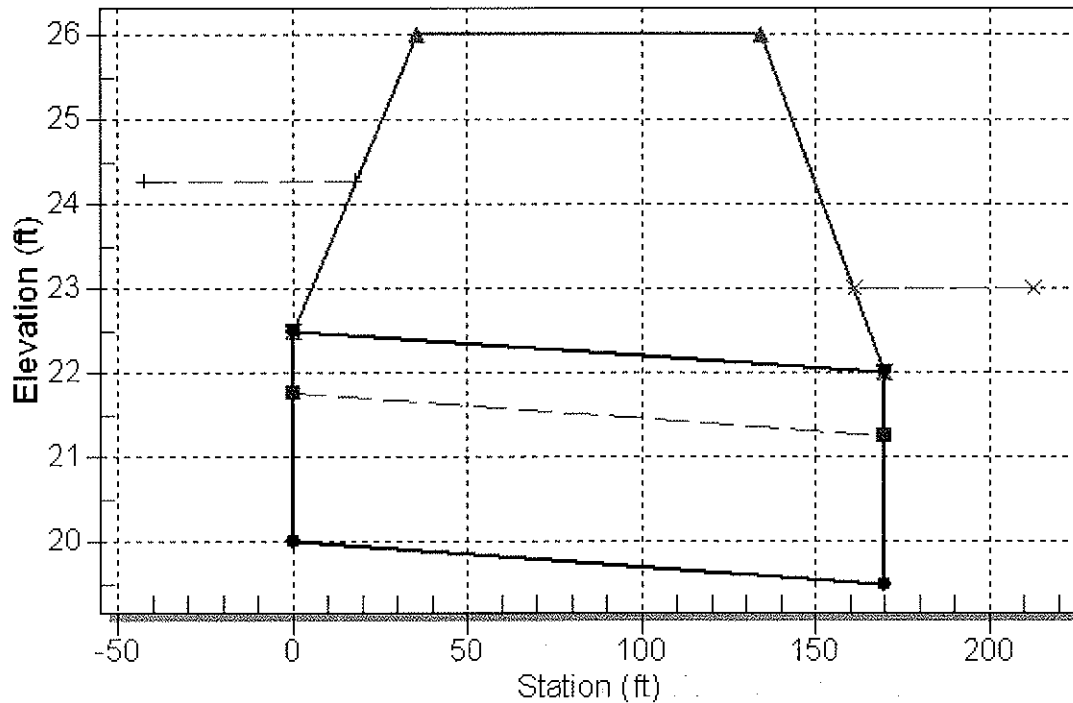
Culvert: CD-6 Proposed



Water Surface Profile Plot for Culvert: CD-6 Proposed

Crossing - CD-6 Proposed, Design Discharge - 26.4 cfs

Culvert - CD-6 Proposed, Culvert Discharge - 26.4 cfs



Site Data - CD-6 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.00 ft

Outlet Station: 170.00 ft

Outlet Elevation: 19.50 ft

Number of Barrels: 1

Culvert Data Summary - CD-6 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-6 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	23.00	3.00
24.73	23.00	3.00
26.40	23.00	3.00
29.19	23.00	3.00
31.42	23.00	3.00
33.65	23.00	3.00
35.88	23.00	3.00
38.11	23.00	3.00
40.34	23.00	3.00
42.57	23.00	3.00
44.80	23.00	3.00

Tailwater Channel Data - CD-6 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 23.00 ft

Roadway Data for Crossing: CD-6 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 26.00 ft

Roadway Surface: Paved

Roadway Top Width: 98.00 ft

Project: <u>SR 46 PD&E Study (SR 415 to CR 426)</u>	Design By: <u>DEP</u>	Date: <u>8/7/2012</u>
FIN No.: <u>240216-4-28-01</u>	Checked by: <u>DTL</u>	Date: <u>9/25/12</u>
Subject: <u>CD-7: 24" RCP (Sta 310+51.92)</u>		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-7. Based on the URS site visit conducted on Feb. 12th, 2012 the headwall of the culvert was buried. It appears a turn lane had been added and the culvert was not extended. The pipe was nearly halfway filled with sediment at the Endwall. The existing concrete culvert has been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. We will also ignore the existing turn lane addition and buried culvert as we understand this was a temporary condition to access an adjacent borrow pit. Approximate historical drainage area is 28.47 acres per existing SR 46 Plans. Due to no record of flooding at CD-7, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>2 ft</u>			
No of culverts:	<u>1</u>		Material: <u>RCP</u>	
Exist culvert length:	<u>79.0 ft</u>			
Avg flowline elev upstream:	<u>20.10'</u>	(NAVD)	(21.1 NGVD)	<u>Per Existing SR 46 Plans</u>
Avg flowline elev downstream:	<u>20.00'</u>	(NAVD)	(21.0 NGVD)	<u>Per Existing SR 46 Plans</u>
Longitudinal slope:	<u>0.001266</u>	=	<u>0.1266%</u>	
Tailwater:	<u>22.83</u>	(NAVD)		<u>High Water Mark Stain on D/S End</u> <u>(Approximately 10" above Crown)</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.5 (Note 1)	24.69	25.45
100	1.4	26.4	25.39	26.44
500	1.7	44.8	27.02	27.03

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing Culvert
 Note 3: Values obtained from HY 8 model of proposed extension Culvert

Overtopping		
	Existing	Proposed
Elev (NAVD)	27.00	27.00
Q* (cfs)	33.72	28.39
Freq (yr)	308	143

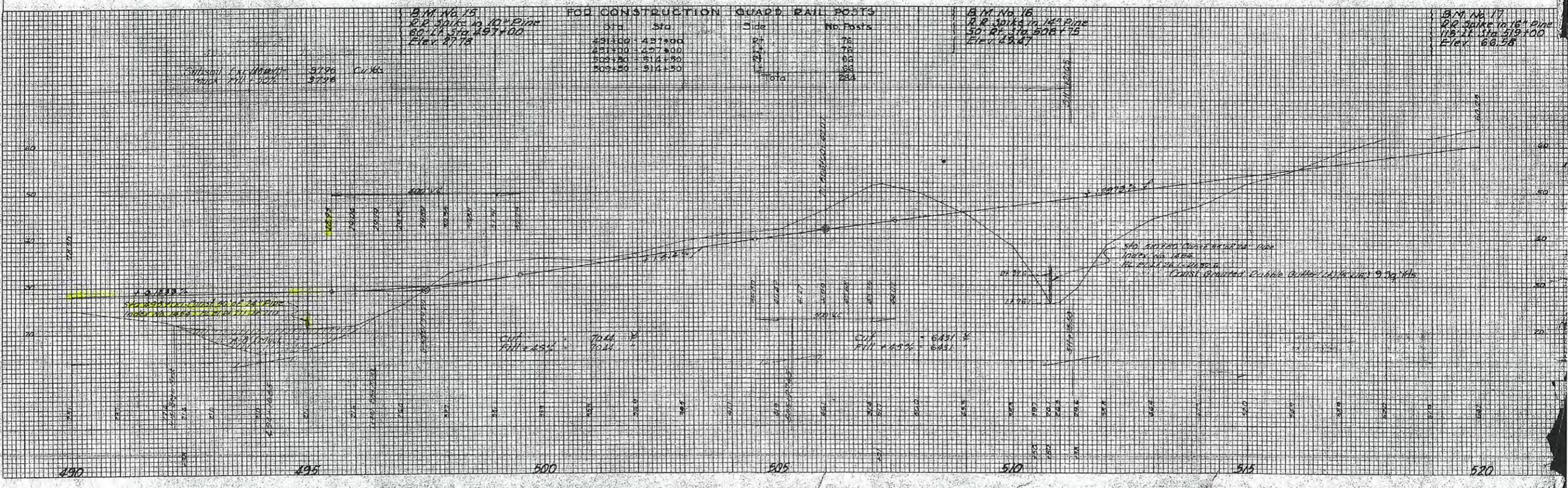
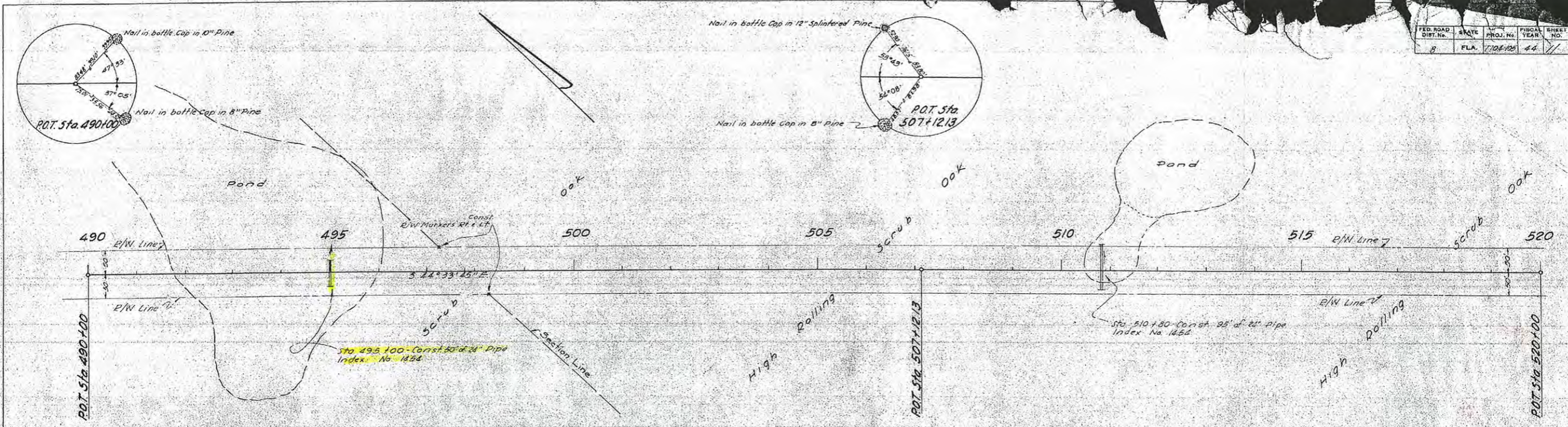
* From HY 8 culvert analysis

Proposed Culvert

Note: Culvert replacement to be 24" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 26.5

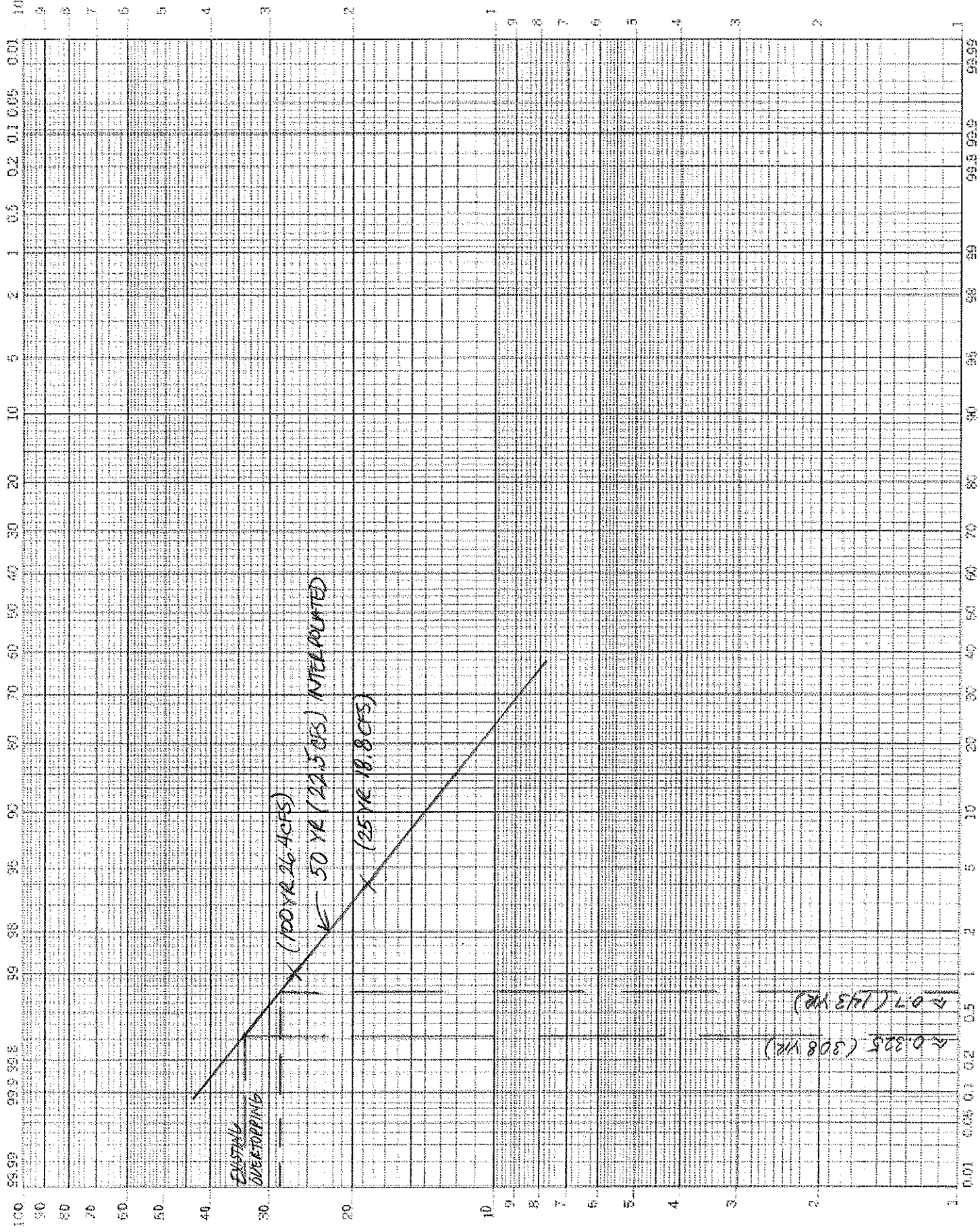
Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	75.3 ft	20.10
Downstream:	15.7 ft	19.90
Total length of proposed culvert:	170.0 ft	



20662-A 20662-C

FREQUENCY



DFS

**HY-8 Culvert Analysis Report
CD-7 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-7 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-7 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
24.69	22.50	22.50	0.00	1
25.07	24.73	24.73	0.00	1
25.39	26.40	26.40	0.00	1
25.96	29.19	29.19	0.00	1
26.45	31.42	31.42	0.00	1
26.98	33.65	33.65	0.00	1
27.01	35.88	33.75	1.86	10
27.01	38.11	33.77	4.11	4
27.02	40.34	33.78	6.19	3
27.02	42.57	33.80	8.46	3
27.02	44.80	33.81	10.76	3

Rating Curve Plot for Crossing: CD-7 Existing

Total Rating Curve

Crossing: CD-7 Existing

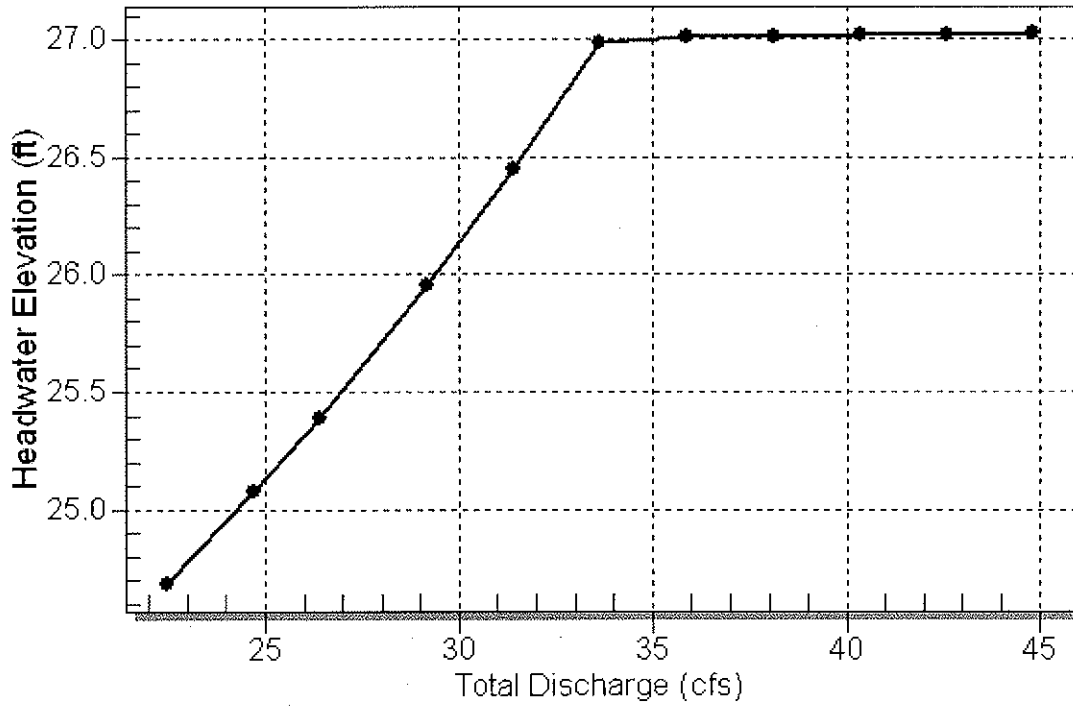


Table 2 - Culvert Summary Table: CD-7 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	24.69	3.361	4.587	4-FFf	2.000	1.678	2.000	2.830	7.162	0.000
24.73	24.73	25.07	3.782	4.973	4-FFf	2.000	1.744	2.000	2.830	7.872	0.000
26.40	26.40	25.39	4.127	5.286	4-FFf	2.000	1.793	2.000	2.830	8.403	0.000
29.19	29.19	25.96	4.757	5.855	4-FFf	2.000	1.876	2.000	2.830	9.291	0.000
31.42	31.42	26.45	5.308	6.351	4-FFf	2.000	1.941	2.000	2.830	10.001	0.000
33.65	33.65	26.98	5.898	6.883	4-FFf	2.000	2.000	2.000	2.830	10.711	0.000
35.88	33.75	27.01	5.924	6.907	4-FFf	2.000	2.000	2.000	2.830	10.741	0.000
38.11	33.77	27.01	5.929	6.912	4-FFf	2.000	2.000	2.000	2.830	10.748	0.000
40.34	33.78	27.02	5.935	6.917	4-FFf	2.000	2.000	2.000	2.830	10.754	0.000
42.57	33.80	27.02	5.939	6.920	4-FFf	2.000	2.000	2.000	2.830	10.759	0.000
44.80	33.81	27.02	5.943	6.924	4-FFf	2.000	2.000	2.000	2.830	10.764	0.000

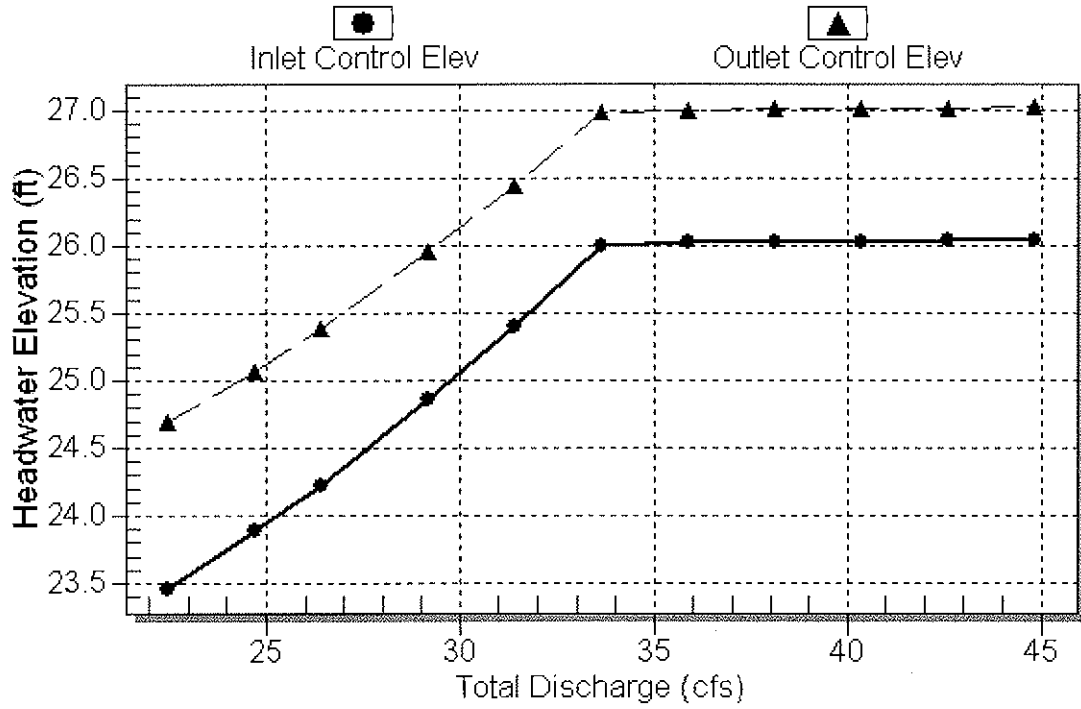
Inlet Elevation (invert): 20.10 ft, Outlet Elevation (invert): 20.00 ft

Culvert Length: 79.00 ft, Culvert Slope: 0.0013

Culvert Performance Curve Plot: CD-7 Existing

Performance Curve

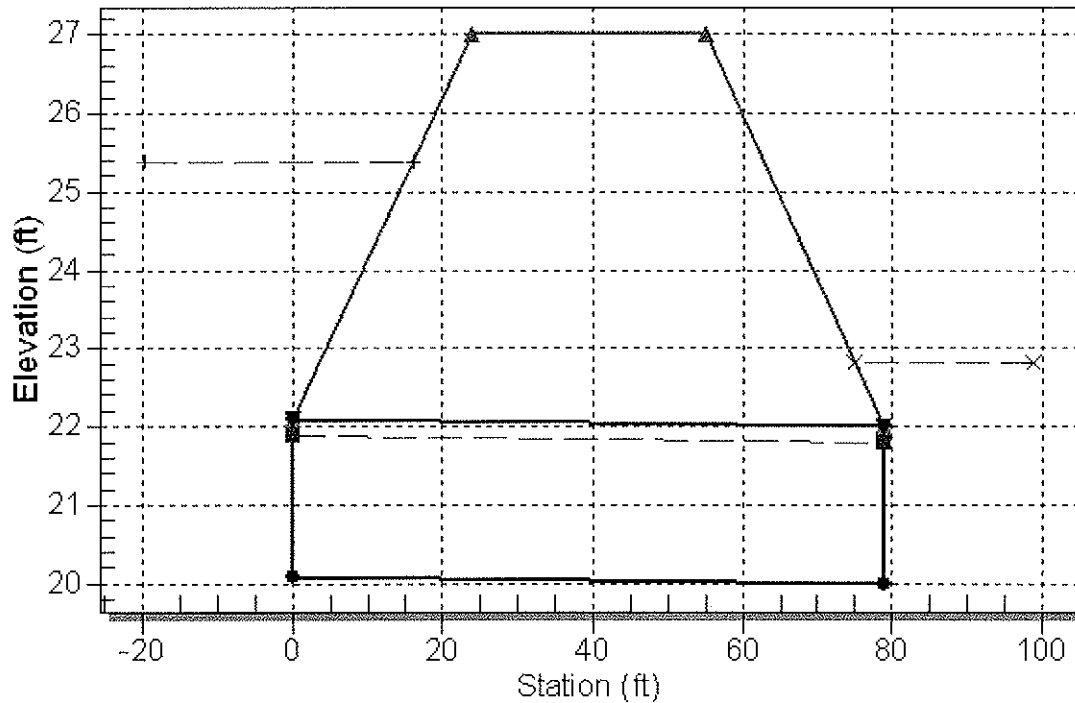
Culvert: CD-7 Existing



Water Surface Profile Plot for Culvert: CD-7 Existing

Crossing - CD-7 Existing, Design Discharge - 26.4 cfs

Culvert - CD-7 Existing, Culvert Discharge - 26.4 cfs



Site Data - CD-7 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.10 ft

Outlet Station: 79.00 ft

Outlet Elevation: 20.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-7 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-7 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	22.83	2.83
24.73	22.83	2.83
26.40	22.83	2.83
29.19	22.83	2.83
31.42	22.83	2.83
33.65	22.83	2.83
35.88	22.83	2.83
38.11	22.83	2.83
40.34	22.83	2.83
42.57	22.83	2.83
44.80	22.83	2.83

Tailwater Channel Data - CD-7 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 22.83 ft

Roadway Data for Crossing: CD-7 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 27.00 ft

Roadway Surface: Paved

Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-7 (Proposed 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-7 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-7 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
25.45	22.50	22.50	0.00	1
25.99	24.73	24.73	0.00	1
26.44	26.40	26.40	0.00	1
26.94	29.19	28.19	0.00	50
27.01	31.42	28.42	2.78	15
27.01	33.65	28.44	5.04	4
27.02	35.88	28.45	7.13	3
27.02	38.11	28.46	9.39	3
27.03	40.34	28.47	11.68	3
27.03	42.57	28.48	13.95	3
27.03	44.80	28.49	16.21	3

Rating Curve Plot for Crossing: CD-7 Proposed

Total Rating Curve
Crossing: CD-7 Proposed

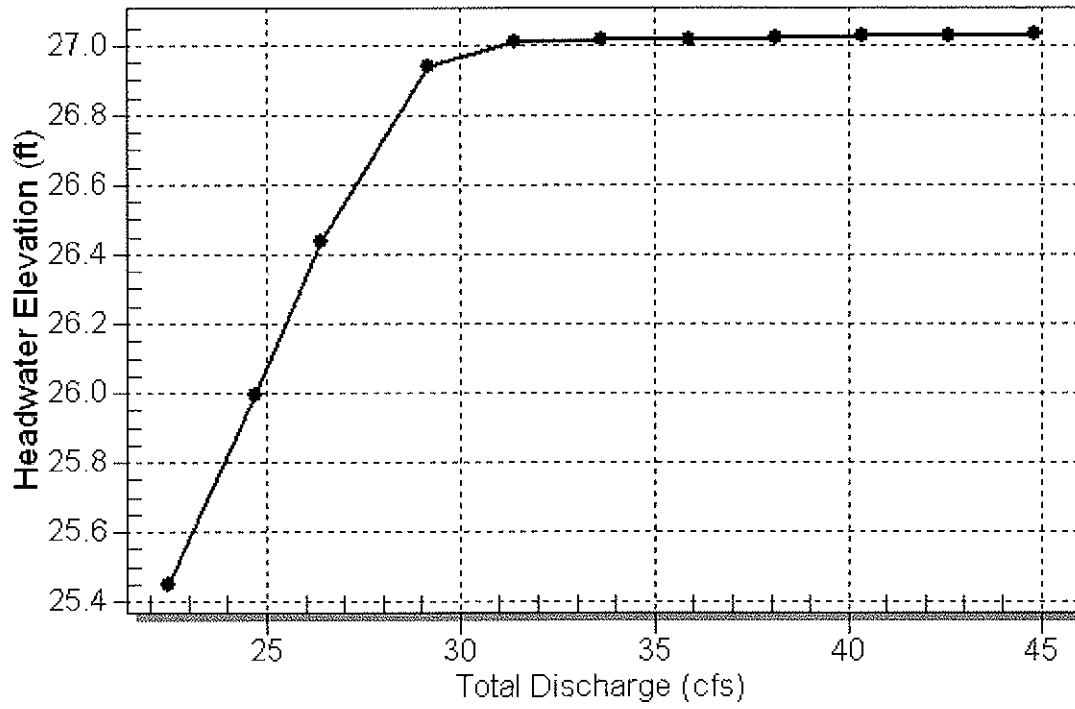


Table 2 - Culvert Summary Table: CD-7 Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	25.45	3.361	5.350	4-FFf	2.000	1.678	2.000	2.830	7.162	0.000
24.73	24.73	25.99	3.782	5.895	4-FFf	2.000	1.744	2.000	2.830	7.872	0.000
26.40	26.40	26.44	4.127	6.336	4-FFf	2.000	1.793	2.000	2.830	8.403	0.000
29.19	28.19	26.94	4.523	6.841	4-FFf	2.000	1.846	2.000	2.830	8.972	0.000
31.42	28.42	27.01	4.577	6.910	4-FFf	2.000	1.853	2.000	2.830	9.047	0.000
33.65	28.44	27.01	4.581	6.914	4-FFf	2.000	1.854	2.000	2.830	9.052	0.000
35.88	28.45	27.02	4.584	6.918	4-FFf	2.000	1.854	2.000	2.830	9.056	0.000
38.11	28.46	27.02	4.587	6.922	4-FFf	2.000	1.854	2.000	2.830	9.060	0.000
40.34	28.47	27.03	4.589	6.925	4-FFf	2.000	1.855	2.000	2.830	9.064	0.000
42.57	28.48	27.03	4.592	6.928	4-FFf	2.000	1.855	2.000	2.830	9.067	0.000
44.80	28.49	27.03	4.594	6.931	4-FFf	2.000	1.855	2.000	2.830	9.070	0.000

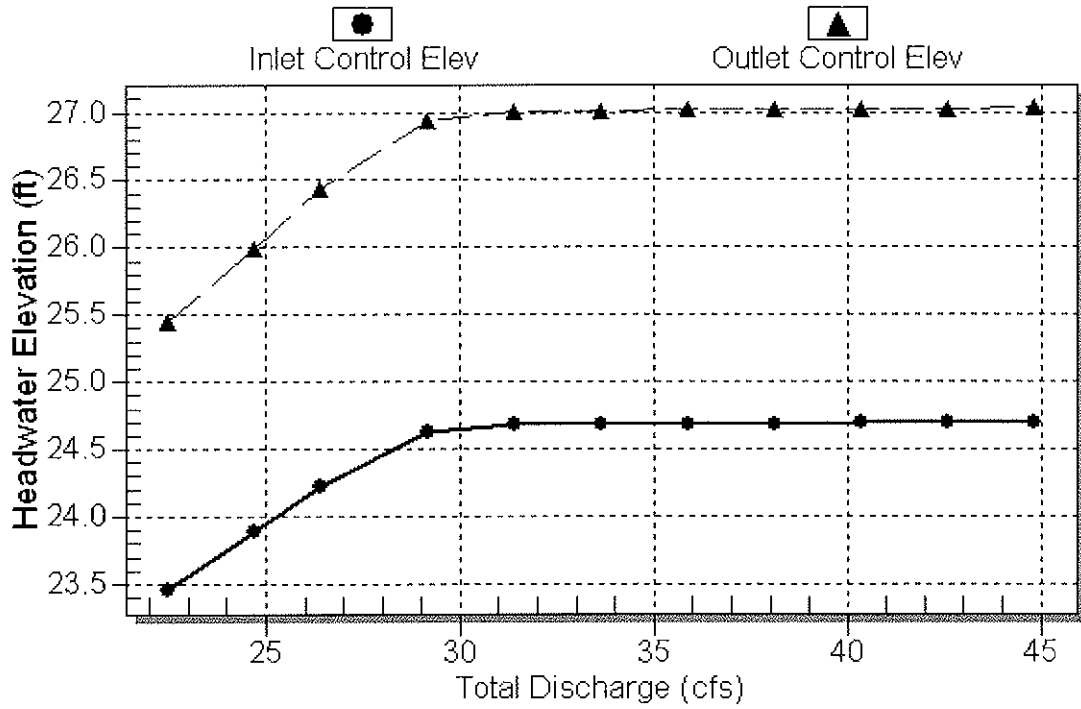
Inlet Elevation (invert): 20.10 ft, Outlet Elevation (invert): 19.90 ft

Culvert Length: 170.00 ft, Culvert Slope: 0.0012

Culvert Performance Curve Plot: CD-7 Proposed

Performance Curve

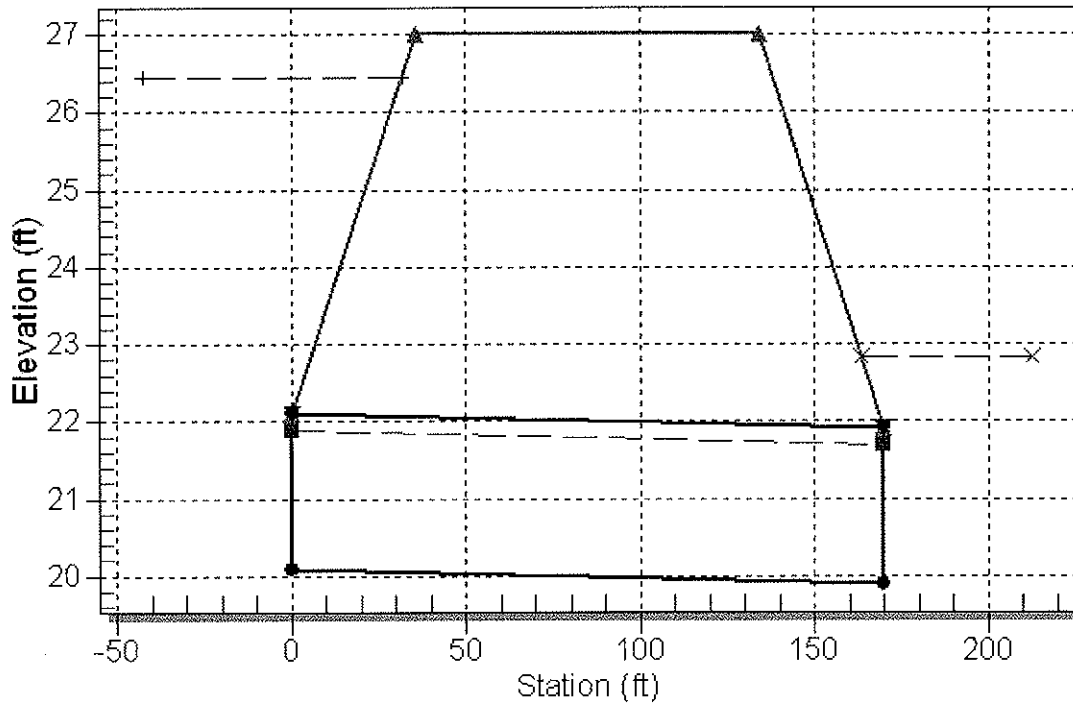
Culvert: CD-7 Proposed



Water Surface Profile Plot for Culvert: CD-7 Proposed

Crossing - CD-7 Proposed, Design Discharge - 26.4 cfs

Culvert - CD-7 Proposed, Culvert Discharge - 26.4 cfs



Site Data - CD-7 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.10 ft

Outlet Station: 170.00 ft

Outlet Elevation: 19.90 ft

Number of Barrels: 1

Culvert Data Summary - CD-7 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-7 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	22.83	2.83
24.73	22.83	2.83
26.40	22.83	2.83
29.19	22.83	2.83
31.42	22.83	2.83
33.65	22.83	2.83
35.88	22.83	2.83
38.11	22.83	2.83
40.34	22.83	2.83
42.57	22.83	2.83
44.80	22.83	2.83

Tailwater Channel Data - CD-7 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation
Constant Tailwater Elevation: 22.83 ft

Roadway Data for Crossing: CD-7 Proposed

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 27.00 ft
Roadway Surface: Paved
Roadway Top Width: 98.00 ft

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 8/7/2012
FIN No.: 240216-4-28-01	Checked by: DTL	Date: 9/25/12
Subject: CD-8: 24" RCP (Sta 326+72.92)		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-8. Based on the URS site visit conducted on Feb. 12th, 2012 the Endwall was buried. It appears that the sandy soils on the embankment have washed into the front of the Endwall to bury the pipe. The existing concrete culvert has been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. We will also ignore the buried Endwall as we understand this condition shall be cleaned up by the maintenance department. The tailwater shall be assumed at the crown of the existing endwall. Approximate historical drainage area is 12.4 acres per existing SR 46 Plans. Due to no record of flooding at CD-8, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	2 ft		
No of culverts:	1		Material: RCP
Exist culvert length:	100.0 ft		
Avg flowline elev upstream:	31.60	(NAVD)	(32.6 NGVD) Per Existing SR 46 Plans
Avg flowline elev downstream:	25.10	(NAVD)	(26.1 NGVD) Per Existing SR 46 Plans
Longitudinal slope:	0.065000	=	6.5000%
Tailwater:	27.10	(NAVD)	Endwall Buried, Crown assumed.

Estimate discharge & Overlapping & HW for existing and proposed:

Area of culvert (A): 3.1 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		18.8		
50		22.5 (Note 1)	34.9	34.92
100	1.4	26.4	35.66	35.69
500	1.7	44.8	41.15	41.2

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing Culvert
 Note 3: Values obtained from HY 8 model of proposed extension Culvert

Overtopping		
	Existing	Proposed
Elev (NAVD)	44.50	44.50
Q* (cfs)	52.86	52.71
Freq (yr)	>500	>500

* From HY 8 culvert analysis

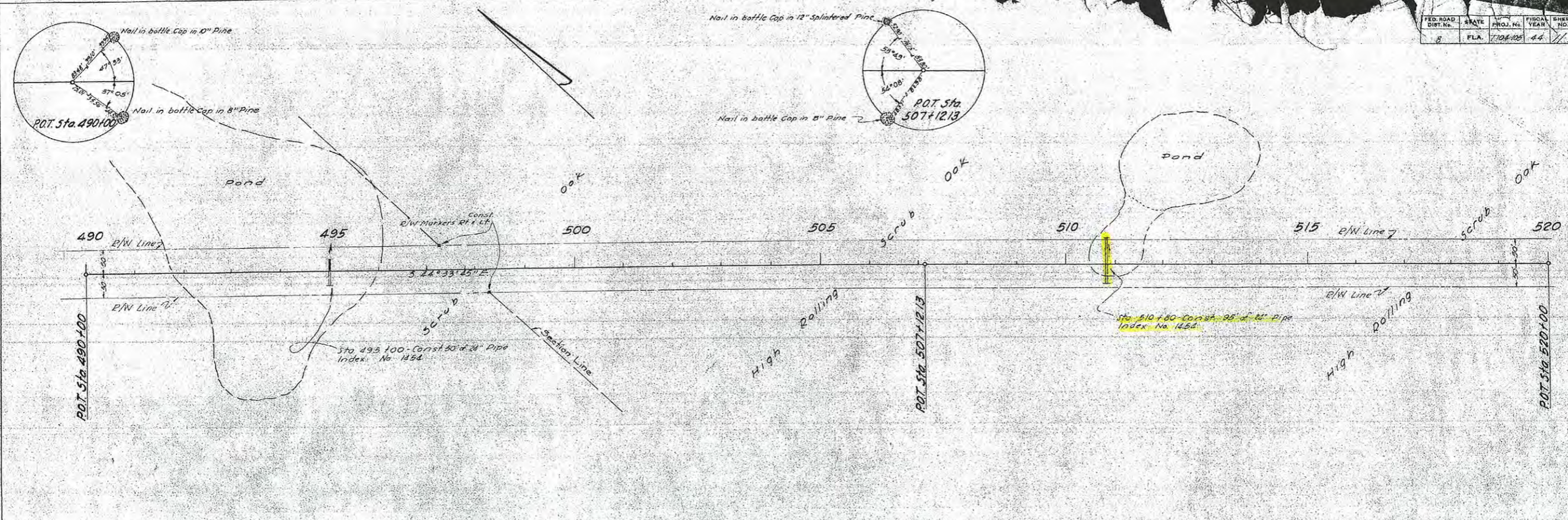
Proposed Culvert

Note: Culvert replacement to be 24" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 44

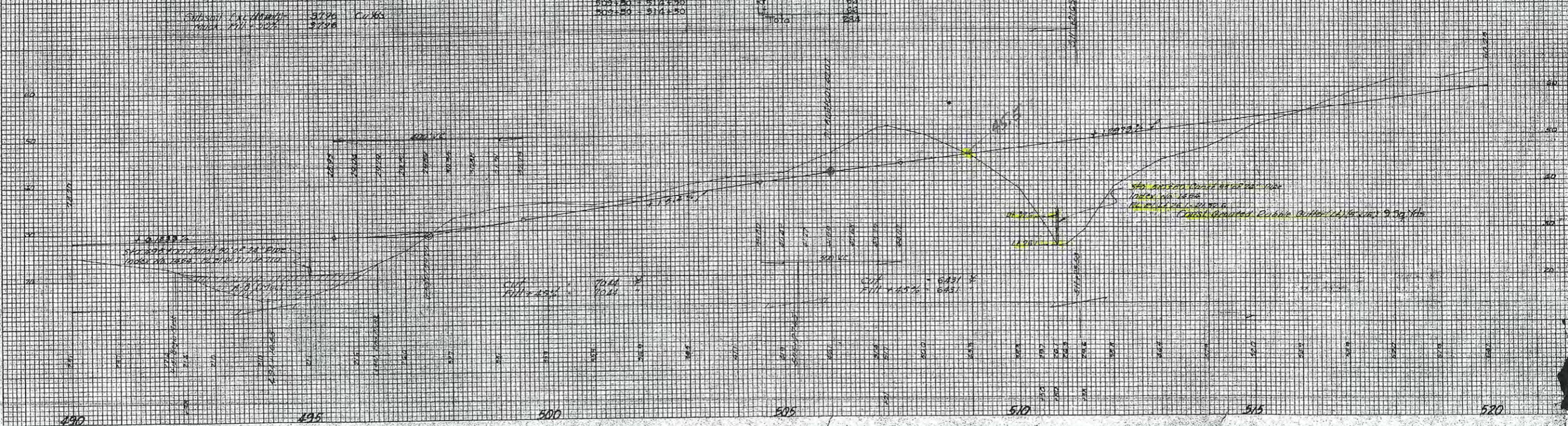
Proposed Information

	Extension Length	Invert (NAVD)
Upstream:	67.6 ft	31.60
Downstream:	2.4 ft	25.10
Total length of proposed culvert:	170.0 ft	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
8	FLA.	7104-105	44	11	11

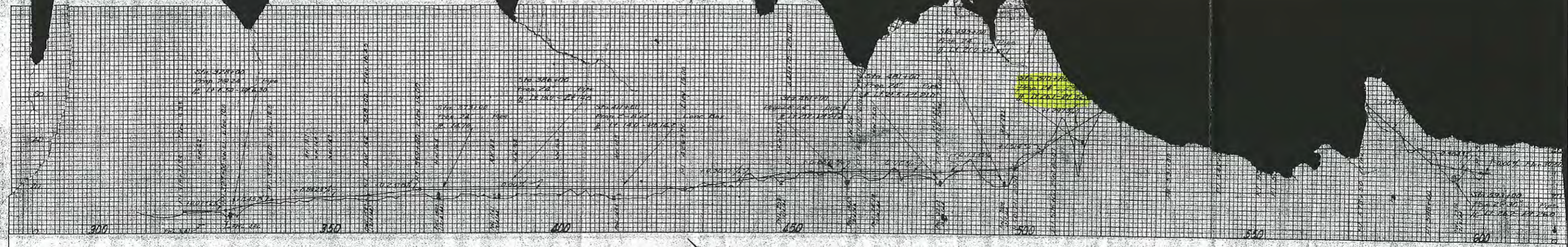


B.M. No. 15 R.R. Spikes in 10" Pipe 60' Lx 1 1/2" Sta. 497+00 Elev. 27.78	FOR CONSTRUCTION GUARD RAIL POSTS				B.M. No. 16 R.R. Spikes in 14" Pipe 50' Lx 1 1/2" Sta. 508+75 Elev. 42.47	B.M. No. 17 R.R. Spikes in 14" Pipe 50' Lx 1 1/2" Sta. 519+00 Elev. 60.58
	Sta.	Sta.	Side	No. Posts		
	491+00	491+00	RT	76		
	491+00	497+00	LT	76		
	503+20	514+20	RT	62		
	503+20	514+20	LT	62		
	Total			234		



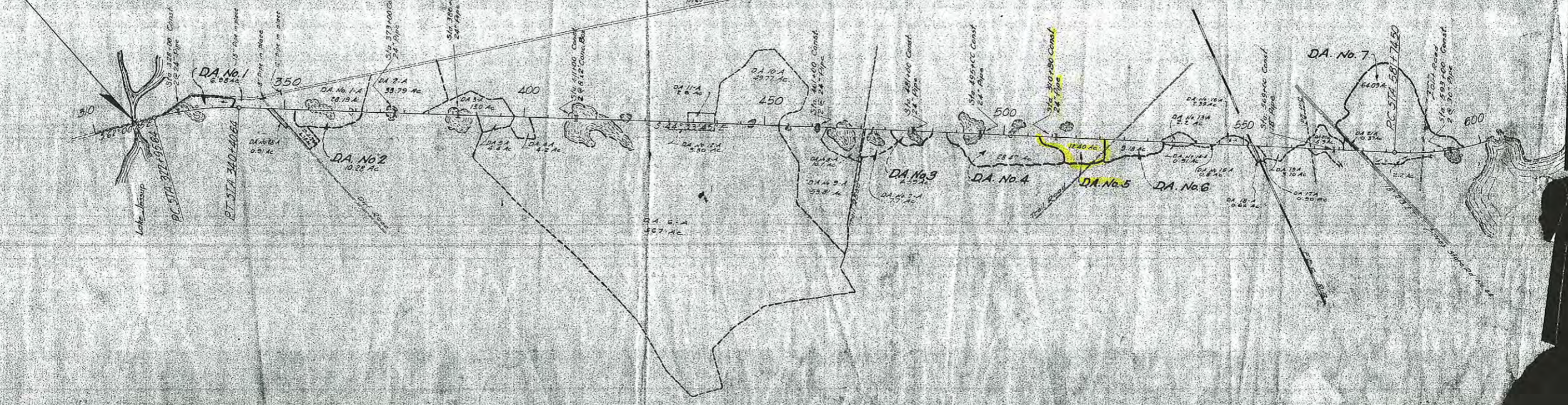
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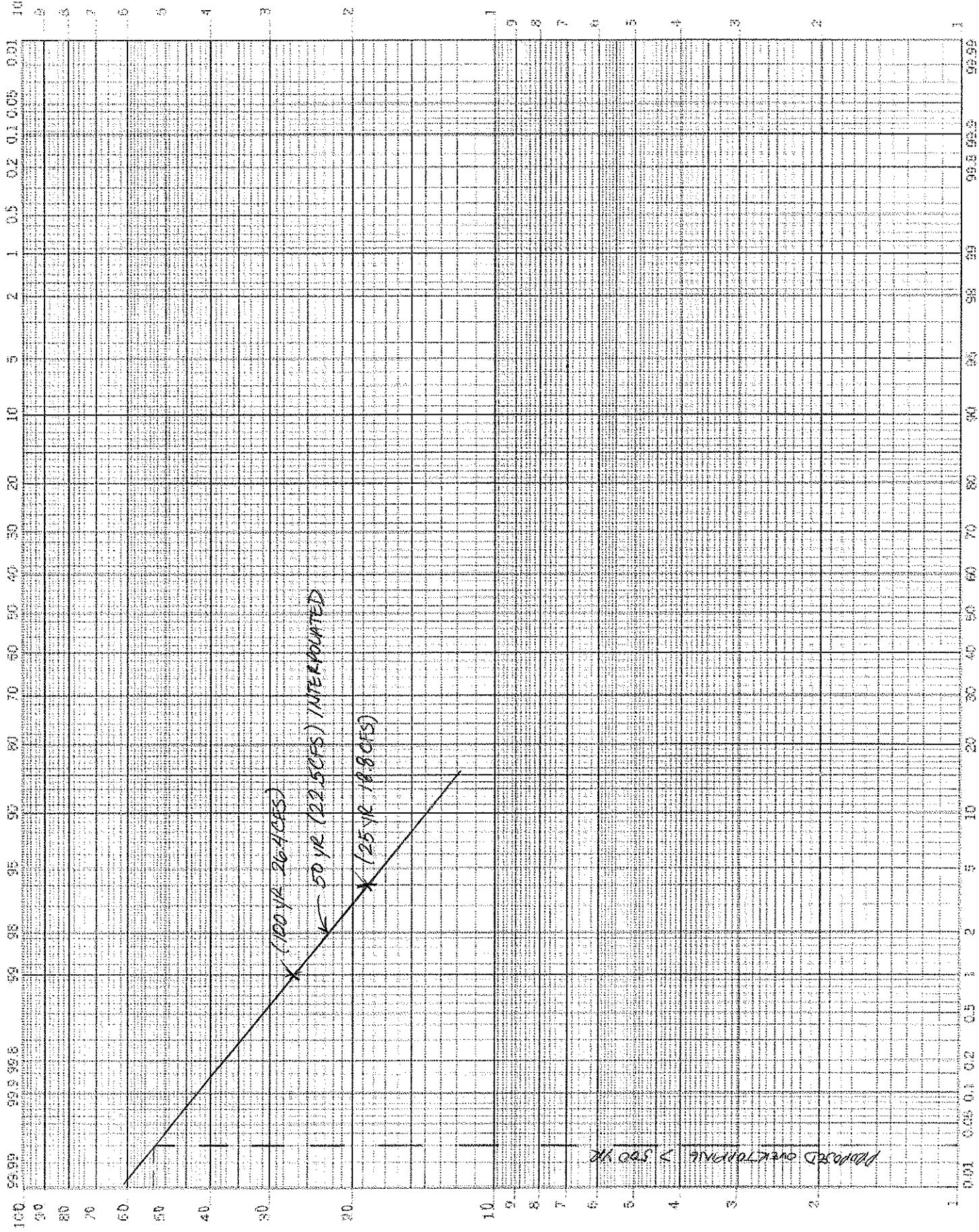


SCALE 1" = 100'

BEGIN PROJECT
STA 318+31.95



FREQUENCY



**HY-8 Culvert Analysis Report
CD-8 (Existing 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-8 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-8 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
34.90	22.50	22.50	0.00	1
35.32	24.73	24.73	0.00	1
35.66	26.40	26.40	0.00	1
36.29	29.19	29.19	0.00	1
36.84	31.42	31.42	0.00	1
37.43	33.65	33.65	0.00	1
38.08	35.88	35.88	0.00	1
38.79	38.11	38.11	0.00	1
39.53	40.34	40.34	0.00	1
40.32	42.57	42.57	0.00	1
41.15	44.80	44.80	0.00	1

Rating Curve Plot for Crossing: CD-8 Existing

Total Rating Curve

Crossing: CD-8 Existing

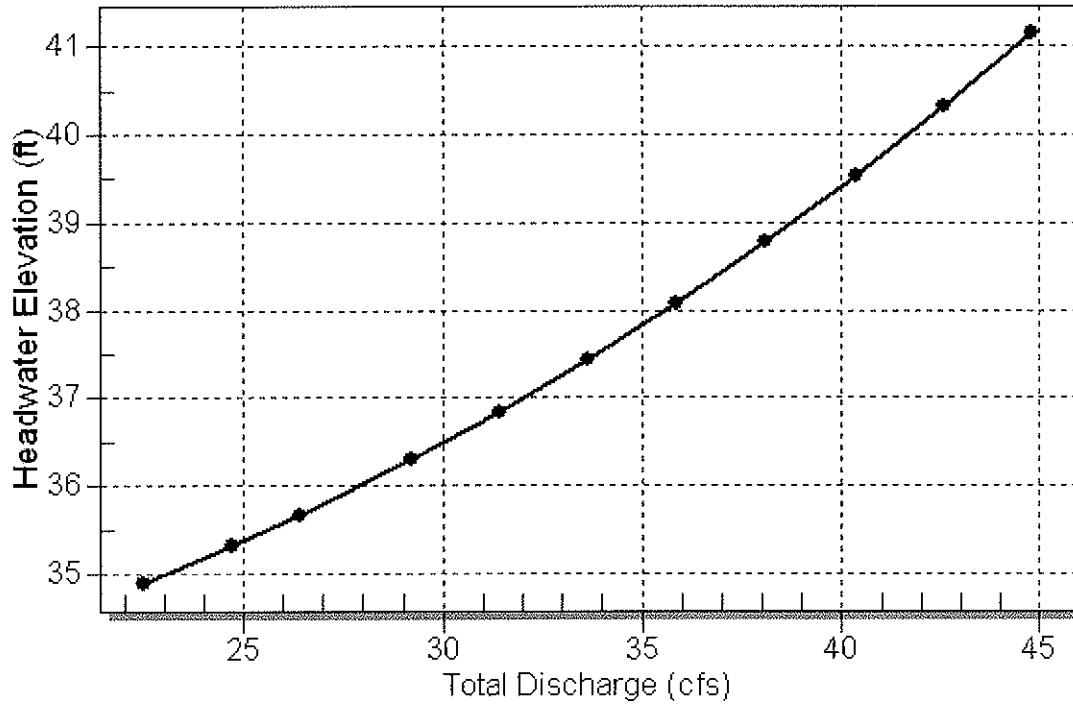


Table 2 - Culvert Summary Table: CD-8 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	34.90	3.298	3.298	5-S1f	0.827	1.678	1.678	2.000	8.020	0.000
24.73	24.73	35.32	3.719	3.719	5-S1f	0.871	1.744	1.744	2.000	8.531	0.000
26.40	26.40	35.66	4.063	4.063	5-S1f	0.904	1.793	1.793	2.000	8.893	0.000
29.19	29.19	36.29	4.694	4.694	5-S1f	0.959	1.876	1.876	2.000	9.602	0.000
31.42	31.42	36.84	5.244	5.244	1-S1f	1.002	1.941	1.941	2.000	10.156	0.000
33.65	33.65	37.43	5.834	0.037	5-S2n	1.044	2.000	1.119	2.000	18.620	0.000
35.88	35.88	38.08	6.484	0.660	5-S2n	1.085	2.000	1.165	2.000	18.898	0.000
38.11	38.11	38.79	7.186	1.323	5-S2n	1.127	2.000	1.212	2.000	19.132	0.000
40.34	40.34	39.53	7.932	2.027	5-S2n	1.168	2.000	1.260	2.000	19.372	0.000
42.57	42.57	40.32	8.719	2.770	5-S2n	1.210	2.000	1.308	2.000	19.584	0.000
44.80	44.80	41.15	9.549	3.553	5-S2n	1.253	2.000	1.352	2.000	19.845	0.000

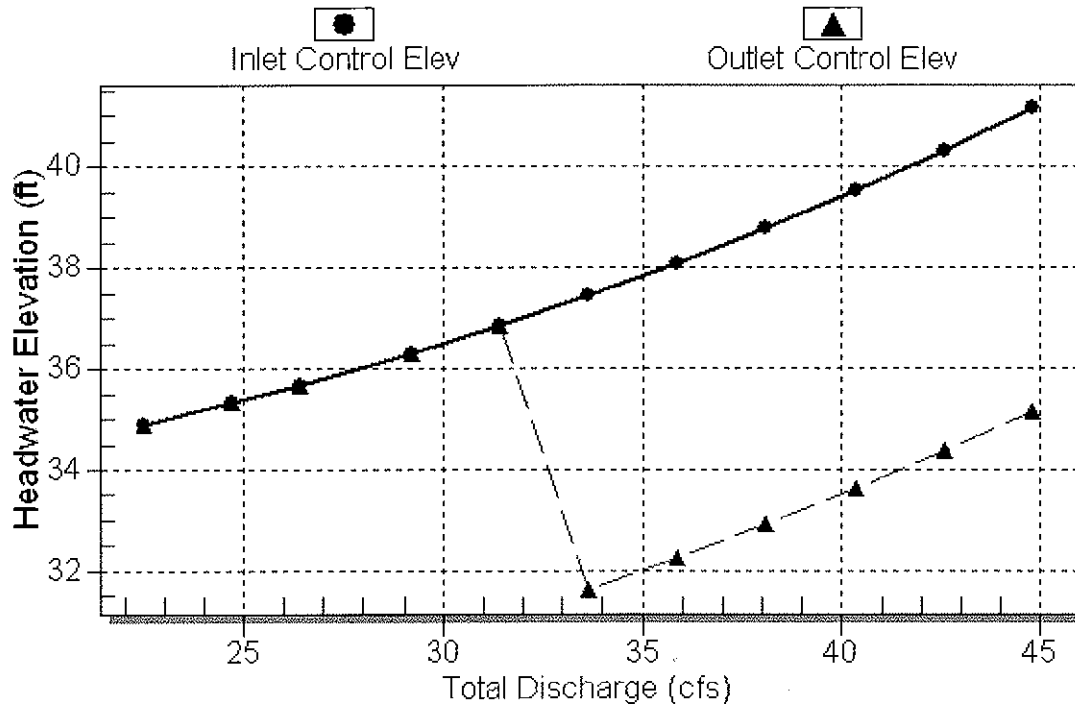
Inlet Elevation (invert): 31.60 ft, Outlet Elevation (invert): 25.10 ft

Culvert Length: 100.21 ft, Culvert Slope: 0.0650

Culvert Performance Curve Plot: CD-8 Existing

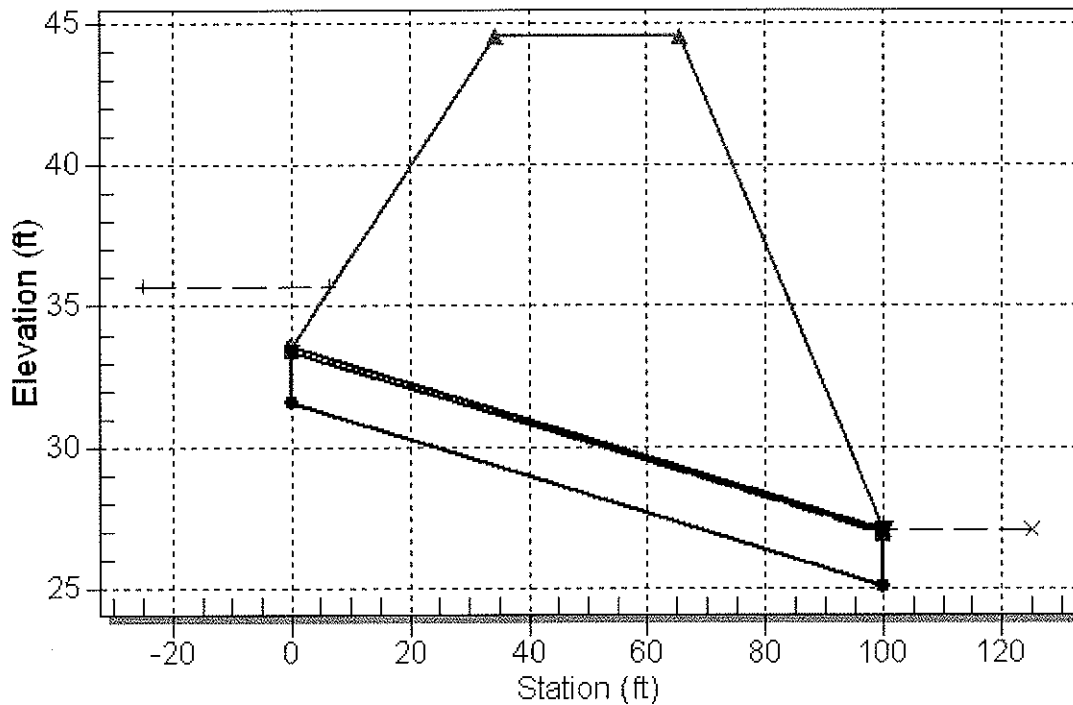
Performance Curve

Culvert: CD-8 Existing



Water Surface Profile Plot for Culvert: CD-8 Existing

Crossing - CD-8 Existing, Design Discharge - 26.4 cfs
Culvert - CD-8 Existing, Culvert Discharge - 26.4 cfs



Site Data - CD-8 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 31.60 ft

Outlet Station: 100.00 ft

Outlet Elevation: 25.10 ft

Number of Barrels: 1

Culvert Data Summary - CD-8 Existing

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-8 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	27.10	2.00
24.73	27.10	2.00
26.40	27.10	2.00
29.19	27.10	2.00
31.42	27.10	2.00
33.65	27.10	2.00
35.88	27.10	2.00
38.11	27.10	2.00
40.34	27.10	2.00
42.57	27.10	2.00
44.80	27.10	2.00

Tailwater Channel Data - CD-8 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation
Constant Tailwater Elevation: 27.10 ft

Roadway Data for Crossing: CD-8 Existing

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 44.50 ft
Roadway Surface: Paved
Roadway Top Width: 31.00 ft

**HY-8 Culvert Analysis Report
CD-8 (Proposed 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-8 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-8 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
34.92	22.50	22.50	0.00	1
35.35	24.73	24.73	0.00	1
35.69	26.40	26.40	0.00	1
36.32	29.19	29.19	0.00	1
36.87	31.42	31.42	0.00	1
37.46	33.65	33.65	0.00	1
38.11	35.88	35.88	0.00	1
38.82	38.11	38.11	0.00	1
39.57	40.34	40.34	0.00	1
40.36	42.57	42.57	0.00	1
41.20	44.80	44.80	0.00	1

Rating Curve Plot for Crossing: CD-8 Proposed

Total Rating Curve
Crossing: CD-8 Proposed

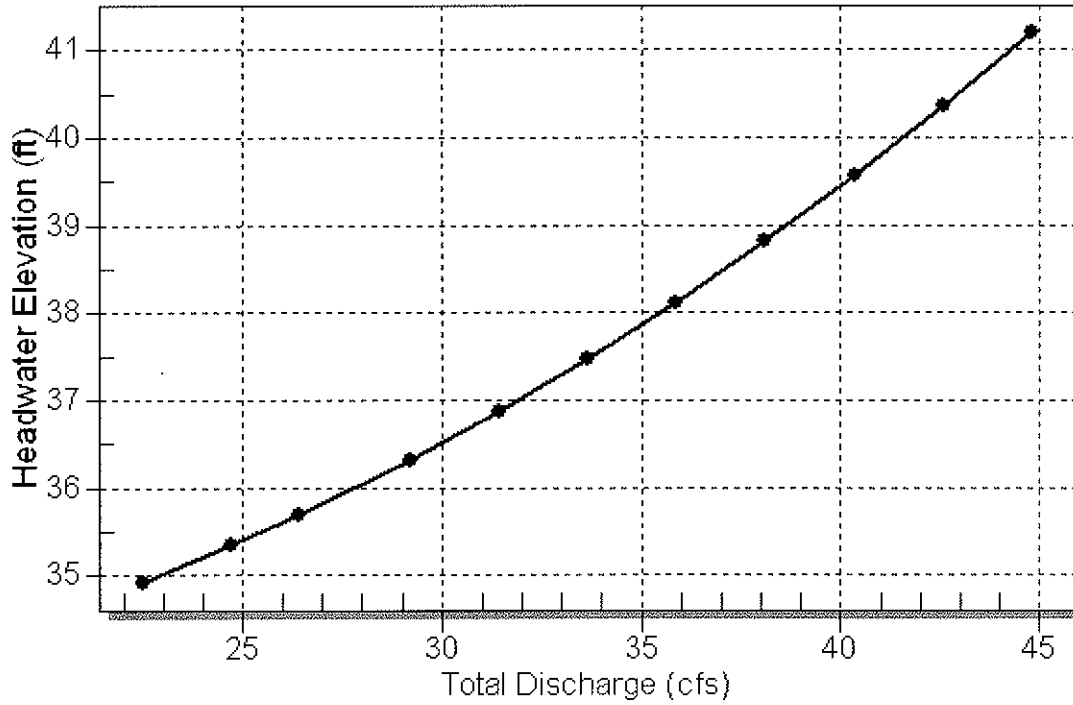


Table 2 - Culvert Summary Table: CD-8 Proposed

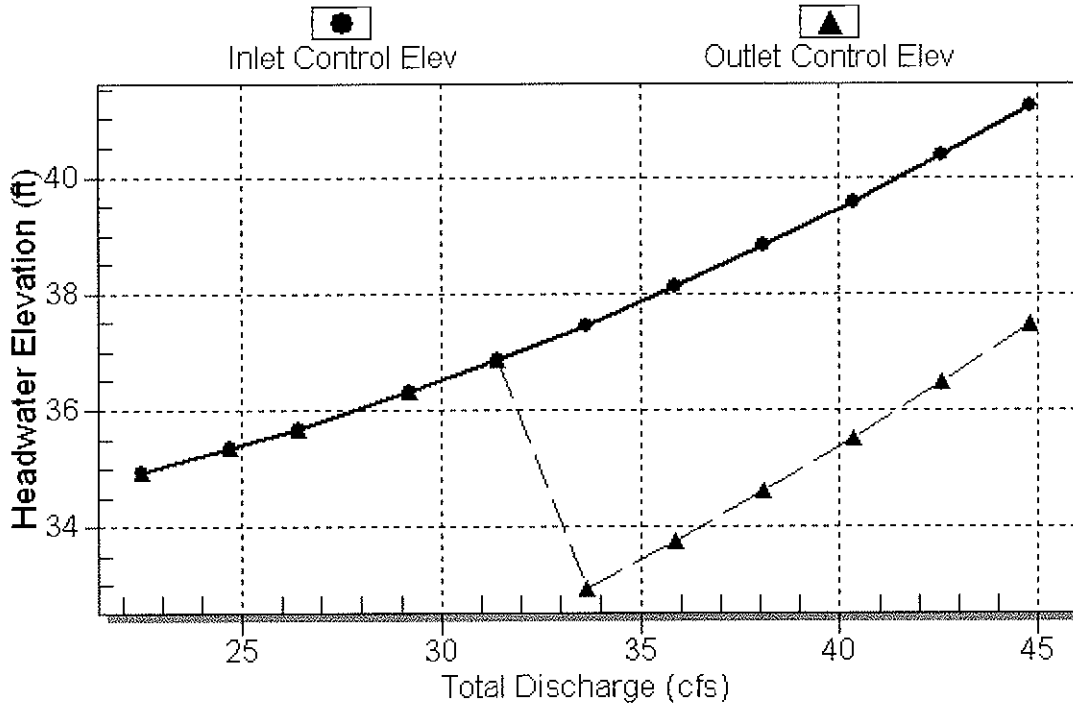
Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.50	22.50	34.92	3.324	3.324	5-S1f	0.961	1.678	1.678	2.000	8.020	0.000
24.73	24.73	35.35	3.745	3.745	5-S1f	1.017	1.744	1.744	2.000	8.531	0.000
26.40	26.40	35.69	4.090	4.090	5-S1f	1.058	1.793	1.793	2.000	8.893	0.000
29.19	29.19	36.32	4.720	4.720	5-S1f	1.126	1.876	1.876	2.000	9.602	0.000
31.42	31.42	36.87	5.271	5.271	1-S1f	1.180	1.941	1.941	2.000	10.156	0.000
33.65	33.65	37.46	5.861	1.357	5-S2n	1.235	2.000	1.235	2.000	16.514	0.000
35.88	35.88	38.11	6.514	2.159	5-S2n	1.291	2.000	1.324	2.000	16.282	0.000
38.11	38.11	38.82	7.221	3.013	5-S2n	1.347	2.000	1.349	2.000	16.924	0.000
40.34	40.34	39.57	7.971	3.919	5-S2n	1.404	2.000	1.405	2.000	17.106	0.000
42.57	42.57	40.36	8.763	4.876	5-S2n	1.470	2.000	1.510	2.000	16.770	0.000
44.80	44.80	41.20	9.597	5.885	5-S2n	1.537	2.000	1.539	2.000	17.304	0.000

 Inlet Elevation (invert): 31.60 ft, Outlet Elevation (invert): 25.10 ft

Culvert Length: 170.12 ft, Culvert Slope: 0.0382

Culvert Performance Curve Plot: CD-8 Proposed

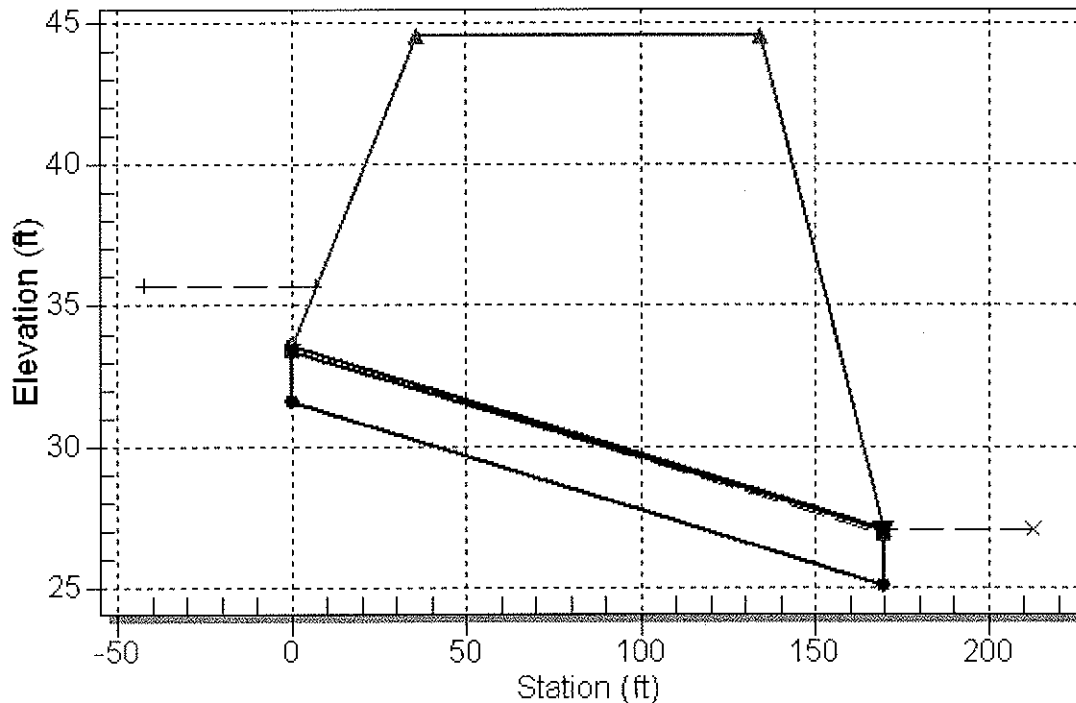
Performance Curve Culvert: CD-8 Proposed



Water Surface Profile Plot for Culvert: CD-8 Proposed

Crossing - CD-8 Proposed, Design Discharge - 26.4 cfs

Culvert - CD-8 Proposed, Culvert Discharge - 26.4 cfs



Site Data - CD-8 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 31.60 ft

Outlet Station: 170.00 ft

Outlet Elevation: 25.10 ft

Number of Barrels: 1

Culvert Data Summary - CD-8 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-8 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
22.50	27.10	2.00
24.73	27.10	2.00
26.40	27.10	2.00
29.19	27.10	2.00
31.42	27.10	2.00
33.65	27.10	2.00
35.88	27.10	2.00
38.11	27.10	2.00
40.34	27.10	2.00
42.57	27.10	2.00
44.80	27.10	2.00

Tailwater Channel Data - CD-8 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation
Constant Tailwater Elevation: 27.10 ft

Roadway Data for Crossing: CD-8 Proposed

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 1000.00 ft
Crest Elevation: 44.50 ft
Roadway Surface: Paved
Roadway Top Width: 98.00 ft

Project: SR 46 PD&E Study (SR 415 to CR 426)	Design By: DEP	Date: 8/7/2012
FIN No.: 240216-4-28-01	Checked by: DTZ	Date: 8/25/12
Subject: CD-9: 18" RCP (Sta 384+60.16) ✓		

Existing Culvert

Note: Based on the Record of Conversation document dated Feb. 7th, 2012 between URS and FDOT Maintenance Office (Jim Wood), there is no recorded history of flooding problems associated with CD-9. Based on the URS site visit conducted on Feb. 12th, 2012 there are no apparent erosion problems. The existing concrete culvert has been lined with a plastic pipe insert to protect the roadway base due to leaks in the existing RCP joints. For the purpose of the PD&E Study, the existing culvert analysis shall ignore the plastic pipe insert as our understanding is this was a temporary solution. Approximate historical drainage area is 5.9 acres per existing SR 46 Plans. Due to no record of flooding at CD-9, Velocity Method shall be used for the analysis.

Method used: Velocity (v) = 6 ft/s (Since no history of problems is known)

Existing Information:

Culvert Diameter:	<u>1.5</u>		
No of culverts:	<u>1</u>		Material: <u>RCP</u>
Exist culvert length:	<u>74.0 ft</u>		
Avg flowline elev upstream:	<u>58.50</u>	(NAVD)	(59.5 NGVD) <u>Per Existing SR 46 Plans</u>
Avg flowline elev downstream:	<u>58.40</u>	(NAVD)	(59.4 NGVD) <u>Per Existing SR 46 Plans</u>
Longitudinal slope:	0.001351	=	<u>0.1351%</u>
Tailwater:	<u>59.90</u>	(NAVD)	<u>Assume Crown of Pipe, no stain mark located on Endwall</u>

Estimate discharge & Overtopping & HW for existing and proposed:

Area of culvert (A): 1.8 sq ft

Frequency	Factor	Q = A x v	HW Stage Existing (Note 2)	HW Stage Proposed (Note 3)
(yr)		cu ft/s		
25		10.6		
50		12.5 (Note 1)	61.95	60.54
100	1.4	14.8	62.01	60.79
500	1.7	25.2	62.03	62.01

Note 1: Interpolated from Discharge vs Frequency graph (existing)
 Note 2: Values obtained from HY 8 model of existing CBC
 Note 3: Values obtained from HY 8 model of proposed extension CBC

Overtopping		
	Existing	Proposed
Elev (NAVD)	62	62.00
Q* (cfs)	12.64	22.68
Freq (yr)	50	>500

* From HY 8 culvert analysis

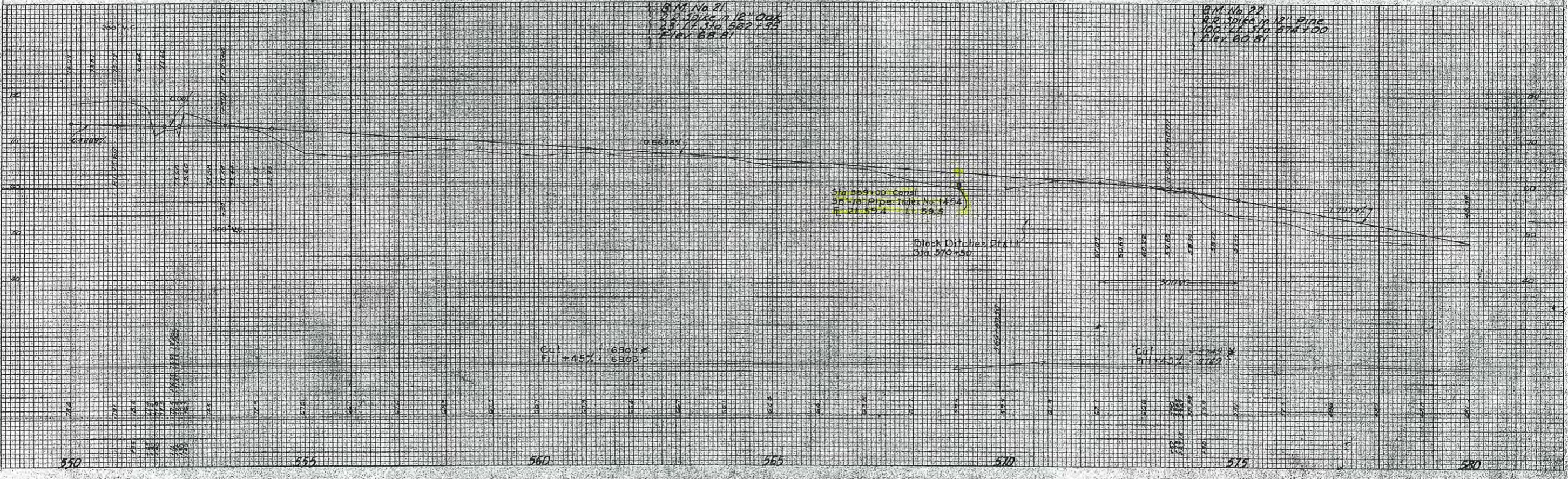
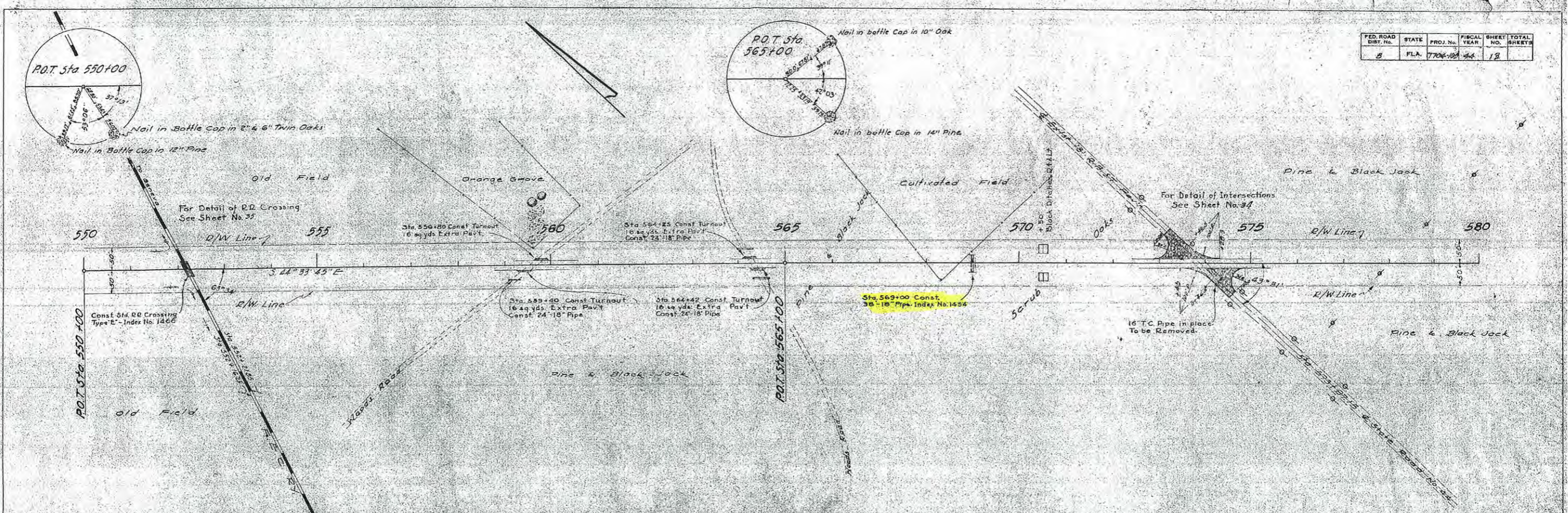
Proposed Culvert

Note: Culvert replacement to be 24" RCP
 Assume allowable headwater (EOT) to be 6" below CL of Existing SR 46 = 61.5

Proposed information

	Extension Length	Invert (NAVD)
Upstream:	9.3 ft	58.00
Downstream:	20.7 ft	57.90
Total length of proposed culvert:	104.0 ft	

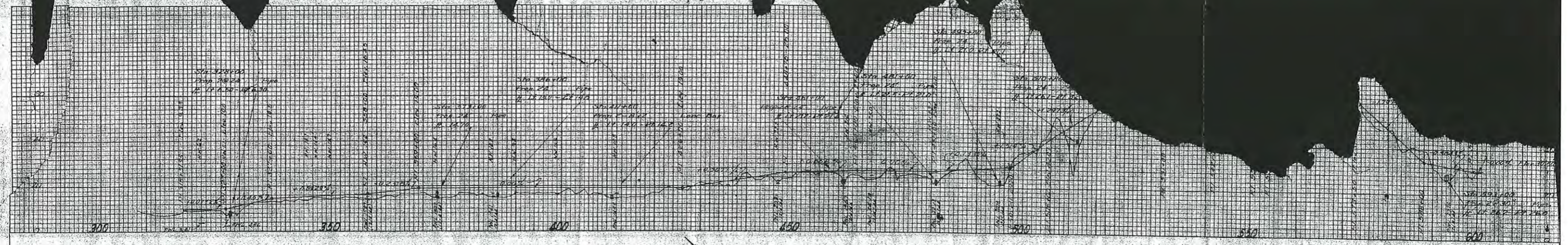
FED. ROAD DIST. No.	STATE	PROJ. No.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	FLA.	7706-10	44	12	



20662-A 20662-C

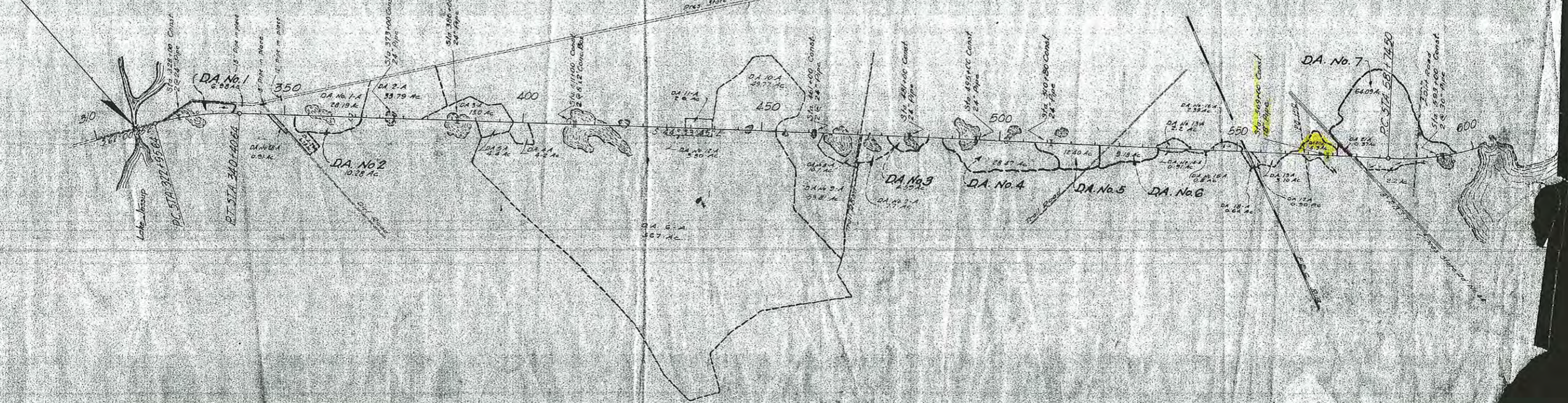
A. W. CORSEWELL
ANN ARBOR, MICH.

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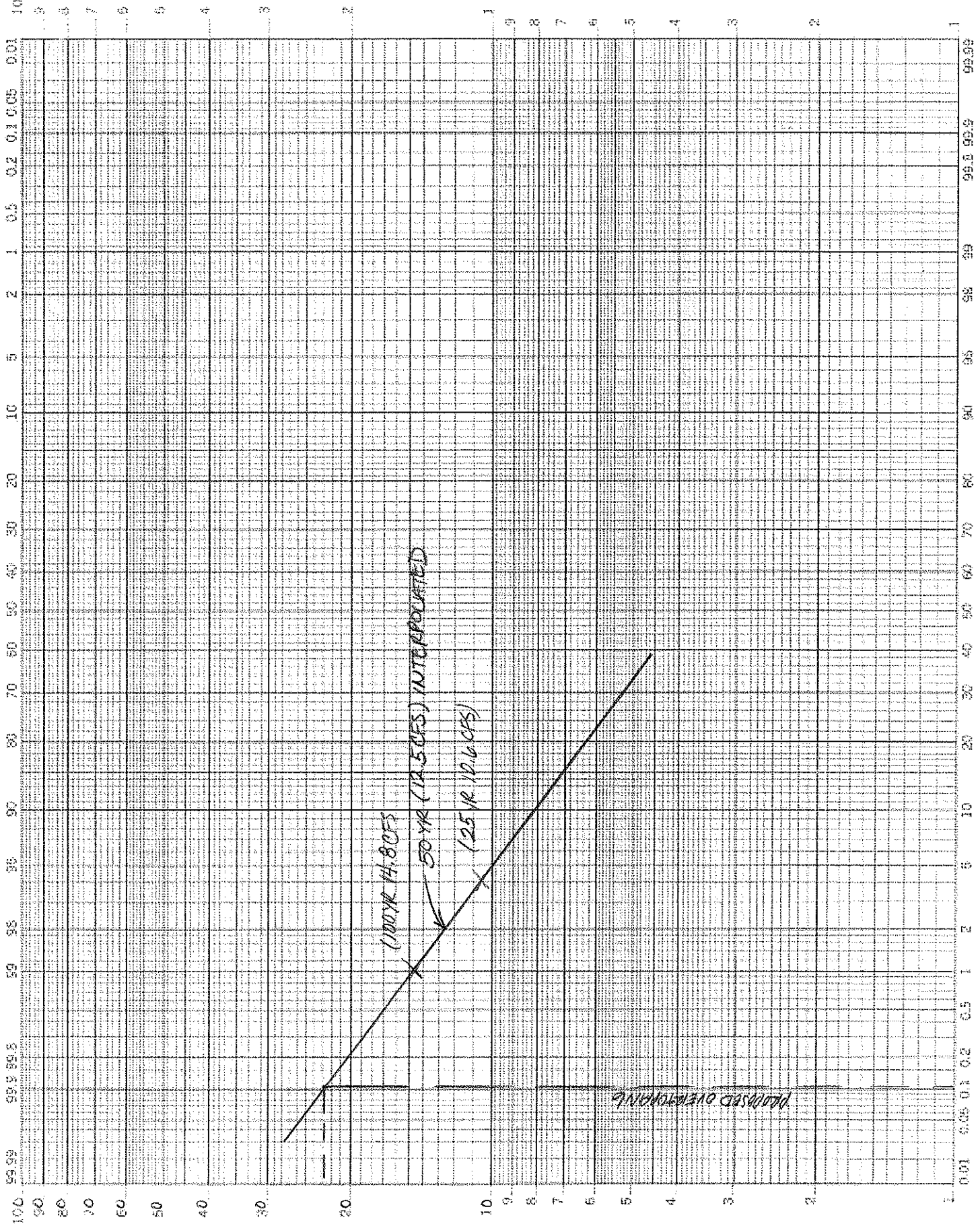


Scale 1" = 100'

BEGIN PROJECT
STA. 318 + 31.95



FREQUENCY



CFS

**HY-8 Culvert Analysis Report
CD-9 (Existing 18" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-9 Existing

Headwater Elevation (ft)	Total Discharge (cfs)	CD-9 Existing Discharge (cfs)	Roadway Discharge (cfs)	Iterations
61.95	12.50	12.50	0.00	1
62.00	13.77	12.66	0.99	21
62.01	14.80	12.66	2.01	4
62.01	16.31	12.68	3.55	4
62.01	17.58	12.68	4.76	3
62.02	18.85	12.69	6.04	3
62.02	20.12	12.70	7.34	3
62.02	21.39	12.70	8.63	3
62.02	22.66	12.71	9.91	3
62.02	23.93	12.71	10.99	2
62.03	25.20	12.72	12.43	3

Rating Curve Plot for Crossing: CD-9 Existing

Total Rating Curve

Crossing: CD-9 Existing

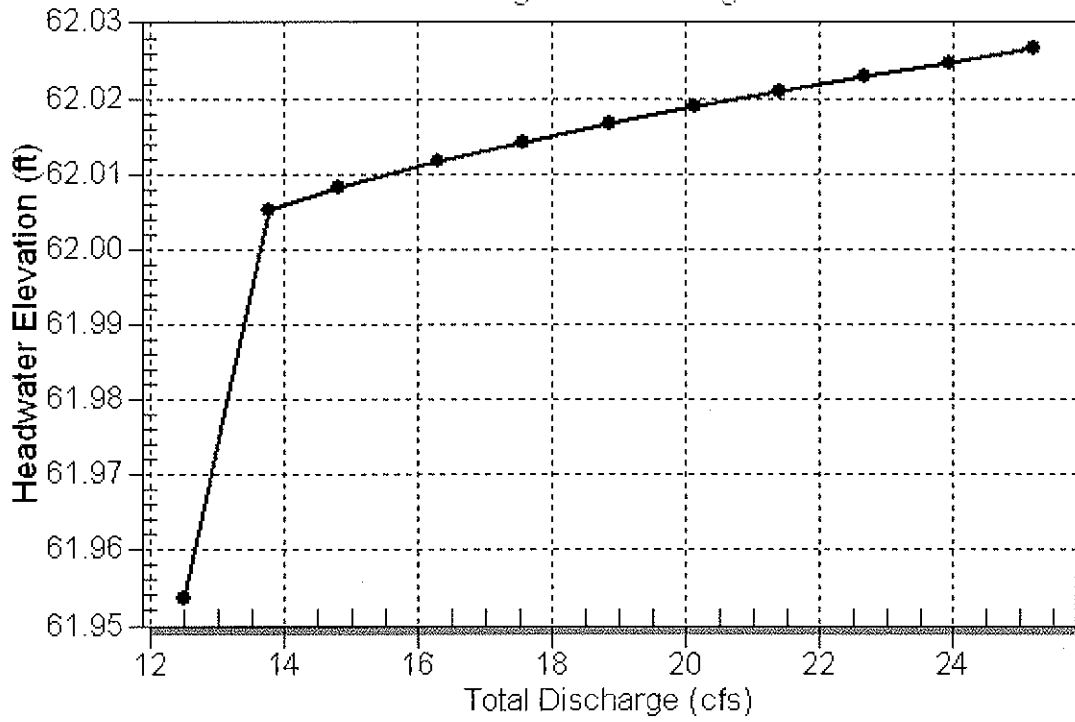


Table 2 - Culvert Summary Table: CD-9 Existing

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
12.50	12.50	61.95	2.978	3.453	4-FFf	1.500	1.329	1.500	1.500	7.074	0.000
13.77	12.66	62.00	3.028	3.505	4-FFf	1.500	1.336	1.500	1.500	7.162	0.000
14.80	12.66	62.01	3.031	3.508	4-FFf	1.500	1.336	1.500	1.500	7.167	0.000
16.31	12.68	62.01	3.035	3.511	4-FFf	1.500	1.337	1.500	1.500	7.173	0.000
17.58	12.68	62.01	3.037	3.514	4-FFf	1.500	1.337	1.500	1.500	7.177	0.000
18.85	12.69	62.02	3.040	3.516	4-FFf	1.500	1.337	1.500	1.500	7.181	0.000
20.12	12.70	62.02	3.042	3.519	4-FFf	1.500	1.338	1.500	1.500	7.185	0.000
21.39	12.70	62.02	3.044	3.521	4-FFf	1.500	1.338	1.500	1.500	7.189	0.000
22.66	12.71	62.02	3.046	3.523	4-FFf	1.500	1.338	1.500	1.500	7.192	0.000
23.93	12.71	62.02	3.047	3.524	4-FFf	1.500	1.338	1.500	1.500	7.195	0.000
25.20	12.72	62.03	3.049	3.526	4-FFf	1.500	1.339	1.500	1.500	7.198	0.000

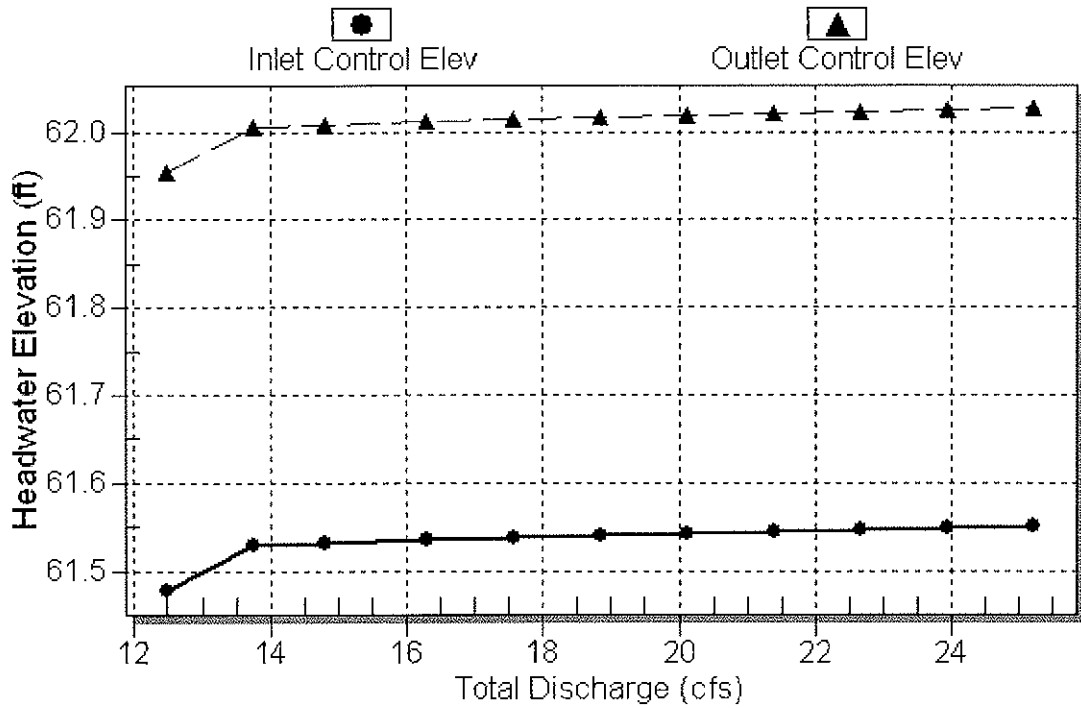
Inlet Elevation (invert): 58.50 ft, Outlet Elevation (invert): 58.40 ft

Culvert Length: 74.00 ft, Culvert Slope: 0.0014

Culvert Performance Curve Plot: CD-9 Existing

Performance Curve

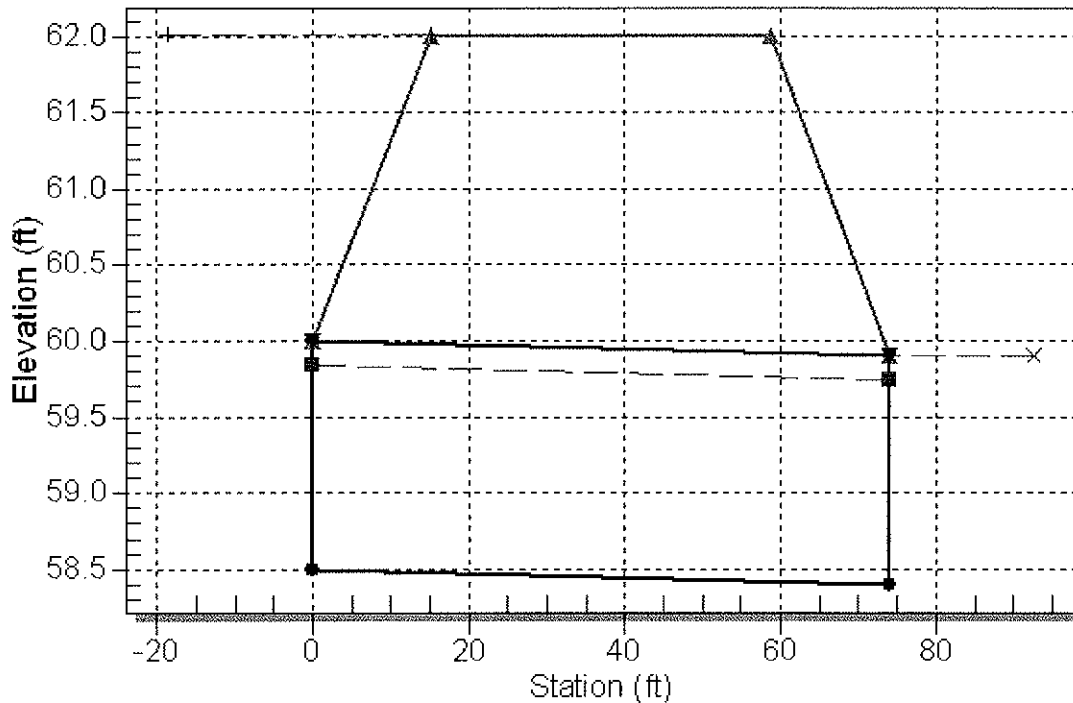
Culvert: CD-9 Existing



Water Surface Profile Plot for Culvert: CD-9 Existing

Crossing - CD-9 Existing, Design Discharge - 14.8 cfs

Culvert - CD-9 Existing, Culvert Discharge - 12.7 cfs



Site Data - CD-9 Existing

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 58.50 ft

Outlet Station: 74.00 ft

Outlet Elevation: 58.40 ft

Number of Barrels: 1

Culvert Data Summary - CD-9 Existing

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-9 Existing)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
12.50	59.90	1.50
13.77	59.90	1.50
14.80	59.90	1.50
16.31	59.90	1.50
17.58	59.90	1.50
18.85	59.90	1.50
20.12	59.90	1.50
21.39	59.90	1.50
22.66	59.90	1.50
23.93	59.90	1.50
25.20	59.90	1.50

Tailwater Channel Data - CD-9 Existing

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 59.90 ft

Roadway Data for Crossing: CD-9 Existing

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 62.00 ft

Roadway Surface: Paved

Roadway Top Width: 43.40 ft

**HY-8 Culvert Analysis Report
CD-9 (Proposed 24" RCP)**

Table 1 - Summary of Culvert Flows at Crossing: CD-9 Proposed

Headwater Elevation (ft)	Total Discharge (cfs)	CD-9 Proposed Discharge (cfs)	Roadway Discharge (cfs)	Iterations
60.54	12.50	12.50	0.00	1
60.67	13.77	13.77	0.00	1
60.79	14.80	14.80	0.00	1
60.99	16.31	16.31	0.00	1
61.16	17.58	17.58	0.00	1
61.35	18.85	18.85	0.00	1
61.55	20.12	20.12	0.00	1
61.77	21.39	21.39	0.00	1
62.00	22.66	22.66	0.00	1
62.01	23.93	22.71	1.06	7
62.01	25.20	22.73	2.34	4

Rating Curve Plot for Crossing: CD-9 Proposed

Total Rating Curve
Crossing: CD-9 Proposed

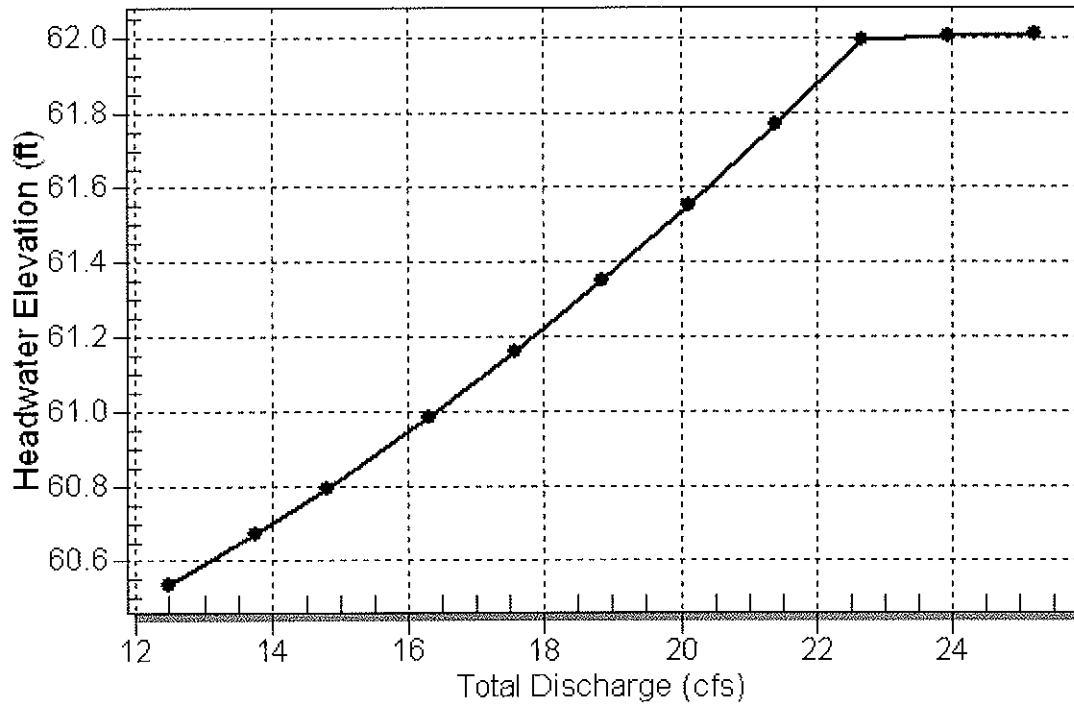


Table 2 - Culvert Summary Table: CD-9 Proposed

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
12.50	12.50	60.54	1.973	2.538	4-FFf	2.000	1.267	2.000	2.000	3.979	0.000
13.77	13.77	60.67	2.115	2.674	4-FFf	2.000	1.332	2.000	2.000	4.383	0.000
14.80	14.80	60.79	2.234	2.794	4-FFf	2.000	1.385	2.000	2.000	4.711	0.000
16.31	16.31	60.99	2.420	2.986	4-FFf	2.000	1.451	2.000	2.000	5.192	0.000
17.58	17.58	61.16	2.588	3.161	4-FFf	2.000	1.505	2.000	2.000	5.596	0.000
18.85	18.85	61.35	2.768	3.350	4-FFf	2.000	1.558	2.000	2.000	6.000	0.000
20.12	20.12	61.55	2.961	3.552	4-FFf	2.000	1.608	2.000	2.000	6.404	0.000
21.39	21.39	61.77	3.169	3.768	4-FFf	2.000	1.646	2.000	2.000	6.809	0.000
22.66	22.66	62.00	3.390	3.996	4-FFf	2.000	1.683	2.000	2.000	7.213	0.000
23.93	22.71	62.01	3.399	4.005	4-FFf	2.000	1.685	2.000	2.000	7.228	0.000
25.20	22.73	62.01	3.402	4.008	4-FFf	2.000	1.685	2.000	2.000	7.234	0.000

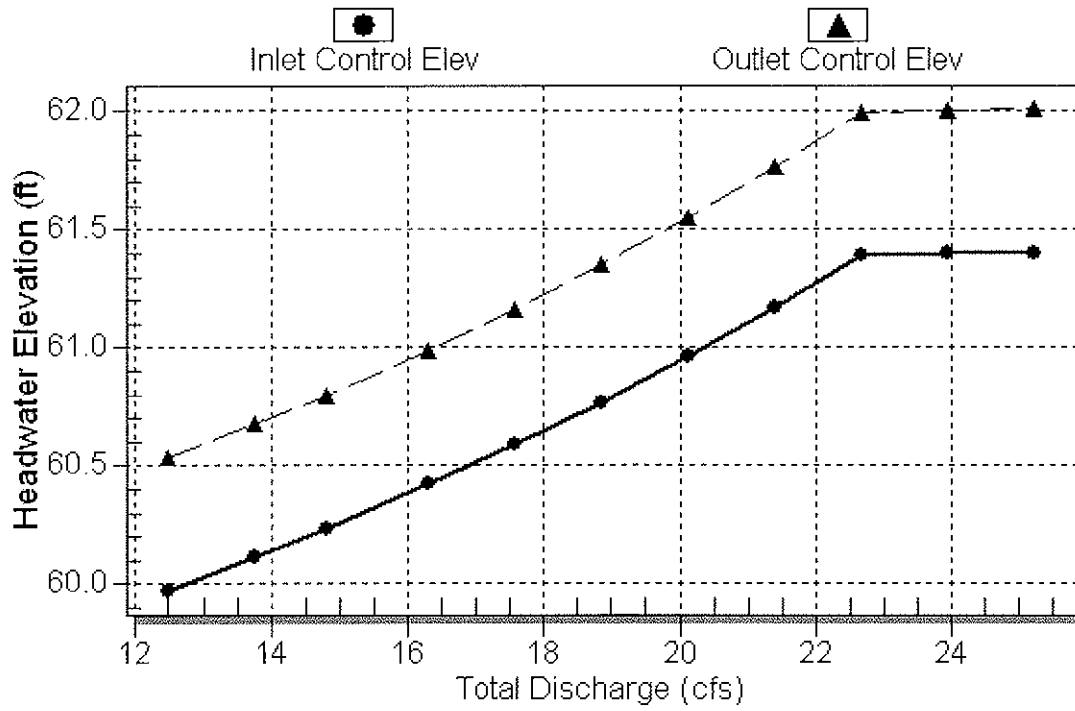
Inlet Elevation (invert): 58.00 ft, Outlet Elevation (invert): 57.90 ft

Culvert Length: 104.00 ft, Culvert Slope: 0.0010

Culvert Performance Curve Plot: CD-9 Proposed

Performance Curve

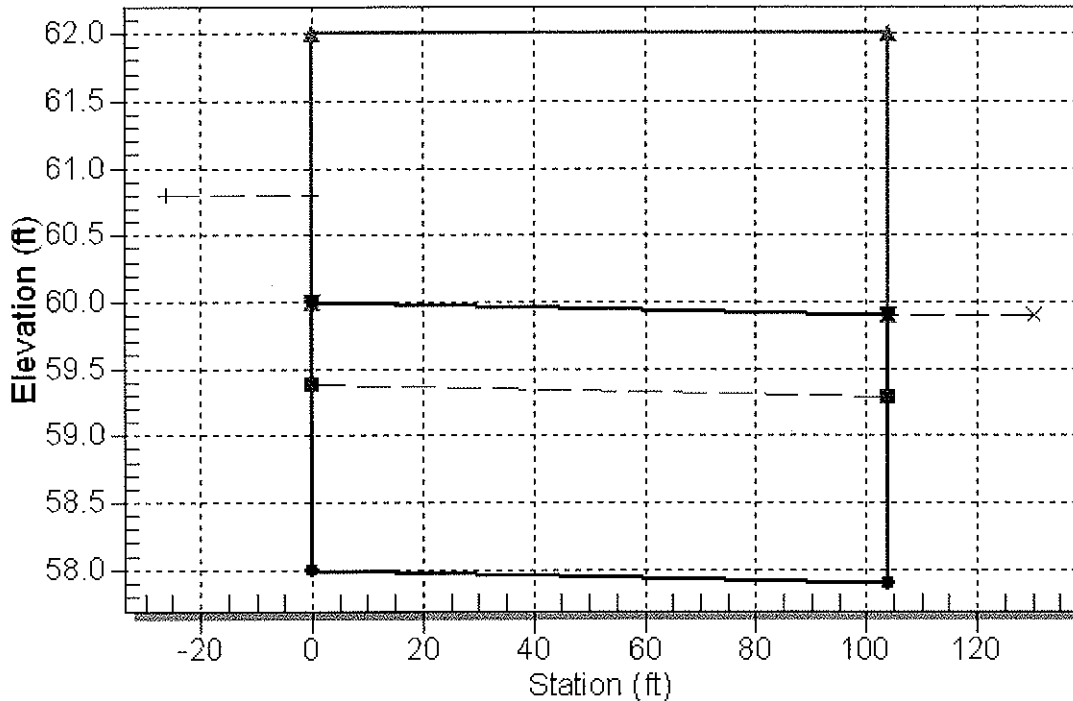
Culvert: CD-9 Proposed



Water Surface Profile Plot for Culvert: CD-9 Proposed

Crossing - CD-9 Proposed, Design Discharge - 14.8 cfs

Culvert - CD-9 Proposed, Culvert Discharge - 14.8 cfs



Site Data - CD-9 Proposed

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 58.00 ft

Outlet Station: 104.00 ft

Outlet Elevation: 57.90 ft

Number of Barrels: 1

Culvert Data Summary - CD-9 Proposed

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Barrel Manning's n: 0.0120

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-9 Proposed)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
12.50	59.90	2.00
13.77	59.90	2.00
14.80	59.90	2.00
16.31	59.90	2.00
17.58	59.90	2.00
18.85	59.90	2.00
20.12	59.90	2.00
21.39	59.90	2.00
22.66	59.90	2.00
23.93	59.90	2.00
25.20	59.90	2.00

Tailwater Channel Data - CD-9 Proposed

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 59.90 ft

Roadway Data for Crossing: CD-9 Proposed

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 62.00 ft

Roadway Surface: Paved

Roadway Top Width: 104.00 ft

APPENDIX E
100-Year Floodplain Analysis

URS

MADE BY: DTL
 CHECKED BY: *DEP*
 CALCULATIONS FOR: SR 46 PD&E Floodplain Impacts/Compensation

DATE: 11/26/13
 DATE: 12/19/13

JOB NO.
 SHEET NO.

Roadway Cross-Section Station:	Floodplain Impact (Fill) Area (ft ²):	Floodplain Compensation (Cut) Area (ft ²):	Floodplain Impact Net Area (ft ²):	Floodplain Impact Net Volume (ft ³):	Floodplain Impact Net Volume (ac-ft)
<i>Center Line for SR 46 Widening</i>					
22+00	19.23	0.00	19.23	-	-
23+00	21.32	0.00	21.32	2,027.25	0.05
24+00	22.42	0.00	22.42	2,186.75	0.05
25+00	22.91	0.00	22.91	2,266.13	0.05
26+00	0.00	0.00	0.00	1,145.25	0.03
27+00	33.08	0.00	33.08	1,654.13	0.04
28+00	12.46	0.00	12.46	2,277.25	0.05
29+00	37.32	0.00	37.32	2,488.88	0.06
30+00	30.83	0.00	30.83	3,407.00	0.08
31+00	2.28	0.00	2.28	1,655.13	0.04
32+00	59.09	0.00	59.09	3,068.38	0.07
33+00	147.05	0.00	147.05	10,307.13	0.24
34+00	94.61	0.00	94.61	12,083.25	0.28
35+00	218.45	0.00	218.45	15,653.13	0.36
36+00	297.11	0.00	297.11	25,778.00	0.59
37+00	175.48	0.00	175.48	23,629.50	0.54
38+00	274.54	0.00	274.54	22,500.75	0.52
39+00	278.36	0.00	278.36	27,644.50	0.63
40+00	275.50	0.00	275.50	27,692.88	0.64
41+00	285.98	0.00	285.98	28,074.00	0.64
42+00	290.02	0.00	290.02	28,799.63	0.66
43+00	288.26	0.00	288.26	28,913.88	0.66
44+00	291.59	0.00	291.59	28,992.50	0.67
45+00	328.28	0.00	328.28	30,993.25	0.71
46+00	296.62	0.00	296.62	31,244.63	0.72
47+00	300.84	0.00	300.84	29,872.75	0.69
48+00	272.93	0.00	272.93	28,688.50	0.66
49+00	264.38	0.00	264.38	26,865.50	0.62
50+00	282.57	0.00	282.57	27,347.38	0.63
51+00	252.87	0.00	252.87	26,771.63	0.61
52+00	258.46	0.00	258.46	25,566.00	0.59
53+00	279.72	0.00	279.72	26,908.75	0.62
54+00	272.62	0.00	272.62	27,617.13	0.63
55+00	259.04	0.00	259.04	26,583.00	0.61
56+00	253.56	0.00	253.56	25,629.75	0.59
57+00	251.34	0.00	251.34	25,244.63	0.58
58+00	234.30	0.00	234.30	24,281.75	0.56
59+00	225.72	0.00	225.72	23,001.00	0.53
60+00	209.29	0.00	209.29	21,750.38	0.50
61+00	206.01	0.00	206.01	20,765.00	0.48
62+00	206.06	0.00	206.06	20,603.38	0.47
63+00	212.62	0.00	212.62	20,933.75	0.48
64+00	210.14	0.00	210.14	21,137.88	0.49
65+00	213.30	0.00	213.30	21,171.75	0.49
66+00	190.69	0.00	190.69	20,199.13	0.46
67+00	199.30	0.00	199.30	19,499.25	0.45
68+00	206.36	0.00	206.36	20,282.88	0.47
69+00	189.59	0.00	189.59	19,797.38	0.45
70+00	180.60	0.00	180.60	18,509.63	0.42
71+00	215.75	0.00	215.75	19,817.63	0.45
72+00	207.11	0.00	207.11	21,142.88	0.49
73+00	204.30	0.00	204.30	20,570.25	0.47
74+00	196.96	0.00	196.96	20,063.00	0.46
75+00	176.25	0.00	176.25	18,660.38	0.43
76+00	140.45	0.00	140.45	15,834.50	0.36
77+00	221.73	0.00	221.73	18,108.75	0.42
78+00	218.82	0.00	218.82	22,027.38	0.51
79+00	97.88	0.00	97.88	15,835.00	0.36
80+00	91.45	0.00	91.45	9,466.75	0.22
81+00	78.67	0.00	78.67	8,506.00	0.20
82+00	72.47	0.00	72.47	7,556.63	0.17
83+00	82.02	0.00	82.02	7,724.13	0.18

URS

MADE BY: DTL
 CHECKED BY: DCP
 CALCULATIONS FOR: SR 46 PD&E Floodplain Impacts/Compensation

DATE: 11/26/13
 DATE: 12/19/13

JOB NO.
 SHEET NO.

Roadway Cross-Section Station:	Floodplain Impact (Fill) Area (ft ²):	Floodplain Compensation (Cut) Area (ft ²):	Floodplain Impact Net Area (ft ²):	Floodplain Impact Net Volume (ft ³):	Floodplain Impact Net Volume (ac-ft)
84+00	56.11	0.00	56.11	6,906.25	0.16
85+00	86.93	0.00	86.93	7,151.75	0.16
86+00	87.51	0.00	87.51	8,722.00	0.20
87+00	87.24	0.00	87.24	8,737.63	0.20
88+00	84.60	0.00	84.60	8,592.00	0.20
89+00	98.80	0.00	98.80	9,170.13	0.21
90+00	104.68	0.00	104.68	10,174.25	0.23
91+00	76.38	0.00	76.38	9,053.13	0.21
92+00	12.27	0.00	12.27	4,432.25	0.10
93+00	6.16	0.00	6.16	921.38	0.02
94+00	48.91	0.00	48.91	2,753.75	0.06
95+00	35.95	0.00	35.95	4,243.00	0.10
96+00	30.04	0.00	30.04	3,299.25	0.08
97+00	33.83	0.00	33.83	3,193.13	0.07
98+00	31.30	0.00	31.30	3,256.13	0.07
99+00	33.13	0.00	33.13	3,221.25	0.07
100+00	33.37	0.00	33.37	3,324.75	0.08
101+00	35.75	0.00	35.75	3,455.88	0.08
102+00	32.34	0.00	32.34	3,404.50	0.08

Centerline SR 46 Widening - Station 22+00 to 102+00

TOTAL:	1,242,836.88	28.53
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140+00	64.10	0.00	64.10		
141+00	68.48	0.00	68.48	6,628.50	0.15
142+00	62.30	0.00	62.30	6,538.50	0.15
143+00	23.00	0.00	23.00	4,264.50	0.10
144+00	48.94	0.00	48.94	3,596.63	0.08
145+00	15.14	0.00	15.14	3,203.88	0.07
146+00	20.15	0.00	20.15	1,764.63	0.04
147+00	4.83	0.00	4.83	1,249.13	0.03
148+00	8.74	0.00	8.74	678.38	0.02

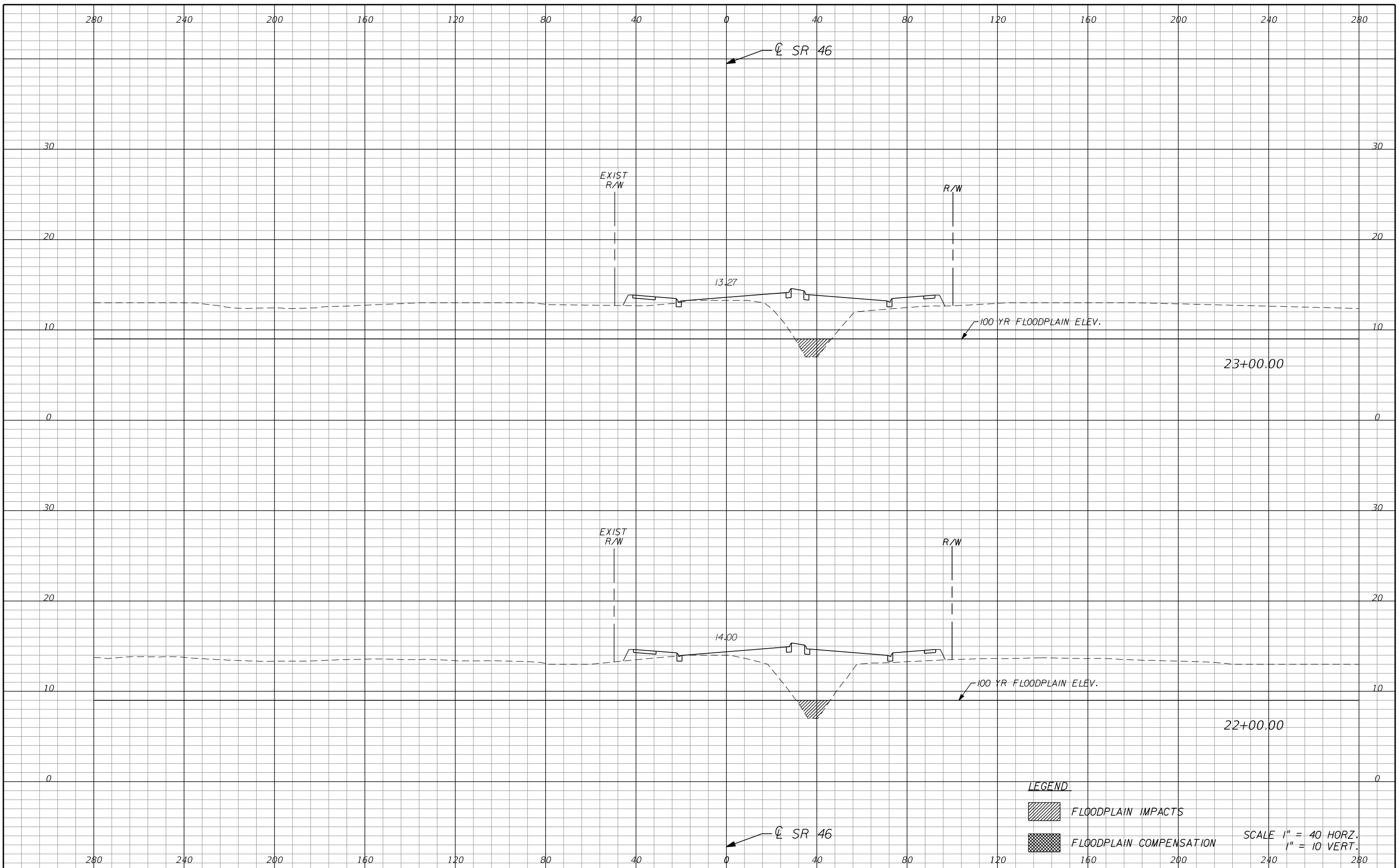
Centerline SR 46 Widening - Station 140+00 to 148+00

TOTAL:	27924.13	0.64
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Summary of Floodplain No. 1 Impact Volumes for SR 46 Widening:

		Floodplain Impact Net Volume (ft ³):	Floodplain Impact Net Volume (ac-ft)
<i>Centerline SR 46 Widening - Station 22+00 to 102+00</i>	TOTAL:	1,242,836.88	28.53
<i>Centerline SR 46 Widening - Station 140+00 to 148+00</i>	TOTAL:	27924.13	0.64

FLOODPLAIN NO. 1 PROJECT TOTAL:	29.17
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LEGEND

-  FLOODPLAIN IMPACTS
-  FLOODPLAIN COMPENSATION

SCALE 1" = 40' HORZ.
1" = 10' VERT.

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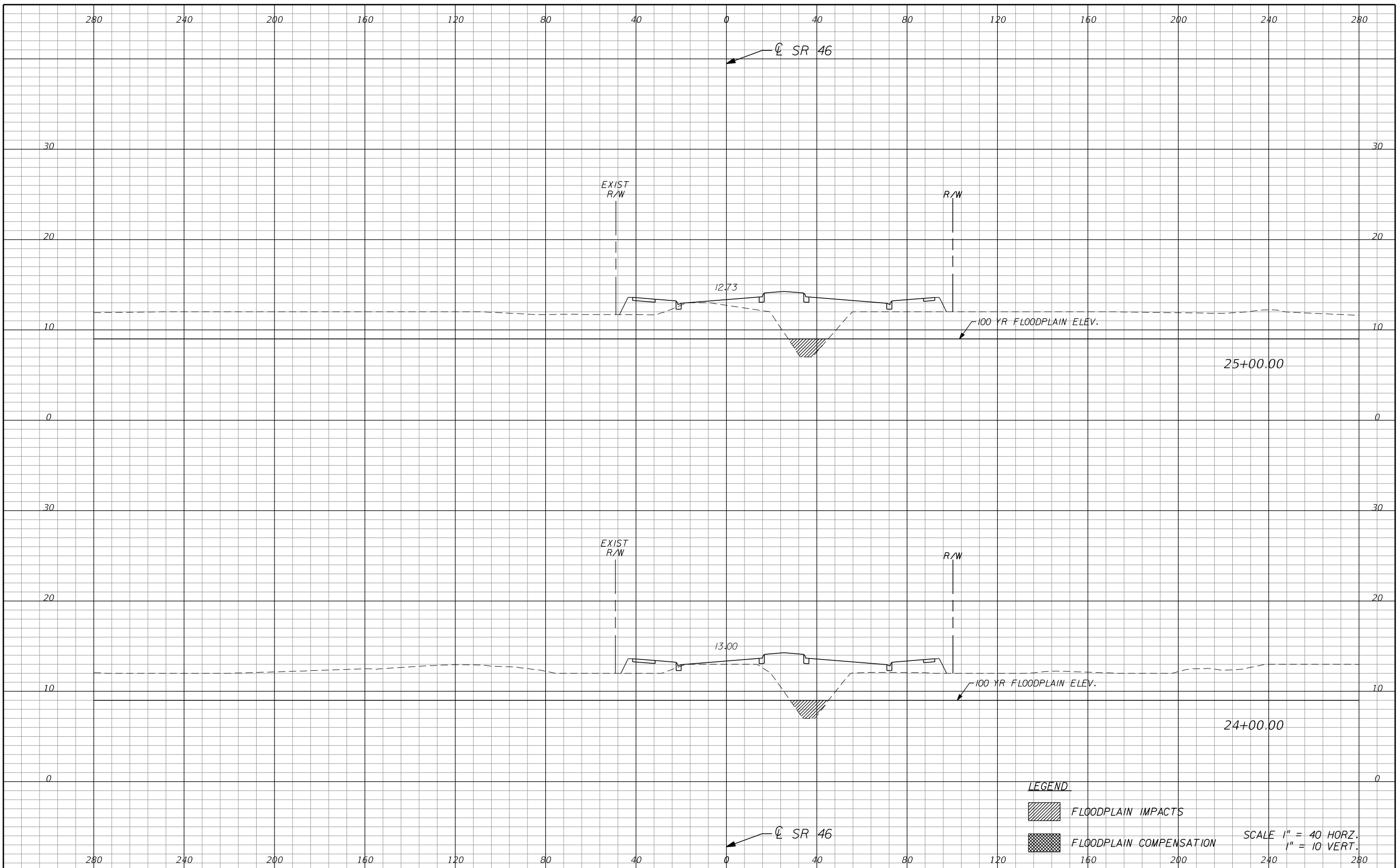
DANH T. LEE
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ROAD NO.		COUNTY	CIP #
SR 46		SEMINOLE	
SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE			
FINANCIAL PROJECT ID			

SR 46 PD&E
100 YR FLOODPLAIN IMPACTS
& COMPENSATION

SHEET NO.



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-  FLOODPLAIN COMPENSATION

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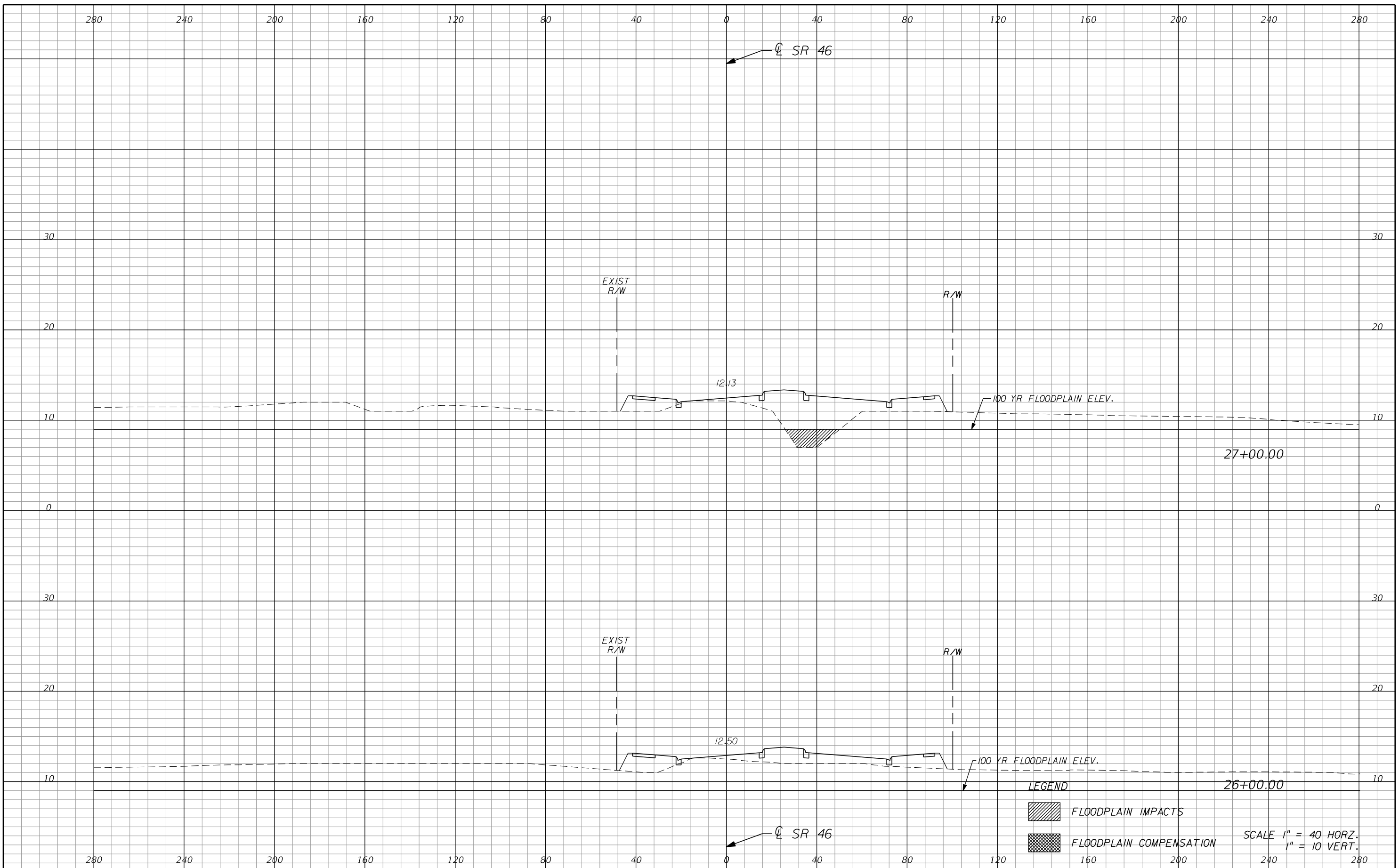
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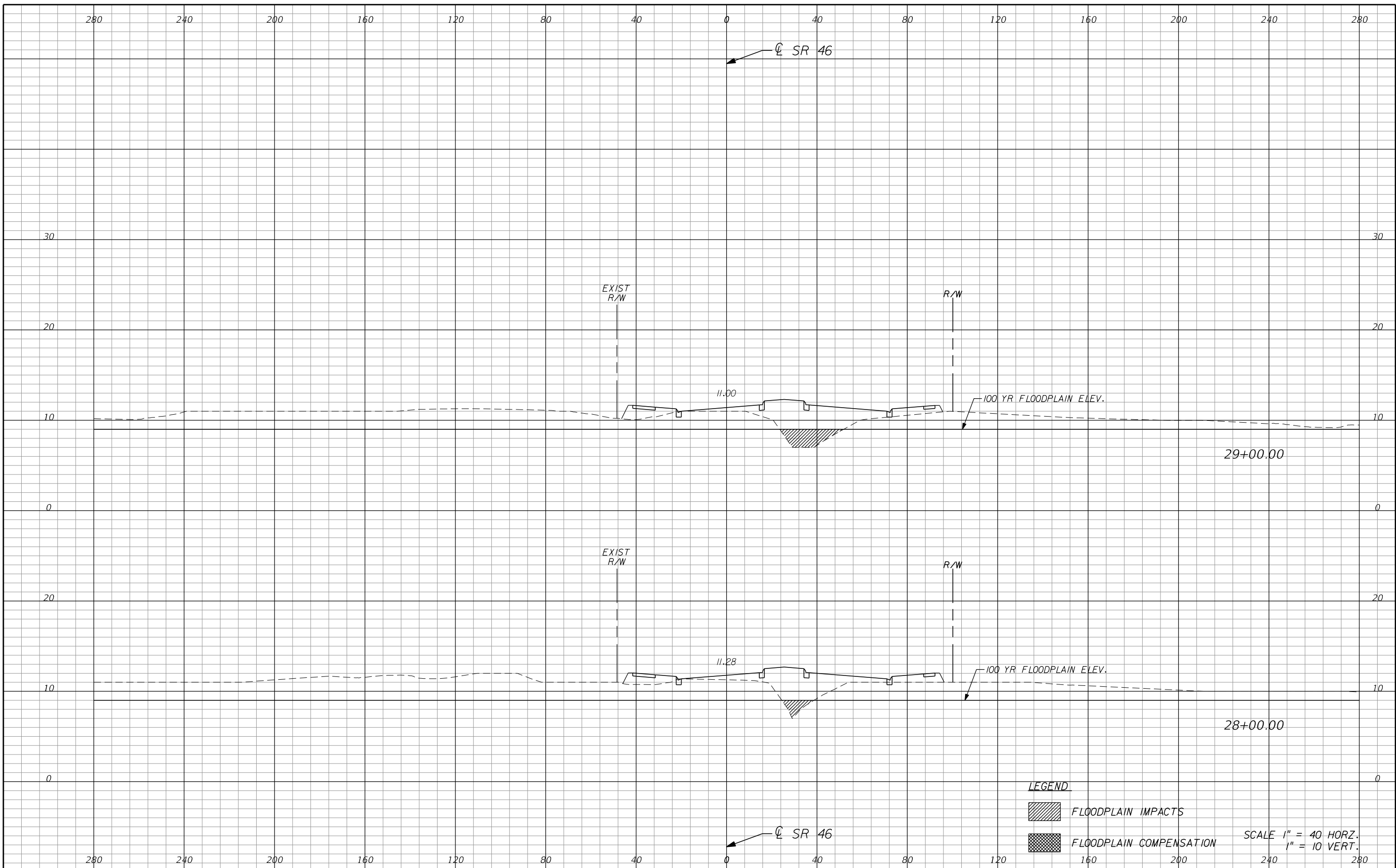


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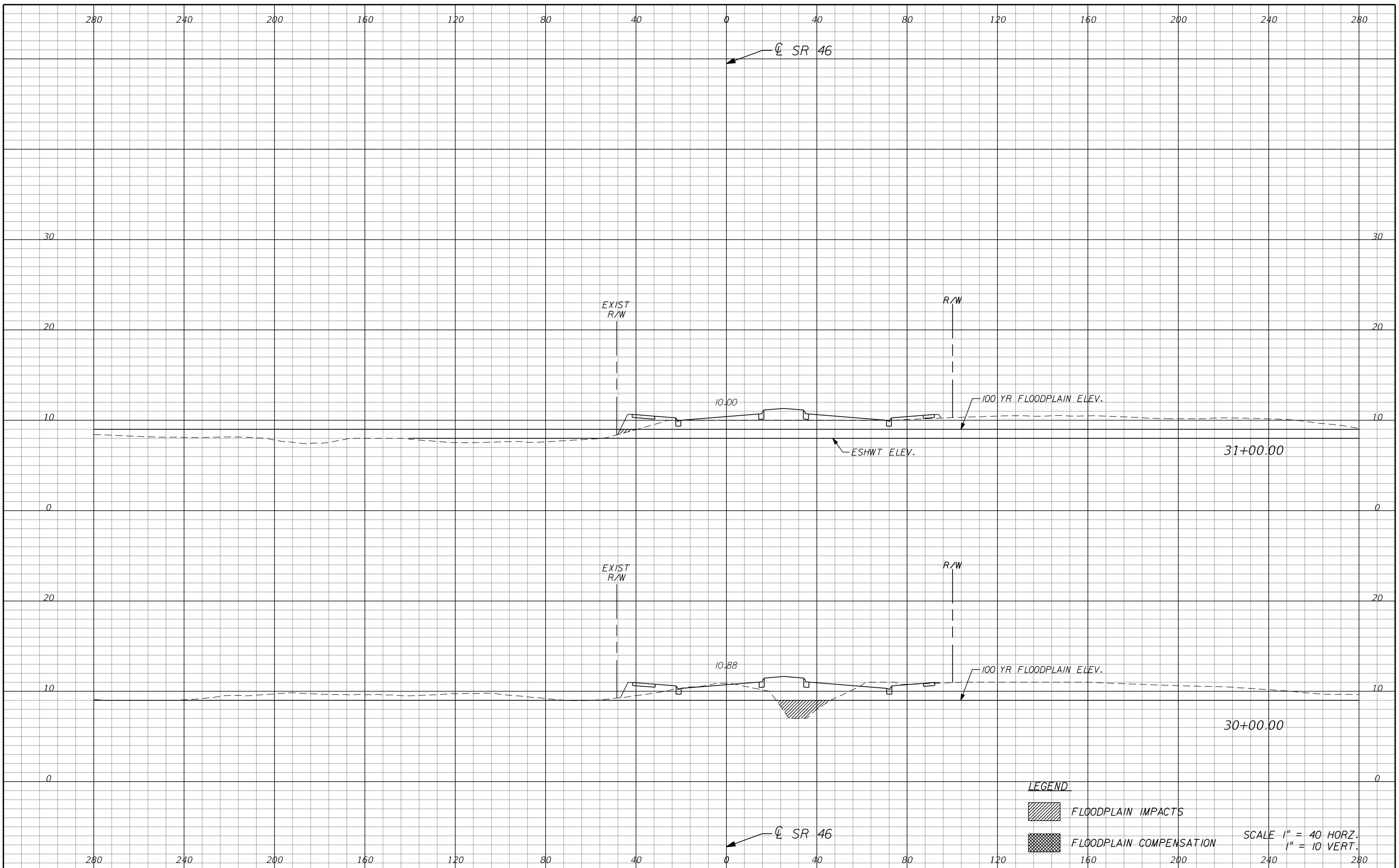
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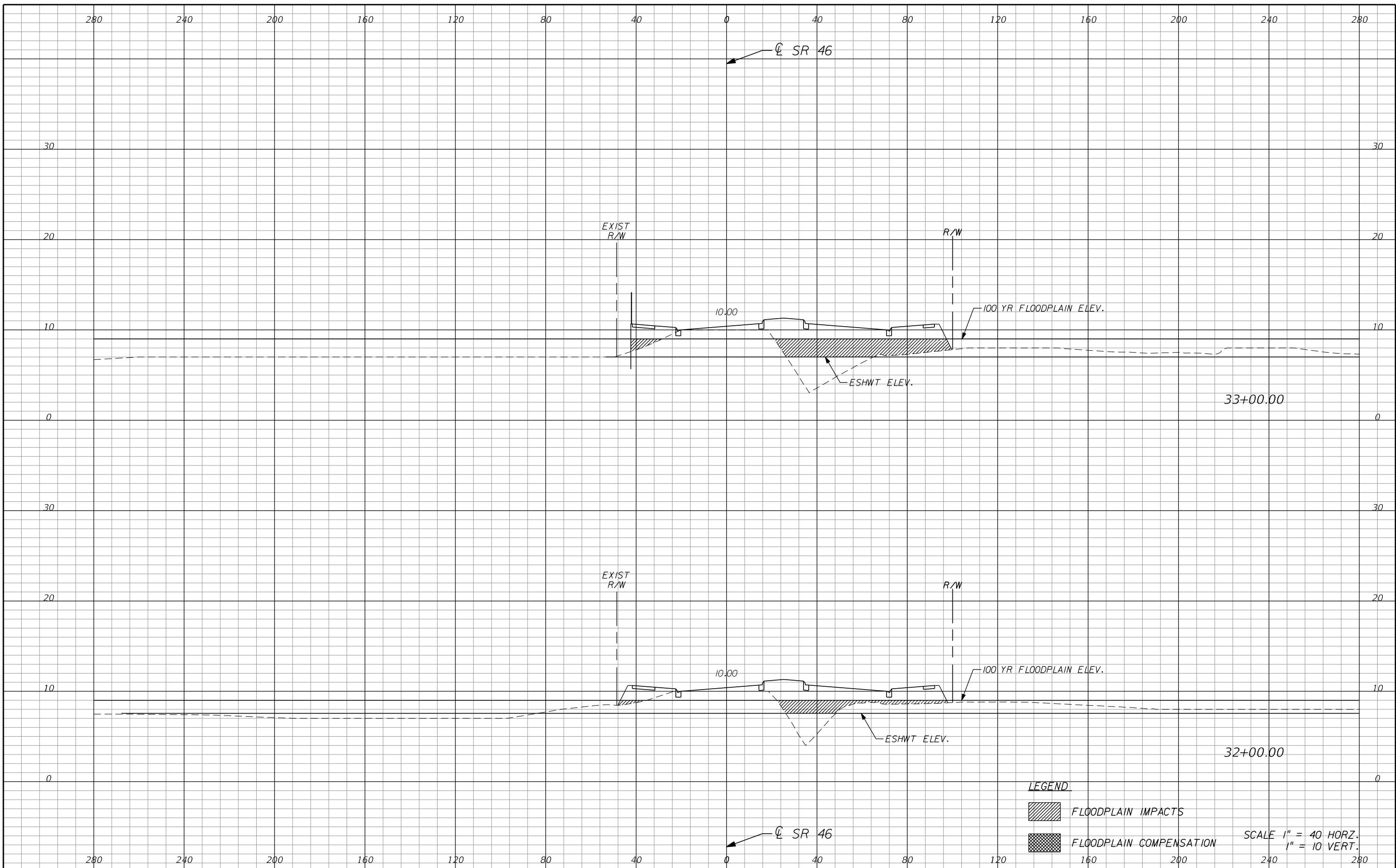
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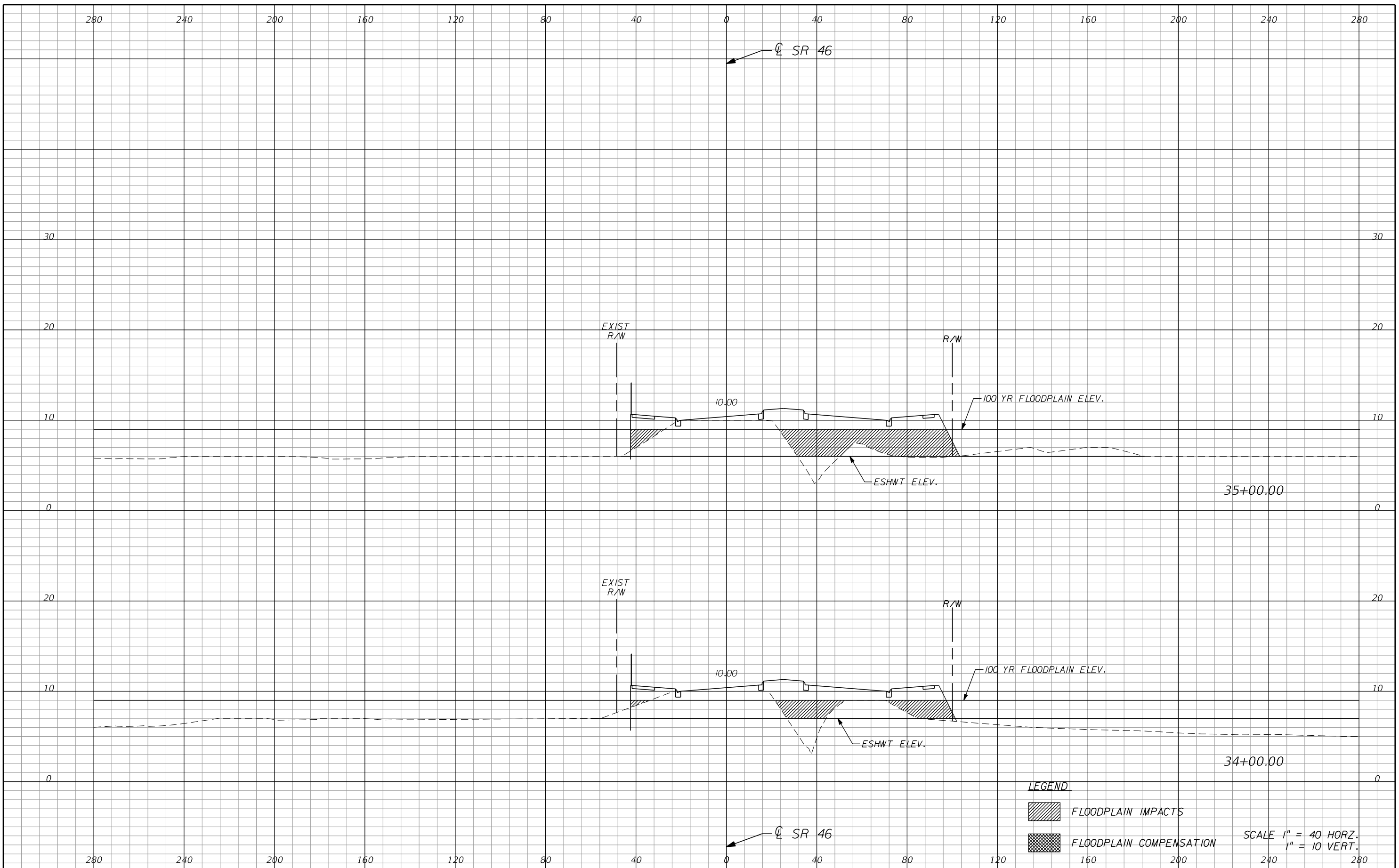


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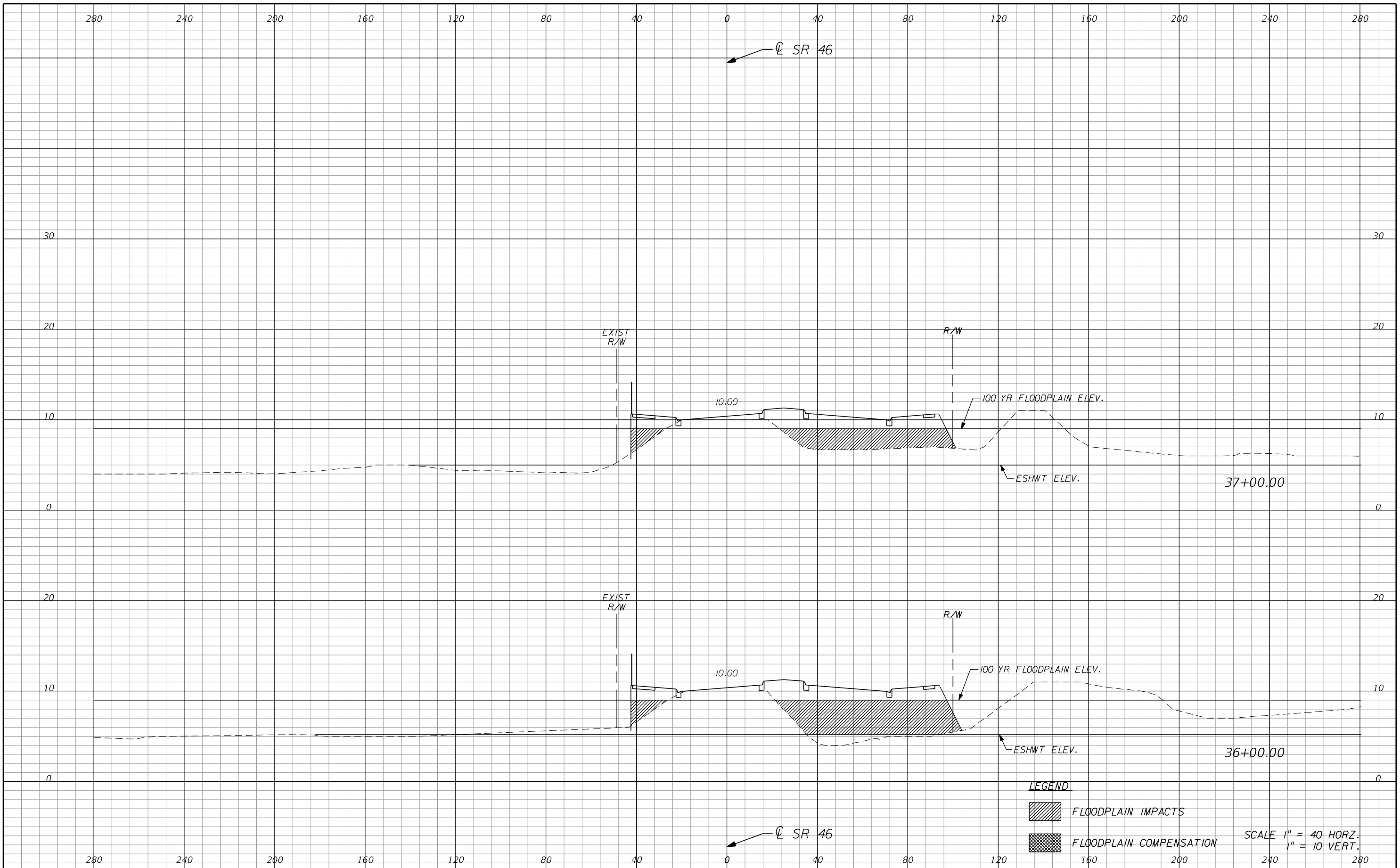


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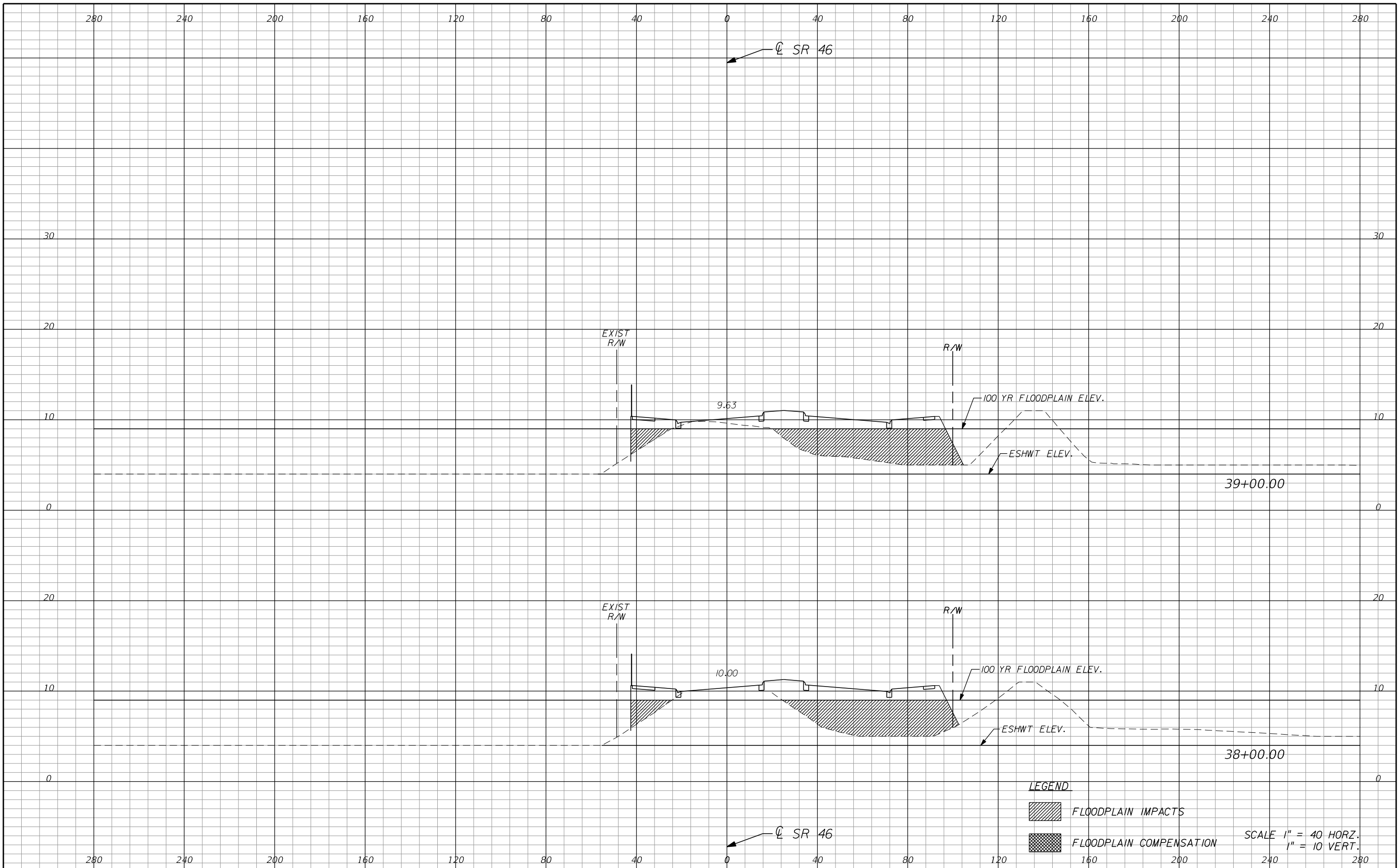


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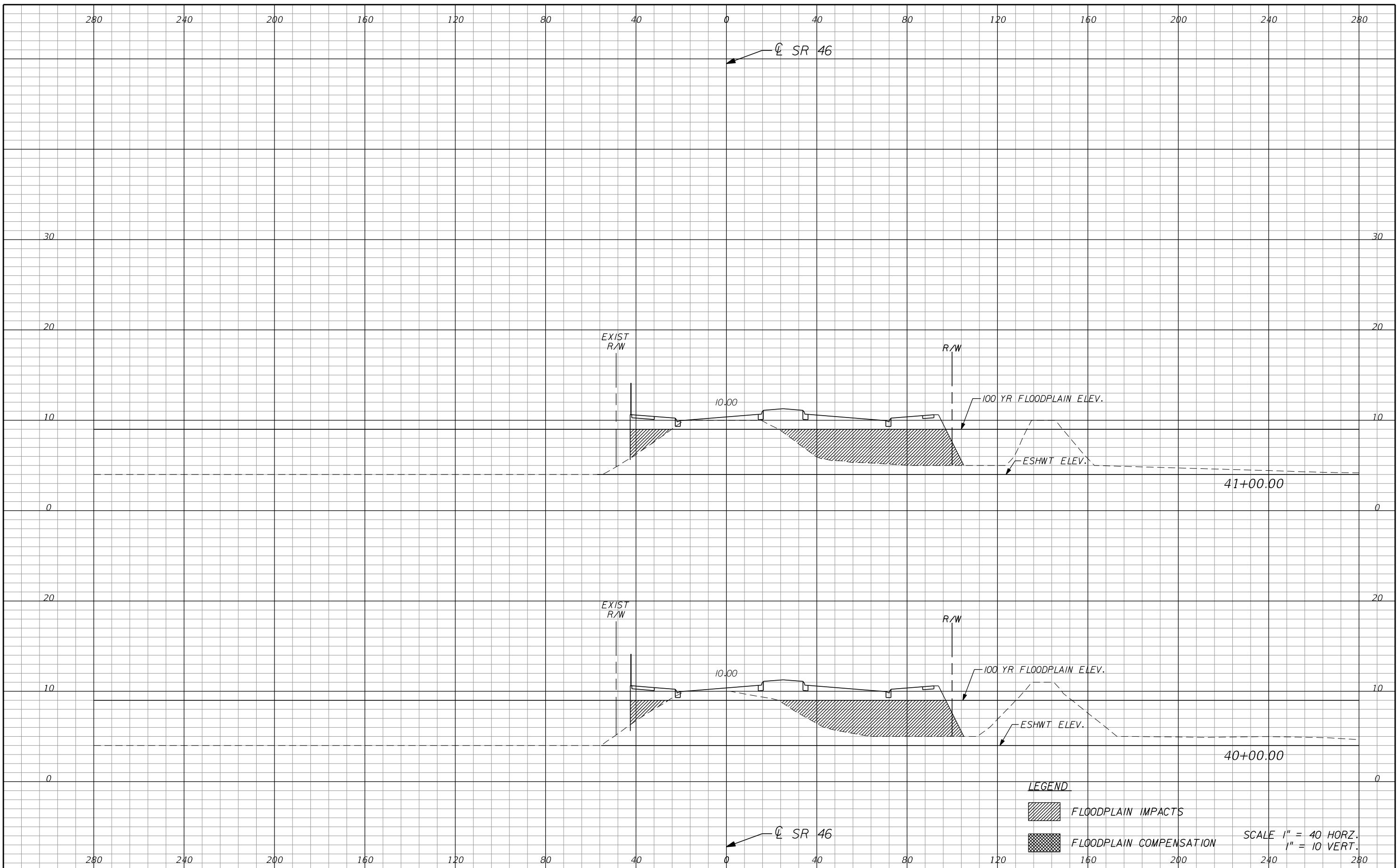
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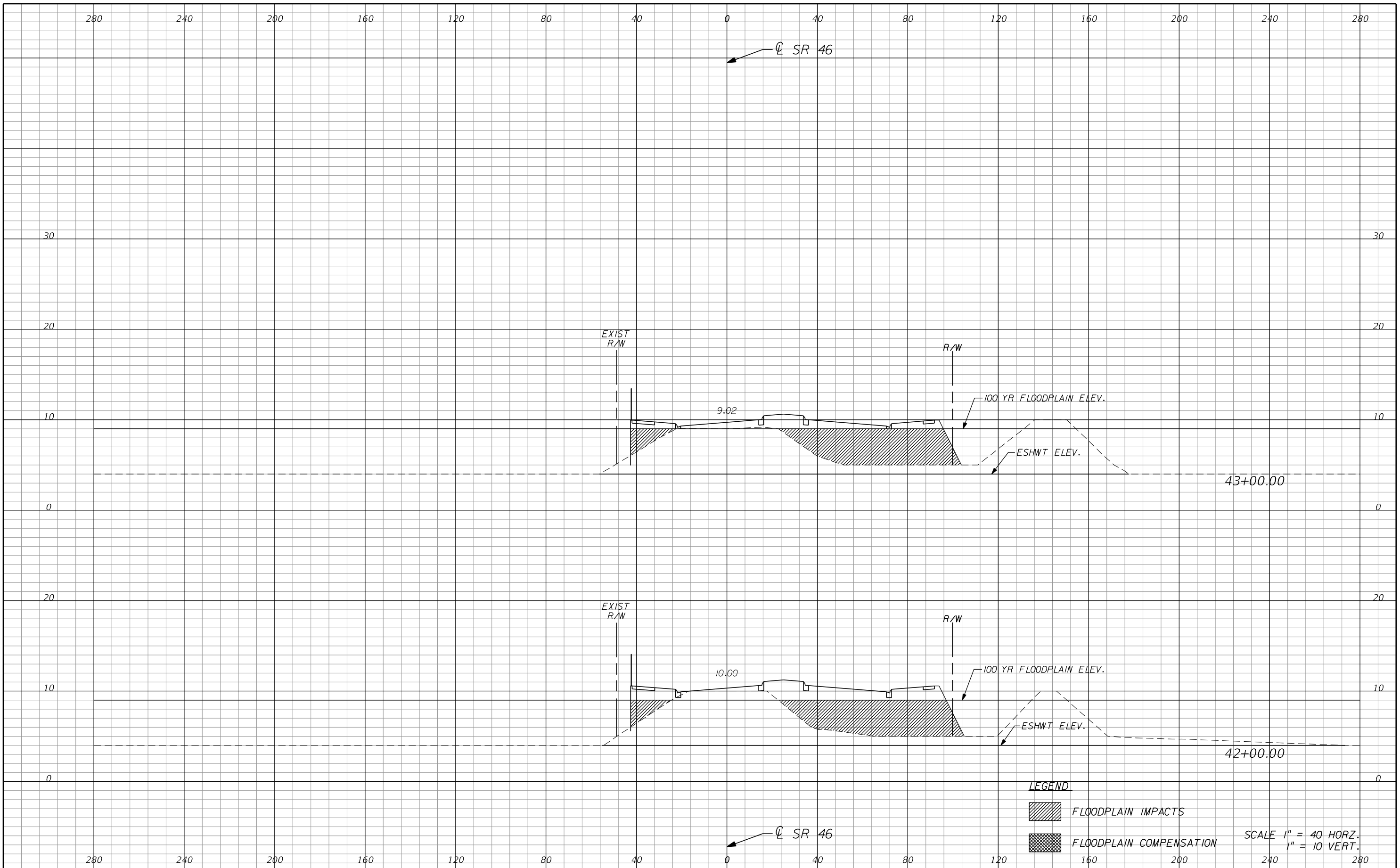
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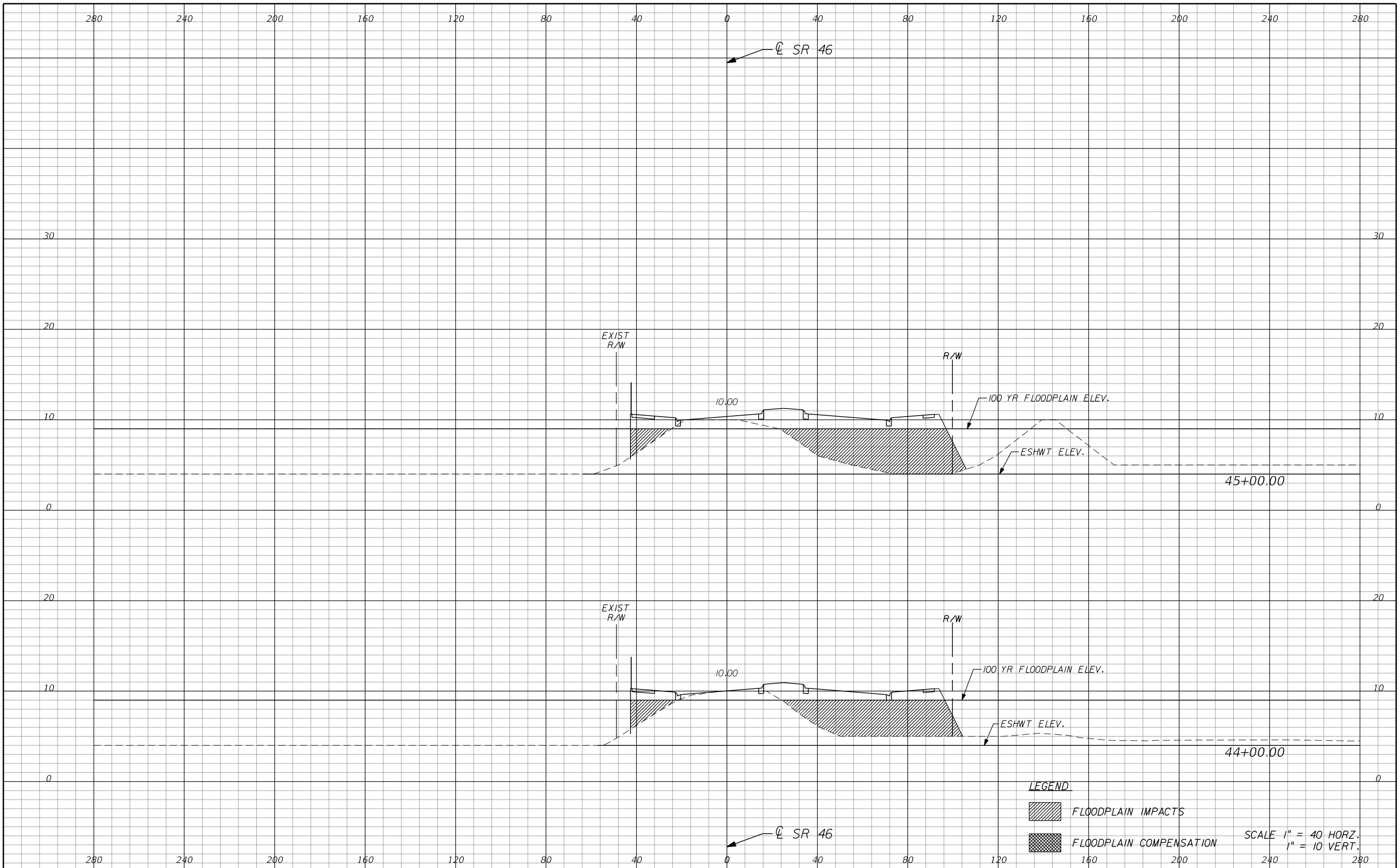
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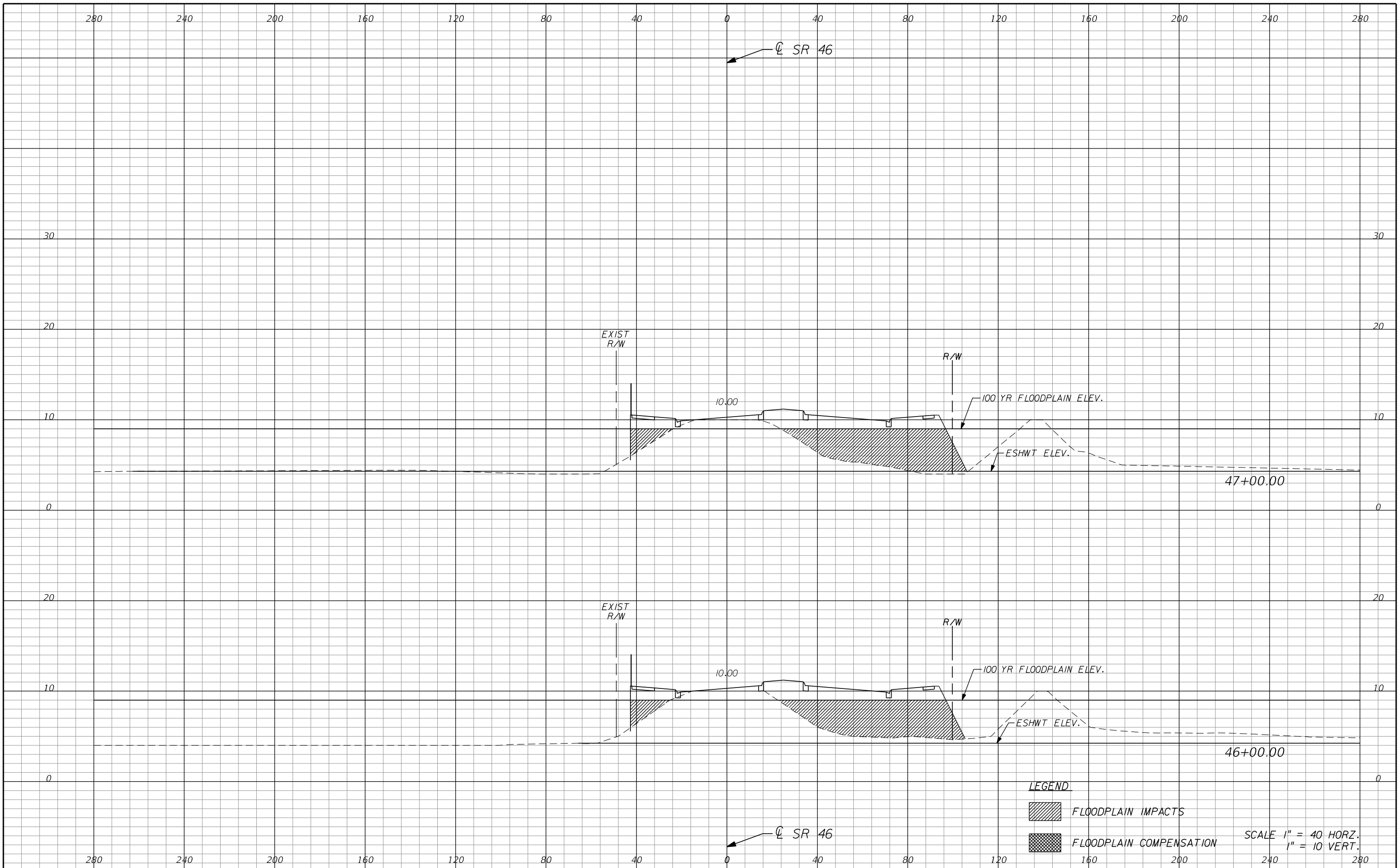
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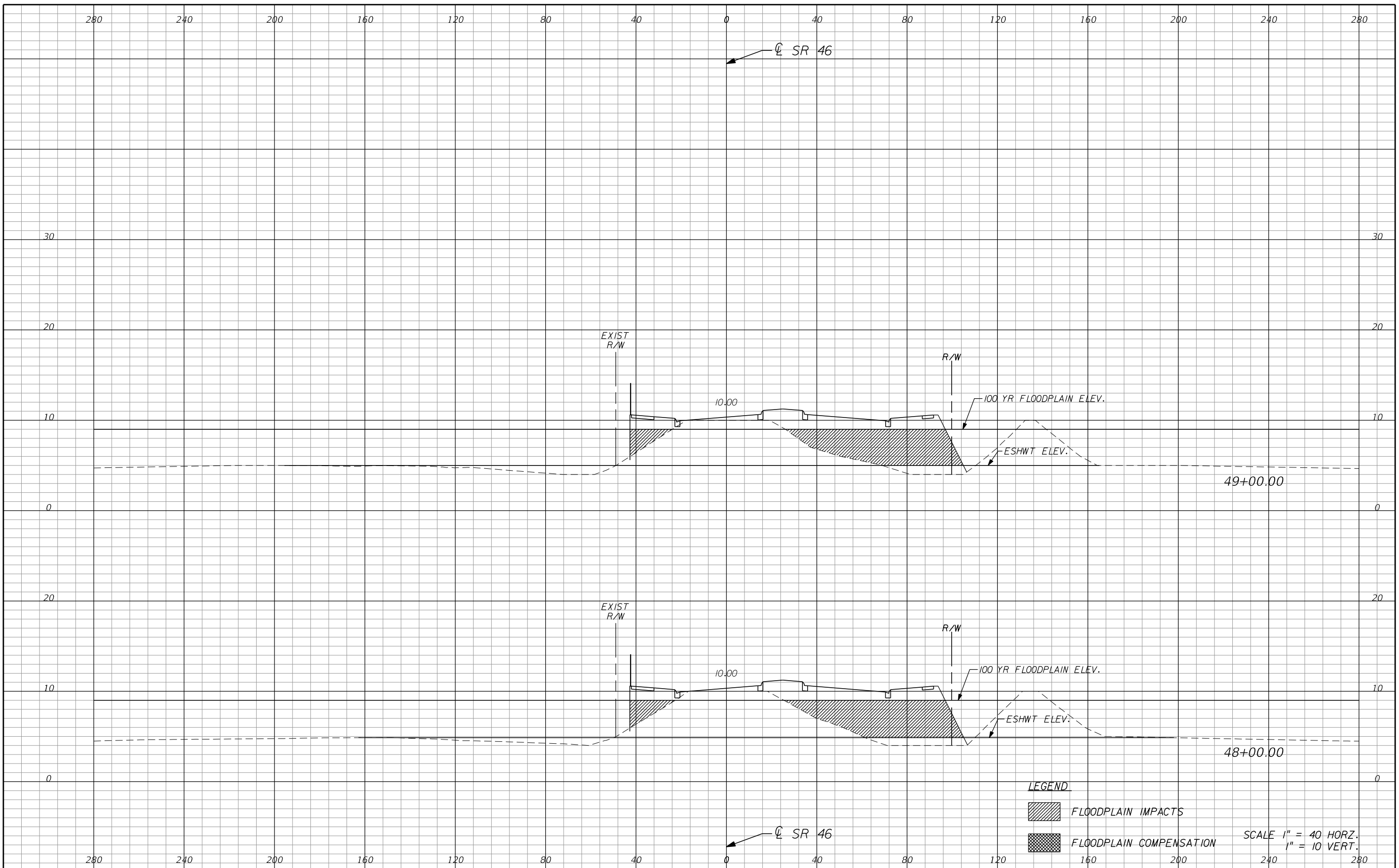


STATE OF FLORIDA			
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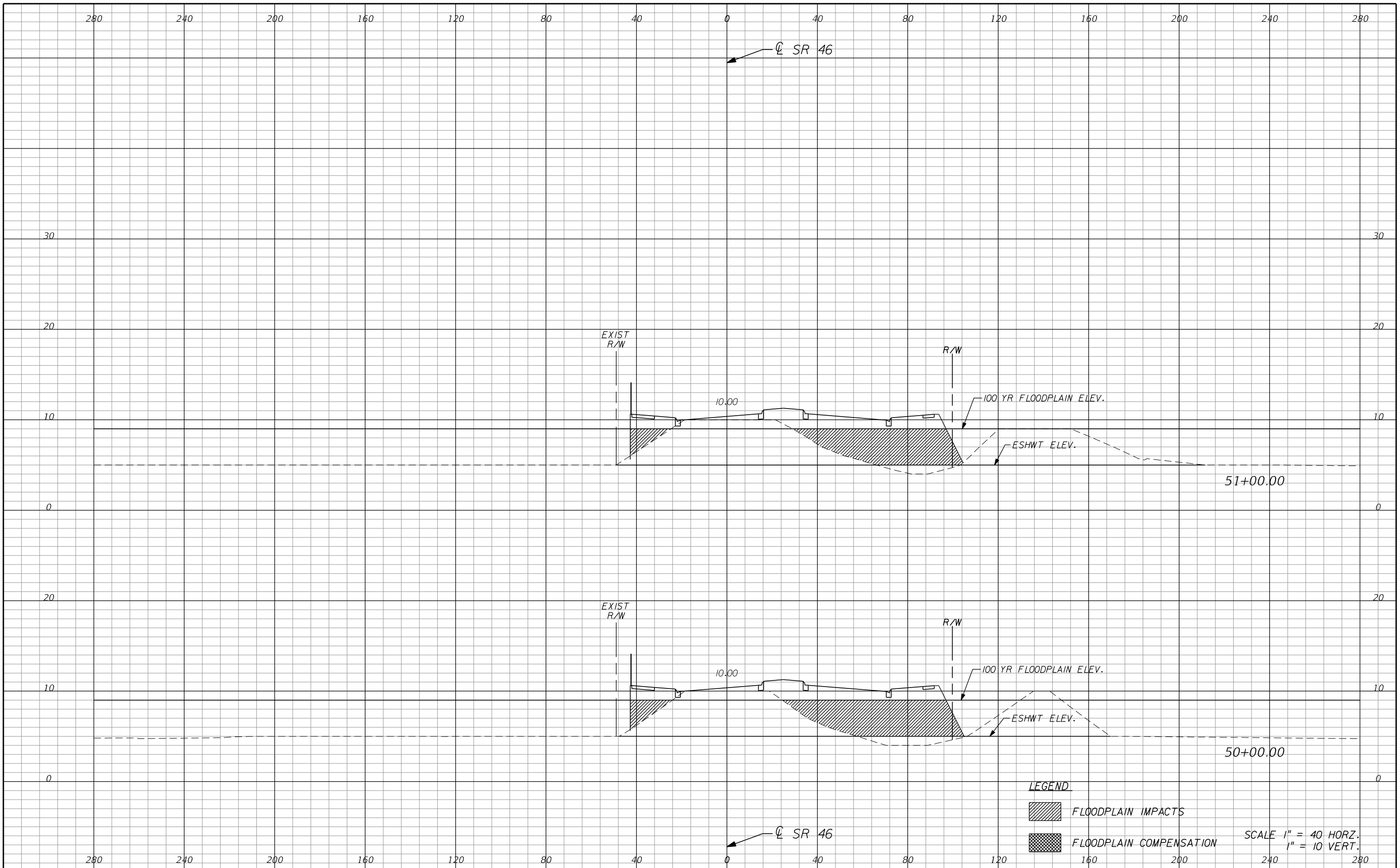
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SR 46	SEMINOLE				

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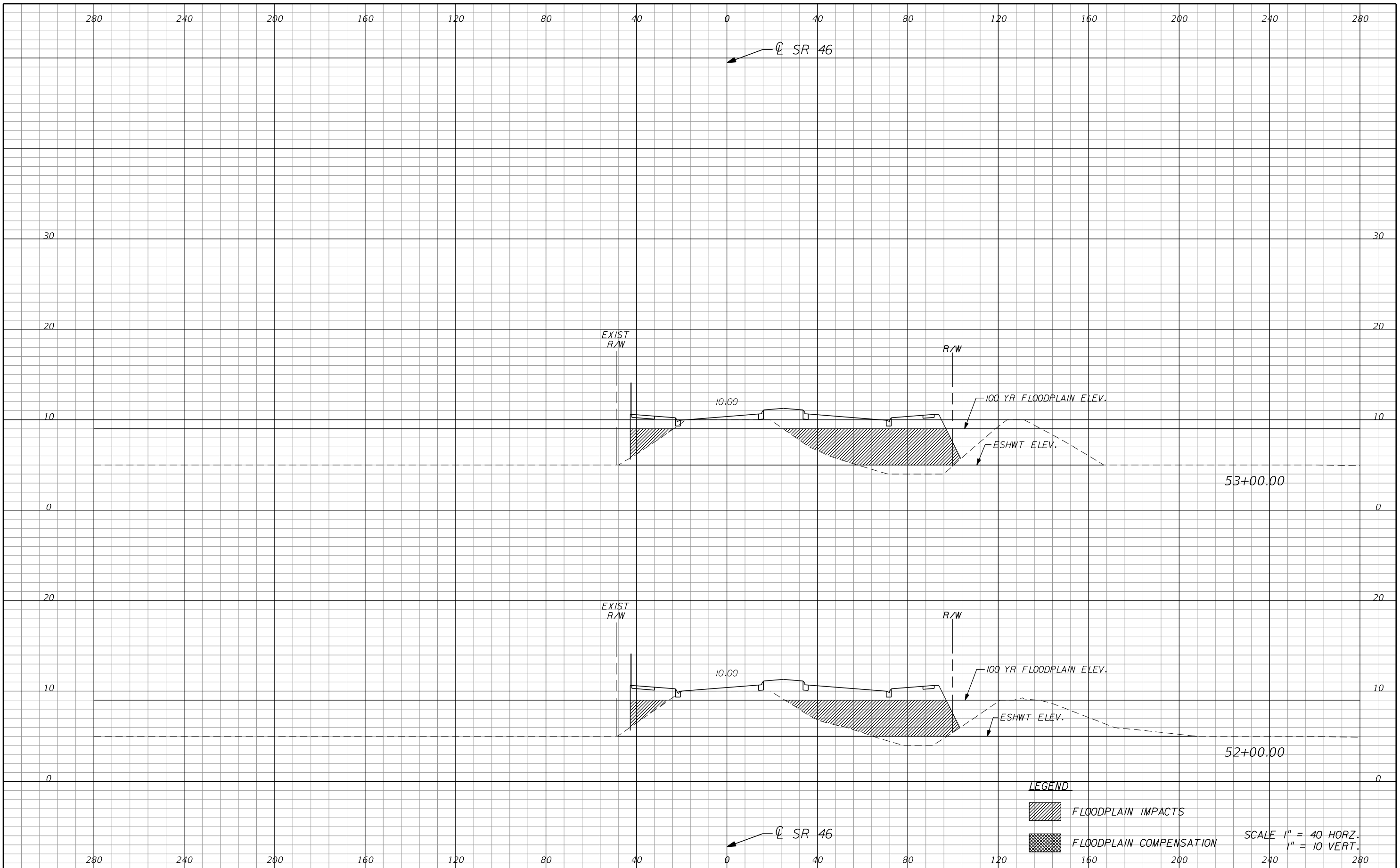


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-  FLOODPLAIN COMPENSATION

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DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

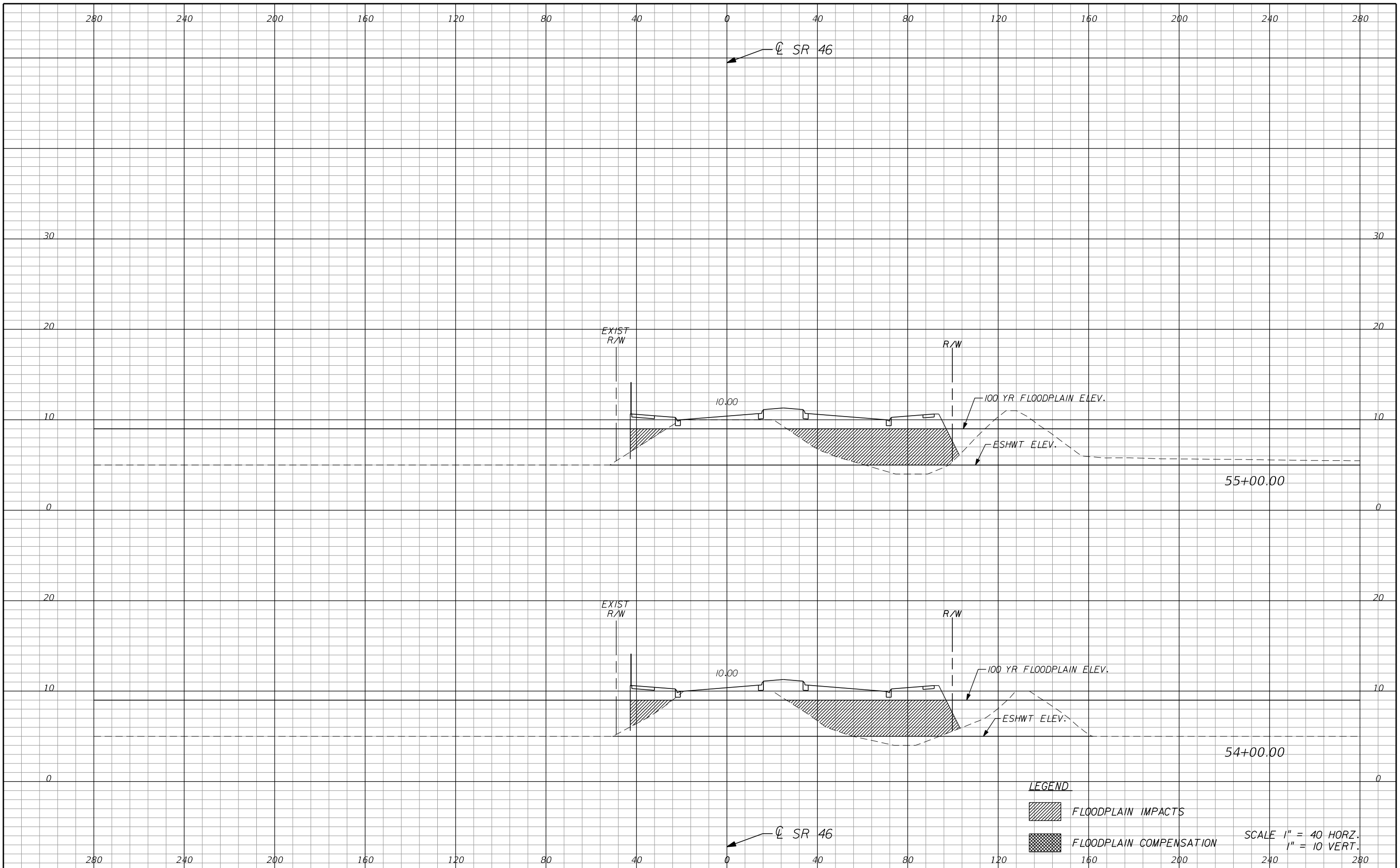
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URS CORPORATION
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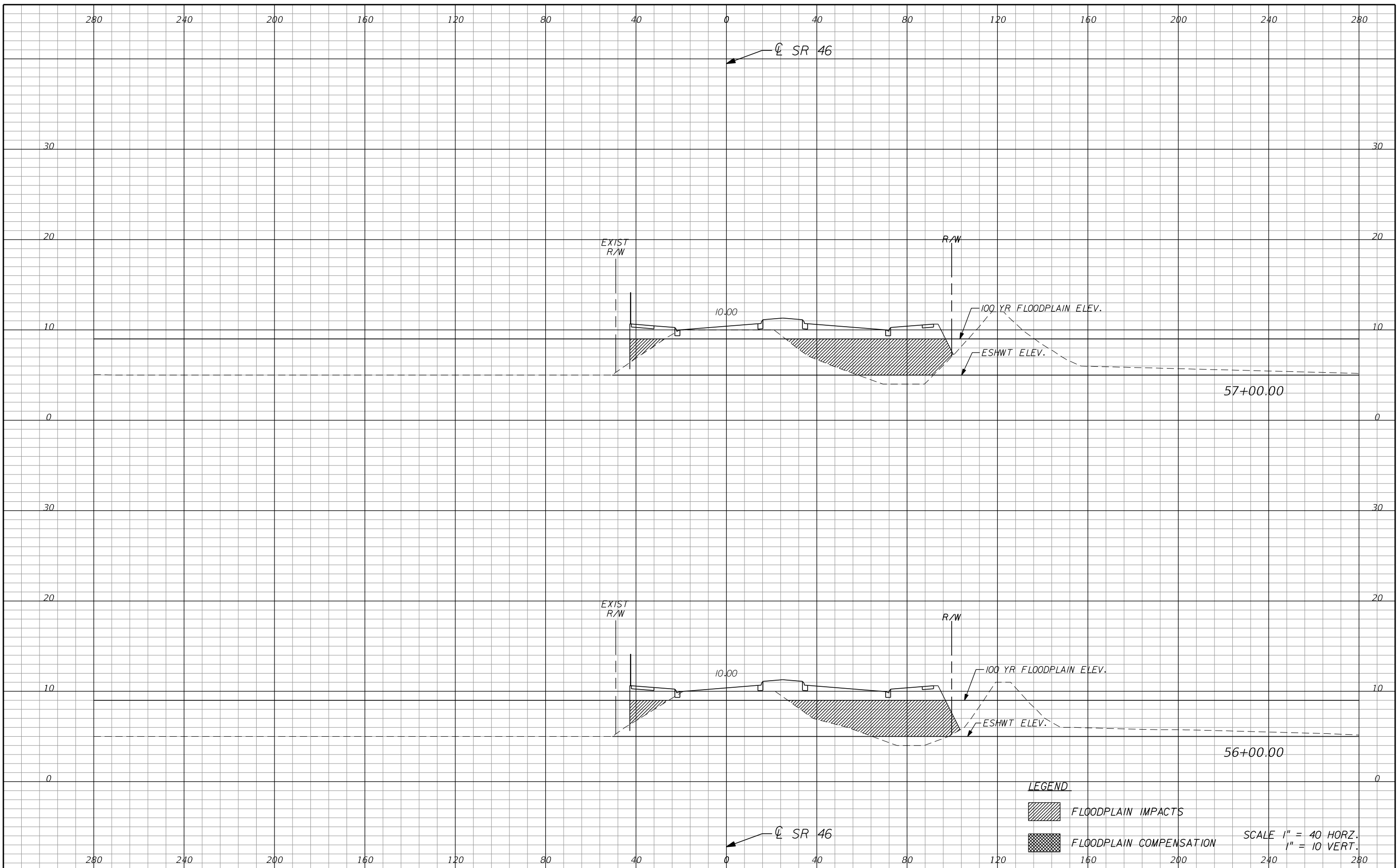
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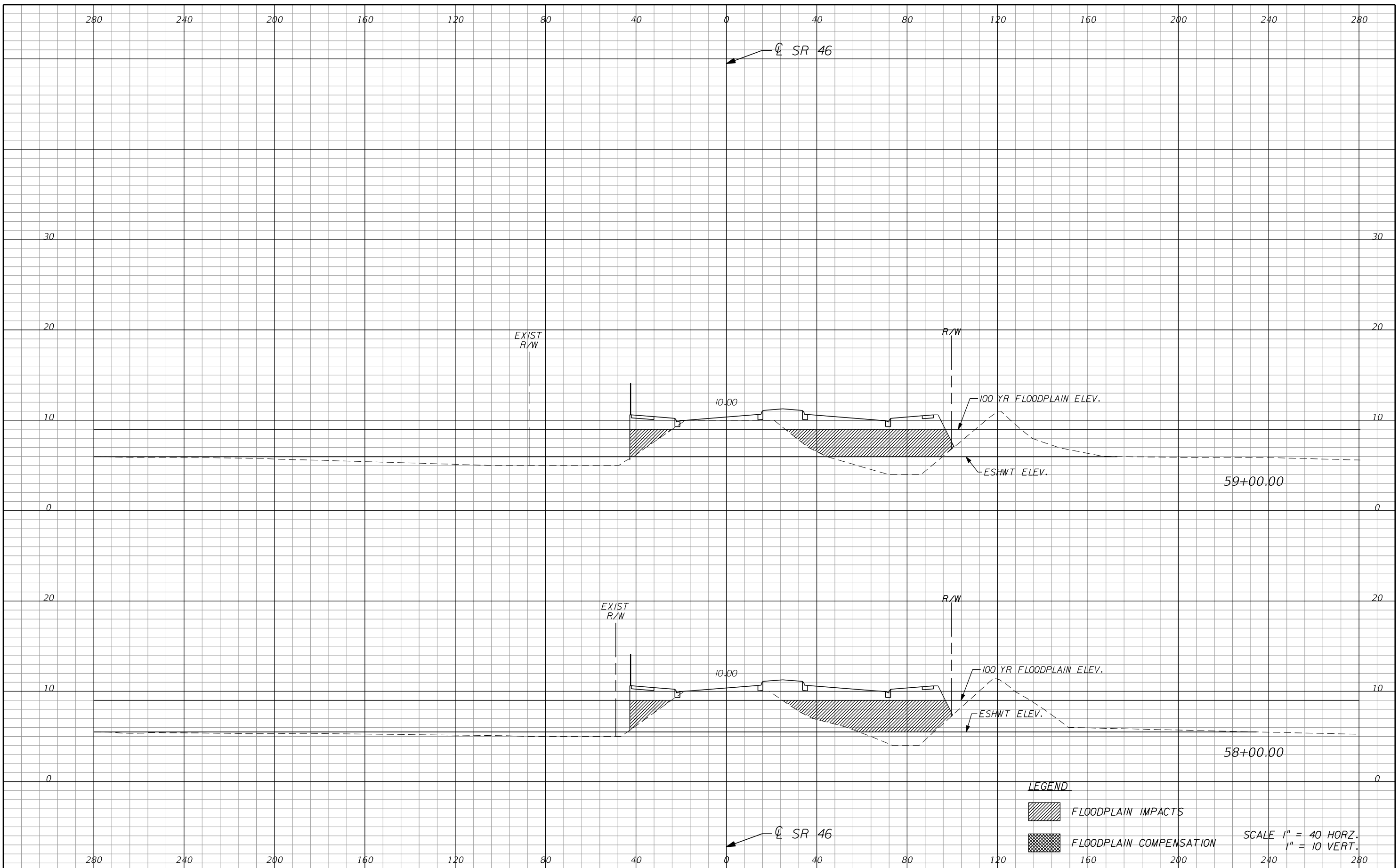
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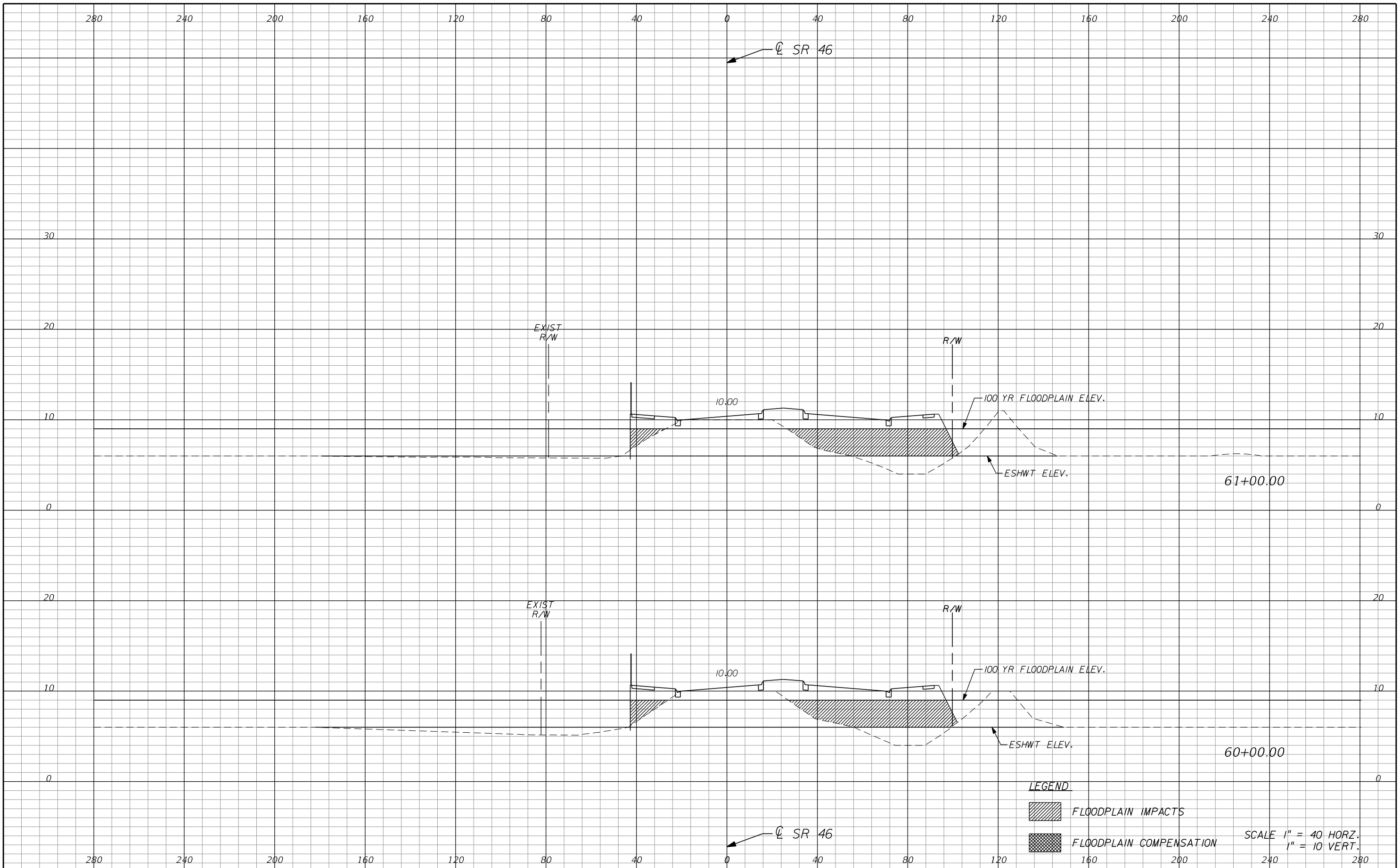


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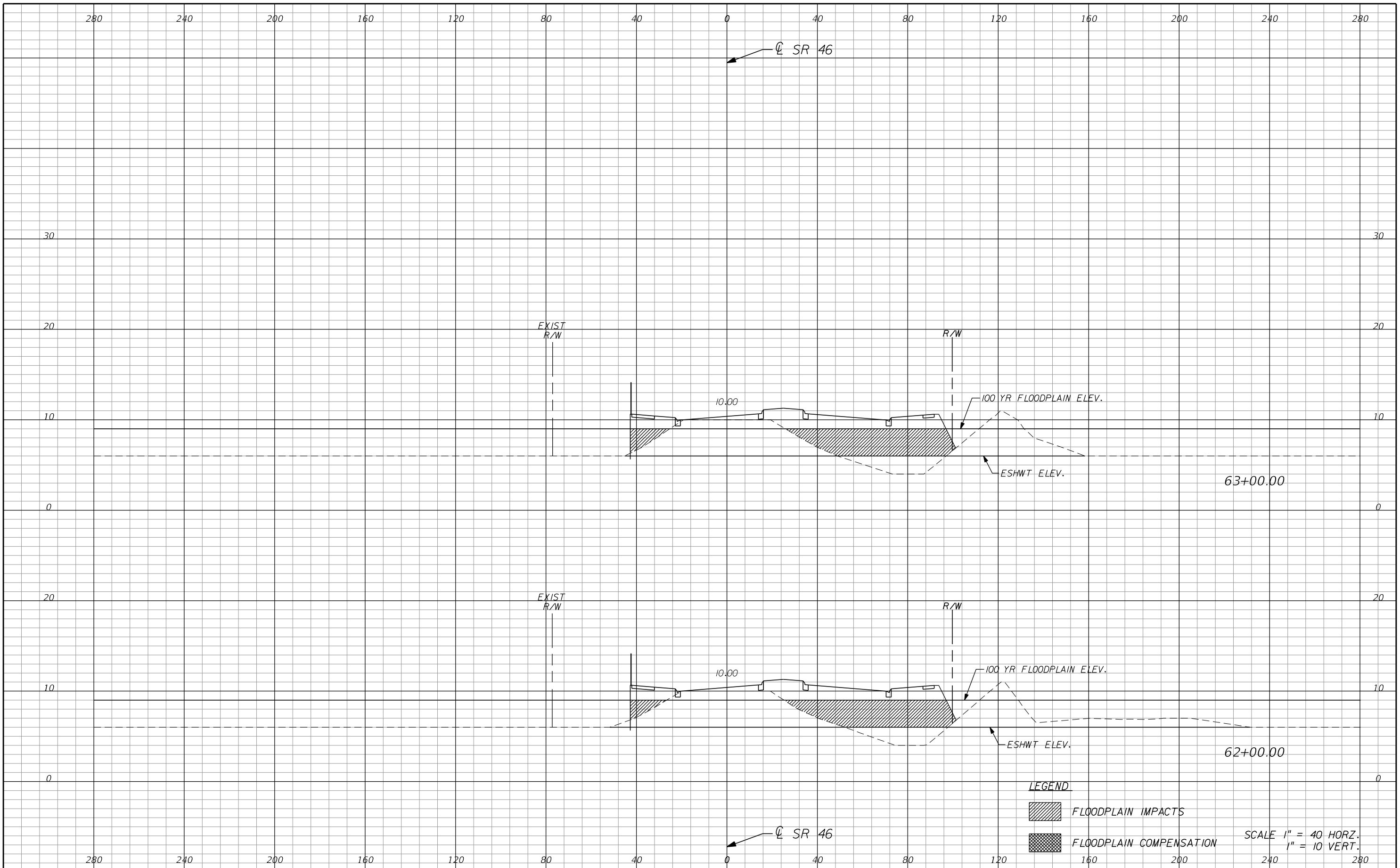
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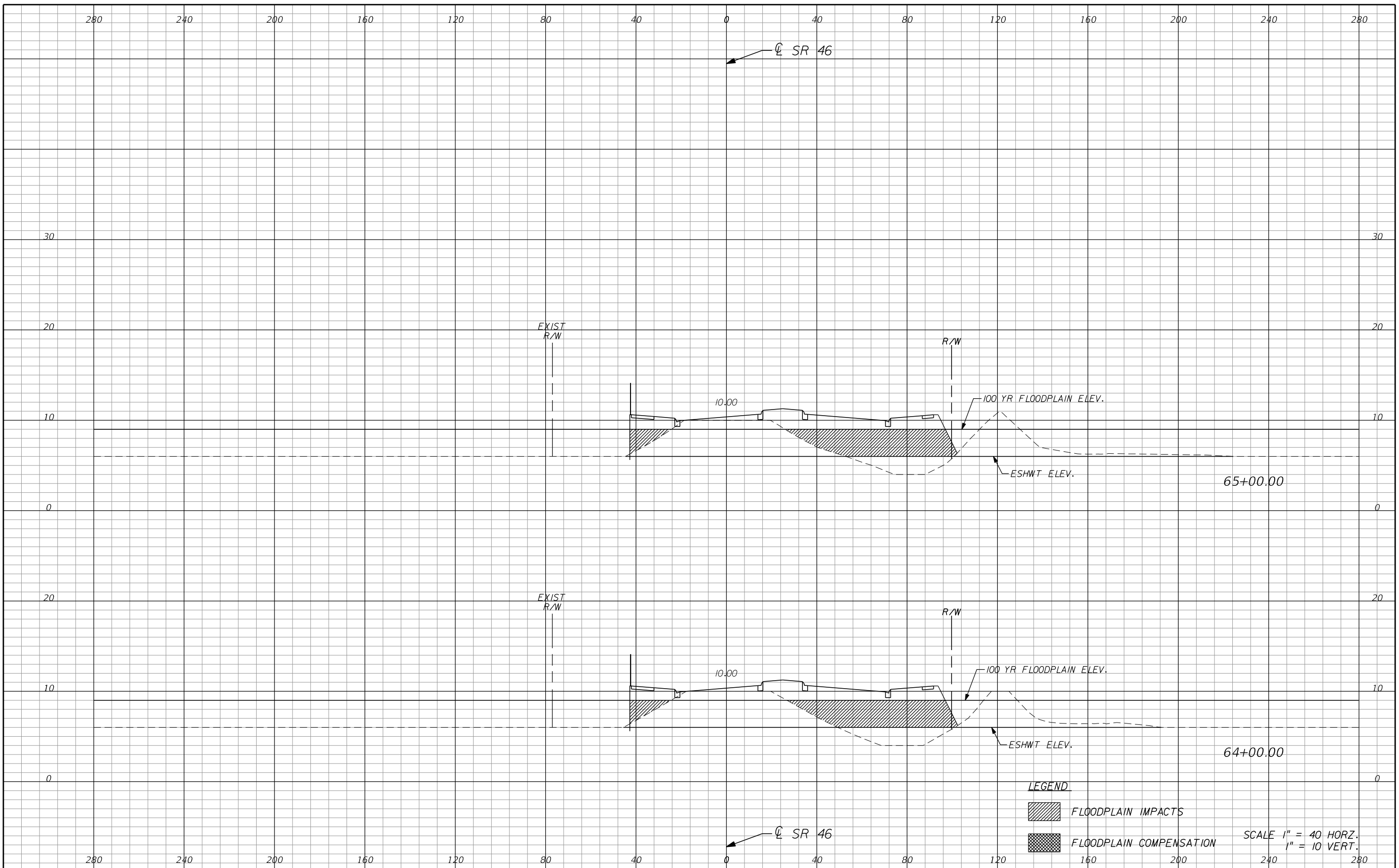


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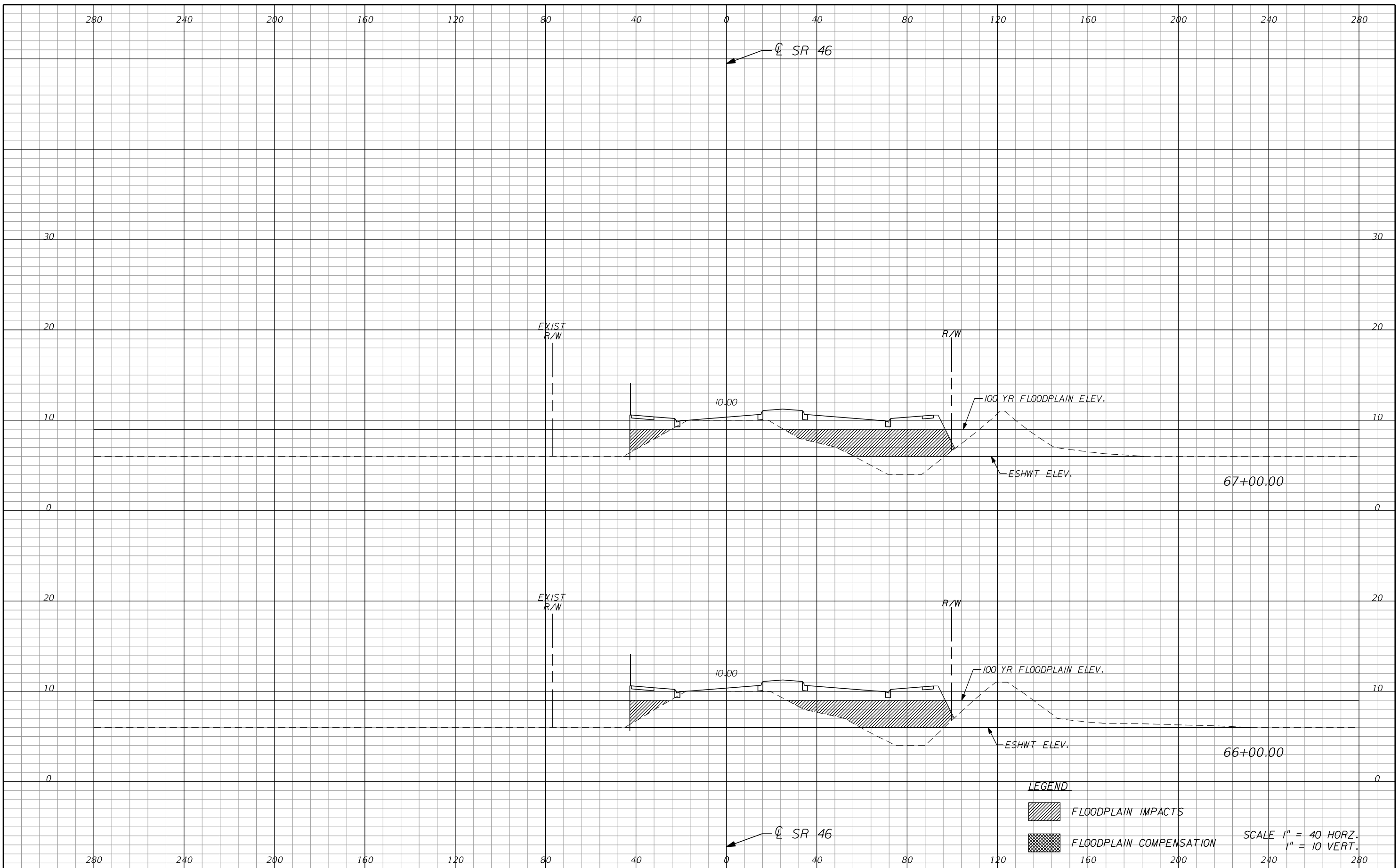
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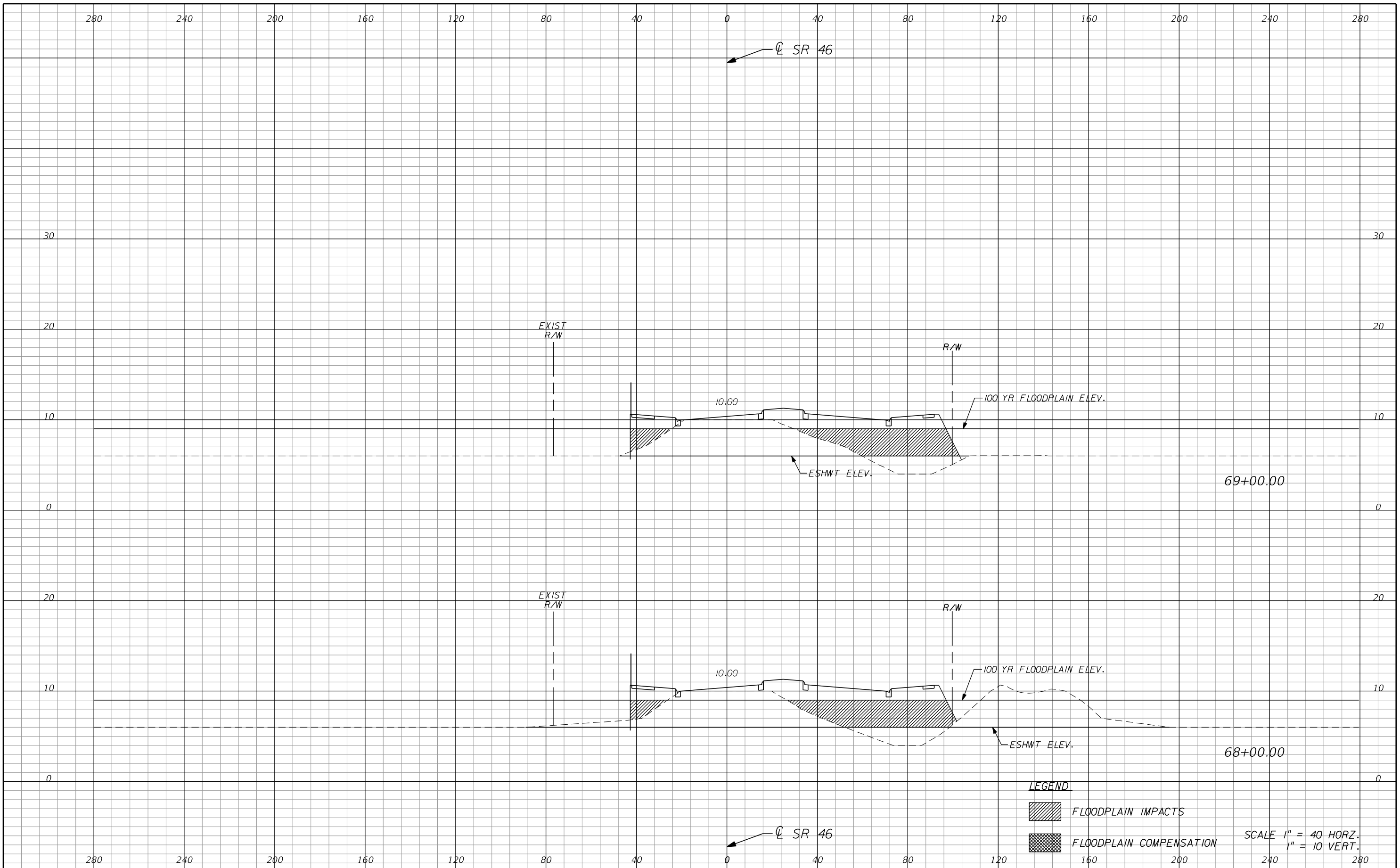


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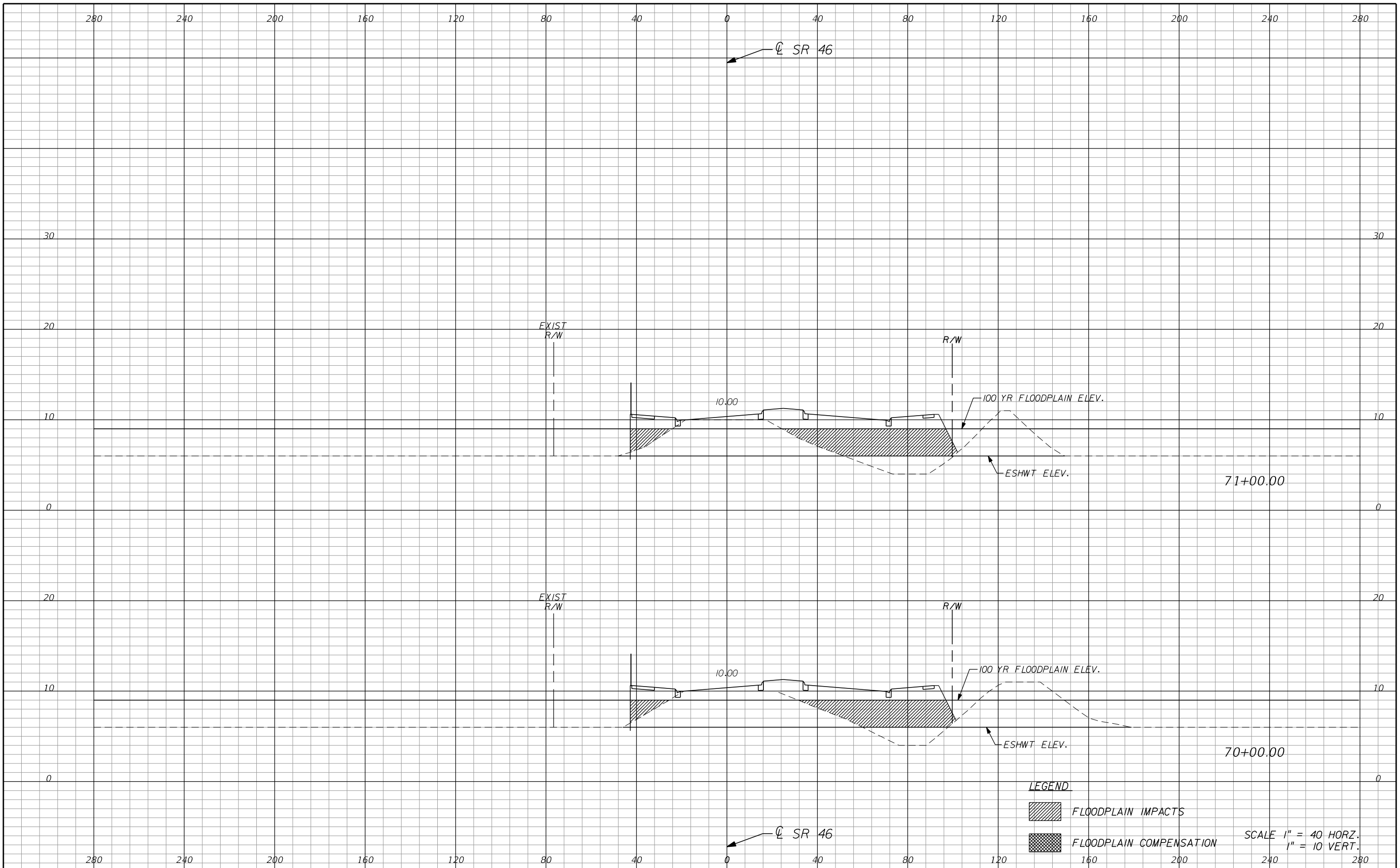
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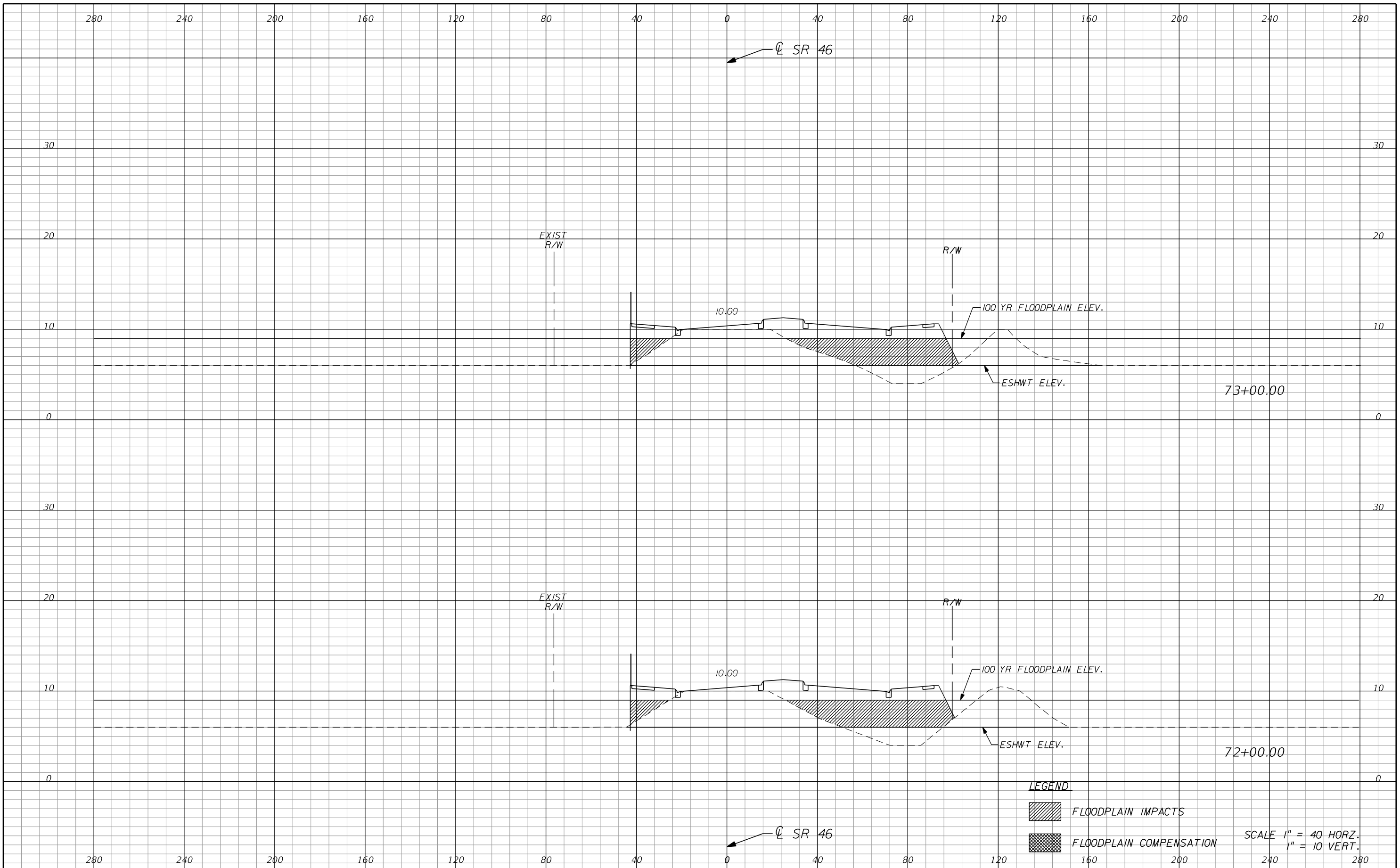
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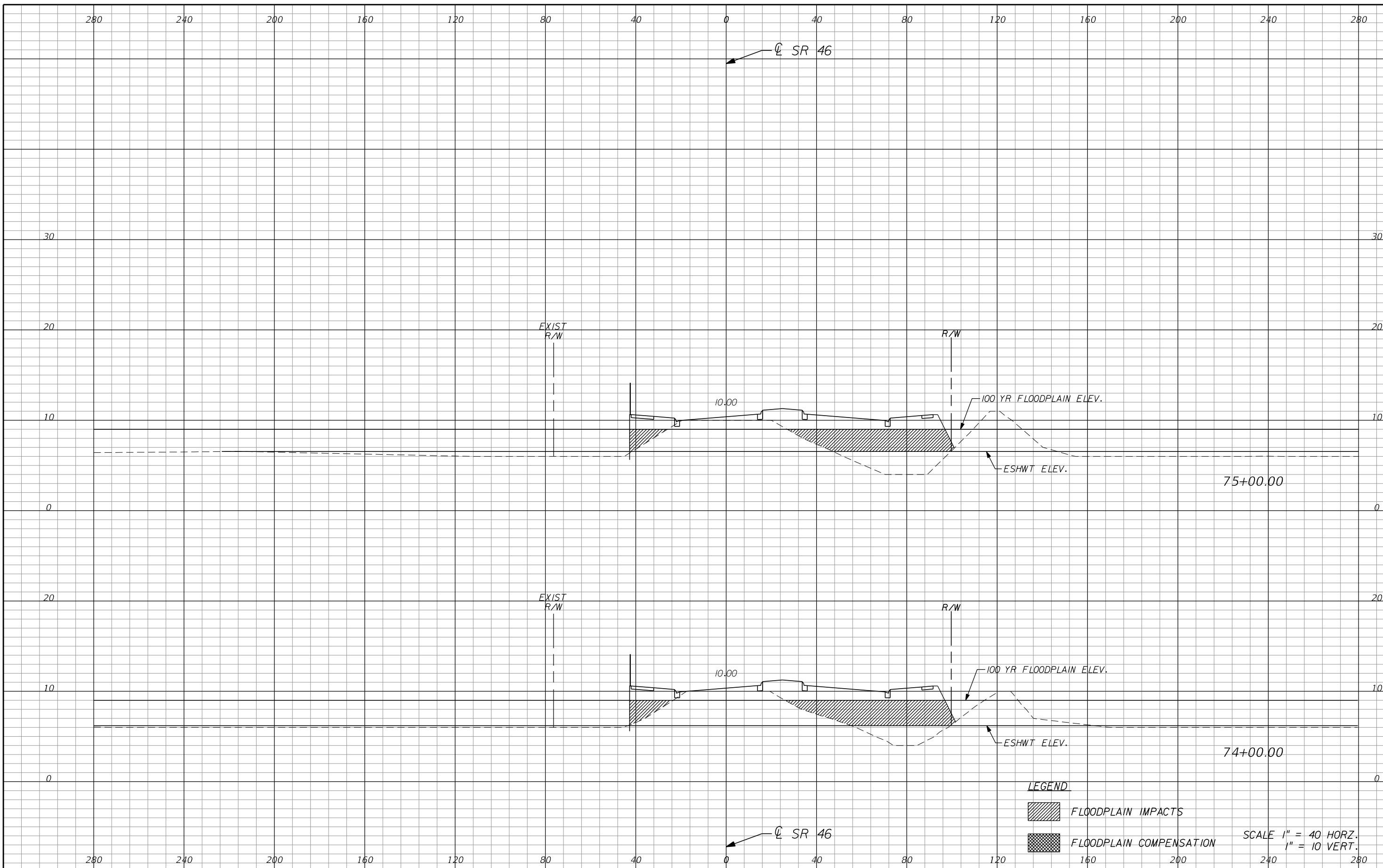
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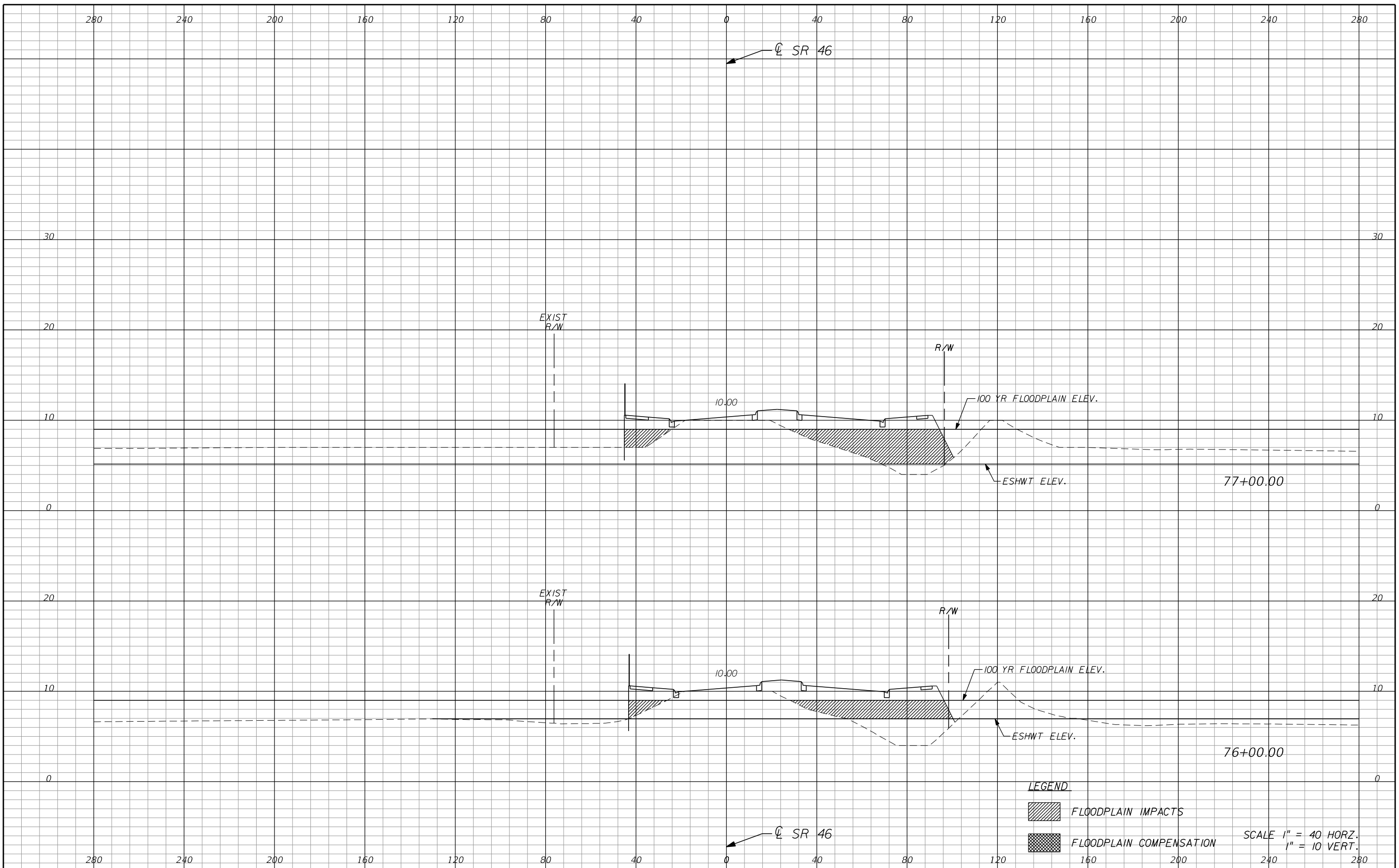


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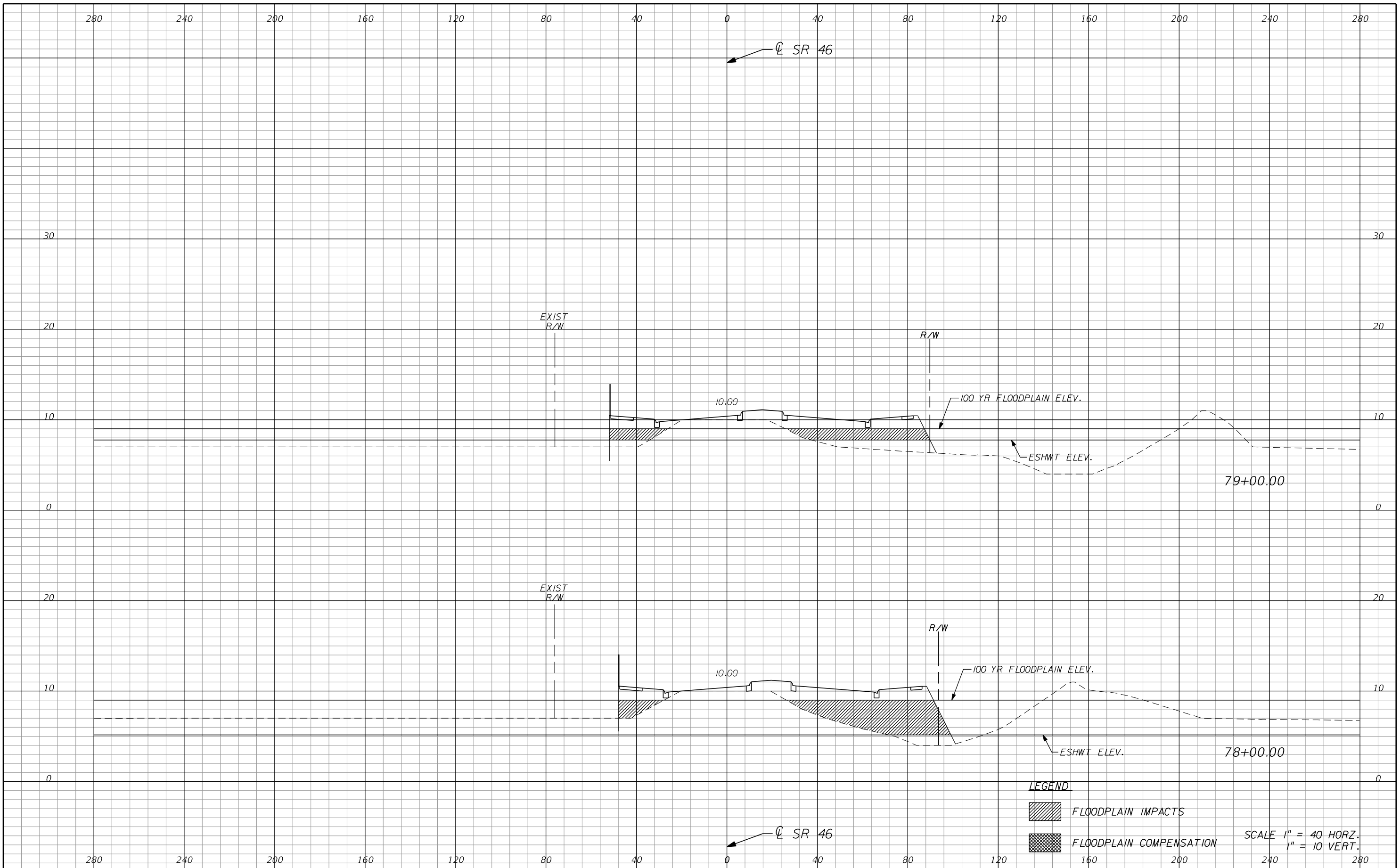


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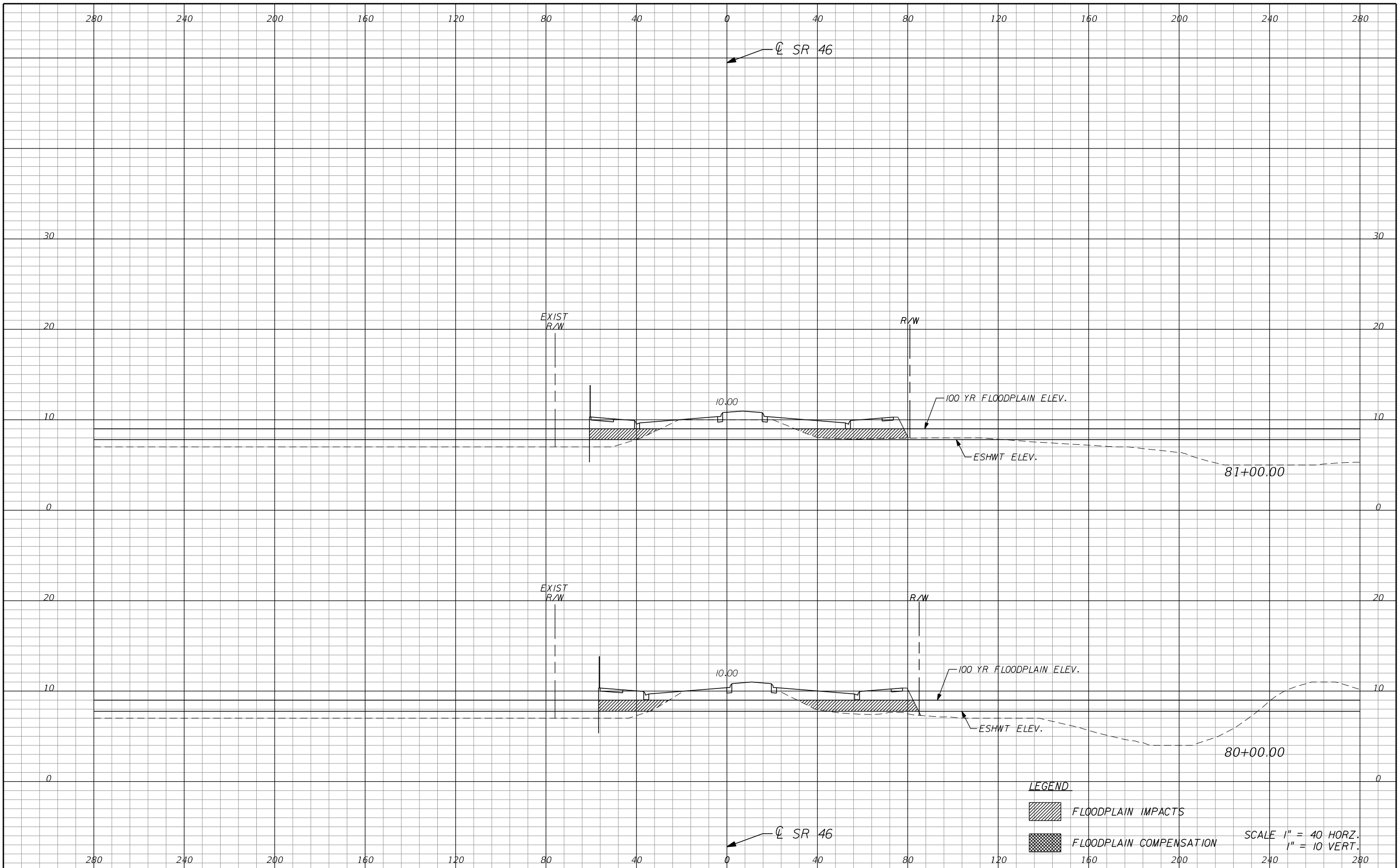


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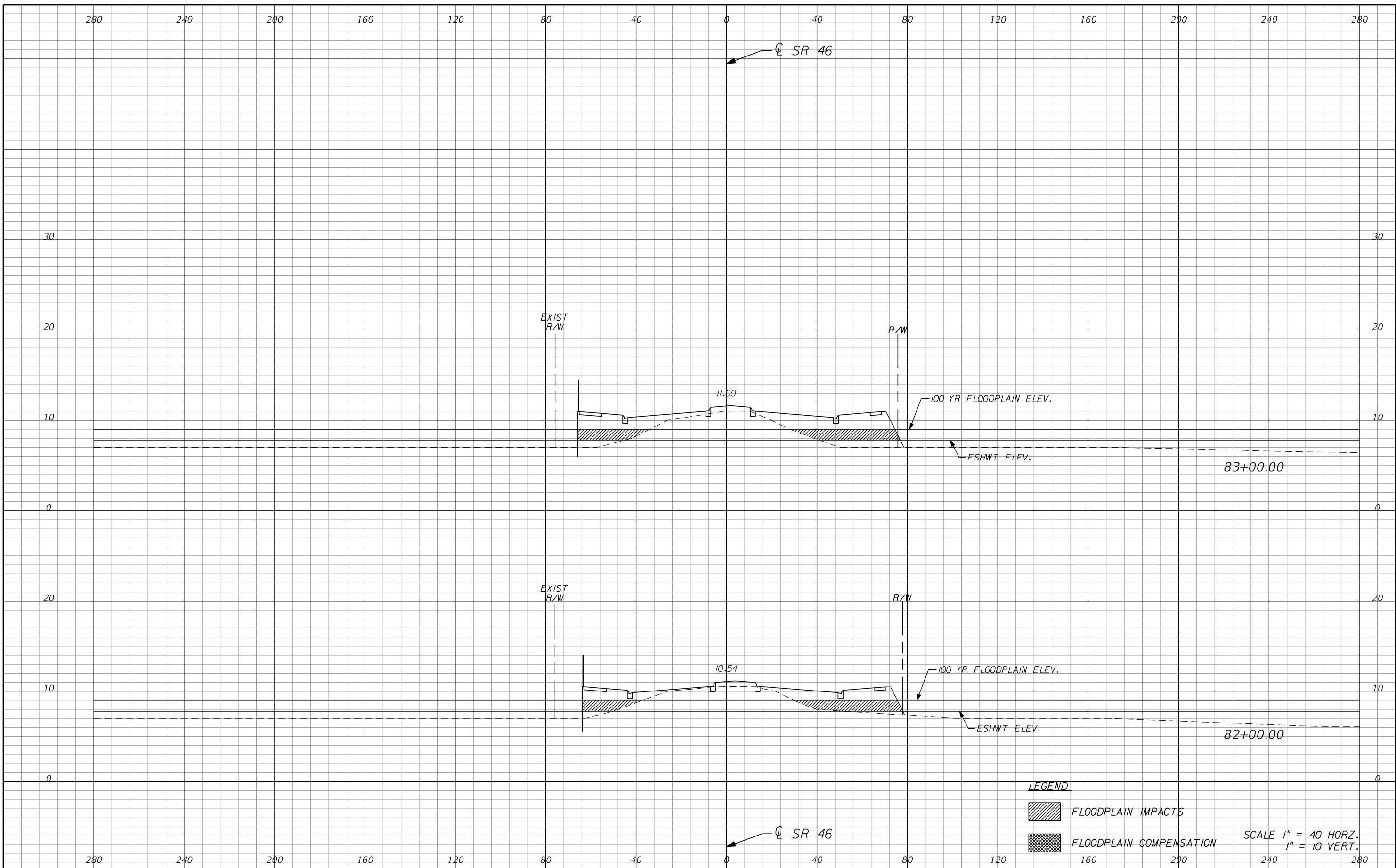


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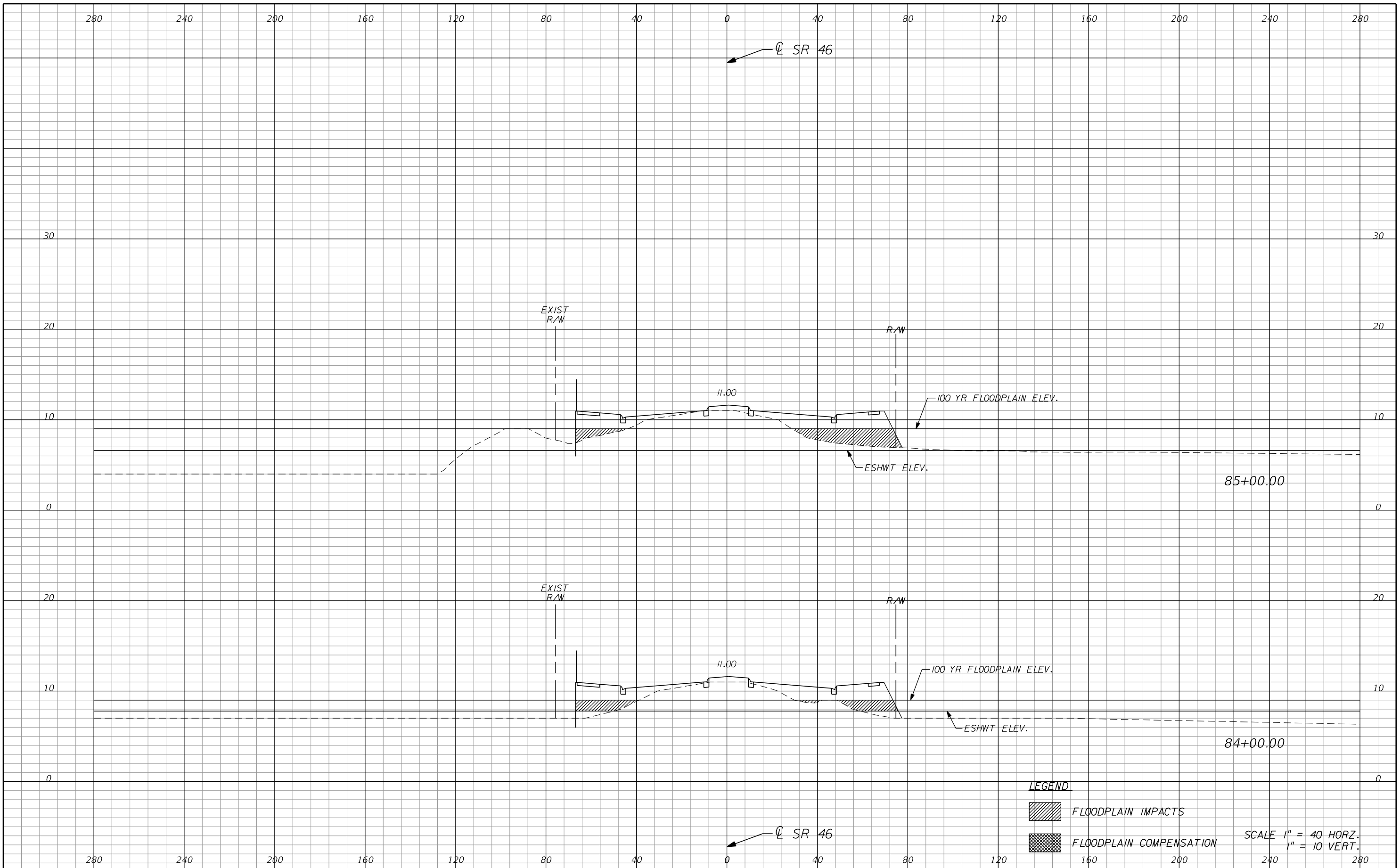
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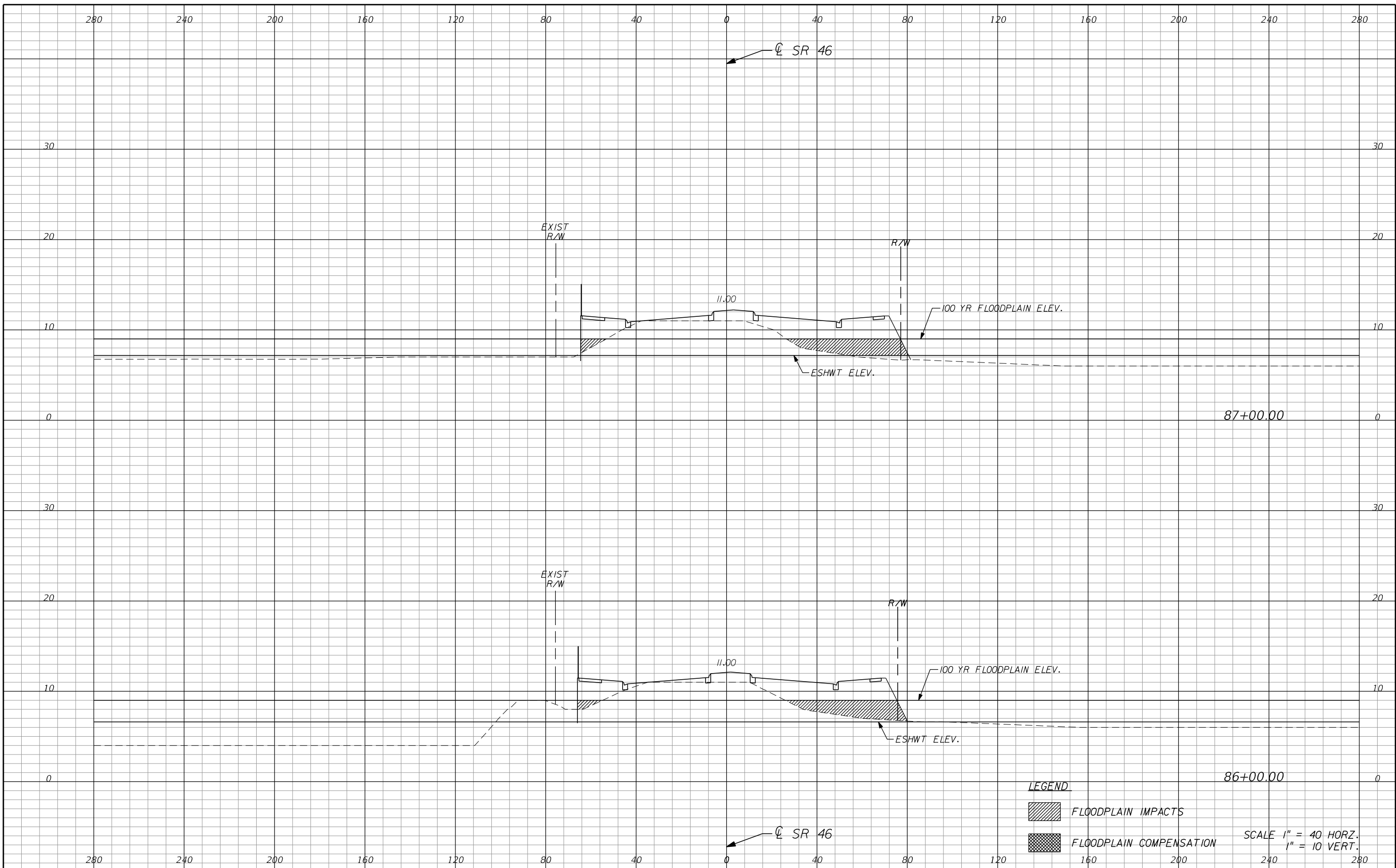
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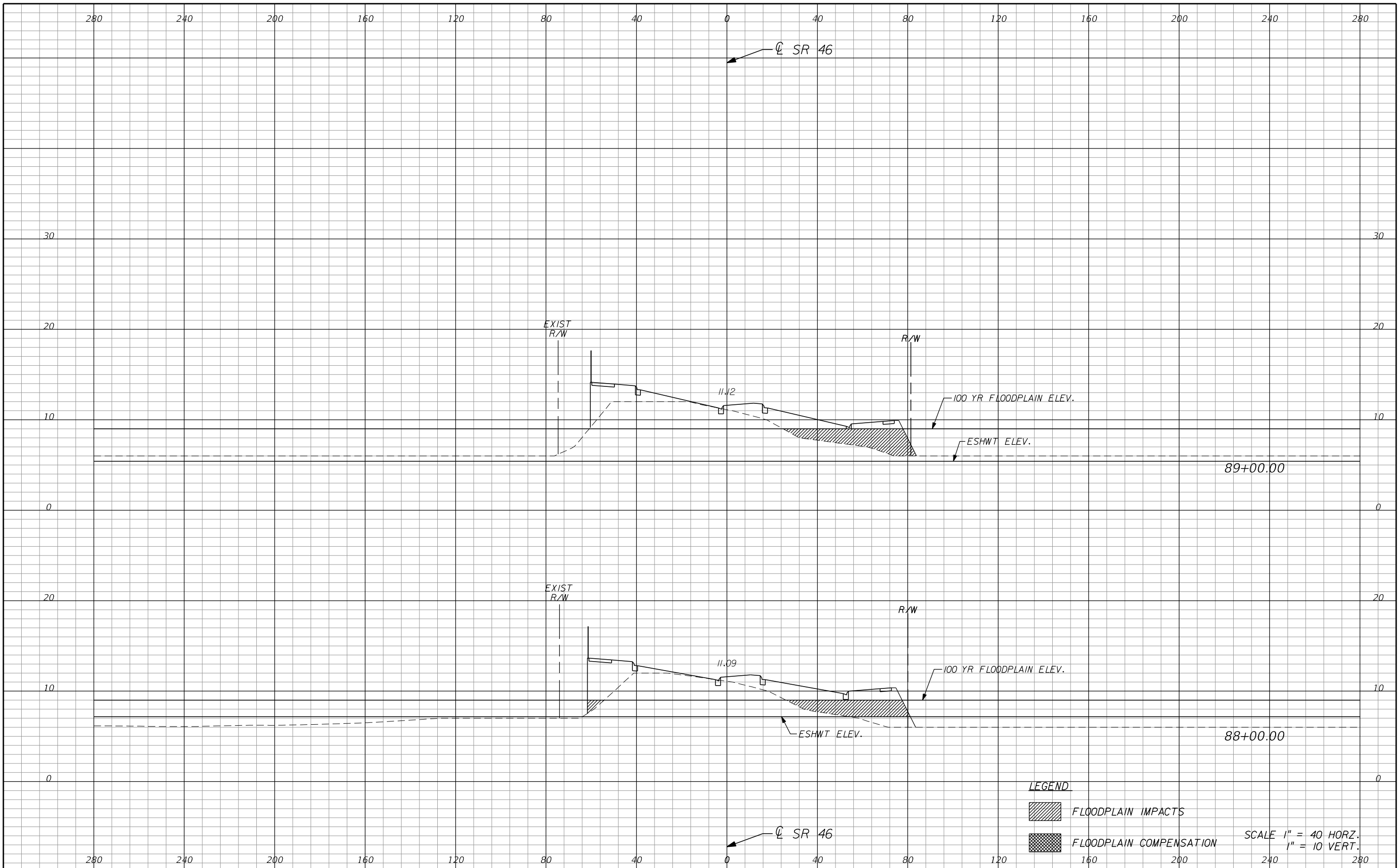


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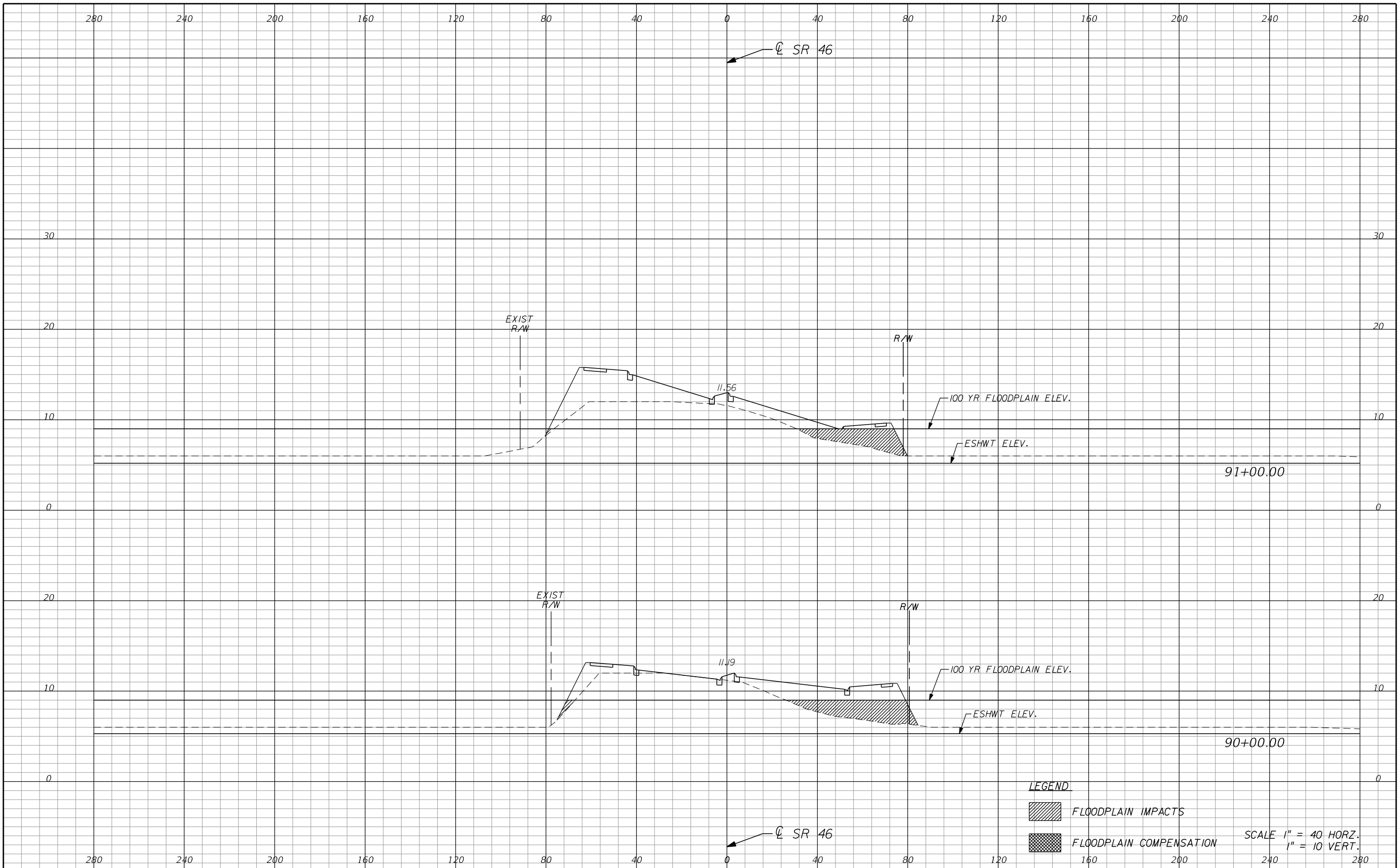
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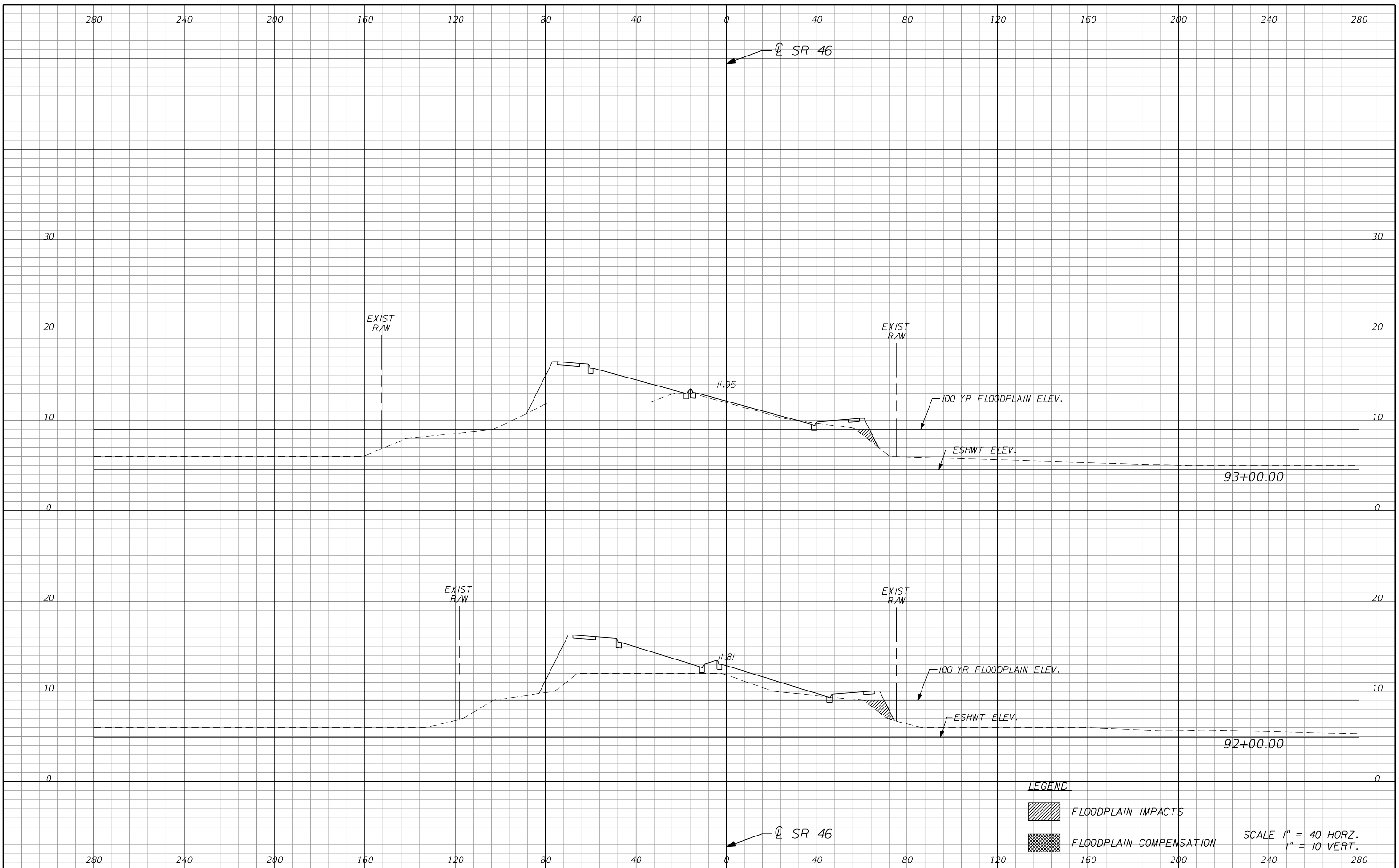
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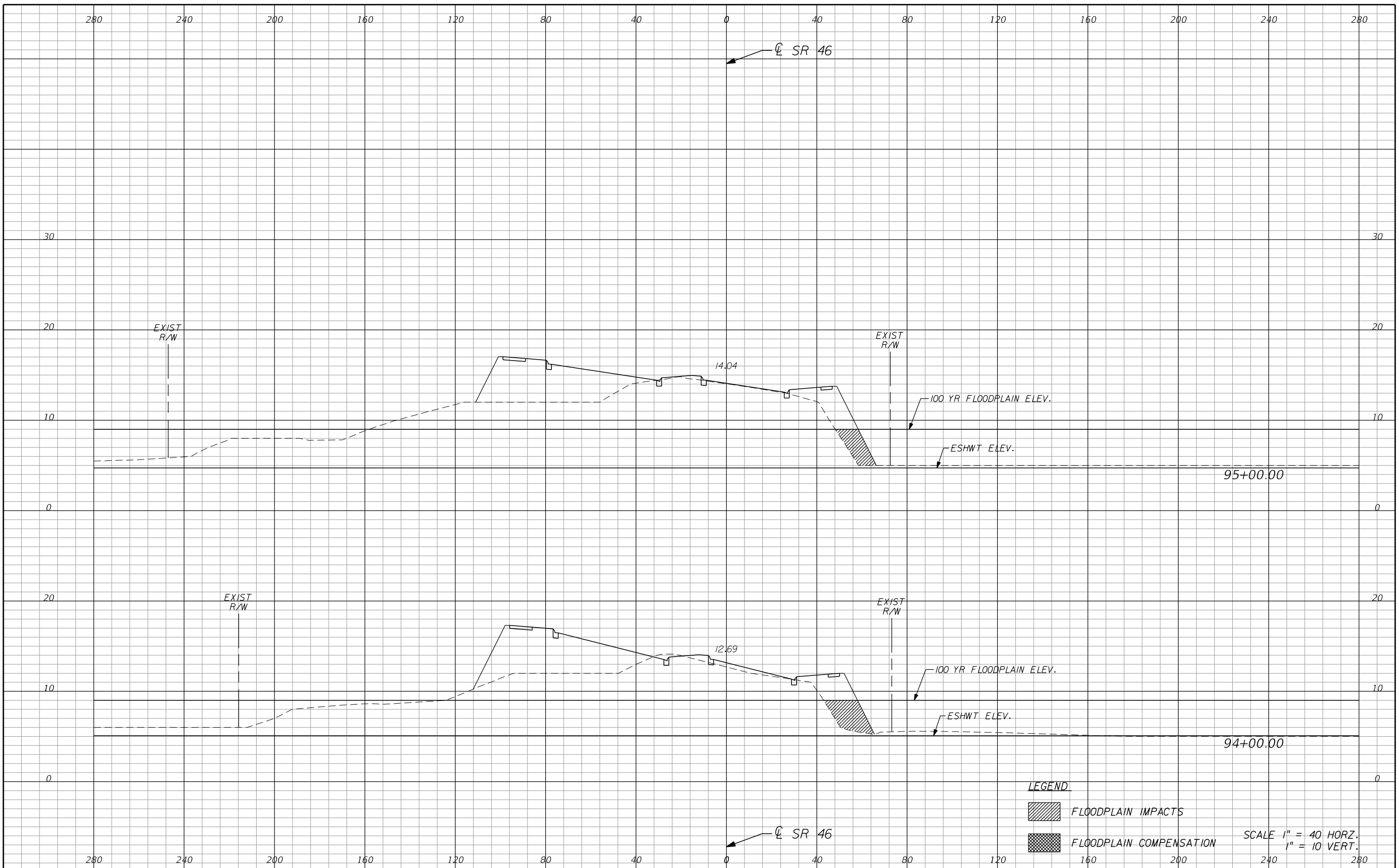


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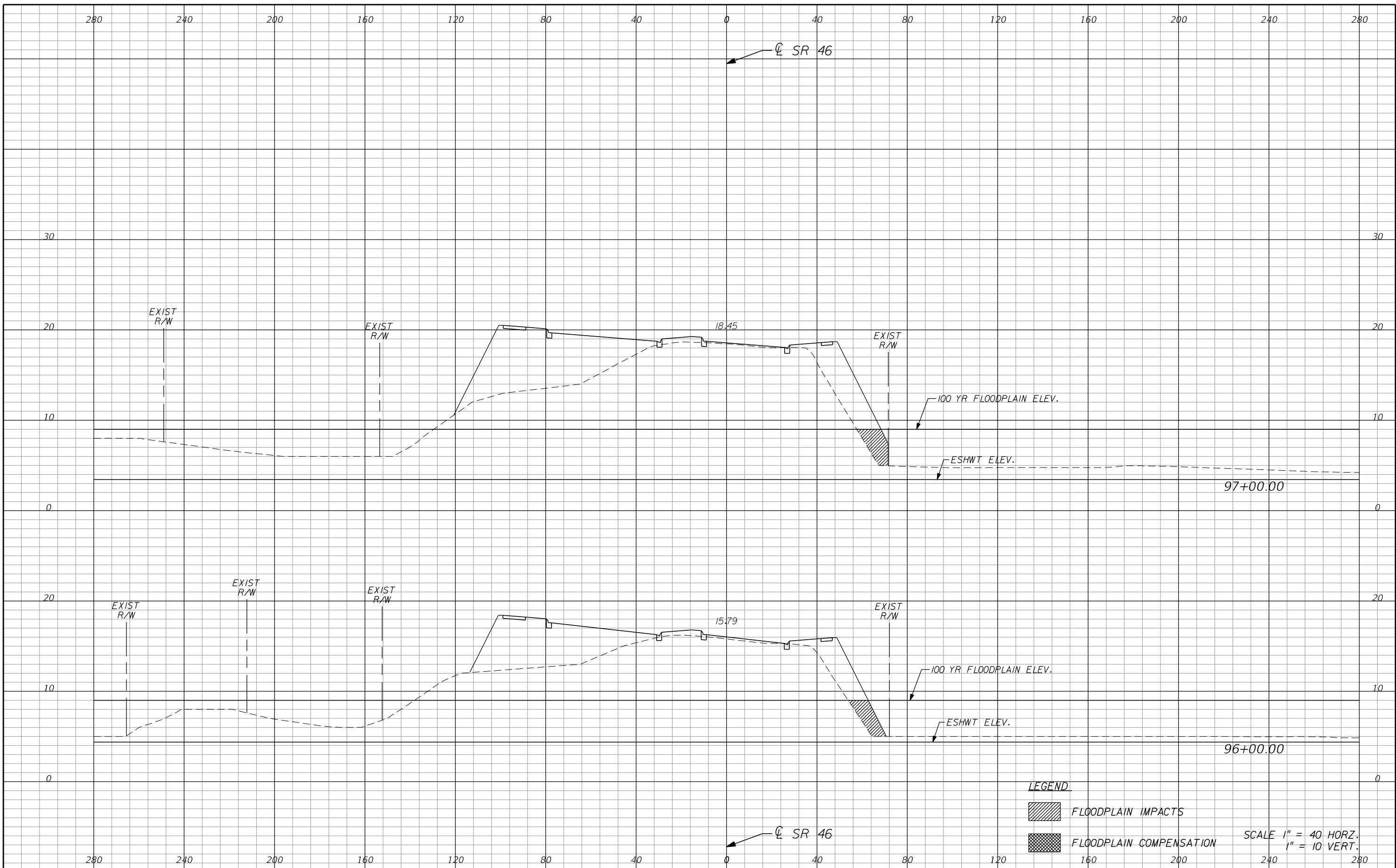


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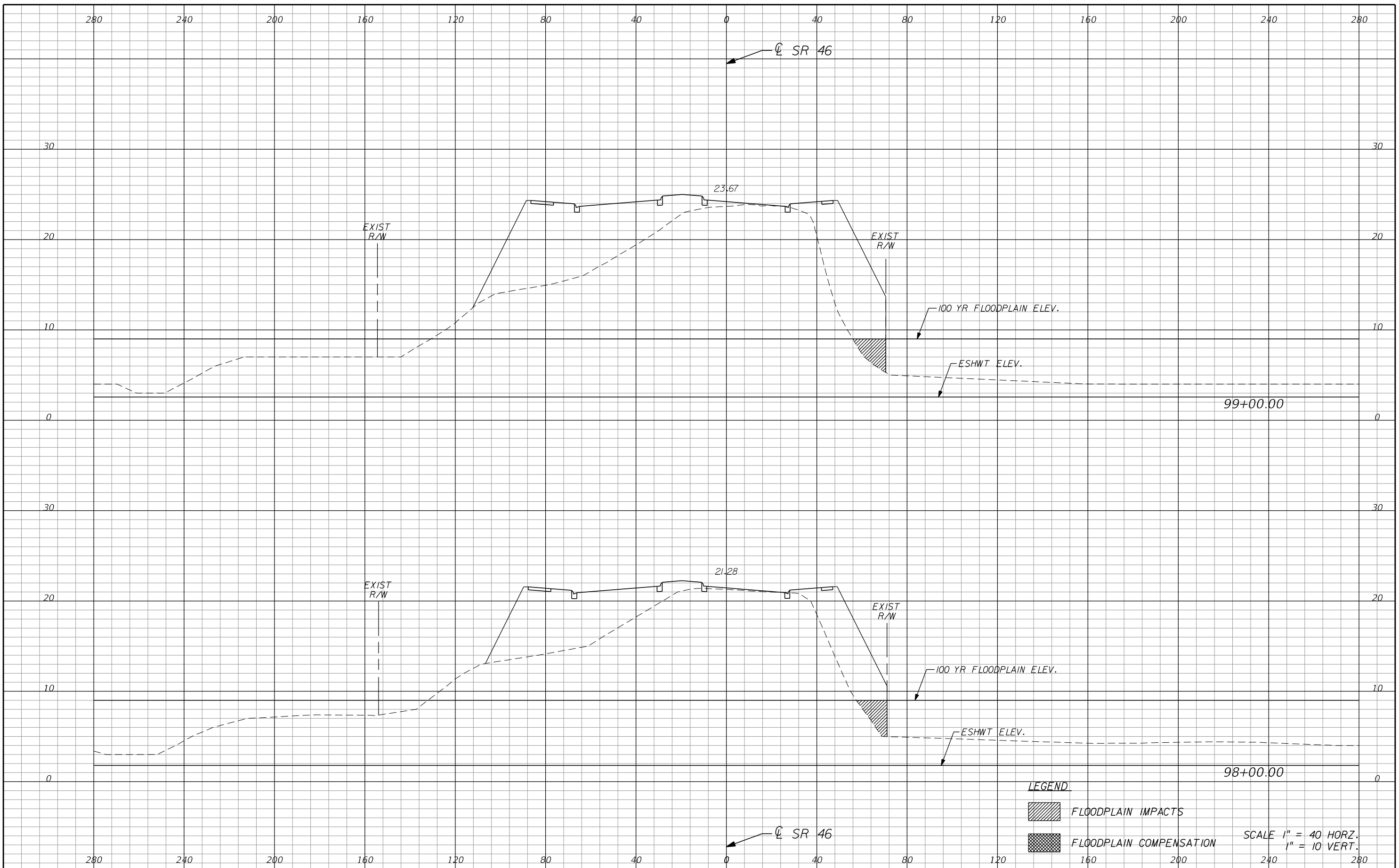


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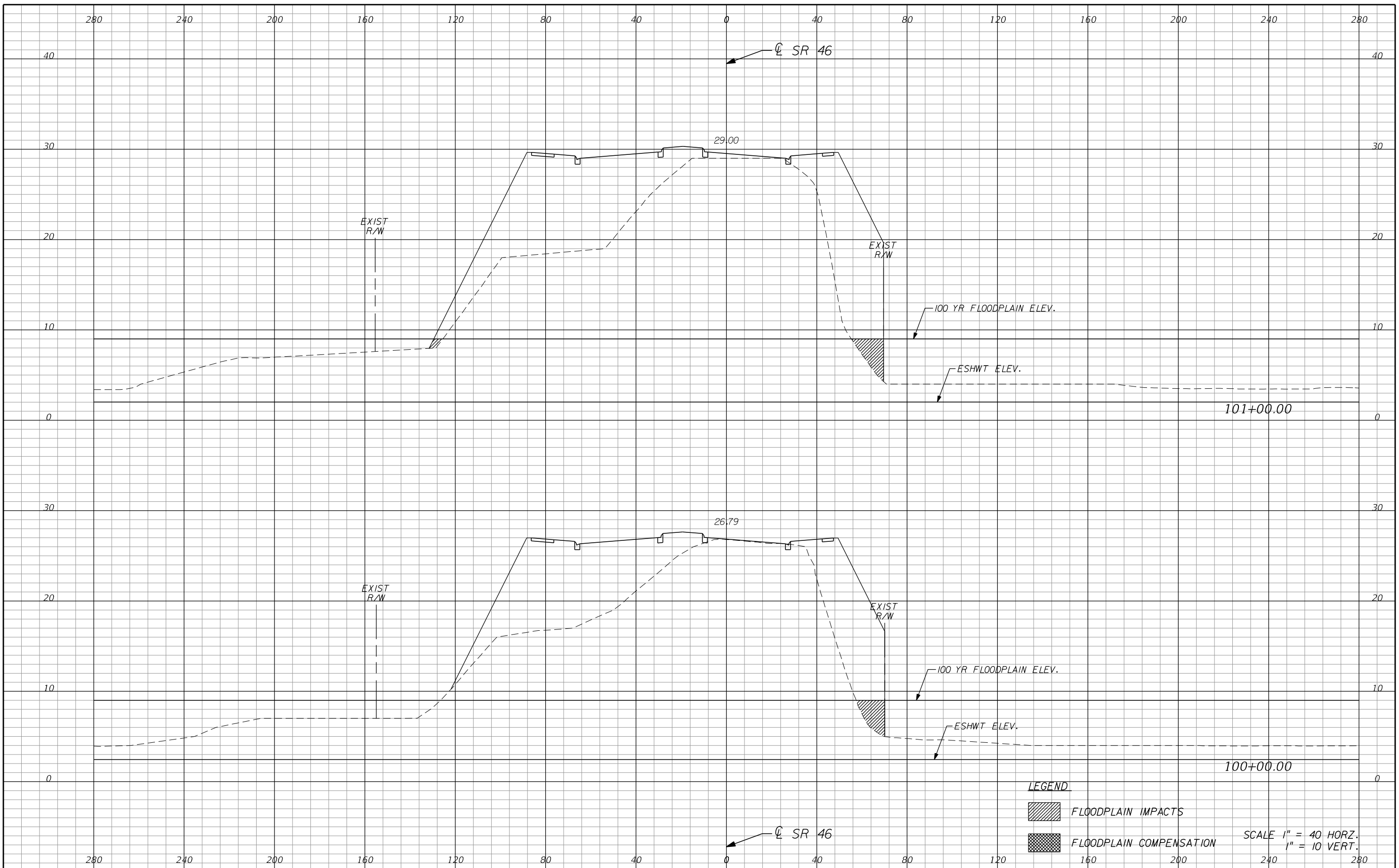
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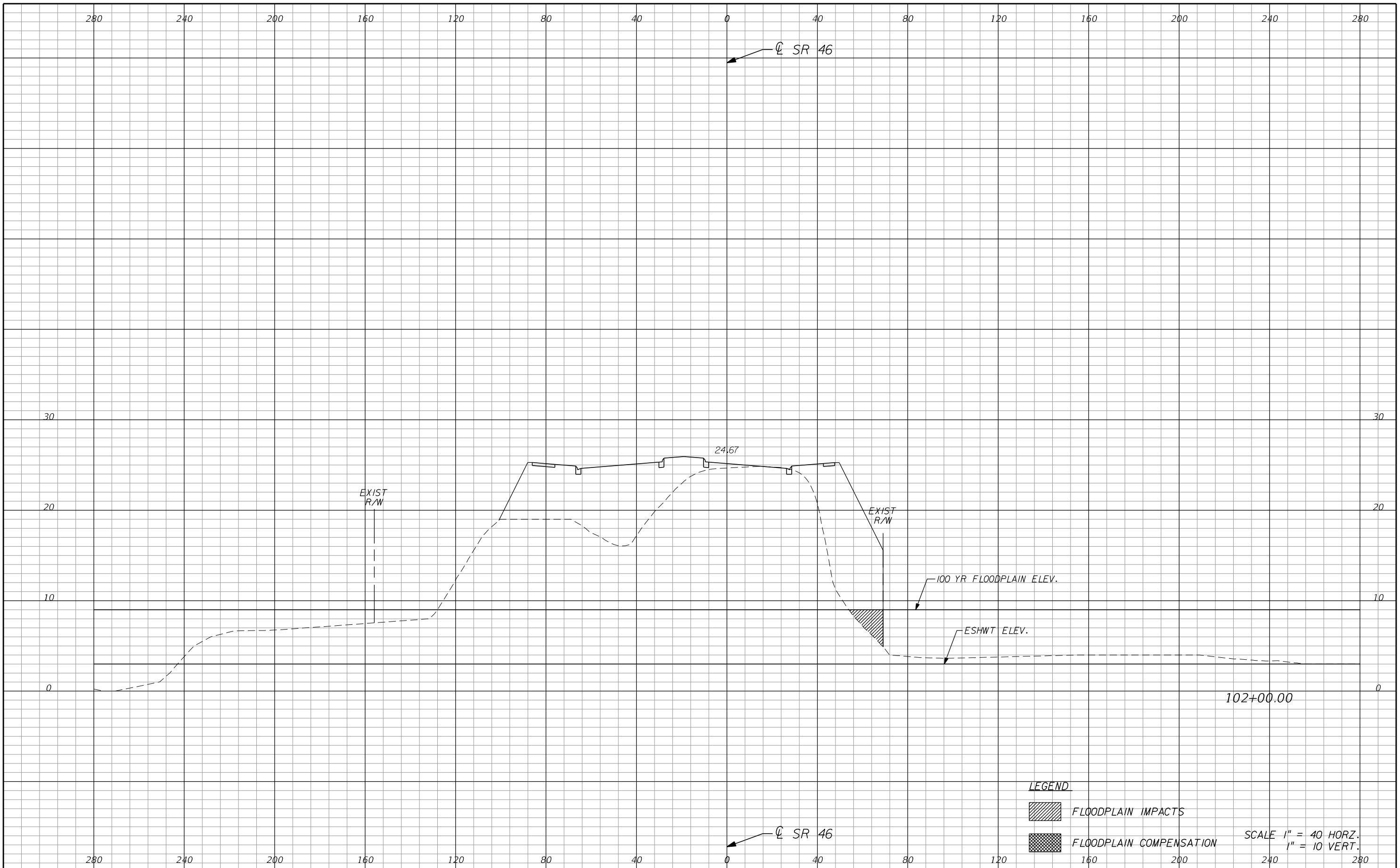
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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

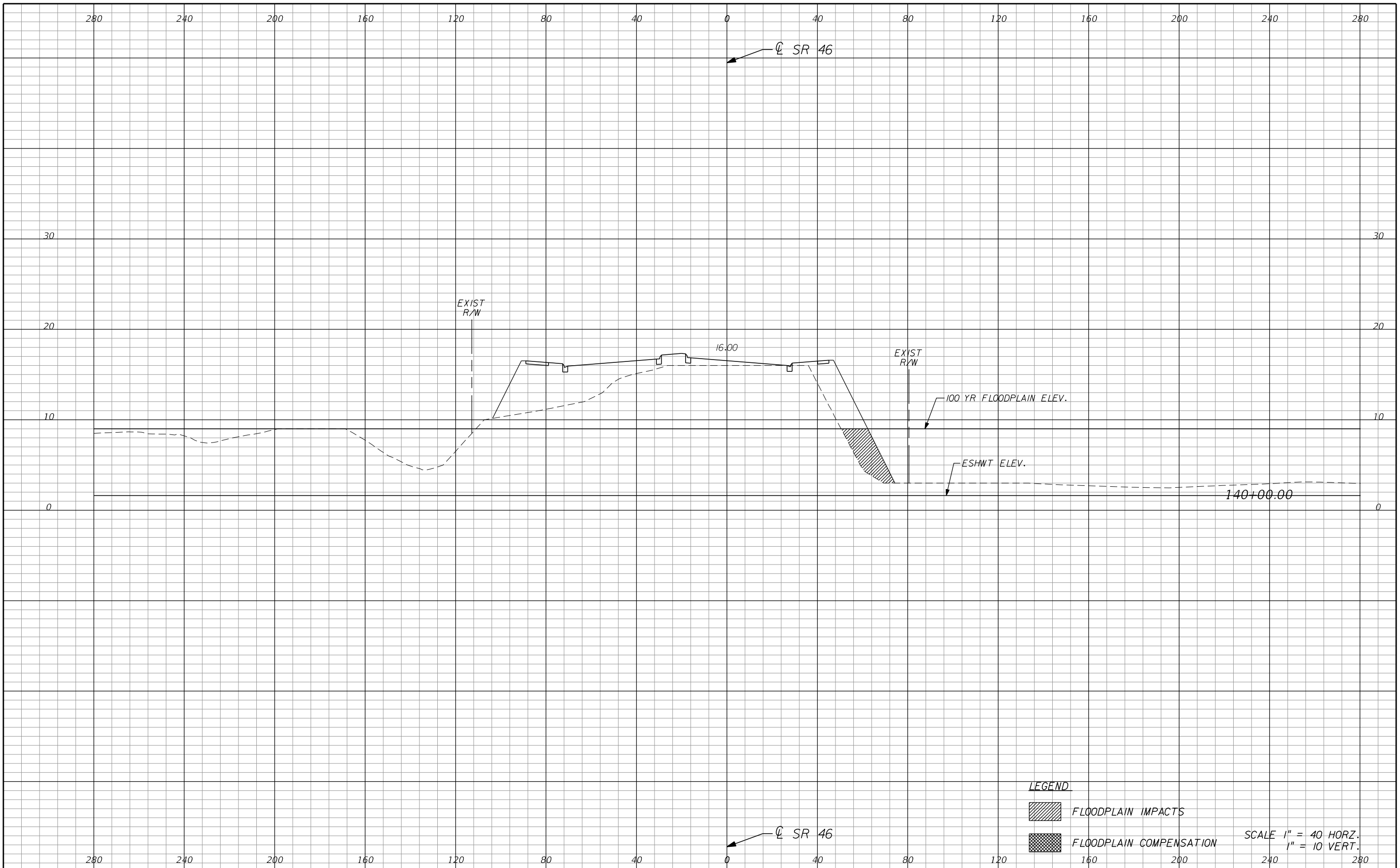
DANH T. LEE
P.E., LICENSE NO. 68228
URS CORPORATION
315 E. ROBINSON STREET, SUITE 245
ORLANDO, FL 32801-1949
PH (407) 422-0353 FAX (407) 423-2695
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STATE OF FLORIDA			
DEPARTMENT OF TRANSPORTATION		SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE	
ROAD NO.	COUNTY	CIP #	FINANCIAL PROJECT ID
SR 46	SEMINOLE		

SR 46 PD&E
100 YR FLOODPLAIN IMPACTS
& COMPENSATION

SHEET NO.



LEGEND

-  FLOODPLAIN IMPACTS
-  FLOODPLAIN COMPENSATION

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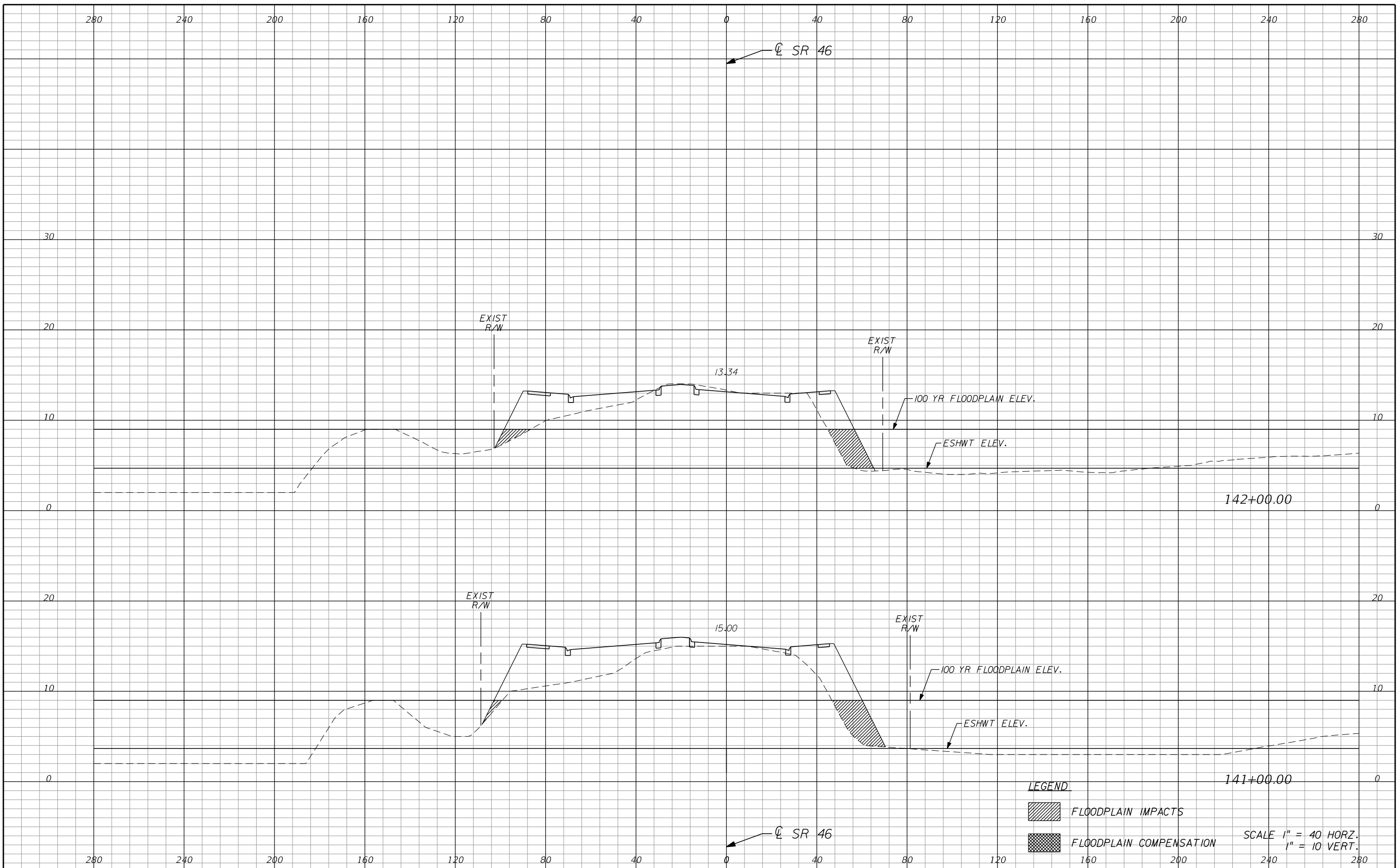
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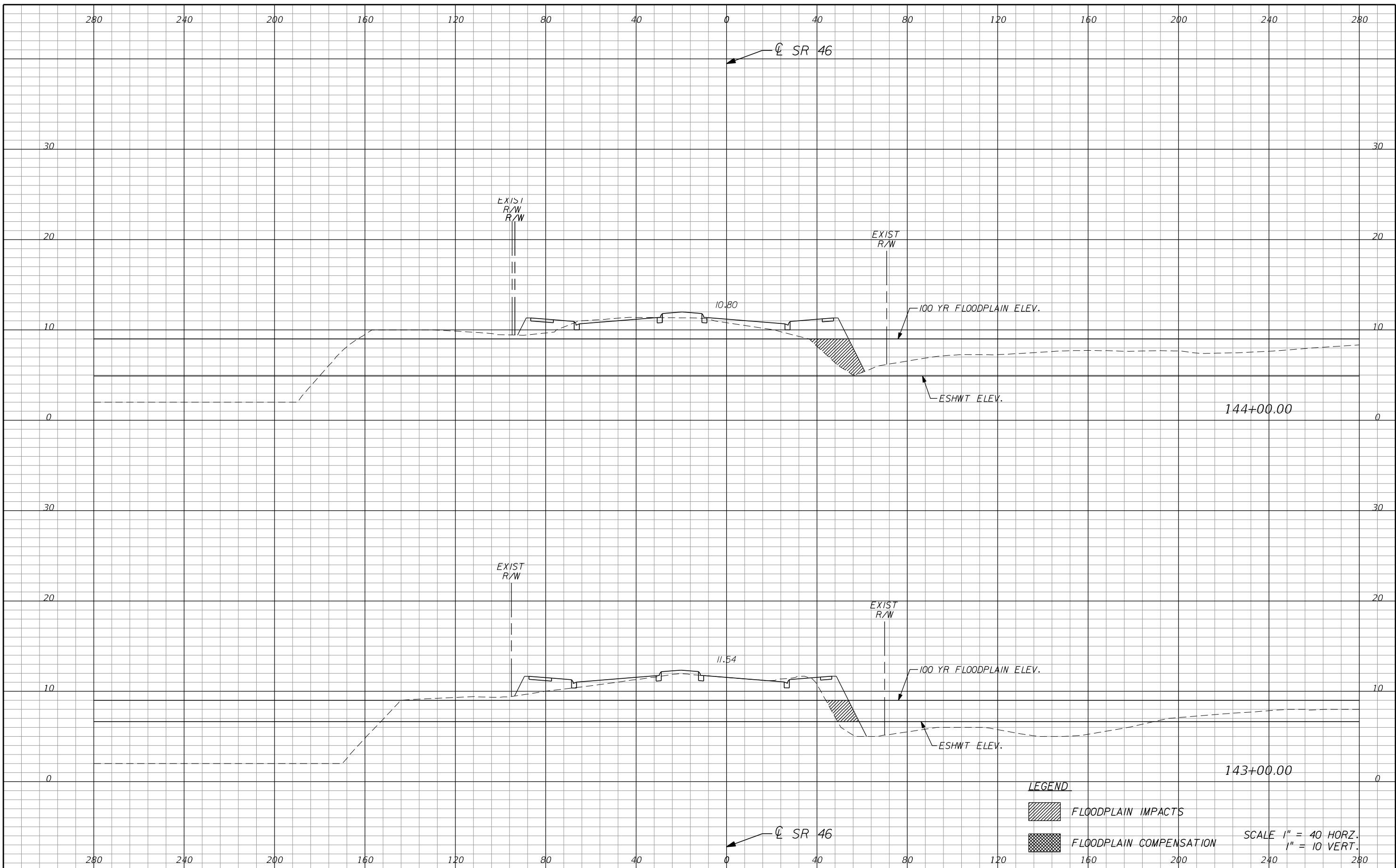


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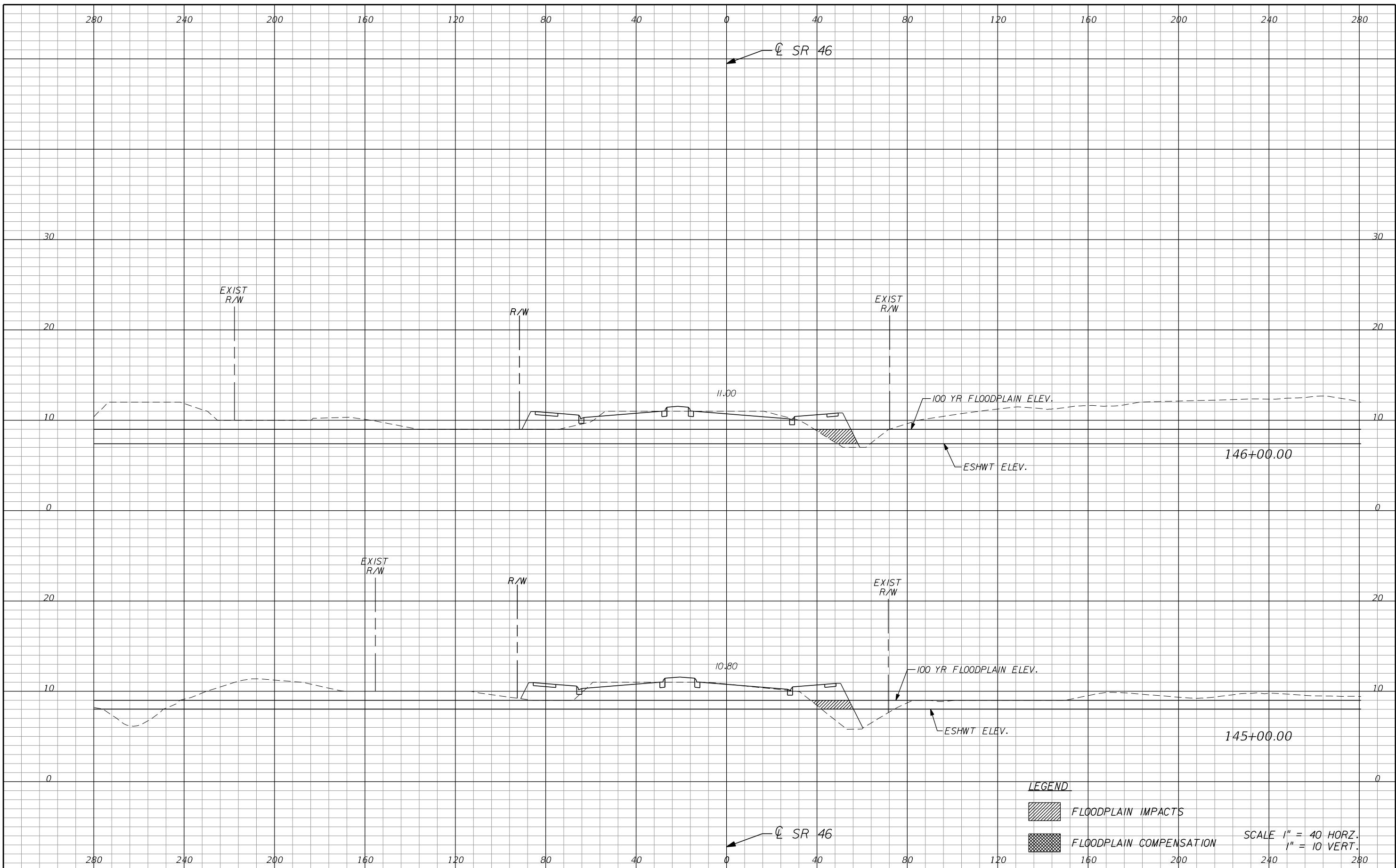


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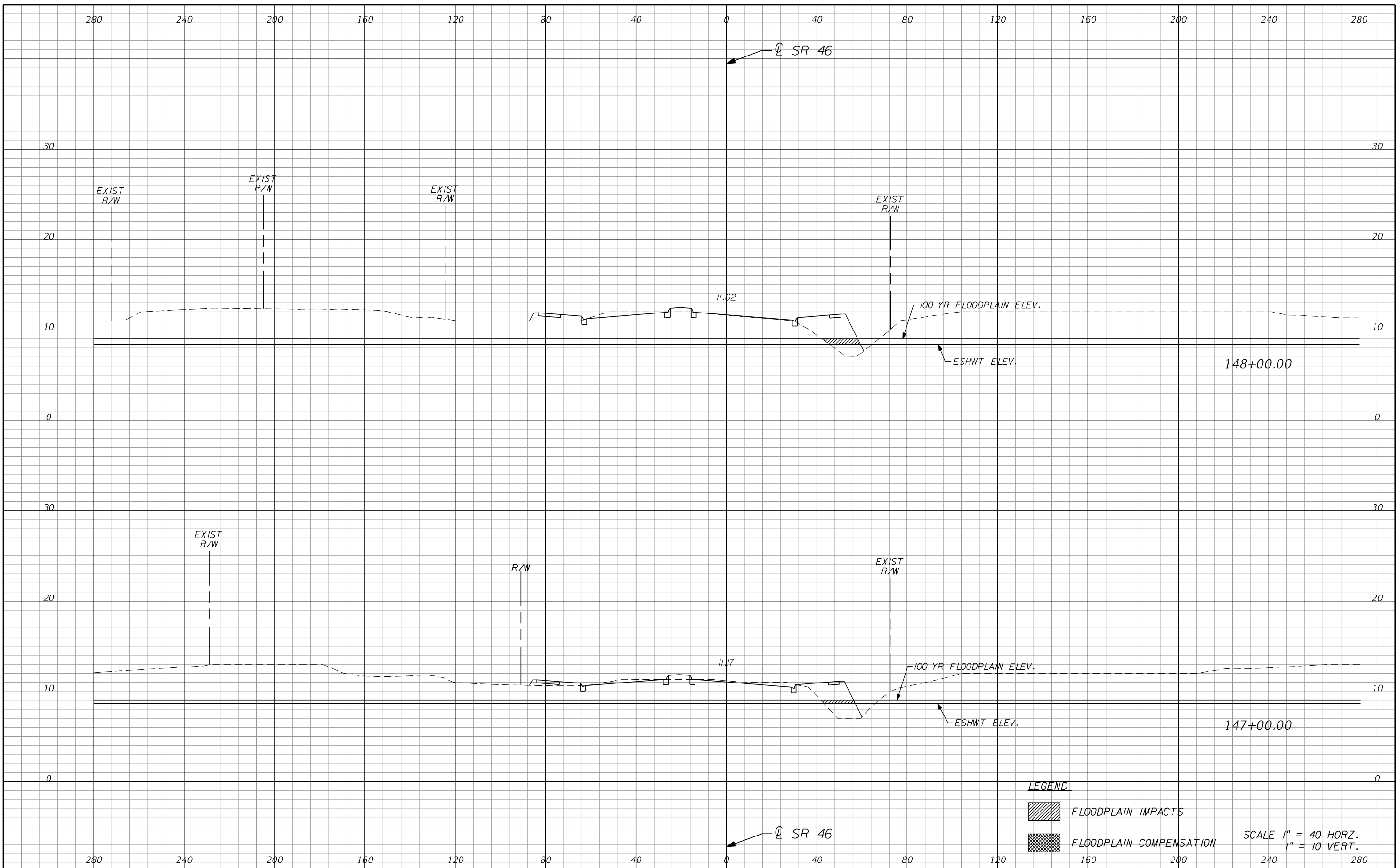
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SR 46 PD&E
100 YR FLOODPLAIN IMPACTS
& COMPENSATION

SHEET NO.

Job SR 46 P&E

Project No. _____

Sheet _____ of _____

Description 100 YR Floodplain Calc

Computed by DTL

Date 12/6/13

Proposed FP Camp Pond 2

Checked by DEP

Date 12/19/13

Reference

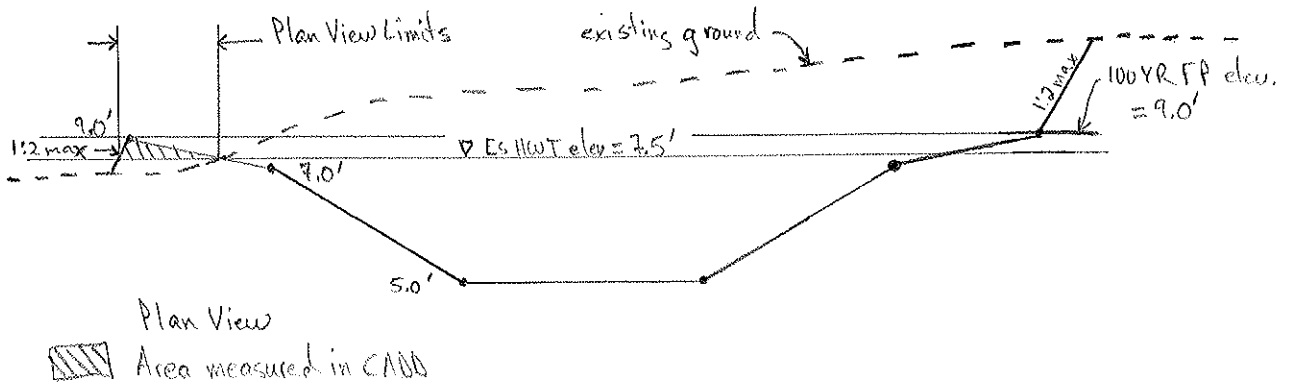
Pond Geometry (NAVD)

Outside Berm elev = 9.0 ft

Inside Berm elev = 7.0 ft

Bottom elev = 5.0 ft

ESHWT elev = 7.5 ft * Obtained from ESHWT elev. used
for permitted Sterling Meadows Pond 101
SJRWMD Permit No. 4-117-51666-2



Average Fill height = 1.25 ft
Fill Area = 0.03 ac

100 YR Floodplain impact volume = (1.25 ft)(0.03 ac) = 0.04 ac-ft

Job SR 46 PD&E

Project No. _____

Sheet ____ of ____

Description 100-YR Floodplain Calc.

Computed by DTL

Date 12/6/13

Proposed Pond A3

Checked by DEP

Date 12/19/13

Reference

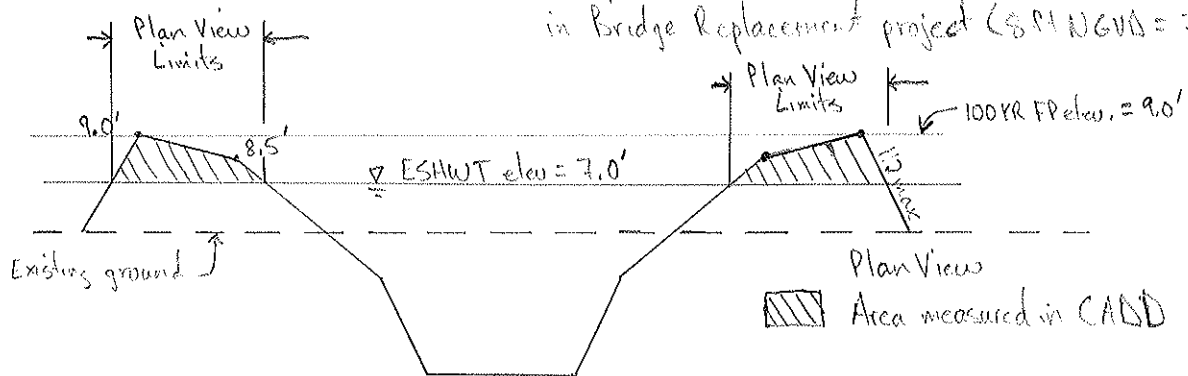
Pond Geometry (NAVD)

Outside berm elev. = 9.00 ft.
 Inside berm elev. = 8.50 ft.
 NWL elev. = 6.40 ft.
 Bottom elev. = -2.40 ft.

Average existing ground elev = 4.00 ft

ESHWT elev. = 7.00 ft

* Obtained from ESHWT elev. used for permitted Pond 1 constructed in Bridge Replacement project (SM NAVD = 7 ft NAVD)



Average Fill height = 1.75 ft
 Fill Area = 1.22 ac.

100 YR Floodplain impact volume = (1.75 ft)(1.22 ac) = 2.14 ac-ft

Job SR 46 PD&E

Project No. _____

Sheet _____ of _____

Description 100YR Floodplain Calc.
Modified Pond 1

Computed by DTL

Date 12/6/13

Checked by DEP

Date 12/19/13

Reference

Pond Geometry (NGVD*)

* NGVD will be used because Bridge Replacement Project was permitted in NGVD

- Outside berm elev = 11.0 ft
- Inside berm elev = 10.0 ft
- NWL elev = 7.4 ft
- Bottom elev = 7.0 ft

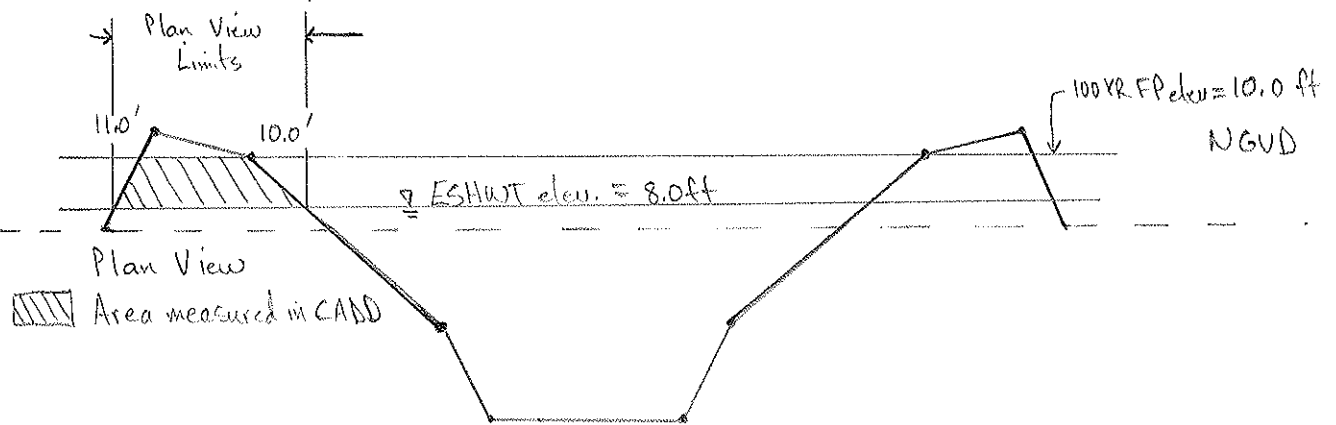
Average existing ground elev = 8.0 ft (NGVD)

ESHWT elev. = 8.0 ft (NGVD) * obtained from permitted conditions

100YR FP elev = 9.0 ft NAVD = 10.0 ft NGVD

⇒ Permitted Pond 1 is being modified to provide additional treatment and attenuation volume for the SR 46 widening project.

⇒ 100-YR Floodplain impacts are only accounted for the expanded portion of the modified pond.



Average Fill height = 2.0 ft
Fill Area = 0.41 ac

100 YR Floodplain impact volume = (2.0 ft) (0.41 ac) = 0.82 ac · ft

Job SR 46 PD&E

Project No. _____

Sheet _____ of _____

Description 100 YR - Floodplain Calc

Computed by DJZ

Date 12/6/13

Proposed FP Comp Ponds

Checked by JEP

Date 12/19/13

Reference

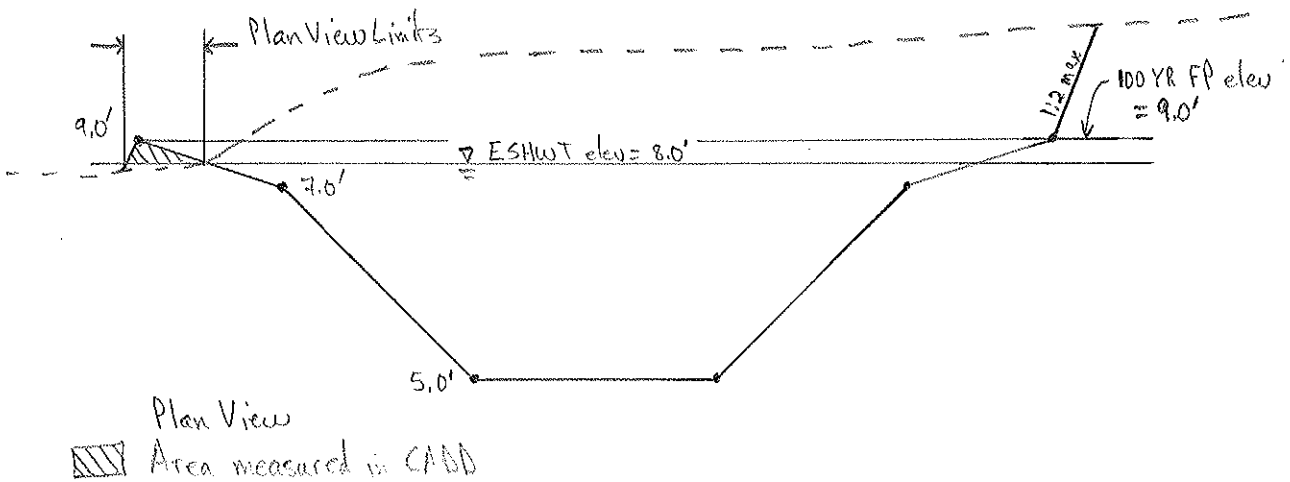
Pond Geometry (NAVD)

Outside Berm elev = 9.0 ft

Inside Berm elev = 7.0 ft

Bottom elev = 5.0 ft

Conservative estimate of ESHWT being 1 ft below 100 YR Floodplain elevation.



Average Fill height = 0.75 ft

Fill Area = 0.10 ac

$$100\text{ YR Floodplain impact volume} = (0.75\text{ ft})(0.10\text{ ac}) = 0.08\text{ ac-ft}$$

URS

MADE BY:
 CHECKED BY:
 CALCULATIONS FOR: SR 46 PD&E

DTL
 DEP

DATE: 11/26/13
 DATE: 12/12/13
 POND: FP Comp Pond 1

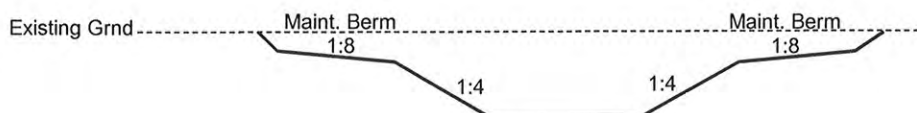
JOB NO.
 SHEET NO.
 BASIN:

Floodplain Compensation Pond 1**Stage Storage Calculations**

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	Out Berm	7.73				11.09
	100 YR FP Elev		7.40	1.50	11.09	
7.50	ESHWT Elev.	7.06				
7.00	Inside Berm	6.84				
5.00	Bottom	6.41				

Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation.

ESHWT elevation based on permitted conditions from Sterling Meadows subdivision Pond 101 (SJRWMD Permit No. 4-117-51666-2).



URS

MADE BY:
 CHECKED BY:
 CALCULATIONS FOR: SR 46 PD&E

DTL
 DEP

DATE: 11/26/13
 DATE: 2/19/13
 POND: FP Comp Pond 2

JOB NO.
 SHEET NO.
 BASIN:

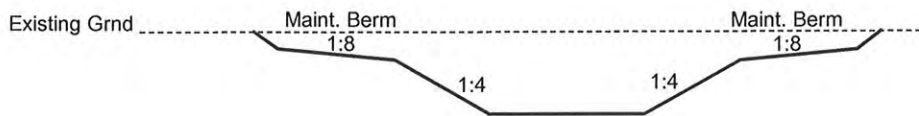
Floodplain Compensation Pond 2

Stage Storage Calculations

ELEV. (ft)	Description	AREA (ac)	AVG AREA (ac)	Delta D (ft)	Delta storage (ac-ft)	Sum Storage (ac-ft)
9.00	Out Berm	24.71				24.27
	<i>100 YR FP Elev</i>		24.27	1.00	24.27	
8.00	ESHWT Elev.	23.83				
7.00	Inside Berm	22.97				
5.00	Bottom	22.11				

Floodplain compensation will be based on any cut volume between the 100-year floodplain elevation and the ESHWT elevation.

Conservative estimate of ESHWT elevation being 1 ft below 100 year floodplain elevation.



URS

MADE BY:

DTL

DATE:

11/26/13

JOB NO.

CHECKED BY:

DEP

DATE:

12/19/13

SHEET NO.

CALCULATIONS FOR: SR 46 PD&E Floodplain Impacts/Compensation

Roadway Cross-Section Station:	Floodplain Impact (Fill) Area (ft ²):	Floodplain Compensation (Cut) Area (ft ²):	Floodplain Impact Net Volume (ft ³):	Floodplain Compensation Net Volume (ft ³):
<i>Center Line for SR 46 Widening</i>				
198+00	18.21	21.36	-	-
199+00	24.55	20.76	2,137.63	2,105.50
200+00	25.69	22.24	2,511.50	2,149.88
201+00	32.08	22.84	2,888.25	2,254.13
202+00	18.70	29.30	2,538.88	2,606.88
203+00	17.30	24.07	1,799.63	2,668.25
204+00	3.79	20.07	1,054.13	2,206.75
205+00	35.06	19.48	1,942.38	1,977.50
206+00	42.80	22.48	3,893.13	2,097.88
207+00	40.24	24.68	4,152.00	2,357.63
208+00	9.27	23.92	2,475.50	2,429.88
209+00	16.72	23.42	1,299.75	2,367.00
210+00	15.68	23.42	1,620.13	2,342.00
211+00	21.21	28.41	1,844.25	2,591.38

Summary of Floodplain No. 2 Impact Volumes for SR 46 Widening:*Centerline SR 46 Widening - Station 198+00 to 211+00 LT*

TOTAL (ac-ft):

0.69

0.69

URS

MADE BY: DTL
 CHECKED BY: *DP*
 CALCULATIONS FOR: SR 46 PD&E Floodplain Impacts/Compensation

DATE: 11/26/13
 DATE: 12/19/13

JOB NO.
 SHEET NO.

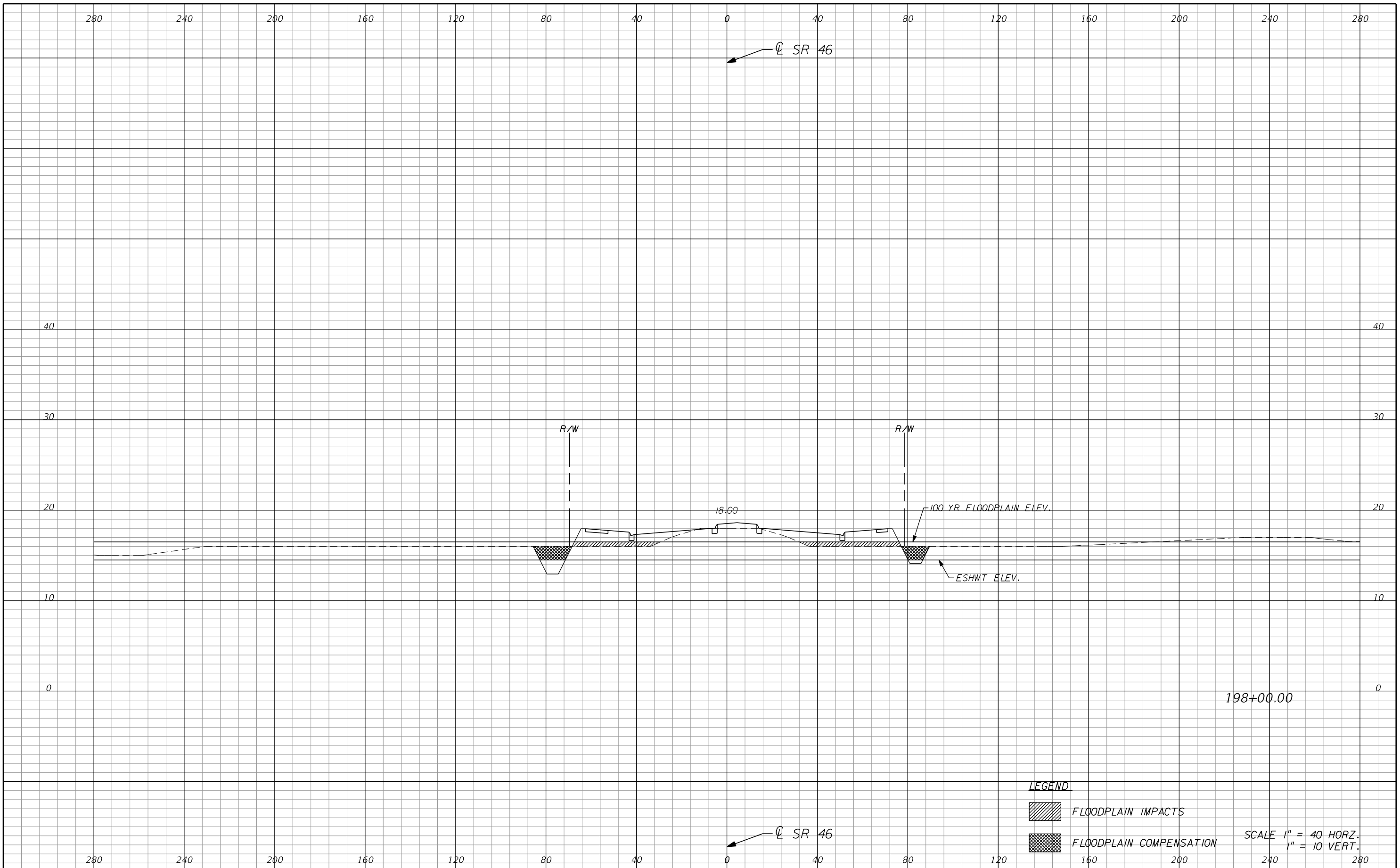
Roadway Cross-Section Station:	Floodplain Impact (Fill) Area (ft ²):	Floodplain Compensation (Cut) Area (ft ²):	Floodplain Impact Net Volume (ft ³):	Floodplain Compensation Net Volume (ft ³):
<i>Center Line for SR 46 Widening</i>				
198+00	21.25	14.28	-	-
199+00	8.14	15.87	1,469.38	1,507.75
200+00	6.95	18.18	754.25	1,702.50
201+00	9.63	18.96	829.13	1,856.63
202+00	8.58	18.20	910.50	1,857.50
203+00	8.92	18.79	874.63	1,849.00
204+00	10.16	0.00	953.88	939.25
205+00	10.43	0.00	1,029.38	0.00
206+00	6.87	0.00	864.88	0.00
207+00	7.58	0.00	722.38	0.00

Summary of Floodplain No. 3 Impact Volumes for SR 46 Widening:



Centerline SR 46 Widening - Station 198+00 to 207+00 RT

TOTAL (ac-ft):

0.19	0.22
------	------



LEGEND

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-  FLOODPLAIN COMPENSATION

SCALE 1" = 40' HORZ.
1" = 10' VERT.

REVISIONS					
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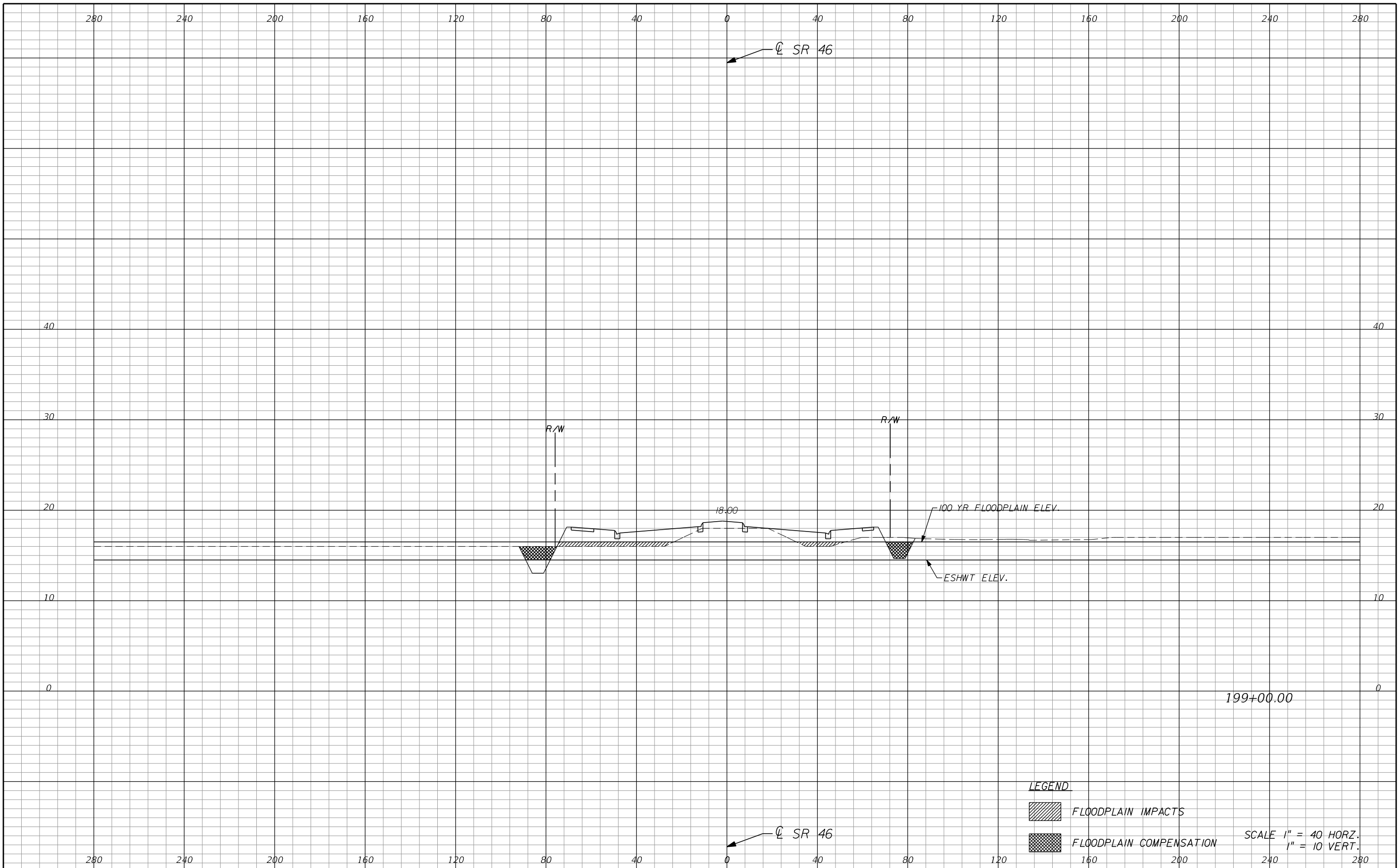
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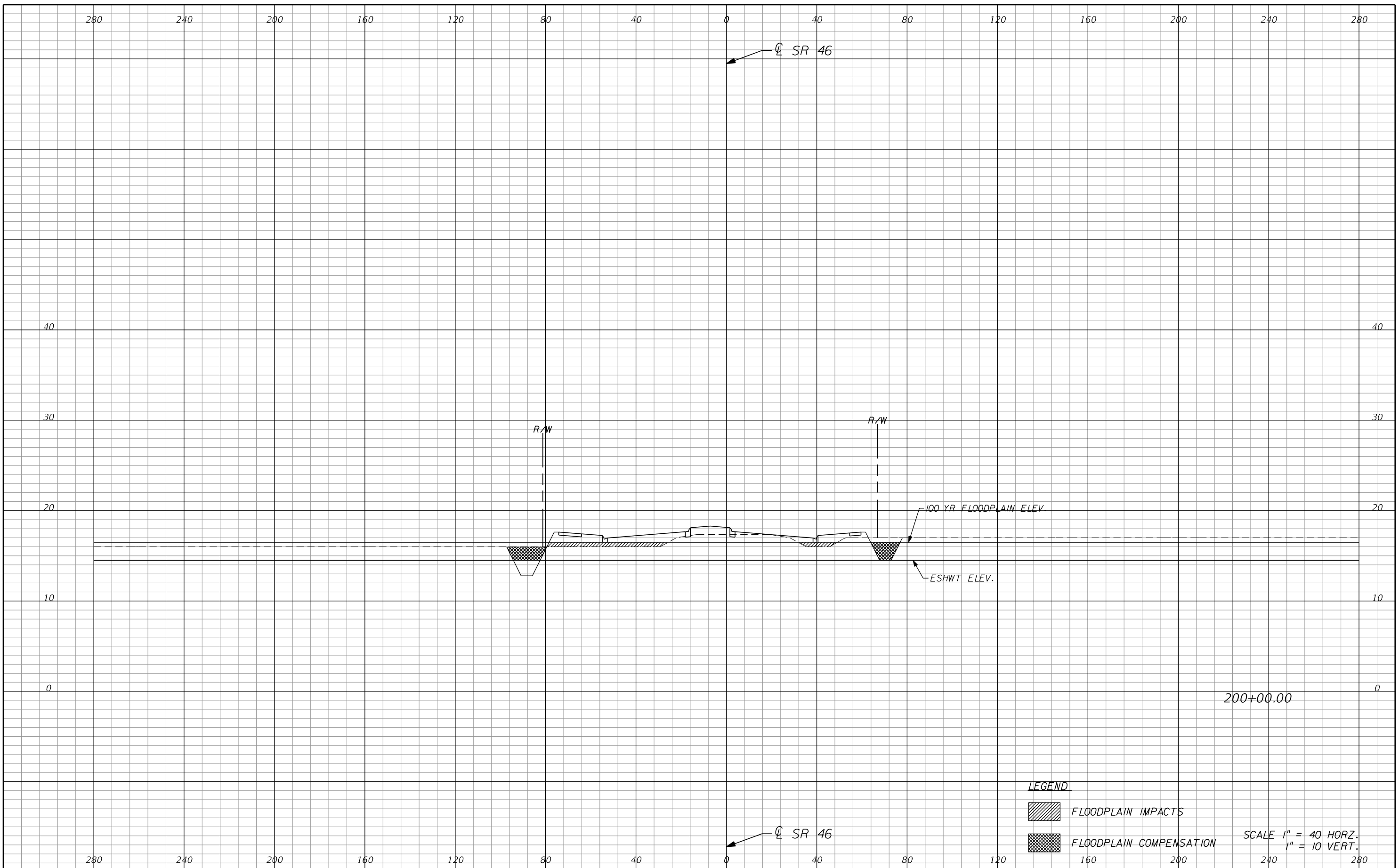


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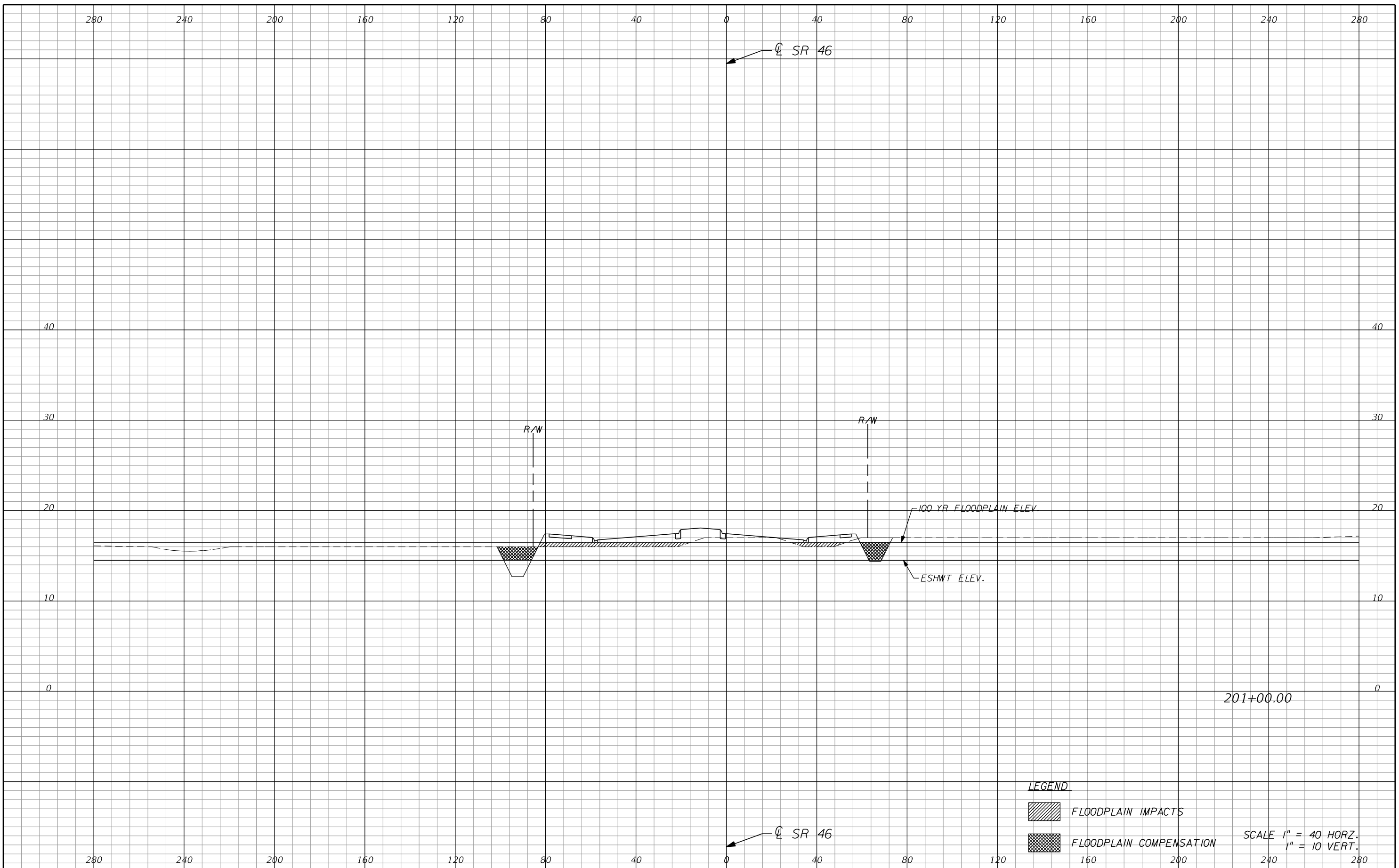


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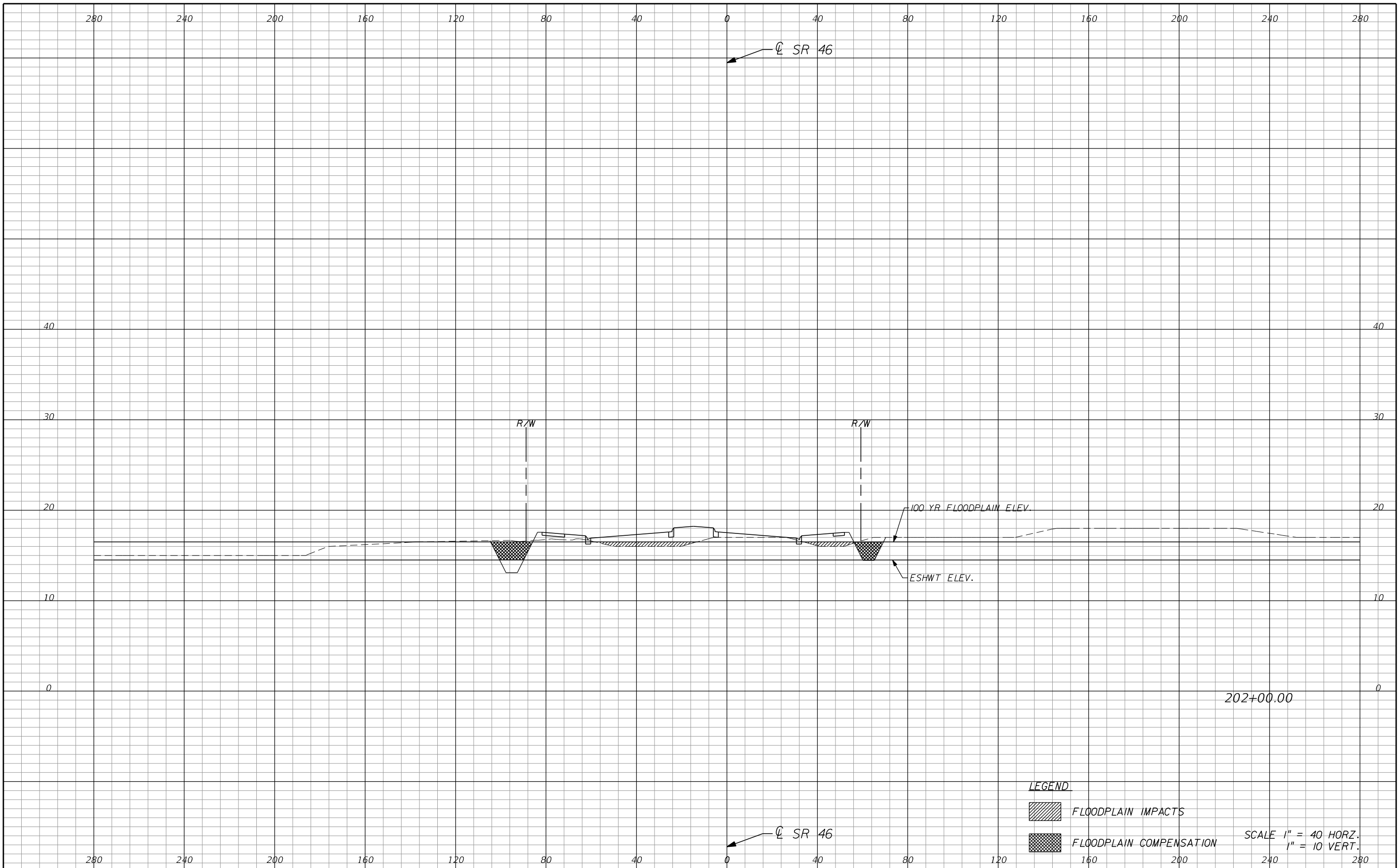
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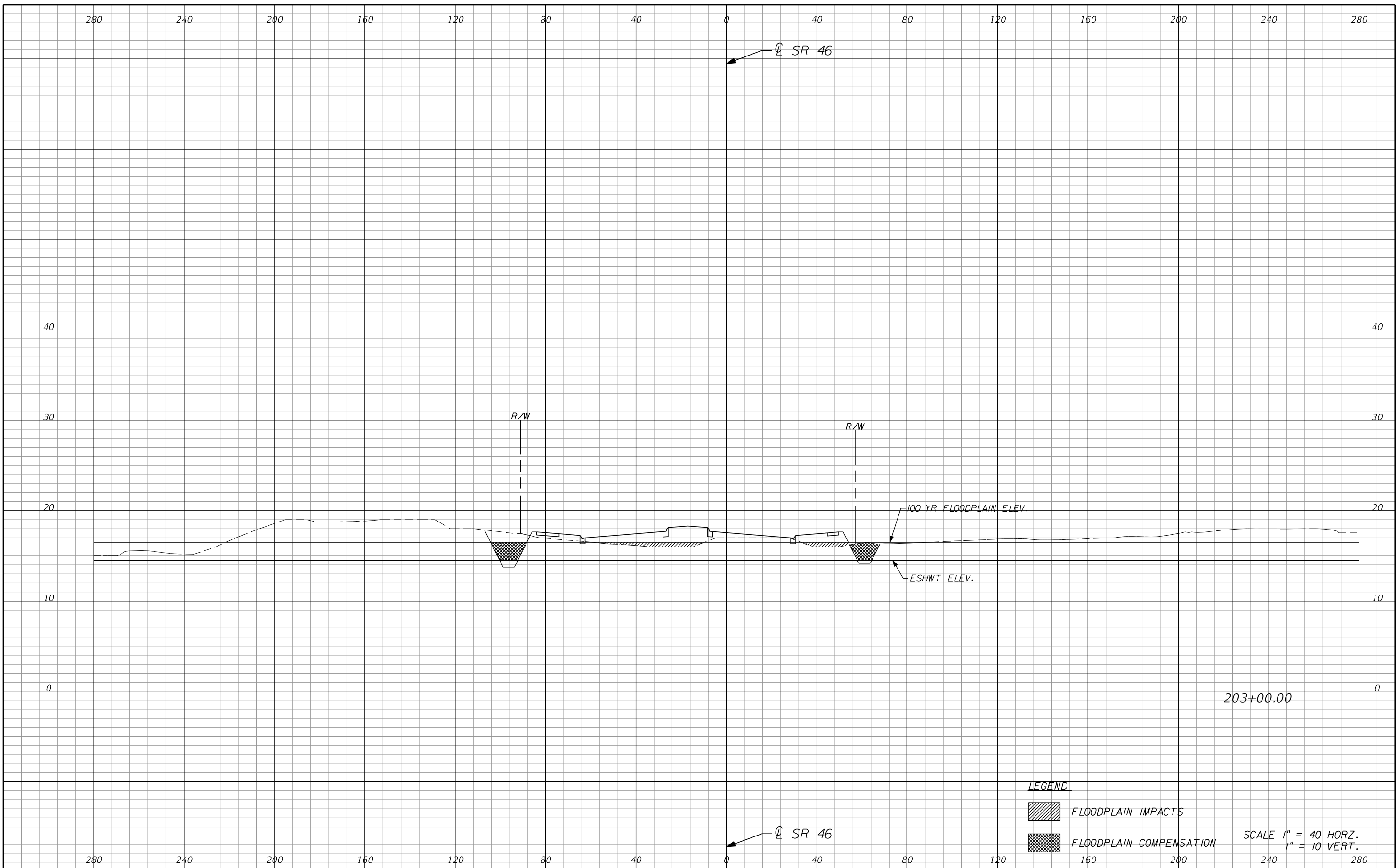
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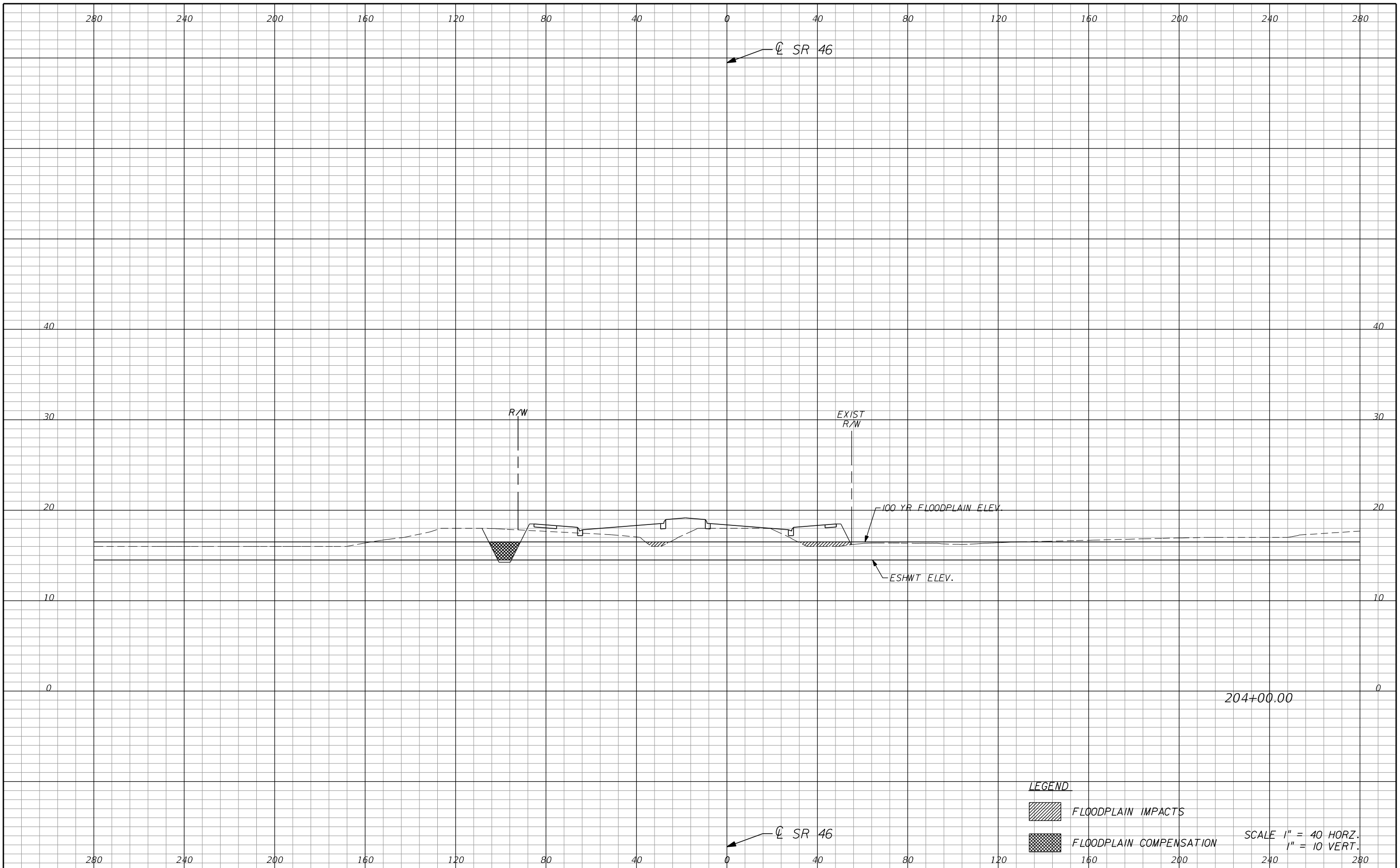
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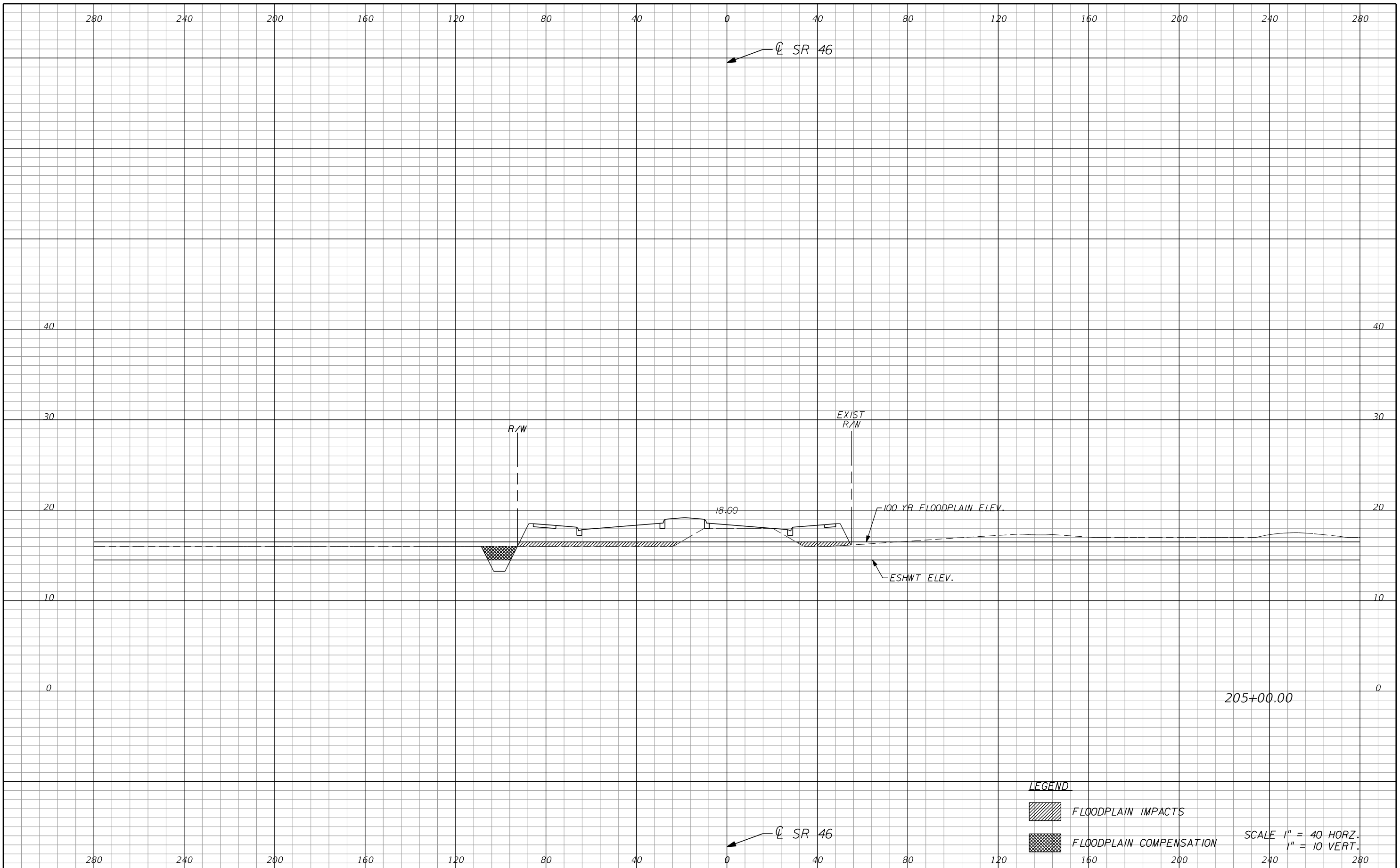
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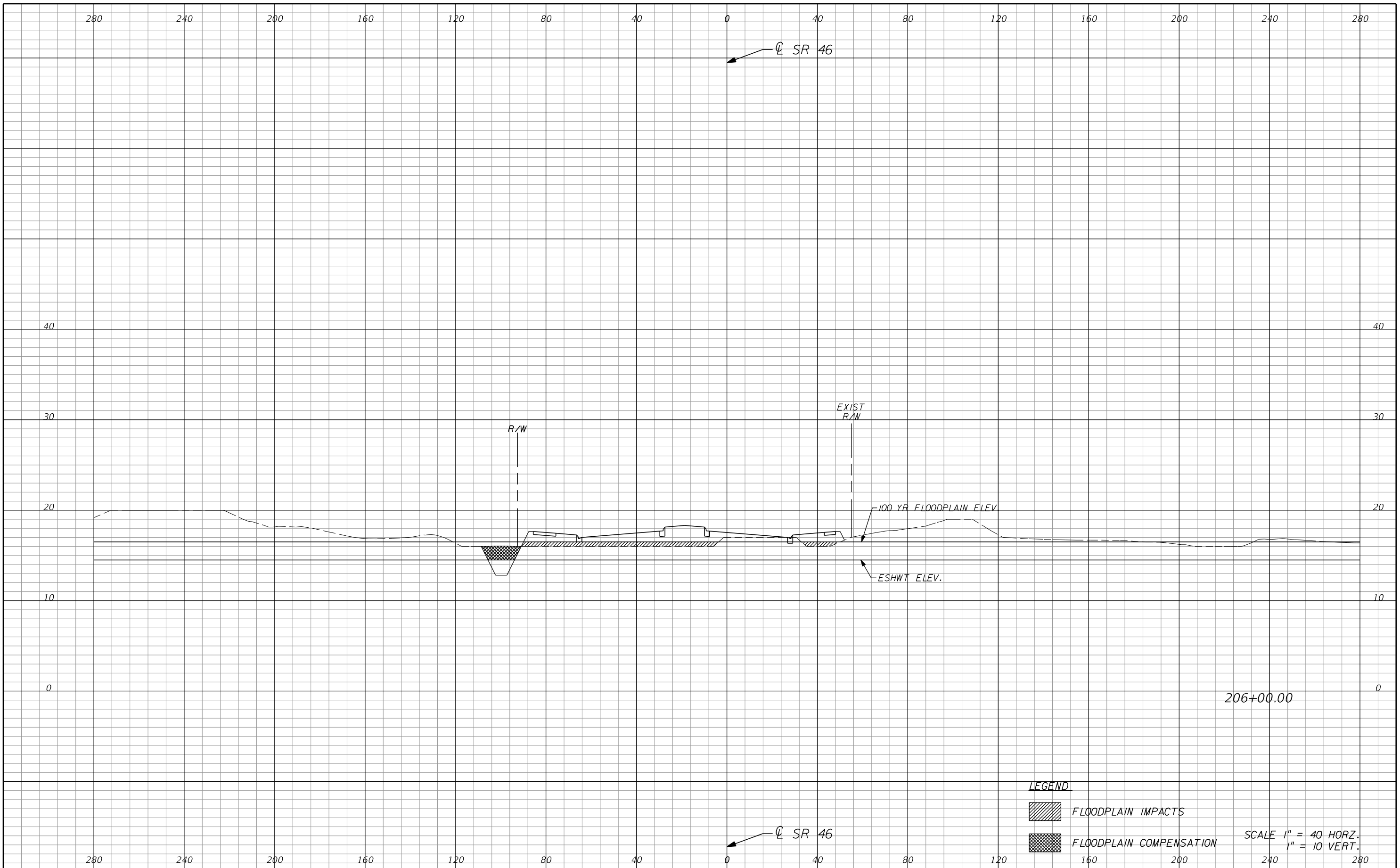
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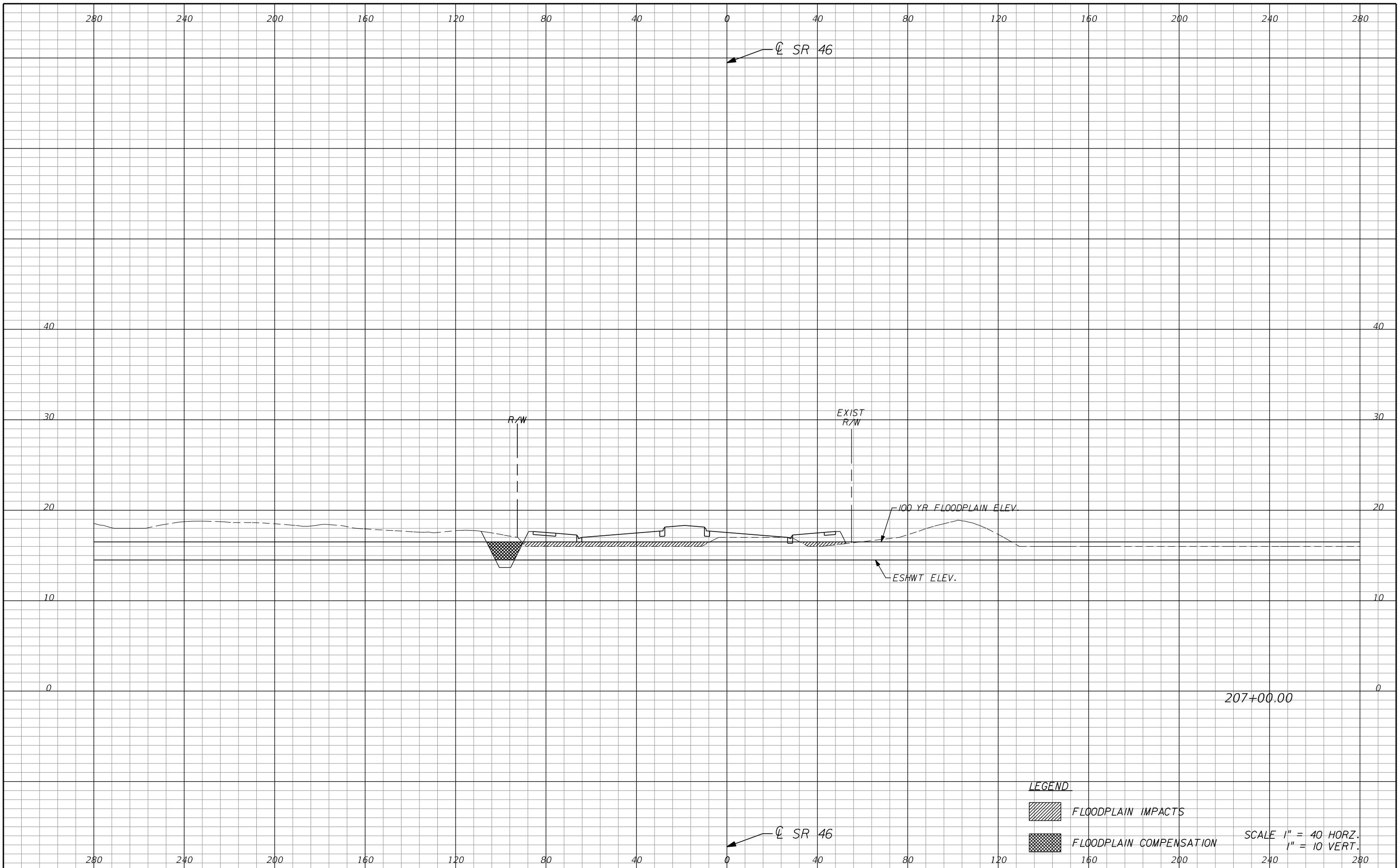
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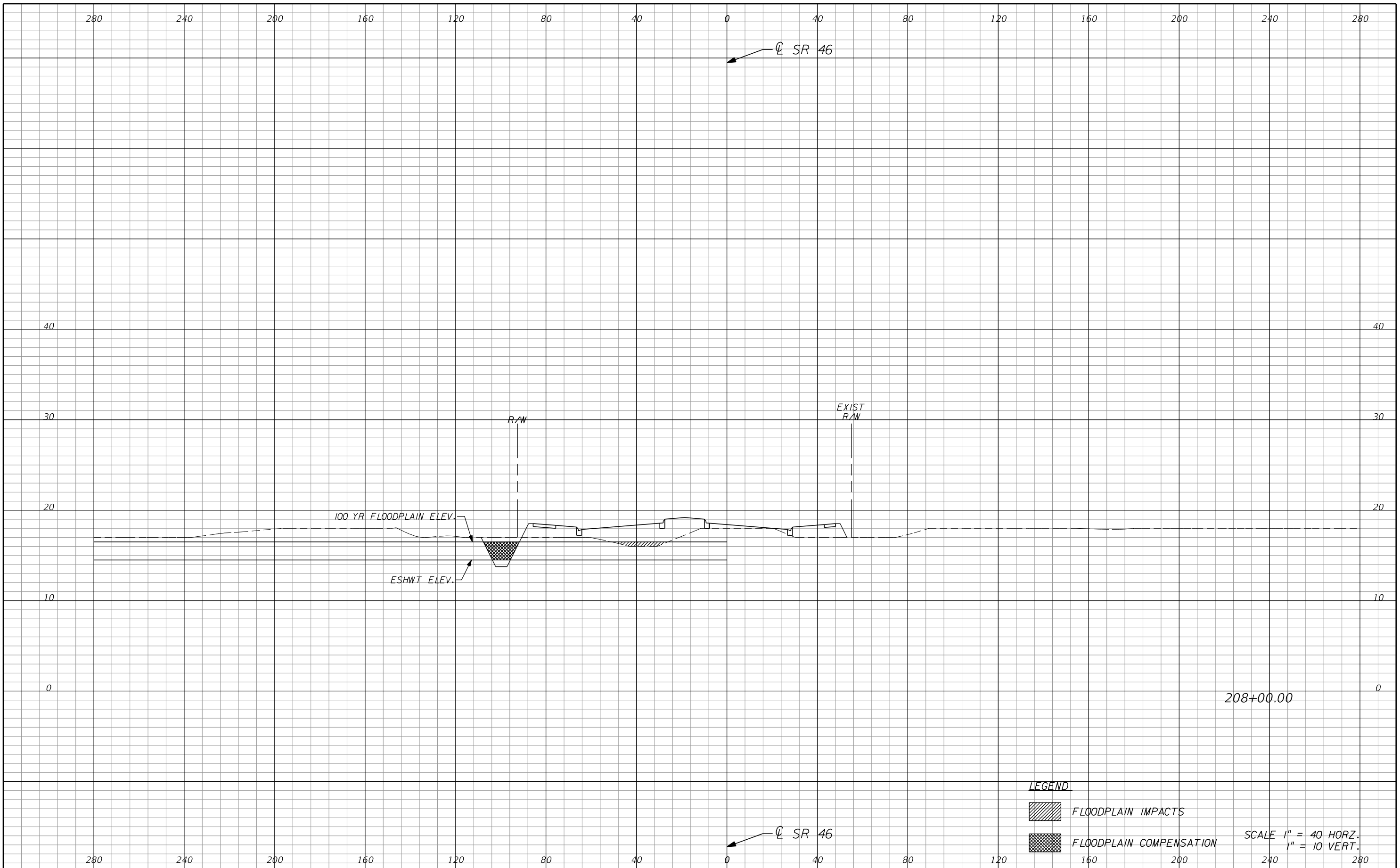
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CERTIFICATE OF AUTHORIZATION NO. 000002





STATE OF FLORIDA			
DEPARTMENT OF TRANSPORTATION		SEMINOLE COUNTY FLORIDA'S NATURAL CHOICE	
ROAD NO.	COUNTY	CIP #	FINANCIAL PROJECT ID
SR 46	SEMINOLE		

SR 46 PD&E
100 YR FLOODPLAIN IMPACTS
& COMPENSATION

SHEET NO.



LEGEND

-  FLOODPLAIN IMPACTS
-  FLOODPLAIN COMPENSATION

SCALE 1" = 40' HORZ.
1" = 10' VERT.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

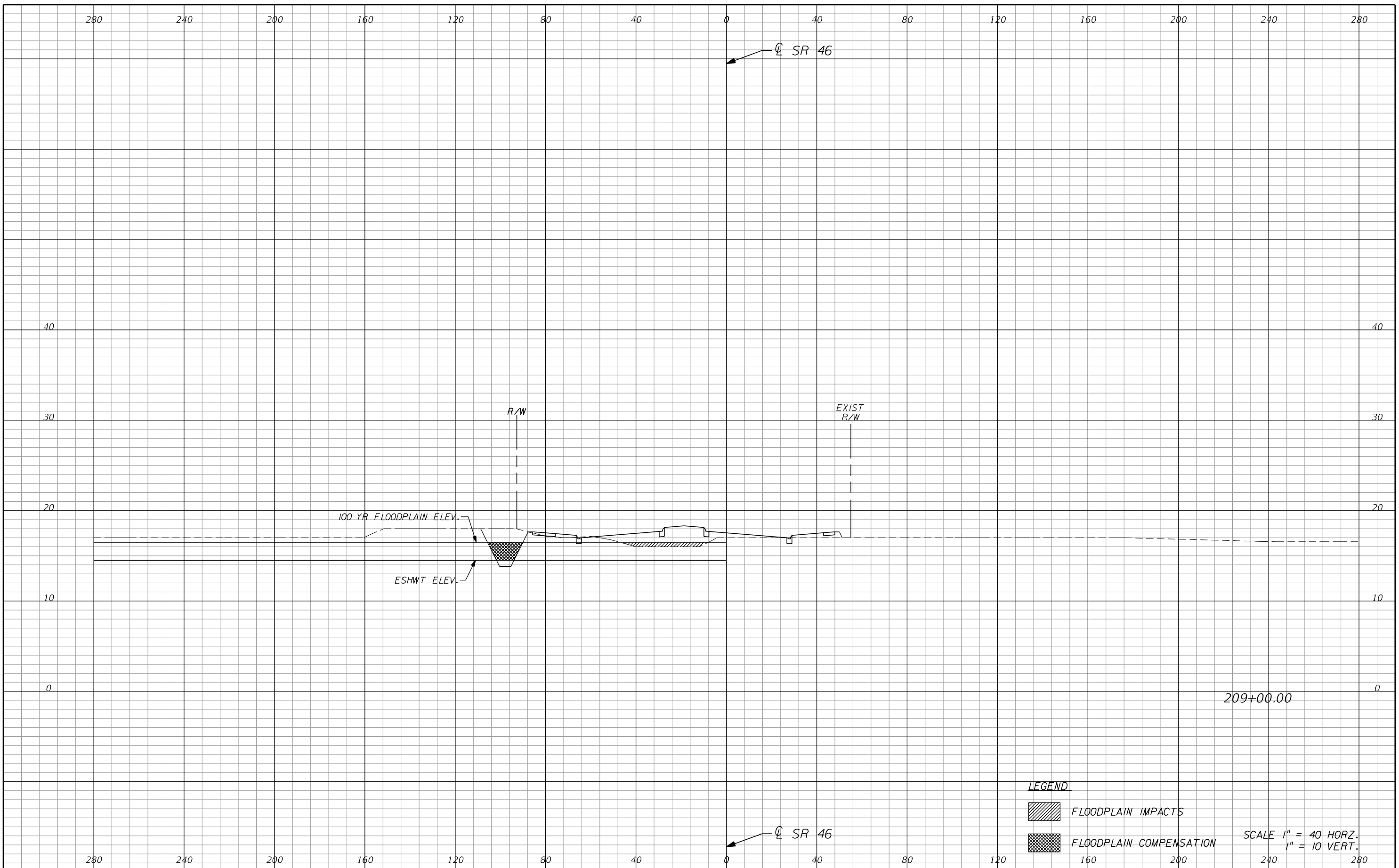
DANH T. LEE
 P.E., LICENSE NO. 68228
URS CORPORATION
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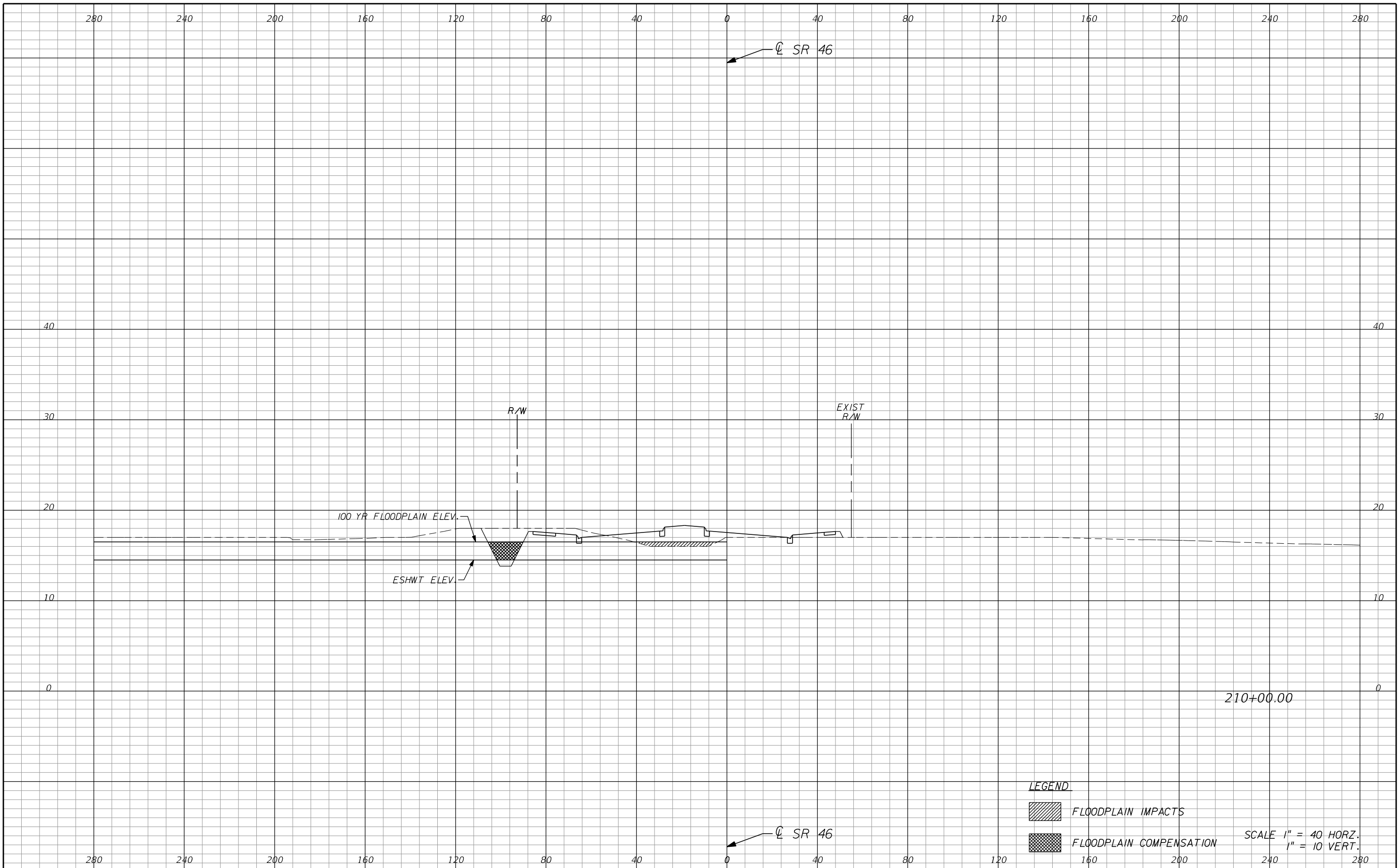


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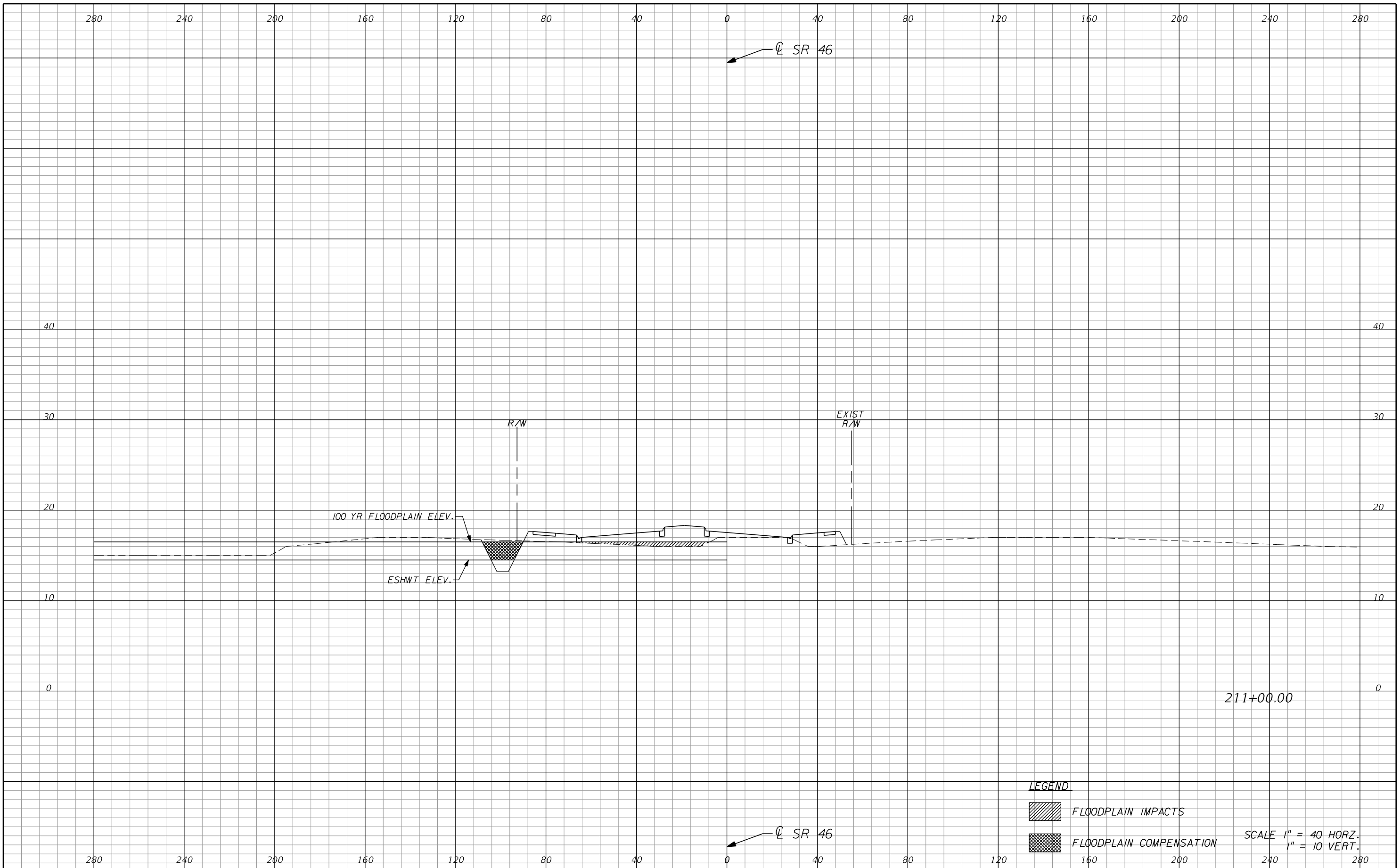
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APPENDIX F
Correspondence

RECORD OF CONVERSATION

DATE: Feb. 7, 2012 JOB #: 12721027

RECORDED BY: DTL CLIENT: Seminole County & FDOT

TALKED WITH: Jim Wood OF: FDOT Maintenance

NATURE OF CALL: Incoming Outgoing Meeting

ROUTE TO: _____

MAIN SUBJECT OF CONVERSATION: Drainage issues and base clearance

Danh Lee spoke with Jim Wood of FDOT Maintenance about any possible drainage concerns within the project corridor. The first item of concern, Jim mentioned, deals with an existing cross drain (CD-5 at mile post 7.97) and the fact that there is not positive drainage at the outfall. However, the outfall drains into private property and thus has not been fixed. Jim believes that the problem exist due to the grading or lack thereof, within the private property.

The only other concern is in the area of Mullet Lake Park Road. The east side of the roadway, north of SR 46 sometimes floods. FDOT has received calls in the past regarding flooding in this area. However, since the flooding occurs outside of FDOT right of way, there is not much they can do to fix the problem. Jim believes that flooding happens due to the ultimate outfall and the conveyance system(s) leading into St. Johns River. Specifically, the water is backing up into private property due to not having positive drainage / adequate grading required within certain private properties. Also, the conveyance systems may be undersized to handle the required flow capacities which would allow for the runoff to be maintained within the appropriate limits.

The discussion continued about field observations that were made on 2/2/12. During the field visit, I noticed that two (2) endwalls for the existing cross drains

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were buried. The endwall for CD-7, on the south side of the roadway was completely buried. The top of the endwall for CD-8, on the north side was only visible and the 24” RCP was completely underground. Jim stated that no problems existed in these areas and that the maintenance crew would be sent out soon to uncover the endwalls during this current dry season.

The next item of discussion was base clearance. I asked Jim if there were any issues regarding base clearance and / or any problems with deterioration of the existing road surface. Jim stated that there were no issues that he could recall. He did state that the road surface within the project corridor was recently milled and re-surfaced so no problems are currently visible. However, he stated that before the milling and re-surfacing project, there were some areas that had “alligator” cracking.