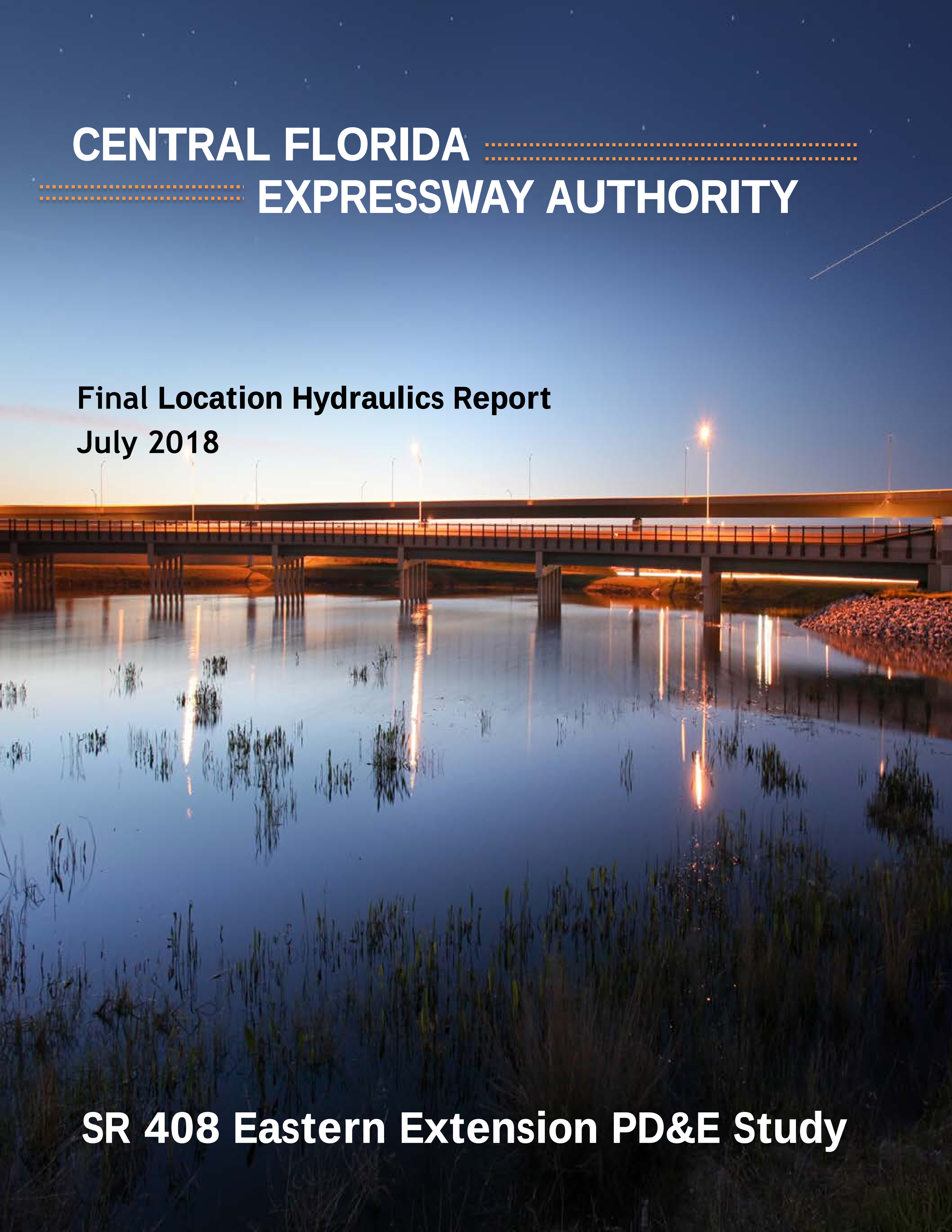

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Final Location Hydraulics Report

July 2018

SR 408 Eastern Extension PD&E Study

PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing engineering with Metric Engineering, Inc. and I have reviewed or approved the evaluation, findings, opinions and conclusions as reported for:

PROJECT:	**SR-408 Eastern Extension PD&E Study**
FINANCIAL PROJECT NUMBER:	**CFX-Project No. 408-254**
LOCATION:	**Orange County**
CLIENT:	**Central Florida Expressway Authority**

This Location Hydraulics Report (LHR) provides the results of a summary of data collection efforts, and limited calculation for the proposed cross drains and floodplain evaluations prepared for the conceptual analyses for the Project Development and Environment Study for SR-408 Eastern Extension project. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of hydrologic analysis and hydraulic engineering as applied through professional judgment and experience. This document is for planning purposes only and is not to replace any effort required for the final design.

Florida Registered Engineer:

Name: Chandra S Raman, P.E.

Registration Number: FL # 58740

Signature: Chandra Raman

Date: 7/24/18

CHANDRASEGARAN RAMAN
LICENSE
No. 58740
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

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PD&E – Project Development and Environment

LHR – Location Hydraulics Report

BHR – Bridge Hydraulics Report

PSR – Pond Siting Report

CFX – Central Florida Expressway Authority

SJRWMD – St. Johns River Water Management District

IDF – Intensity-Duration-Frequency

BMP – Best Management Practices

MSSW – Management and Storage of Surface Waters

FIRM – Flood Insurance Rate Map

FPL – Florida Power & Light Company

SR – State Road

EXECUTIVE SUMMARY

The purpose of the SR-408 Eastern Extension Project Development and Environment (PD&E) study is to develop a proposed improvement strategy that is technically sound, environmentally sensitive and publicly acceptable. As with every PD&E Study, emphasis has been placed on the development, evaluation and documentation of detailed engineering and environmental studies including data collection, conceptual design, environmental analyses, project documentation and the preparation of a Location Hydraulics Report (LHR). The project is located in Orange County, Florida.

The Central Florida Expressway Authority (CFX) is presently evaluating the potential to expand SR-408 from its current eastern terminus at SR-50, locally known as East Colonial Drive, to SR-520 in northeast Orange County. This new seven-mile eastern extension of SR-408 would constitute the first stage towards providing a west-east high-speed corridor with future connectivity to I-95; enhancing safety, capacity and mobility for the region and CFX's customers. After a comprehensive evaluation process of various typical sections, horizontal alignment combinations, and public involvement efforts, a recommended alignment was selected.

The proposed SR-408 Eastern Extension project is divided into three segments based on the land use characteristics. Segment 1 is more urban in nature and exhibits a higher traffic demand than Segments 2 and 3. Segment 1 is from the beginning of the SR-50/SR-408 interchange to Avalon Park Boulevard. Segments 2 and 3, beginning east of Avalon Park Boulevard to SR-520 at the east end of the study area, exhibit more of a rural tendency.

The purpose of this LHR is to identify and discuss the proposed cross drains throughout the project corridor. There are fourteen new cross drains identified for this project. The cross drains were sized appropriately using HY-8 program to minimize the impacts to flood elevations and limits of the floodplain. The cross drain analysis indicates the proposed structures will be able maintain hydraulic connectivity within the tributaries, wetlands or floodplains that the project crosses without significant increase in the existing flood elevation. Thus, the project will not affect existing flood heights or floodplain limits. This project will not cause significant change in the potential for interruption or termination of emergency service or emergency evacuation routes in the surrounding areas. Therefore, it has been determined that the encroachment due to the proposed roadway is not significant.

1.0 INTRODUCTION

The vision of this enhanced west-east corridor has been documented in prior concept studies prepared by CFX, including the SR-408 Eastern Extension Concept Development and Evaluation Study completed in 2008. The limits of this study generally extend from the current terminus of SR-408 at SR-50 to the vicinity of the SR-50/SR-520 intersection. The project location and vicinity are shown in **Appendix-A**. The proposed Typical Sections for Segment 1 and Segment 2/3 are provided in **Appendix-D**. The SR-408 Eastern Extension is one piece of Florida's Strategic transportation investments to support future growth and create connections between global trade activities, from the Orlando International Airport and the University of Central Florida to Cape Canaveral.

SR-50 is located within the project vicinity and is classified as a major arterial facility. SR-50 provides an important connectivity function between the east Orlando area to the west, and I-95 just south of Titusville to the east. As traffic continues to grow within the study area due to the projected development, it is essential to maintain adequate mobility for the region. A new expressway facility will not only improve mobility but significantly reduce the existing exposure to at-grade conflict points associated with traffic signals and local access issues. In summary, the proposed SR-408 Eastern Extension will greatly enhance Central Florida's regional expressway needs and provide the initial phase of the ultimate vision of an expressway connection from Orlando to I-95.

This report discusses and analyzes proposed cross drains throughout the project corridor. The proposed corridor impacts wetlands and floodplains, therefore the placement of cross drains is crucial to maintain the natural flow. A description of each proposed cross drain is located in Section 4.1 of this report. Exhibits showing proposed cross drains within wetlands and floodplains are in **Appendix-E**. Based on an assumed profile, the proposed culverts are shown along the existing ground based on a 1' contour tin file (**Appendix-F**).

2.0 CROSS DRAIN ANALYSIS METHODOLOGY AND DESIGN CRITERIA

The proposed project alignment is a new corridor. There are no existing cross drains along the proposed project corridor; therefore, the project will consist of all new cross drains. Cross drains were located strategically along the proposed SR-408 Eastern Extension corridor to maintain flow connectivity within the impacted wetlands, floodplains, and Econ River tributaries. There are a total of fourteen cross drains proposed along this new corridor. The flow rates for cross drains 1 through 4 were obtained from the Big Econ River Basin Stormwater Management Master Plan (**Appendix-I**). In accordance with the FDOT Drainage Design Guide for designing culverts, the Rational Method was used to conduct hydrologic analysis for cross drains 5 through 9. The Rational Method was used because the delineated drainage areas for each cross drain were less than 600 acres. Drainage areas were delineated by using a one foot Lidar contour map (St. Johns River Water Management District), existing drainage maps from SR-50 projects, and drainage maps from land development projects along the project corridor. The flow rates for cross drains 10 through 13 were obtained from the Bithlo Area Stormwater Management Master Plan (**Appendix-J**).

2.1 Contributing Flow Determination

Rational Method

- The Rational Method procedures require calculating a peak basin flow rate from the basin characteristics.
- The composite runoff coefficient was calculated based on the percentage of land use for residential, commercial, flat lawns, and woods/wetland areas per the FDOT Hydrology Handbook.
- Time of concentration was calculated using the TR-55 Method.
- The intensity for each storm event was calculated from the FDOT Intensity-Duration-Frequency (IDF) curve for Zone 7.
- The composite coefficient is only designed for a storm period of 10 years. Storm frequency factors were used to adjust the composite runoff coefficient for 25, 50, and 100 year storm events (**Appendix-H**, **Table B-5**).
- Frequency Factor for Return Period 500 year runoff coefficient is not provided in the FDOT Hydrology Handbook; therefore, a log-log graph was created in order to interpolate the peak discharge.
- The Rational Method should only be used for areas up to 600 acres.

2.2 Floodplains/Floodways Criteria

- The proposed project may not cause a net reduction in flood storage within the 10-year floodplain.
- Structures shall cause no more than a one-tenth (0.1) of a flood increase in the 100-year flood elevation 500-feet upstream.
- Proposed construction shall not cause a reduction in flood conveyance capabilities.
- Best Management Practices (BMP's) shall be employed to minimize velocity to avoid undue erosion.
- The design of encroachments shall be consistent with standards established by FEMA.

2.3 Culvert Design Criteria

The following criteria was drawn from the 2018 FDOT Drainage Manual. The following table provides the required storm events to be analyzed for each cross drain per the FDOT Drainage Manual and the FDOT Drainage Design Guide.

Table-1 Storm Frequency Criteria

Storm Event Frequency	Definitions
50-Year	Design Flood Event
100-Year	Base Flood Event
500-Year	Greatest Flood Event

- All cross drains, if applicable, shall be designed to have sufficient hydraulic capacity to convey the 50-year (Design Frequency) storm event. In accordance with the FDOT Drainage Manual, mainline interstate culverts should be designed for a frequency of 50 years (**Appendix-H**). All culverts shall be analyzed for the base flood (100 year).
- Backwater shall not significantly change land use values unless flood rights are purchased.
- The headwater for design frequency conditions shall be kept at or below the travel lanes.
- The highest tailwater elevation, which can reasonably be expected to occur coincident with the design storm event, shall be used (typically, crown of pipe is used at the outlet).
- The minimum culvert size is 18” or its equivalent size.
- The design of all cross culverts shall comply with the guidelines set forth in the FDOT Drainage Manual, Chapter 4.
- The flows and tailwater elevations used in this report are based on preliminary information. The culvert design will need to be reviewed for flows and tailwater elevations during the final design.

The criteria listed above was collected from the following applicable sources:

- FDOT Drainage Design Guide – Culvert Design (January 2018)
- FDOT Drainage Manual (January 2018)
- FHWA Code of Federal Regulation 23 CFR 650A
- SJRWMD Management and Storage of Surface Waters (MSSW) Permit Information Manual (October 2013)

2.4 Culvert Sizing

All cross drains were sized for a 100-year storm event even though the FDOT design criteria specifies a 50-year Design Frequency. The Big Econ River Basin Stormwater Management Master Plan and Bithlo Area Stormwater Management Master Plan only provided flows and stages for 5-year, 10-year, 25-year, and 100-year. The 50-year and 500-year flows were interpolated by a log-log graph. Since stages were not provided for the 50-year storm event, the 100-year flows and stages were used instead. The calculated 100-year backwater stage elevation from the HY-8 analysis was compared with the existing 100-year flood stage. Culvert trial sizes were determined by using the Manning’s Equation. The trial sizes were used to perform HY-8 analysis. While performing the overtopping analysis, the cross drains were appropriately sized to conform with the floodplain criteria in Section 2.2 of this report.

Manning's Equation

- The pipe length was measured from R/W to R/W for each cross drain.
- The change in flow line elevation from upstream to downstream was assumed to be 0.50 ft.
- Manning's "n" value of 0.012 was used.
- The 100-year flow rate for each cross drain was used.

HY-8

- The trial culvert size from the Manning's equation was used for the HY-8 analysis.
- The culvert size was adjusted to maintain backwater stage elevations below the 100-year stage elevation.
- The 10-year flow was the minimum flow, 50-year flow was the design flow, and 100-year flow was the maximum flow.
- The crown of the pipe/top of box culvert or existing SR-50 cross drain DHW elevations were used as the constant tailwater elevations.

3.0 EXISTING CONDITIONS

3.1 Soil Data

The NRCS Soil Survey of Orange County published by United States Department of Agriculture (USDA) has been reviewed for the project. The soil survey map and soil types found throughout the proposed corridor are shown in the complete NRCS USDA Soil Survey located in **Appendix-C**. In general, the superficial soils consist of fine sands, muck and poorly drained soil. The groundwater is at a depth of 0'-3.5' below the existing ground. Refer to **Table-2** below for the most occurring soils within the project area.

Table-2 USDA NRCS Soil Survey Information

Soil No.	Orange County USDA Soil Name	Depth to Water Table (inches)	Hydrologic Soil Group
3	Basinger Fine Sand	0	A/D
15	Felda Fine Sand	0 to 6	A/D
20	Immokalee Fine Sand	6 to 12	B/D
34	Pomello Fine Sand	24 to 42	A
37	St. Johns Fine Sand	6 to 12	B/D
42	Sanibel Muck	0	A/D
44	Smyrna-Smyrna, Wet, Fine Sand	6 to 18	A/D
51	Wabasso Fine Sand	6 to 18	B/D
53	Wauberg Fine Sand	0 to 6	D
54	Zolfo Fine Sand	24 to 42	A

3.2 Land Use

The existing land use along the proposed SR-408 Eastern Extension corridor consists mostly of residential developments, commercial properties, and undeveloped areas. The residential areas consist of both multi-family and single-family residences. There are a few commercial properties along the proposed corridor as well. The undeveloped areas are mostly wetlands and upland forests with conservation easements. Please refer to **Appendix-A** for a Land Use map.

3.3 Existing Cross Drains

Considering this is a new alignment, there are not any existing cross drains or bridge structures for review. However, existing cross drains upstream and downstream of the proposed alignment were taken into consideration to maintain functionality and to verify the recommended improvements do not adversely impact the overall drainage function. Refer to **Table-3** for existing SR-50 cross drain information. The SR-50 Straight Line Diagram is in **Appendix-N** and identifies each SR-50 cross drain**.** The culvert size and 50-Year DHW elevations were obtained from the construction plans in **Appendix-P**, **Appendix-Q**, and **Appendix-R**. There is no evidence of scour or sedimentation of any existing cross drains along SR-50. Refer to **Appendix-S** for photos of the existing SR-50 cross drains.

Table-3 Existing SR-50 Cross Drain General Information

Cross Drain ID	Pipe Description	50-Year DHW EL (ft)	Date of Construction
SR-50 CD-1	2-8’x6’ CBC	58.57	2012
SR-50 CD-2	2-24” RCP	53.53	2012
SR-50 CD-3	2-12.95’x8.5’ CBC	50.04	2012
SR-50 CD-4	1-30” RCP	54.68	2012
SR-50 CD-5	3-10’x6’ CBC	43.70	1960
SR-50 CD-6	3-36” RCP	59.10	1960
SR-50 CD-7	1-4’x4’ CBC & 1-54” RCP Jointed	59.10	1960
SR-50 CD-8	1-30” RCP	66.50	1960
SR-50 CD-9	1-8’x7’ CBC	54.80	1960
SR-50 CD-10	1-10’x4’ CBC	60.80	1960
SR-50 CD-11	1-24” RCP	61.60	1960

4.0 PROPOSED CONDITIONS

The project corridor will cross through residential homes, commercial businesses, wetlands, wooded areas, and Econ River tributaries. Most tributaries west of the Econ River which cross the proposed SR-408 Eastern Extension corridor flow north and eventually into the Econ River. There is one slough, where UCF is located north of SR-50, which flows south into one of the Econ River tributaries and ultimately flows north to the Econ River. All tributaries east of the Econ River, which cross the proposed SR-408 Eastern Extension corridor, flow south and ultimately flow into the Econ River. Refer to the Drainage Basin Map located on **Page-17**.

4.1 Proposed Cross Drains

The roadway geometry is limited in order to minimize impacts and meet the requirements for the proposed design speed. Different interchange layouts and considerations were made to provide alternative conceptual designs. Fourteen cross drain locations were selected once the alignment and the most effective interchange layouts were identified. The proposed cross drain locations were also chosen based on the natural flow of the land from the surrounding floodplains and wetlands. The proposed SR-408 Eastern Extension corridor will have floodplain impacts along most of the corridor. These floodplain impacts will be mitigated by routing this volume to the project's proposed storm water management facilities, and roadside swales. Refer to **Table-4** for calculated culvert size, flow direction, and floodplain status. Refer to **Table-5** for flood data and **Table-6** for 100-year flows, 100-year stage elevations, tailwater elevations, and backwater stage elevations. Refer to **Appendix-G** for proposed cross drain calculations and HY-8 analyses.

Table-4 Proposed SR-408 Cross Drain General Information

Cross Drain ID	Pipe Description	Flow Direction	Receiving Water Body	Within Floodplain (Yes/No)
CD-1	3-11’x5’ CBC	North	Unnamed Tributary(1)	Yes (Zone A)
CD-2	4-10’x5’ CBC	South	Unnamed Tributary(1)	Yes (Zone A)
CD-3	3-11’x7’ CBC	North	Unnamed Tributary(1)	Yes (Zone A)
CD-3A	1-30” RCP	South	Unnamed Tributary(2)	Yes (Zone A)
CD-4	2-8’x4’ CBC	North	Unnamed Tributary(2)	Yes (Zone A)
CD-5	2-72” RCP	North	Floodplain	Yes (Zone A)
CD-6	2-72” RCP	North	Floodplain	Yes (Zone A)
CD-7	2-48” RCP	South	Wetland	Yes (Zone X)
CD-8	1-10’x5’ CBC	South	Wetland	Yes (Zone X)
CD-9	1-72” RCP	South	Floodplain	Yes (Zone AE)
CD-10	2-6’x4’ CBC	South	Channel E	Yes (Zone AE)
CD-11	2-24” RCP	South	Channel K	Yes (Zone A)
CD-12	2-8’x4’ CBC	South	Channel KE	Yes (Zone A)
CD-13	1-48” RCP	South	Channel M	Yes (Zone X)

Table-5 Flood Data Summary Table

Structure Number	Proposed Size		Design Flood 50-Yr Storm Event		Base Flood 100-Yr Storm Event		Overtopping Flood			Overtopping EL (ft)
	Size	Length (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Discharge (cfs)	Stage (ft)	Storm Frequency	
CD-1	3-11'x5' CBC	485	1160.00	51.97	1322.00	52.45	4902.10	88.87	>500 Yr	88.87
CD-2	4-10'x5' CBC	302	1499.00	51.91	1690.00	52.41	5709.63	85.27	>500 Yr	85.27
CD-3	3-11'x7' CBC	400	1770.00	52.05	2000.00	52.51	6240.70	80.88	>500 Yr	80.88
CD-3A	1-30" RCP	303	5.76	57.88	7.69	57.95	84.31	75.41	>500 Yr	75.41
CD-4	2-8'x4' CBC	456	427.00	52.03	496.00	52.95	1727.16	82.31	>500 Yr	82.31
CD-5	2-72" RCP	374	226.00	51.51	312.00	52.46	1603.28	84.25	>500 Yr	84.25
CD-6	2-72" RCP	427	190.00	52.10	259.00	52.91	1588.91	84.64	>500 Yr	84.64
CD-7	2-48" RCP	129	165.00	61.86	231.00	63.17	384.40	68.47	<500 Yr	68.47
CD-8	1-10'x5' CBC	447	223.00	54.27	309.00	54.96	1356.63	84.68	>500 Yr	84.68
CD-9	1-72" RCP	300	153.00	43.51	212.00	44.45	532.70	54.79	>500 Yr	54.79
CD-10	2-6'x4' CBC	310	353.00	44.11	398.00	44.69	896.98	55.97	>500 Yr	55.97
CD-11	2-24" RCP	395	21.00	58.98	24.00	59.28	107.98	83.94	>500 Yr	83.94
CD-12	2-8'x4' CBC	522	373.00	54.57	409.00	54.89	1405.58	75.36	>500 Yr	75.36
CD-13	1-48" RCP	325	42.00	56.50	51.00	56.73	173.94	64.50	>500 Yr	64.50

** The flows and tailwater elevations used in this report are based on preliminary information. The culvert design will need to be reviewed for flows and tailwater elevations during the final design.

Table-6 Summary of Proposed SR-408 Cross Drains (HY-8 Analysis)

Cross Drain	HY-8 Cross Drain Size	100-Year Flow (cfs)	Existing Ground EL (ft)	Tailwater EL (ft)	Existing 100-Year EL (ft)*	Backwater Stage Based on HY-8 (ft)
CD-1	3-11'x5' CBC	1322	51.00	50.04	52.70[1]	52.45
CD-2	4-10'x5' CBC	1690	49.38	50.04	52.70[1]	52.41
CD-3	3-11'x7' CBC	2000	45.00	50.04	52.70[1]	52.51
CD-3A	1-30” RCP	7.69	57.71	57.80	58.00	57.95
CD-4	2-8'x4' CBC	496	49.00	50.40	53.70[1]	52.95
CD-5	2-72” RCP	312	49.00	49.73	53.04[3]	52.46
CD-6	2-72” RCP	259	51.00	49.73	53.04[3]	52.91
CD-7	2-48” RCP	231	57.40	60.50	63.56	63.17
CD-8	1-10'x5' CBC	309	48.51	53.51	55.03	54.96
CD-9	1-72” RCP	212	37.50	42.50	45.00	44.45
CD-10	2-6'x4' CBC	398	38.00	42.00	45.40[2]	44.69
CD-11	2-24" RCP	24	58.00	58.00	59.50[2]	59.28
CD-12	2-8'x4' CBC	409	51.00	53.00	55.50[2]	54.89
CD-13	1-48" RCP	51	55.00	56.00	57.10[2]	56.73

* The existing 100-year elevations from the sources listed below were converted from NGVD to NAVD by subtracting 1.1 ft.

[1] Big Econ Stormwater Management Master Plan (**Appendix-I**)

[2] Bithlo Area Stormwater Management Master Plan (**Appendix-J**)

[3] Waterford Trails Construction Plans from Harling Locklin & Associates, Inc. (**Appendix-L**)

** The flows and tailwater elevations used in this report are based on preliminary information. The culvert design will need to be reviewed for flows and tailwater elevations during the final design.

CD-1

The proposed alignment will impact wetlands; therefore, CD-1 was strategically placed to maintain the flow connectivity between wetlands and the Econ River tributary that flows south through proposed CD-2 and then north through proposed CD-3. The culvert will convey runoff from one side of the road to the other while replicating the natural flow of the tributary. The 50-Year DHW elevation of 50.04 ft from SR-50 CD-3 (**Table-3**) was used as the tailwater for this cross drain. The 100-year elevation of 52.70 ft and 100-year flow of 1322 cfs from the Big Econ River Basin Stormwater Management Master Plan (Model ID: BEWL015X, **Appendix-I**) were used to size this cross drain. The calculated backwater stage elevation of 52.45 ft from HY-8 analysis is less than the existing 100-year flood elevation of 52.70 ft. The proposed culvert sizes from the HY-8 analysis are 3-11'x5' concrete box culverts.

CD-2

CD-2 was proposed in order to maintain flow connectivity of the existing slough, which drains from the north to the south into a tributary. The tributary flows north through proposed CD-3 and drains into the Econ River. The 50-Year DHW elevation of 50.04 ft from SR-50 CD-3 (**Table-3**) was used as the tailwater for this cross drain. The 100-year elevation of 52.70 ft and 100-year flow of 1690 cfs from the Big Econ River Basin Stormwater Management Master Plan (Model ID: BEWL020C, **Appendix-I**) were used to size this cross drain. The calculated backwater stage elevation of 52.41 ft from HY-8 analysis is less than the existing 100-year flood elevation of 52.70 ft. The proposed culvert sizes from the HY-8 analysis are 4-10'x5' concrete box culverts.

CD-3

CD-3 maintains flow connectivity to a tributary, which flows north into the Econ River. The 50-Year DHW elevation of 50.04 ft from SR-50 CD-3 (**Table-3**) was used as the tailwater for this cross drain. The 100-year elevation of 52.70 ft and 100-year flow of 2000 cfs from the Big Econ River Basin Stormwater Management Master Plan (Model ID: BEWL030C, **Appendix-I**) were used to size this cross drain. The calculated backwater stage elevation of 52.51 ft from HY-8 analysis is less than the existing 100-year flood elevation of 52.70 ft. The proposed culvert sizes from the HY-8 analysis are 3-11'x7' concrete box culverts.

CD-3A

The basin area is approximately 2.35 acres. A time of concentration of 10 minutes was assumed. The crown of the pipe was used as the tailwater. The DHW elevation of 58.00 ft was obtained from SJRWMD Permit 100527 (**Appendix-X**). The calculated backwater stage elevation of 57.95 ft from HY-8 analysis is less than the existing 100-year flood elevation of 58.00 ft; therefore. The 100-year flow of 7.69 cfs was calculated using the Rational Method. The proposed culvert size from the HY-8 analysis are 1-30" RCP. The culvert will convey runoff from the wetlands that are severed by the proposed corridor, which flows southeast to the tributary that flows north and drains into the Econ River.

CD-4

The culverts will maintain flow connectivity to a tributary, which flows north into the Econ River. The elevation from the top of the box culvert was used as the tailwater. The 100-year elevation of 53.70 ft and the 100-year flow of 496 cfs from the Big Econ River Basin Stormwater Management Master Plan (Model ID: BEBE195X, **Appendix-I**) were used to size this cross drain. The calculated backwater stage elevation of 52.95 ft from HY-8 analysis is less than the existing 100-year flood elevation of 53.70 ft. The proposed culvert sizes from the HY-8 analysis are 2-8'x4' concrete box culverts.

CD-5

The basin area is approximately 109.03 acres. A time of concentration of 1.39 hours was calculated for this basin area using the TR-55 method. The elevation from the top of the box culvert was used as the tailwater. The 100-year elevation of 53.04 ft was obtained from SJRWMD Permit 70394-1 (**Appendix-L**). The calculated backwater stage elevation of 52.46 ft from HY-8 analysis is less than the existing 100-year flood elevation of 53.04 ft. The 100-year flow of 312 cfs was calculated using the Rational Method. The proposed culvert sizes from the HY-8 analysis are 2-72" pipes. The culvert will convey runoff from the wetlands to the tributary which flows north and drains into the Econ River. There is forty-six feet of space from the edge of the proposed ramp to the right-of-way line; therefore, a by-pass swale can be constructed in order to provide flow connectivity from CD-5 to CD-6 (**Appendix-E, Page-E3**). In addition to the one foot contour map, two drainage maps (**Appendix-O** and **Appendix-R**) were used to determine the basin area.

CD-6

CD-6 will maintain flow connectivity between the wetlands that will be severed by the proposed SR-408 Eastern Extension alignment. The runoff from the wetlands flows north and drains into the Econ River. The basin area is approximately 119.01 acres. The time of concentration was calculated for this basin area using the TR-55 method. The total time of concentration for this basin area is 1.44 hours. The elevation from the top of the box culvert was used as the tailwater. The 100-year elevation of 53.04 ft was obtained from SJRWMD Permit 70394-1 (**Appendix-L**). The calculated backwater stage elevation of 52.91 ft from HY-8 analysis is less than the existing 100-year flood elevation of 53.04 ft. The 100-Year flow of 259 cfs was calculated using the Rational Method. The proposed culvert sizes from the HY-8 analysis are 2-72" pipes. There is forty-six feet of space from the edge of the proposed ramp to the right-of-way line; therefore, a by-pass swale can be constructed in order to provide flow connectivity from CD-5 to CD-6 (**Appendix-E, Page-E3**). In addition to the one foot contour map, a regional drainage map (**Appendix-O**) was used to determine to the basin area.

CD-7

CD-7 will provide flow connectivity between wetlands that will be severed by the proposed CR 419 (Chuluota Road) corridor. The runoff flows south through proposed CD-8 and drains into the Econ River. The basin area is approximately 77.95 acres. A time of concentration of 1.54 hours was calculated for this basin area using the TR-55 method. The crown of pipe was used as the tailwater. The 100-year elevation of 63.56 ft was obtained from SJRWMD Permit #27625-4 (**Appendix-M**). The calculated backwater stage elevation of 63.17 ft from HY-8 analysis is less than the existing 100-year flood elevation of 63.56 ft. The 100-year flow of 231 cfs was calculated using the Rational Method. The proposed culvert sizes from the HY-8 analysis are 2-48" RCP. A one foot contour map was used to delineate the basin area for this cross drain. This basin area consists of single-family residential homes, several commercial businesses located on SR-50, several ponds, and woodland areas.

CD-8

The culvert will convey runoff from the severed wetlands to the tributary which flows south and drains into the Econ River. The total basin area for CD-8 is 121.44 acres and consists of two basin areas, which includes the basin area for CD-7. The time of concentration was calculated for this basin area using the TR-55 method. The total time of concentration calculated for this basin area is 1.68 hours. The elevation from the top of the box culvert used as the tailwater. The 100-year elevation of 55.03 ft was averaged from two 100-year elevations of 63.56 ft from existing Pond 200 and 46.50 ft from existing Pond 100 (SJRWMD Permit #27625-4, **Appendix-M**). CD-8 is located between existing Pond 200 and existing Pond 100. The calculated backwater stage elevation of 54.96 ft from HY-8 analysis is less than the existing 100-year flood elevation of 55.03 ft. The 100-year flow of 309 cfs was calculated using the Rational Method. The proposed culvert size from the HY-8 analysis is a single 10'x5' concrete box culvert. A one foot contour map was used to delineate the basin area for this cross drain. This basin area consists of single-family residential homes, several commercial businesses located on SR-50, several ponds, and woodland areas.

CD-9

The basin area is approximately 75.82 acres. A time of concentration of 1.66 hours was calculated for this basin area using the TR-55 method. The calculated flow rate for a 100-year storm event is 212 cfs. The 100-year flood elevation of 45.00 ft was obtained from the FEMA Flood Map (**Appendix-B**). The top of the box culvert was used as the tailwater for this culvert. The calculated backwater stage elevation of 44.45 ft from HY-8 analysis is less than the existing 100-year flood elevation of 45.00 ft. The proposed culvert size from the HY-8 analysis is a single 72" RCP. The culvert will convey runoff from the wetlands to the tributary which flows south and drains into the Econ River. A one foot contour map was used to delineate the basin area for this cross drain.

CD-10

CD-10 will maintain flow connectivity from Channel E that flows south into the Econ River. The proposed alignment interrupts the natural flow of Channel E; therefore, culverts will be strategically placed where the proposed corridor and the channel intersect. The elevation from the top of the box culvert was used as the tailwater. The 100-year stage elevation of 45.40 ft and 100-Year flow of 398 cfs for Channel E (Node ID: NE-020, **Appendix-J**) from the Bithlo Area Stormwater Management Master Plan were used to size this cross drain. The calculated backwater stage elevation of 44.69 ft from HY-8 analysis is less than the existing 100-year flood elevation of 45.40 ft. The proposed culvert sizes from the HY-8 analysis are 2-6’x4’ concrete box culverts.

CD-11

CD-11 will provide flow connectivity between a wetland and Channel K that will be severed by the proposed SR-408 Eastern Extension corridor. The proposed cross drain location is on an existing wetland that is east of CR13. The crown of pipe was used as the tailwater. The proposed location of CD-11 lies directly on a Wetland East of CR13 (Node ID: NK-130, **Appendix-J**) from the Bithlo Area Stormwater Management Master Plan. The wetland has a 100-year stage elevation of 59.50 ft and a 100-year flow of 24 cfs, which were used to size this cross drain. The calculated backwater stage elevation of 59.28 ft from HY-8 analysis is less than the existing 100-year flood elevation of 59.50 ft. The proposed culvert sizes from the HY-8 analysis are 2-24” pipes.

CD-12

The new alignment interrupts the natural flow of Channel KE. To maintain the natural flow connectivity of Channel KE, concrete box culverts will be strategically placed where the proposed roadway and channel intersect. The culverts will convey runoff from one side of the road to the other as it flows south towards the Econ River. The elevation from the top of the box culvert was used as the tailwater. The 100-year stage elevation of 55.50 ft and 100-Year flow of 409 cfs for Channel KE (Node ID: NKE-080, **Appendix-J**) from the Bithlo Area Stormwater Management Master Plan were used to size this cross drain. The calculated backwater stage elevation of 54.89 ft from HY-8 analysis is less than the existing 100-year flood elevation of 55.50 ft. The proposed culvert sizes from the HY-8 analysis are 2-8’x4’ concrete box culverts. The existing upstream pipe size is a single 10’x4’ concrete box culvert, therefore, the calculated culvert sizes of 2-8’x4’ CBC are larger than the existing upstream culvert and will not restrict flow.

CD-13

The new alignment interrupts the natural flow of Channel M. To maintain the natural flow of Channel M, CD-13 will be strategically placed where the proposed roadway and channel intersect. This pipe will convey runoff from Channel M to the existing pond M-1. The crown of pipe was used as the tailwater. The 100-year stage elevation of 57.10 ft and 100-Year flow of 51 cfs for Channel M (Node ID: NM-070, **Appendix-J**) from the Bithlo Area Stormwater Management Master Plan were used to size this cross drain. The calculated backwater stage elevation of 56.73 ft from HY-8 analysis is less than the existing 100-year flood elevation of 57.10 ft. The proposed culvert size from HY-8 is a single 48” pipe. Pond M-1 will also be modified due to the proposed alignment. Please refer to **Appendix-K** for oversized drawings of pond M-1.

4.2 Floodplain Impacts

The project will impact the 100-year floodplain in three different ways:

1) Longitudinal roadway widening impacts resulting from filling the floodplain areas associated with Econ River and its tributaries.
2) Impact due to proposed pond locations in floodplain.
3) Impact due to proposed cross drains in floodplain.

The longitudinal impact due to the recommended SR-408 Eastern Extension alignment cannot be avoided. During the final design phase of the project, every effort should be taken to minimize floodplain impacts. During the design phase, floodplain impacts should be mitigated by routing to proposed stormwater management facilities and roadside swales. Also, a Bridge Hydraulics Report (BHR) will be prepared during the design phase to document the hydraulic impacts of the recommended SR-408 Eastern Extension alignment.

The FEMA’s Flood Insurance Rate Map (FIRM) for Orange County shows that a portion of the project lies within the 100-year floodplain areas Zone AE (100 year Base flood elevations are provided) and Zone A (100 year base flood elevations are not provided, areas with 1% change of flooding) . Most of the project lies within flood Zone X (Areas of minimal flood hazard and above the 500-year flood zone). FEMA Map No. 12095C0280F, 129095C0285F, 12095C0295F and 12095C0315F, provide flood information for the project. Floodplain impact will occur throughout the project corridor and includes the Econ River and its tributaries. Please refer to **Appendix-A** for a FEMA exhibit and **Appendix-B** for a FEMA Flood Insurance Rate Map.

The total floodplain impact due to roadway fill for the entire proposed project corridor is 100.28 ac-ft. Available compensation in the proposed stormwater ponds and floodplain compensation ponds are 107.47 ac-ft. Please refer to Table-7 in the PSR for a summary of floodplain impacts and compensation. The dredge and fill volume are based on limited information available during the PD&E study. A detail evaluation has to be done during the final design. Based on the preliminary evaluation the project will provide more floodplain compensation than the impact. Therefore, a cup for cup compensation is provided by the project.

Two floodplain compensation pond sites were identified for this project in Basin 11C. The pond sites are Pond 11C3 and Pond 11C4. Both Pond 11C3 and Pond 11C4 are selected as the recommended floodplain compensation ponds. Beside this two floodplain compensation ponds, several stormwater ponds located adjacent to floodplains will also provide floodplain compensation. Please refer to Table-7 in the PSR. At certain segments of the project, for example at Basin 11C, the roadway profile is low enough to provide floodplain compensation in the swales; this option should be evaluated during the design phase.

Runoff from within the corridor will be collected and conveyed to stormwater management facilities; therefore, reducing the overall impact to the remaining floodplains. The preliminary hydraulic evaluation indicates the flood elevation and limits will not change significantly; therefore, it is assumed that the project will not have a significant impact and the encroachment will be minimal.

4.3 Project Classification

The floodplain is in a medium density, semi-urbanized area and the encroachments are classified as “minimal”. Minimal encroachment of a floodplain occurs when there is 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 FDOT drainage design standards and following the Water Management procedures to achieve results that will not increase or significantly change the flood elevation and the floodplain limits.

4.4 Flooding History and Maintenance Concern

In a phone interview with FDOT maintenance staff at the Oviedo Operations Center on 7/8/2016; there are no areas of flooding concern along the SR-50 corridor. The staff member Mike Danos mentioned that there have been no reports of flooding or overtopping within the SR-50 corridor. The proposed SR-408 Eastern Extension alignment is located just south of SR-50. Due to the close proximity of the proposed SR-408 Eastern Extension project to existing SR-50, flooding history of SR-50 will be used as a comparison for this project. Future investigation regarding flooding concerns at the proposed SR-408 Eastern Extension project corridor should be conducted during the final design.

5.0 BRIDGE HYDRAULICS EVALUATION

Bridges are proposed at the Econ River and at a major Econ River Tributary (Channel A) just east of the FPL Transmission Line (Sta. 660+00). Both proposed bridges will maintain flow conveyance in the Econ River and its major tributary. Bridge Hydraulic Reports for these proposed bridges shall be prepared during the design phase. The proposed Econ River Bridge will span over the river without impacting the floodplain or wetland. Please refer to the Bridge Analysis Report for the determination of bridge length, span and the pier locations. There is minimal impact to the floodplain due to the bridge piers. Refer to the Drainage Basin Map on **Page-17**, Econ River Basin Map on **Page-18**, Floodplain and Wetland Exhibits in **Appendix-E**, and Bridge Profiles in **Appendix-F**. The flows and stages in **Table-7** for the Econ River Bridge were obtained from the Big Econ River Stormwater Management Master Plan (Model ID: BEBE160X, **Appendix-I**). The flows and stages in **Table-7** for the Econ River Tributary Bridge were obtained from the Bithlo

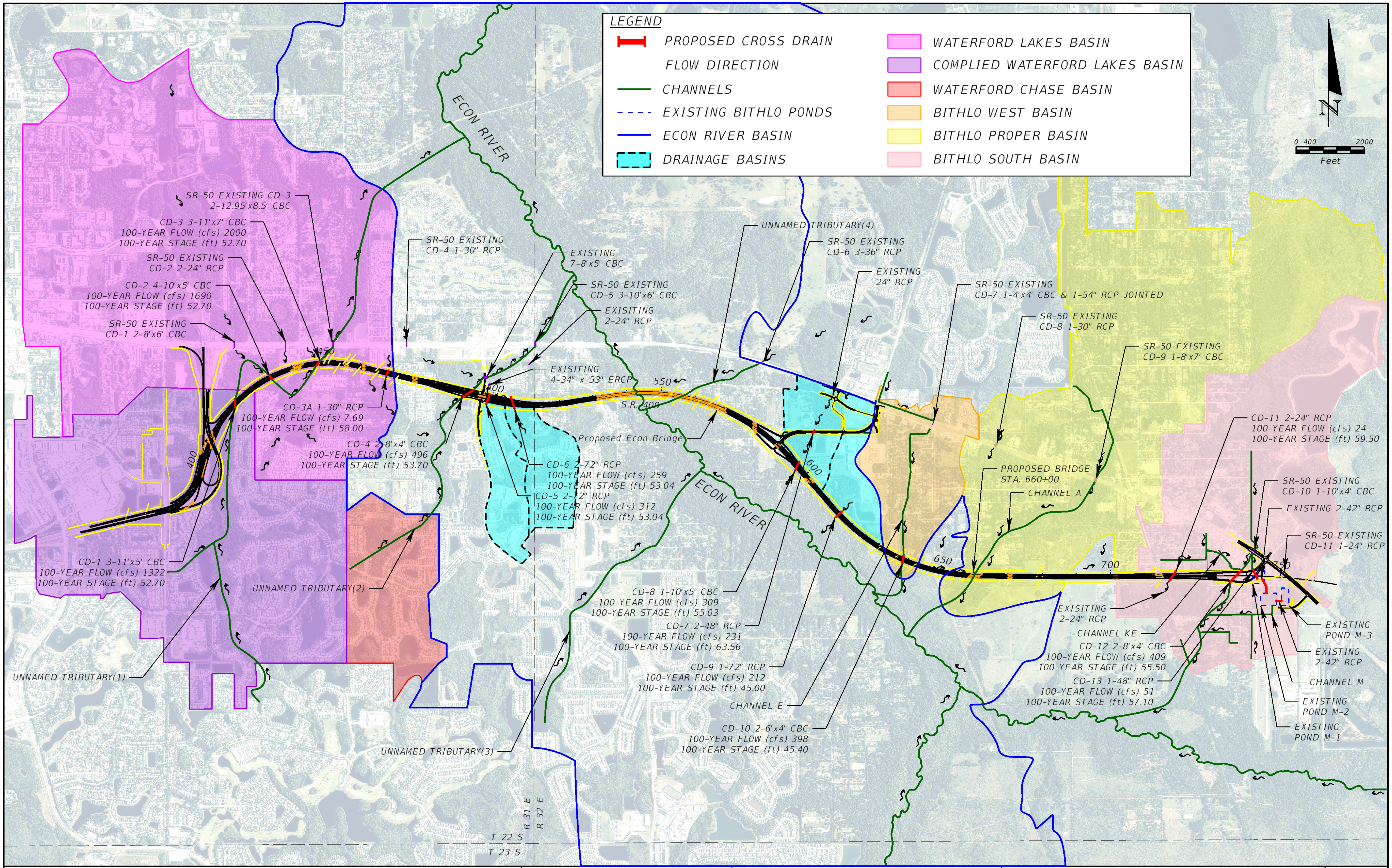
Area Stormwater Management Master Plan (Node ID: NA-060, **Appendix-J**). The Econ River Tributary Bridge will need to account for additional runoff from a small area between Station 649+50 to 651+00. It is assumed that the proposed bridge over the Econ River will not increase the flood stage or the flood limits. Minor floodplain impacts are anticipated due to the bridge pier placement. Overall, insignificant impacts are anticipated at the Econ River. During the design phase, a FEMA No-Rise Certification should be assessed.

Table-7 Proposed SR-408 Bridge Structure Information

Bridge Structure	100-Year Flow (cfs)	100-Year EL (ft)	Bridge Low Member EL (ft)	Existing Ground EL (ft)	Bridge Clearance (ft)	Bridge Length (ft)
Econ River	10360	42.20	74.41	31.00	42.20	3820
Econ River Tributary (Channel A)	697	48.30	63.41	40.00	16.87	300

6.0 CONCLUSION

The purpose of this report was to determine potential cross drain locations along the proposed SR-408 Eastern Extension project corridor to reduce impacts to floodplains and wetlands.The proposed alignment will cross through residences, commercial businesses, wetlands, Econ River tributaries, and wooded areas. These proposed cross drain locations were chosen based on maintaining the natural flow of the land from the surrounding floodplains, wetlands, and Econ River tributaries. Fourteen potential cross drains were selected and analyzed for this project. The 100-year flow rates for cross drains 1 through 4 were obtained from the Big Econ River Basin Stormwater Management Master Plan. The 100-year flow rates for cross drains 10 through 13 were obtained from the Bithlo Area Stormwater Management Master Plan. The Rational Method was used to determine the flow for cross drains 5 through 9. Each cross drain was designed for a 100-year storm event, in order to compare the 100-year backwater elevation with the 100-year existing flood elevation. Manning's Equation was used to determine trial sizes for each culvert. The trial sizes were used to perform the HY-8 analysis. The floodplains will be impacted due to longitudinal roadway widening and proposed pond locations. By following FDOT design standards and water management procedures, the proposed cross drains will have minimal impacts on the existing floodplains and wetlands. The purpose is to achieve results which do not increase or significantly change existing flood elevations or floodplain limits. The proposed cross drains located within floodplains will have minor volumetric impacts, and insignificant impact to flood stage and flood limits. The final design team should verify the proposed culvert sizes and their locations, based on the final roadway geometry and profile. BHR's for the Econ River Bridge and the Econ River Tributary Bridge should be provided during the design phase. The flows and tailwater elevations used in this report are based on preliminary information. The culvert design will need to be reviewed for flows and tailwater elevations during the final design.



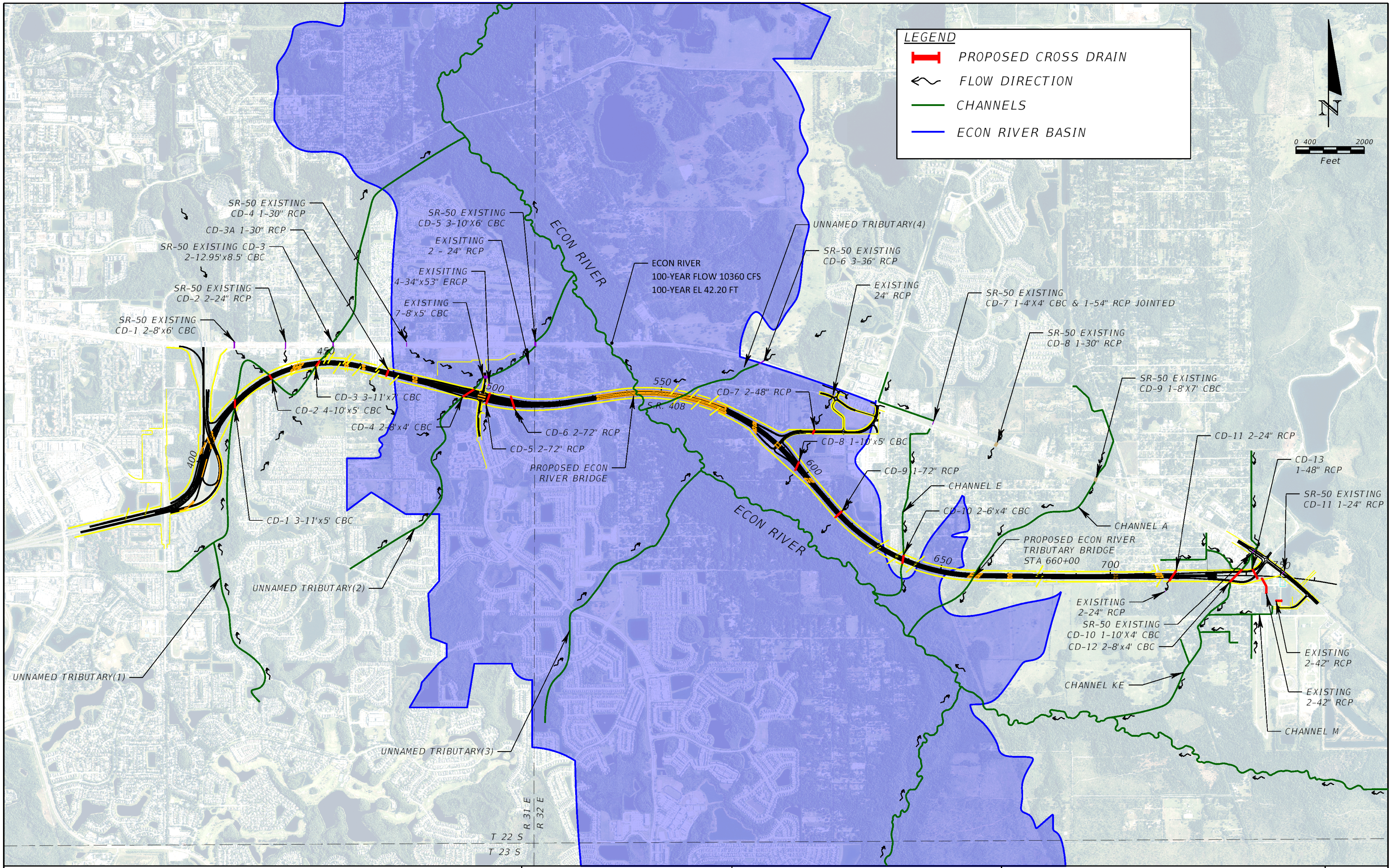
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SR 408 PD&E STUDY
DRAINAGE BASIN MAP

SHEET NO.
18



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

SR 408 PD&E STUDY
ECON RIVER BASIN MAP

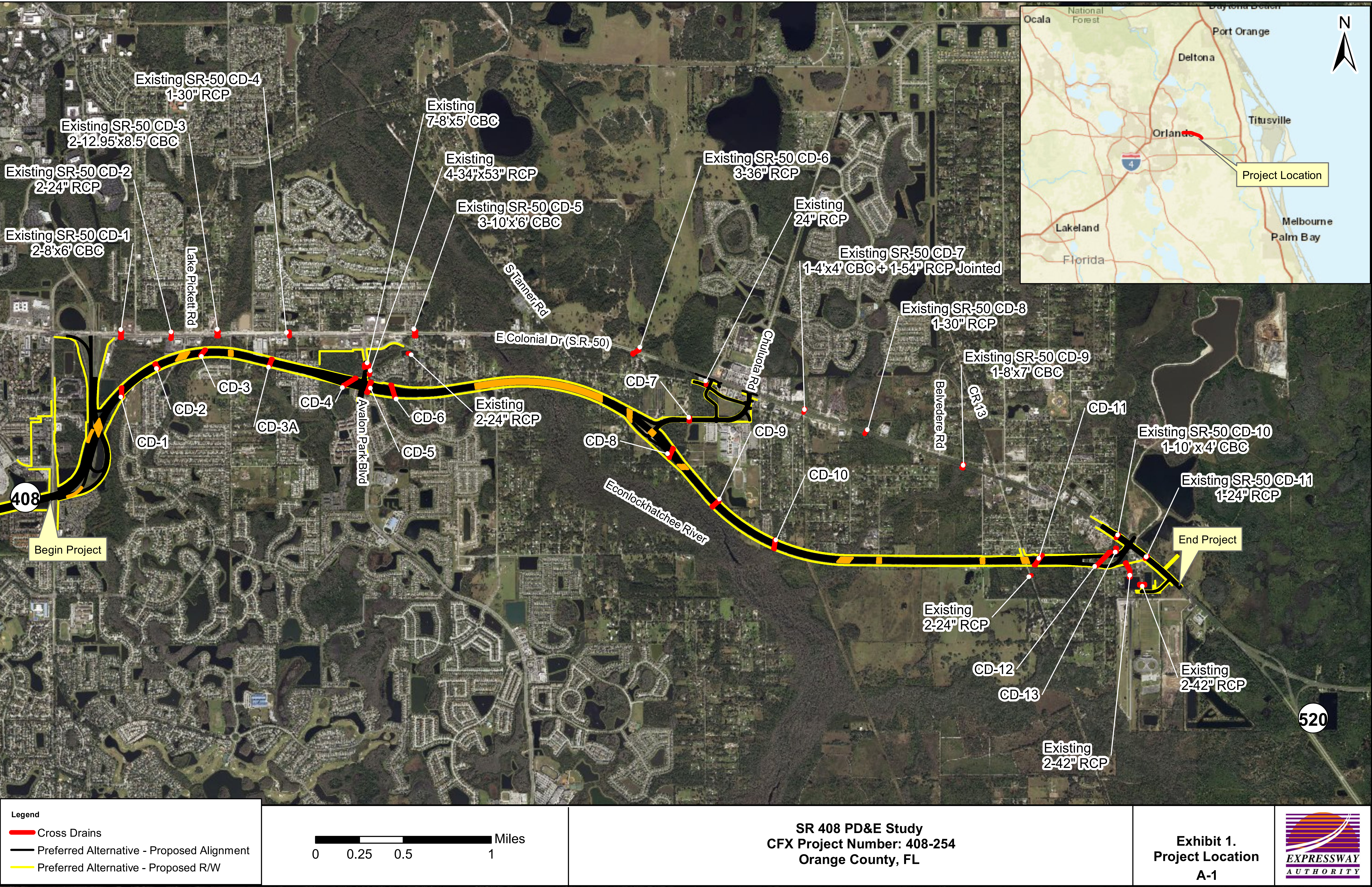
SHEET NO.
19

$USERS $DATES $TIMES $FILES

Appendix: A

Exhibits:

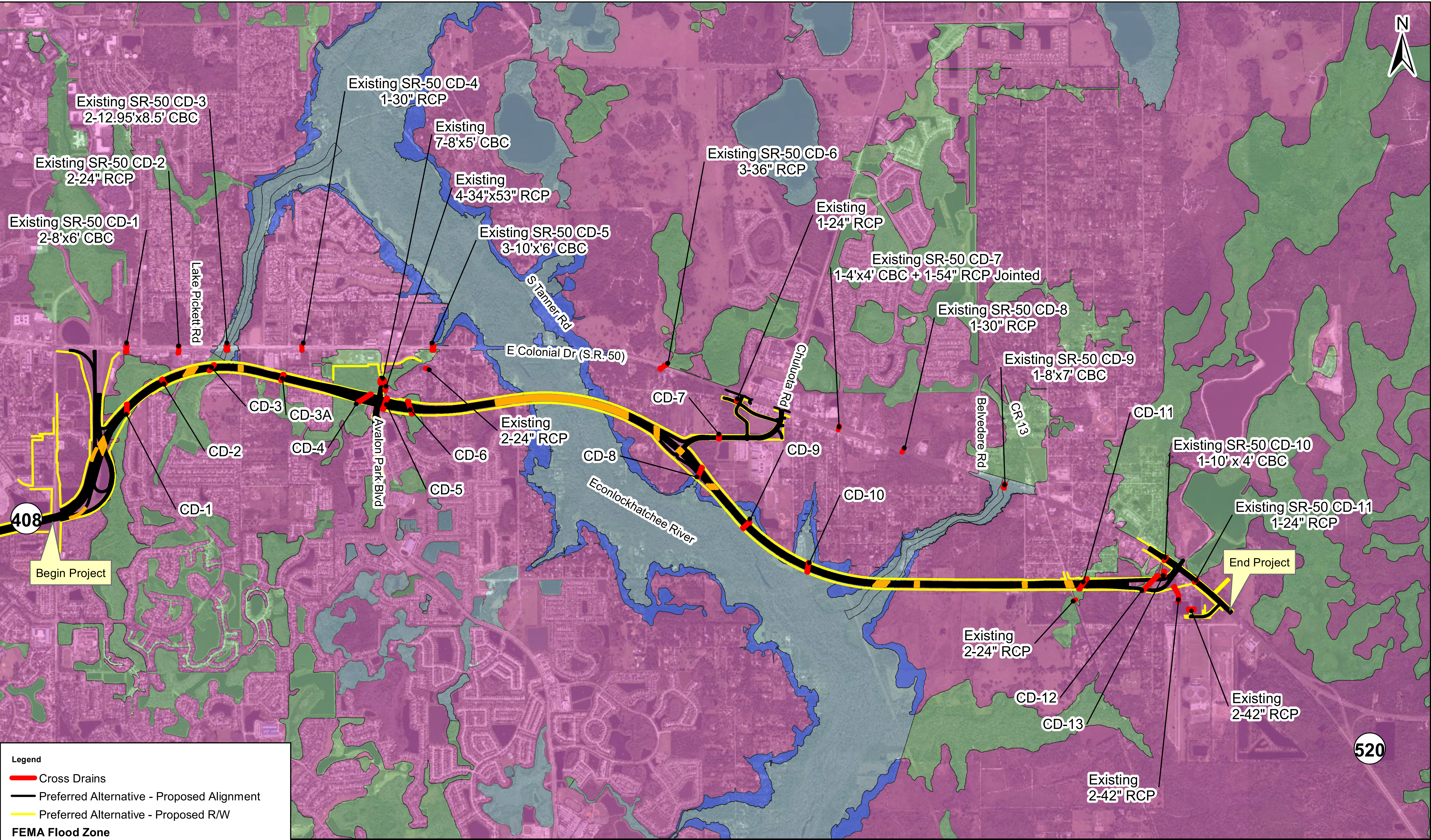
- Project Location Map
- FEMA Flood Insurance Rate Map
- Soil Survey
- USGS Quadrangle Map
- Existing Land Use Map



SR 408 PD&E Study
CFX Project Number: 408-254
Orange County, FL

Exhibit 1.
Project Location
A-1

EXPRESSWAY AUTHORITY



Legend

Cross Drains

Preferred Alternative - Proposed Alignment

Preferred Alternative - Proposed R/W

FEMA Flood Zone

0.2 PCT ANNUAL CHANCE FLOOD HAZARD

A

AE

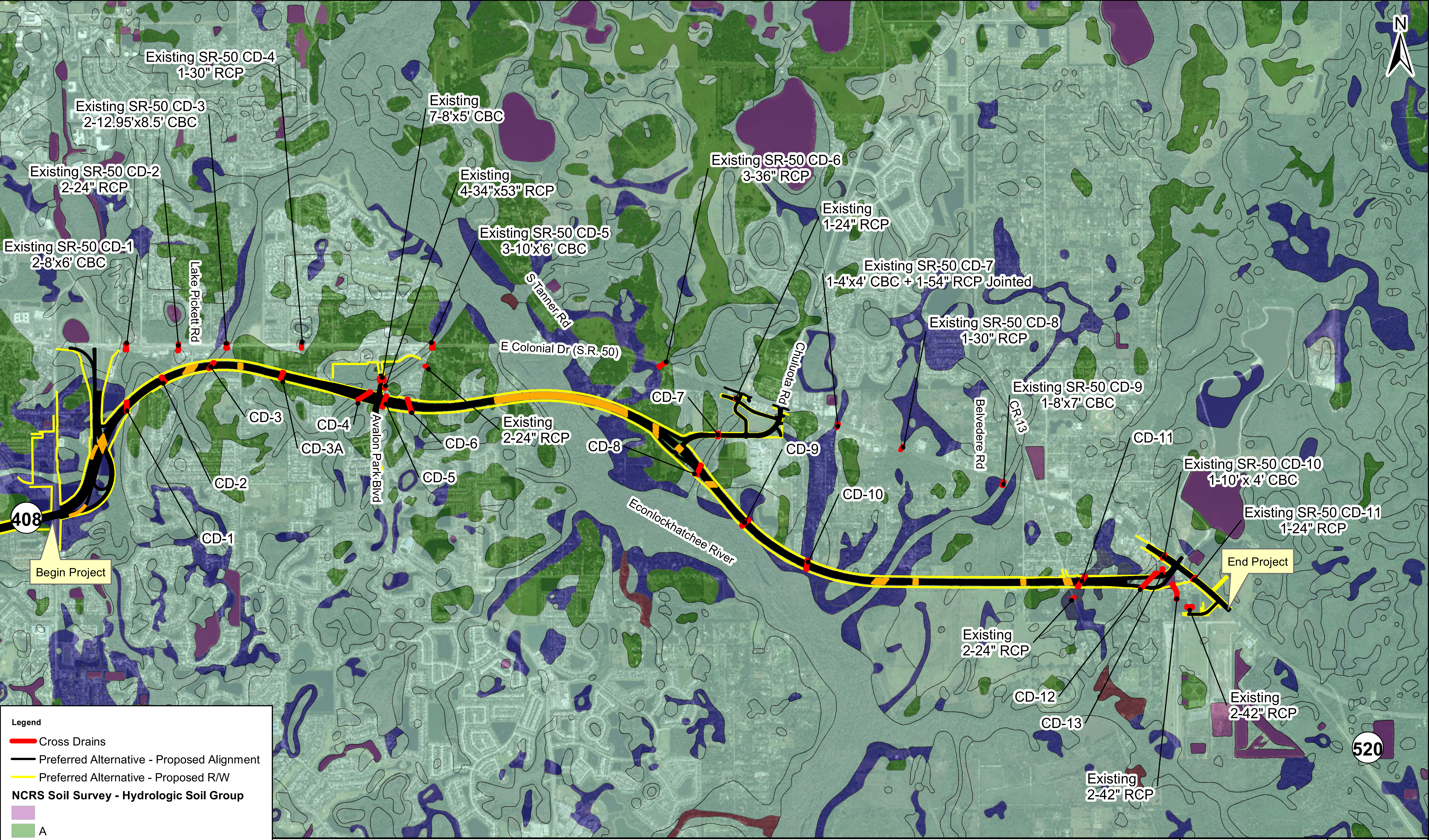
X

Miles
0 0.25 0.5 1

SR 408 PD&E Study
CFX Project Number: 408-254
Orange County, FL

Exhibit 2.
FEMA Flood Insurance Rate A-2

EXPRESSWAY AUTHORITY

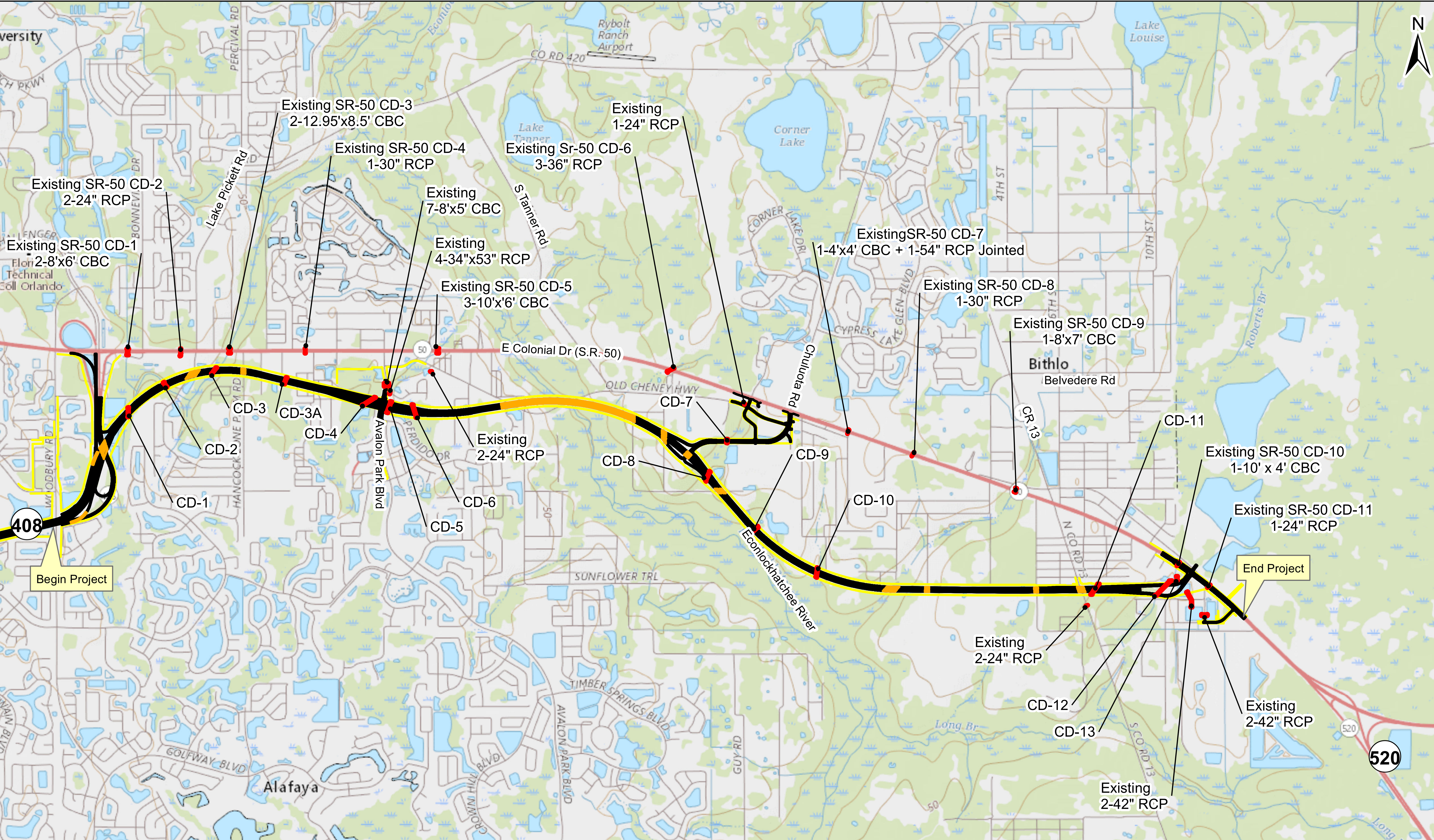


Miles
0 0.25 0.5 1

SR 408 PD&E Study
CFX Project Number: 408-254
Orange County, FL

Exhibit 3.
Soil Survey
A-3

EXPRESSWAY AUTHORITY



Legend

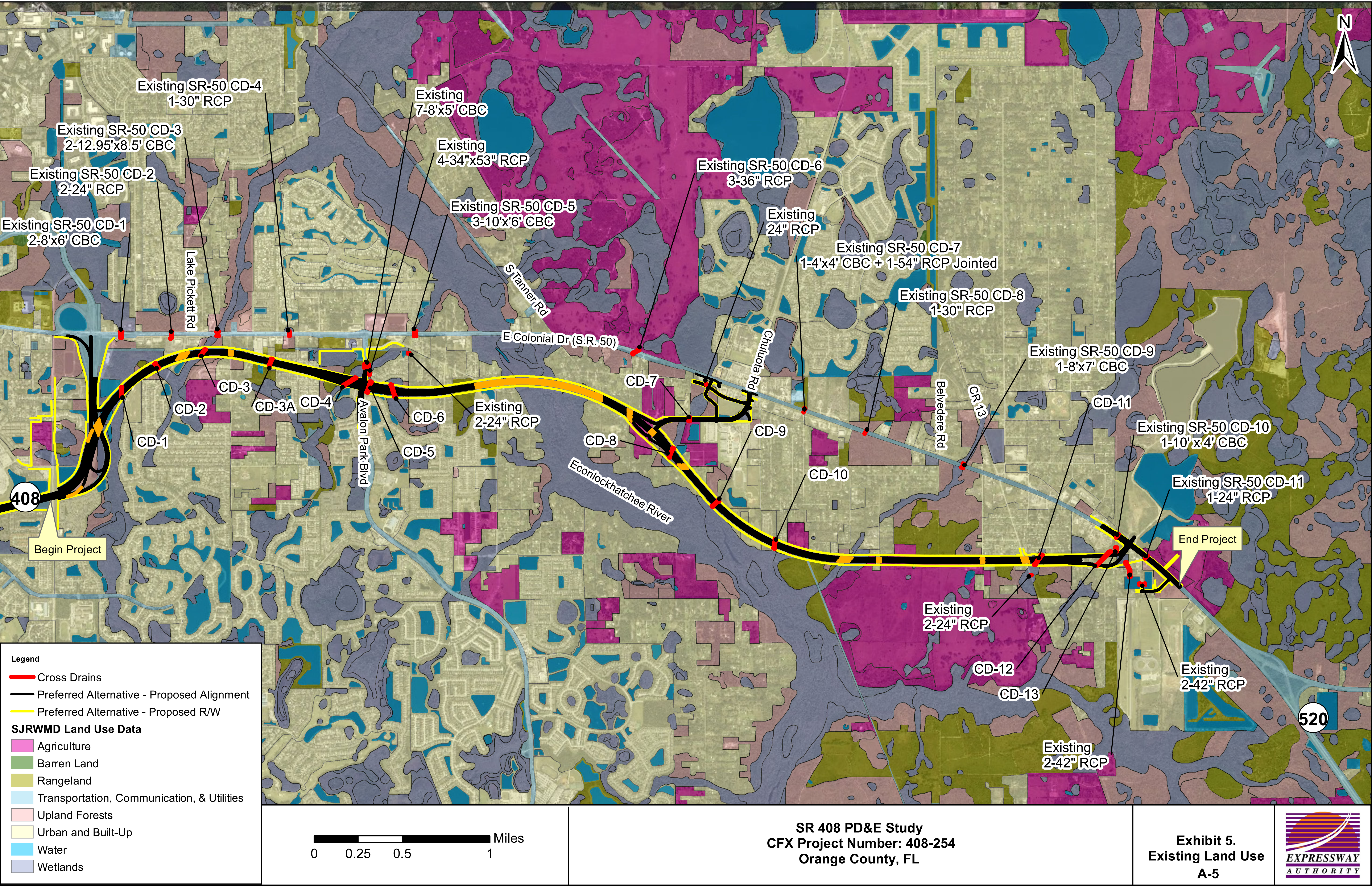
- Cross Drains
- Preferred Alternative - Proposed Alignment
- Preferred Alternative - Proposed R/W

0 0.25 0.5 1 Miles

SR 408 PD&E Study
CFX Project Number: 408-254
Orange County, FL

Exhibit 4.
USGS Quadrangle
A-4

EXPRESSWAY AUTHORITY



Miles
0 0.25 0.5 1

SR 408 PD&E Study
CFX Project Number: 408-254
Orange County, FL

Exhibit 5.
Existing Land Use
A-5

EXPRESSWAY AUTHORITY

Appendix: B

FEMA Flood
Insurance Rate Map

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was State Plane Florida East FIPS Zone 0901. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by Orange County, Florida.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

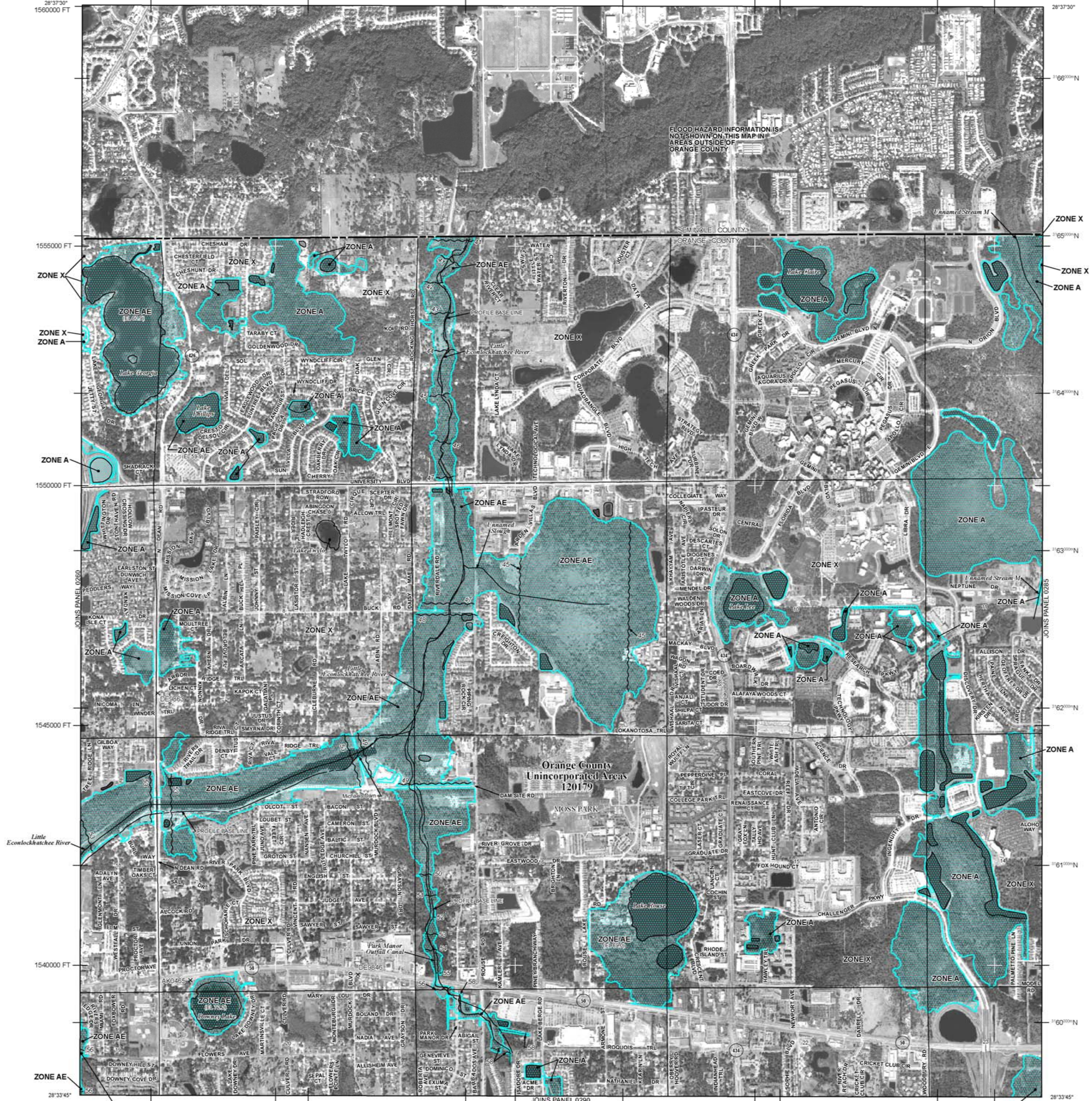
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

NGVD29 to NAVD88 Vertical Datum Conversion Table (feet)

Watershed Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
Big Econlockhatchee River	-1.03	-1.15	-1.09	0.06
Boggy Creek	-0.91	-1.01	-0.96	0.05
Cypress Creek	-0.87	-0.91	-0.89	0.02
Howell Branch	-0.96	-1.05	-0.98	0.07
Lake Apopka	-0.87	-0.97	-0.91	0.06
Lake Hart	-0.97	-1.07	-1.02	0.05
Little Econlockhatchee River	-0.92	-1.07	-1.01	0.09
Little Wekiva River	-0.91	-1.02	-0.95	0.07
Reedy Creek	-0.86	-0.89	-0.88	0.02
Shingle Creek	-0.88	-0.95	-0.91	0.04
St. Johns River	-1.08	-1.33	-1.19	0.14
Wekiva River	-0.88	-1.01	-0.94	0.07



area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 17
6000000 FT	5000-foot grid values: Florida State Plane coordinate system, East Zone (FIPSZONE = 901), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 6, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 25, 2009 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to update map format, to add roads and road names, to incorporate previously issued Letters of Map Revision, to reflect updated topographic information, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0280F

FIRM
FLOOD INSURANCE RATE MAP
ORANGE COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 280 OF 750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY	120179	0280	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12095C0280F

B-1

possible updated or additional flood hazard information.

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Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

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National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

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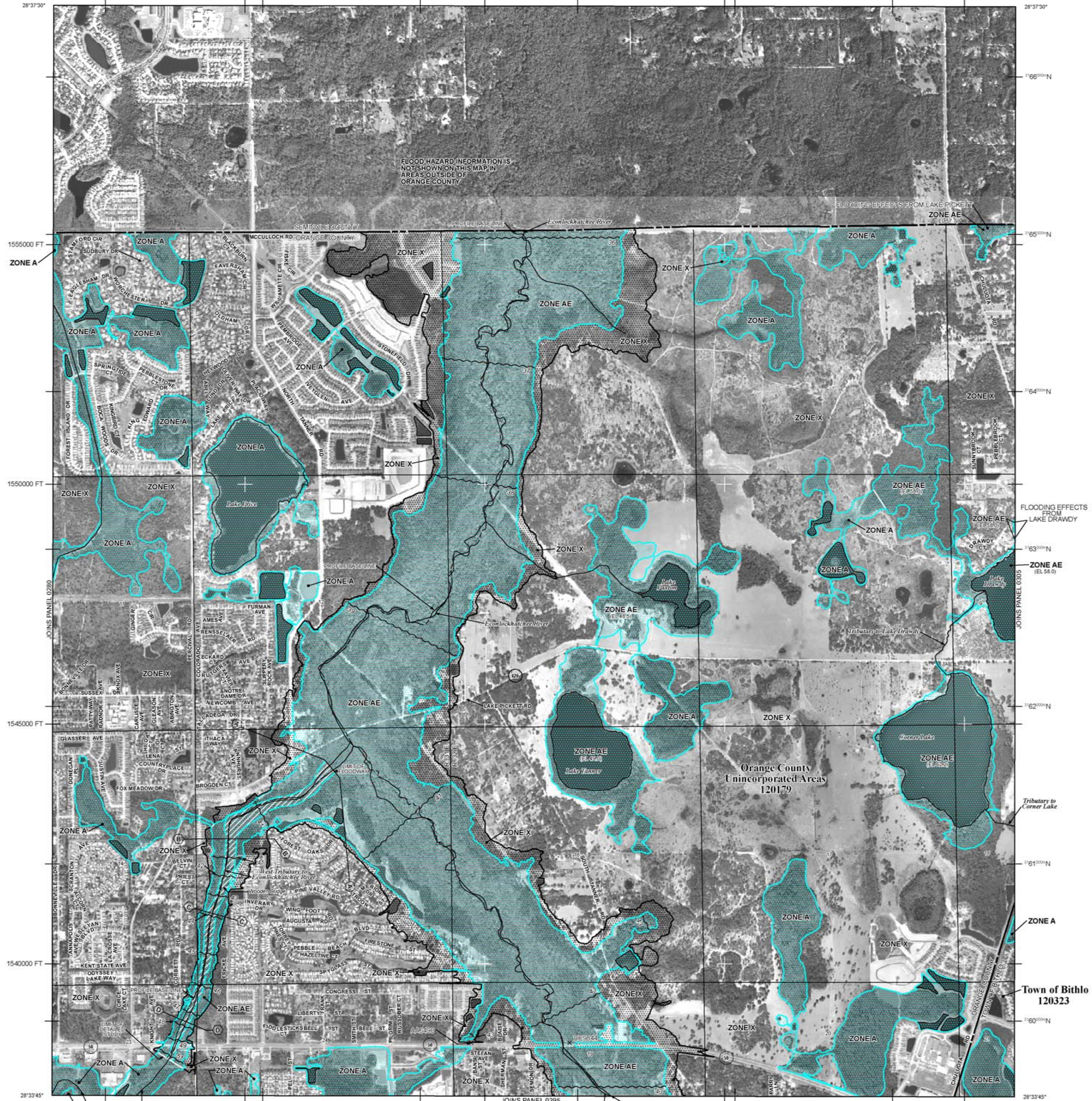
Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

NGVD29 to NAVD88 Vertical Datum Conversion Table (feet)

Watershed Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
Big Econlockhatchee River	-1.03	-1.15	-1.09	0.06
Boggy Creek	-0.91	-1.01	-0.96	0.05
Cypress Creek	-0.87	-0.91	-0.89	0.02
Howell Branch	-0.96	-1.05	-0.98	0.07
Lake Apopka	-0.87	-0.97	-0.91	0.06
Lake Hart	-0.97	-1.07	-1.02	0.05
Little Econlockhatchee River	-0.92	-1.07	-1.01	0.09
Little Wekiva River	-0.91	-1.02	-0.95	0.07
Reedy Creek	-0.86	-0.89	-0.88	0.02
Shingle Creek	-0.88	-0.95	-0.91	0.04
St. Johns River	-1.08	-1.33	-1.19	0.14
Wekiva River	-0.88	-1.01	-0.94	0.07



ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
A—A Cross section line
23—23 Transect line
97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 17
6000000 FT — 5000-foot grid values: Florida State Plane coordinate system, East Zone (FIPSZONE = 901), Transverse Mercator projection
DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 6, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 25, 2009 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to update map format, to add roads and road names, to incorporate previously issued Letters of Map Revision, to reflect updated topographic information, and to incorporate previously issued Letters of Map Amendment.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0285F

FIRM
FLOOD INSURANCE RATE MAP
ORANGE COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 285 OF 750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BITHLO, TOWN OF	120323	0285	F
ORANGE COUNTY	120179	0285	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12095C0285F

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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Silver Spring, Maryland 20910
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Watershed Name	Minimum Conversion	Maximum Conversion	Average Conversion	Maximum Offset
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Cypress Creek	-0.87	-0.91	-0.89	0.02
Howell Branch	-0.96	-1.05	-0.98	0.07
Lake Apopka	-0.87	-0.97	-0.91	0.06
Lake Hart	-0.97	-1.07	-1.02	0.05
Little Econlockhatchee River	-0.92	-1.07	-1.01	0.09
Little Wekiva River	-0.91	-1.02	-0.95	0.07
Reedy Creek	-0.86	-0.89	-0.88	0.02
Shingle Creek	-0.88	-0.95	-0.91	0.04
St. Johns River	-1.08	-1.33	-1.19	0.14
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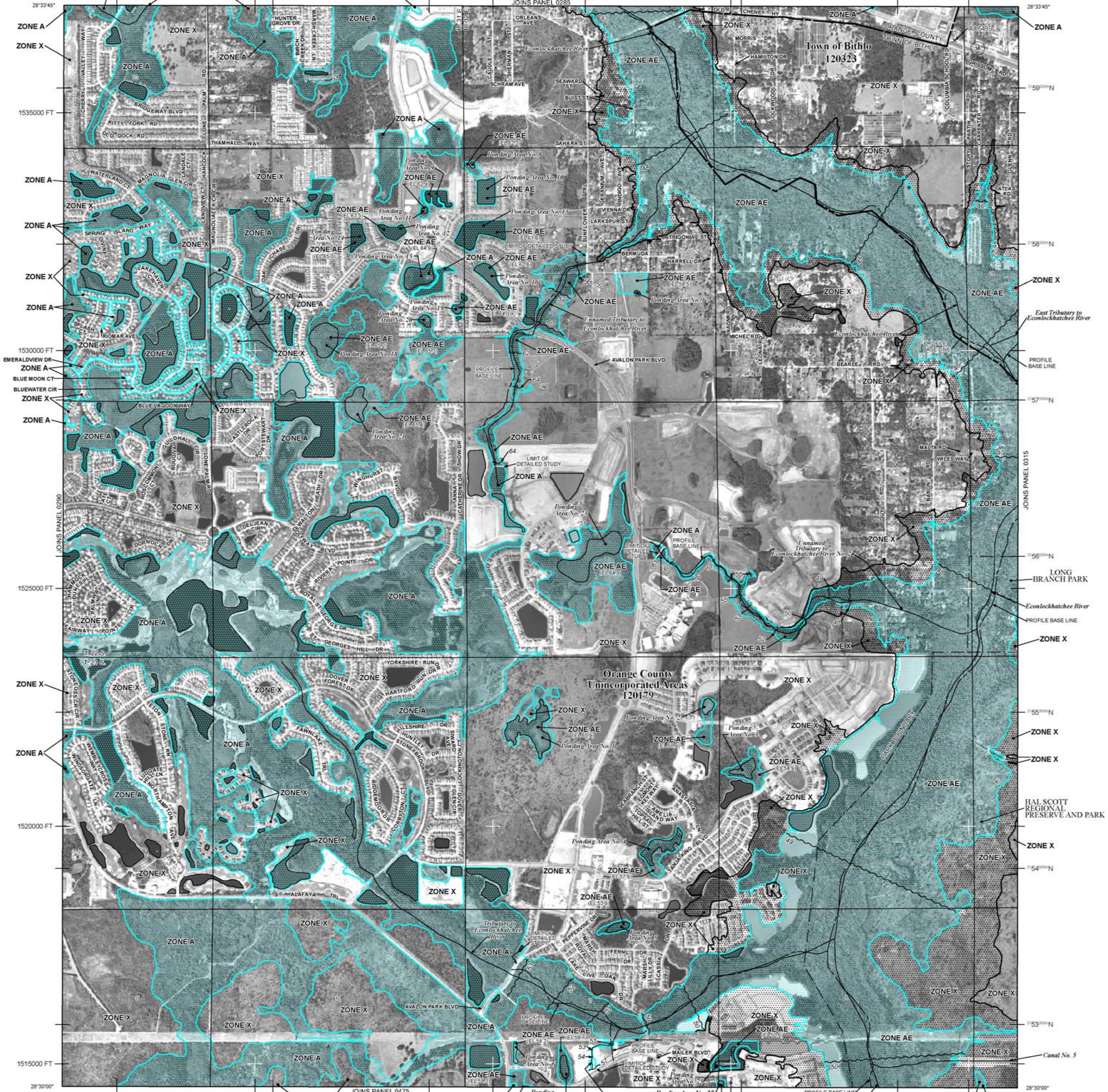

area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)———(A)	Cross section line
(23)- - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
$^{42}75^{000m}$E	1000-meter Universal Transverse Mercator grid ticks, zone 17
6000000 FT	5000-foot grid values: Florida State Plane coordinate system, East Zone (FIPSZONE = 901), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 6, 2000

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 25, 2009 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to update map format, to add roads and road names, to incorporate previously issued Letters of Map Revision, to reflect updated topographic information, and to incorporate previously issued Letters of Map Amendment.

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MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0295F

FIRM
FLOOD INSURANCE RATE MAP
ORANGE COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 295 OF 750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BITHLO, TOWN OF	120323	0295	F
ORANGE COUNTY	120179	0295	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12095C0295F

B-3

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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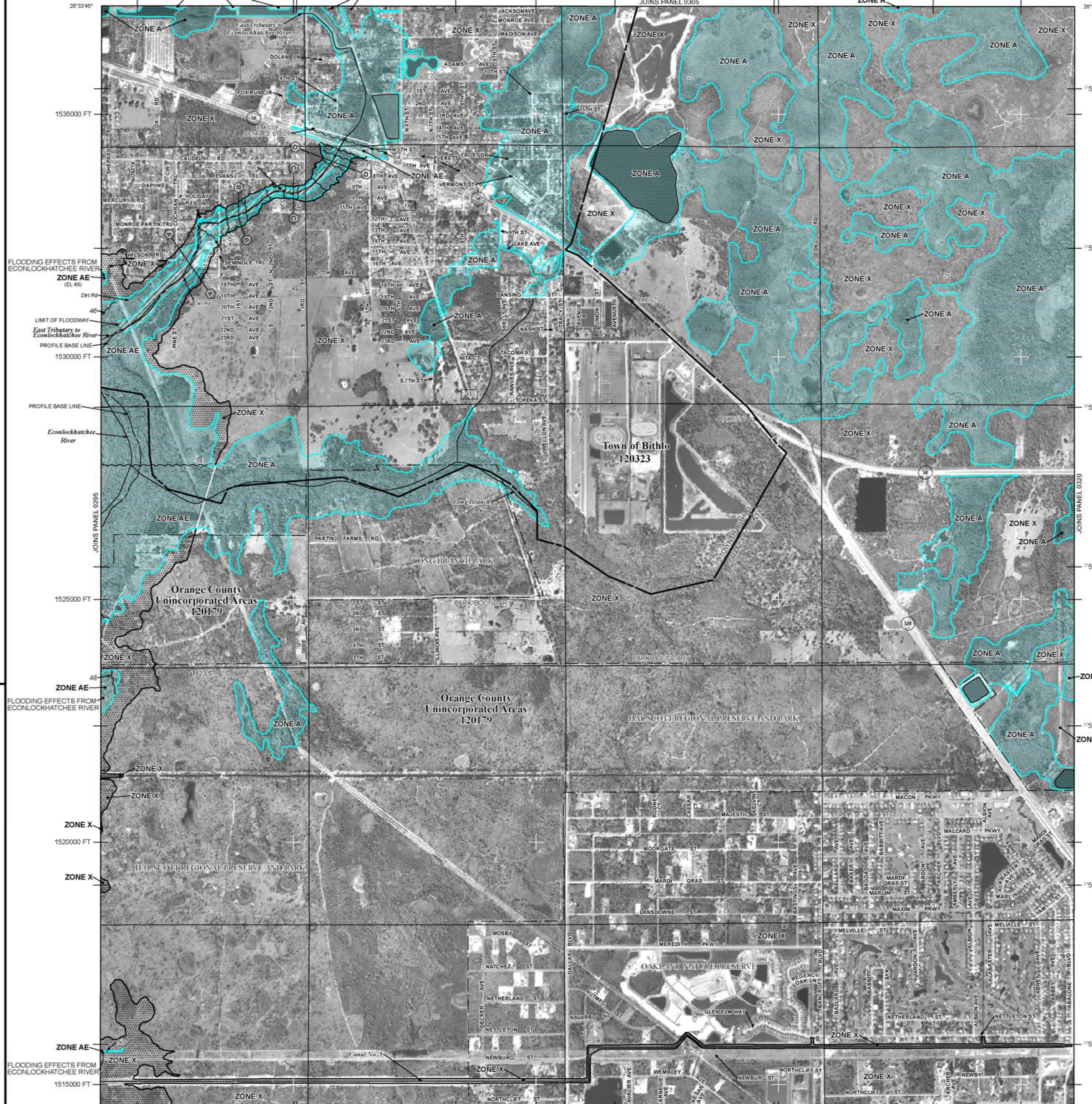
St. Johns River	-1.08	-1.33	-1.19	0.14
Wekiva River	-0.88	-1.01	-0.94	0.07



EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP DECEMBER 6, 2000

1% annual chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
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513	Base Flood Elevation line and value; elevation in feet*
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 6, 2000

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SEPTEMBER 25, 2009 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to update map format, to add roads and road names, to incorporate previously issued Letters of Map Revision, to reflect updated topographic information, and to incorporate previously issued Letters of Map Amendment.

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MAP SCALE 1" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0315F

FIRM
FLOOD INSURANCE RATE MAP
ORANGE COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 315 OF 750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BITHLO, TOWN OF	120323	0315	F
ORANGE COUNTY	120179	0315	F

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MAP NUMBER
12095C0315F

Appendix: C

USDA NRCS Soil Report

United States Department of Agriculture

NRCS

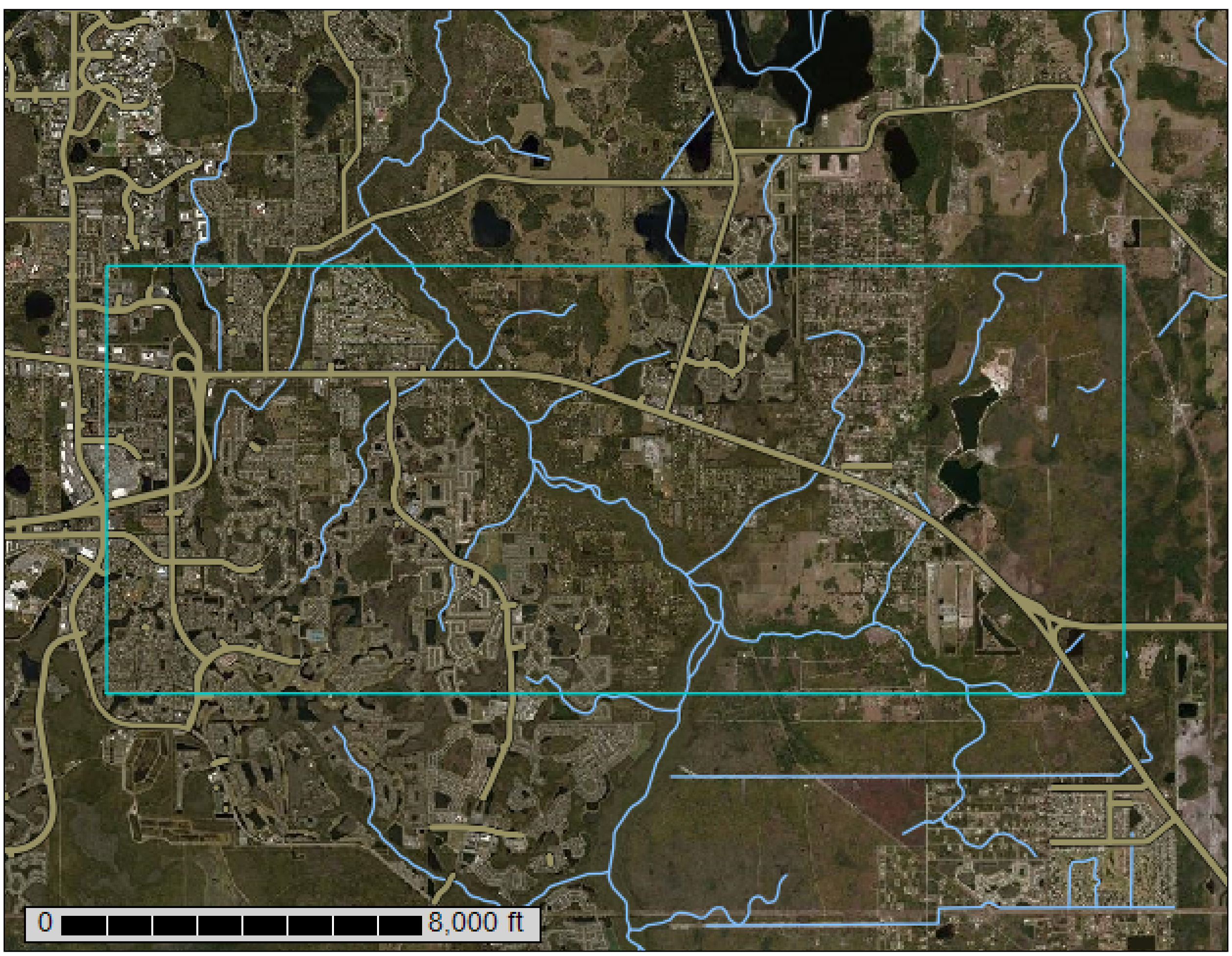
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

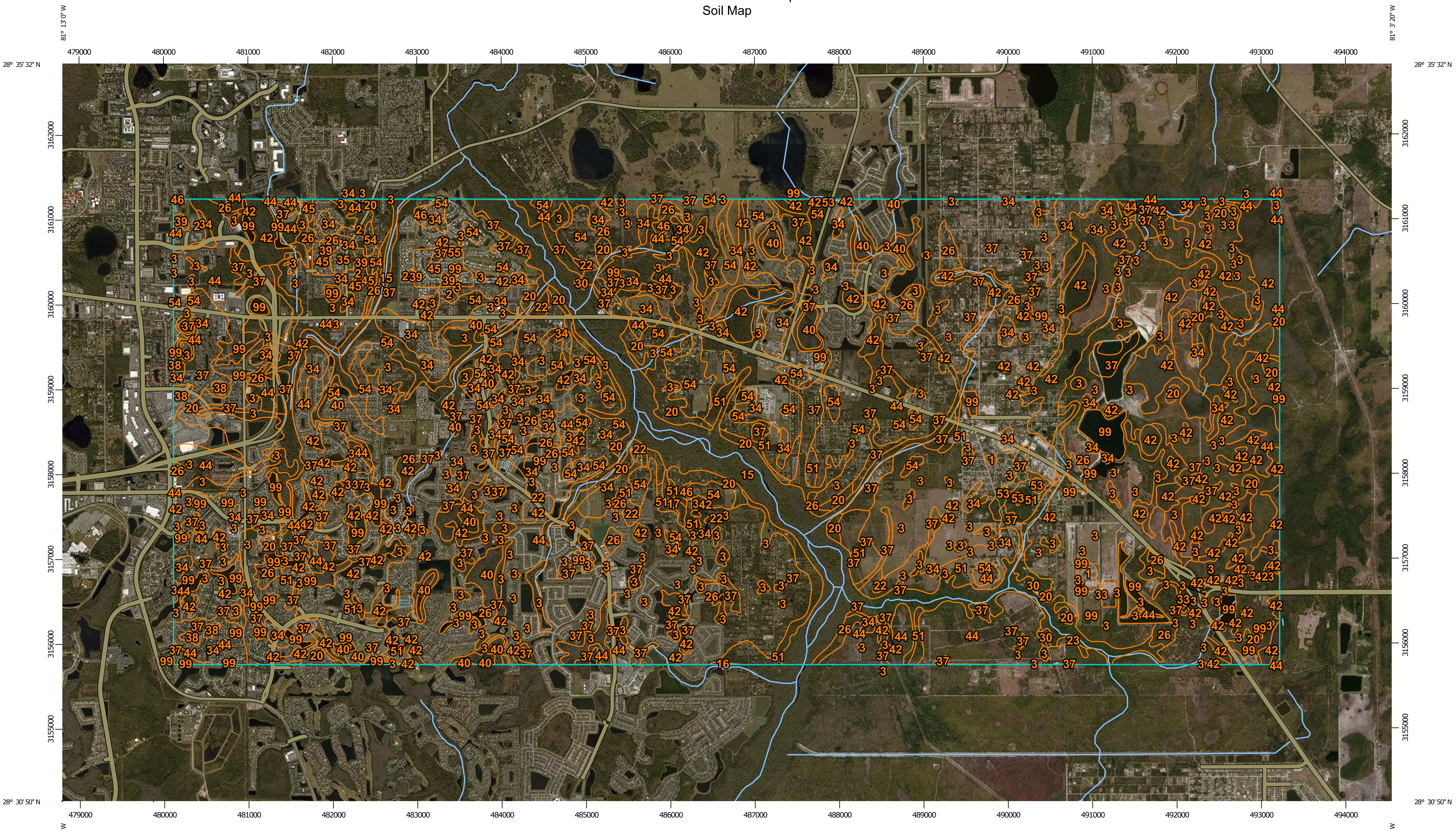
Orange County, Florida

SR 408 Soil Data



May 27, 2016

Custom Soil Resource Report
Soil Map



Map Scale: 1:42,400 if printed on B landscape (17" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County, Florida
Survey Area Data: Version 12, Nov 19, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 12, 2011—Feb 20, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Orange County, Florida (FL095)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Arents, nearly level	16.4	0.1%
2	Archbold fine sand, 0 to 5 percent slopes	73.1	0.4%
3	Basinger fine sand, depressional, 0 to 1 percent slopes	1,106.2	6.2%
15	Felda fine sand, frequently flooded	1,060.0	5.9%
16	Floridana fine sand, frequently flooded	1.5	0.0%
17	Floridana mucky fine sand, depressional	13.6	0.1%
20	Immokalee fine sand	754.8	4.2%
22	Lochloosa fine sand	57.6	0.3%
23	Malabar fine sand	7.3	0.0%
26	Ona fine sand	193.0	1.1%
27	Ona-Urban land complex	4.8	0.0%
30	Pineda fine sand	28.5	0.2%
33	Pits	13.4	0.1%
34	Pomello fine sand, 0 to 5 percent slopes	986.4	5.5%
35	Pomello-Urban land complex, 0 to 5 percent slopes	19.4	0.1%
37	St. Johns fine sand	920.5	5.2%
38	St. Lucie fine sand, 0 to 5 percent slopes	34.7	0.2%
39	St. Lucie-Urban land complex, 0 to 5 percent slopes	29.9	0.2%
40	Samsula muck	145.3	0.8%
42	Sanibel muck	1,496.8	8.4%
44	Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes	9,067.4	50.9%
45	Smyrna-Urban land complex	80.9	0.5%
46	Tavares fine sand, 0 to 5 percent slopes	11.6	0.1%
51	Wabasso fine sand, 0 to 2 percent slopes	669.4	3.8%
53	Wauberg fine sand	26.8	0.2%
54	Zolfo fine sand, 0 to 2 percent slopes	717.2	4.0%
55	Zolfo-Urban land complex	11.2	0.1%
99	Water	277.9	1.6%
Totals for Area of Interest		**17,825.4**	**100.0%**

3—Basinger fine sand, depressional, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2v16v
Elevation: 0 to 160 feet
Mean annual precipitation: 38 to 62 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 300 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Basinger, depressional, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Basinger, Depressional

Setting

Landform: Depressions on marine terraces, drainageways on marine terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy marine deposits

Typical profile

A - 0 to 5 inches: fine sand
E - 5 to 14 inches: fine sand
Bh/E - 14 to 36 inches: fine sand
Cg - 36 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)

Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Sandy soils on stream terraces, flood plains, or in depressions (G155XB145FL)
Hydric soil rating: Yes

Minor Components

Smyrna, hydric

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Samsula, muck

Percent of map unit: 3 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Freshwater Marshes and Ponds (R155XY010FL), Organic soils in depressions and on flood plains (G155XB645FL)
Hydric soil rating: Yes

Floridana, hydric

Percent of map unit: 2 percent
Landform: Depressions on marine terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Cypress Woodlands (MCV026CA), Sandy over loamy soils on stream terraces, flood plains, or in depressions (G155XB245FL)
Hydric soil rating: Yes

20—Immokalee fine sand

Map Unit Setting

National map unit symbol: bv7n
Mean annual precipitation: 45 to 53 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Immokalee, non-hydric, and similar soils: 82 percent
Immokalee, hydric, and similar soils: 10 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Immokalee, Non-hydric

Setting

Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 5 inches: fine sand
E - 5 to 35 inches: fine sand
Bh - 35 to 67 inches: fine sand
C - 67 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Description of Immokalee, Hydric

Setting

Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 5 inches: fine sand
E - 5 to 35 inches: fine sand

Bh - 35 to 67 inches: fine sand
C - 67 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Minor Components

Pineda

Percent of map unit: 4 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Sandy over loamy soils on flats of hydric or mesic lowlands (G155XB241FL)
Hydric soil rating: Yes

Wabasso

Percent of map unit: 4 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

34—Pomello fine sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2v16y
Elevation: 0 to 180 feet
Mean annual precipitation: 44 to 52 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 342 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Pomello and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pomello

Setting

Landform: Knolls on marine terraces, ridges on marine terraces
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve, riser
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 47 inches: fine sand
Bh - 47 to 58 inches: fine sand
Bw - 58 to 65 inches: fine sand
C - 65 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Other vegetative classification: Sand Pine Scrub (R155XY001FL), Sandy soils on rises and knolls of mesic uplands (G155XB131FL)
Hydric soil rating: No

Minor Components

Smyrna

Percent of map unit: 3 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Tavares

Percent of map unit: 1 percent
Landform: Ridges on marine terraces, flats on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: Longleaf Pine-Turkey Oak Hills (R154XY002FL)
Other vegetative classification: Sandy soils on rises, knolls, and ridges of mesic uplands (G154XB121FL)
Hydric soil rating: No

Bulow

Percent of map unit: 1 percent
Landform: Ridges on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy over loamy soils on knolls and ridges of mesic uplands (G155XB211FL)
Hydric soil rating: No

37—St. Johns fine sand

Map Unit Setting

National map unit symbol: bv87
Elevation: 30 to 150 feet
Mean annual precipitation: 45 to 53 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

St. johns, non-hydric, and similar soils: 60 percent
St. johns, hydric, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of St. Johns, Non-hydric

Setting

Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 12 inches: fine sand
E - 12 to 24 inches: fine sand
Bh - 24 to 44 inches: fine sand
C - 44 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: B/D
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Description of St. Johns, Hydric

Setting

Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 12 inches: fine sand
E - 12 to 24 inches: fine sand
Bh - 24 to 44 inches: fine sand
C - 44 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Minor Components

Wabasso

Percent of map unit: 5 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Immokalee, non-hydric

Percent of map unit: 5 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

42—Sanibel muck

Map Unit Setting

National map unit symbol: bv8f
Mean annual precipitation: 45 to 53 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Sanibel, undrained, and similar soils: 65 percent
Sanibel, drained, and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sanibel, Undrained

Setting

Landform: Marshes on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Thin organic material over sandy marine deposits

Typical profile

Oa - 0 to 11 inches: muck
A - 11 to 15 inches: fine sand
C - 15 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Other vegetative classification: Organic soils in depressions and on flood plains (G155XB645FL)
Hydric soil rating: Yes

Description of Sanibel, Drained

Setting

Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Thin organic material over sandy marine deposits

Typical profile

Oa - 0 to 11 inches: muck
A - 11 to 15 inches: fine sand
C - 15 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Other vegetative classification: Organic soils in depressions and on flood plains (G155XB645FL)
Hydric soil rating: Yes

Minor Components

Hontoon, undrained

Percent of map unit: 5 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Organic soils in depressions and on flood plains (G155XB645FL)
Hydric soil rating: Yes

Samsula

Percent of map unit: 5 percent
Landform: Depressions on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Organic soils in depressions and on flood plains (G155XB645FL)
Hydric soil rating: Yes

44—Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2v171
Elevation: 0 to 150 feet
Mean annual precipitation: 38 to 62 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 300 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Smyrna, non-hydric, and similar soils: 76 percent
Smyrna, hydric, and similar soils: 20 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Smyrna, Non-hydric

Setting

Landform: Flatwoods on marine terraces, flats on marine terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 17 inches: fine sand
Bh - 17 to 27 inches: loamy fine sand
C - 27 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Description of Smyrna, Hydric

Setting

Landform: Flats on marine terraces, flatwoods on marine terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 17 inches: fine sand
Bh - 17 to 27 inches: loamy fine sand
C - 27 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Minor Components

Basinger, depressional

Percent of map unit: 2 percent
Landform: Depressions on marine terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Sandy soils on stream terraces, flood plains, or in depressions (G155XB145FL)
Hydric soil rating: Yes

Pomona, non-hydric

Percent of map unit: 1 percent
Landform: Flatwoods on marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Eaugallie, hydric

Percent of map unit: 1 percent
Landform: Flatwoods on marine terraces, flats on marine terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R154XY003FL), Sandy soils on flats of mesic or hydric lowlands (G154XB141FL)
Hydric soil rating: Yes

Across-slope shape: Linear
Other vegetative classification: North Florida Flatwoods (R154XY004FL), Sandy soils on rises and knolls of mesic uplands (G155XB131FL)
Hydric soil rating: No

51—Wabasso fine sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2svzg
Elevation: 0 to 130 feet
Mean annual precipitation: 38 to 62 inches
Mean annual air temperature: 68 to 77 degrees F
Frost-free period: 300 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Wabasso and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wabasso

Setting

Landform: Flatwoods on flats on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits over loamy marine deposits

Typical profile

A - 0 to 4 inches: fine sand
E - 4 to 16 inches: fine sand
Bh - 16 to 28 inches: fine sand
E' - 28 to 32 inches: fine sand
Btg - 32 to 48 inches: fine sandy loam
Cg - 48 to 80 inches: loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 12 to 63 inches to strongly contrasting textural stratification
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Minor Components

Basinger

Percent of map unit: 4 percent
Landform: Drainageways on flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Felda

Percent of map unit: 4 percent
Landform: Flatwoods on drainageways on marine terraces
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Linear
Across-slope shape: Concave, linear
Ecological site: Slough (R155XY011FL)
Other vegetative classification: Slough (R155XY011FL), Sandy over loamy soils on stream terraces, flood plains, or in depressions (G155XB245FL)
Hydric soil rating: Yes

Riviera

Percent of map unit: 4 percent
Landform: Flatwoods on drainageways on marine terraces
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Linear, convex
Across-slope shape: Concave, linear
Ecological site: Slough (R155XY011FL)
Other vegetative classification: Slough (R155XY011FL), Sandy over loamy soils on flats of hydric or mesic lowlands (G156AC241FL)
Hydric soil rating: Yes

Boca

Percent of map unit: 3 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: South Florida Flatwoods (R155XY003FL)
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy over loamy soils on flats of hydric or mesic lowlands (G155XB241FL)
Hydric soil rating: Yes

53—Wauberg fine sand

Map Unit Setting

National map unit symbol: bv8t
Mean annual precipitation: 45 to 53 inches
Mean annual air temperature: 70 to 77 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Wauberg and similar soils: 94 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wauberg

Setting

Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and loamy marine deposits

Typical profile

A - 0 to 8 inches: fine sand
E - 8 to 28 inches: fine sand
B - 28 to 60 inches: sandy clay loam
C - 60 to 80 inches: sandy clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Other vegetative classification: Sandy over loamy soils on flats of hydric or mesic lowlands (G155XB241FL)

Hydric soil rating: Yes

Minor Components

Wabasso

Percent of map unit: 6 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

54—Zolfo fine sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w0q1
Elevation: 30 to 160 feet
Mean annual precipitation: 44 to 56 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 324 to 365 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Zolfo and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zolfo

Setting

Landform: Rises on marine terraces, knolls on marine terraces
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, side slope, riser
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Typical profile

A - 0 to 6 inches: fine sand
E - 6 to 53 inches: fine sand
Bh - 53 to 80 inches: fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 4.0
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Other vegetative classification: North Florida Flatwoods (R154XY004FL), South Florida Flatwoods (R154XY003FL), Sandy soils on rises and knolls of mesic uplands (G154XB131FL)
Hydric soil rating: No

Minor Components

Myakka

Percent of map unit: 4 percent
Landform: Flatwoods on marine terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: South Florida Flatwoods (R155XY003FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: No

Tavares

Percent of map unit: 3 percent
Landform: Ridges on marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear
Other vegetative classification: Longleaf Pine-Turkey Oak Hills (R154XY002FL), Sandy soils on rises, knolls, and ridges of mesic uplands (G154XB121FL)
Hydric soil rating: No

Millhopper

Percent of map unit: 3 percent
Landform: Ridges on marine terraces, knolls on marine terraces, flatwoods on marine terraces
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, concave
Across-slope shape: Linear
Other vegetative classification: Upland Hardwood Hammock (R154XY008FL), Sandy soils on rises, knolls, and ridges of mesic uplands (G154XB121FL)
Hydric soil rating: No

Lochloosa

Percent of map unit: 1 percent
Landform: Rises on marine terraces
Landform position (three-dimensional): Interfluve, rise
Down-slope shape: Convex

Across-slope shape: Linear
Other vegetative classification: Sandy over loamy soils on rises and knolls of mesic uplands (G155XB231FL)
Hydric soil rating: No

Malabar

Percent of map unit: 1 percent
Landform: Drainageways on marine terraces
Landform position (three-dimensional): Dip
Down-slope shape: Linear, convex
Across-slope shape: Concave, linear
Other vegetative classification: Slough (R155XY011FL), Sandy soils on flats of mesic or hydric lowlands (G155XB141FL)
Hydric soil rating: Yes

Appendix: D

SR-408 Typical Section

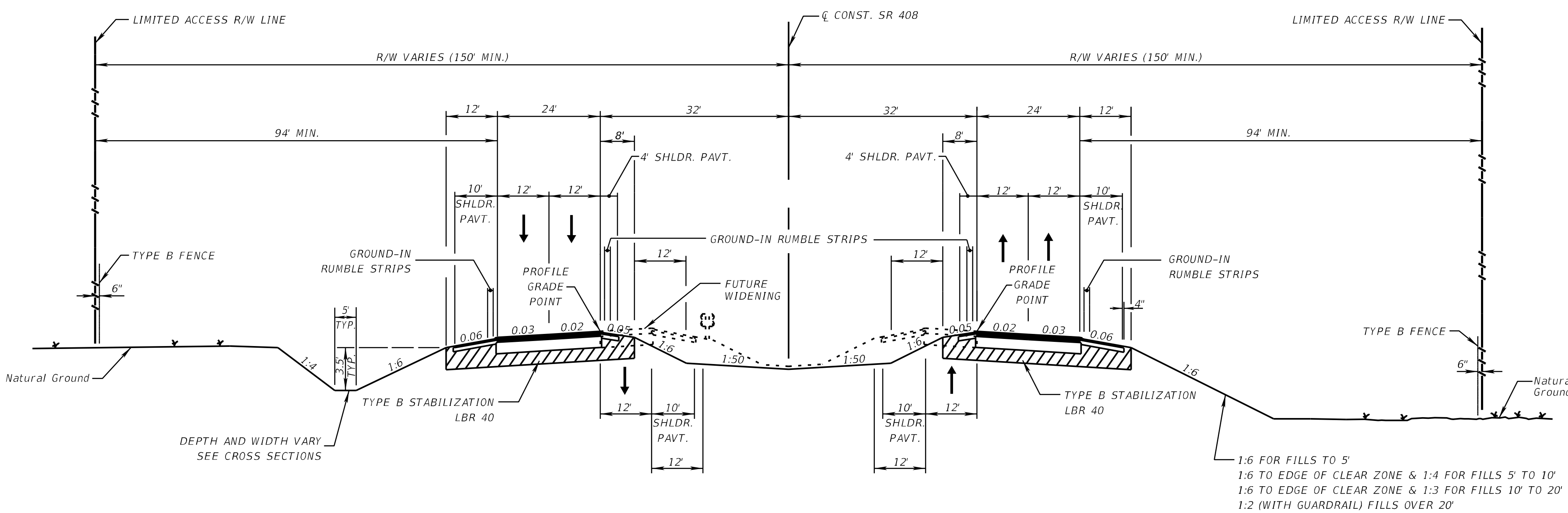
PROJECT IDENTIFICATION

CFX PROJECT NO. 408-254 | FEDERAL AID PROJECT NO. N/A | COUNTY NAME ORANGE

SECTION NO. 75008160 | ROAD DESIGNATION SR 408 | LIMITS/MILEPOST N/A

PROJECT DESCRIPTION SR 408 EASTERN EXTENSION PD&E STUDY (FROM CURRENT EASTERN TERMINUS NEAR WOODBURY ROAD TO SR 50, NEAR SR 520)

PROPOSED ROADWAY TYPICAL SECTION



<u>BEGIN PROJECT TO EAST OF AVALON PARK</u>
DESIGN SPEED = 65 MPH

<u>EAST OF AVALON PARK TO END PROJECT</u>
DESIGN SPEED = 70 MPH

TYPICAL SECTION
SR 408
STA 358+41.08 TO STA 731+27.29

APPROVED BY: C. Brian Fuller, P.E. License No.: 49524	CFX CONCURRENCE	CFX APPROVAL
Engineer Of Record Signature — Date	Jonathan Williamson, AICP CFX Project Manager — Date	Glenn M. Pressimone, PE CFX Director of Engineering — Date

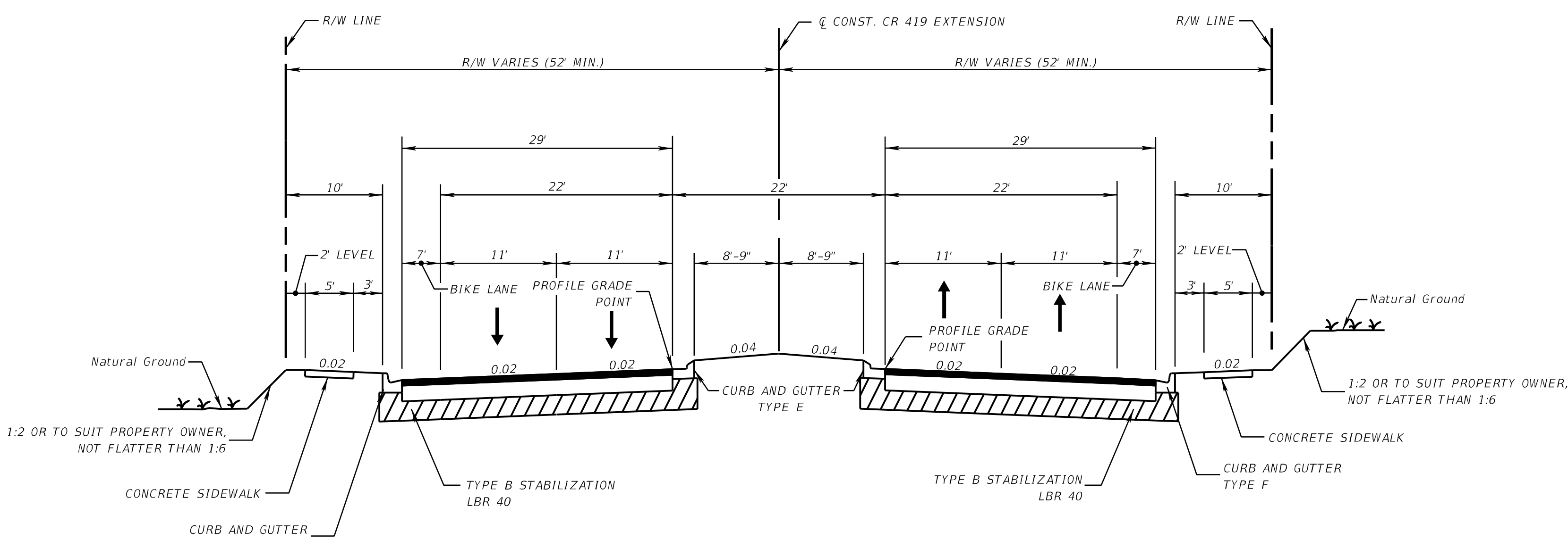
PROJECT IDENTIFICATION

CFX PROJECT NO. 408-254 | FEDERAL AID PROJECT NO. N/A | COUNTY NAME ORANGE

SECTION NO. 75008160 | ROAD DESIGNATION SR 408 | LIMITS/MILEPOST N/A

PROJECT DESCRIPTION SR 408 EASTERN EXTENSION PD&E STUDY (FROM CURRENT EASTERN TERMINUS NEAR WOODBURY ROAD TO SR 50, NEAR SR 520)

PROPOSED ROADWAY TYPICAL SECTION



TYPICAL SECTION
CR 419 EXTENSION (4-LANE)
STA 4001+82.33 TO STA 4037+98.12

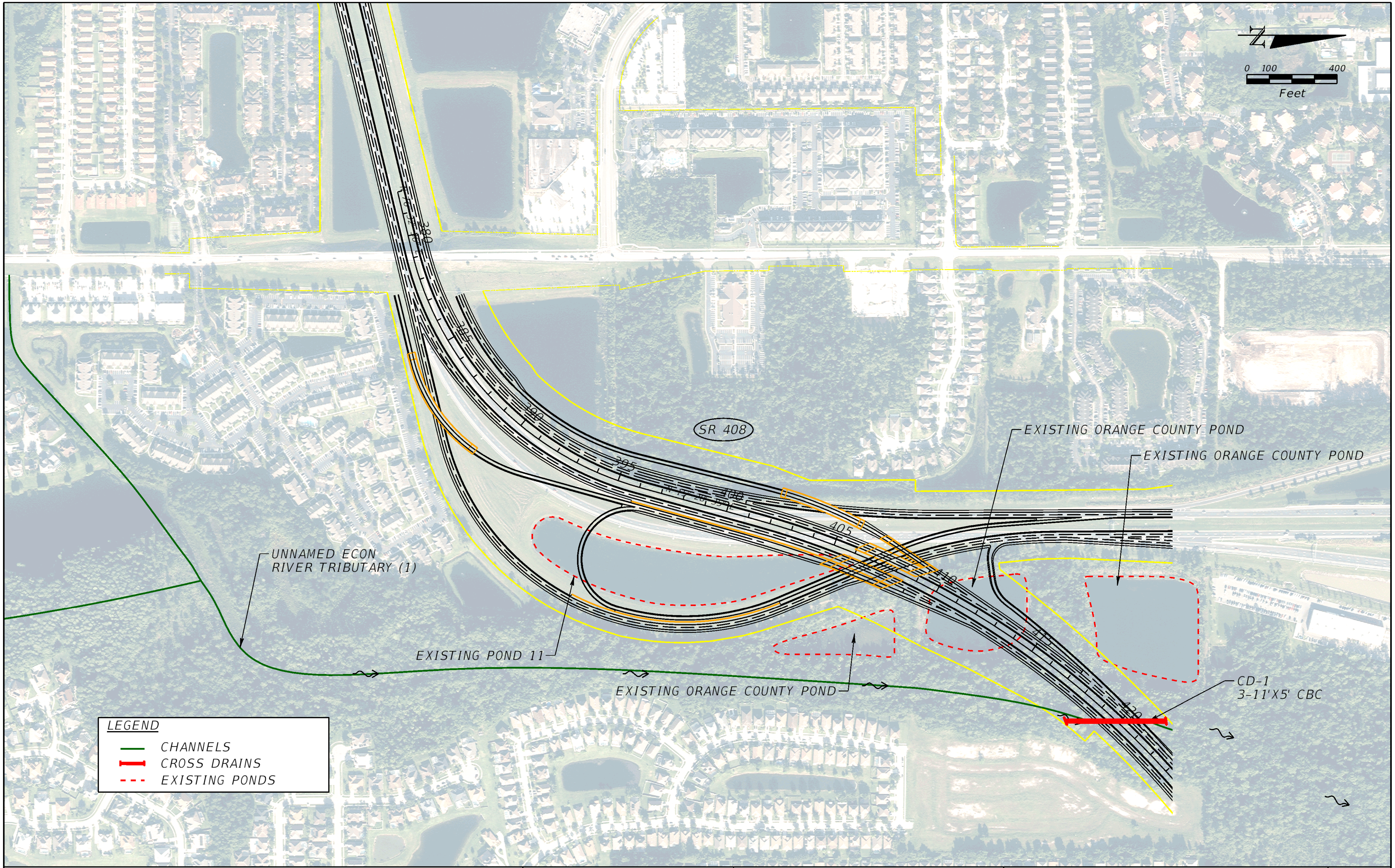
DESIGN SPEED = 40 MPH

APPROVED BY: C. Brian Fuller, P.E. License No.: 49524	CFX CONCURRENCE	CFX APPROVAL
Engineer Of Record Signature — Date	Jonathan Williamson, AICP CFX Project Manager — Date	Glenn M. Pressimone, PE CFX Director of Engineering — Date

Appendix: E

Cross Drain Exhibits

Cross Drains Site Maps



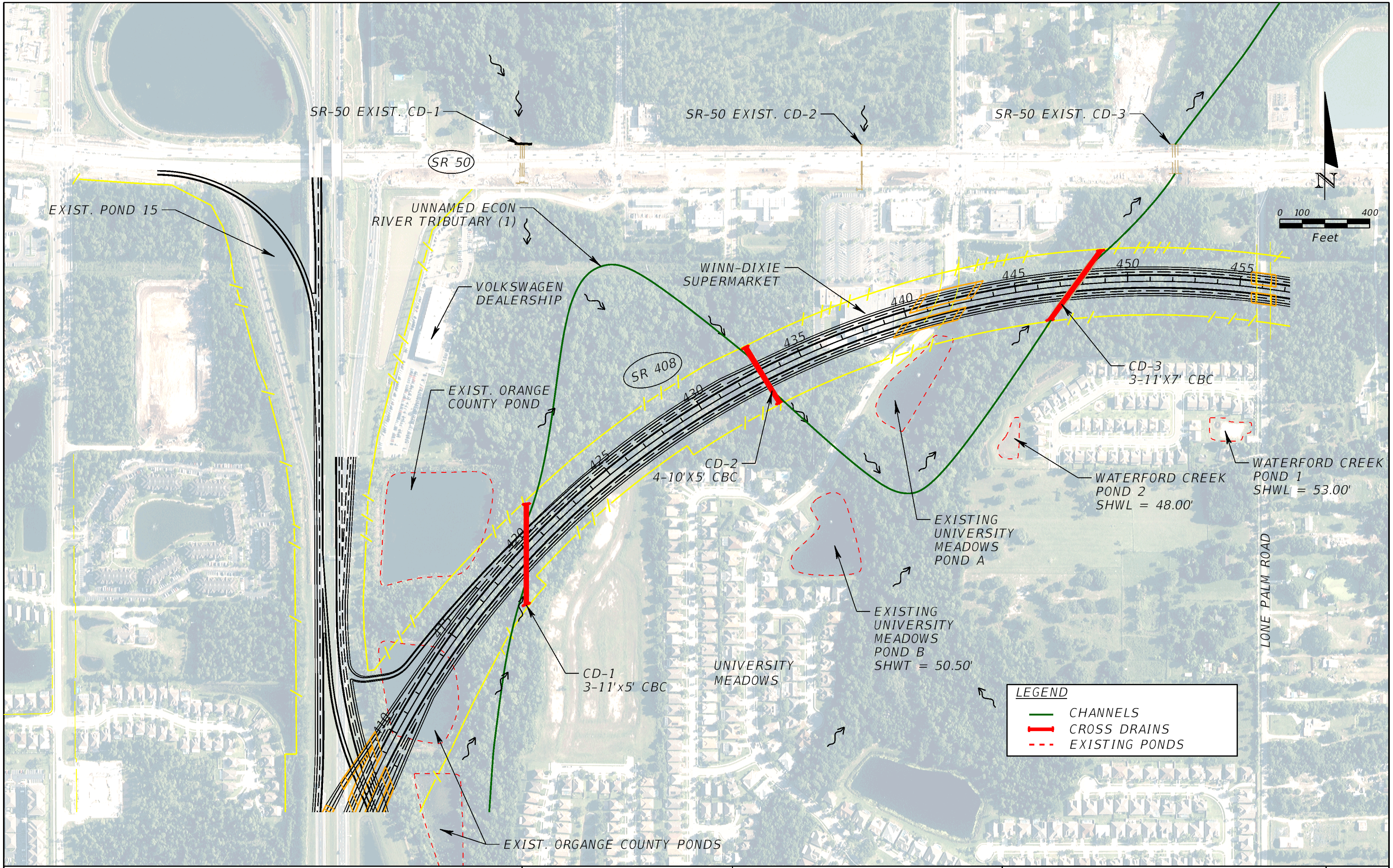
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN SITE MAP

SHEET NO.
E-1



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN
SITE MAP

SHEET NO.
E-2

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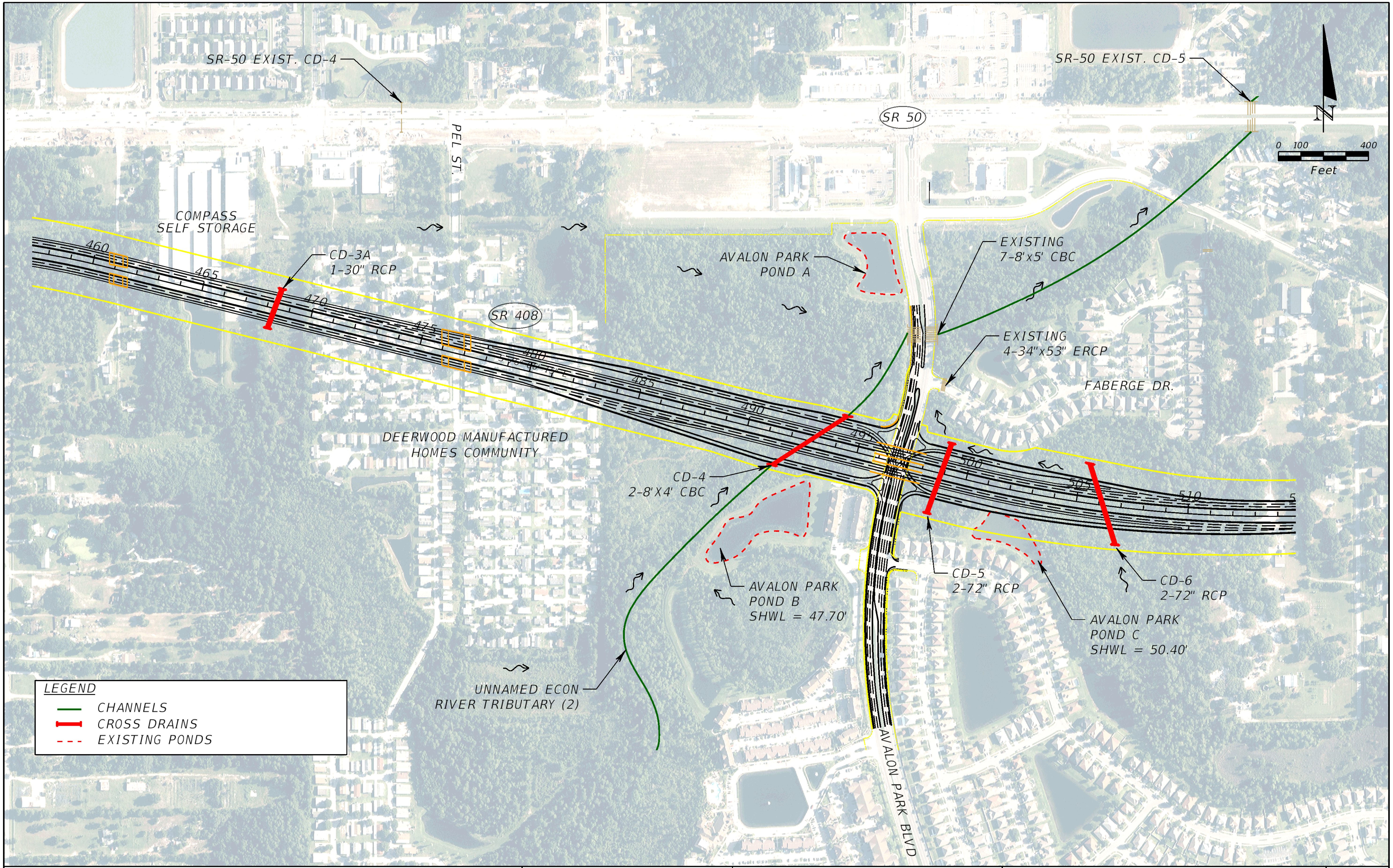

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN SITE MAP

SHEET NO.
E-3

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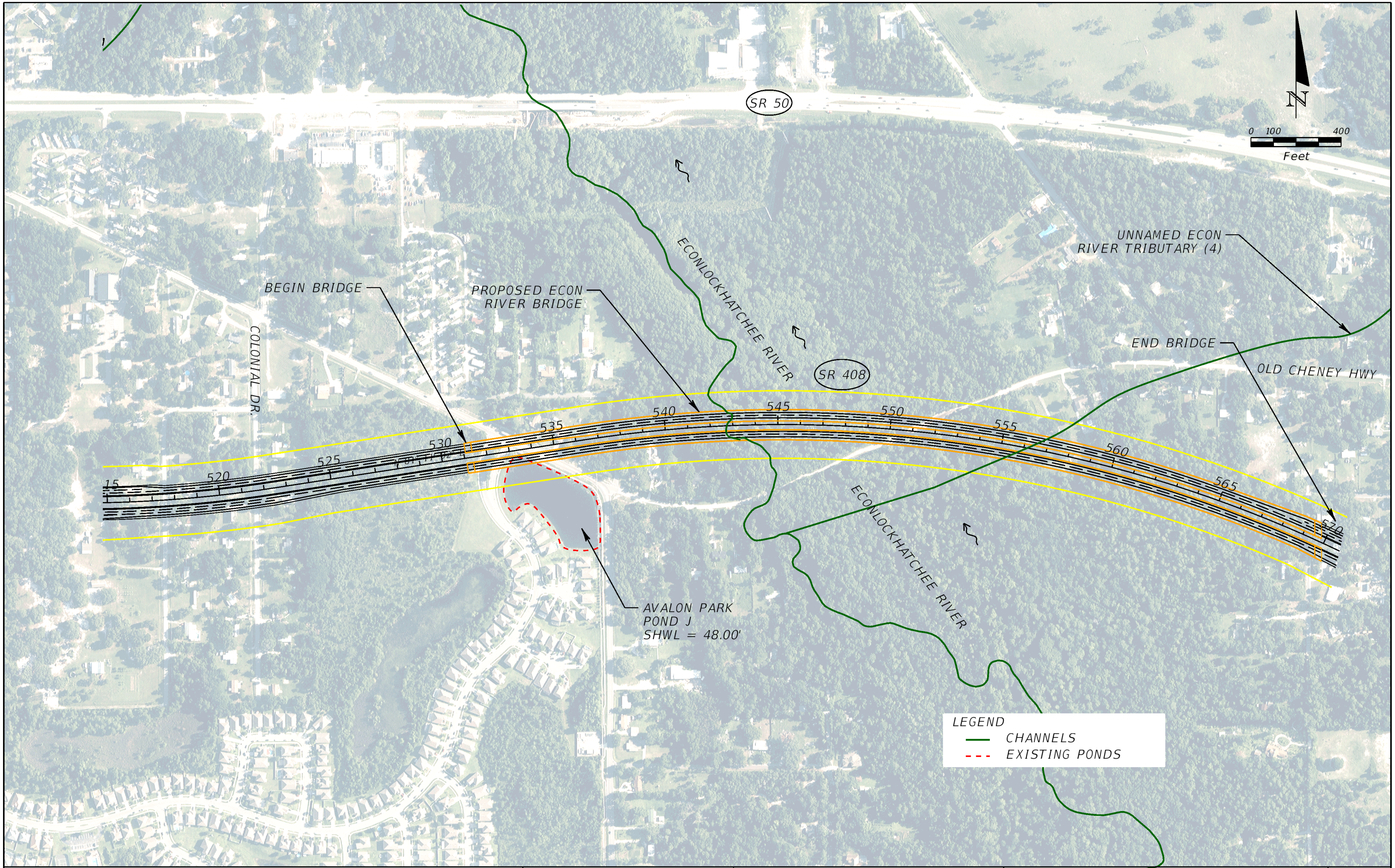

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN
SITE MAP

SHEET NO.
E-4

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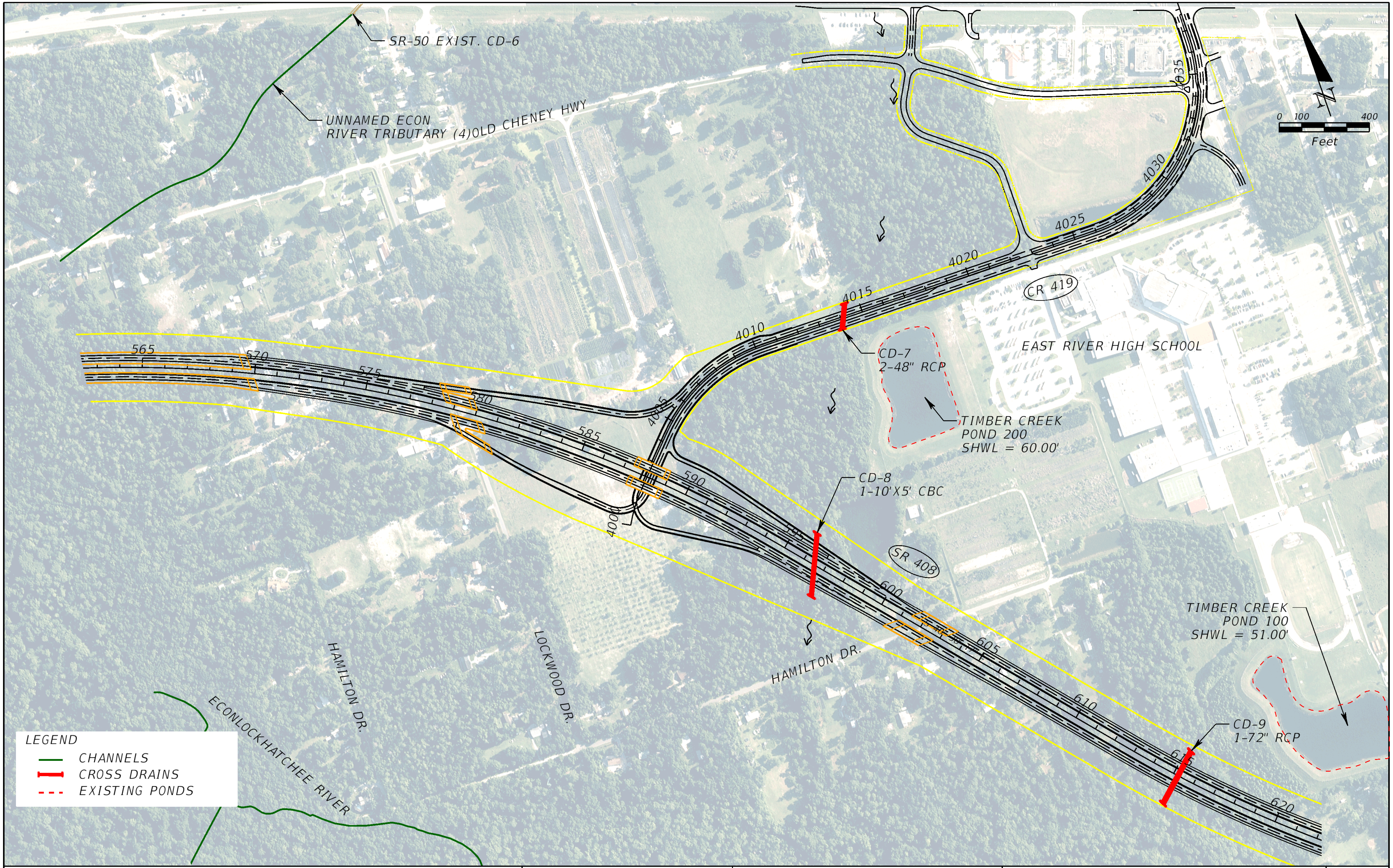


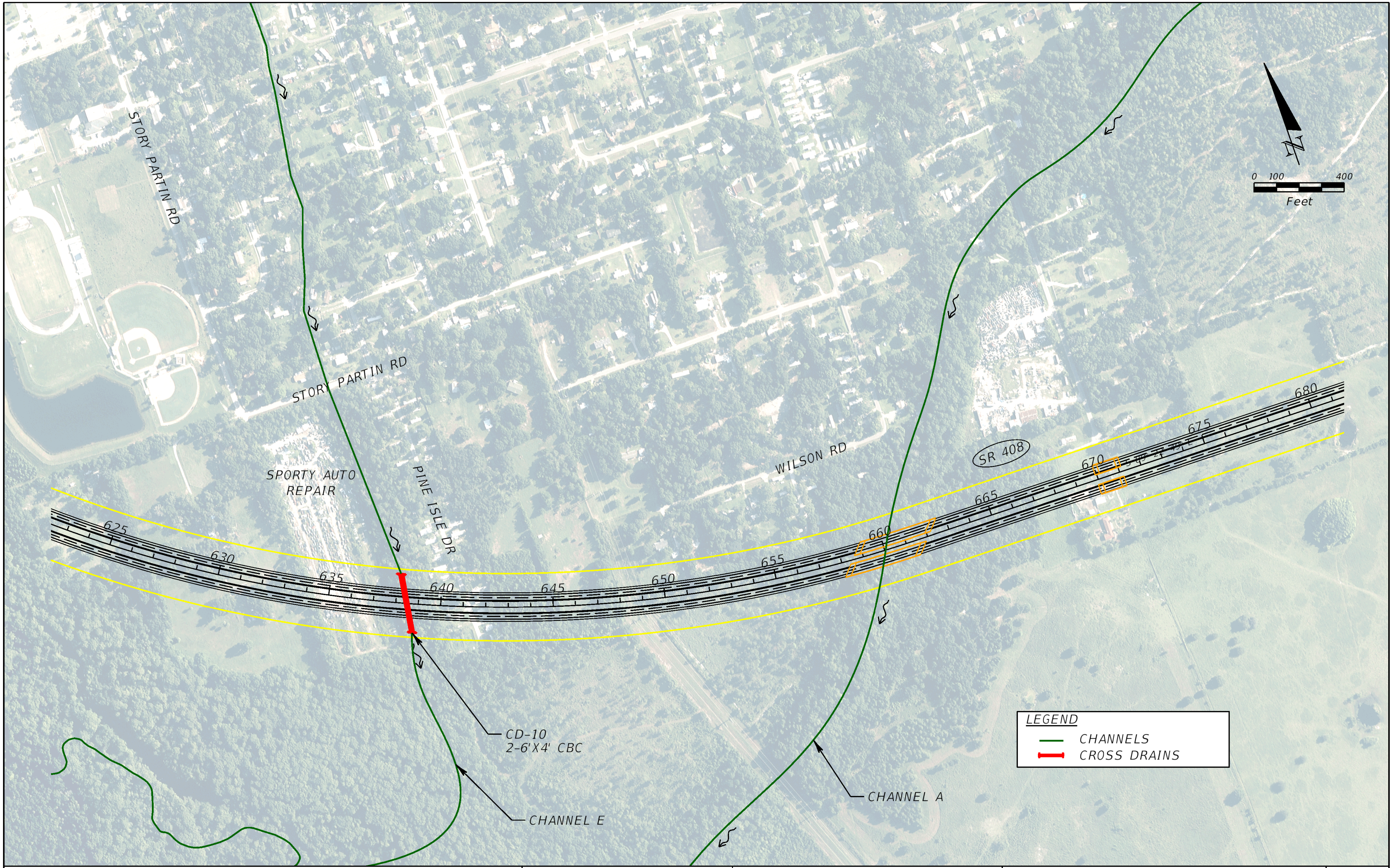
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN SITE MAP

SHEET NO.
E-5



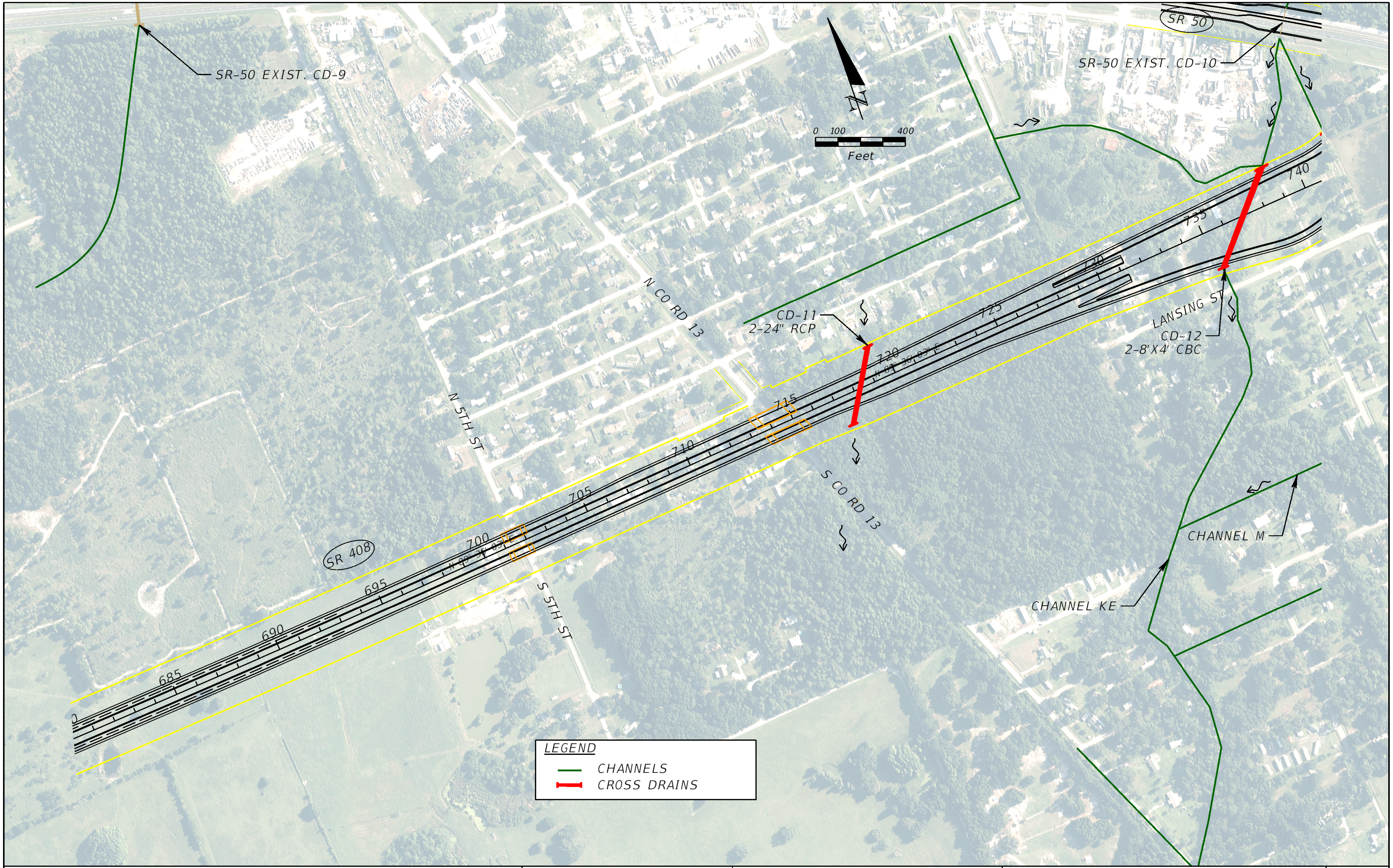
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN
SITE MAP

SHEET NO.
E-6



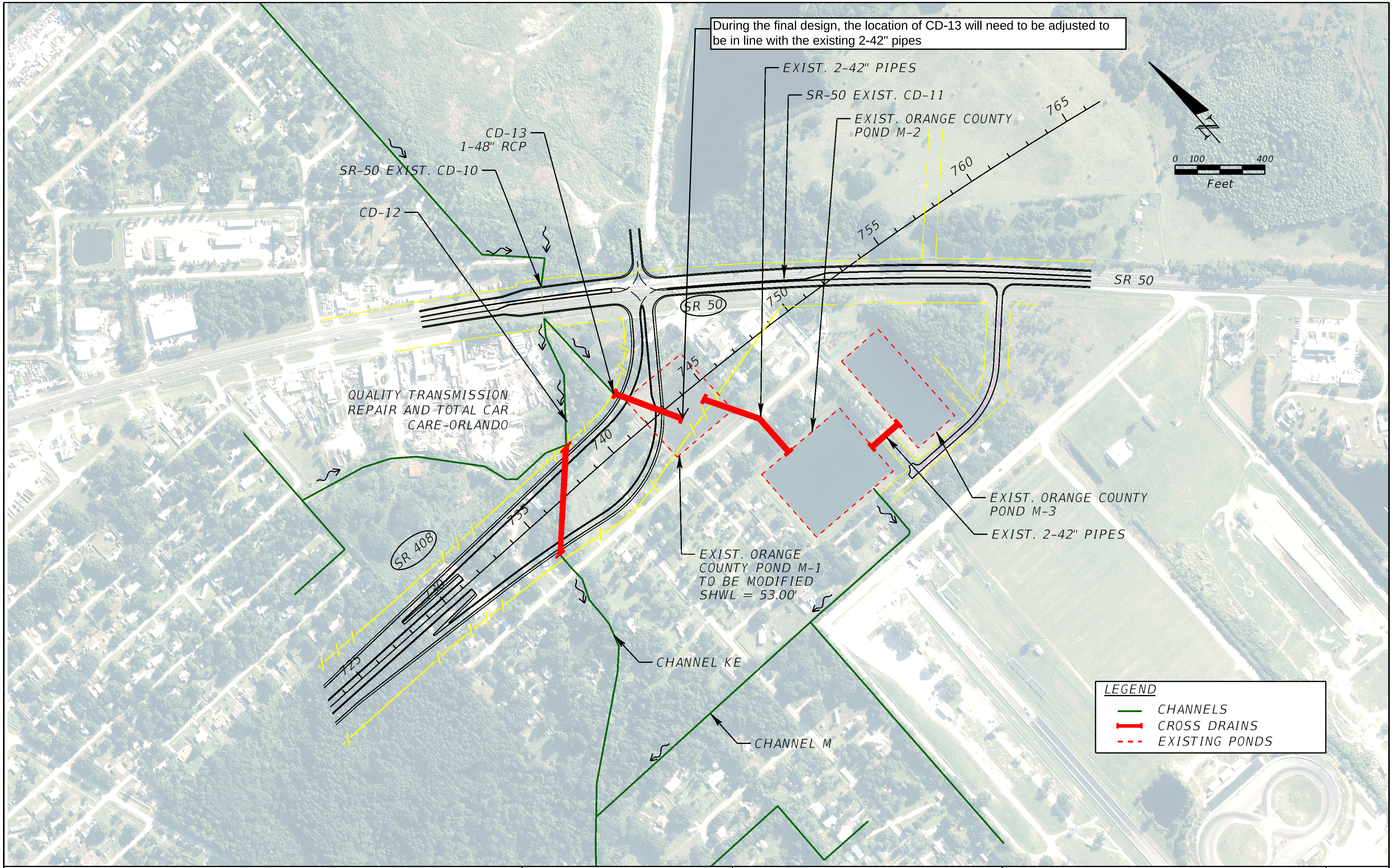
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN
SITE MAP

SHEET NO.
E-7



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

CROSS DRAIN
SITE MAP

SHEET NO.
E-8

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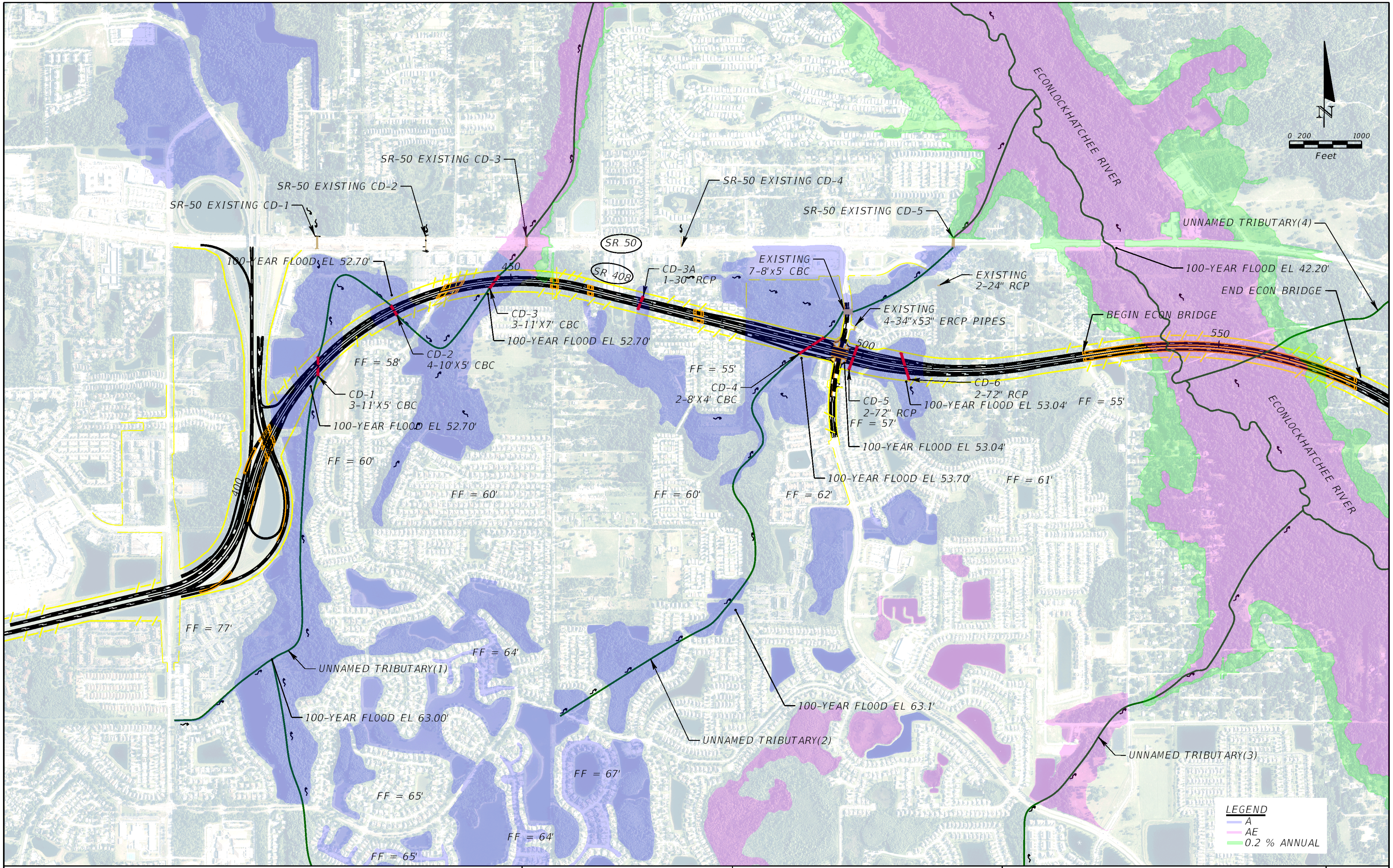
Proposed Cross Drains Within Floodplains



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

PROPOSED CROSS DRAINS
WITHIN FLOODPLAINS

SHEET NO.
E-9

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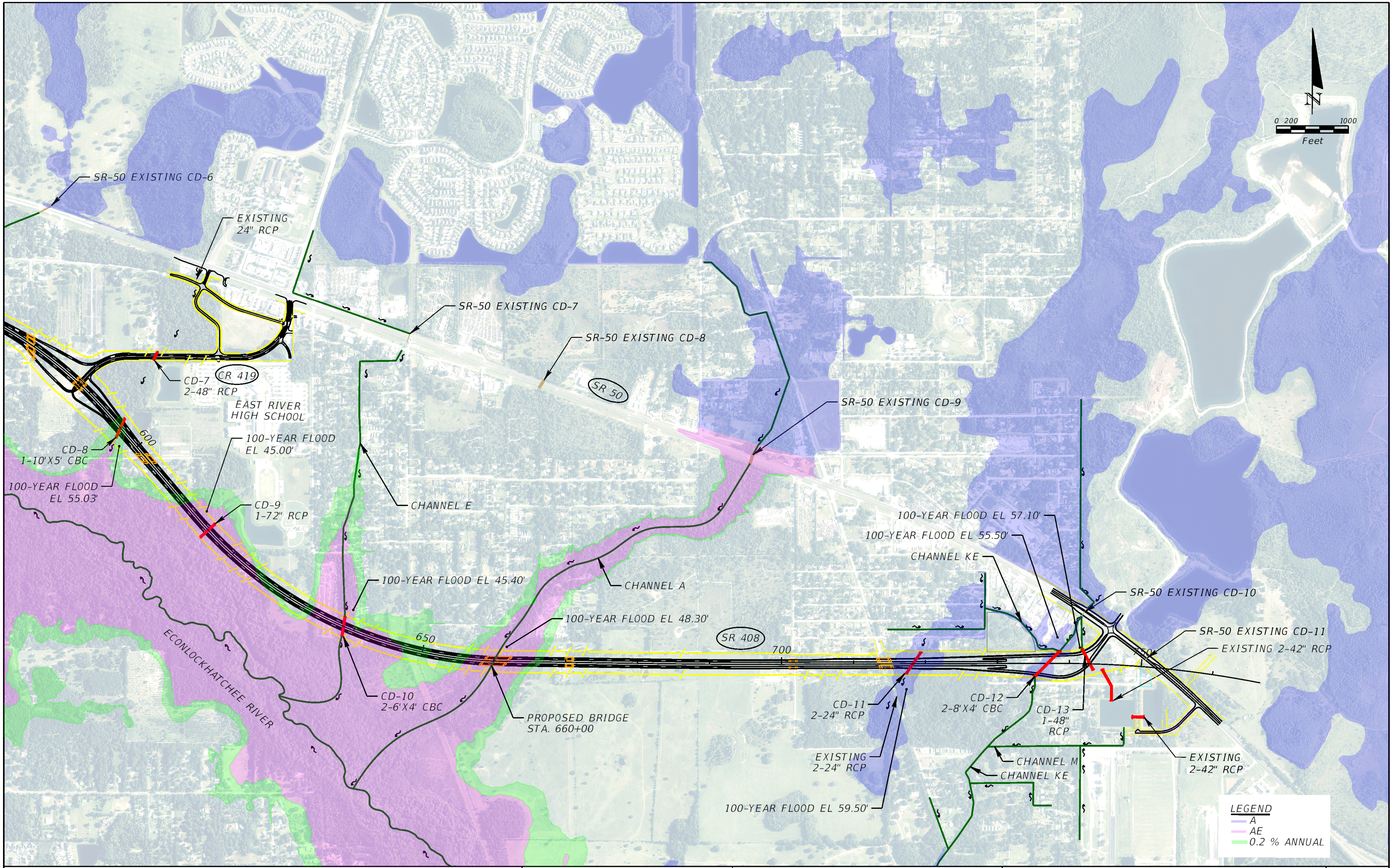


REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

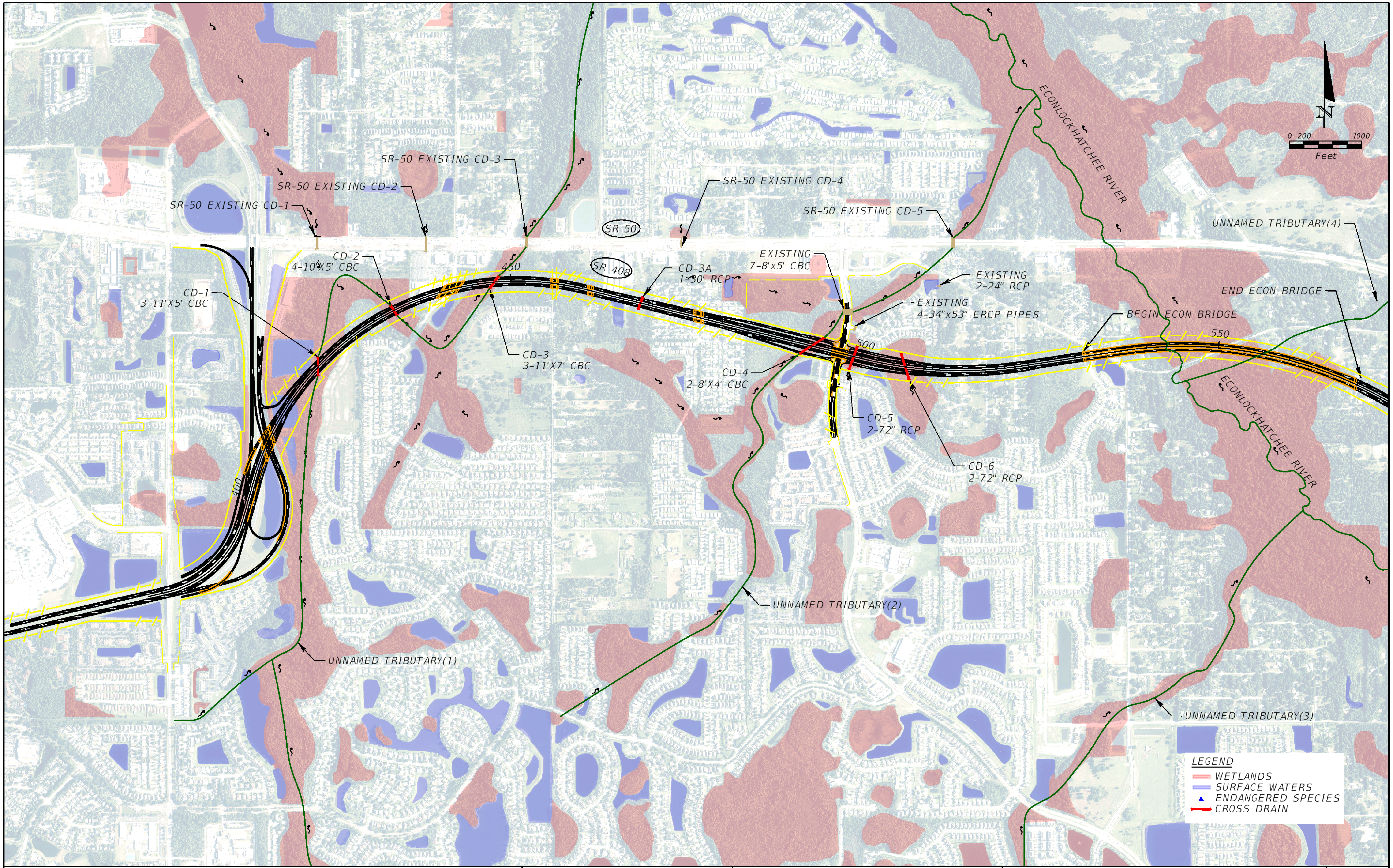
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

PROPOSED CROSS DRAINS WITHIN FLOODPLAINS

SHEET NO.
E-10

Proposed Cross Drains Within Wetlands



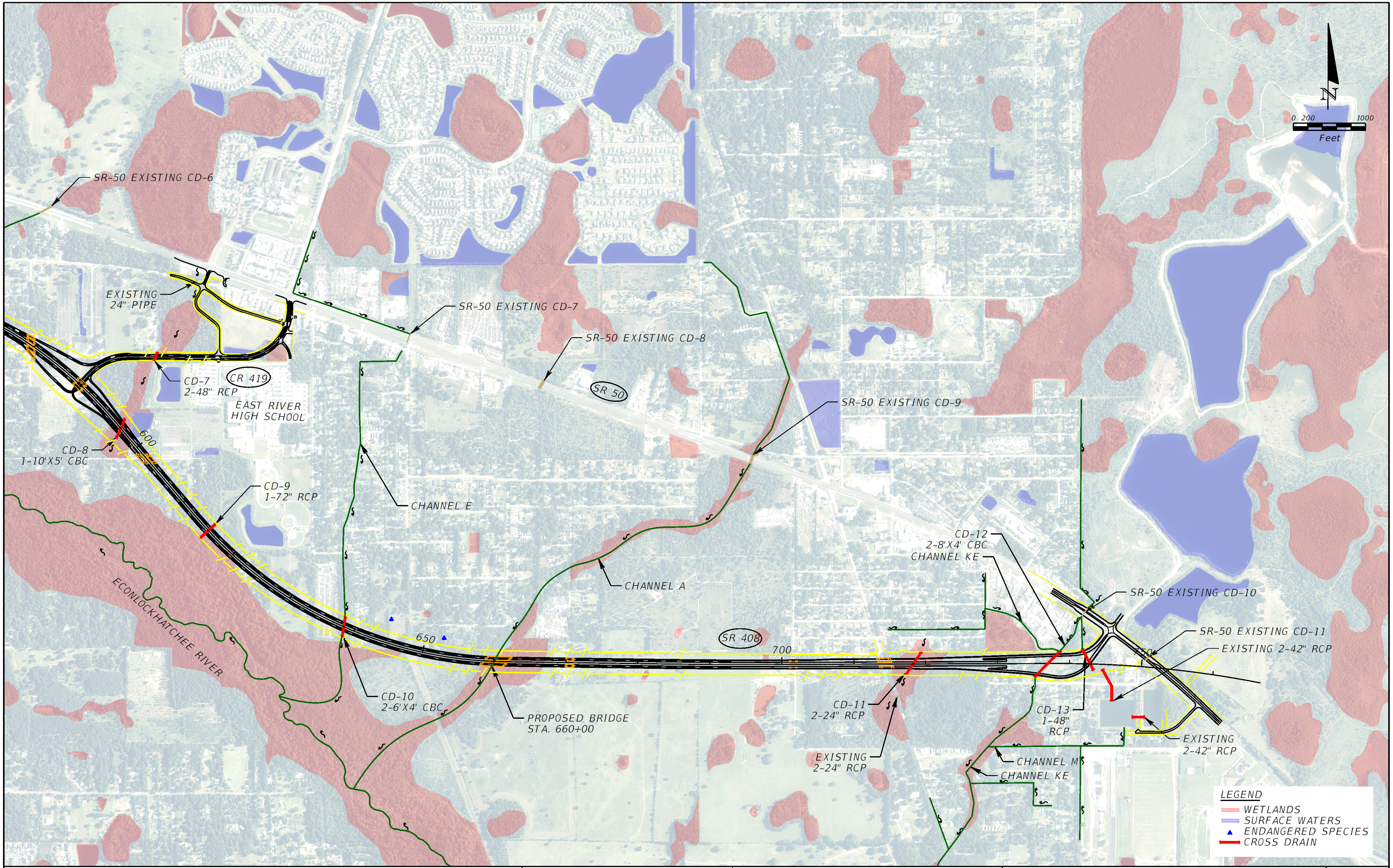
REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

PROPOSED CROSS DRAINS WITHIN WETLANDS

SHEET NO.
E-11



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID

PROPOSED CROSS DRAINS WITHIN WETLANDS

SHEET NO.
E-12

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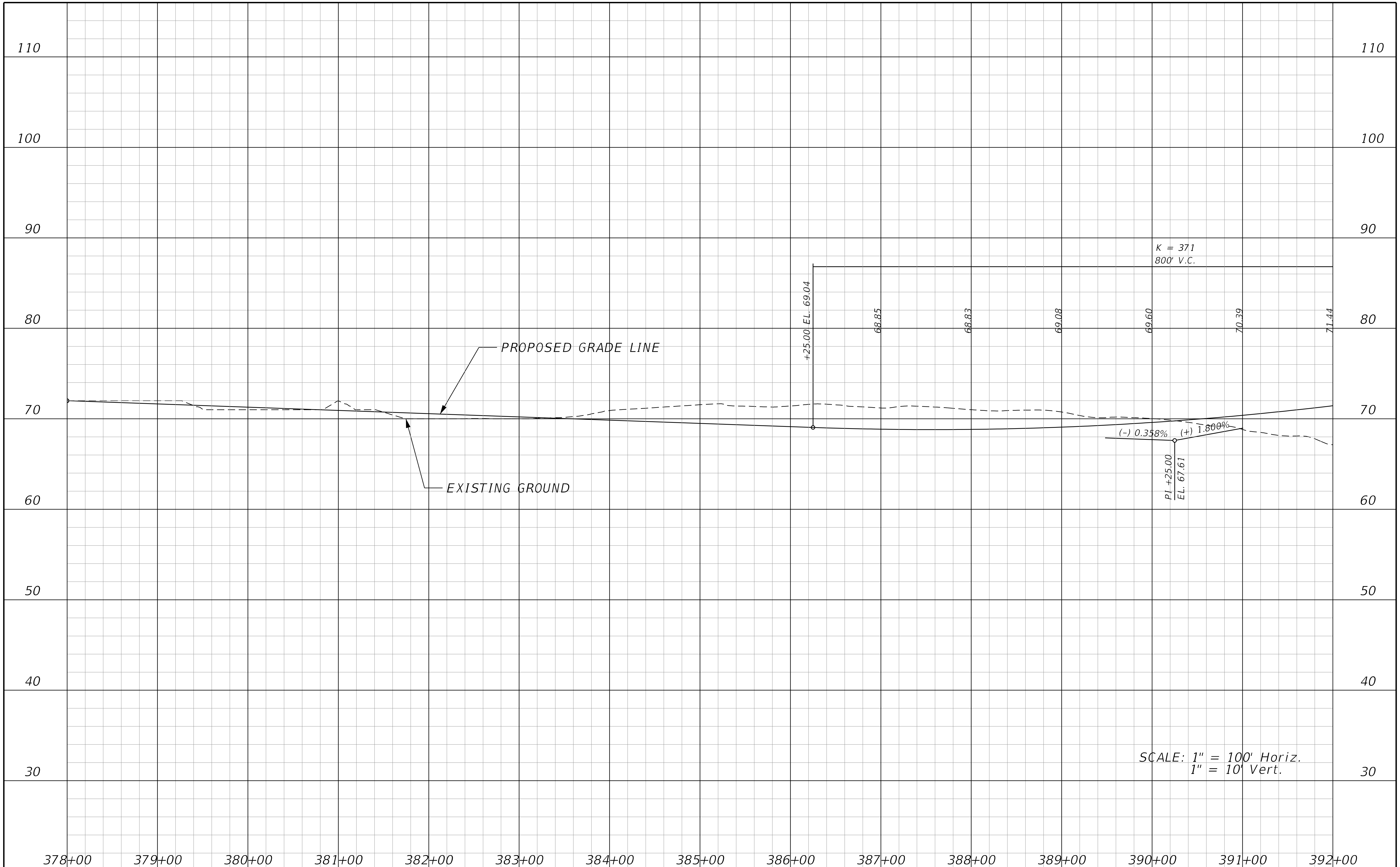
Appendix: F

Cross Drain and Bridge Profiles



REVISIONS			
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C. BRIAN FULLER, P.E.
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METRIC ENGINEERING, INC.
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LAKE MARY, FLORIDA 32746
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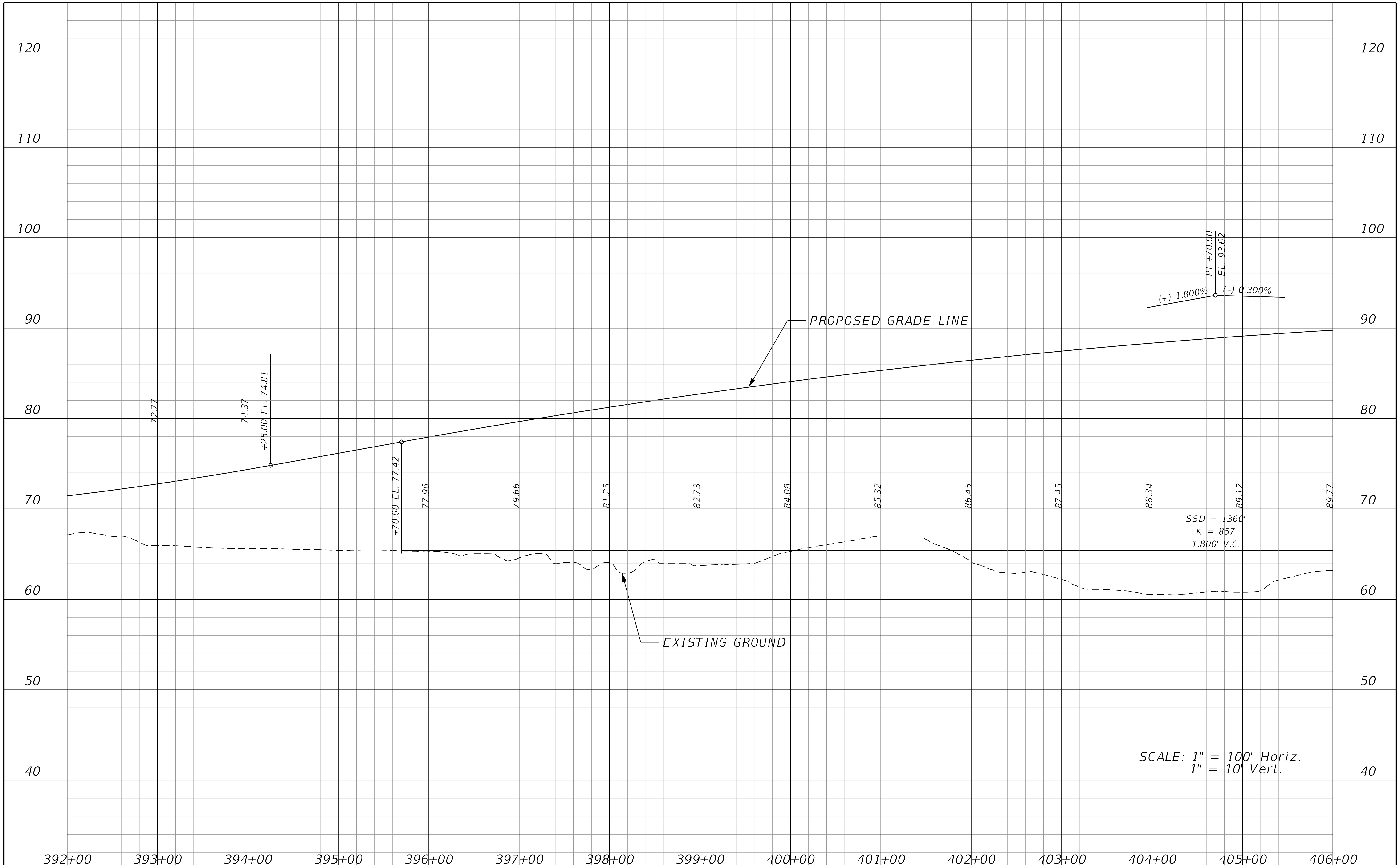
FAX. (407) 644-2376
CERTIFICATE OF AUTHORIZATION: 2294

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-1



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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

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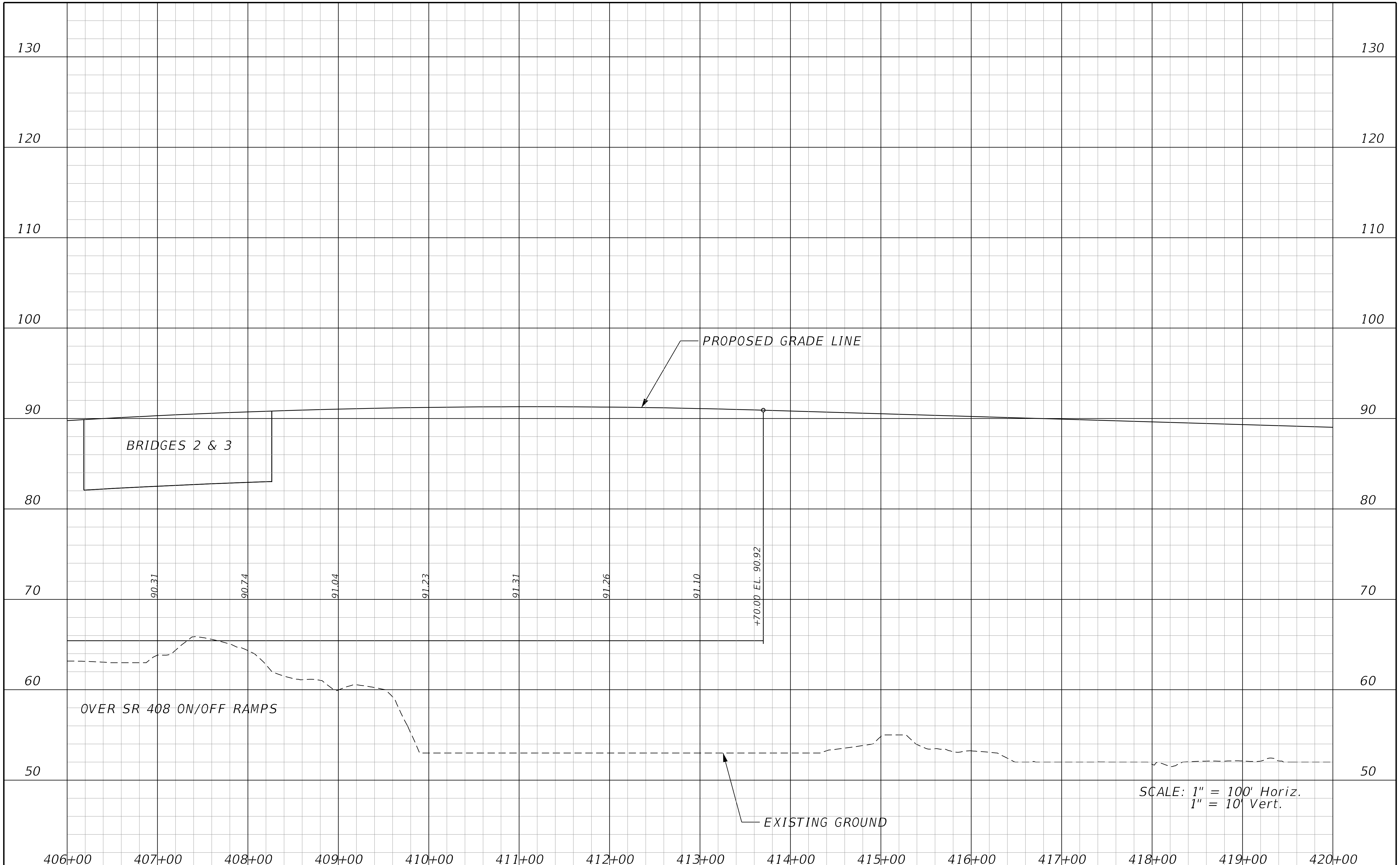
F-2



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DATE	DESCRIPTION	DATE	DESCRIPTION

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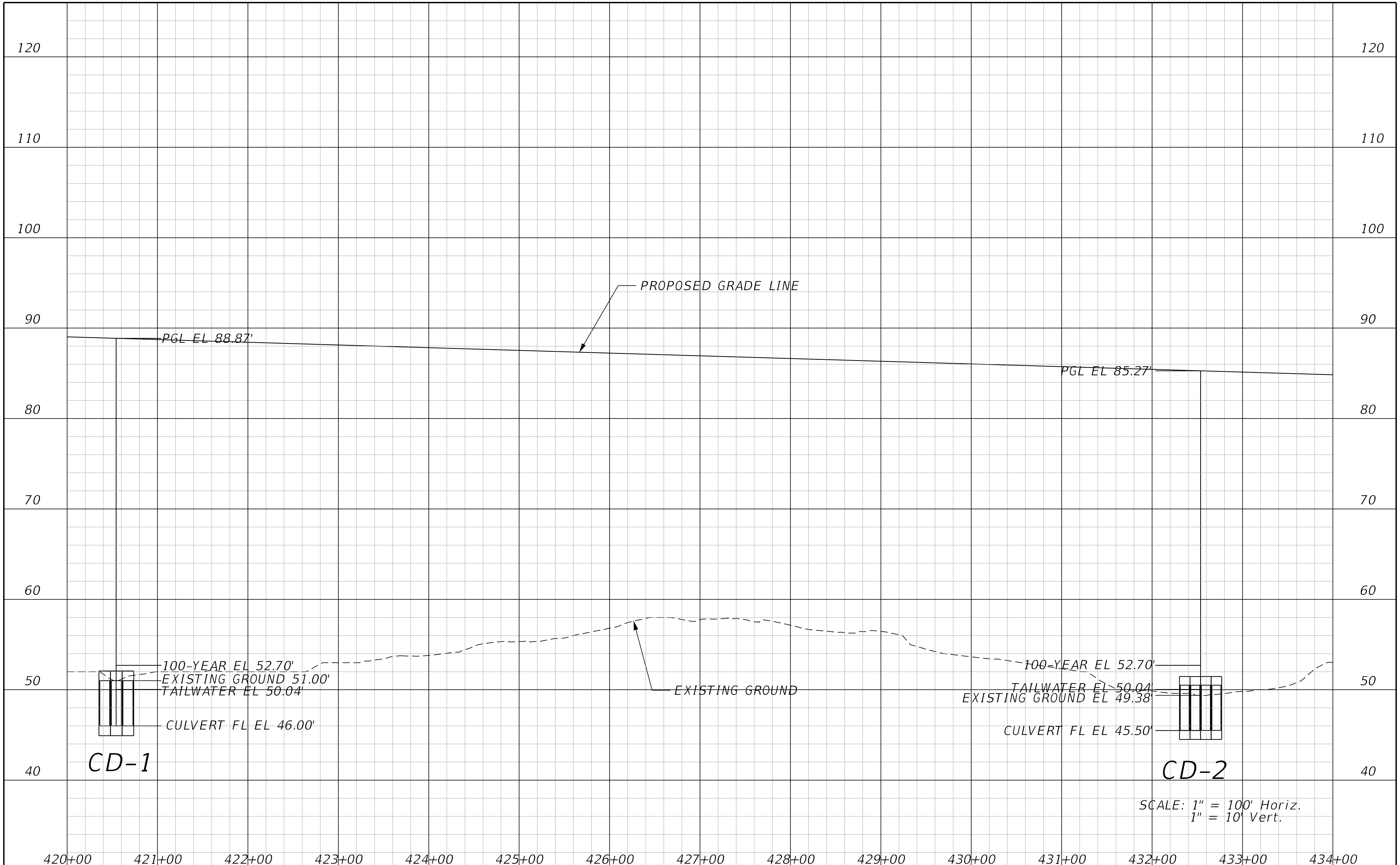
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO. F-3



REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
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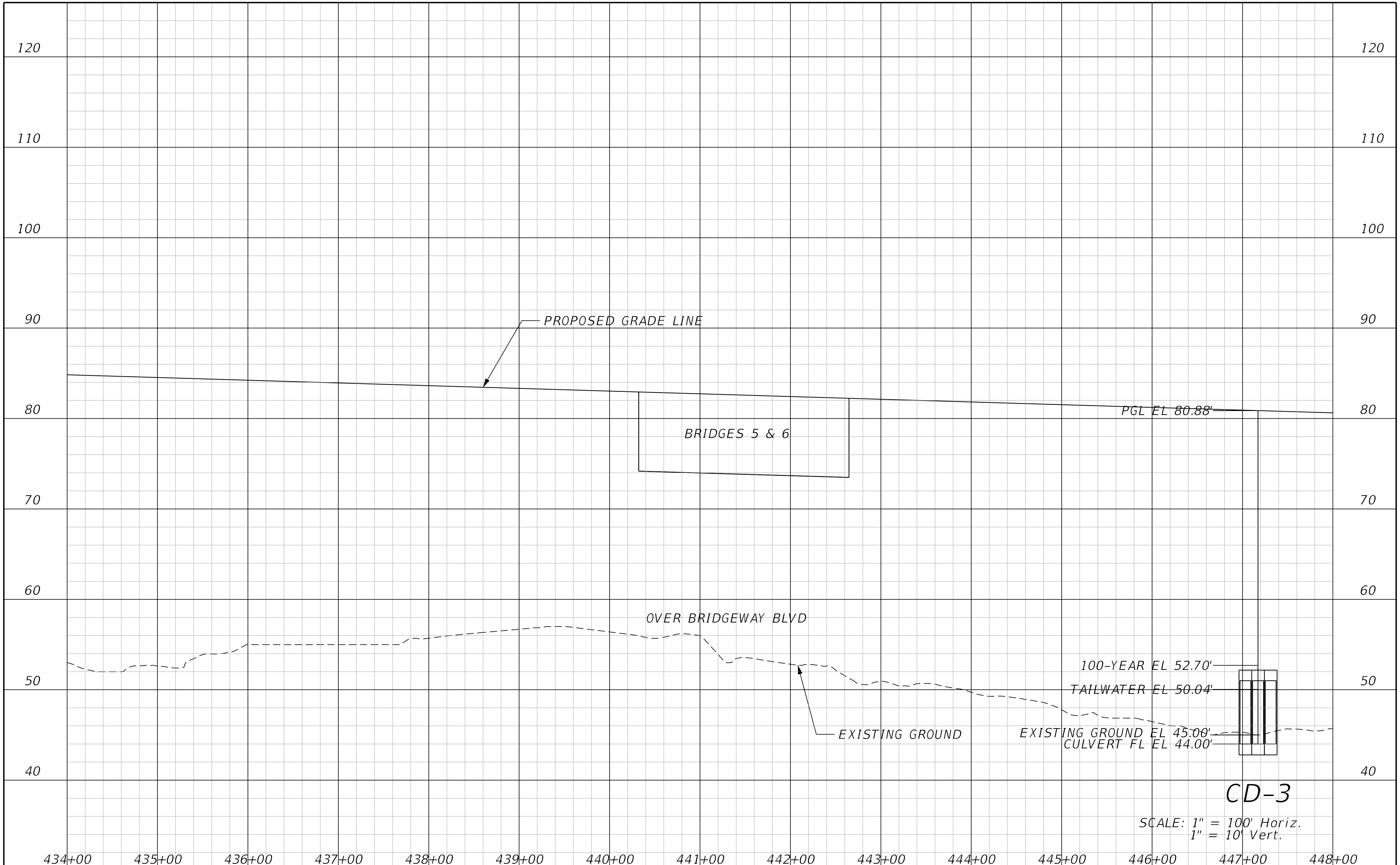
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-4



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
P.E. NO.: 49524
METRIC ENGINEERING, INC.
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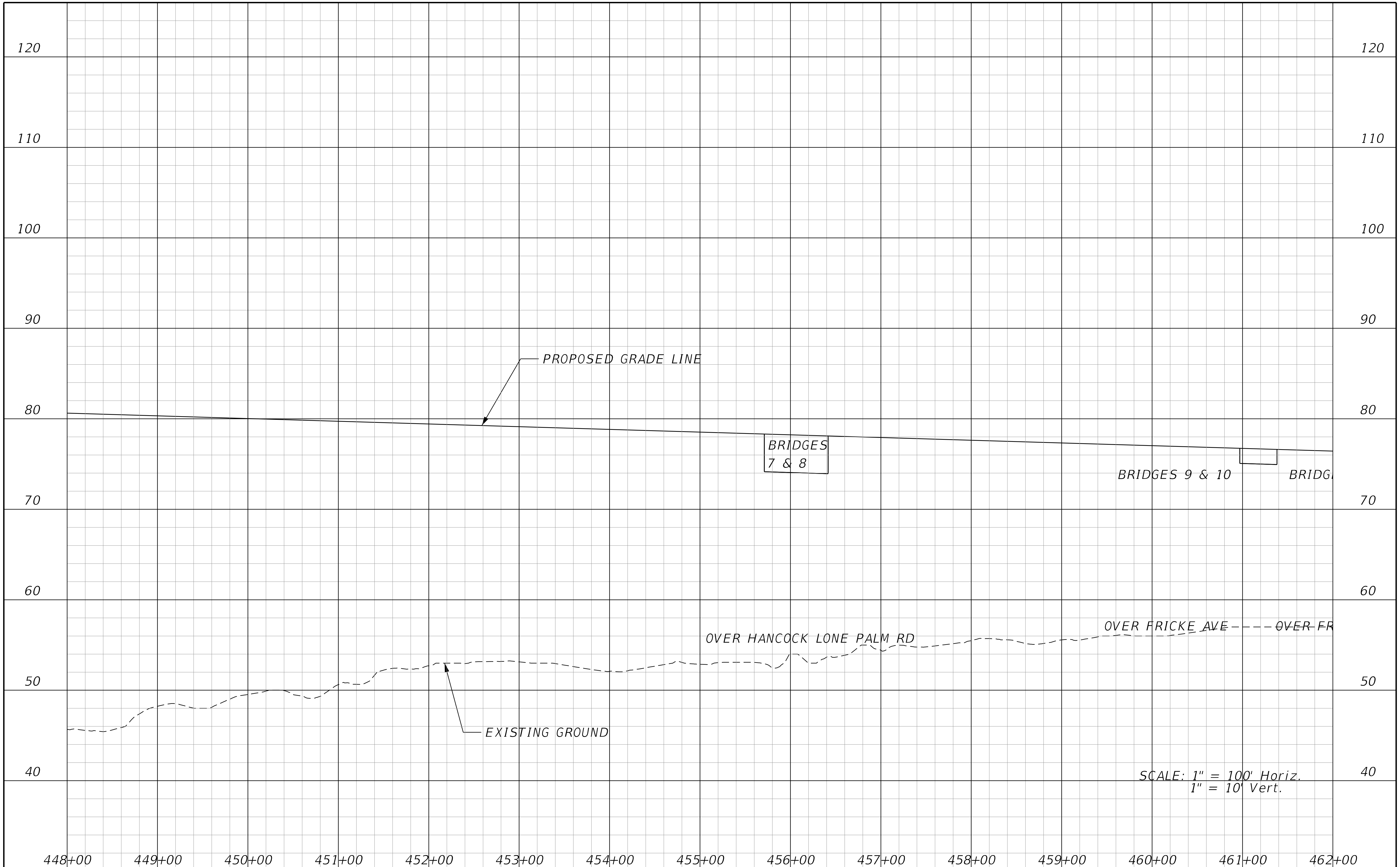
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-5



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
P.E. NO.: 49524
METRIC ENGINEERING, INC.
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CERTIFICATE OF AUTHORIZATION: 2294

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-6

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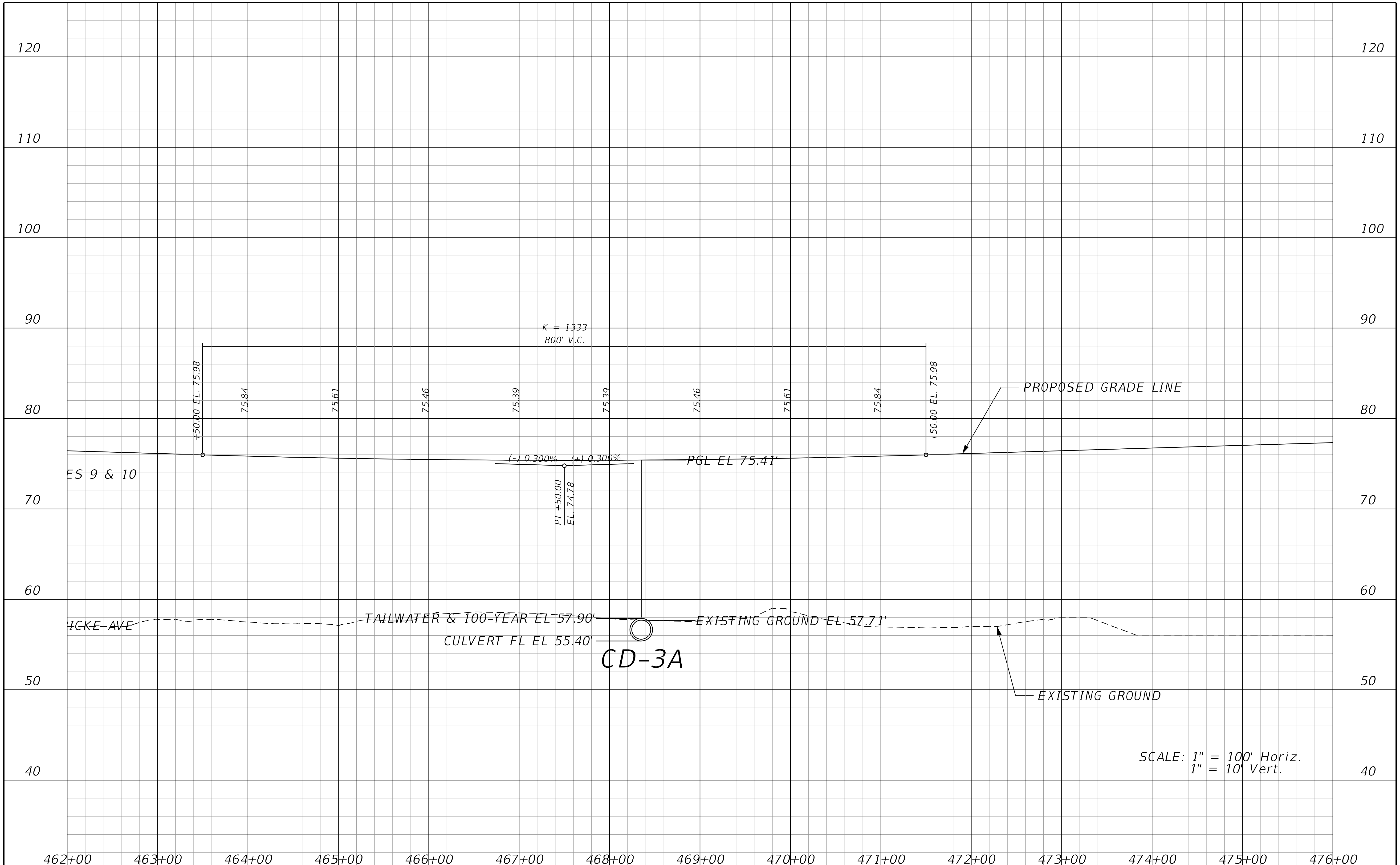

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
P.E. NO.: 49524
METRIC ENGINEERING, INC.
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FAX. (407) 644-2376
CERTIFICATE OF AUTHORIZATION: 2294

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-7

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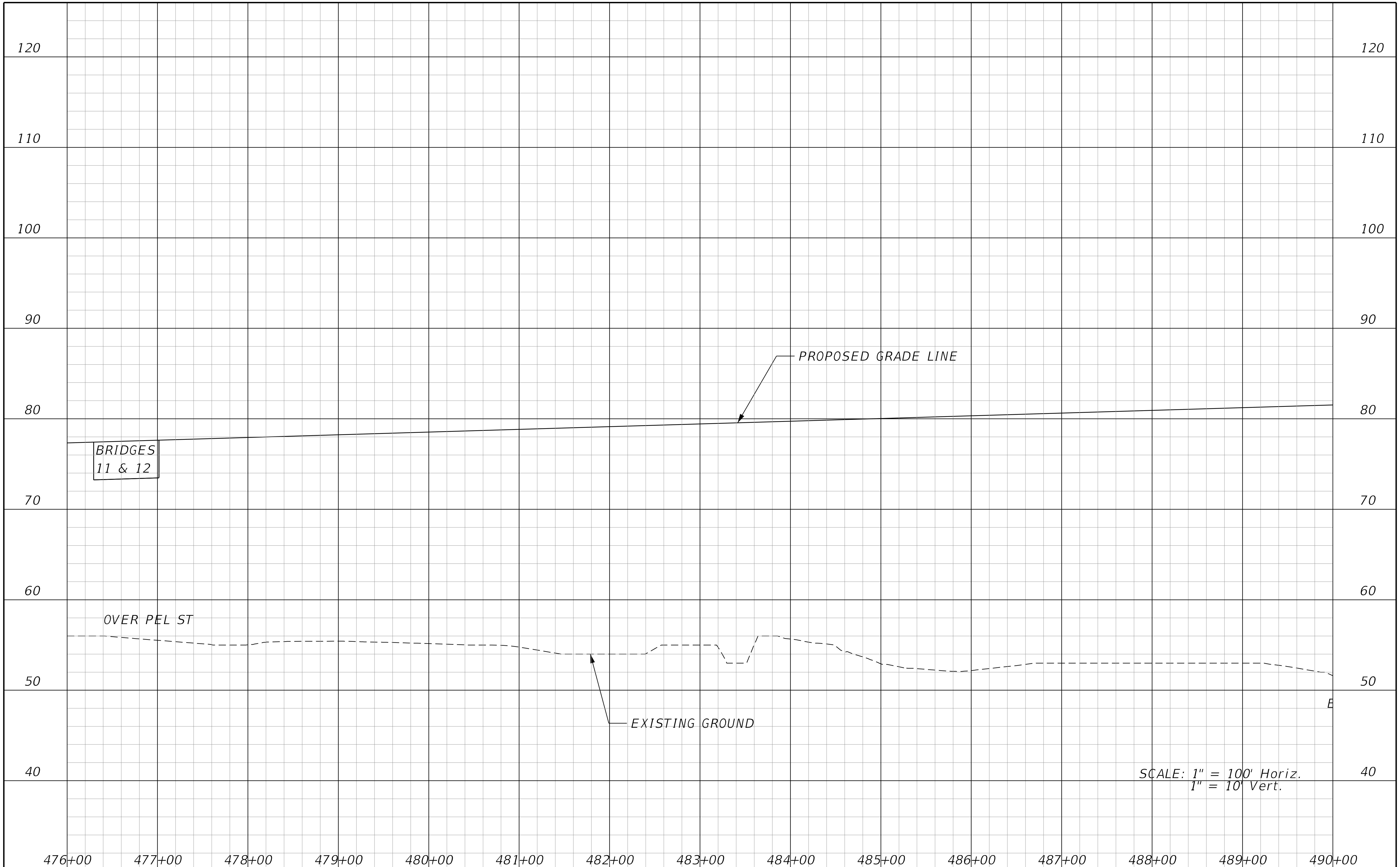

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
P.E. NO.: 49524
METRIC ENGINEERING, INC.
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LAKE MARY, FLORIDA 32746
TEL. (407) 644-1898
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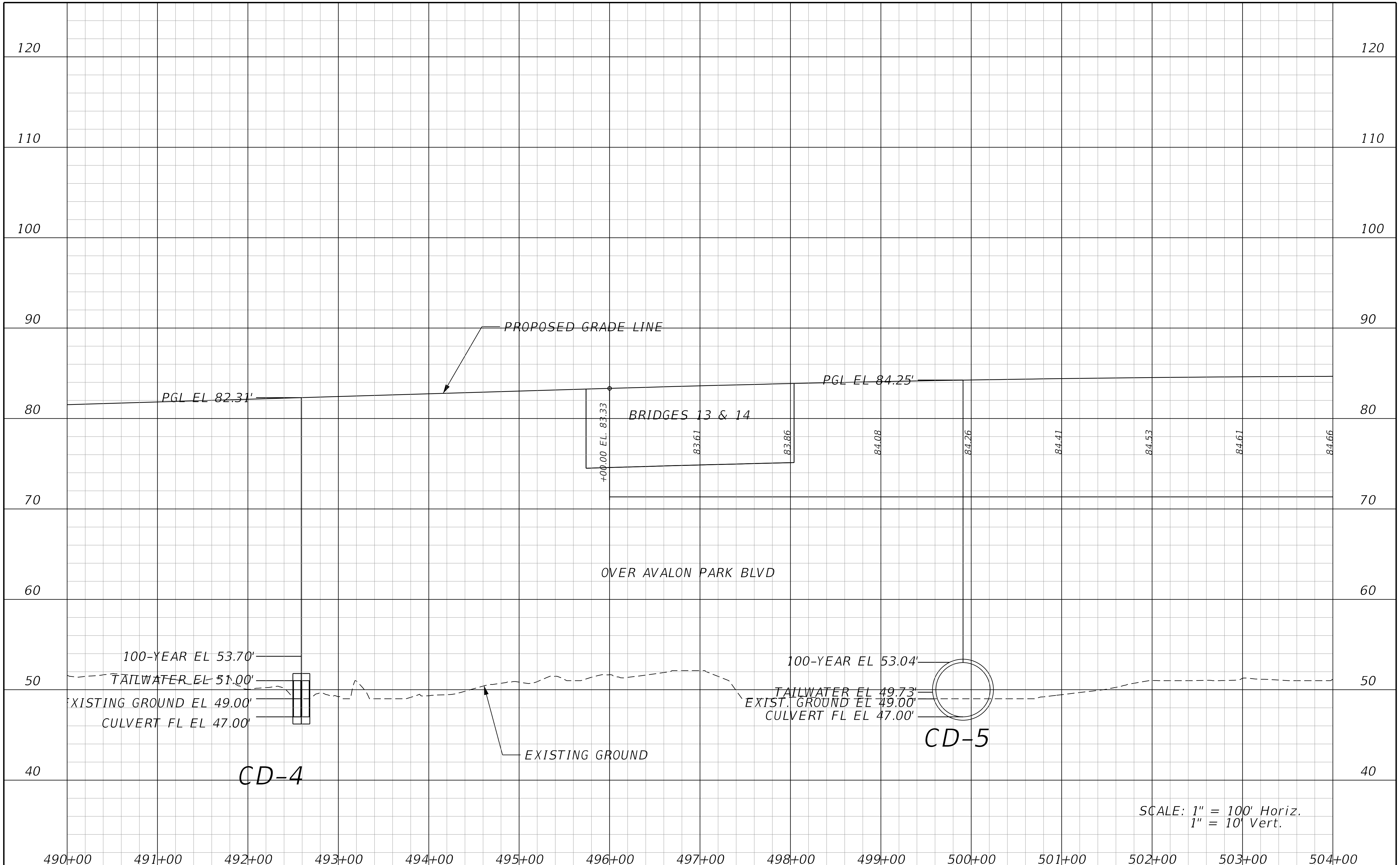
CERTIFICATE OF AUTHORIZATION: 2294

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-8



REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

C. BRIAN FULLER, P.E.
P.E. NO.: 49524
METRIC ENGINEERING, INC.
615 CRESCENT EXECUTIVE CT, SUITE 524
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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 408	ORANGE	408254

PROFILE SHEET

SHEET NO.
F-9

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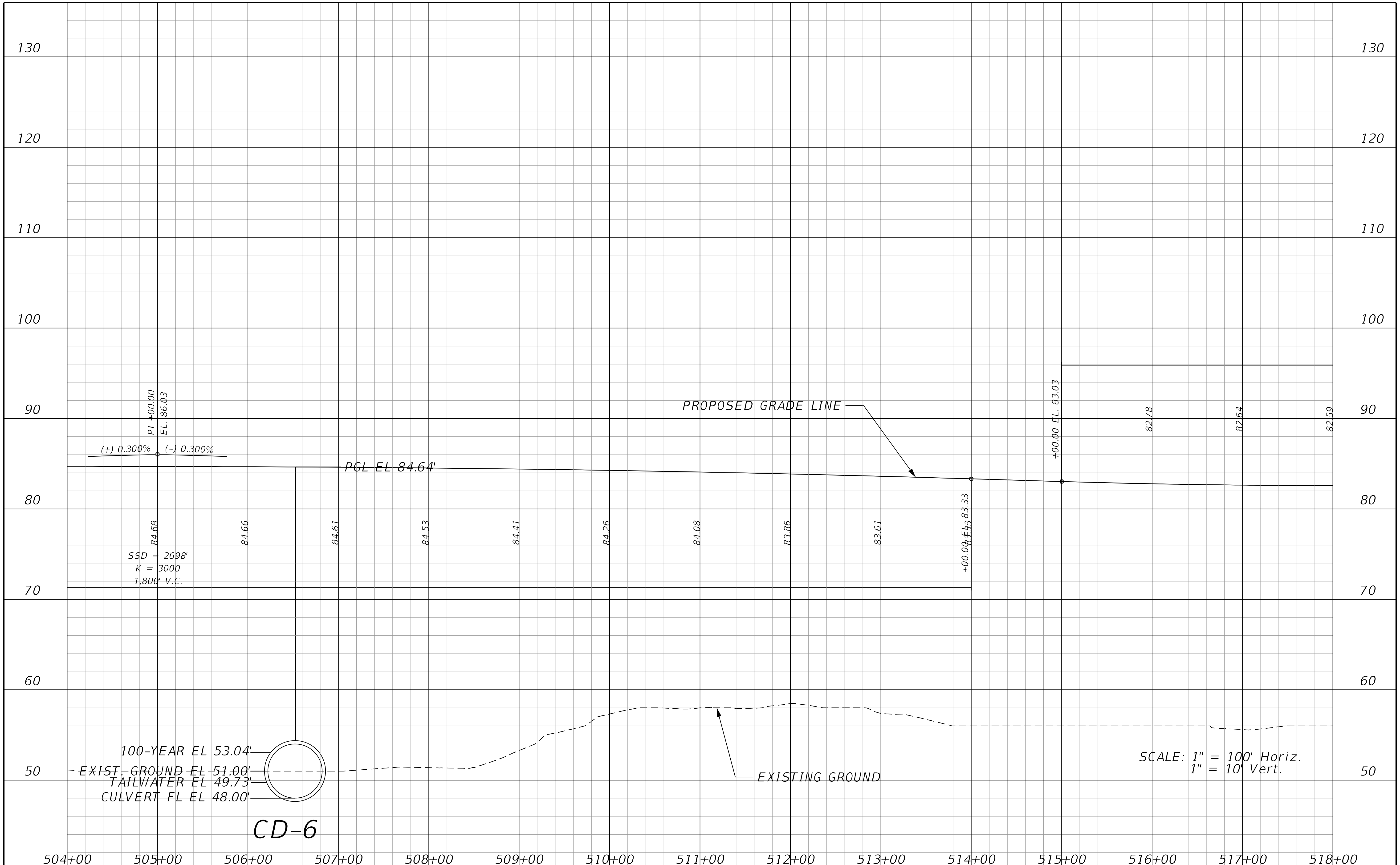

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PROFILE SHEET

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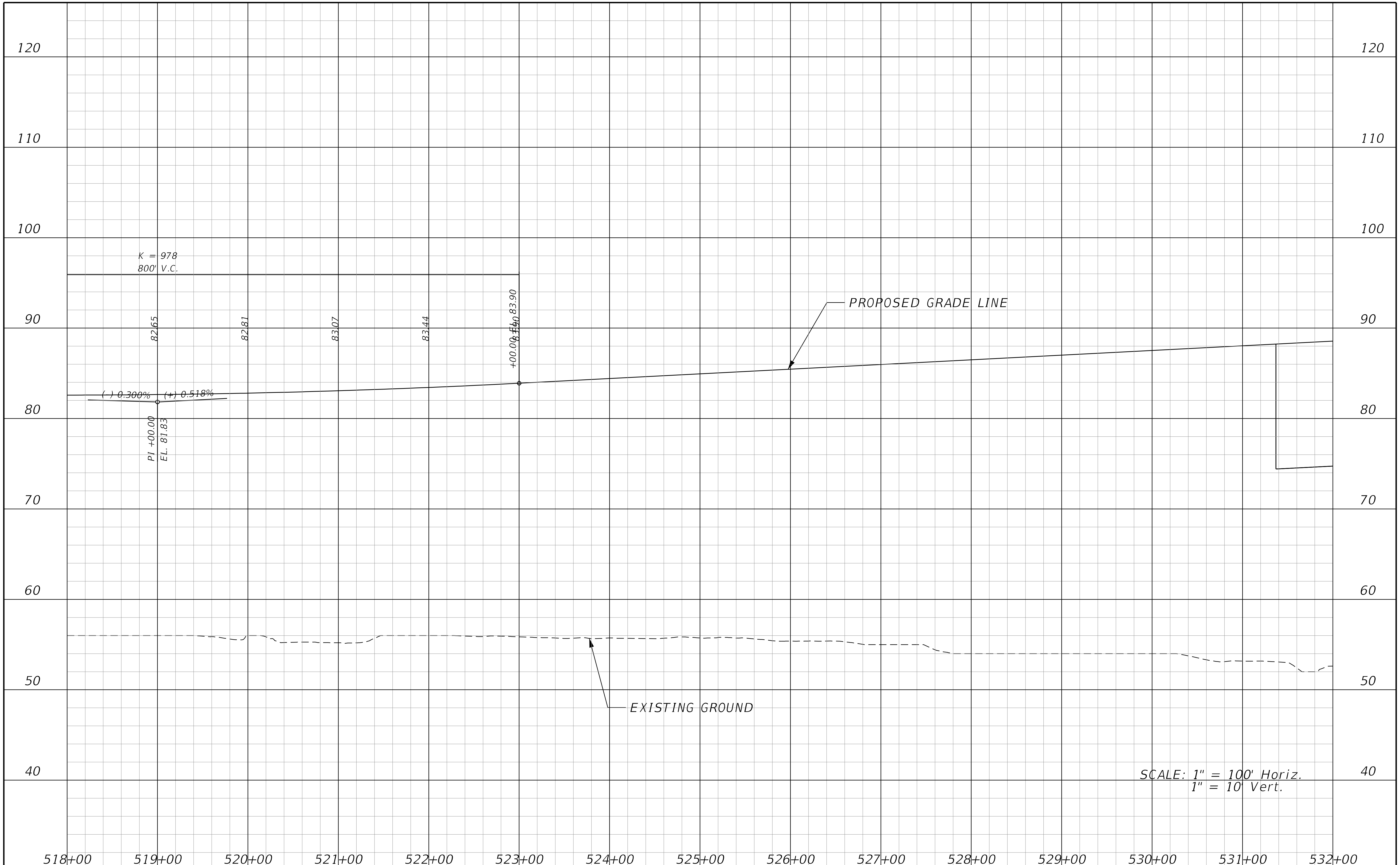

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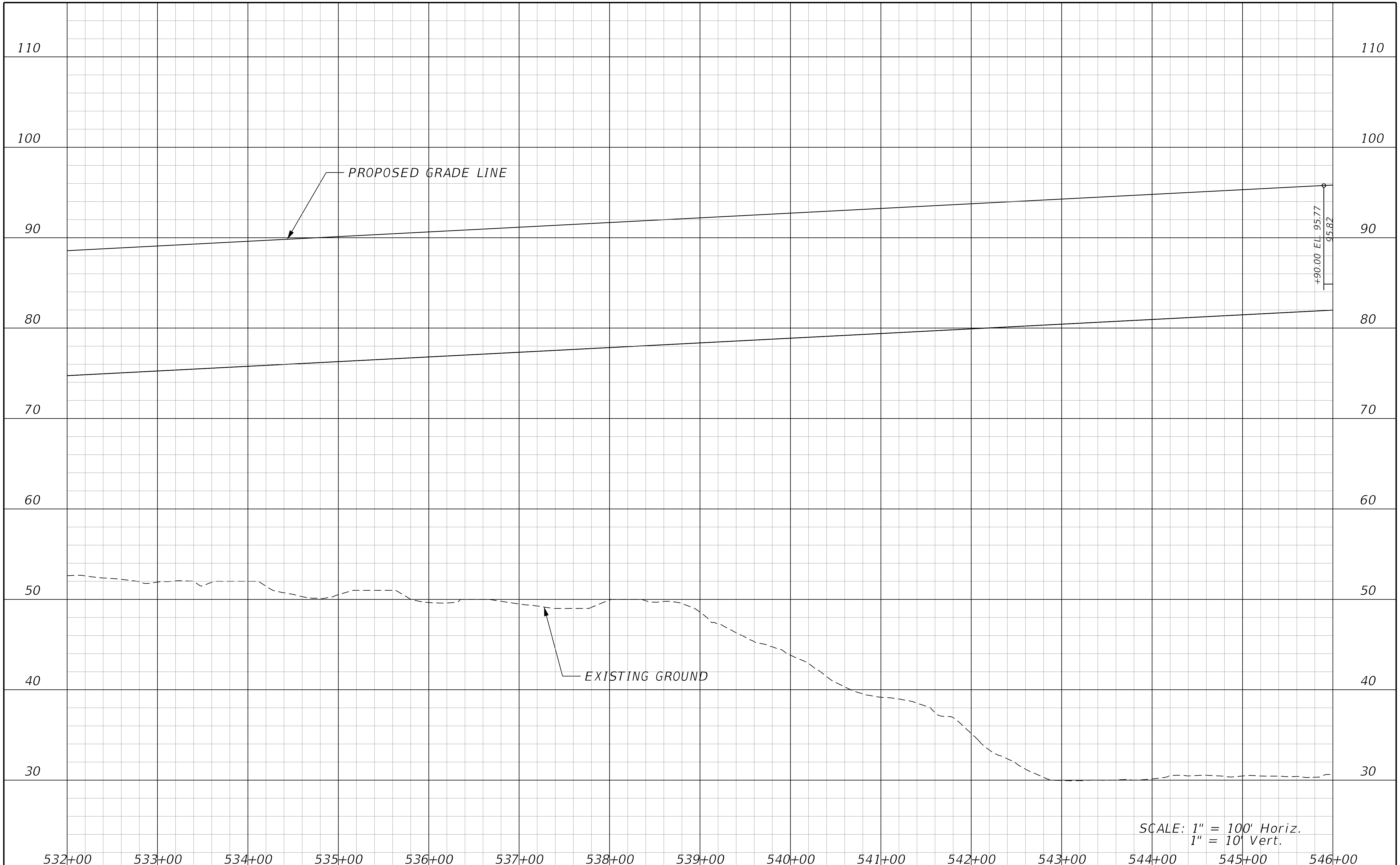

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PROFILE SHEET

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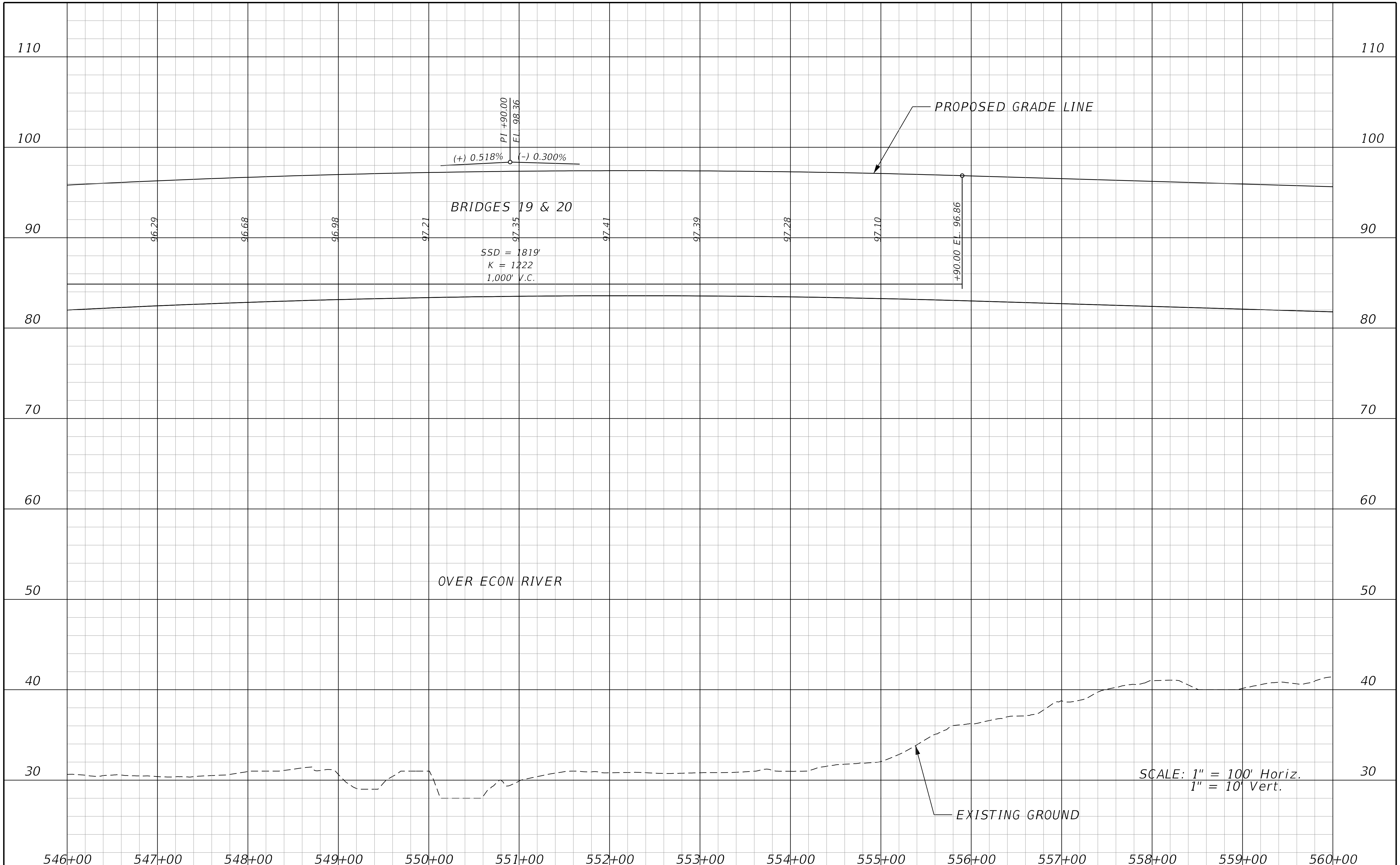

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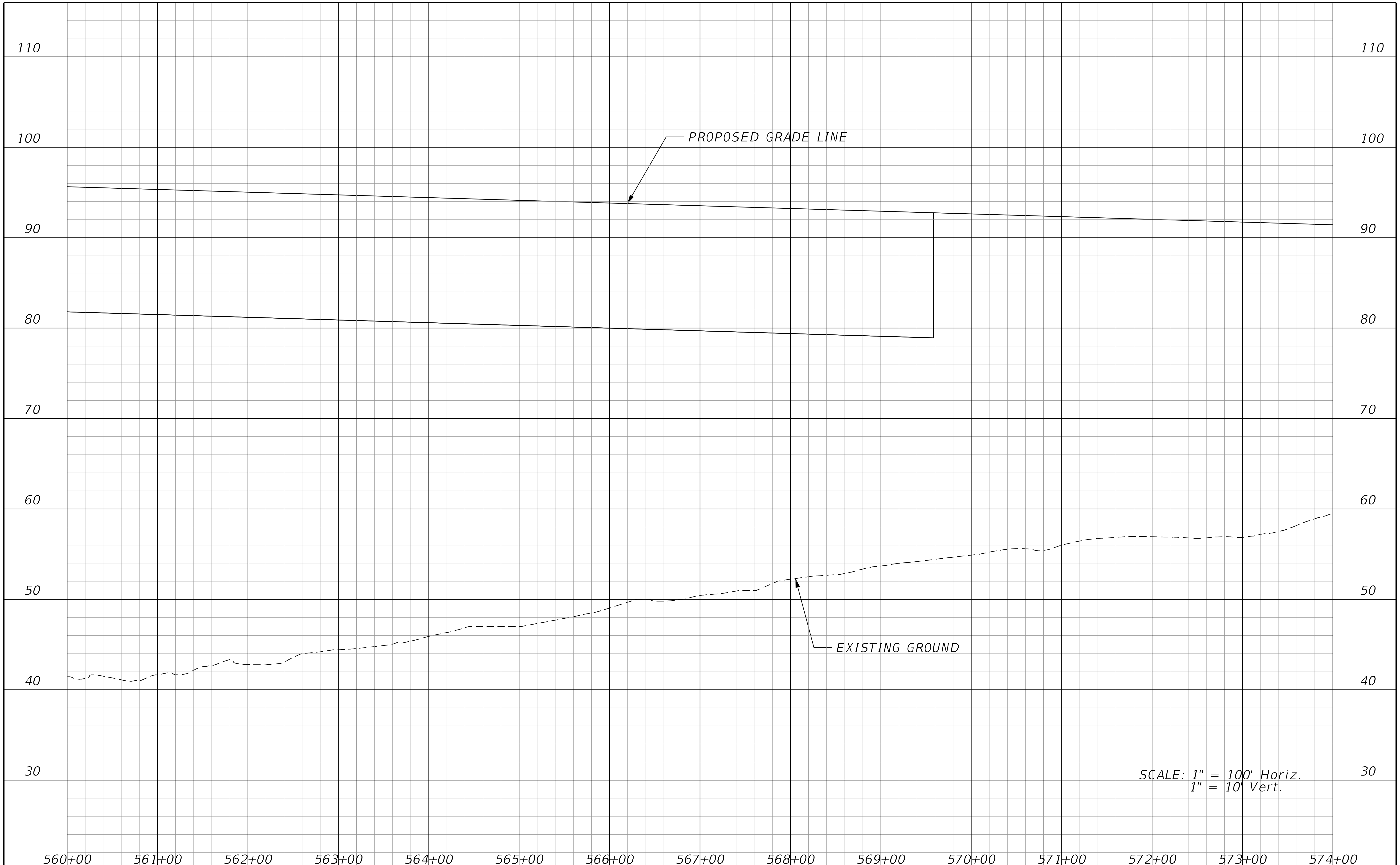

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PROFILE SHEET

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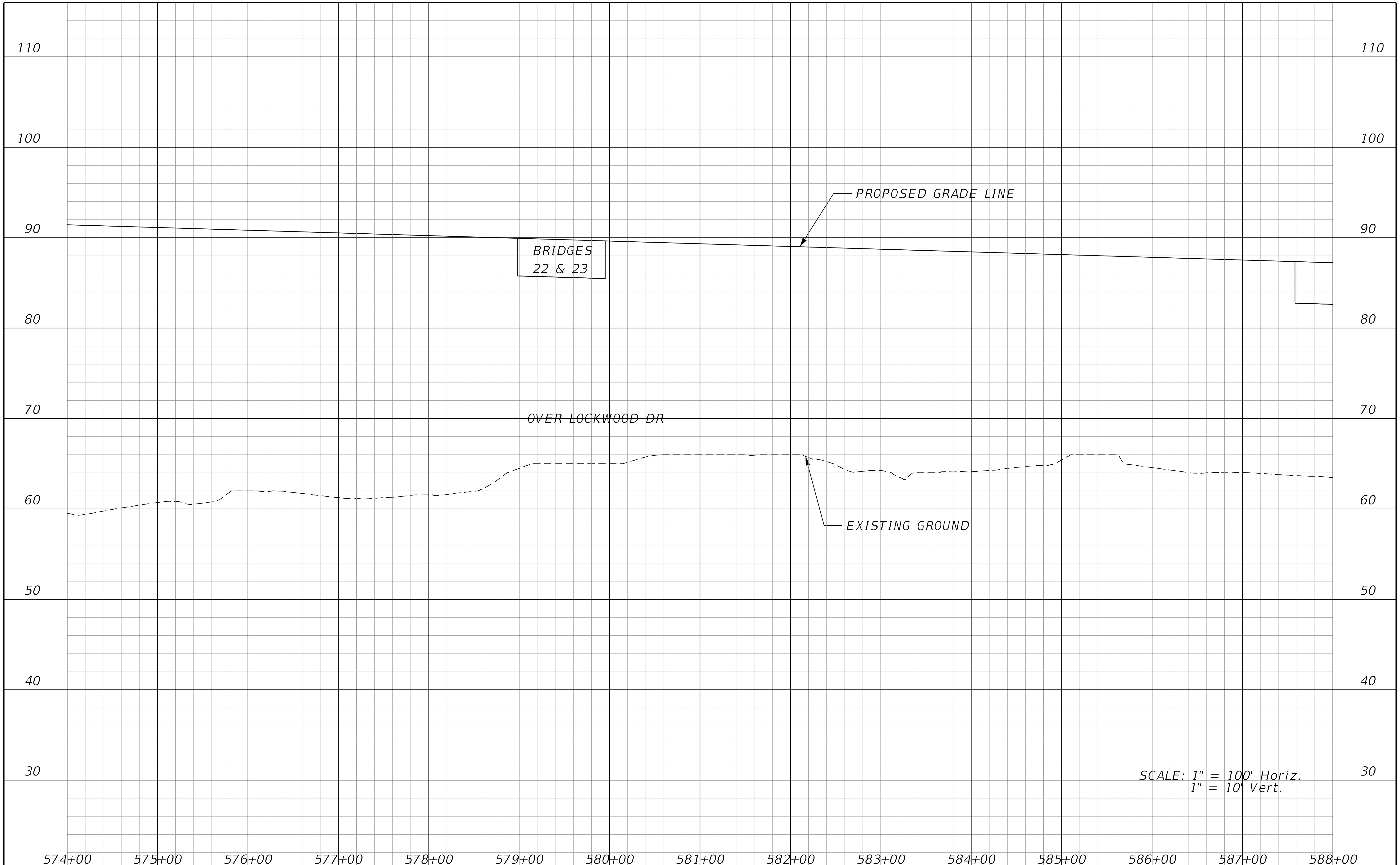

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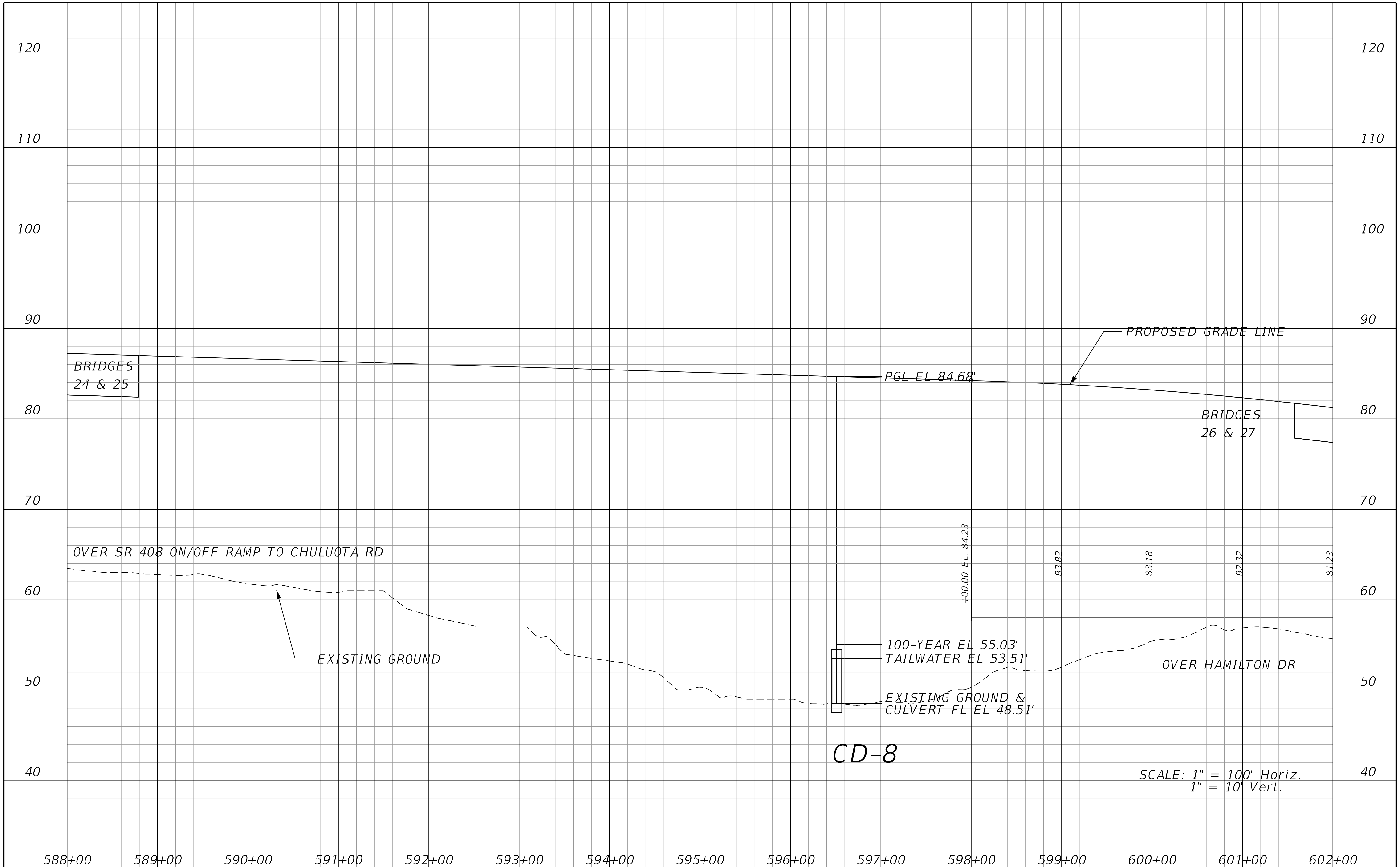

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PROFILE SHEET

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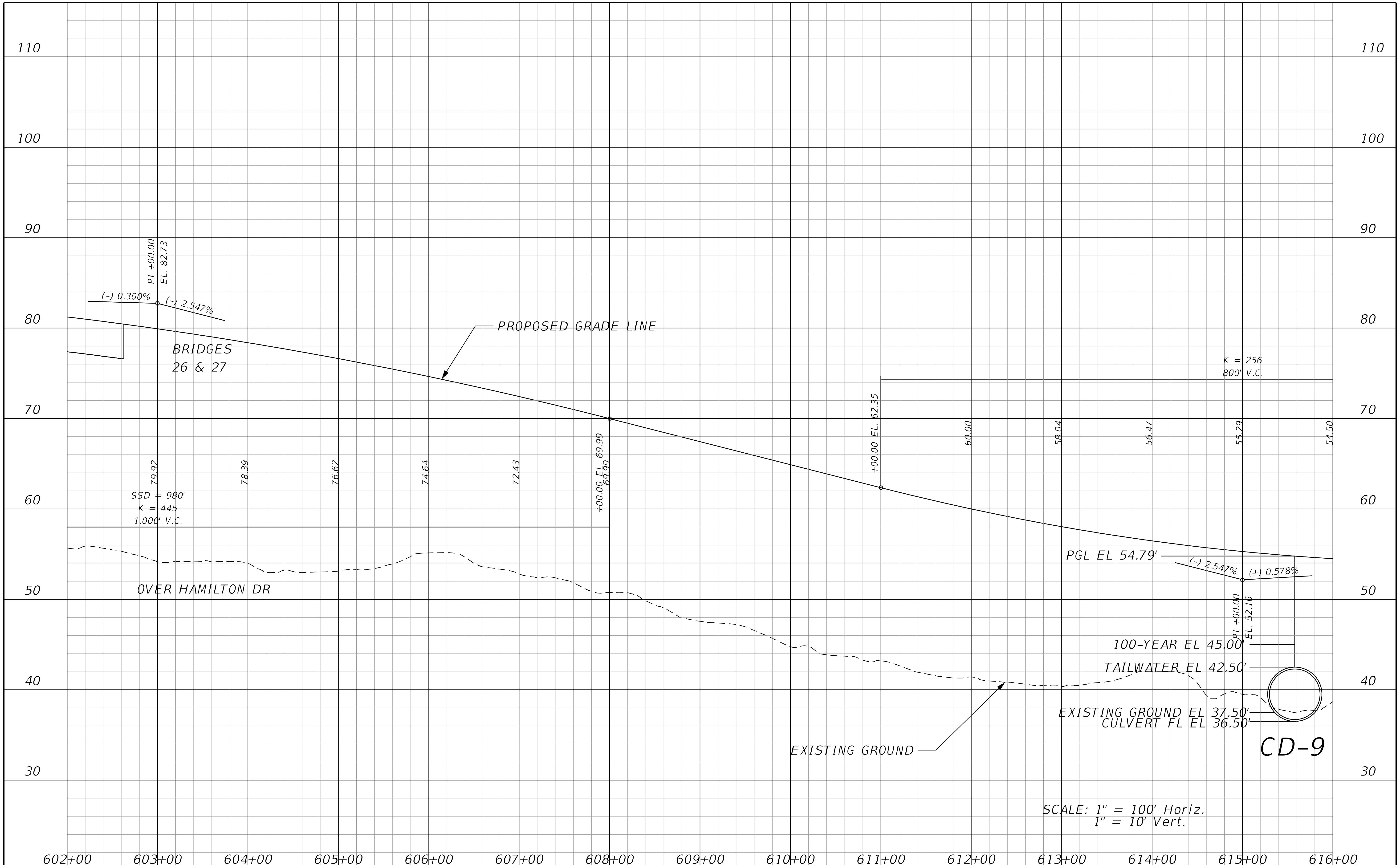

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PROFILE SHEET

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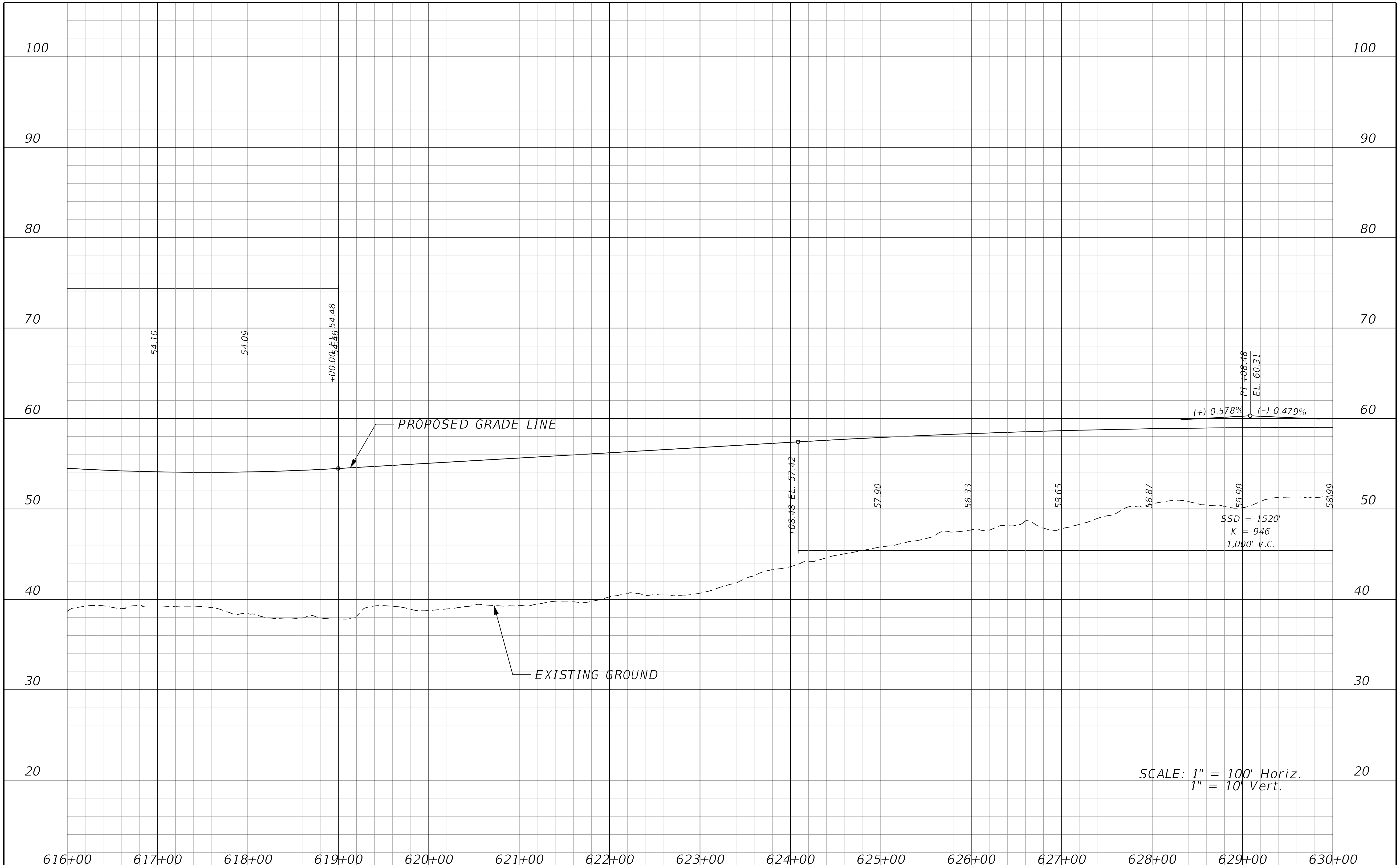

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SR 408	ORANGE	408254

PROFILE SHEET

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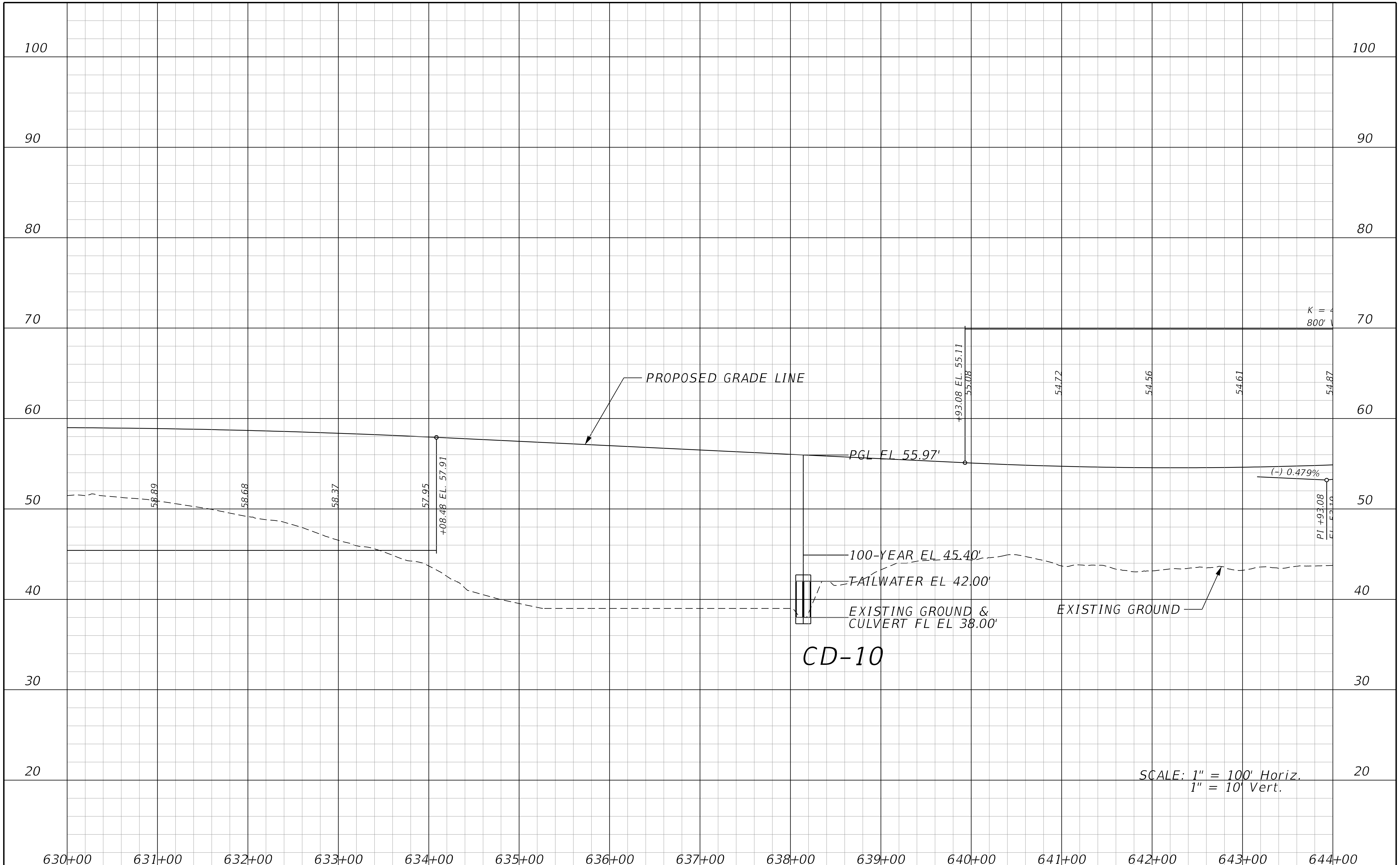

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SR 408	ORANGE	408254

PROFILE SHEET

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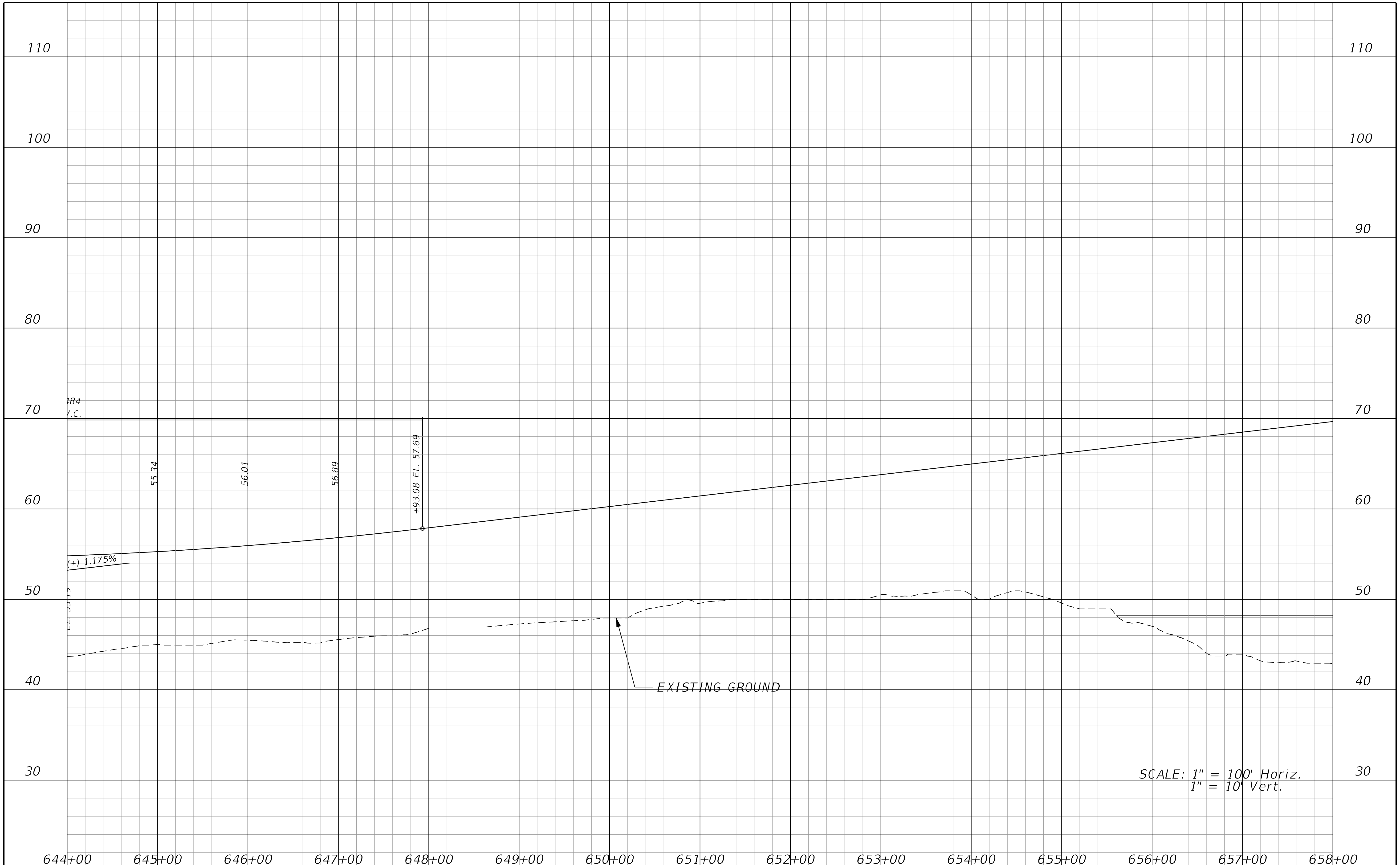

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PROFILE SHEET

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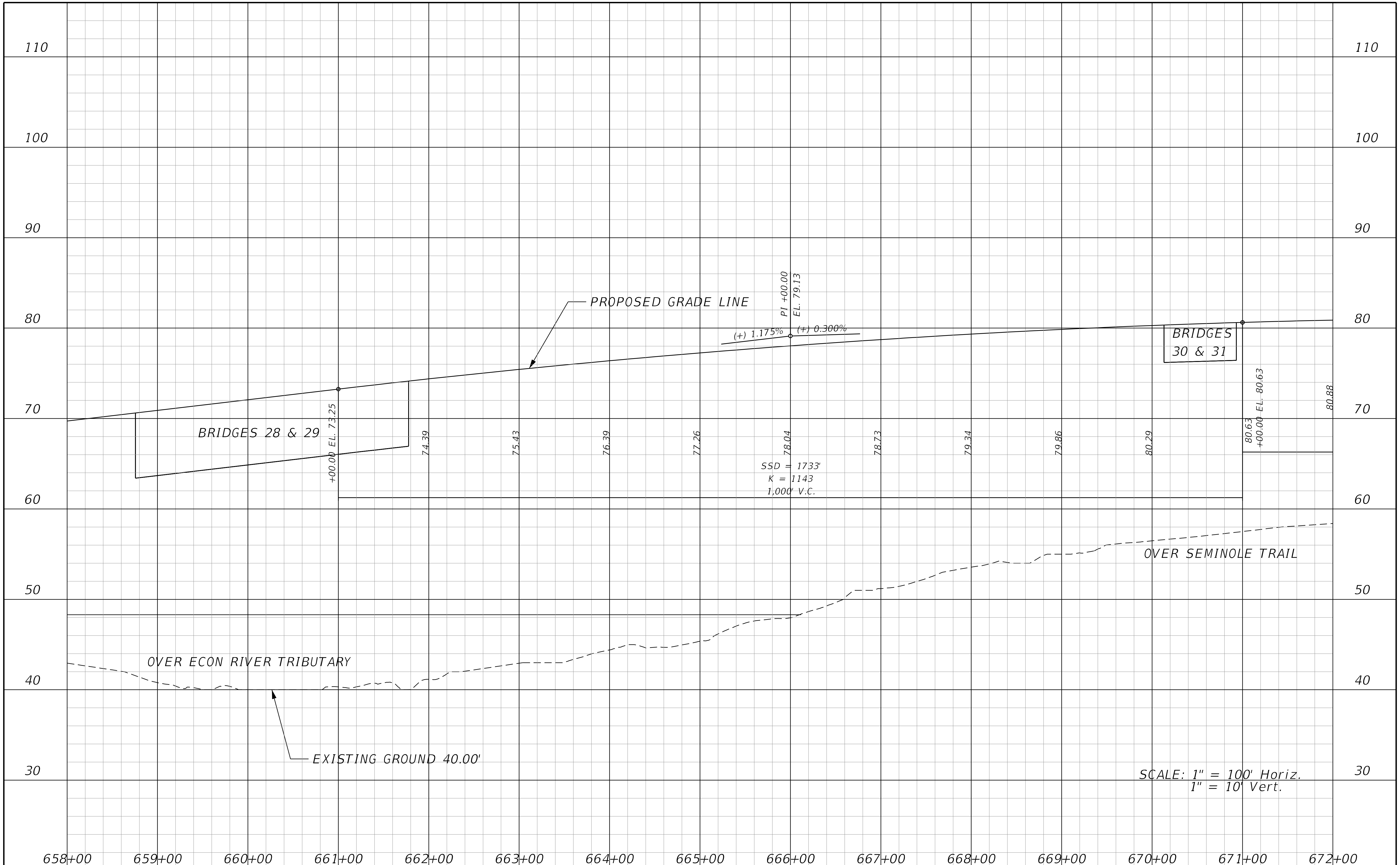

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PROFILE SHEET

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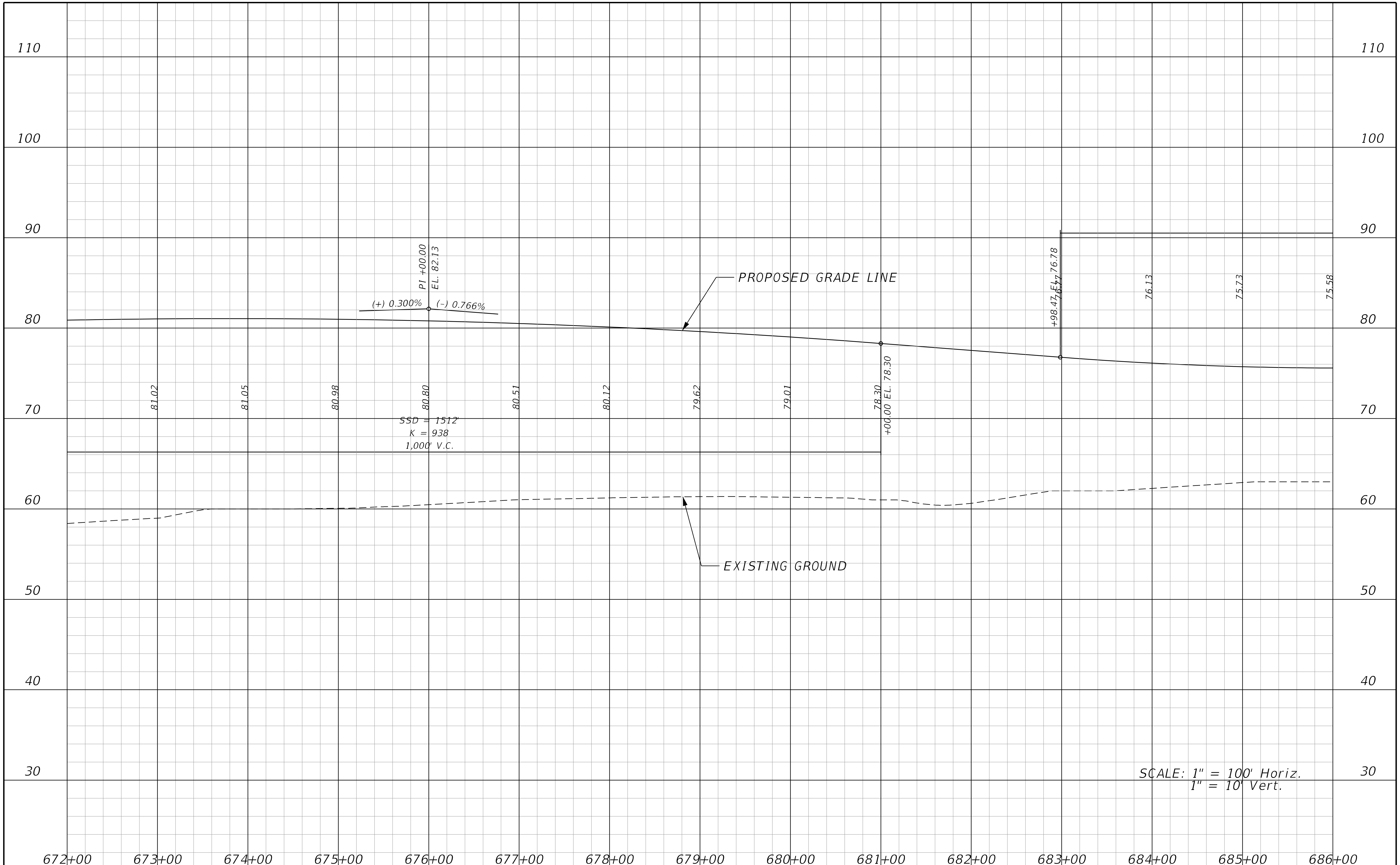

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SR 408	ORANGE	408254

PROFILE SHEET

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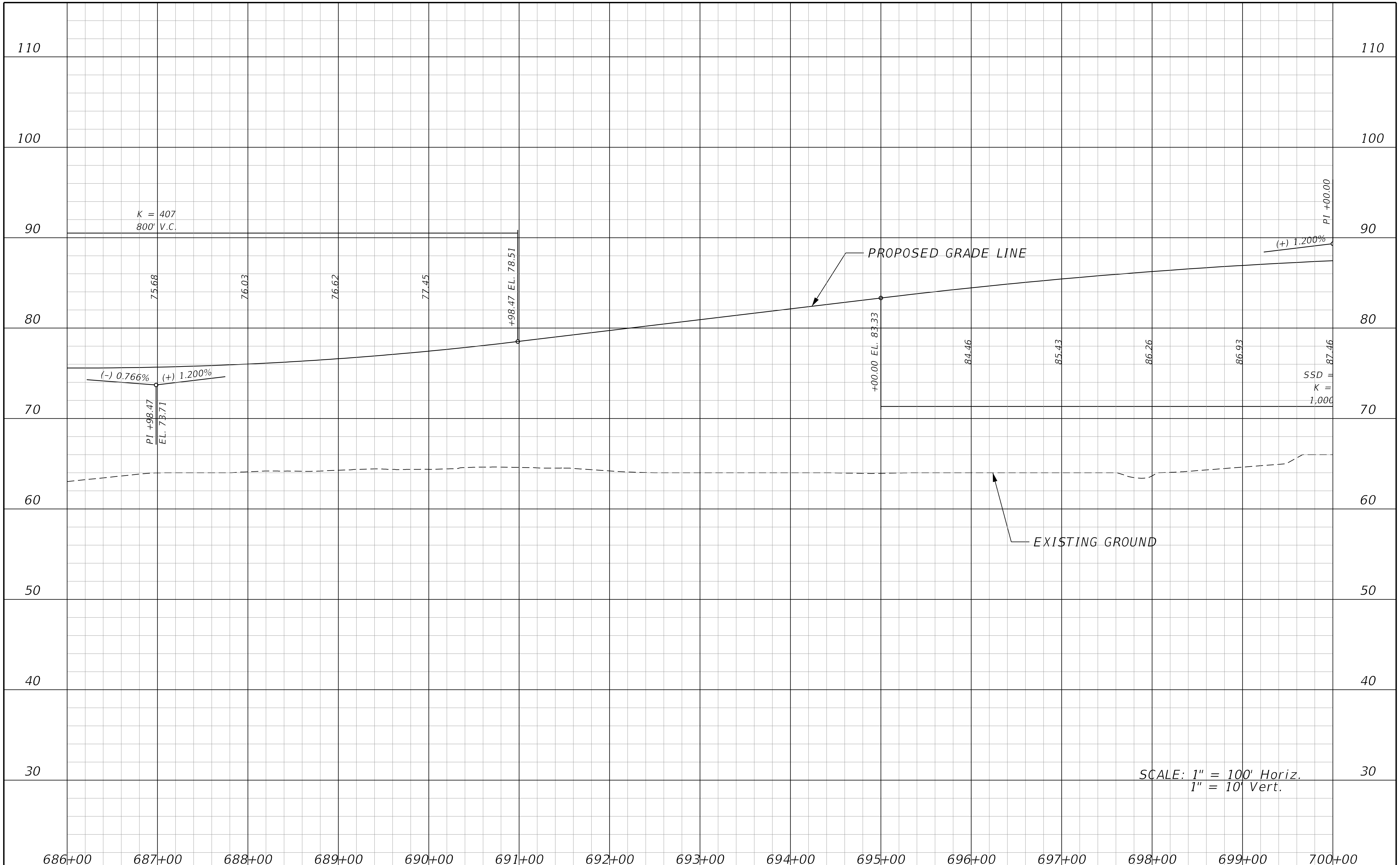

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PROFILE SHEET

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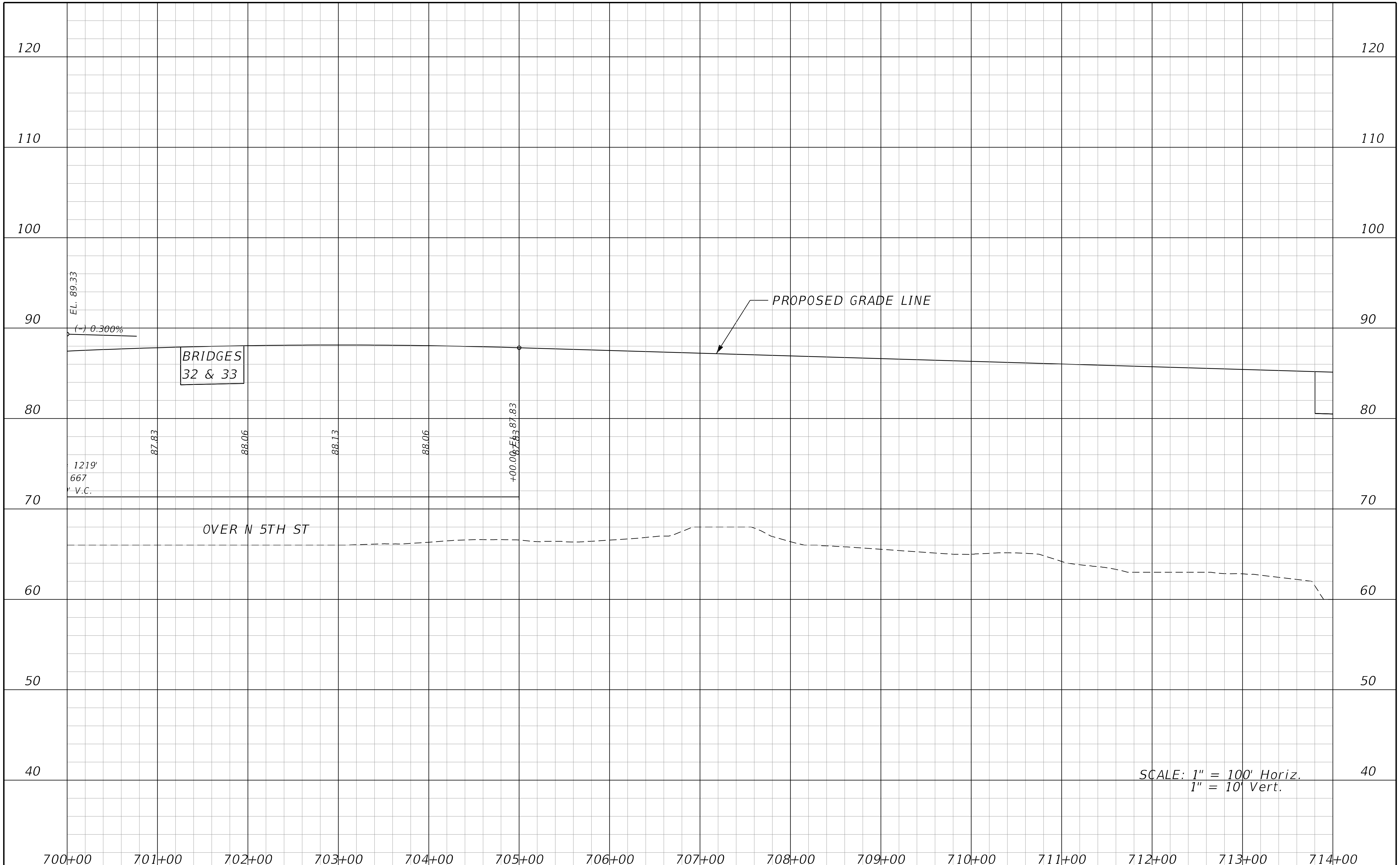

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PROFILE SHEET

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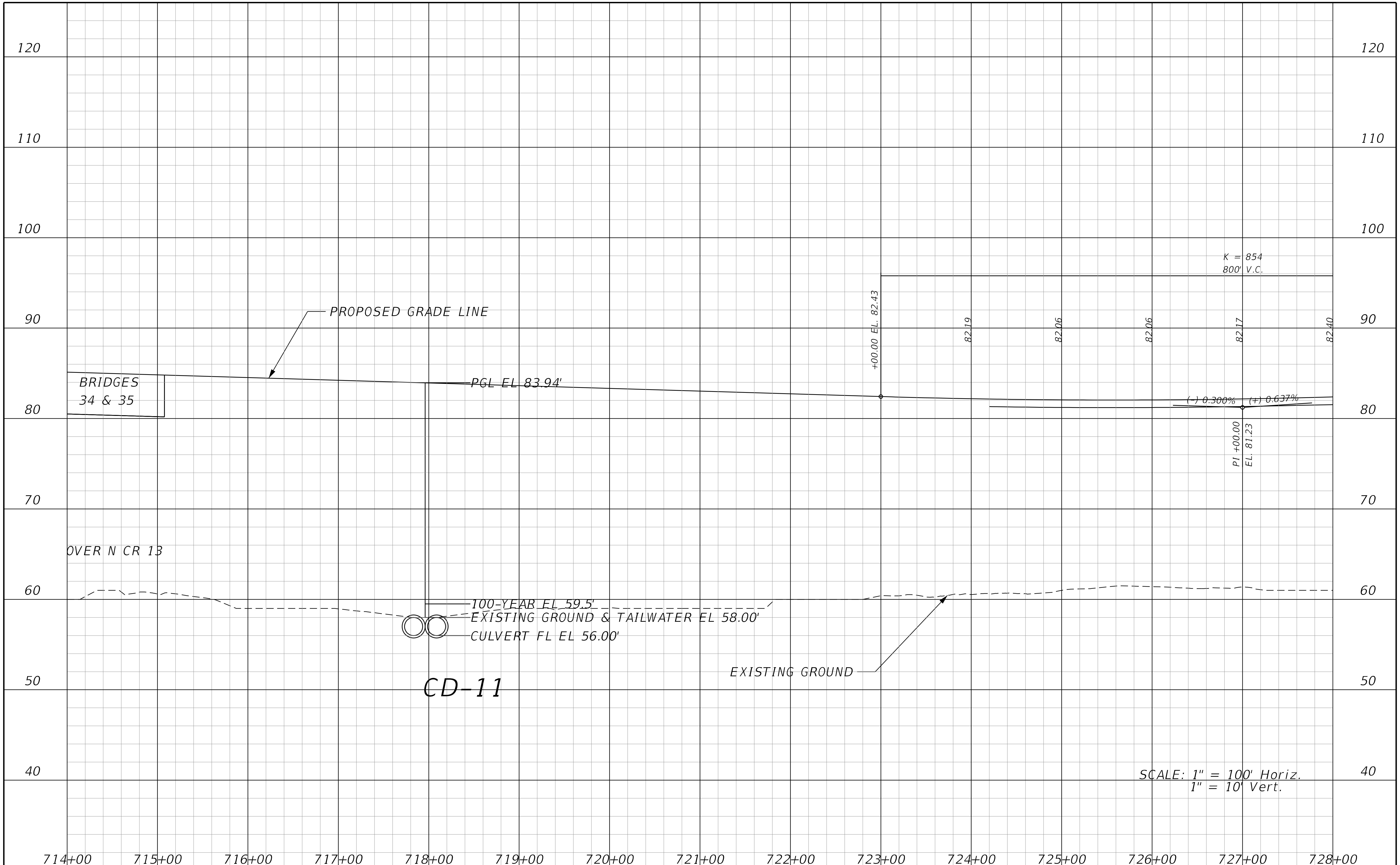

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PROFILE SHEET

SHEET NO.
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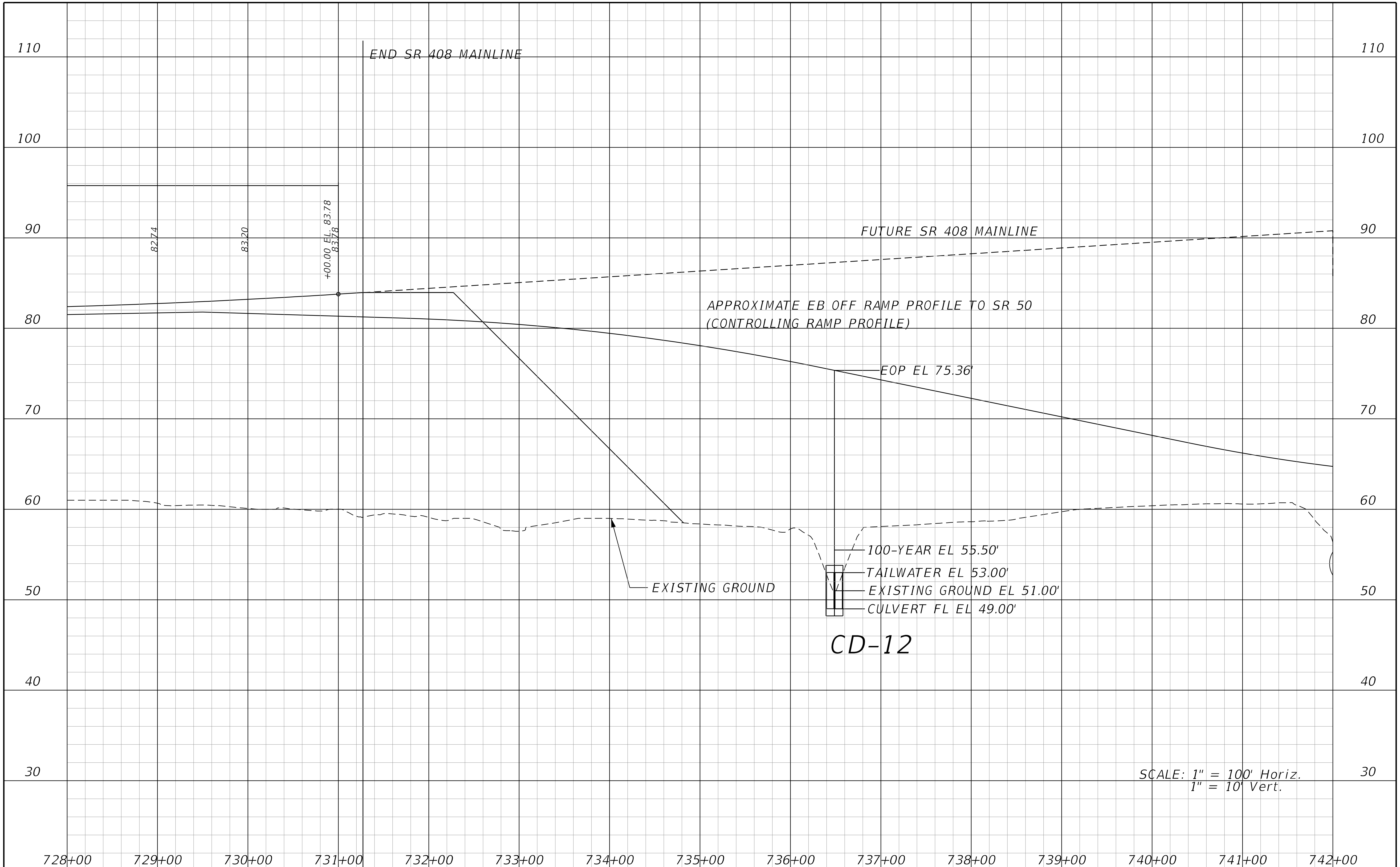

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PROFILE SHEET

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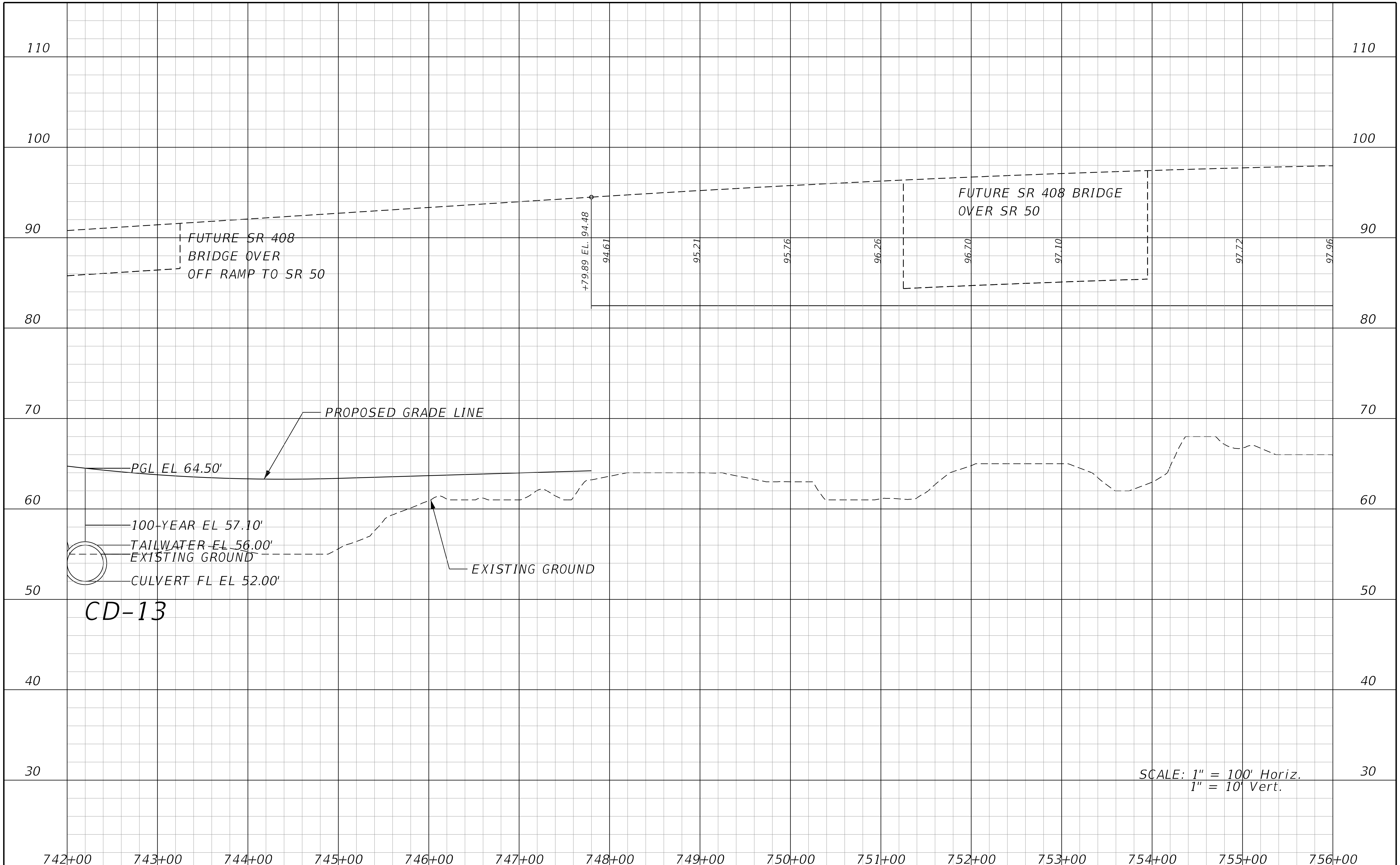
F-26



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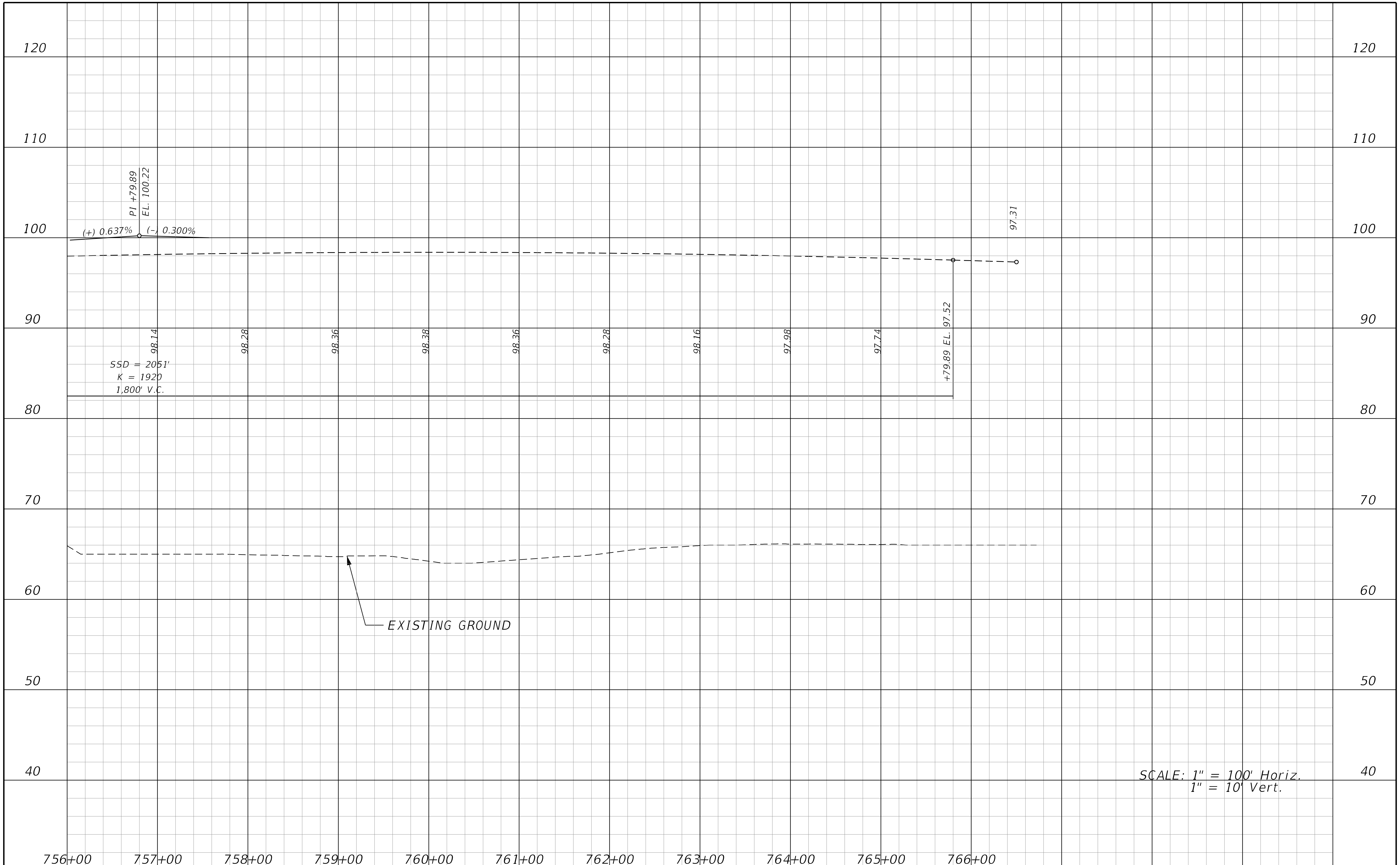
PROFILE SHEET

SHEET NO.
F-27



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PROFILE SHEET

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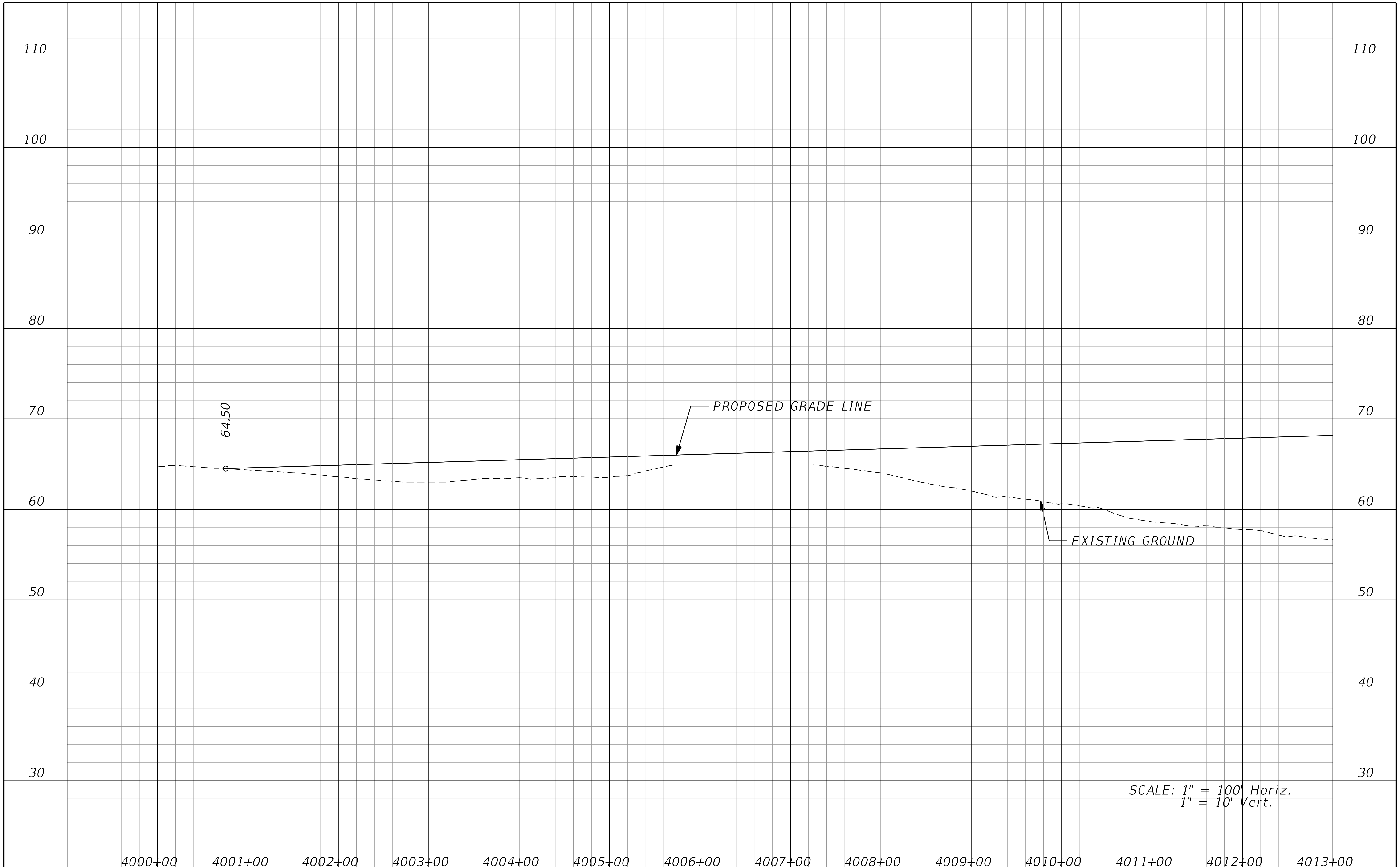

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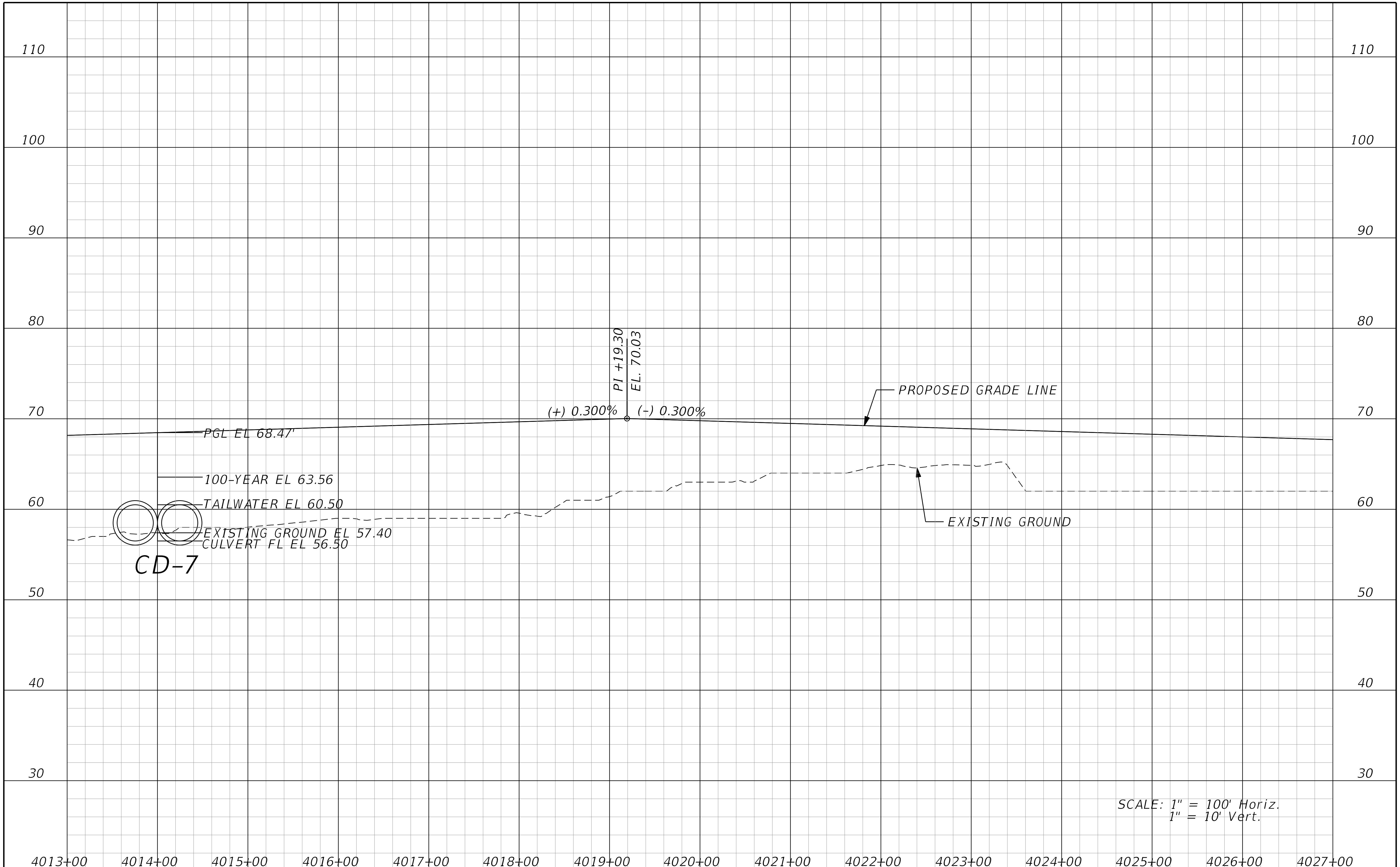
PROFILE SHEET
CHULUOTA RD EXT

SHEET NO.
F-29



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PROFILE SHEET
CHULUOTA RD EXT

SHEET NO.
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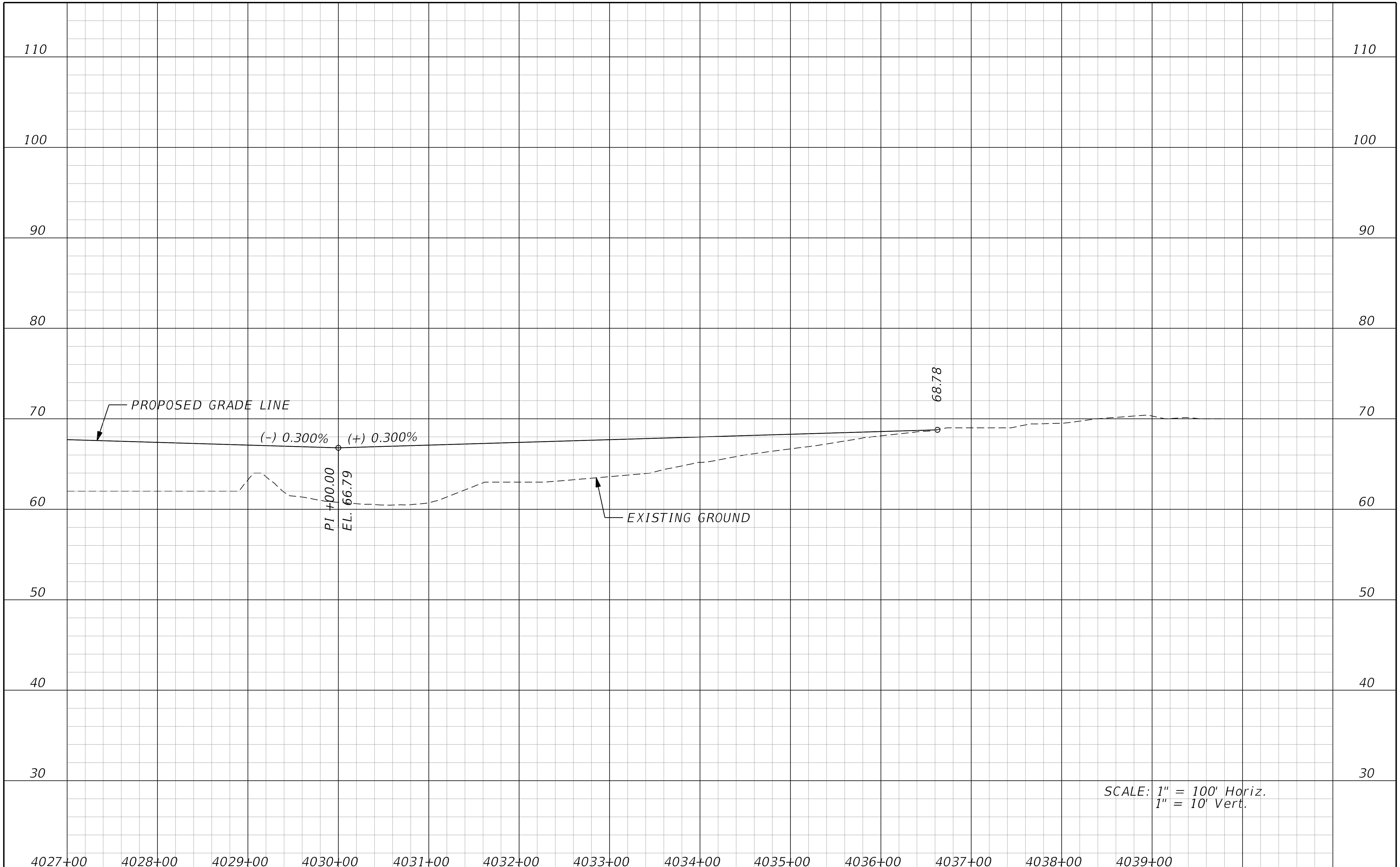

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PROFILE SHEET
CHULUOTA RD EXT

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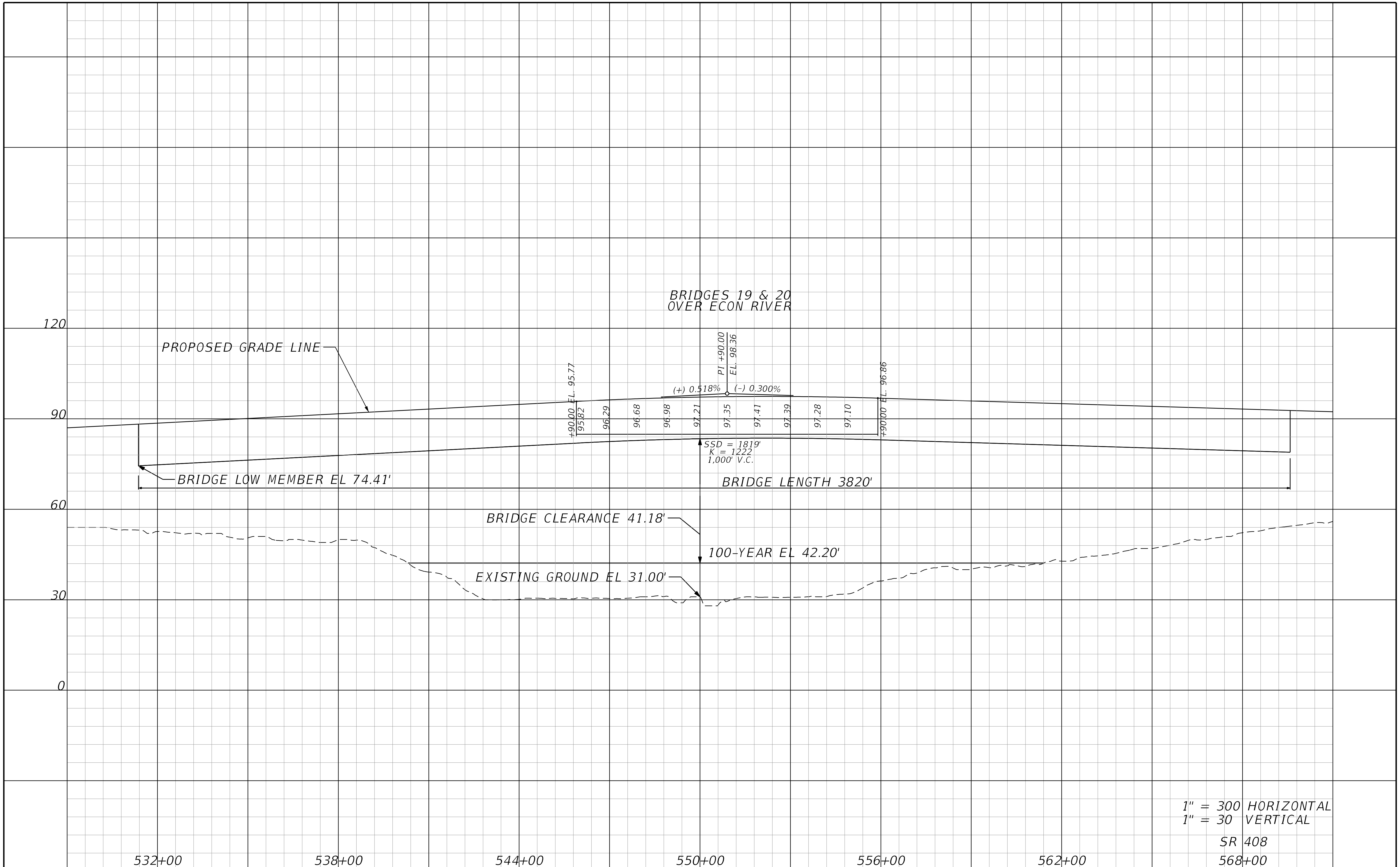

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ECON RIVER BRIDGE PROFILE

SHEET NO.
F-32

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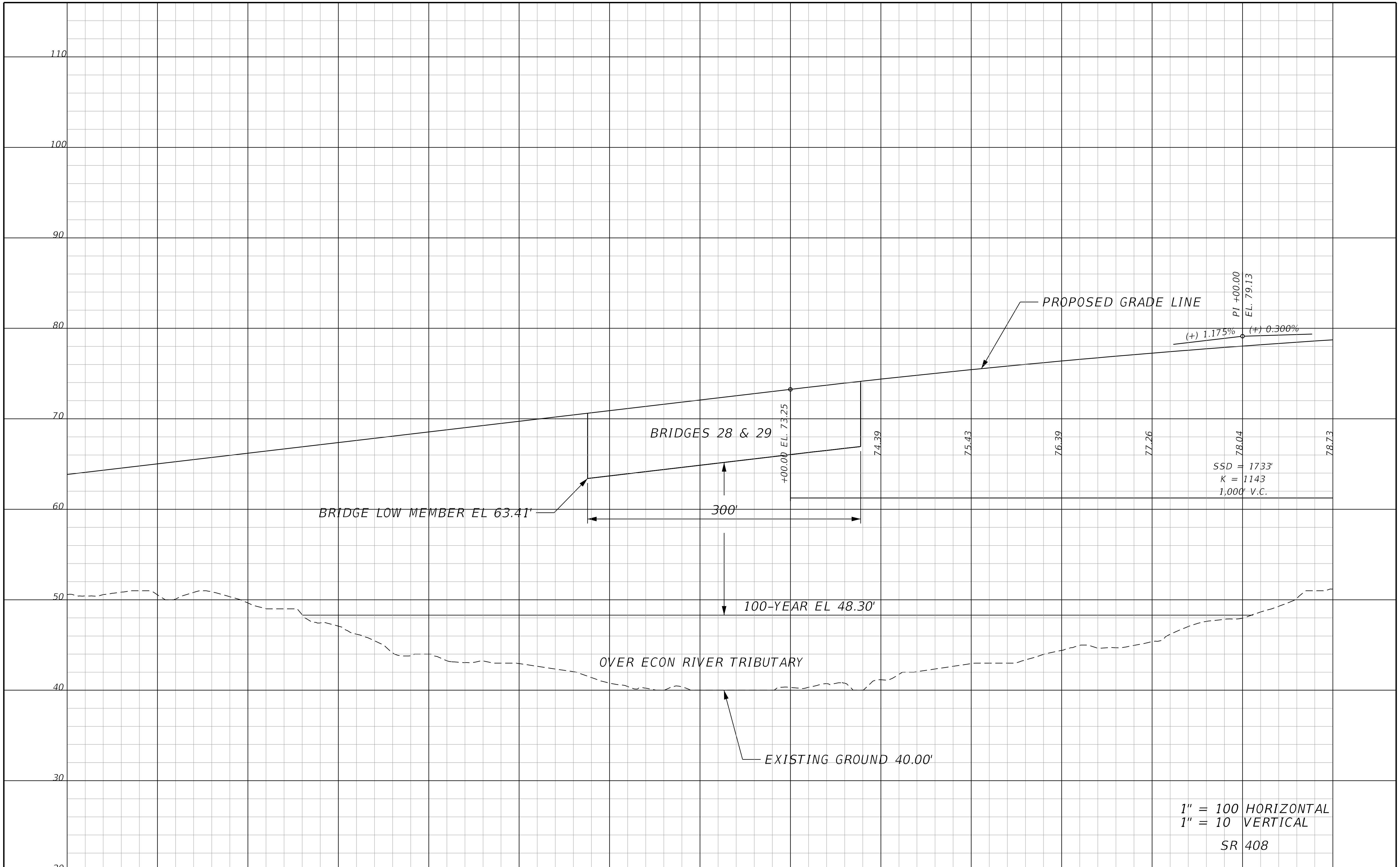

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ECON RIVER BRIDGE TRIBUTARY PROFILE

SHEET NO.
F-33

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Appendix: G

Cross Drain Hydraulic Analysis

Cross Drain 1

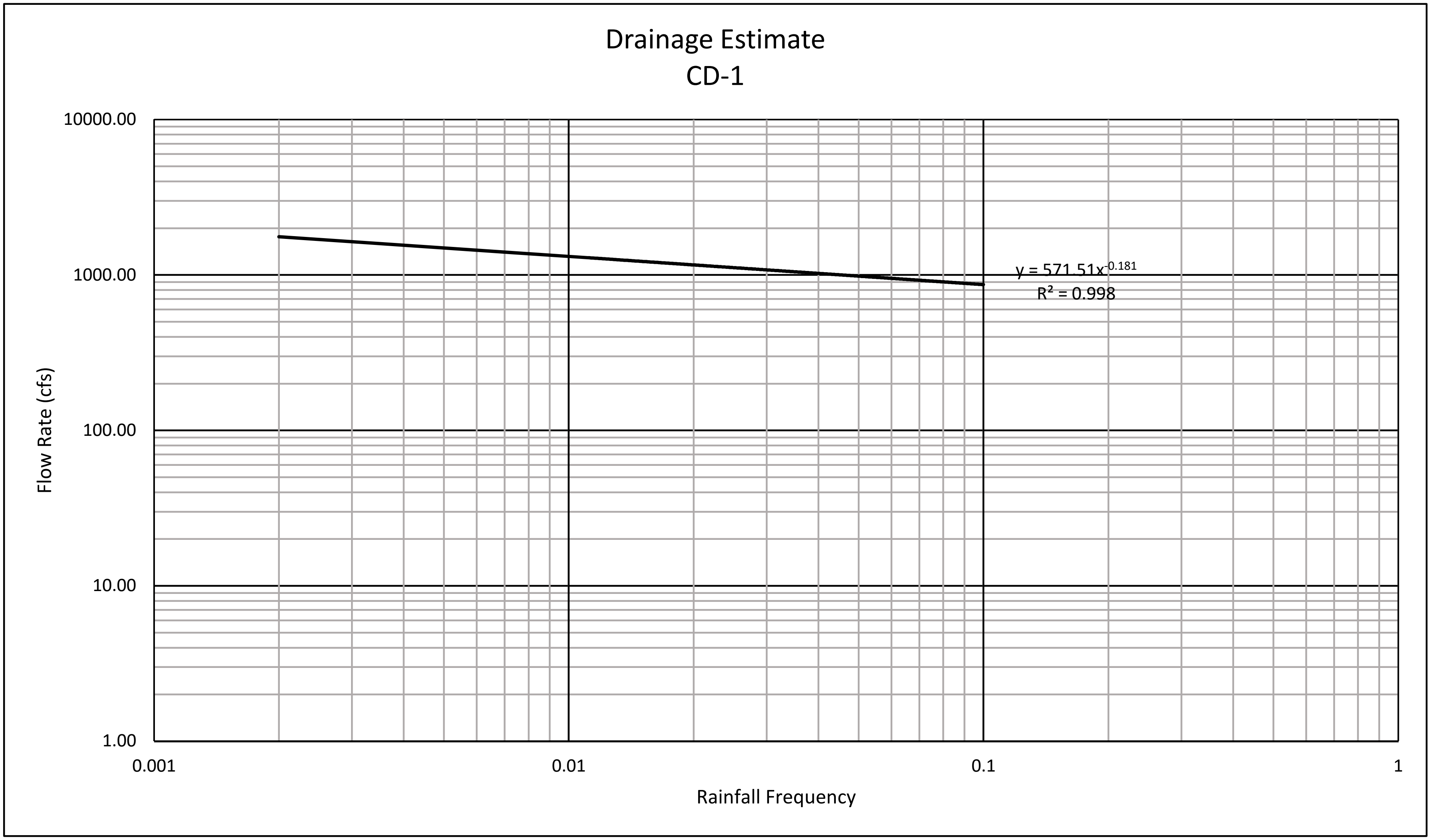
CD-1 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Big Econ Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-1.

Flow Rate 10 =	873	ft^3/s
Flow Rate 25 =	1013	ft^3/s
Flow Rate 50 =	1160	ft^3/s
Flow Rate 100 =	1322	ft^3/s
Flow Rate 500 =	1760	ft^3/s
Pipe Length =	485	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	13.66	ft
D =	163.95	in
A =	146.60	ft^2
Proposed Size =	3-11'x5'	CBC


Drainage Estimate
CD-1
10000.00
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 571.51x^-0.181
R² = 0.998

CD-1 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 873 cfs

Design Flow: 1160 cfs

Maximum Flow: 1322 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
51.20	873.00	873.00	0.00	1
51.31	917.90	917.90	0.00	1
51.79	962.80	962.80	0.00	1
51.87	1007.70	1007.70	0.00	1
51.72	1052.60	1052.60	0.00	1
51.79	1097.50	1097.50	0.00	1
51.92	1142.40	1142.40	0.00	1
51.97	1160.00	1160.00	0.00	1
52.18	1232.20	1232.20	0.00	1
52.31	1277.10	1277.10	0.00	1
52.45	1322.00	1322.00	0.00	1
88.87	4902.10	4902.10	0.00	Overtopping

Rating Curve Plot for Crossing: CD-1

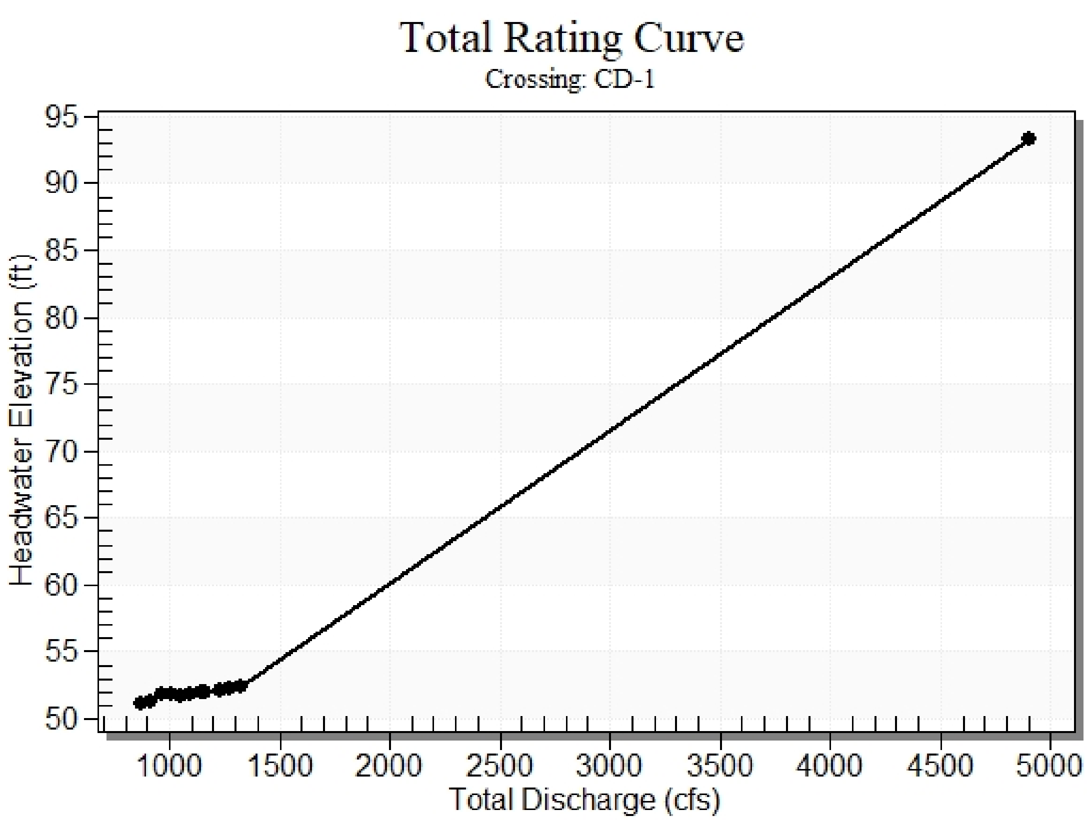


Table 2 - Culvert Summary Table: CD-1

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)
873.00	873.00	51.20	4.724	5.199	7-M1t	3.751	2.791	4.540	4.040	5.827	0.000
917.90	917.90	51.31	4.890	5.312	7-M1t	3.889	2.886	4.540	4.040	6.127	0.000
962.80	962.80	51.79	5.057	5.793	7-M2t	5.000	2.979	4.540	4.040	6.426	0.000
1007.70	1007.70	51.87	5.224	5.869	7-M2t	5.000	3.071	4.540	4.040	6.726	0.000
1052.60	1052.60	51.72	5.392	5.722	3-M2t	5.000	3.161	4.540	4.040	7.026	0.000
1097.50	1097.50	51.79	5.562	5.793	3-M2t	5.000	3.251	4.540	4.040	7.325	0.000
1142.40	1142.40	51.92	5.734	5.919	3-M2t	5.000	3.339	4.540	4.040	7.625	0.000
1160.00	1160.00	51.97	5.802	5.970	3-M2t	5.000	3.373	4.540	4.040	7.743	0.000
1232.20	1232.20	52.18	6.085	6.177	3-M2t	5.000	3.512	4.540	4.040	8.225	0.000
1277.10	1277.10	52.31	6.266	6.308	3-M2t	5.000	3.596	4.540	4.040	8.524	0.000
1322.00	1322.00	52.45	6.449	6.440	3-M2t	5.000	3.680	4.540	4.040	8.824	0.000

****

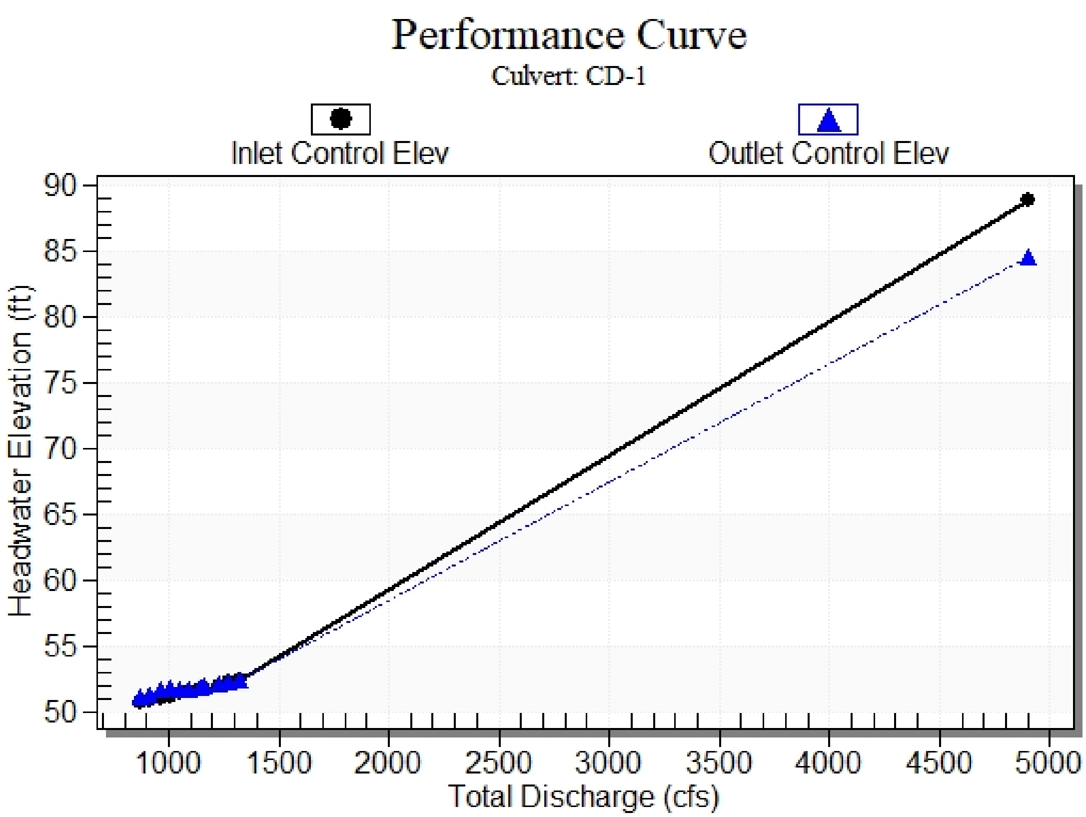
Straight Culvert

Inlet Elevation (invert): 46.00 ft,   Outlet Elevation (invert): 45.50 ft

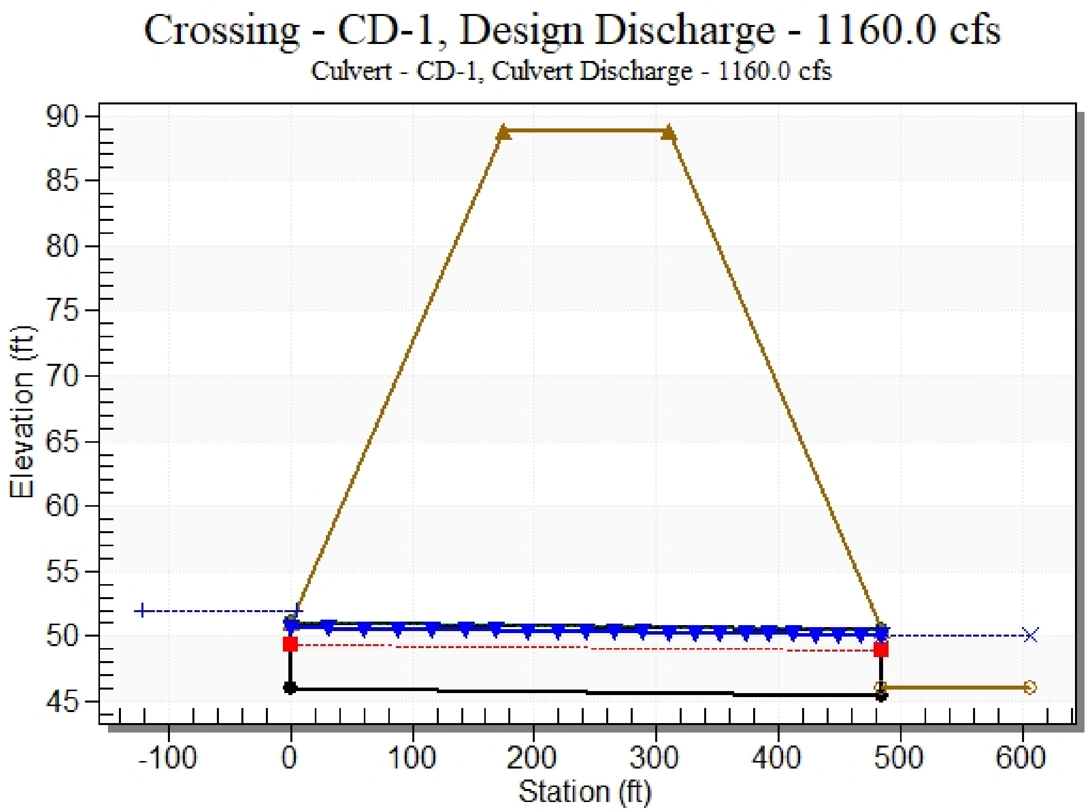
Culvert Length: 485.00 ft,   Culvert Slope: 0.0010

****

Culvert Performance Curve Plot: CD-1



Water Surface Profile Plot for Culvert: CD-1



Site Data - CD-1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 46.00 ft

Outlet Station: 485.00 ft

Outlet Elevation: 45.50 ft

Number of Barrels: 3

Culvert Data Summary - CD-1

Barrel Shape: Concrete Box

Barrel Span: 11.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
873.00	50.04	4.04
917.90	50.04	4.04
962.80	50.04	4.04
1007.70	50.04	4.04
1052.60	50.04	4.04
1097.50	50.04	4.04
1142.40	50.04	4.04
1160.00	50.04	4.04
1232.20	50.04	4.04
1277.10	50.04	4.04
1322.00	50.04	4.04

Tailwater Channel Data - CD-1

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 50.04 ft

Roadway Data for Crossing: CD-1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 88.87 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 2

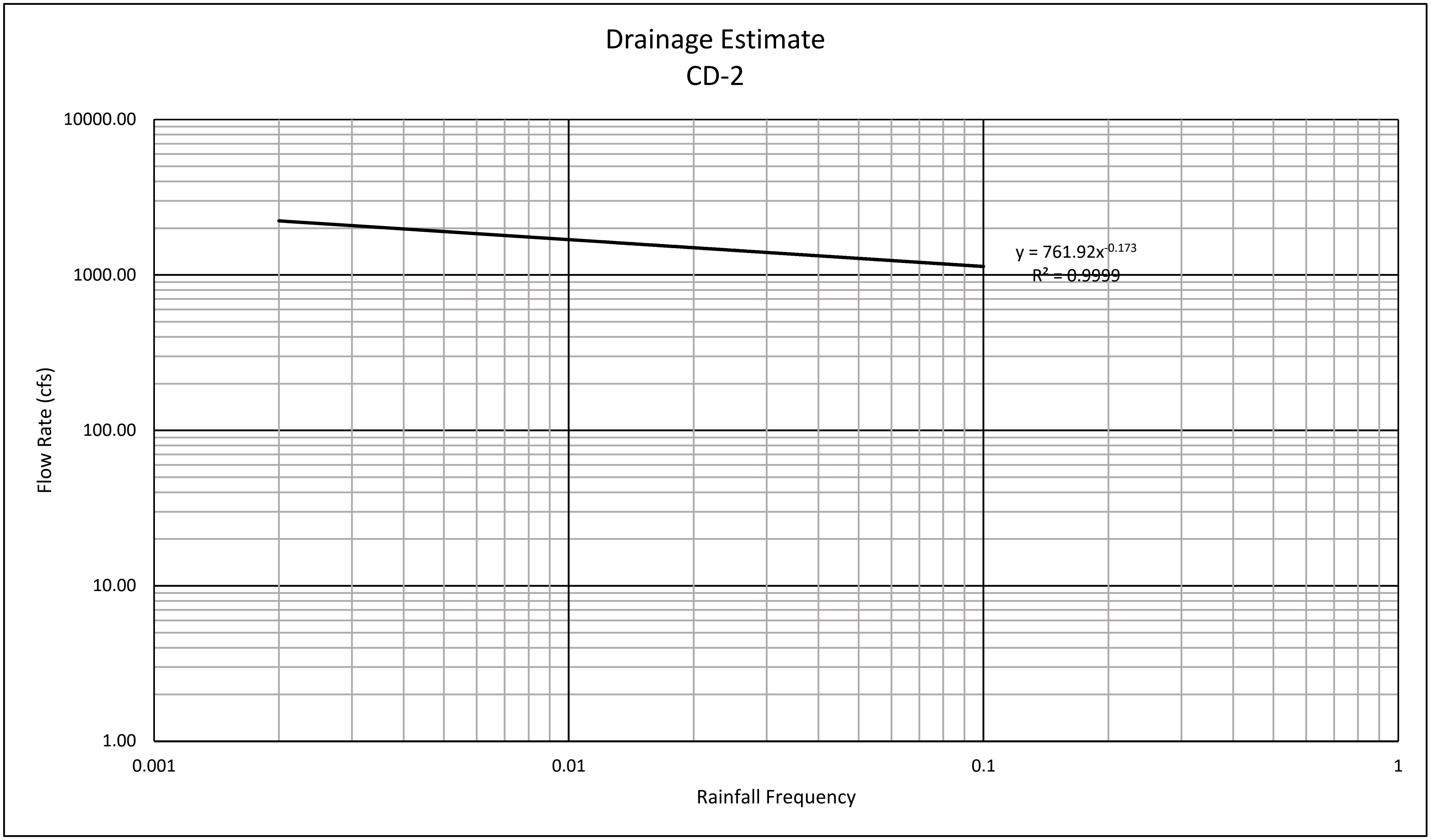
CD-2 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Big Econ Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-2.

Flow Rate 10 =	1136	ft^3/s
Flow Rate 25 =	1325	ft^3/s
Flow Rate 50 =	1499	ft^3/s
Flow Rate 100 =	1690	ft^3/s
Flow Rate 500 =	2233	ft^3/s
Pipe Length =	302	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	13.71	ft
D =	164.48	in
A =	147.56	ft^2
Proposed Size =	4-10'x5'	CBC


Drainage Estimate
CD-2
10000.00
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
y = 761.92x-0.173
R² = 0.9999
0.001
0.01
0.1
1
Rainfall Frequency

CD-2 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 1136 cfs

Design Flow: 1499 cfs

Maximum Flow: 1690 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
51.06	1136.00	1136.00	0.00	1
51.16	1191.40	1191.40	0.00	1
51.27	1246.80	1246.80	0.00	1
51.40	1302.20	1302.20	0.00	1
51.57	1357.60	1357.60	0.00	1
51.70	1413.00	1413.00	0.00	1
51.83	1468.40	1468.40	0.00	1
51.91	1499.00	1499.00	0.00	1
52.11	1579.20	1579.20	0.00	1
52.26	1634.60	1634.60	0.00	1
52.41	1690.00	1690.00	0.00	1
85.27	5709.63	5709.63	0.00	Overtopping

Rating Curve Plot for Crossing: CD-2

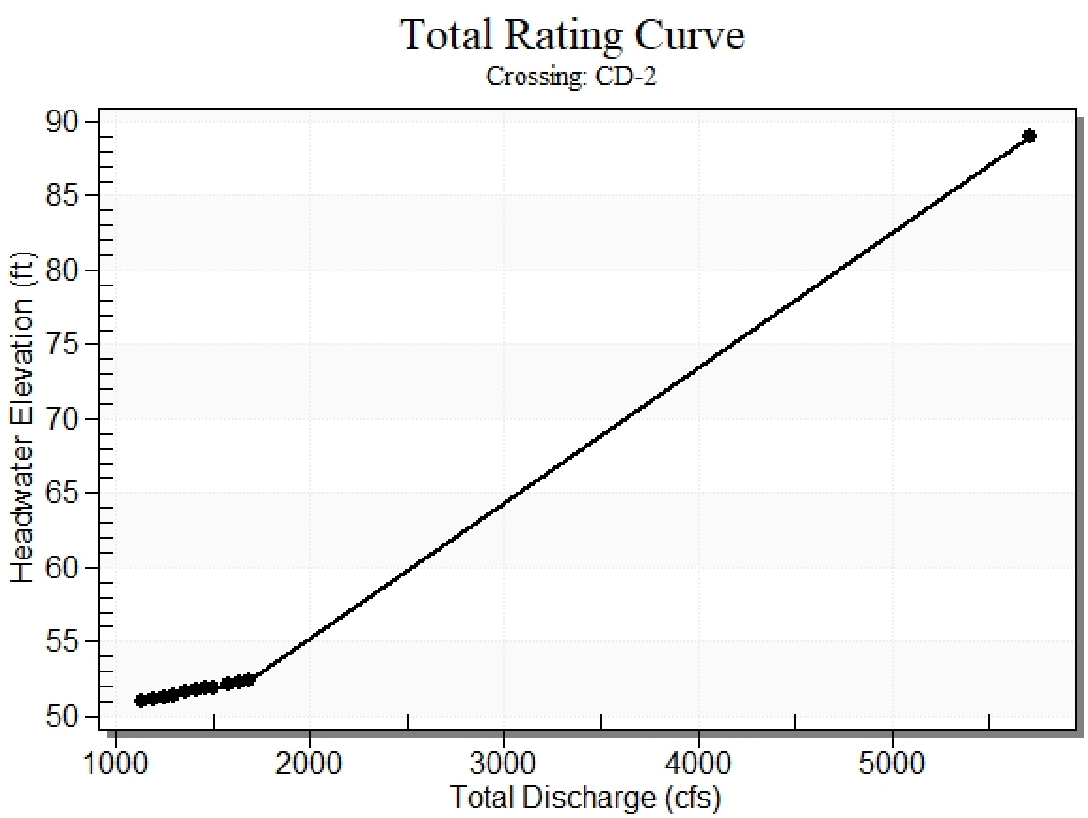


Table 2 - Culvert Summary Table: CD-2

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)
1136.00	1136.00	51.06	4.960	5.557	3-M1f	3.393	2.926	5.000	4.540	5.680	0.000
1191.40	1191.40	51.16	5.130	5.659	3-M1f	3.511	3.020	5.000	4.540	5.957	0.000
1246.80	1246.80	51.27	5.301	5.770	3-M1f	3.629	3.113	5.000	4.540	6.234	0.000
1302.20	1302.20	51.40	5.473	5.895	3-M1f	3.745	3.205	5.000	4.540	6.511	0.000
1357.60	1357.60	51.57	5.647	6.071	3-M1f	3.860	3.295	5.000	4.540	6.788	0.000
1413.00	1413.00	51.70	5.823	6.197	4-FFf	3.974	3.384	5.000	4.540	7.065	0.000
1468.40	1468.40	51.83	6.002	6.330	4-FFf	5.000	3.472	5.000	4.540	7.342	0.000
1499.00	1499.00	51.91	6.102	6.405	4-FFf	5.000	3.520	5.000	4.540	7.495	0.000
1579.20	1579.20	52.11	6.369	6.610	4-FFf	5.000	3.644	5.000	4.540	7.896	0.000
1634.60	1634.60	52.26	6.558	6.758	4-FFf	5.000	3.729	5.000	4.540	8.173	0.000
1690.00	1690.00	52.41	6.751	6.911	4-FFf	5.000	3.813	5.000	4.540	8.450	0.000

****

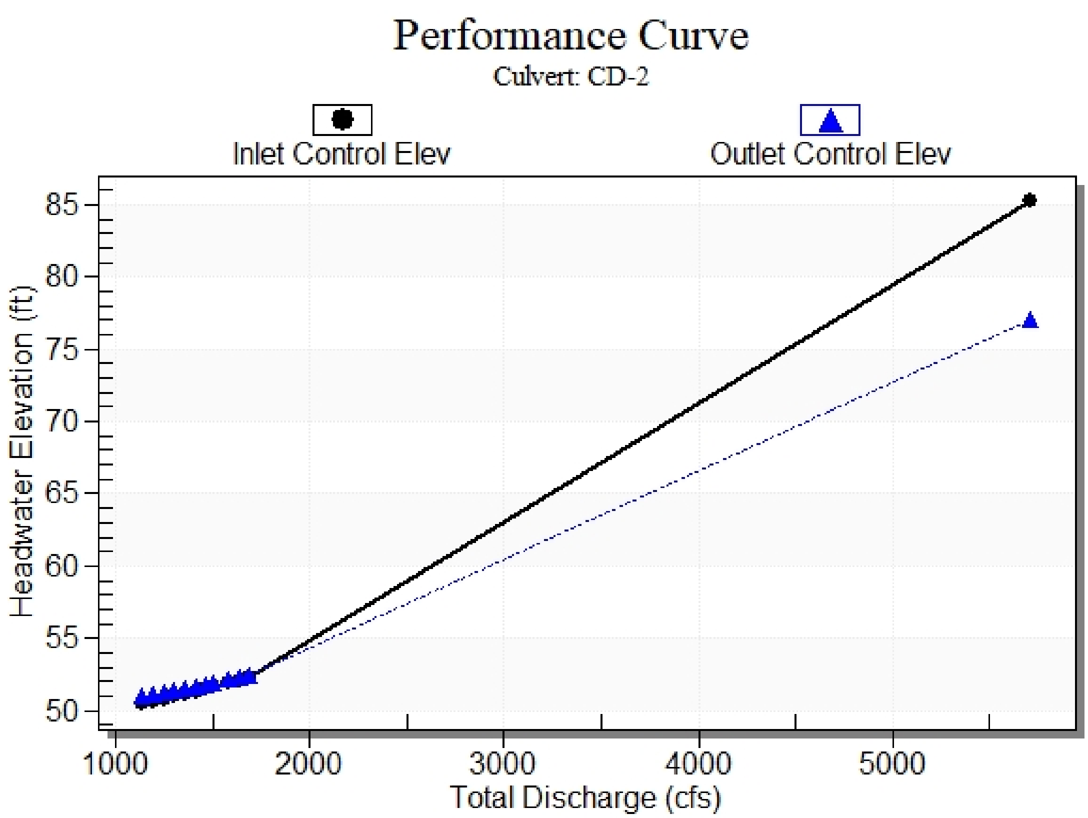
Straight Culvert

Inlet Elevation (invert): 45.50 ft, Outlet Elevation (invert): 45.00 ft

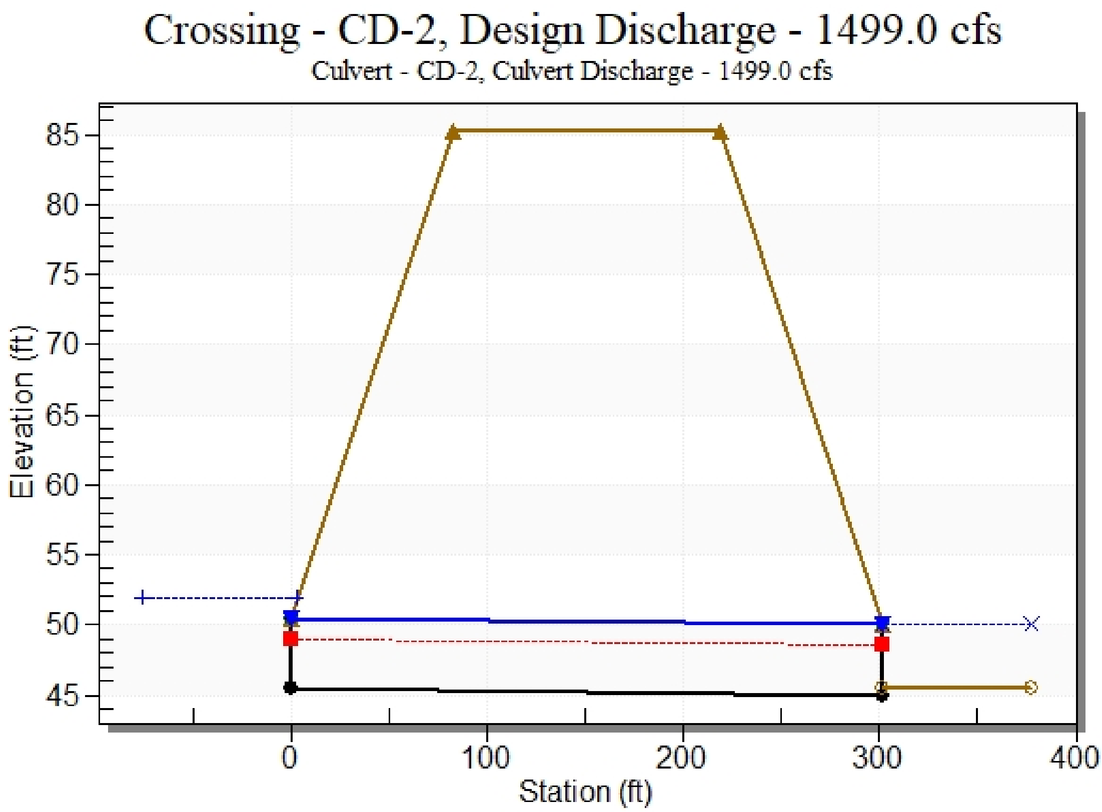
Culvert Length: 302.00 ft, Culvert Slope: 0.0017

****

Culvert Performance Curve Plot: CD-2



Water Surface Profile Plot for Culvert: CD-2



Site Data - CD-2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 45.50 ft

Outlet Station: 302.00 ft

Outlet Elevation: 45.00 ft

Number of Barrels: 4

Culvert Data Summary - CD-2

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
1136.00	50.04	4.54
1191.40	50.04	4.54
1246.80	50.04	4.54
1302.20	50.04	4.54
1357.60	50.04	4.54
1413.00	50.04	4.54
1468.40	50.04	4.54
1499.00	50.04	4.54
1579.20	50.04	4.54
1634.60	50.04	4.54
1690.00	50.04	4.54

Tailwater Channel Data - CD-2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 50.04 ft

Roadway Data for Crossing: CD-2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 85.27 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 3

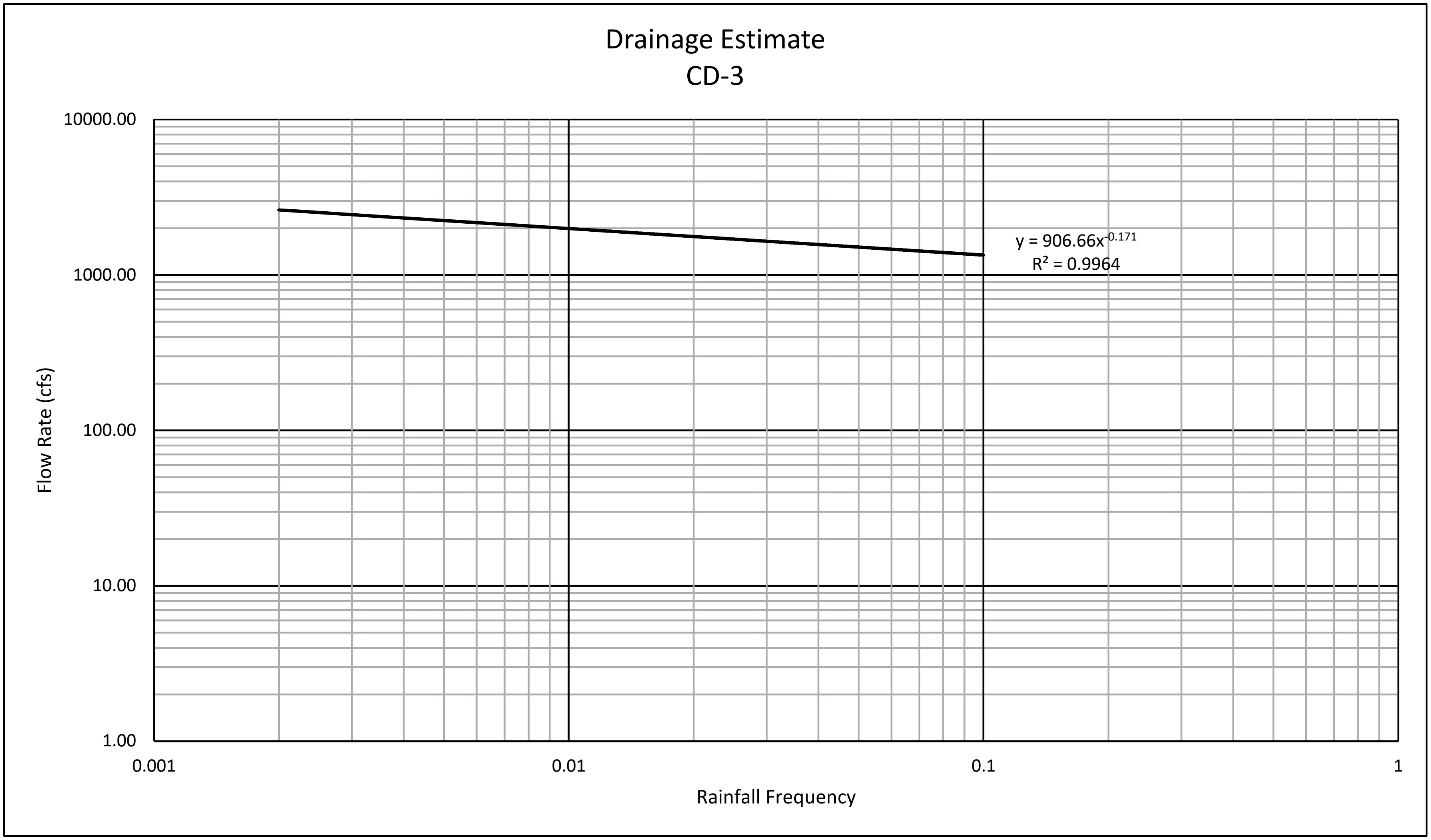
CD-3 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Big Econ Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-3.

Flow Rate 10 =	1354	ft^3/s
Flow Rate 25 =	1549	ft^3/s
Flow Rate 50 =	1770	ft^3/s
Flow Rate 100 =	2000	ft^3/s
Flow Rate 500 =	2624	ft^3/s
Pipe Length =	400	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	15.39	ft
D =	184.69	in
A =	186.04	ft^2
Proposed Size =	3-11'x7'	CBC



Drainage Estimate
CD-3
10000.00
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
y = 906.66x-0.171
R² = 0.9964
0.001
0.01
0.1
1
Rainfall Frequency

CD-3 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 1354 cfs

Design Flow: 1770 cfs

Maximum Flow: 2000 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
51.24	1354.00	1354.00	0.00	1
51.36	1418.60	1418.60	0.00	1
51.47	1483.20	1483.20	0.00	1
51.60	1547.80	1547.80	0.00	1
51.72	1612.40	1612.40	0.00	1
51.85	1677.00	1677.00	0.00	1
51.99	1741.60	1741.60	0.00	1
52.05	1770.00	1770.00	0.00	1
52.26	1870.80	1870.80	0.00	1
52.41	1935.40	1935.40	0.00	1
52.51	2000.00	2000.00	0.00	1
80.88	6240.70	6240.70	0.00	Overtopping

Rating Curve Plot for Crossing: CD-3

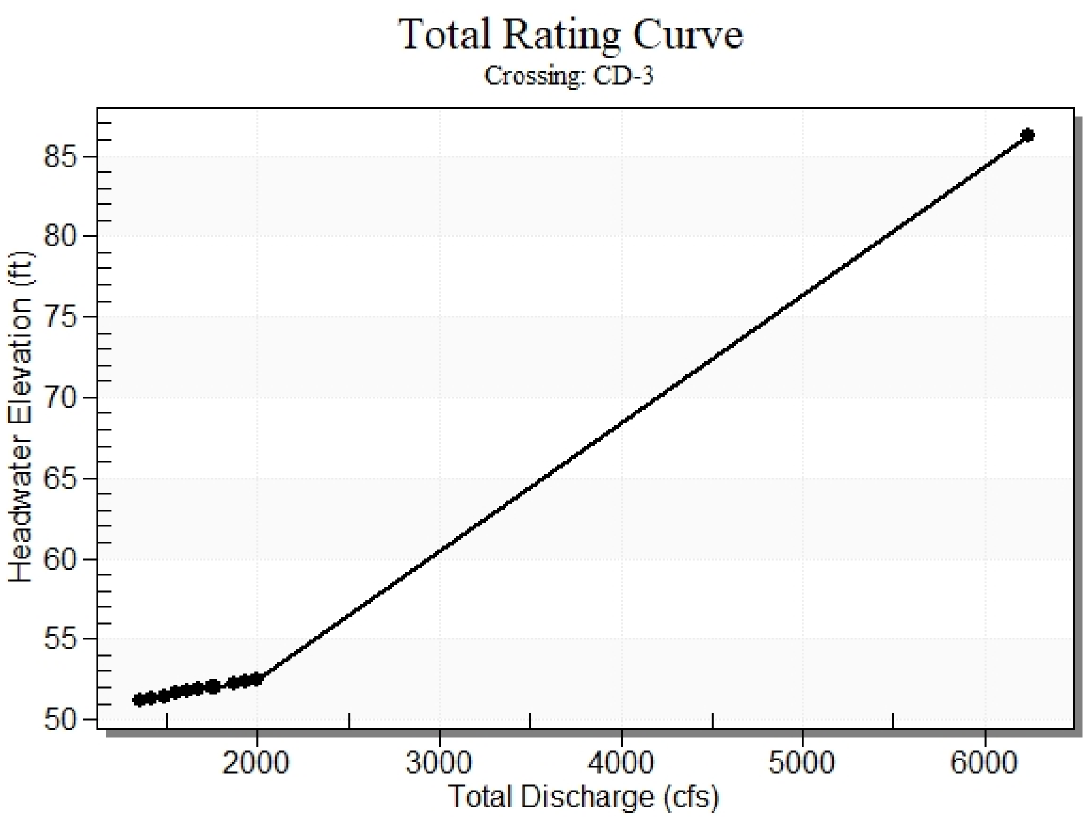


Table 2 - Culvert Summary Table: CD-3

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)
1354.00	1354.00	51.24	6.323	7.243	7-M1t	4.816	3.739	6.540	6.040	6.274	0.000
1418.60	1418.60	51.36	6.526	7.356	7-M1t	4.985	3.857	6.540	6.040	6.573	0.000
1483.20	1483.20	51.47	6.729	7.474	7-M1t	5.153	3.973	6.540	6.040	6.872	0.000
1547.80	1547.80	51.60	6.931	7.596	7-M1t	5.320	4.088	6.540	6.040	7.172	0.000
1612.40	1612.40	51.72	7.134	7.723	7-M1t	5.486	4.201	6.540	6.040	7.471	0.000
1677.00	1677.00	51.85	7.337	7.853	7-M1t	5.651	4.312	6.540	6.040	7.770	0.000
1741.60	1741.60	51.99	7.542	7.986	7-M1t	5.815	4.423	6.540	6.040	8.070	0.000
1770.00	1770.00	52.05	7.633	8.046	7-M1t	5.886	4.470	6.540	6.040	8.201	0.000
1870.80	1870.80	52.26	7.957	8.264	7-M1t	6.140	4.639	6.540	6.040	8.668	0.000
1935.40	1935.40	52.41	8.168	8.407	7-M1t	6.301	4.745	6.540	6.040	8.968	0.000
2000.00	2000.00	52.51	8.381	8.512	7-M1t	6.462	4.850	6.540	6.040	9.267	0.000

****

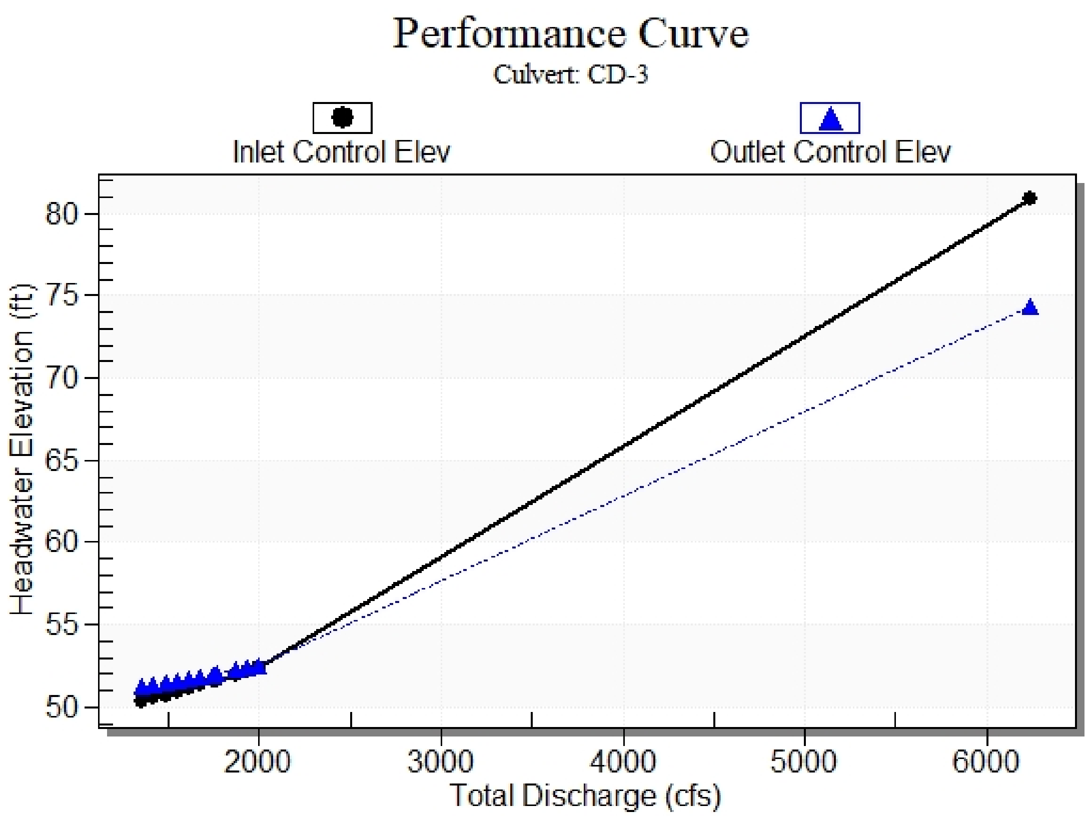
Straight Culvert

Inlet Elevation (invert): 44.00 ft, Outlet Elevation (invert): 43.50 ft

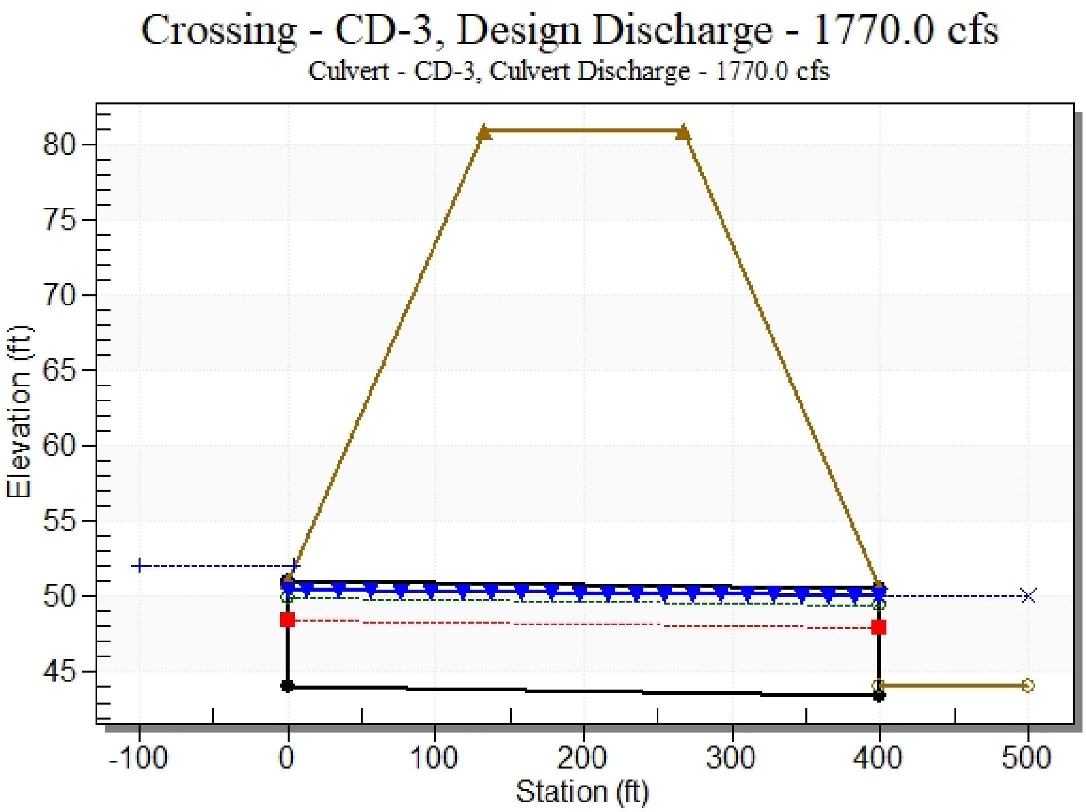
Culvert Length: 400.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: CD-3



Water Surface Profile Plot for Culvert: CD-3



Site Data - CD-3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 44.00 ft

Outlet Station: 400.00 ft

Outlet Elevation: 43.50 ft

Number of Barrels: 3

Culvert Data Summary - CD-3

Barrel Shape: Concrete Box

Barrel Span: 11.00 ft

Barrel Rise: 7.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
1354.00	50.04	6.04
1418.60	50.04	6.04
1483.20	50.04	6.04
1547.80	50.04	6.04
1612.40	50.04	6.04
1677.00	50.04	6.04
1741.60	50.04	6.04
1770.00	50.04	6.04
1870.80	50.04	6.04
1935.40	50.04	6.04
2000.00	50.04	6.04

Tailwater Channel Data - CD-3

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 50.04 ft

Roadway Data for Crossing: CD-3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 80.88 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 3A

CD-3A Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-3A.

Flow Rate 10 =	3.59	ft^3/s
Flow Rate 25 =	4.38	ft^3/s
Flow Rate 50 =	5.76	ft^3/s
Flow Rate 100 =	7.69	ft^3/s
Flow Rate 500 =	12.65	ft^3/s
Pipe Length =	303	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

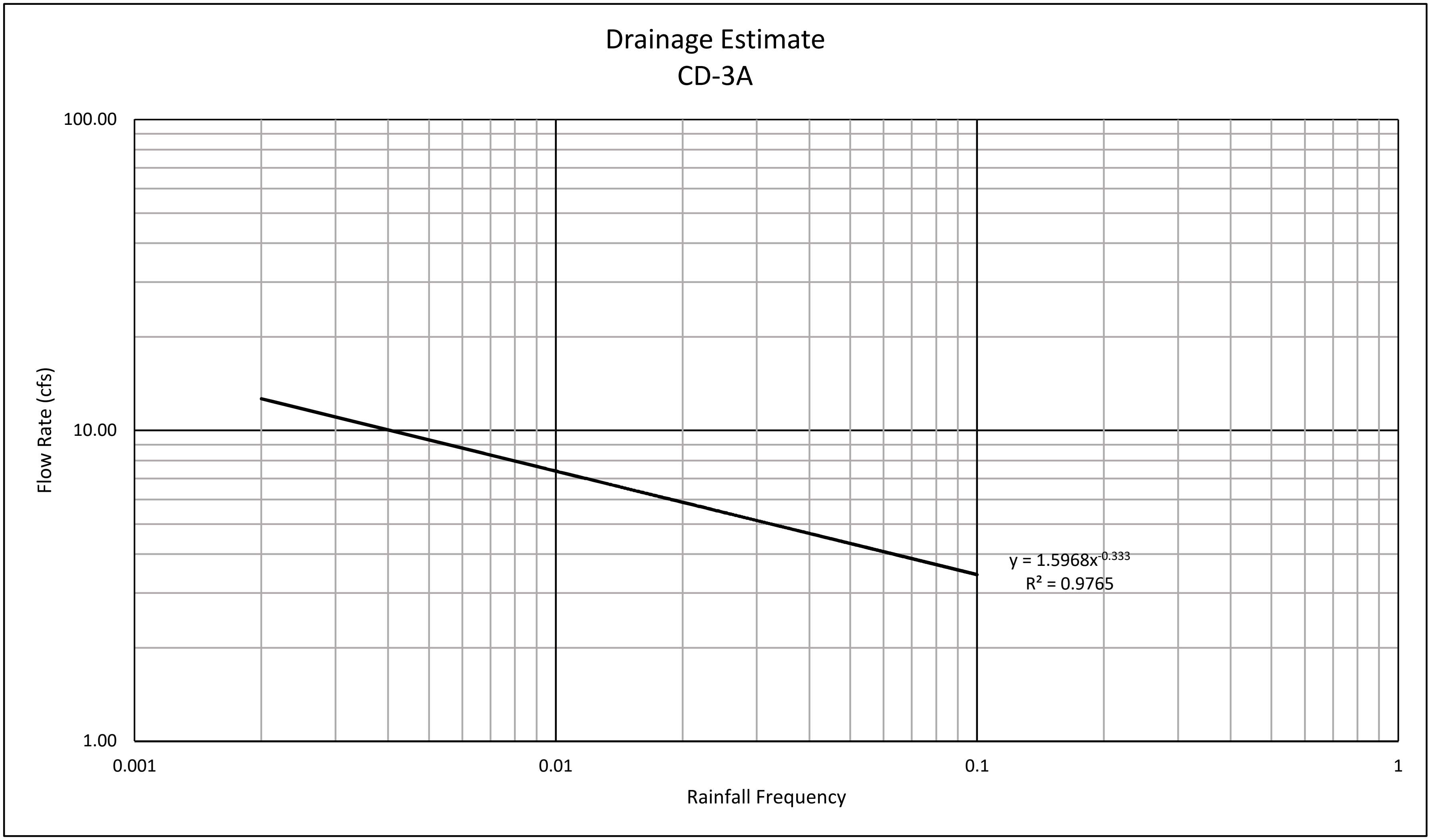
$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	1.82	ft
D =	21.78	in
A =	2.59	ft^2
Proposed Size =	1-30"	RCP

CD-3A Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%		0.45	0.00	0.00
Commercial	0-2%	5	0.95	0.13	0.13
Lawn flat 2%	0-2%	20	0.20	0.47	0.09
Woods/Wetlands	0-2%	75	0.15	1.76	0.26
			Total	2.35	0.49
			Composite Coefficient		0.21
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity - I (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	7.4	0.21	3.59
25-Year	1.1	0.04	8.2	0.23	4.38
50-Year	1.2	0.02	9	0.27	5.76
100-Year	1.25	0.01	9.6	0.34	7.69
500-Year	-	0.002	-	-	12.65
Rational Formula					
$Q = CIA$					

**Time of Concentration was assumed to be 10 minutes for an area this small.

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.



Drainage Estimate
CD-3A
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 1.5968x^-0.333
R² = 0.9765

CD-3A HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 3.59 cfs

Design Flow: 5.76 cfs

Maximum Flow: 7.69 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-3A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
57.83	3.59	3.59	0.00	1
57.84	4.00	4.00	0.00	1
57.85	4.41	4.41	0.00	1
57.86	4.82	4.82	0.00	1
57.87	5.23	5.23	0.00	1
57.88	5.64	5.64	0.00	1
57.88	5.76	5.76	0.00	1
57.90	6.46	6.46	0.00	1
57.92	6.87	6.87	0.00	1
57.93	7.28	7.28	0.00	1
57.95	7.69	7.69	0.00	1
75.41	84.31	84.31	0.00	Overtopping

Rating Curve Plot for Crossing: CD-3A

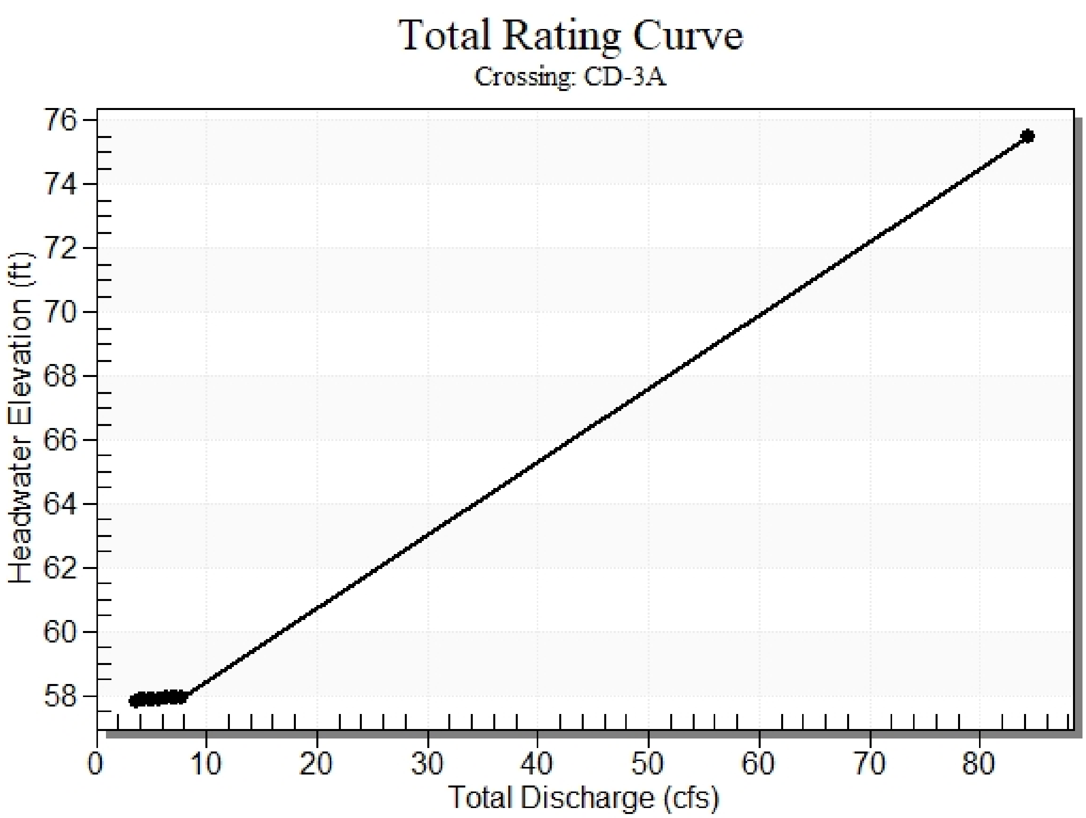


Table 2 - Culvert Summary Table: CD-3A

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)
3.59	3.59	57.83	0.852	2.532	4-FFf	0.733	0.619	2.500	2.500	0.731	0.000
4.00	4.00	57.84	0.900	2.540	4-FFf	0.776	0.655	2.500	2.500	0.815	0.000
4.41	4.41	57.85	0.949	2.548	4-FFf	0.817	0.686	2.500	2.500	0.898	0.000
4.82	4.82	57.86	0.994	2.558	4-FFf	0.856	0.719	2.500	2.500	0.982	0.000
5.23	5.23	57.87	1.038	2.568	4-FFf	0.894	0.751	2.500	2.500	1.065	0.000
5.64	5.64	57.88	1.080	2.579	4-FFf	0.931	0.782	2.500	2.500	1.149	0.000
5.76	5.76	57.88	1.092	2.582	4-FFf	0.942	0.790	2.500	2.500	1.173	0.000
6.46	6.46	57.90	1.161	2.603	4-FFf	1.003	0.839	2.500	2.500	1.316	0.000
6.87	6.87	57.92	1.201	2.617	4-FFf	1.038	0.864	2.500	2.500	1.400	0.000
7.28	7.28	57.93	1.238	2.631	4-FFf	1.072	0.891	2.500	2.500	1.483	0.000
7.69	7.69	57.95	1.280	2.647	4-FFf	1.106	0.918	2.500	2.500	1.567	0.000

****

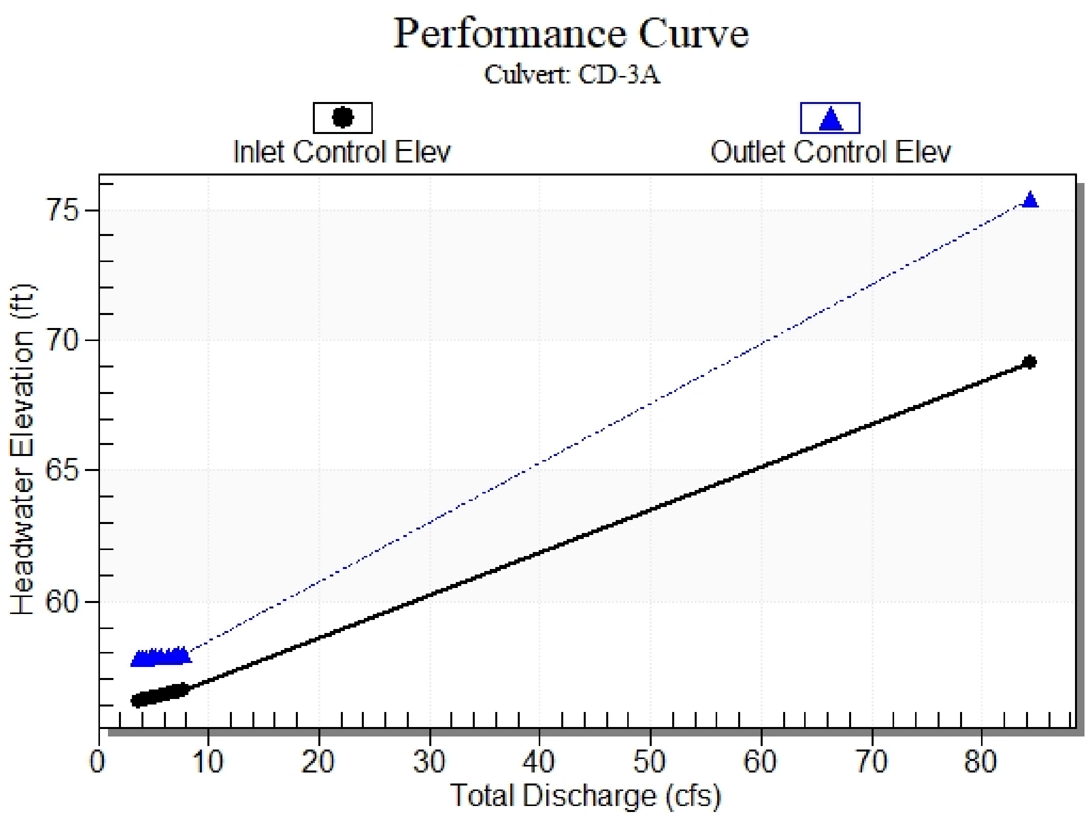
Straight Culvert

Inlet Elevation (invert): 55.30 ft, Outlet Elevation (invert): 54.80 ft

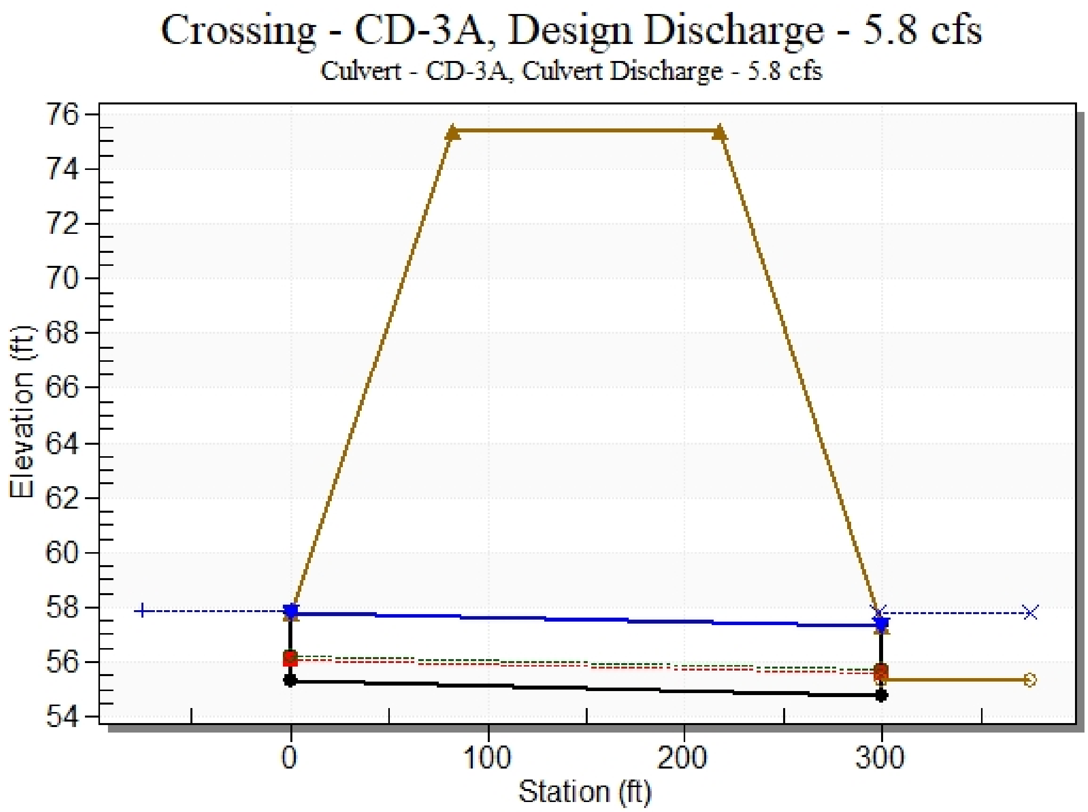
Culvert Length: 300.00 ft, Culvert Slope: 0.0017

****

Culvert Performance Curve Plot: CD-3A



Water Surface Profile Plot for Culvert: CD-3A



Site Data - CD-3A

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 55.30 ft

Outlet Station: 300.00 ft

Outlet Elevation: 54.80 ft

Number of Barrels: 1

Culvert Data Summary - CD-3A

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
3.59	57.80	2.50
4.00	57.80	2.50
4.41	57.80	2.50
4.82	57.80	2.50
5.23	57.80	2.50
5.64	57.80	2.50
5.76	57.80	2.50
6.46	57.80	2.50
6.87	57.80	2.50
7.28	57.80	2.50
7.69	57.80	2.50

Tailwater Channel Data - CD-3A

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 57.80 ft

Roadway Data for Crossing: CD-3A

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 75.41 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 4

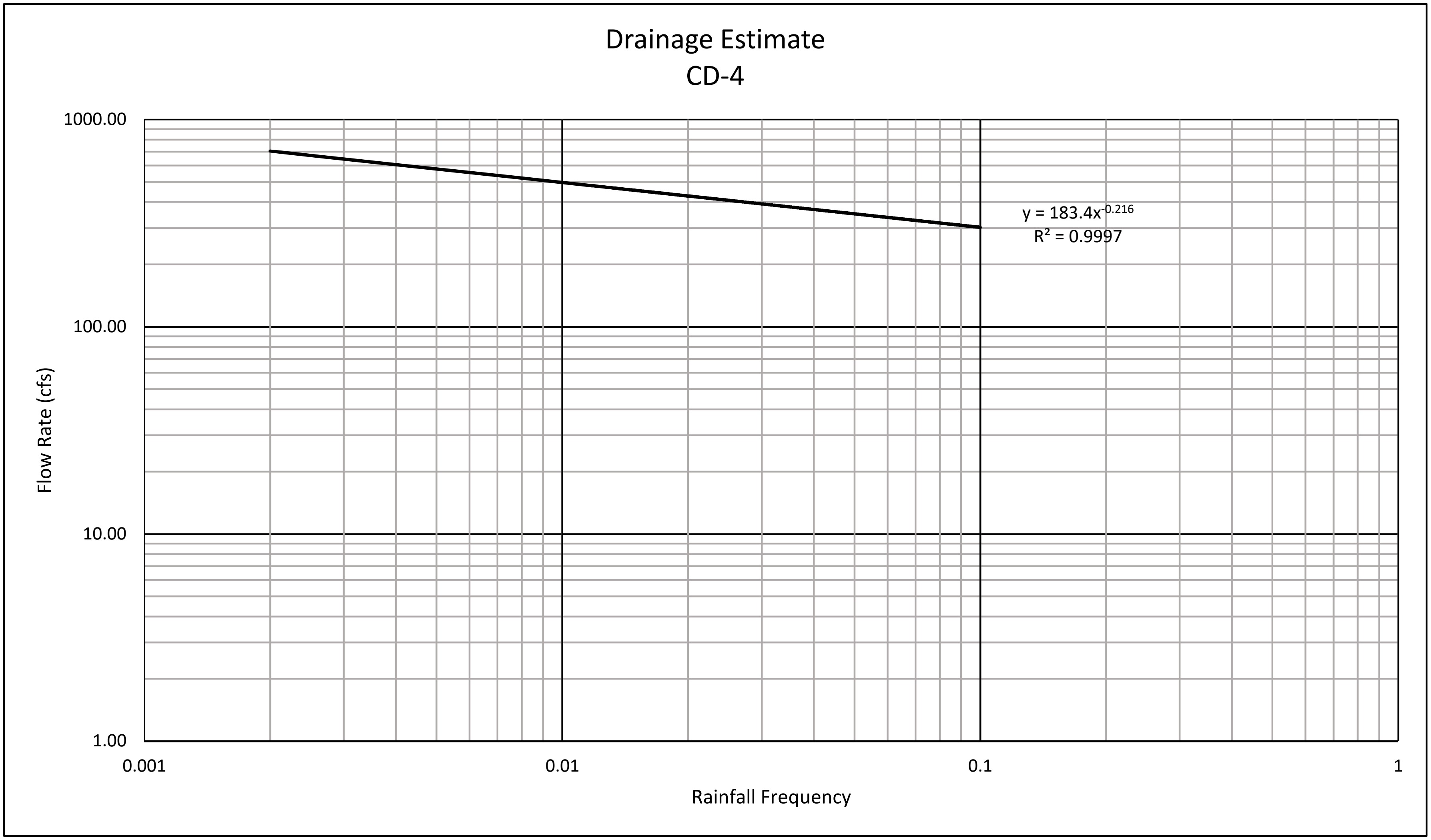
CD-4 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Big Econ Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-4.

Flow Rate 10 =	301	ft^3/s
Flow Rate 25 =	370	ft^3/s
Flow Rate 50 =	427	ft^3/s
Flow Rate 100 =	496	ft^3/s
Flow Rate 500 =	702	ft^3/s
Pipe Length =	456	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	9.35	ft
D =	112.21	in
A =	68.67	ft^2
Proposed Size =	2-8'x4'	CBC



Drainage Estimate
CD-4
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
y = 183.4x^-0.216
R² = 0.9997
0.001
0.01
0.1
1
Rainfall Frequency

CD-4 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 301 cfs

Design Flow: 427 cfs

Maximum Flow: 496 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
51.27	301.00	301.00	0.00	1
51.38	320.50	320.50	0.00	1
51.49	340.00	340.00	0.00	1
51.61	359.50	359.50	0.00	1
51.72	379.00	379.00	0.00	1
51.84	398.50	398.50	0.00	1
51.97	418.00	418.00	0.00	1
52.03	427.00	427.00	0.00	1
52.46	457.00	457.00	0.00	1
52.72	476.50	476.50	0.00	1
52.95	496.00	496.00	0.00	1
82.31	1727.16	1727.16	0.00	Overtopping

Rating Curve Plot for Crossing: CD-4

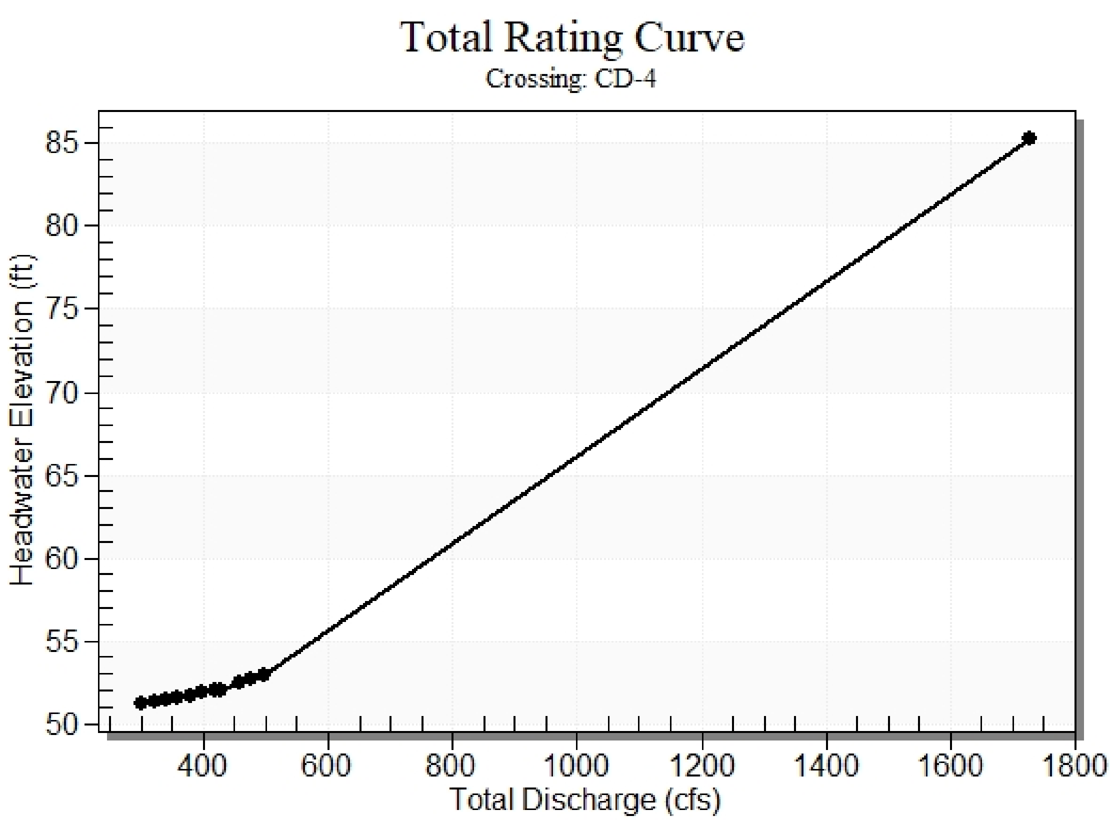


Table 2 - Culvert Summary Table: CD-4

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)
301.00	301.00	51.27	3.763	4.273	7-M1t	3.061	2.223	3.900	3.400	4.824	0.000
320.50	320.50	51.38	3.930	4.380	7-M1t	3.204	2.318	3.900	3.400	5.136	0.000
340.00	340.00	51.49	4.096	4.491	7-M1t	3.346	2.412	3.900	3.400	5.449	0.000
359.50	359.50	51.61	4.265	4.606	7-M1t	3.487	2.503	3.900	3.400	5.761	0.000
379.00	379.00	51.72	4.434	4.724	7-M1t	3.626	2.593	3.900	3.400	6.074	0.000
398.50	398.50	51.84	4.606	4.844	7-M1t	3.764	2.681	3.900	3.400	6.386	0.000
418.00	418.00	51.97	4.782	4.968	3-M2t	4.000	2.767	3.900	3.400	6.699	0.000
427.00	427.00	52.03	4.864	5.025	3-M2t	4.000	2.807	3.900	3.400	6.843	0.000
457.00	457.00	52.46	5.144	5.464	7-M2t	4.000	2.937	3.900	3.400	7.324	0.000
476.50	476.50	52.72	5.331	5.717	7-M2t	4.000	3.020	3.900	3.400	7.636	0.000
496.00	496.00	52.95	5.524	5.954	7-M2t	4.000	3.102	3.900	3.400	7.949	0.000

****

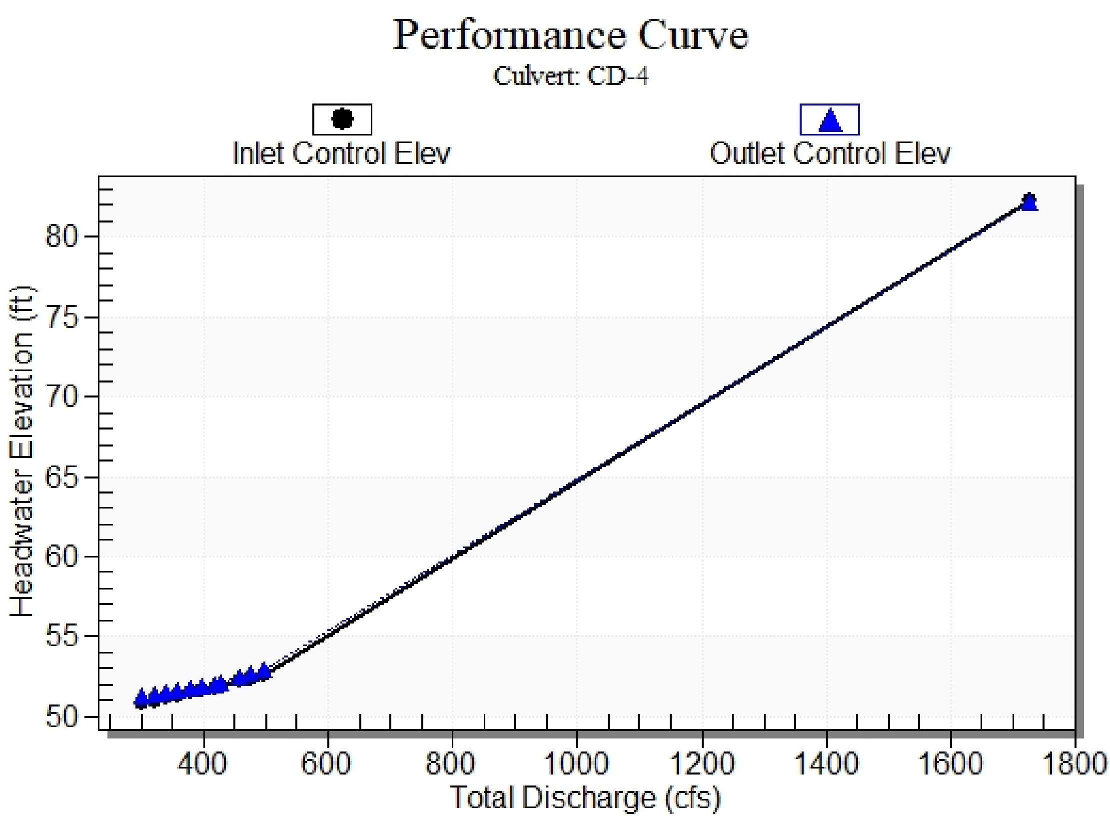
Straight Culvert

Inlet Elevation (invert): 47.00 ft, Outlet Elevation (invert): 46.50 ft

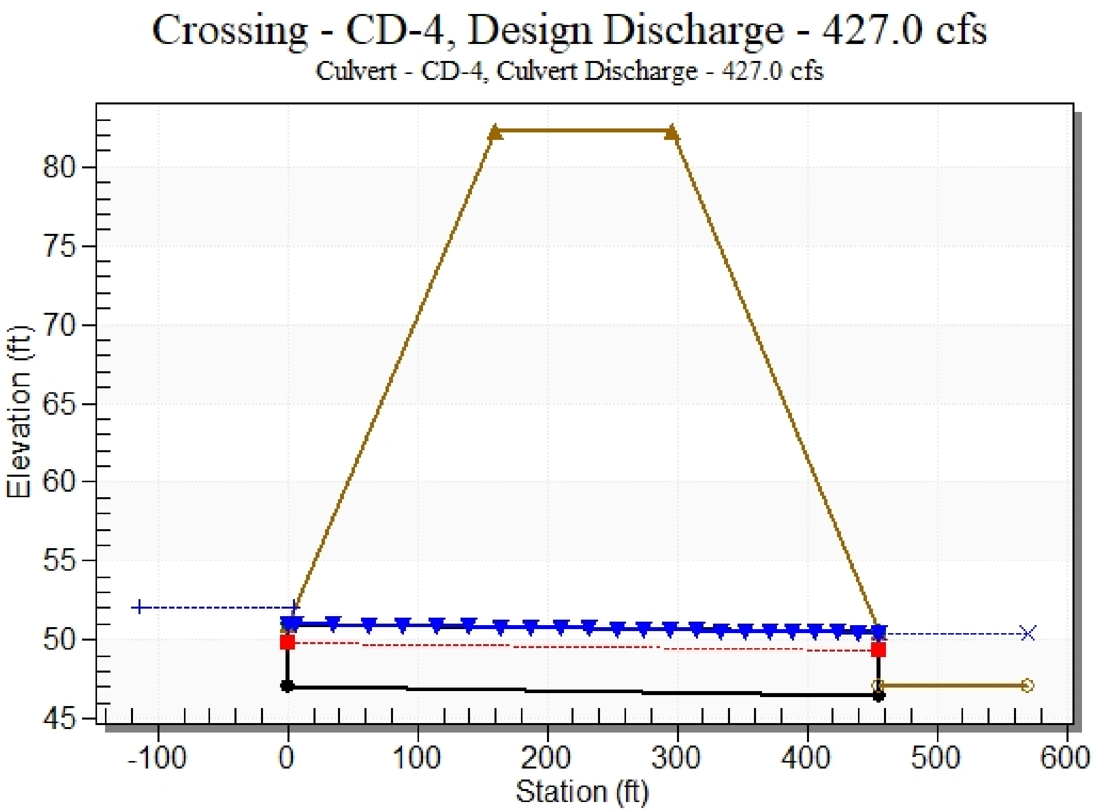
Culvert Length: 456.00 ft, Culvert Slope: 0.0011

****

Culvert Performance Curve Plot: CD-4



Water Surface Profile Plot for Culvert: CD-4



Site Data - CD-4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 47.00 ft

Outlet Station: 456.00 ft

Outlet Elevation: 46.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-4

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
301.00	50.40	3.40
320.50	50.40	3.40
340.00	50.40	3.40
359.50	50.40	3.40
379.00	50.40	3.40
398.50	50.40	3.40
418.00	50.40	3.40
427.00	50.40	3.40
457.00	50.40	3.40
476.50	50.40	3.40
496.00	50.40	3.40

Tailwater Channel Data - CD-4

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 50.40 ft

Roadway Data for Crossing: CD-4

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 82.31 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 5

CD-5 Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-5.

Flow Rate 10 =	134	ft^3/s
Flow Rate 25 =	171	ft^3/s
Flow Rate 50 =	226	ft^3/s
Flow Rate 100 =	312	ft^3/s
Flow Rate 500 =	541	ft^3/s
Pipe Length =	374	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	7.58	ft
D =	90.92	in
A =	45.08	ft^2
Proposed Size =	2-72"	RCP

TIME OF CONCENTRATION

PROJECT TITLE: STATE ROAD NO. 408 EASTERN EXTENSION NUMBER:
LOCATION : ORANGE COUNTY FILE:
BASIN NAME: CD-5

CONDITIONS	
Pre-Development	X
Post-Development	
Rainfall Zone:	7

COMPUTED VARIABLE	
T□dc	X
T□dt	
Frequency:	

Water Resources Group		Date
Computed By	KS	09/05/17
Checked By	CR	

SHEET FLOW (Applicable To T□dc□Only)

	Units	Segment ID			
1) SURFACE DESCRIPTION (table 5-4)					
2) MANNNING'S ROUGHNESS COEFF., [n] (table 5-4)		0.08			
3) FLOW LENGTH, [L] (TOTAL L <= 300 ft)	ft	300			
4) HIGH ELEVATION, [A]	ft	70.0			
5) LOW ELEVATION, [B]	ft	68.0			
6) TWO YEAR 24-hr RAINFALL , [P]	in	4.92			
7) LAND SLOPE, [s]	ft/ft	0.007			
8) COMPUTE T□dt□ T□dt□ = (.007*(n*L)^0.8)/(P^0.5 * s^0.4)	hr	0.291 +			0.291
				min =	17.4

SHALLOW CONCENTRATED FLOW

	Units	Segment ID			
9) SURFACE DESCRIPTION Enter 1 (Paved) or 2 (Unpaved)		1			
10) FLOW LENGTH, [L]	ft	4687			
11) HIGH ELEVATION, [C]		68.0			
12) LOW ELEVATION, [D]		52.0			
13) WATERCOURSE SLOPE, [s]	ft/ft	0.0034			
14) AVERAGE VELOCITY, [V] **	ft/sec	1.19			
15) COMPUTE T□dt□ T□dt□ = L / 3600*V	hr	1.10 +		=	1.10
				min =	65.8

CHANNEL FLOW

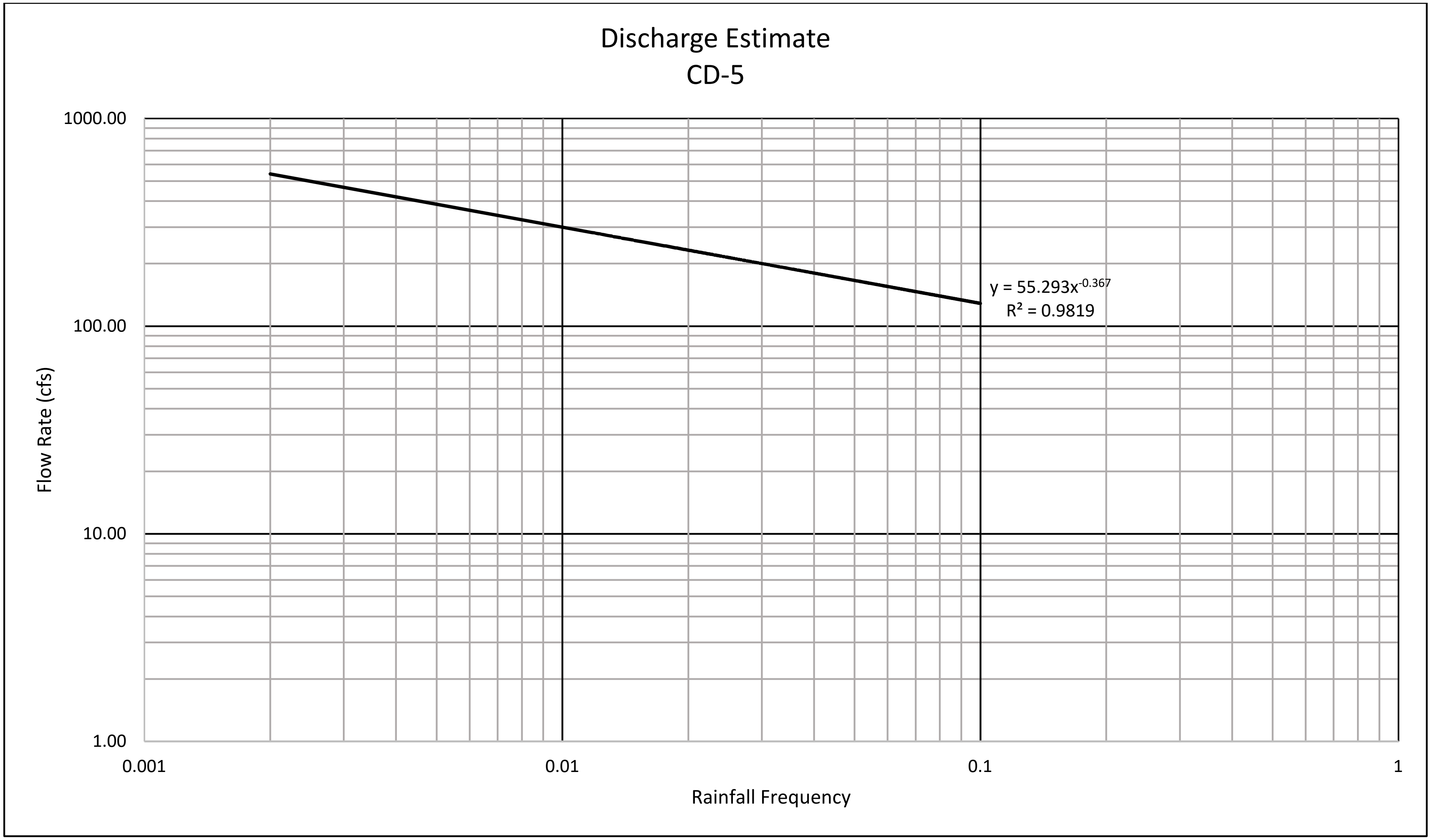
	Units	Segment ID			
16) CROSS SECTIONAL FLOW AREA, [a]	ft^2				
17) WETTED PERIMETER, [P□dw□]	ft				
18) HYDRAULIC RADIUS, [r] = a / P□dw□	ft				
19) FLOW LENGTH, [L]	ft				
20) HIGH ELEVATION, [D]	ft				
21) LOW ELEVATION, [E]	ft				
22) CHANNEL SLOPE, [s]	ft/ft				
23) MANNNING'S ROUGHNESS COEFF., [n]					
24) COMPUTE V: V = (1.49*r^2/3 * s^1/2) / n	ft/sec				
25) COMPUTE T□dt□ T□dt□ = L / 3600*V	hr			=	
				min =	0.0

TOTAL TIME (hr)	**1.39**
TOTAL TIME (min)	**83.2**

** Reference: FDOT Drainage Manual Chapter 5.5, TR-55 Chapter 3 & APP-F.

CD-5 Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%	40	0.45	43.61	19.63
Commercial	0-2%	25	0.95	27.26	25.89
Lawn flat 2%	0-2%	25	0.20	27.26	5.45
Woods/Wetlands	0-2%	10	0.15	10.90	1.64
			Total	109.03	52.61
			Composite Coefficient		0.48
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity - I (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	2.55	0.48	134.15
25-Year	1.1	0.04	2.95	0.53	170.71
50-Year	1.2	0.02	3.25	0.64	225.68
100-Year	1.25	0.01	3.60	0.80	312.49
500-Year	-	0.002	-	-	540.99
Rational Formula					
$Q = CIA$					

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.


Discharge Estimate
CD-5
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 55.293x^-0.367
R² = 0.9819

CD-5 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 134 cfs

Design Flow: 226 cfs

Maximum Flow: 312 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
50.50	134.00	134.00	0.00	1
50.68	151.80	151.80	0.00	1
50.88	169.60	169.60	0.00	1
51.08	187.40	187.40	0.00	1
51.27	205.20	205.20	0.00	1
51.48	223.00	223.00	0.00	1
51.51	226.00	226.00	0.00	1
51.87	258.60	258.60	0.00	1
52.07	276.40	276.40	0.00	1
52.26	294.20	294.20	0.00	1
52.46	312.00	312.00	0.00	1
84.25	1603.28	1603.28	0.00	Overtopping

Rating Curve Plot for Crossing: CD-5

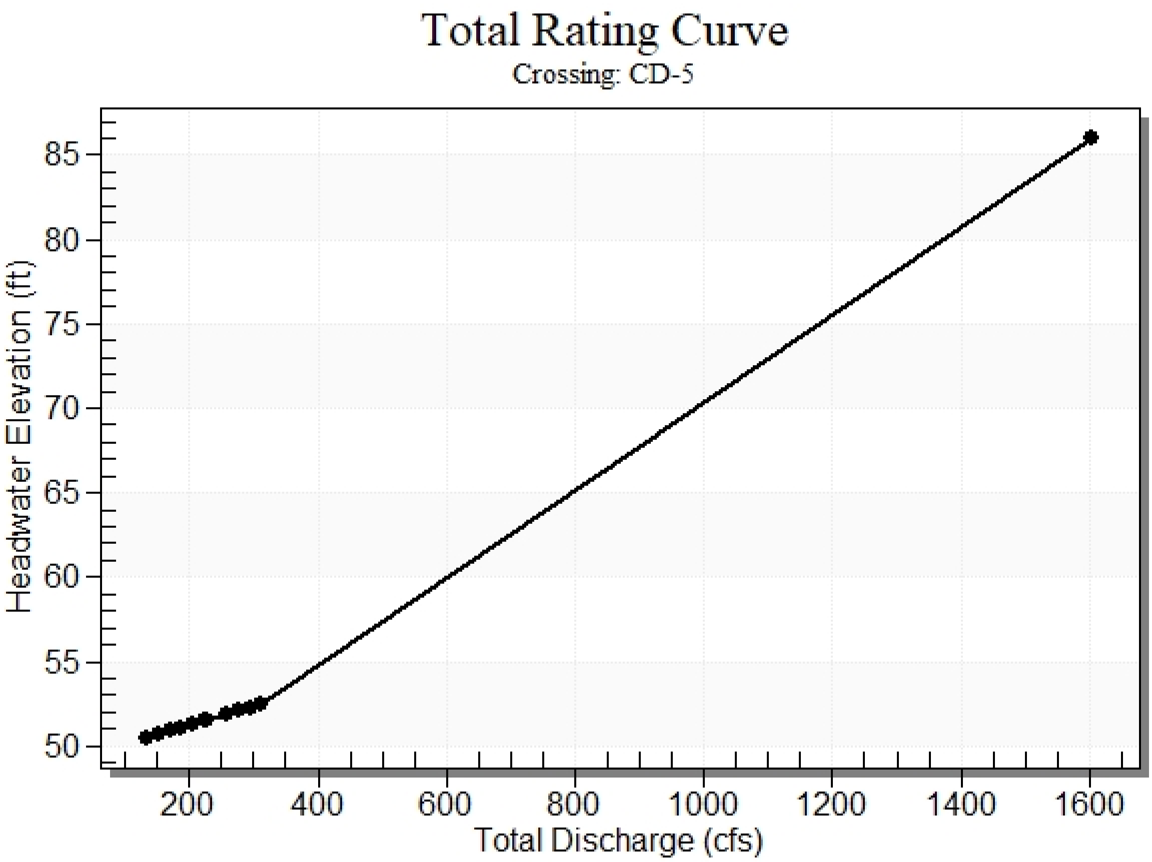


Table 2 - Culvert Summary Table: CD-5

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)
134.00	134.00	50.50	3.027	3.495	3-M1t	2.566	2.181	3.230	2.730	4.318	0.000
151.80	151.80	50.68	3.278	3.682	3-M1t	2.755	2.325	3.230	2.730	4.892	0.000
169.60	169.60	50.88	3.516	3.876	3-M1t	2.938	2.466	3.230	2.730	5.465	0.000
187.40	187.40	51.08	3.741	4.075	3-M1t	3.119	2.598	3.230	2.730	6.039	0.000
205.20	205.20	51.27	3.957	4.266	3-M2t	3.299	2.727	3.230	2.730	6.613	0.000
223.00	223.00	51.48	4.164	4.475	3-M2t	3.479	2.849	3.230	2.730	7.186	0.000
226.00	226.00	51.51	4.198	4.509	3-M2t	3.509	2.869	3.230	2.730	7.283	0.000
258.60	258.60	51.87	4.558	4.871	3-M2t	3.845	3.076	3.230	2.730	8.333	0.000
276.40	276.40	52.07	4.747	5.067	3-M2t	4.037	3.182	3.230	2.730	8.907	0.000
294.20	294.20	52.26	4.934	5.262	2-M2c	4.238	3.289	3.289	2.730	9.269	0.000
312.00	312.00	52.46	5.117	5.455	2-M2c	4.453	3.390	3.390	2.730	9.472	0.000

****

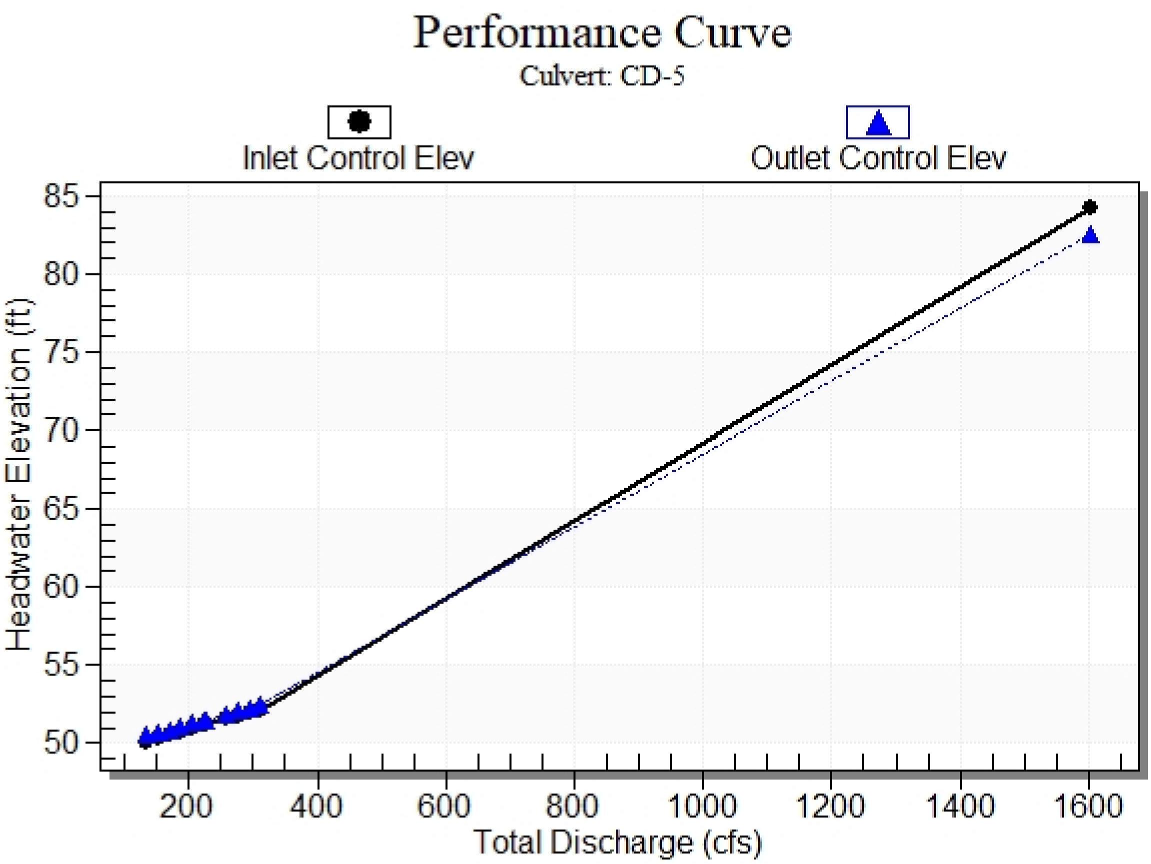
Straight Culvert

Inlet Elevation (invert): 47.00 ft,   Outlet Elevation (invert): 46.50 ft

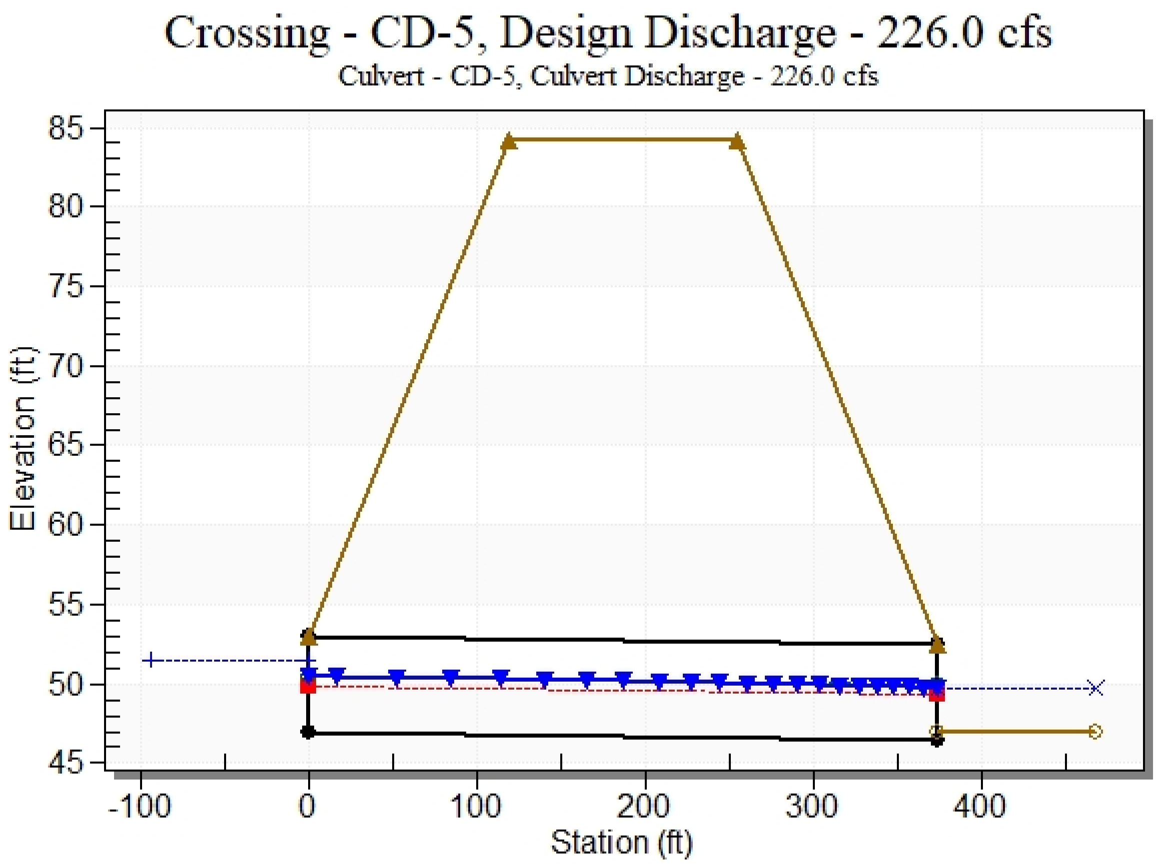
Culvert Length: 374.00 ft,   Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: CD-5



Water Surface Profile Plot for Culvert: CD-5



Site Data - CD-5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 47.00 ft

Outlet Station: 374.00 ft

Outlet Elevation: 46.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-5

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
134.00	49.73	2.73
151.80	49.73	2.73
169.60	49.73	2.73
187.40	49.73	2.73
205.20	49.73	2.73
223.00	49.73	2.73
226.00	49.73	2.73
258.60	49.73	2.73
276.40	49.73	2.73
294.20	49.73	2.73
312.00	49.73	2.73

Tailwater Channel Data - CD-5

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 49.73 ft

Roadway Data for Crossing: CD-5

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 84.25 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 6

CD-6 Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-6.

Flow Rate 10 =	112	ft^3/s
Flow Rate 25 =	141	ft^3/s
Flow Rate 50 =	190	ft^3/s
Flow Rate 100 =	259	ft^3/s
Flow Rate 500 =	449	ft^3/s
Pipe Length =	427	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D= (2.159\ Qn/S^{0.5})^{3/8}$

D =	7.24	ft
D =	86.92	in
A =	41.21	ft^2
Proposed Size =	2-72"	RCP

TIME OF CONCENTRATION

PROJECT TITLE: STATE ROAD NO. 408 EASTERN EXTENSION — NUMBER:
LOCATION : ORANGE COUNTY — FILE:
BASIN NAME: CD-6

CONDITIONS	
Pre-Development	X
Post-Development	
Rainfall Zone:	7

COMPUTED VARIABLE	
T dc	X
T dt	
Frequency:	

Water Resources Group		Date
Computed By	KS	09/05/17
Checked By	CR	

SHEET FLOW (Applicable To T dc Only)

	Unit	Segment ID			Total
1) SURFACE DESCRIPTION (table 5-4)					
2) MANNNING'S ROUGHNESS COEFF., [n] (table 5-4)		0.14			
3) FLOW LENGTH, [L] (TOTAL L <= 300 ft)	ft	300			
4) HIGH ELEVATION, [A]	ft	66.0			
5) LOW ELEVATION, [B]	ft	65.0			
6) TWO YEAR 24-hr RAINFALL , [P]	in	4.92			
7) LAND SLOPE, [s]	ft/ft	0.003			
8) COMPUTE T dt: T dt = (.007*(n*L)^0.8)/(P^0.5 * s^0.4)	hr	0.626	+		0.626
				min =	37.6

SHALLOW CONCENTRATED FLOW

	Unit	Segment ID			Total
9) SURFACE DESCRIPTION Enter 1 (Paved) or 2 (Unpaved)		1			
10) FLOW LENGTH, [L]	ft	3667			
11) HIGH ELEVATION, [C]		65.0			
12) LOW ELEVATION, [D]		51.0			
13) WATERCOURSE SLOPE, [s]	ft/ft	0.0038			
14) AVERAGE VELOCITY, [V] **	ft/sec	1.26			
15) COMPUTE T dt: T dt = L / 3600*V	hr	0.81	+	=	0.81
				min =	48.7

CHANNEL FLOW

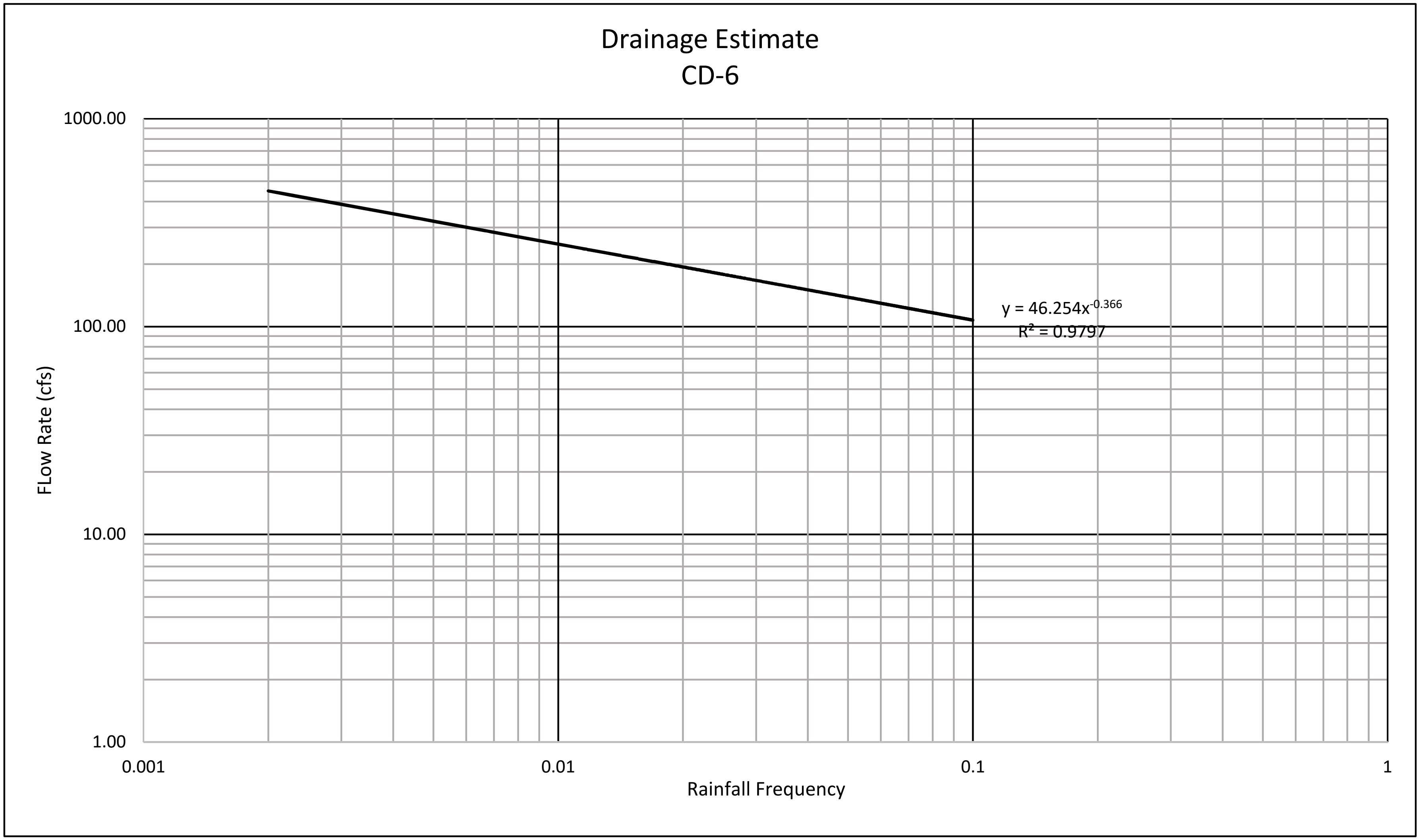
	Unit	Segment ID			Total
16) CROSS SECTIONAL FLOW AREA, [a]	ft^2				
17) WETTED PERIMETER, [P dw]	ft				
18) HYDRAULIC RADIUS, [r] = a / P dw	ft				
19) FLOW LENGTH, [L]	ft				
20) HIGH ELEVATION, [D]	ft				
21) LOW ELEVATION, [E]	ft				
22) CHANNEL SLOPE, [s]	ft/ft				
23) MANNNING'S ROUGHNESS COEFF., [n]					
24) COMPUTE V: V = (1.49*r^2/3 * s^1/2) / n	ft/sec				
25) COMPUTE T dt: T dt = L / 3600*V	hr			=	
				min =	0.0

TOTAL TIME (hr)	**1.44**
TOTAL TIME (min)	**86.2**

** Reference: FDOT Drainage Manual Chapter 5.5, TR-55 Chapter 3 & APP-F.

CD-6 Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%	75	0.45	89.26	40.17
Commercial	0-2%	0	0.95	0.00	0.00
Lawn flat 2%	0-2%	5	0.20	5.95	1.19
Woods/Wetlands	0-2%	20	0.15	23.80	3.57
			Total	119.01	44.93
			Composite Coefficient		0.38
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity - I (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	2.5	0.38	112.32
25-Year	1.1	0.04	2.85	0.42	140.84
50-Year	1.2	0.02	3.2	0.50	189.77
100-Year	1.25	0.01	3.5	0.62	259.45
500-Year	-	0.002	-	-	448.87
Rational Formula					
$Q = CIA$					

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.


Drainage Estimate
CD-6
1000.00
100.00
10.00
1.00
FLow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 46.254x^-0.366
R² = 0.9797

CD-6 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 112 cfs

Design Flow: 190 cfs

Maximum Flow: 259 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
51.06	112.00	112.00	0.00	1
51.27	126.70	126.70	0.00	1
51.48	141.40	141.40	0.00	1
51.67	156.10	156.10	0.00	1
51.86	170.80	170.80	0.00	1
52.04	185.50	185.50	0.00	1
52.10	190.00	190.00	0.00	1
52.40	214.90	214.90	0.00	1
52.57	229.60	229.60	0.00	1
52.74	244.30	244.30	0.00	1
52.91	259.00	259.00	0.00	1
84.64	1588.91	1588.91	0.00	Overtopping

Rating Curve Plot for Crossing: CD-6

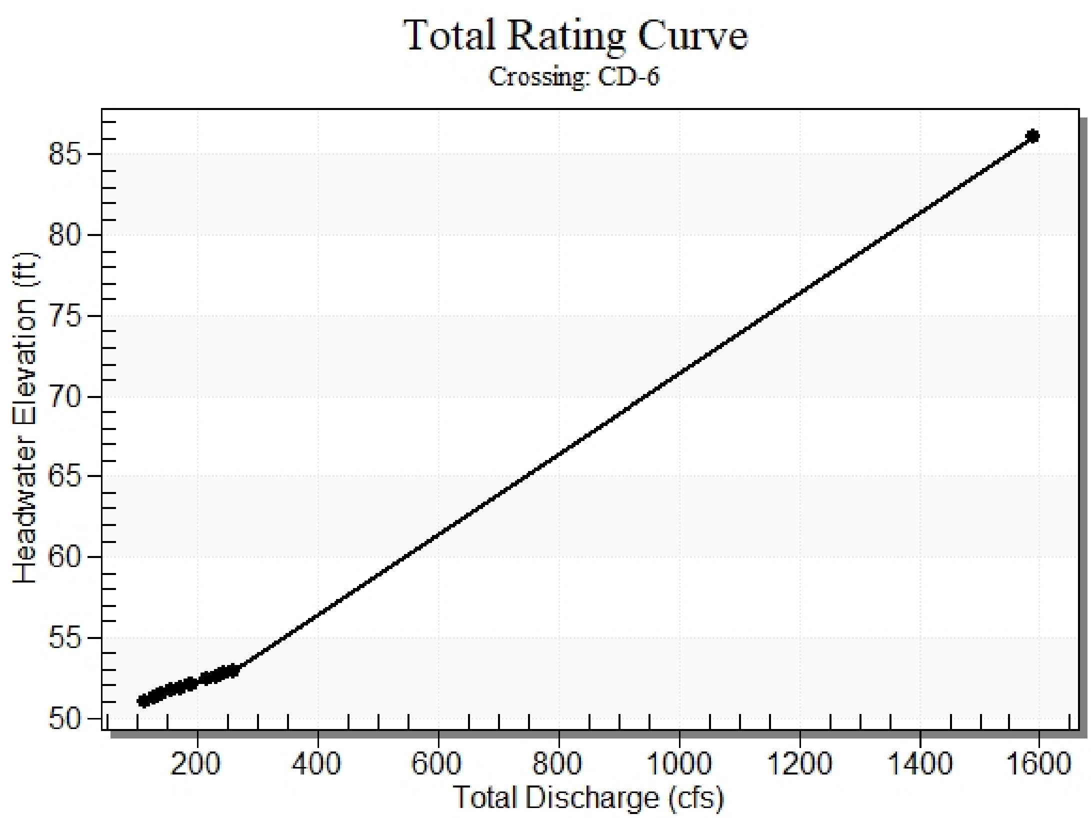


Table 2 - Culvert Summary Table: CD-6

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)
112.00	112.00	51.06	2.745	3.058	3-M2t	2.409	1.988	2.230	1.730	5.853	0.000
126.70	126.70	51.27	2.933	3.274	3-M2t	2.581	2.117	2.230	1.730	6.621	0.000
141.40	141.40	51.48	3.134	3.477	2-M2c	2.747	2.243	2.243	1.730	7.331	0.000
156.10	156.10	51.67	3.337	3.671	2-M2c	2.910	2.359	2.359	1.730	7.561	0.000
170.80	170.80	51.86	3.532	3.860	2-M2c	3.070	2.475	2.475	1.730	7.761	0.000
185.50	185.50	52.04	3.718	4.043	2-M2c	3.228	2.584	2.584	1.730	7.964	0.000
190.00	190.00	52.10	3.774	4.099	2-M2c	3.277	2.617	2.617	1.730	8.020	0.000
214.90	214.90	52.40	4.071	4.398	2-M2c	3.546	2.794	2.794	1.730	8.327	0.000
229.60	229.60	52.57	4.239	4.569	2-M2c	3.707	2.893	2.893	1.730	8.507	0.000
244.30	244.30	52.74	4.403	4.739	2-M2c	3.871	2.988	2.988	1.730	8.686	0.000
259.00	259.00	52.91	4.563	4.906	2-M2c	4.041	3.078	3.078	1.730	8.865	0.000

****

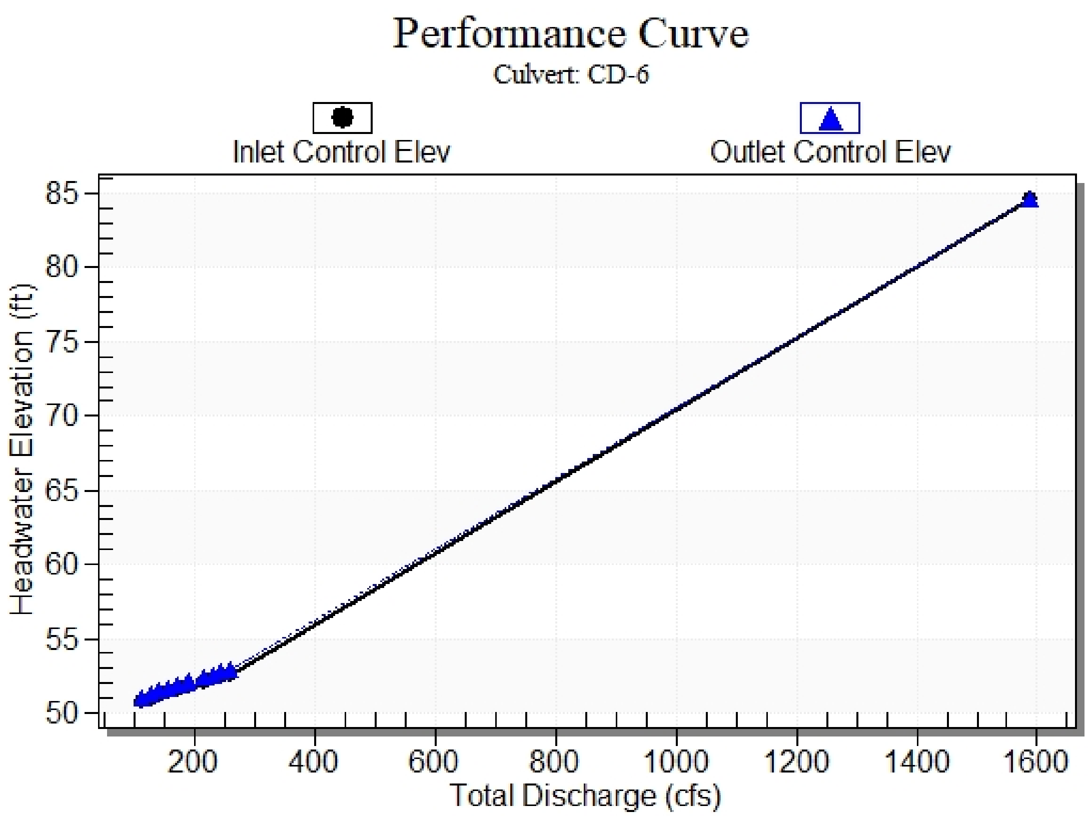
Straight Culvert

Inlet Elevation (invert): 48.00 ft, Outlet Elevation (invert): 47.50 ft

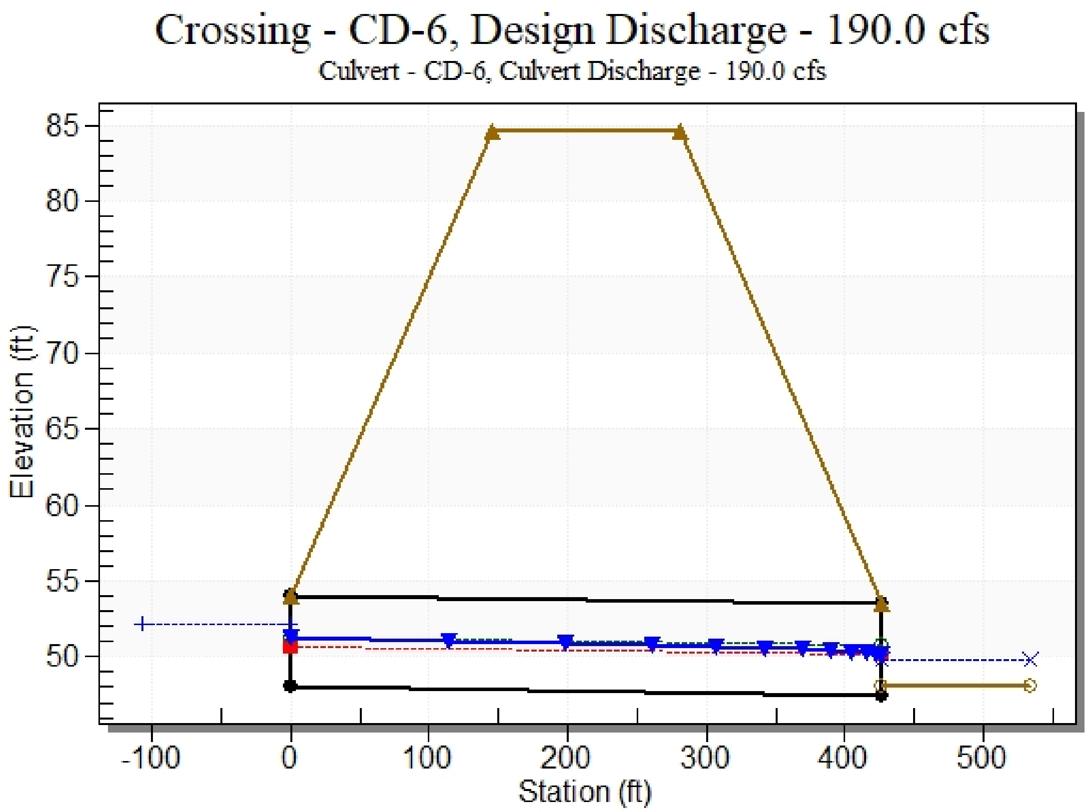
Culvert Length: 427.00 ft, Culvert Slope: 0.0012

****

Culvert Performance Curve Plot: CD-6



Water Surface Profile Plot for Culvert: CD-6



Site Data - CD-6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 48.00 ft

Outlet Station: 427.00 ft

Outlet Elevation: 47.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-6

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
112.00	49.73	1.73
126.70	49.73	1.73
141.40	49.73	1.73
156.10	49.73	1.73
170.80	49.73	1.73
185.50	49.73	1.73
190.00	49.73	1.73
214.90	49.73	1.73
229.60	49.73	1.73
244.30	49.73	1.73
259.00	49.73	1.73

Tailwater Channel Data - CD-6

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 49.73 ft

Roadway Data for Crossing: CD-6

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 84.64 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 7

CD-7 Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-7.

Flow Rate 10 =	98	ft^3/s
Flow Rate 25 =	125	ft^3/s
Flow Rate 50 =	165	ft^3/s
Flow Rate 100 =	231	ft^3/s
Flow Rate 500 =	401	ft^3/s
Pipe Length =	129	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$$D = (2.159\ Qn/S^{0.5})^{3/8}$$

D =	5.54	ft
D =	66.437	in
A =	24.074	ft^2
Proposed Size =	2-48"	RCP

TIME OF CONCENTRATION

PROJECT TITLE: STATE ROAD NO. 408 EASTERN EXTENSION — NUMBER:
LOCATION : ORANGE COUNTY — FILE:
BASIN NAME: CD-7

CONDITIONS	
Pre-Development	X
Post-Development	
Rainfall Zone:	7

COMPUTED VARIABLE	
T_c	X
T_t	
Frequency:	

Water Resources Group		Date
Computed By	KS	09/05/17
Checked By	CR	

SHEET FLOW

(Applicable To T_c Only)

	Unit	Segment ID			
1) SURFACE DESCRIPTION (table 5-4)					
2) MANNNING'S ROUGHNESS COEFF., [n] (table 5-4)		0.36			
3) FLOW LENGTH, [L] (TOTAL L <= 300 ft)	ft	300			
4) HIGH ELEVATION, [A]	ft	68.0			
5) LOW ELEVATION, [B]	ft	67.0			
6) TWO YEAR 24-hr RAINFALL , [P]	in	4.92			
7) LAND SLOPE, [s]	ft/ft	0.003			
8) COMPUTE T_t T_t = (.007*(n*L)^0.8)/(P^0.5 * s^0.4)	hr	1.315	+		1.315
				min =	78.9

SHALLOW CONCENTRATED FLOW

	Unit	Segment ID			
9) SURFACE DESCRIPTION Enter 1 (Paved) or 2 (Unpaved)		1			
10) FLOW LENGTH, [L]	ft	1400			
11) HIGH ELEVATION, [C]		67.0			
12) LOW ELEVATION, [D]		57.0			
13) WATERCOURSE SLOPE, [s]	ft/ft	0.0071			
14) AVERAGE VELOCITY, [V] **	ft/sec	1.72			
15) COMPUTE T_t T_t = L / 3600*V	hr	0.23	+	=	0.23
				min =	13.6

CHANNEL FLOW

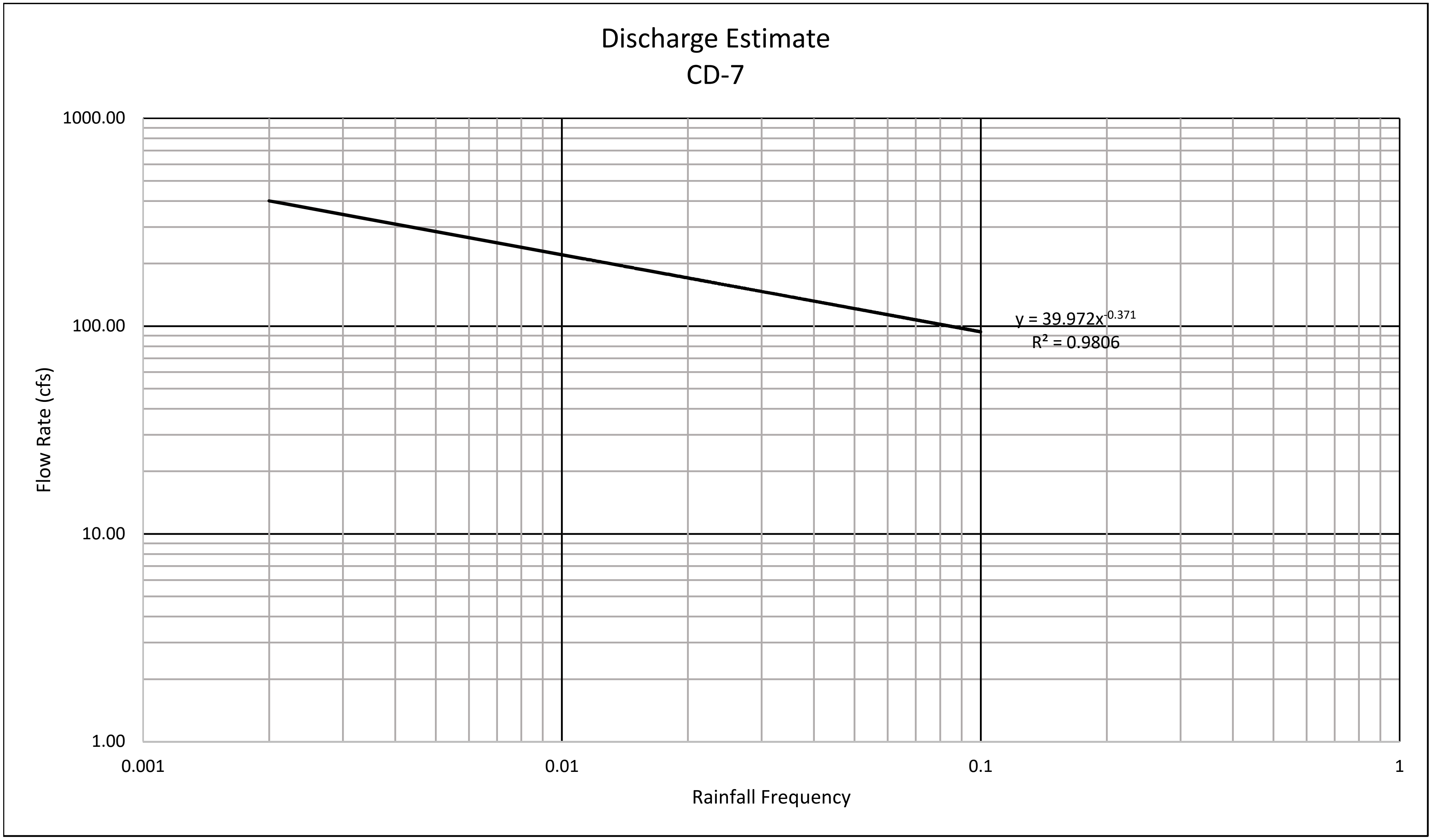
	Unit	Segment ID			
16) CROSS SECTIONAL FLOW AREA, [a]	ft^2				
17) WETTED PERIMETER, [P_w]	ft				
18) HYDRAULIC RADIUS, [r] = a / P_w	ft				
19) FLOW LENGTH, [L]	ft				
20) HIGH ELEVATION, [D]	ft				
21) LOW ELEVATION, [E]	ft				
22) CHANNEL SLOPE, [s]	ft/ft				
23) MANNNING'S ROUGHNESS COEFF., [n]					
24) COMPUTE V: V = (1.49*r^2/3 * s^1/2) / n	ft/sec				
25) COMPUTE T_t T_t = L / 3600*V	hr			=	
				min =	0.0

TOTAL TIME (hr)	**1.54**
TOTAL TIME (min)	**92.5**

** Reference: FDOT Drainage Manual Chapter 5.5, TR-55 Chapter 3 & APP-F.

CD-7 Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%	5	0.45	3.8975	1.75
Commercial	0-2%	45	0.95	35.0775	33.32
Lawn flat 2%	0-2%	20	0.20	15.59	3.12
Woods/Wetlands	0-2%	30	0.15	23.385	3.51
			Total	77.95	41.70
			Composite Coefficient		0.54
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	2.35	0.54	98.00
25-Year	1.1	0.04	2.72	0.59	124.78
50-Year	1.2	0.02	3	0.71	165.14
100-Year	1.25	0.01	3.35	0.88	230.51
500-Year	-	0.002	-	-	400.93
Rational Formula					
$Q = CIA$					

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.



Discharge Estimate
CD-7
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 39.972x-0.371
R² = 0.9806

CD-7 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 98 cfs

Design Flow: 165 cfs

Maximum Flow: 231 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
60.98	98.00	98.00	0.00	1
61.12	111.30	111.30	0.00	1
61.28	124.60	124.60	0.00	1
61.45	137.90	137.90	0.00	1
61.65	151.20	151.20	0.00	1
61.86	164.50	164.50	0.00	1
61.86	165.00	165.00	0.00	1
62.33	191.10	191.10	0.00	1
62.59	204.40	204.40	0.00	1
62.88	217.70	217.70	0.00	1
63.17	231.00	231.00	0.00	1
68.47	384.40	384.40	0.00	Overtopping

Rating Curve Plot for Crossing: CD-7

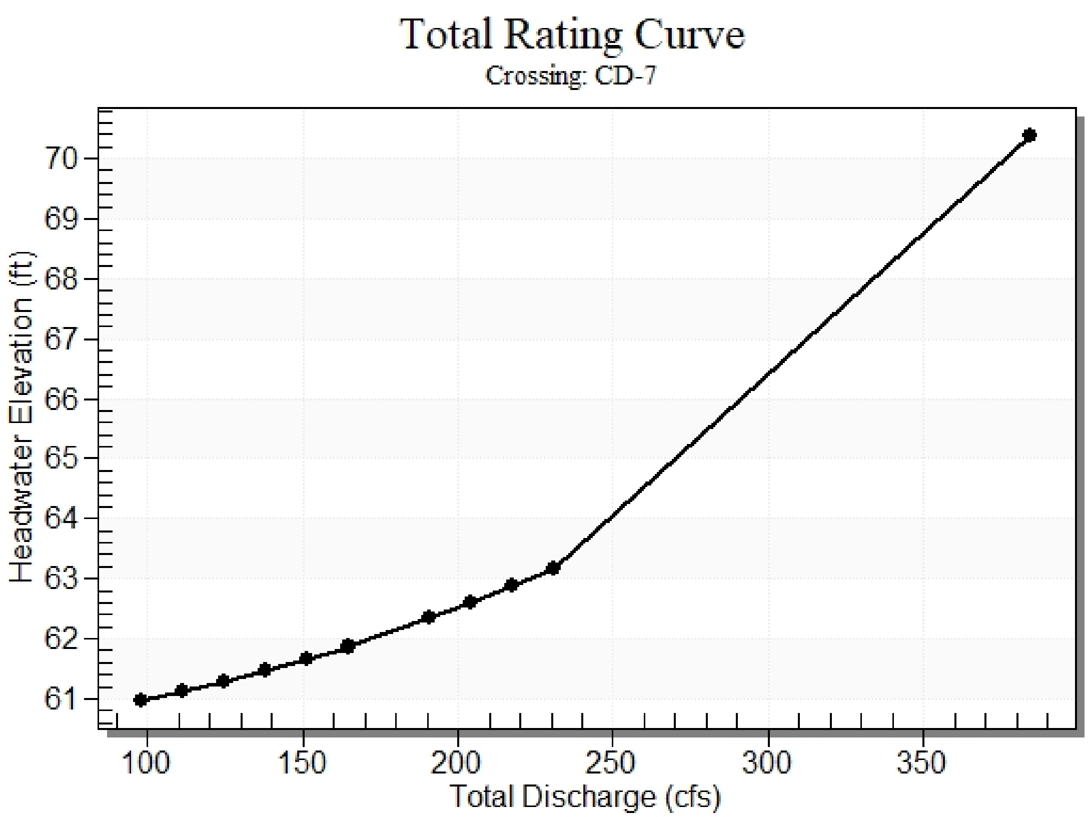


Table 2 - Culvert Summary Table: CD-7

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)
98.00	98.00	60.98	3.115	4.481	4-FFf	1.960	2.096	4.000	4.000	3.899	0.000
111.30	111.30	61.12	3.370	4.621	4-FFf	2.115	2.240	4.000	4.000	4.428	0.000
124.60	124.60	61.28	3.621	4.778	4-FFf	2.270	2.377	4.000	4.000	4.958	0.000
137.90	137.90	61.45	3.873	4.953	4-FFf	2.426	2.505	4.000	4.000	5.487	0.000
151.20	151.20	61.65	4.132	5.146	4-FFf	2.586	2.629	4.000	4.000	6.016	0.000
164.50	164.50	61.86	4.401	5.356	4-FFf	2.754	2.745	4.000	4.000	6.545	0.000
165.00	165.00	61.86	4.411	5.364	4-FFf	2.760	2.749	4.000	4.000	6.565	0.000
191.10	191.10	62.33	4.985	5.830	4-FFf	3.142	2.959	4.000	4.000	7.604	0.000
204.40	204.40	62.59	5.305	6.094	4-FFf	4.000	3.058	4.000	4.000	8.133	0.000
217.70	217.70	62.88	5.647	6.375	4-FFf	4.000	3.151	4.000	4.000	8.662	0.000
231.00	231.00	63.17	6.012	6.674	4-FFf	4.000	3.239	4.000	4.000	9.191	0.000

****

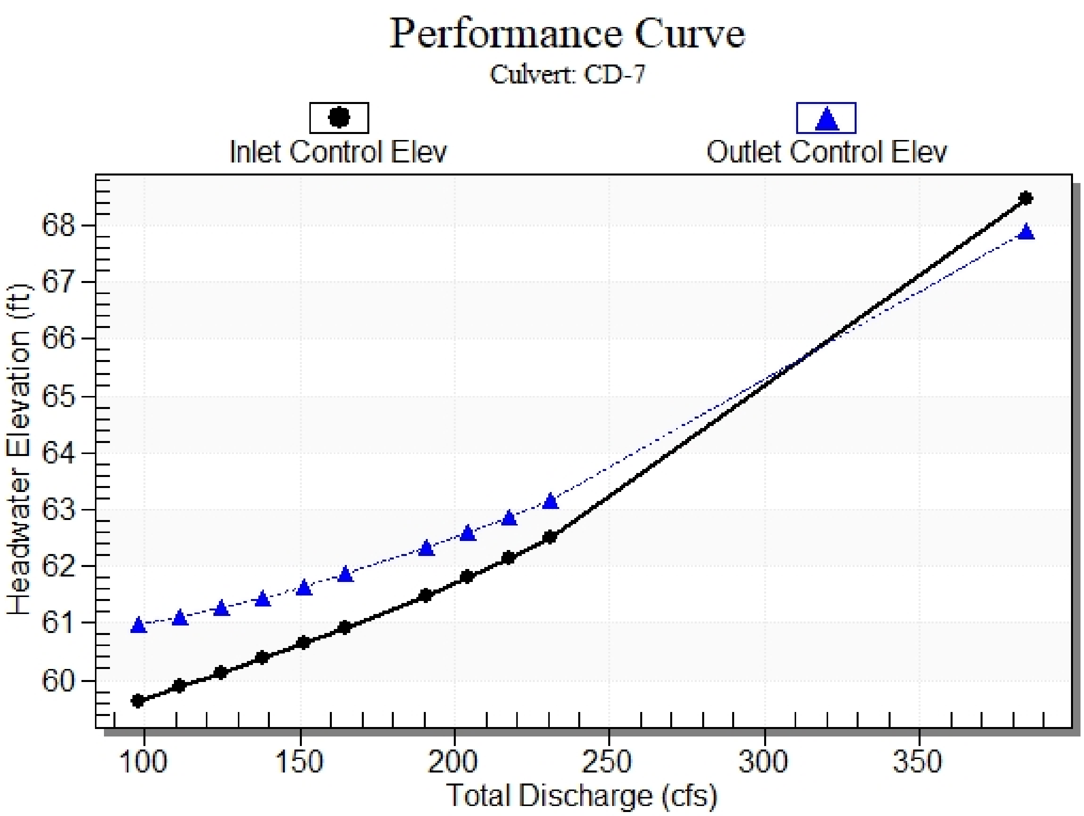
Straight Culvert

Inlet Elevation (invert): 56.50 ft, Outlet Elevation (invert): 56.00 ft

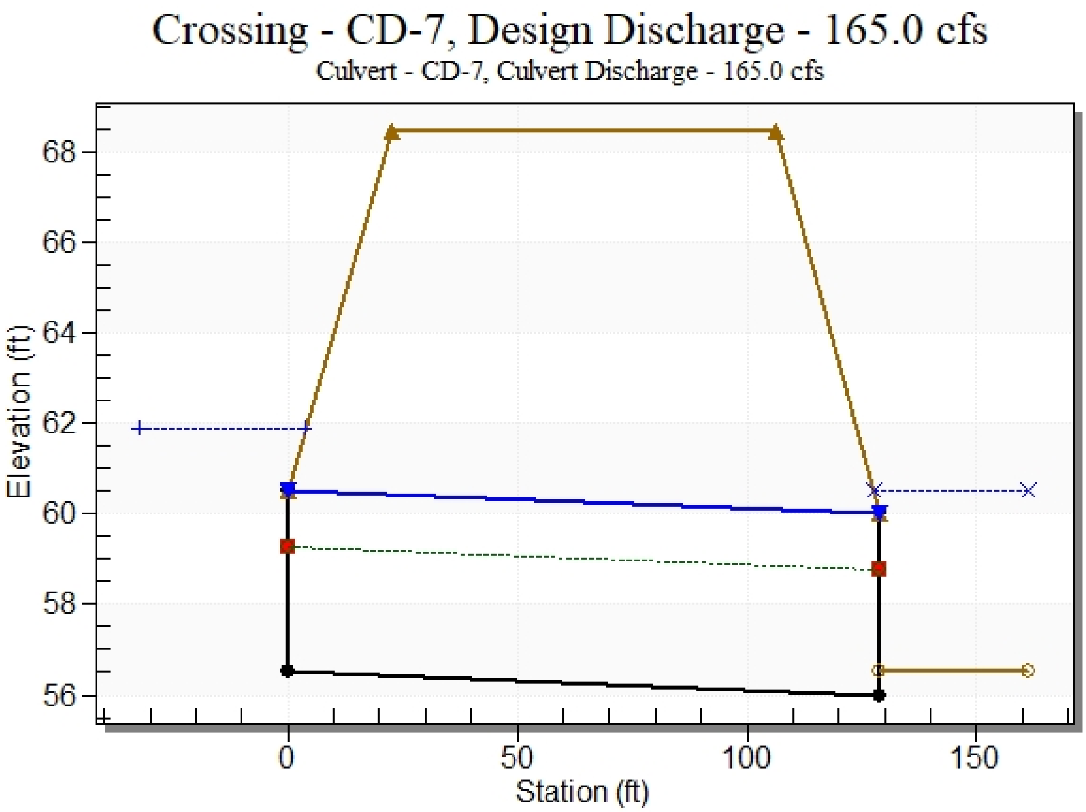
Culvert Length: 129.00 ft, Culvert Slope: 0.0039

****

Culvert Performance Curve Plot: CD-7



Water Surface Profile Plot for Culvert: CD-7



Site Data - CD-7

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 56.50 ft

Outlet Station: 129.00 ft

Outlet Elevation: 56.00 ft

Number of Barrels: 2

Culvert Data Summary - CD-7

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
98.00	60.50	4.00
111.30	60.50	4.00
124.60	60.50	4.00
137.90	60.50	4.00
151.20	60.50	4.00
164.50	60.50	4.00
165.00	60.50	4.00
191.10	60.50	4.00
204.40	60.50	4.00
217.70	60.50	4.00
231.00	60.50	4.00

Tailwater Channel Data - CD-7

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 60.50 ft

Roadway Data for Crossing: CD-7

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 68.47 ft

Roadway Surface: Paved

Roadway Top Width: 84.00 ft

Cross Drain 8

CD-8 Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-8.

Flow Rate 10 =	133	ft^3/s
Flow Rate 25 =	169	ft^3/s
Flow Rate 50 =	223	ft^3/s
Flow Rate 100 =	309	ft^3/s
Flow Rate 500 =	535	ft^3/s
Pipe Length =	447	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D= (2.159\ Qn/S^{0.5})^{3/8}$

D =	7.80	ft
D =	93.615	in
A =	47.80	ft^2
Proposed Size =	1-10'x5'	CBC

TIME OF CONCENTRATION

PROJECT TITLE: STATE ROAD NO. 408 EASTERN EXTENSION
LOCATION : ORANGE COUNTY
BASIN NAME: CD-8

NUMBER:
FILE:

CONDITIONS	
Pre-Development	X
Post-Development	
Rainfall Zone:	7

COMPUTED VARIABLE	
T_{dc}	X
T_{dt}	
Frequency:	

Water Resources Group		Date
Computed By	KS	09/05/17
Checked By	CR	

SHEET FLOW (Applicable To T_{dc} Only)

	Unit	Segment ID			
1) SURFACE DESCRIPTION (table 5-4)					
2) MANNNING'S ROUGHNESS COEFF., [n] (table 5-4)		0.36			
3) FLOW LENGTH, [L] (TOTAL L <= 300 ft)	ft	300			
4) HIGH ELEVATION, [A]	ft	68.0			
5) LOW ELEVATION, [B]	ft	67.0			
6) TWO YEAR 24-hr RAINFALL , [P]	in	4.92			
7) LAND SLOPE, [s]	ft/ft	0.003			
8) COMPUTE T_{dt}: T_{dt} = (.007*(n*L)^0.8)/(P^0.5 * s^0.4)	hr	1.315	+		1.315
				min =	78.9

SHALLOW CONCENTRATED FLOW

	Unit	Segment ID			
9) SURFACE DESCRIPTION Enter 1 (Paved) or 2 (Unpaved)		1			
10) FLOW LENGTH, [L]	ft	2300			
11) HIGH ELEVATION, [C]		67.0			
12) LOW ELEVATION, [D]		50.0			
13) WATERCOURSE SLOPE, [s]	ft/ft	0.0074			
14) AVERAGE VELOCITY, [V] **	ft/sec	1.75			
15) COMPUTE T_{dt}: T_{dt} = L / 3600*V	hr	0.37	+	=	0.37
				min =	21.9

CHANNEL FLOW

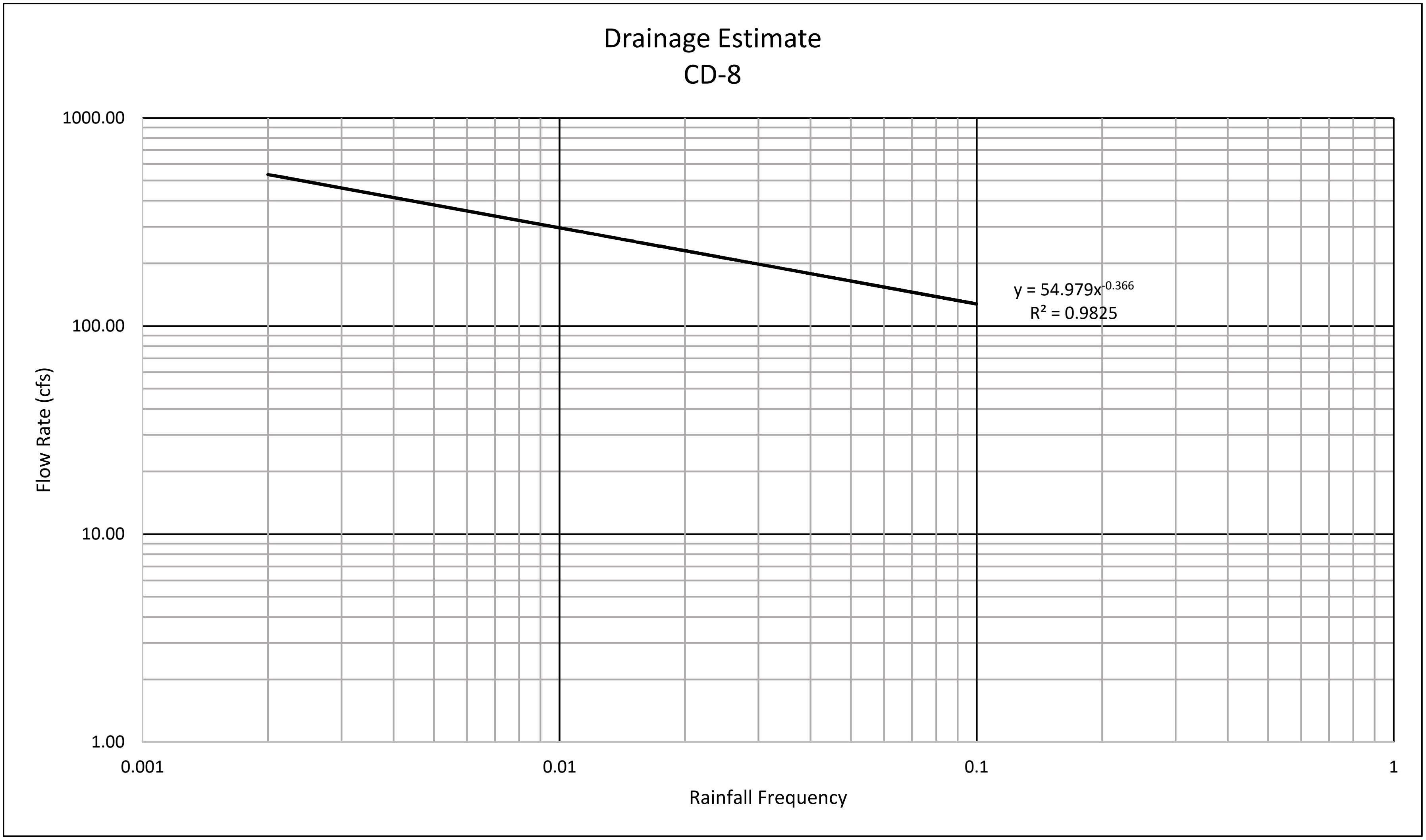
	Unit	Segment ID			
16) CROSS SECTIONAL FLOW AREA, [a]	ft^2				
17) WETTED PERIMETER, [P_{dw}]	ft				
18) HYDRAULIC RADIUS, [r] = a / P_{dw}	ft				
19) FLOW LENGTH, [L]	ft				
20) HIGH ELEVATION, [D]	ft				
21) LOW ELEVATION, [E]	ft				
22) CHANNEL SLOPE, [s]	ft/ft				
23) MANNNING'S ROUGHNESS COEFF., [n]					
24) COMPUTE V: V = (1.49*r^2/3 * s^1/2) / n	ft/sec				
25) COMPUTE T_{dt}: T_{dt} = L / 3600*V	hr			=	
				min =	0.0

TOTAL TIME (hr)	**1.68**
TOTAL TIME (min)	**100.8**

** Reference: FDOT Drainage Manual Chapter 5.5, TR-55 Chapter 3 & APP-F.

CD-8 Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%	5	0.45	6.072	2.73
Commercial	0-2%	40	0.95	48.576	46.15
Lawn flat 2%	0-2%	25	0.20	30.36	6.07
Woods/Wetlands	0-2%	30	0.15	36.432	5.46
			Total	121.44	60.42
			Composite Coefficient		0.50
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity - I (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	2.2	0.50	132.92
25-Year	1.1	0.04	2.55	0.55	169.47
50-Year	1.2	0.02	2.8	0.66	223.30
100-Year	1.25	0.01	3.1	0.82	309.03
500-Year	-	0.002	-	-	534.59
Rational Formula					
$Q = CIA$					

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.


Drainage Estimate
CD-8
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
y = 54.979x^-0.366
R² = 0.9825
0.001
0.01
0.1
1
Rainfall Frequency

CD-8 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 133 cfs

Design Flow: 223 cfs

Maximum Flow: 309 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
53.78	133.00	133.00	0.00	1
53.85	150.60	150.60	0.00	1
53.94	168.20	168.20	0.00	1
54.03	185.80	185.80	0.00	1
54.14	203.40	203.40	0.00	1
54.25	221.00	221.00	0.00	1
54.27	223.00	223.00	0.00	1
54.51	256.20	256.20	0.00	1
54.65	273.80	273.80	0.00	1
54.80	291.40	291.40	0.00	1
54.96	309.00	309.00	0.00	1
84.68	1356.63	1356.63	0.00	Overtopping

Rating Curve Plot for Crossing: CD-8

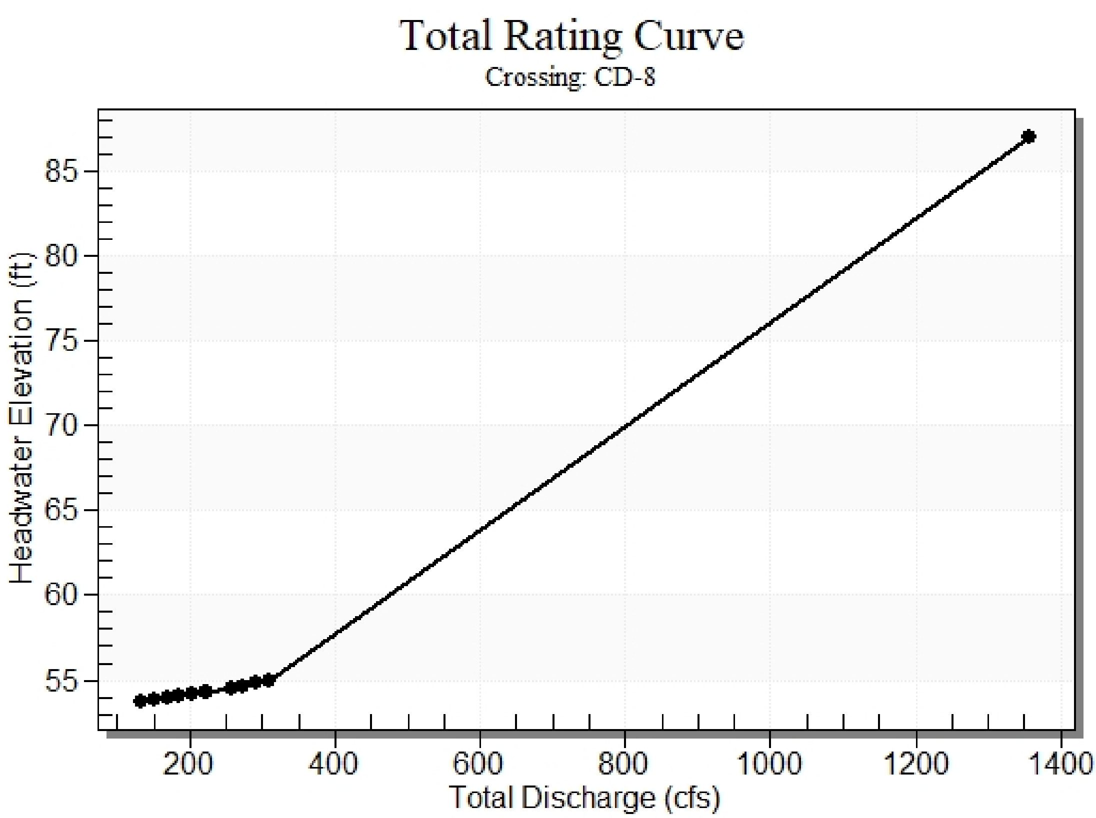


Table 2 - Culvert Summary Table: CD-8

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)
133.00	133.00	53.78	3.008	5.269	4-FFf	2.270	1.764	5.000	5.000	2.660	0.000
150.60	150.60	53.85	3.259	5.344	4-FFf	2.473	1.917	5.000	5.000	3.012	0.000
168.20	168.20	53.94	3.501	5.430	4-FFf	2.671	2.063	5.000	5.000	3.364	0.000
185.80	185.80	54.03	3.735	5.524	4-FFf	2.865	2.205	5.000	5.000	3.716	0.000
203.40	203.40	54.14	3.963	5.628	4-FFf	3.054	2.342	5.000	5.000	4.068	0.000
221.00	221.00	54.25	4.186	5.742	4-FFf	3.240	2.475	5.000	5.000	4.420	0.000
223.00	223.00	54.27	4.211	5.755	4-FFf	3.261	2.490	5.000	5.000	4.460	0.000
256.20	256.20	54.51	4.621	5.997	4-FFf	3.603	2.732	5.000	5.000	5.124	0.000
273.80	273.80	54.65	4.837	6.138	4-FFf	3.780	2.855	5.000	5.000	5.476	0.000
291.40	291.40	54.80	5.052	6.289	4-FFf	3.956	2.977	5.000	5.000	5.828	0.000
309.00	309.00	54.96	5.269	6.450	4-FFf	5.000	3.095	5.000	5.000	6.180	0.000

****

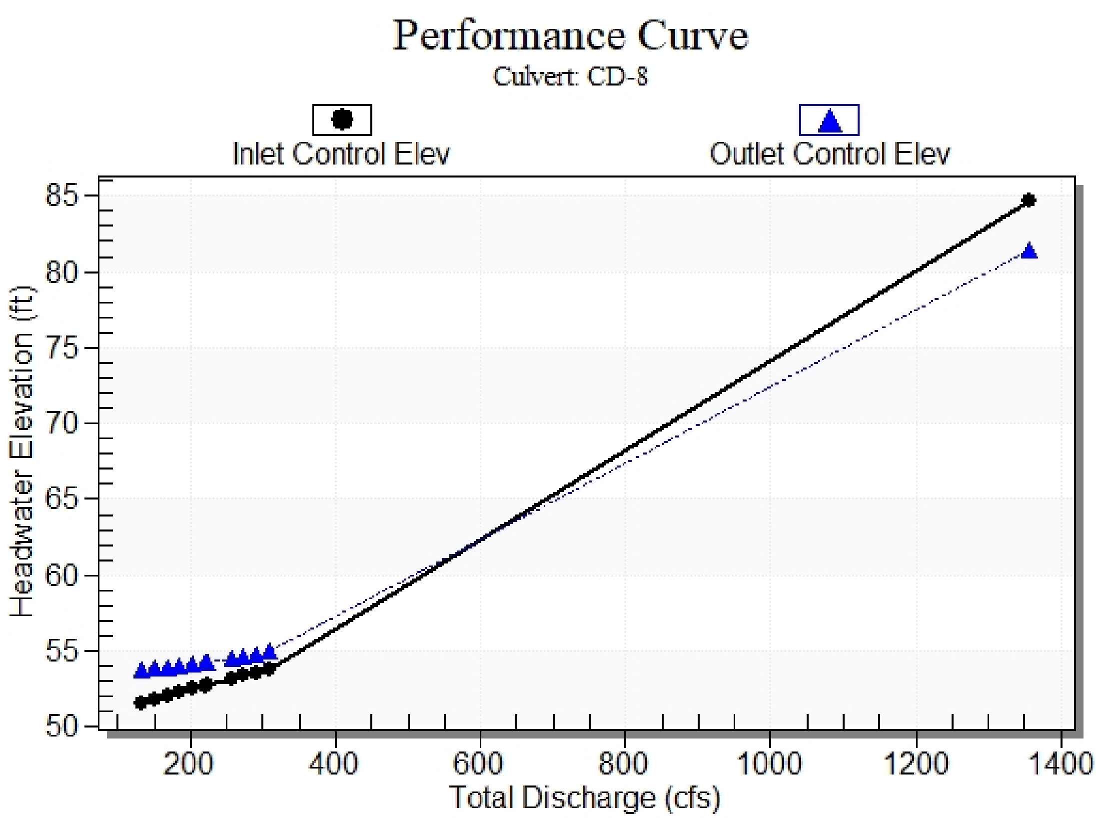
Straight Culvert

Inlet Elevation (invert): 48.51 ft, Outlet Elevation (invert): 48.00 ft

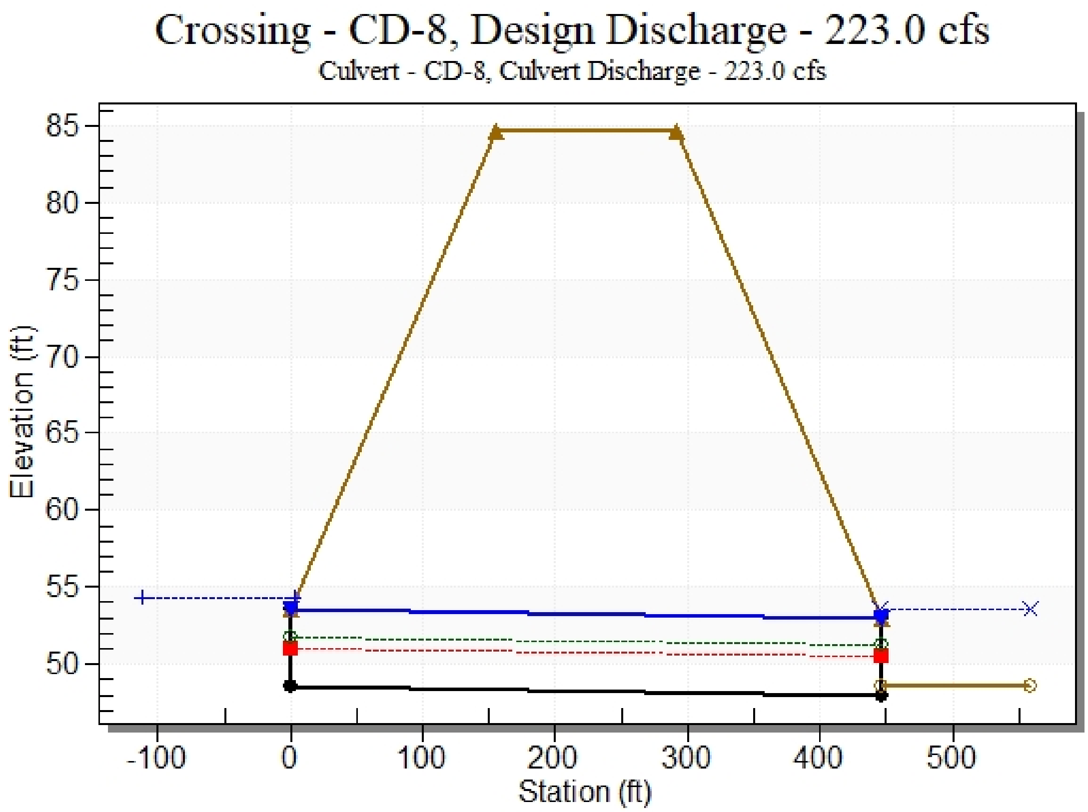
Culvert Length: 447.00 ft, Culvert Slope: 0.0011

****

Culvert Performance Curve Plot: CD-8



Water Surface Profile Plot for Culvert: CD-8



Site Data - CD-8

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 48.51 ft

Outlet Station: 447.00 ft

Outlet Elevation: 48.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-8

Barrel Shape: Concrete Box

Barrel Span: 10.00 ft

Barrel Rise: 5.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
133.00	53.51	5.00
150.60	53.51	5.00
168.20	53.51	5.00
185.80	53.51	5.00
203.40	53.51	5.00
221.00	53.51	5.00
223.00	53.51	5.00
256.20	53.51	5.00
273.80	53.51	5.00
291.40	53.51	5.00
309.00	53.51	5.00

Tailwater Channel Data - CD-8

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 53.51 ft

Roadway Data for Crossing: CD-8

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 84.68 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 9

CD-9 Preliminary Culvert Sizing

The calculated flow rate for a 100-year storm event, determined by the Rational Method, was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-9.

Flow Rate 10 =	92	ft^3/s
Flow Rate 25 =	117	ft^3/s
Flow Rate 50 =	153	ft^3/s
Flow Rate 100 =	212	ft^3/s
Flow Rate 500 =	364	ft^3/s
Pipe Length =	300	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	6.28	ft
D =	75.397	in
A =	31.006	ft^2
Proposed Size =	1-72"	RCP

TIME OF CONCENTRATION

PROJECT TITLE: STATE ROAD NO. 408 EASTERN EXTENSION
LOCATION : ORANGE COUNTY
BASIN NAME: CD-9

NUMBER:
FILE:

CONDITIONS	
Pre-Development	X
Post-Development	
Rainfall Zone:	7

COMPUTED VARIABLE	
Tdc	X
Tdt	
Frequency:	

Water Resources Group		Date
Computed By	KS	09/05/17
Checked By	CR	

SHEET FLOW (Applicable To Tdc Only)

	Units	Segment ID			
1) SURFACE DESCRIPTION (table 5-4)					
2) MANNNING'S ROUGHNESS COEFF., [n] (table 5-4)		0.41			
3) FLOW LENGTH, [L] (TOTAL L <= 300 ft)	ft	300			
4) HIGH ELEVATION, [A]	ft	67.0			
5) LOW ELEVATION, [B]	ft	66.0			
6) TWO YEAR 24-hr RAINFALL , [P]	in	4.92			
7) LAND SLOPE, [s]	ft/ft	0.003			
8) COMPUTE Tdt Tdt = (.007*(n*L)^0.8)/(P^0.5 * s^0.4)	hr	1.441	+		1.441
				min =	86.5

SHALLOW CONCENTRATED FLOW

	Units	Segment ID			
9) SURFACE DESCRIPTION Enter 1 (Paved) or 2 (Unpaved)		2			
10) FLOW LENGTH, [L]	ft	1665			
11) HIGH ELEVATION, [C]		66.0			
12) LOW ELEVATION, [D]		38.0			
13) WATERCOURSE SLOPE, [s]	ft/ft	0.0168			
14) AVERAGE VELOCITY, [V] **	ft/sec	2.09			
15) COMPUTE Tdt Tdt = L / 3600*V	hr	0.22	+	=	0.22
				min =	13.3

CHANNEL FLOW

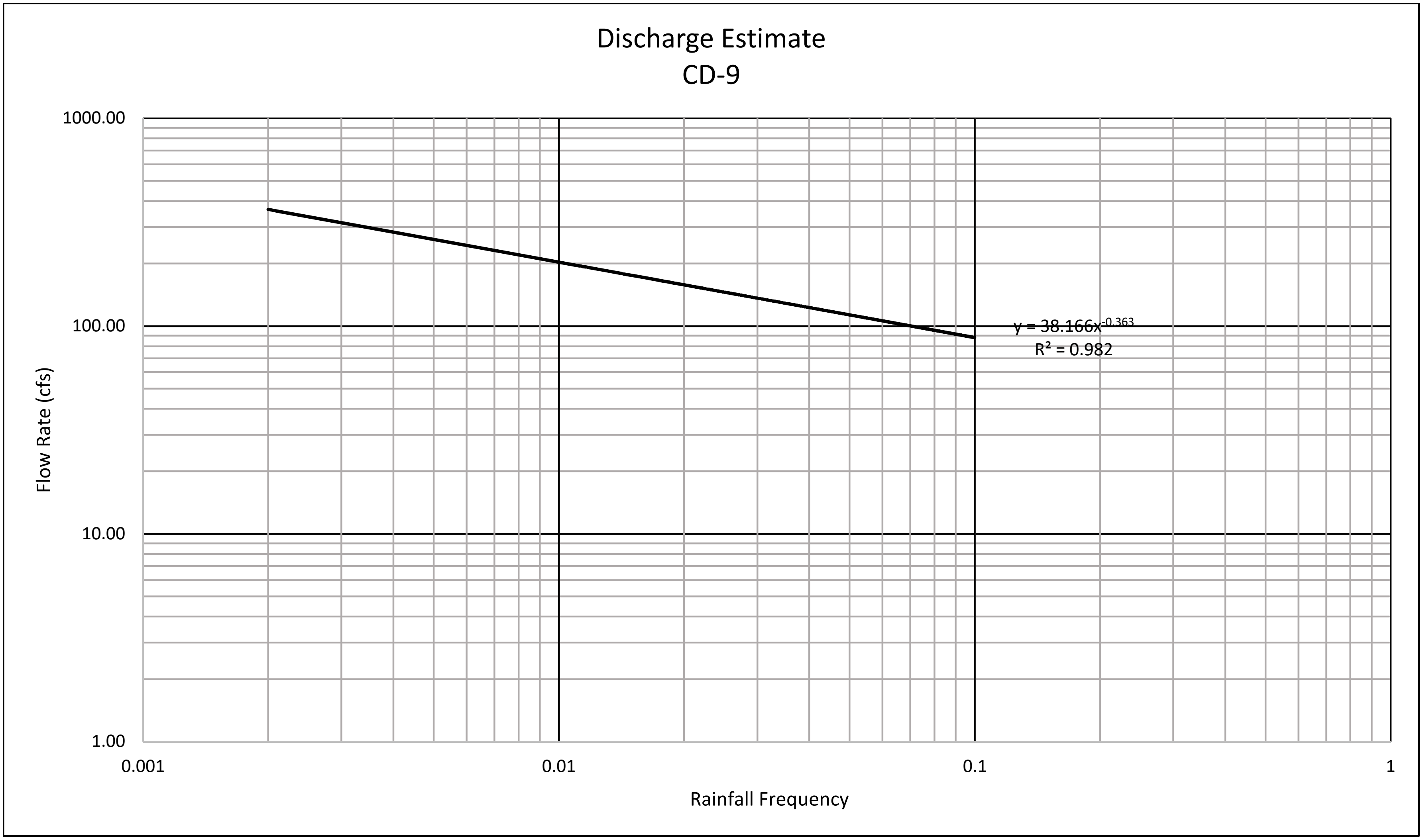
	Units	Segment ID			
16) CROSS SECTIONAL FLOW AREA, [a]	ft^2				
17) WETTED PERIMETER, [Pdw]	ft				
18) HYDRAULIC RADIUS, [r] = a / Pdw	ft				
19) FLOW LENGTH, [L]	ft				
20) HIGH ELEVATION, [D]	ft				
21) LOW ELEVATION, [E]	ft				
22) CHANNEL SLOPE, [s]	ft/ft				
23) MANNNING'S ROUGHNESS COEFF., [n]					
24) COMPUTE V: V = (1.49*r^2/3 * s^1/2) / n	ft/sec				
25) COMPUTE Tdt Tdt = L / 3600*V	hr			=	
				min =	0.0

TOTAL TIME (hr)	**1.66**
TOTAL TIME (min)	**99.7**

** Reference: FDOT Drainage Manual Chapter 5.5, TR-55 Chapter 3 & APP-F.

CD-9 Rational Method					
Runoff Coefficient Calculations					
Land Use	Slope	Land Cover (%)	Runoff Coefficient	Area (acre) - A	Product
Residential	0-2%	5	0.45	3.79	1.71
Commercial	0-2%	45	0.95	34.12	32.41
Lawn flat 2%	0-2%	25	0.20	18.96	3.79
Woods/Wetlands	0-2%	25	0.15	18.96	2.84
			Total	75.82	40.75
			Composite Coefficient		0.54
Contributing Flow Rate for Various Storm Frequency					
Storm Frequency	Storm Frequency Factor	Rainfall Frequency	Intensity - I (in/hr)	Adjusted Runoff Coefficient - C	Runoff Rate - Q (cfs)
10-Year	1	0.1	2.25	0.54	91.69
25-Year	1.1	0.04	2.6	0.59	116.55
50-Year	1.2	0.02	2.85	0.71	153.31
100-Year	1.25	0.01	3.15	0.89	211.82
500-Year	-	0.002	-	-	364.25
Rational Formula					
$Q = CIA$					

** The "Adjusted Runoff Coefficient" will need to be corrected during the final design. The storm frequency factor should be multiplied by the raw 10-year composite coefficient for each storm event.



Discharge Estimate
CD-9
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 38.166x^-0.363
R² = 0.982

CD-9 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 92 cfs

Design Flow: 153 cfs

Maximum Flow: 212 cfs

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

Headwater Elevation (ft)	Total Discharge (cfs)	CD-9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
42.87	92.00	92.00	0.00	1
42.97	104.00	104.00	0.00	1
43.08	116.00	116.00	0.00	1
43.21	128.00	128.00	0.00	1
43.35	140.00	140.00	0.00	1
43.50	152.00	152.00	0.00	1
43.51	153.00	153.00	0.00	1
43.84	176.00	176.00	0.00	1
44.03	188.00	188.00	0.00	1
44.23	200.00	200.00	0.00	1
44.45	212.00	212.00	0.00	1
54.79	532.70	532.70	0.00	Overtopping

Rating Curve Plot for Crossing: CD-9

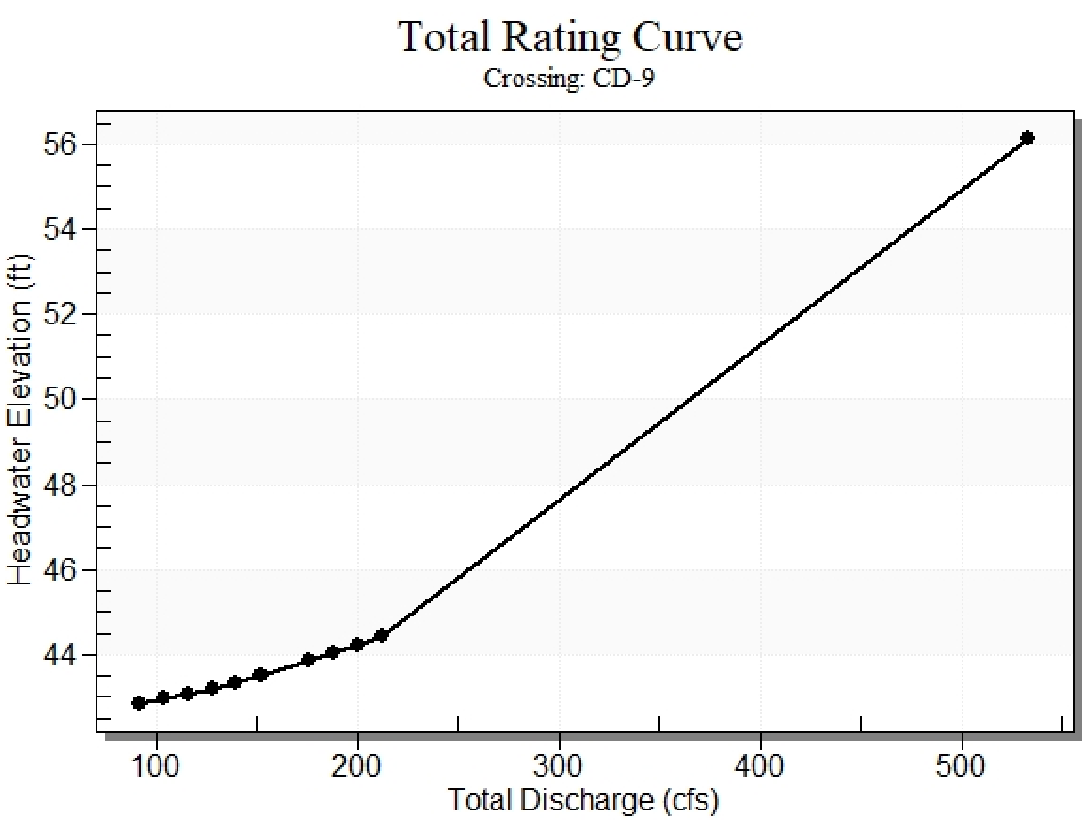


Table 2 - Culvert Summary Table: CD-9

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)
92.00	92.00	42.87	3.698	6.367	4-FFf	2.889	2.572	6.000	6.000	3.254	0.000
104.00	104.00	42.97	3.989	6.468	4-FFf	3.108	2.747	6.000	6.000	3.678	0.000
116.00	116.00	43.08	4.265	6.583	4-FFf	3.325	2.909	6.000	6.000	4.103	0.000
128.00	128.00	43.21	4.529	6.710	4-FFf	3.542	3.060	6.000	6.000	4.527	0.000
140.00	140.00	43.35	4.784	6.849	4-FFf	3.764	3.206	6.000	6.000	4.951	0.000
152.00	152.00	43.50	5.034	7.001	4-FFf	3.991	3.345	6.000	6.000	5.376	0.000
153.00	153.00	43.51	5.055	7.014	4-FFf	4.011	3.356	6.000	6.000	5.411	0.000
176.00	176.00	43.84	5.527	7.341	4-FFf	4.496	3.612	6.000	6.000	6.225	0.000
188.00	188.00	44.03	5.775	7.531	4-FFf	6.000	3.741	6.000	6.000	6.649	0.000
200.00	200.00	44.23	6.026	7.732	4-FFf	6.000	3.862	6.000	6.000	7.074	0.000
212.00	212.00	44.45	6.284	7.946	4-FFf	6.000	3.980	6.000	6.000	7.498	0.000

****

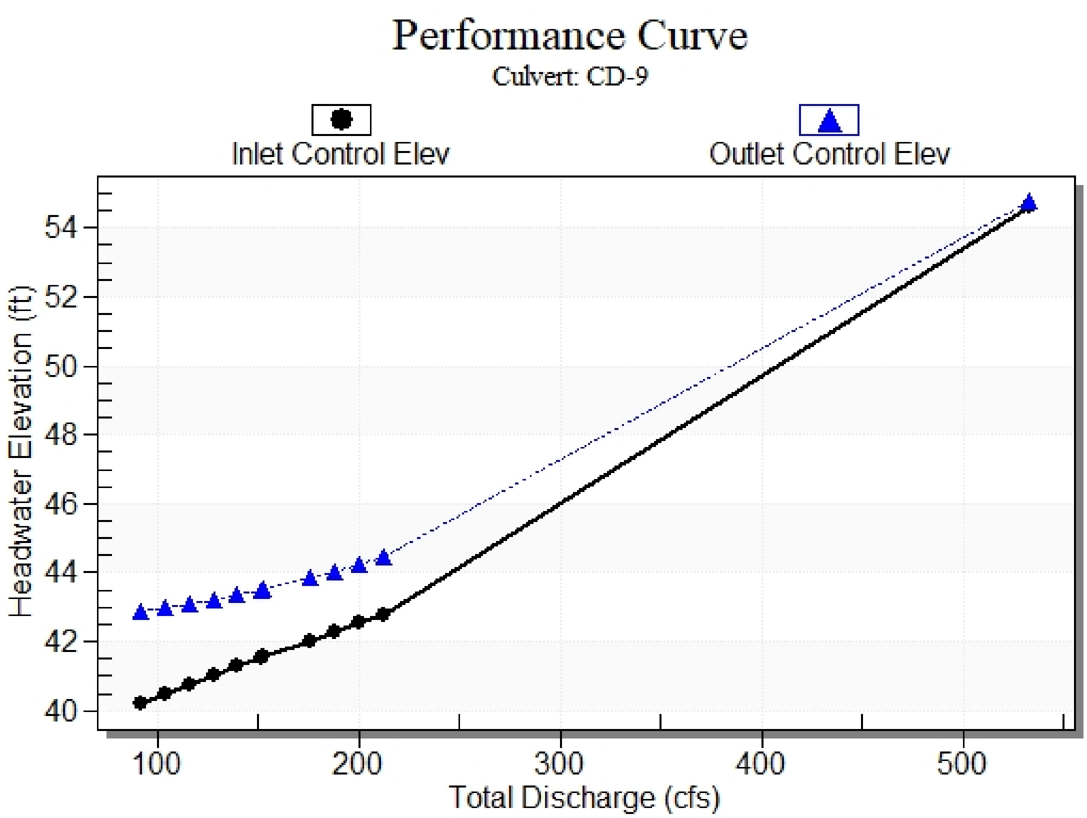
Straight Culvert

Inlet Elevation (invert): 36.50 ft, Outlet Elevation (invert): 36.00 ft

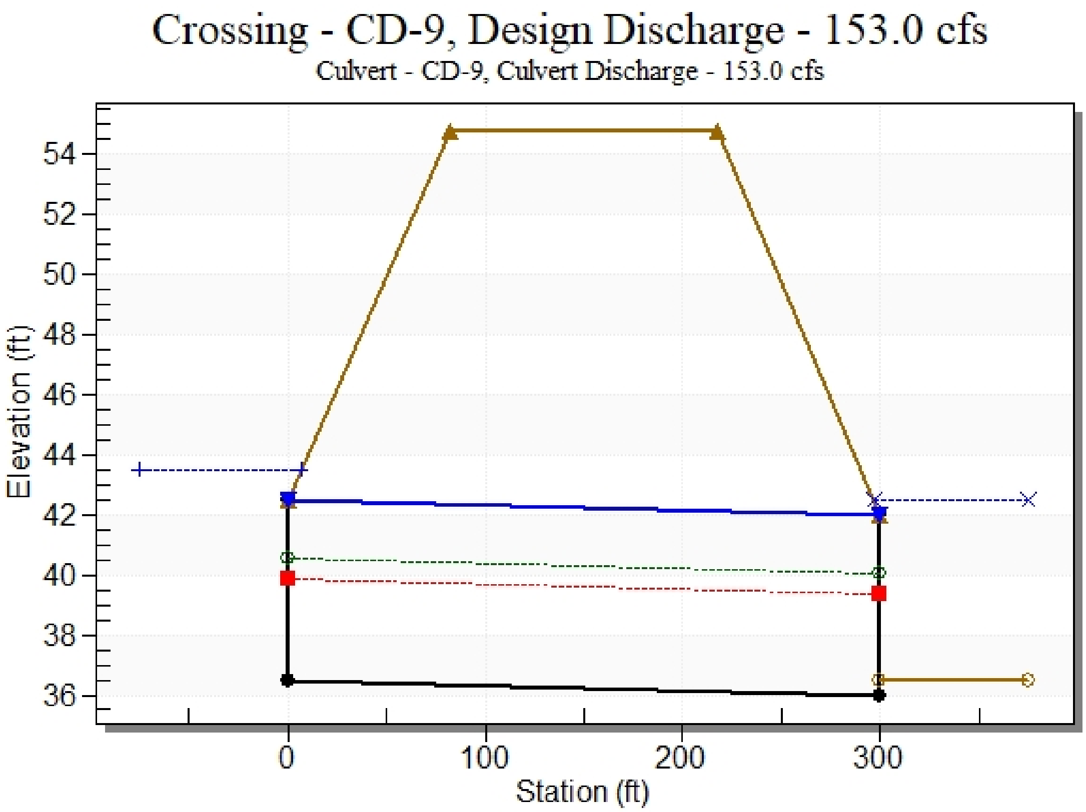
Culvert Length: 300.00 ft, Culvert Slope: 0.0017

****

Culvert Performance Curve Plot: CD-9



Water Surface Profile Plot for Culvert: CD-9



Site Data - CD-9

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 36.50 ft

Outlet Station: 300.00 ft

Outlet Elevation: 36.00 ft

Number of Barrels: 1

Culvert Data Summary - CD-9

Barrel Shape: Circular

Barrel Diameter: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

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

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
92.00	42.50	6.00
104.00	42.50	6.00
116.00	42.50	6.00
128.00	42.50	6.00
140.00	42.50	6.00
152.00	42.50	6.00
153.00	42.50	6.00
176.00	42.50	6.00
188.00	42.50	6.00
200.00	42.50	6.00
212.00	42.50	6.00

Tailwater Channel Data - CD-9

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 42.50 ft

Roadway Data for Crossing: CD-9

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 54.79 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 10

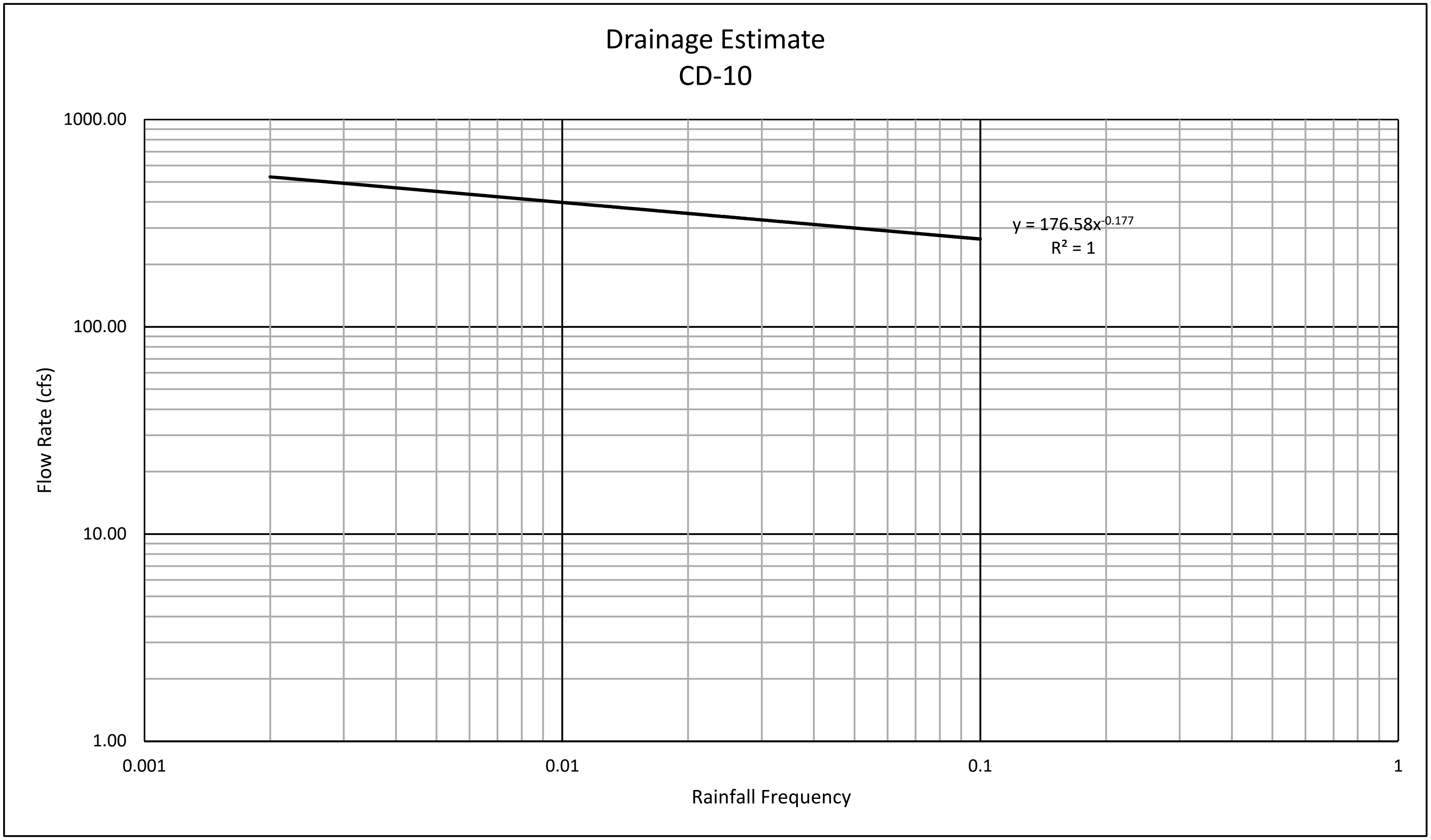
CD-10 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Bithlo Area Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-10.

Flow Rate 10 =	265	ft^3/s
Flow Rate 25 =	312	ft^3/s
Flow Rate 50 =	353	ft^3/s
Flow Rate 100 =	398	ft^3/s
Flow Rate 500 =	530	ft^3/s
Pipe Length =	310	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	8.01	ft
D =	96.11	in
A =	50.38	ft^2
Proposed Size =	2-6'x4'	CBC


Drainage Estimate
CD-10
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
y = 176.58x^-0.177
R² = 1
0.001
0.01
0.1
1
Rainfall Frequency

CD-10 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 265 cfs

Design Flow: 353 cfs

Maximum Flow: 398 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-10

Headwater Elevation (ft)	Total Discharge (cfs)	CD-10 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
43.19	265.00	265.00	0.00	1
43.31	278.30	278.30	0.00	1
43.44	291.60	291.60	0.00	1
43.58	304.90	304.90	0.00	1
43.72	318.20	318.20	0.00	1
43.86	331.50	331.50	0.00	1
44.02	344.80	344.80	0.00	1
44.11	353.00	353.00	0.00	1
44.34	371.40	371.40	0.00	1
44.51	384.70	384.70	0.00	1
44.69	398.00	398.00	0.00	1
55.97	896.98	896.98	0.00	Overtopping

Rating Curve Plot for Crossing: CD-10

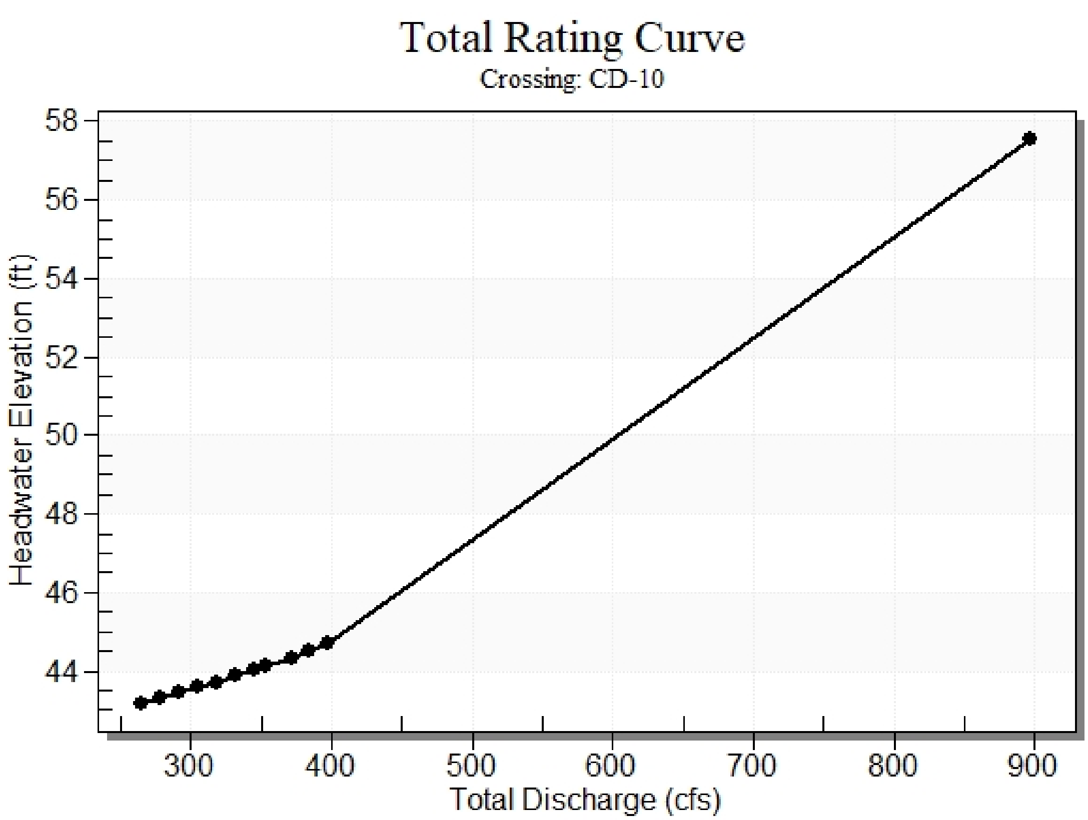


Table 2 - Culvert Summary Table: CD-10

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)
265.00	265.00	43.19	4.210	5.190	4-FFf	3.199	2.474	4.000	4.000	5.521	0.000
278.30	278.30	43.31	4.364	5.313	4-FFf	3.321	2.556	4.000	4.000	5.798	0.000
291.60	291.60	43.44	4.519	5.441	4-FFf	3.441	2.637	4.000	4.000	6.075	0.000
304.90	304.90	43.58	4.677	5.576	4-FFf	3.561	2.717	4.000	4.000	6.352	0.000
318.20	318.20	43.72	4.838	5.716	4-FFf	3.680	2.795	4.000	4.000	6.629	0.000
331.50	331.50	43.86	5.001	5.863	4-FFf	3.799	2.872	4.000	4.000	6.906	0.000
344.80	344.80	44.02	5.169	6.015	4-FFf	4.000	2.949	4.000	4.000	7.183	0.000
353.00	353.00	44.11	5.274	6.112	4-FFf	4.000	2.995	4.000	4.000	7.354	0.000
371.40	371.40	44.34	5.515	6.338	4-FFf	4.000	3.099	4.000	4.000	7.737	0.000
384.70	384.70	44.51	5.695	6.509	4-FFf	4.000	3.172	4.000	4.000	8.015	0.000
398.00	398.00	44.69	5.880	6.685	4-FFf	4.000	3.245	4.000	4.000	8.292	0.000

****

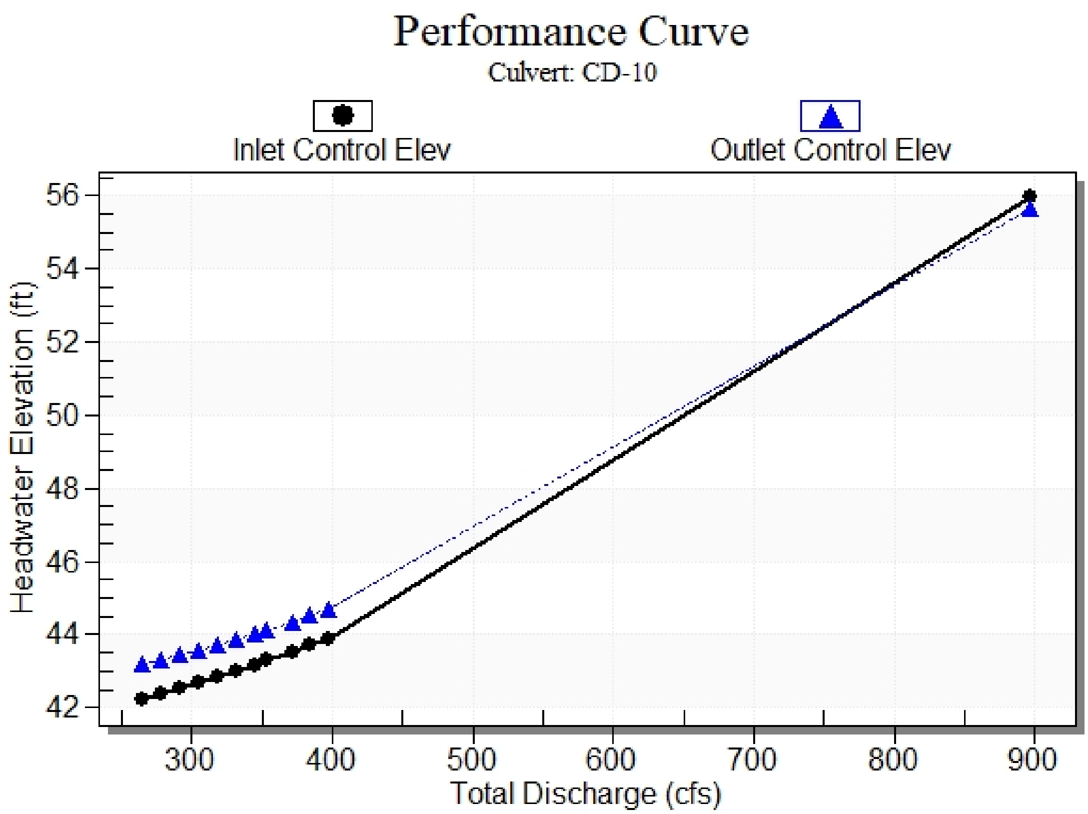
Straight Culvert

Inlet Elevation (invert): 38.00 ft, Outlet Elevation (invert): 37.50 ft

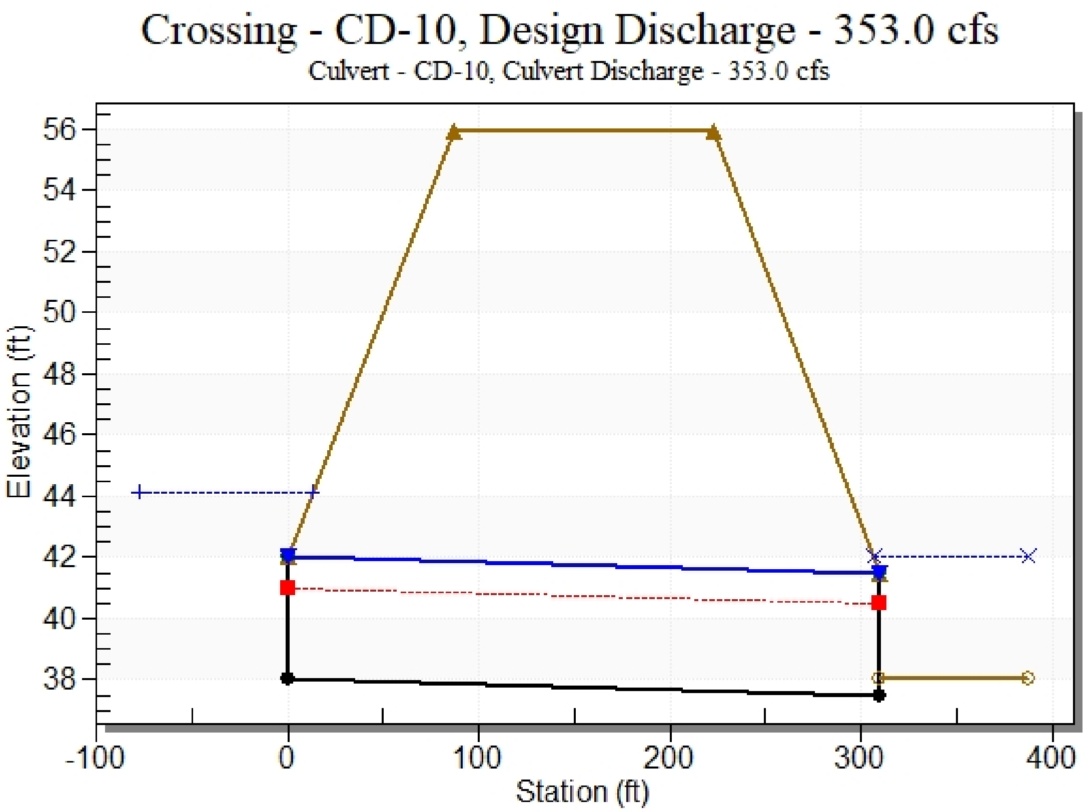
Culvert Length: 310.00 ft, Culvert Slope: 0.0016

****

Culvert Performance Curve Plot: CD-10



Water Surface Profile Plot for Culvert: CD-10



Site Data - CD-10

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 38.00 ft

Outlet Station: 310.00 ft

Outlet Elevation: 37.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-10

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-10)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
265.00	42.00	4.00
278.30	42.00	4.00
291.60	42.00	4.00
304.90	42.00	4.00
318.20	42.00	4.00
331.50	42.00	4.00
344.80	42.00	4.00
353.00	42.00	4.00
371.40	42.00	4.00
384.70	42.00	4.00
398.00	42.00	4.00

Tailwater Channel Data - CD-10

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 42.00 ft

Roadway Data for Crossing: CD-10

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 55.97 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 11

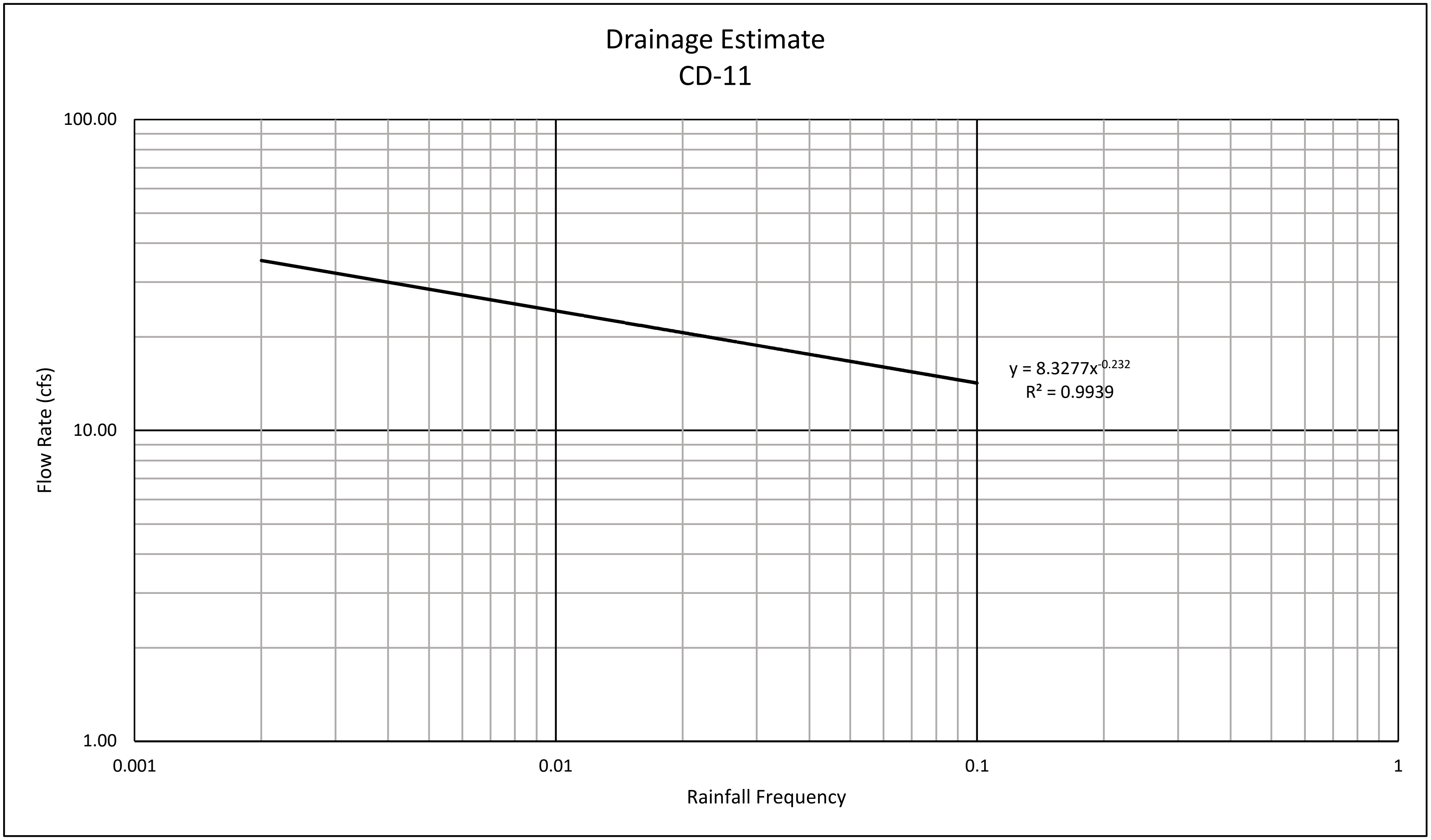
CD-11 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Bithlo Area Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-11.

Flow Rate 10 =	14	ft^3/s
Flow Rate 25 =	18	ft^3/s
Flow Rate 50 =	21	ft^3/s
Flow Rate 100 =	24	ft^3/s
Flow Rate 500 =	35	ft^3/s
Pipe Length =	395	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	2.92	ft
D =	35.08	in
A =	6.71	ft^2
Proposed Size =	2-24"	RCP


Drainage Estimate
CD-11
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 8.3277x^-0.232
R² = 0.9939

CD-11 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 14 cfs

Design Flow: 21 cfs

Maximum Flow: 24 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-11

Headwater Elevation (ft)	Total Discharge (cfs)	CD-11 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
58.44	14.00	14.00	0.00	1
58.50	15.00	15.00	0.00	1
58.57	16.00	16.00	0.00	1
58.64	17.00	17.00	0.00	1
58.72	18.00	18.00	0.00	1
58.80	19.00	19.00	0.00	1
58.89	20.00	20.00	0.00	1
58.98	21.00	21.00	0.00	1
59.08	22.00	22.00	0.00	1
59.18	23.00	23.00	0.00	1
59.28	24.00	24.00	0.00	1
83.94	107.98	107.98	0.00	Overtopping

Rating Curve Plot for Crossing: CD-11

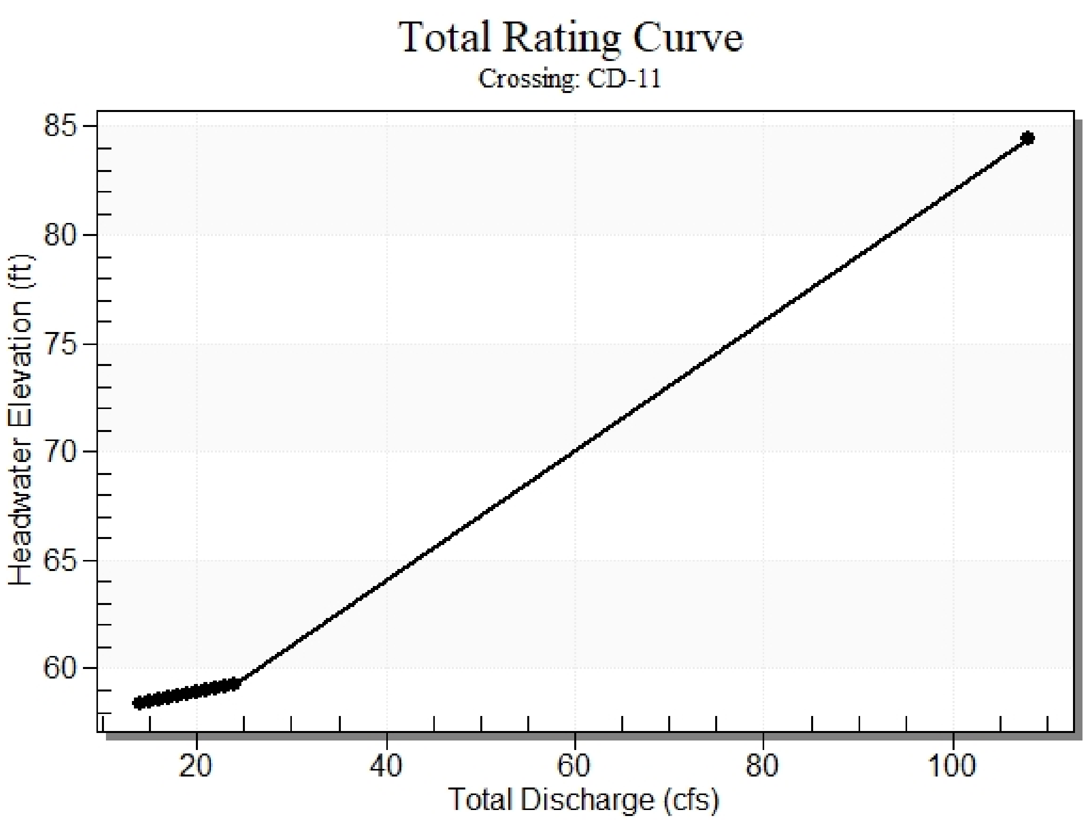


Table 2 - Culvert Summary Table: CD-11

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)
14.00	14.00	58.44	1.370	2.436	4-FFf	1.320	0.939	2.000	2.000	2.228	0.000
15.00	15.00	58.50	1.429	2.501	4-FFf	1.391	0.974	2.000	2.000	2.387	0.000
16.00	16.00	58.57	1.486	2.570	4-FFf	1.467	1.006	2.000	2.000	2.546	0.000
17.00	17.00	58.64	1.542	2.643	4-FFf	1.552	1.038	2.000	2.000	2.706	0.000
18.00	18.00	58.72	1.597	2.721	4-FFf	2.000	1.069	2.000	2.000	2.865	0.000
19.00	19.00	58.80	1.651	2.803	4-FFf	2.000	1.098	2.000	2.000	3.024	0.000
20.00	20.00	58.89	1.705	2.890	4-FFf	2.000	1.126	2.000	2.000	3.183	0.000
21.00	21.00	58.98	1.758	2.981	4-FFf	2.000	1.158	2.000	2.000	3.342	0.000
22.00	22.00	59.08	1.812	3.077	4-FFf	2.000	1.186	2.000	2.000	3.501	0.000
23.00	23.00	59.18	1.865	3.177	4-FFf	2.000	1.213	2.000	2.000	3.661	0.000
24.00	24.00	59.28	1.919	3.282	4-FFf	2.000	1.239	2.000	2.000	3.820	0.000

****

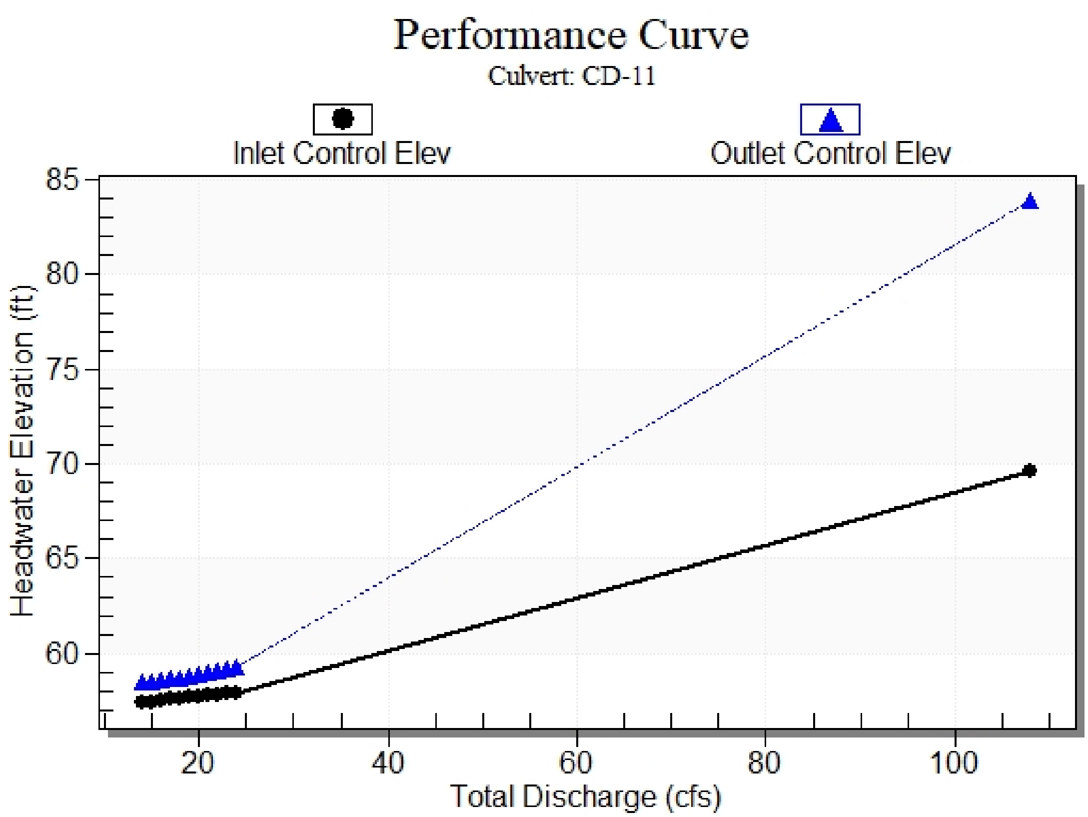
Straight Culvert

Inlet Elevation (invert): 56.00 ft, Outlet Elevation (invert): 55.50 ft

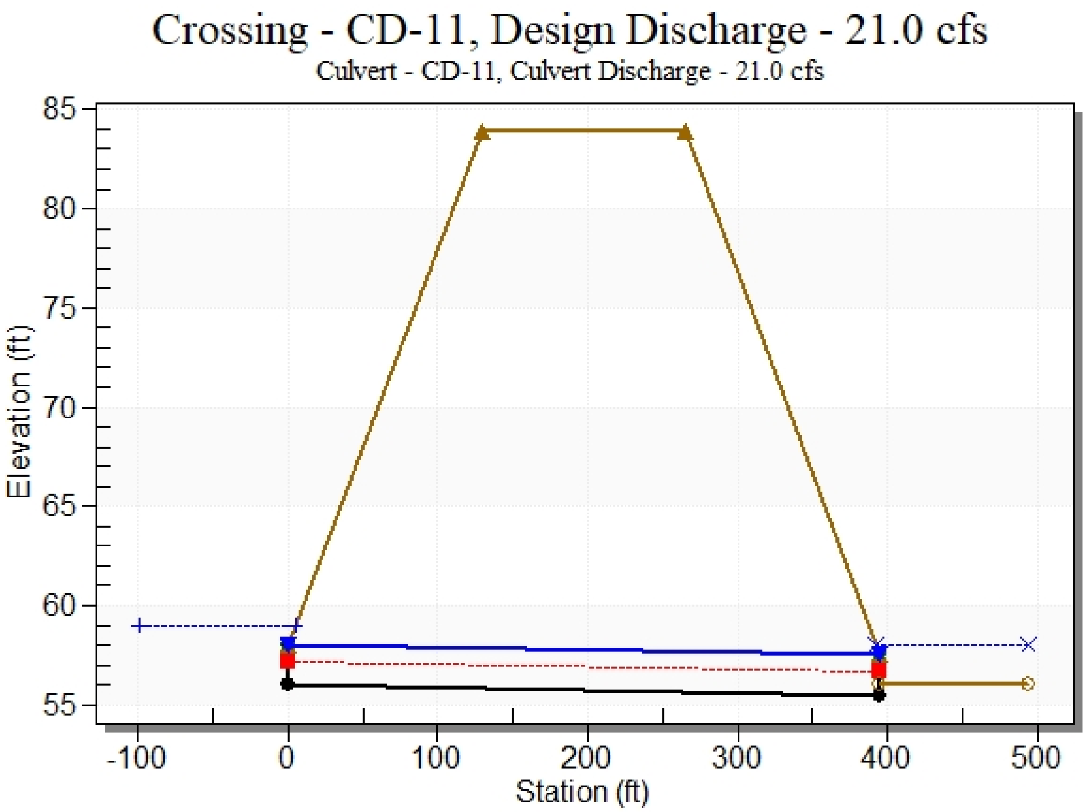
Culvert Length: 395.00 ft, Culvert Slope: 0.0013

****

Culvert Performance Curve Plot: CD-11



Water Surface Profile Plot for Culvert: CD-11



Site Data - CD-11

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 56.00 ft

Outlet Station: 395.00 ft

Outlet Elevation: 55.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-11

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-11)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
14.00	58.00	2.00
15.00	58.00	2.00
16.00	58.00	2.00
17.00	58.00	2.00
18.00	58.00	2.00
19.00	58.00	2.00
20.00	58.00	2.00
21.00	58.00	2.00
22.00	58.00	2.00
23.00	58.00	2.00
24.00	58.00	2.00

Tailwater Channel Data - CD-11

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 58.00 ft

Roadway Data for Crossing: CD-11

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 83.94 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 12

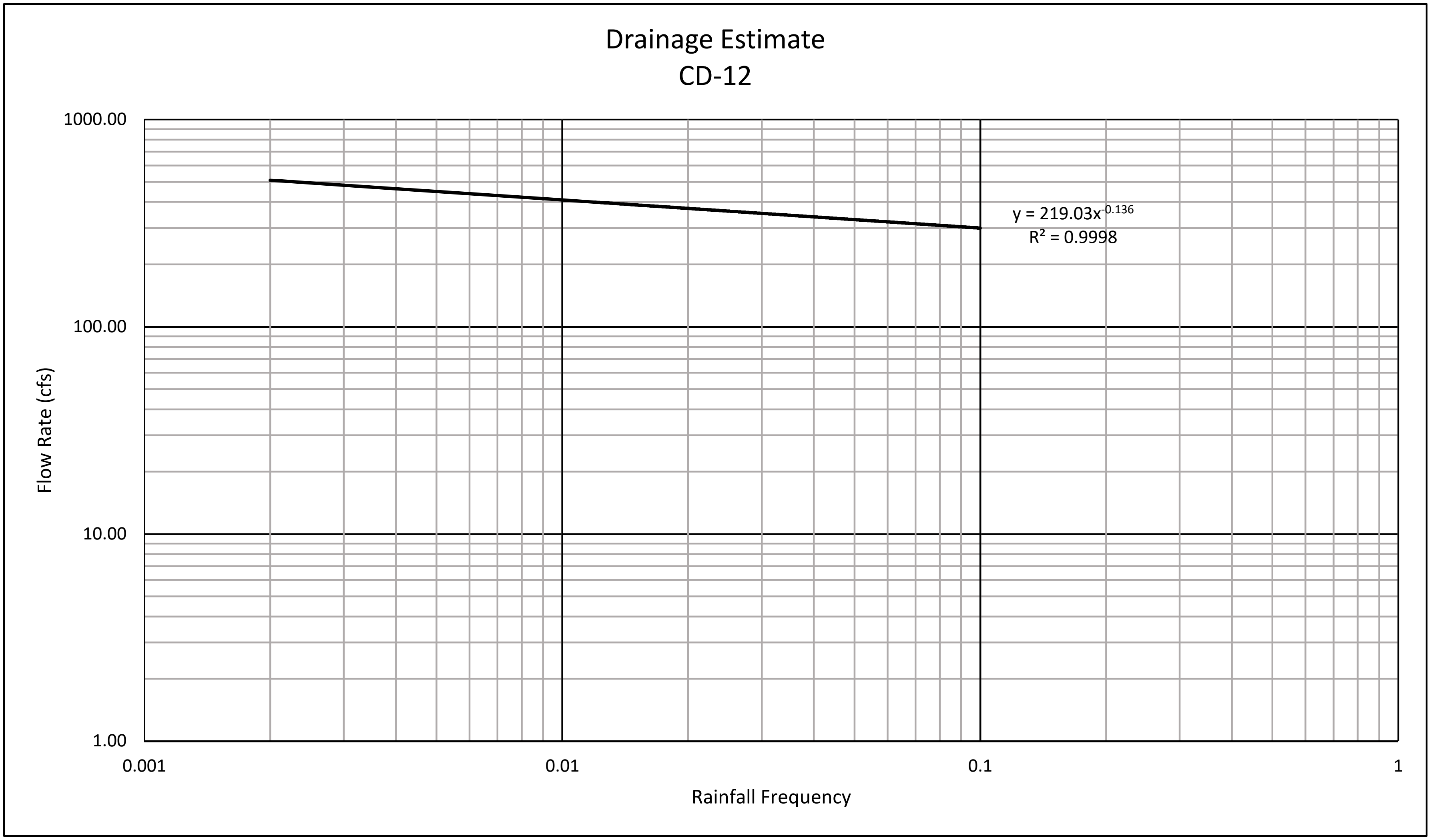
CD-12 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Bithlo Area Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-12.

Flow Rate 10 =	299	ft^3/s
Flow Rate 25 =	340	ft^3/s
Flow Rate 50 =	373	ft^3/s
Flow Rate 100 =	409	ft^3/s
Flow Rate 500 =	510	ft^3/s
Pipe Length =	522	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D = (2.159\ Qn/S^{0.5})^{3/8}$

D =	8.92	ft
D =	107.059	in
A =	62.51	ft^2
Proposed Size =	2-8'x4'	CBC



Drainage Estimate
CD-12
1000.00
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 219.03x^-0.136
R² = 0.9998

CD-12 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 299 cfs

Design Flow: 373 cfs

Maximum Flow: 409 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-12

Headwater Elevation (ft)	Total Discharge (cfs)	CD-12 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
54.01	299.00	299.00	0.00	1
54.09	310.00	310.00	0.00	1
54.17	321.00	321.00	0.00	1
54.25	332.00	332.00	0.00	1
54.33	343.00	343.00	0.00	1
54.42	354.00	354.00	0.00	1
54.51	365.00	365.00	0.00	1
54.57	373.00	373.00	0.00	1
54.70	387.00	387.00	0.00	1
54.79	398.00	398.00	0.00	1
54.89	409.00	409.00	0.00	1
75.36	1405.58	1405.58	0.00	Overtopping

Rating Curve Plot for Crossing: CD-12

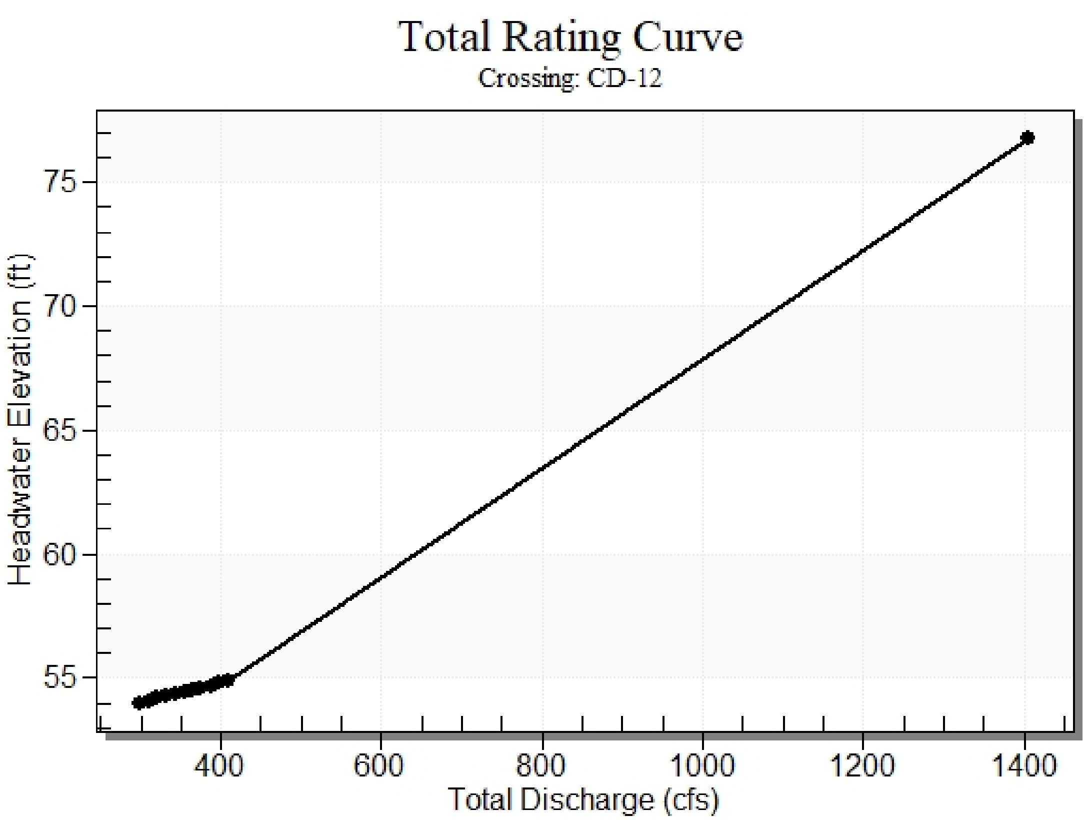


Table 2 - Culvert Summary Table: CD-12

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)
299.00	299.00	54.01	3.746	5.012	4-FFf	3.200	2.214	4.000	4.000	4.672	0.000
310.00	310.00	54.09	3.840	5.088	4-FFf	3.286	2.267	4.000	4.000	4.844	0.000
321.00	321.00	54.17	3.934	5.166	4-FFf	3.371	2.321	4.000	4.000	5.016	0.000
332.00	332.00	54.25	4.028	5.247	4-FFf	3.456	2.374	4.000	4.000	5.188	0.000
343.00	343.00	54.33	4.123	5.332	4-FFf	3.541	2.426	4.000	4.000	5.359	0.000
354.00	354.00	54.42	4.217	5.418	4-FFf	3.624	2.477	4.000	4.000	5.531	0.000
365.00	365.00	54.51	4.312	5.508	4-FFf	3.708	2.528	4.000	4.000	5.703	0.000
373.00	373.00	54.57	4.382	5.575	4-FFf	3.768	2.565	4.000	4.000	5.828	0.000
387.00	387.00	54.70	4.505	5.695	4-FFf	3.874	2.629	4.000	4.000	6.047	0.000
398.00	398.00	54.79	4.602	5.793	4-FFf	4.000	2.678	4.000	4.000	6.219	0.000
409.00	409.00	54.89	4.701	5.893	4-FFf	4.000	2.728	4.000	4.000	6.391	0.000

****

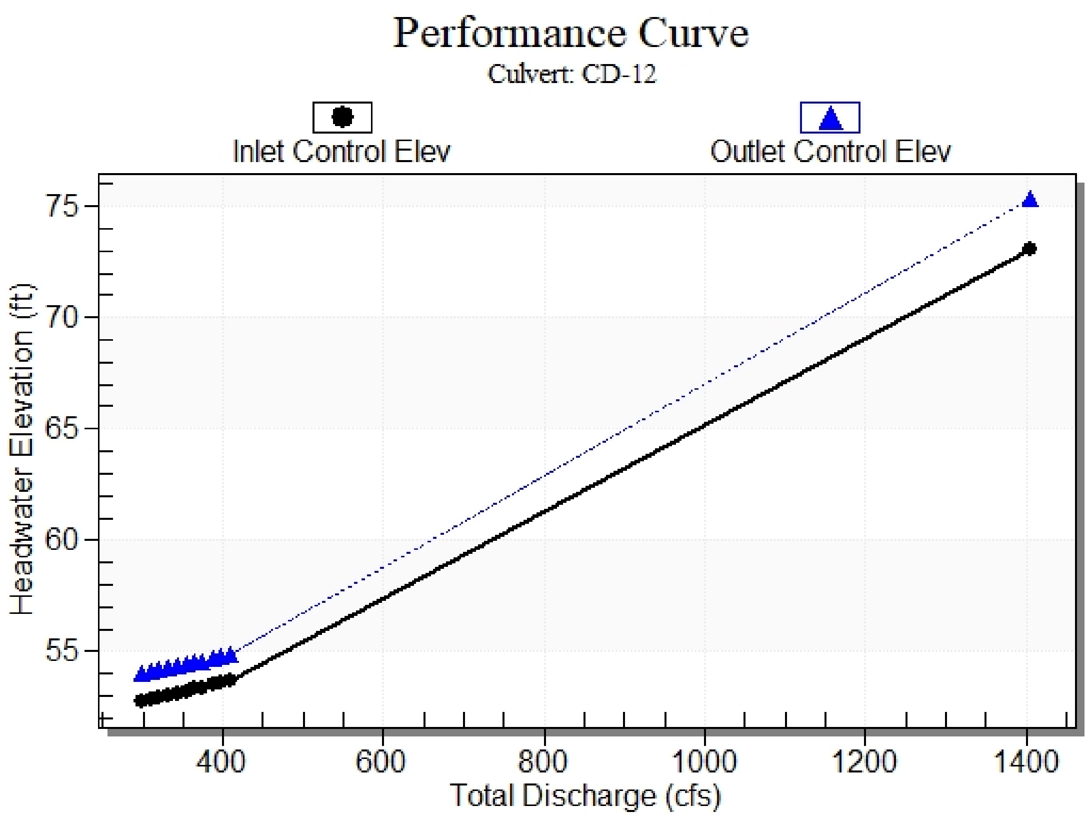
Straight Culvert

Inlet Elevation (invert): 49.00 ft, Outlet Elevation (invert): 48.50 ft

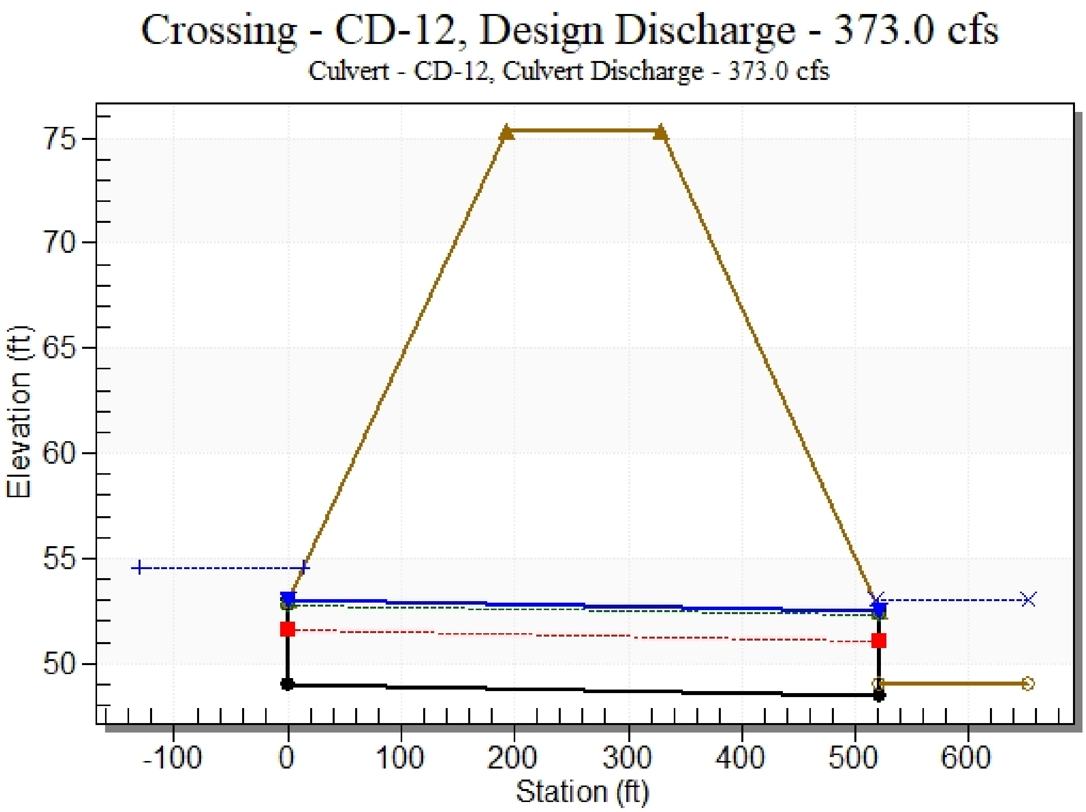
Culvert Length: 522.00 ft, Culvert Slope: 0.0010

****

Culvert Performance Curve Plot: CD-12



Water Surface Profile Plot for Culvert: CD-12



Site Data - CD-12

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 49.00 ft

Outlet Station: 522.00 ft

Outlet Elevation: 48.50 ft

Number of Barrels: 2

Culvert Data Summary - CD-12

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-12)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
299.00	53.00	4.00
310.00	53.00	4.00
321.00	53.00	4.00
332.00	53.00	4.00
343.00	53.00	4.00
354.00	53.00	4.00
365.00	53.00	4.00
373.00	53.00	4.00
387.00	53.00	4.00
398.00	53.00	4.00
409.00	53.00	4.00

Tailwater Channel Data - CD-12

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 53.00 ft

Roadway Data for Crossing: CD-12

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 75.36 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Cross Drain 13

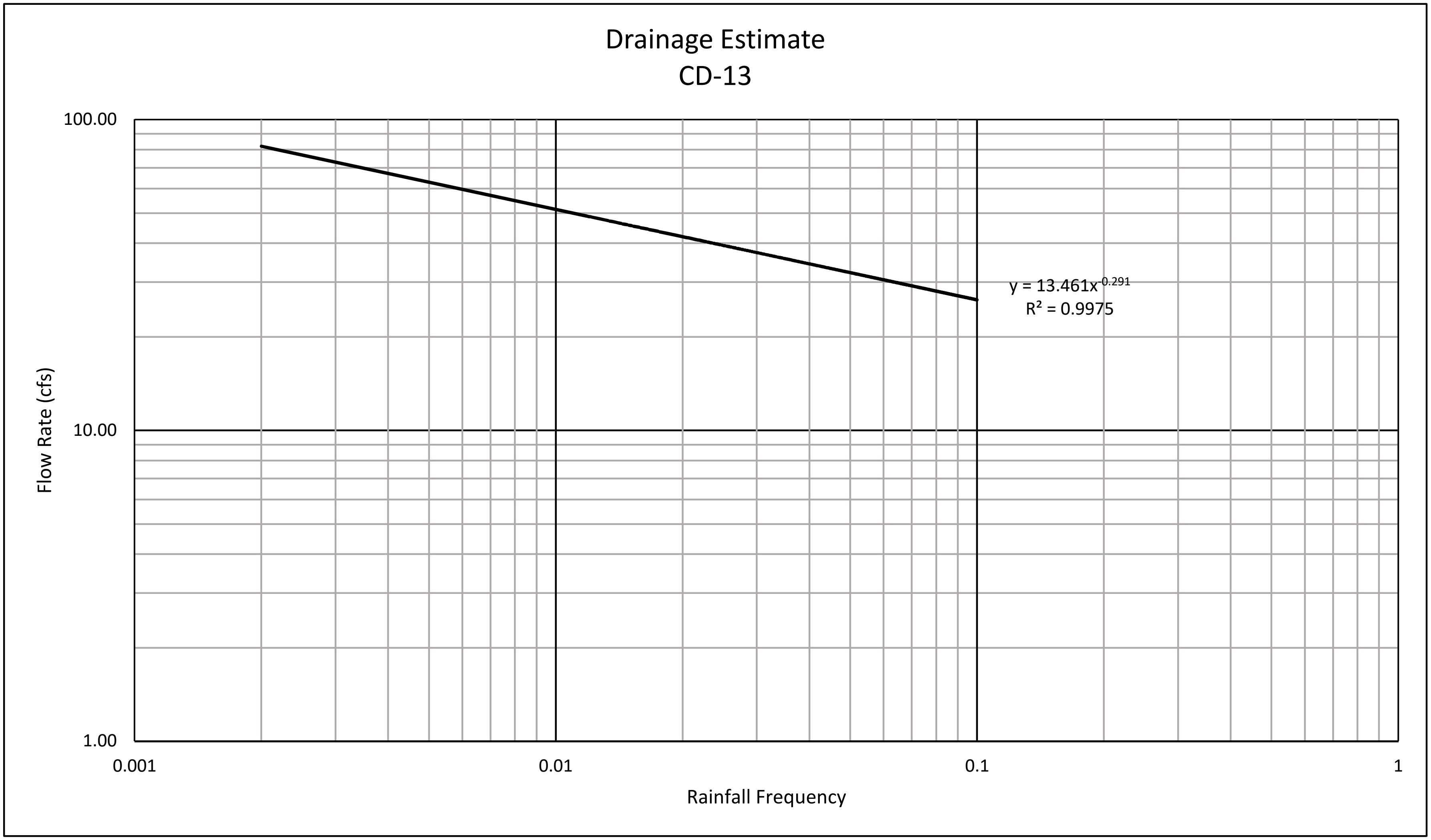
CD-13 Preliminary Culvert Sizing

The flow rate for a 100-year storm event from the Bithlo Area Stormwater Management Master Plan was used to size this culvert. The Manning's Equation was used to produce a trial size for the cross drain. The trial size was used to perform HY-8 analysis. While performing the overtopping analysis, the cross drain was appropriately sized in order to not violate floodplain criteria. The following presents a detailed calculation for sizing CD-13.

Flow Rate 10 =	26	ft^3/s
Flow Rate 25 =	35	ft^3/s
Flow Rate 50 =	42	ft^3/s
Flow Rate 100 =	51	ft^3/s
Flow Rate 500 =	82	ft^3/s
Pipe Length =	325	ft
Change in FL Elevation from Upstream to Downstream =	0.50	ft
Manning's "n" value =	0.012	

$D= (2.159\ Qn/S^{0.5})^{3/8}$

D =	3.74	ft
D =	44.872	in
A =	10.98	ft^2
Proposed Size =	1-48"	RCP


Drainage Estimate
CD-13
100.00
10.00
1.00
Flow Rate (cfs)
0.001
0.01
0.1
1
Rainfall Frequency
y = 13.461x-0.291
R² = 0.9975

CD-13 HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 26 cfs

Design Flow: 42 cfs

Maximum Flow: 51 cfs

Table 1 - Summary of Culvert Flows at Crossing: CD-13

Headwater Elevation (ft)	Total Discharge (cfs)	CD-13 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
56.19	26.00	26.00	0.00	1
56.23	28.50	28.50	0.00	1
56.27	31.00	31.00	0.00	1
56.32	33.50	33.50	0.00	1
56.36	36.00	36.00	0.00	1
56.42	38.50	38.50	0.00	1
56.47	41.00	41.00	0.00	1
56.50	42.00	42.00	0.00	1
56.59	46.00	46.00	0.00	1
56.66	48.50	48.50	0.00	1
56.73	51.00	51.00	0.00	1
64.50	173.94	173.94	0.00	Overtopping

Rating Curve Plot for Crossing: CD-13

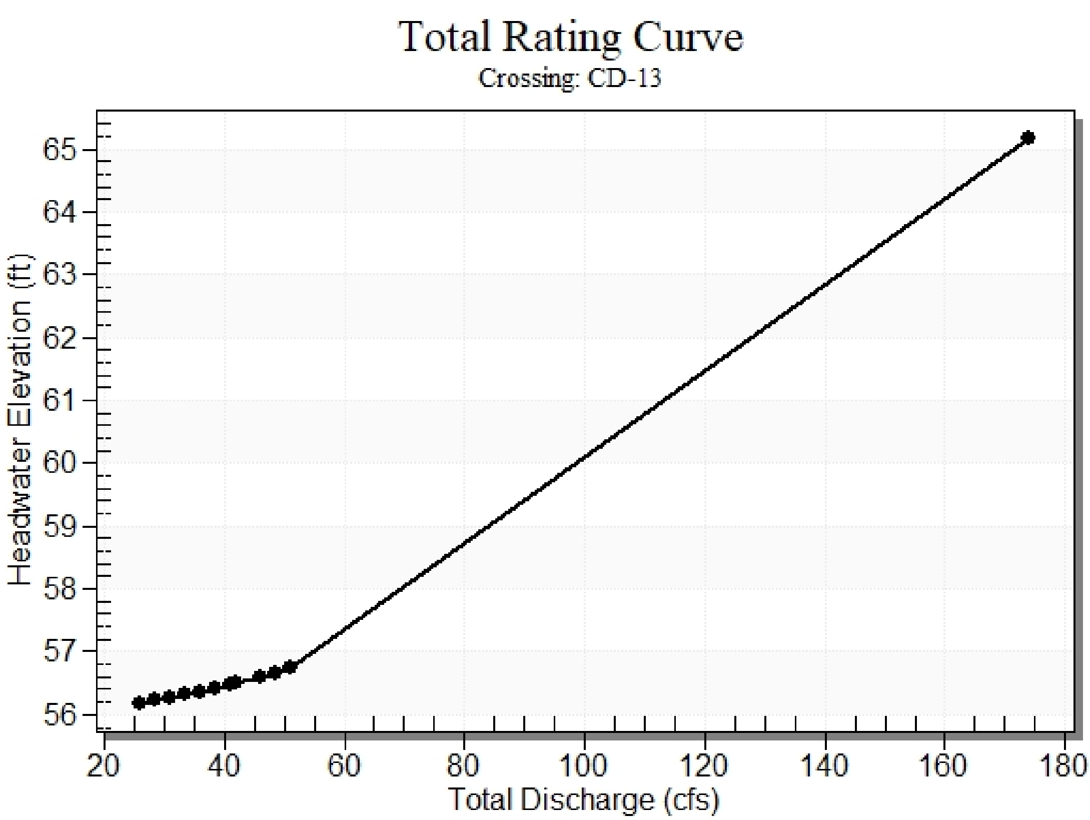


Table 2 - Culvert Summary Table: CD-13

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)
26.00	26.00	56.19	2.106	4.190	4-FFf	1.774	1.503	4.000	4.000	2.069	0.000
28.50	28.50	56.23	2.233	4.228	4-FFf	1.870	1.578	4.000	4.000	2.268	0.000
31.00	31.00	56.27	2.354	4.270	4-FFf	1.964	1.647	4.000	4.000	2.467	0.000
33.50	33.50	56.32	2.471	4.315	4-FFf	2.058	1.718	4.000	4.000	2.666	0.000
36.00	36.00	56.36	2.583	4.364	4-FFf	2.150	1.786	4.000	4.000	2.865	0.000
38.50	38.50	56.42	2.692	4.416	4-FFf	2.243	1.850	4.000	4.000	3.064	0.000
41.00	41.00	56.47	2.798	4.472	4-FFf	2.335	1.913	4.000	4.000	3.263	0.000
42.00	42.00	56.50	2.840	4.496	4-FFf	2.372	1.937	4.000	4.000	3.342	0.000
46.00	46.00	56.59	3.002	4.594	4-FFf	2.524	2.030	4.000	4.000	3.661	0.000
48.50	48.50	56.66	3.100	4.661	4-FFf	2.621	2.086	4.000	4.000	3.860	0.000
51.00	51.00	56.73	3.197	4.731	4-FFf	2.720	2.139	4.000	4.000	4.058	0.000

****

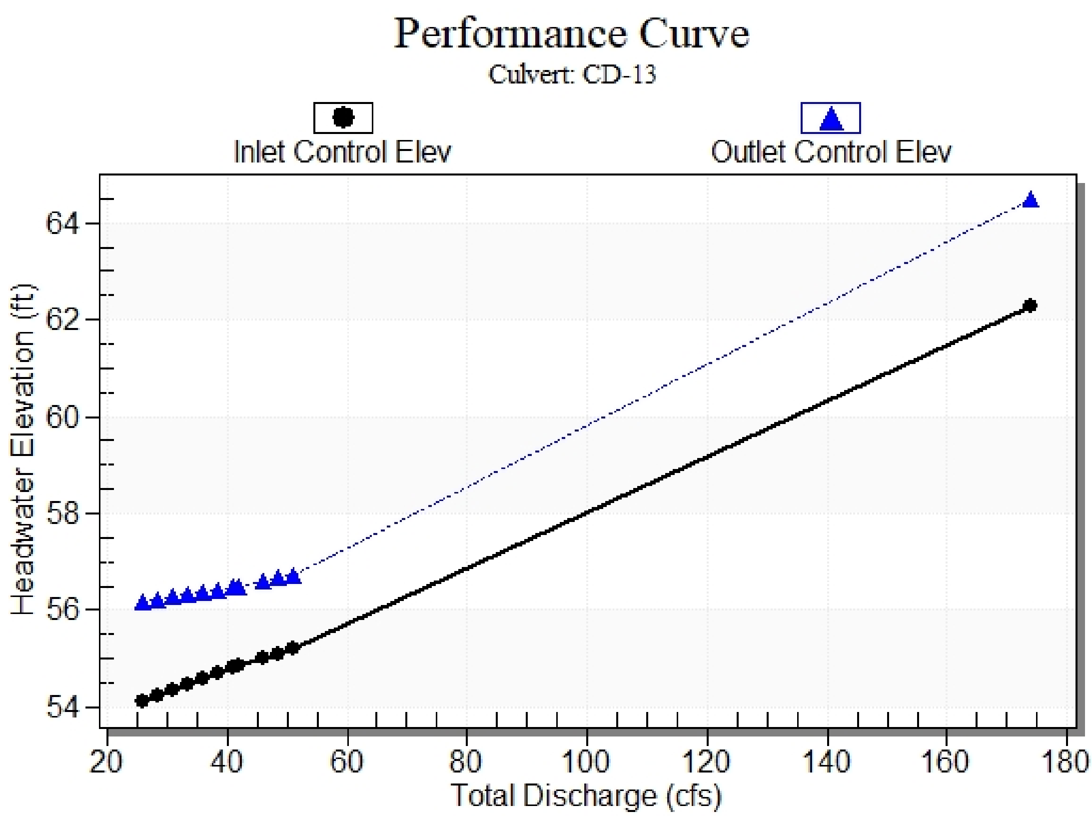
Straight Culvert

Inlet Elevation (invert): 52.00 ft, Outlet Elevation (invert): 51.50 ft

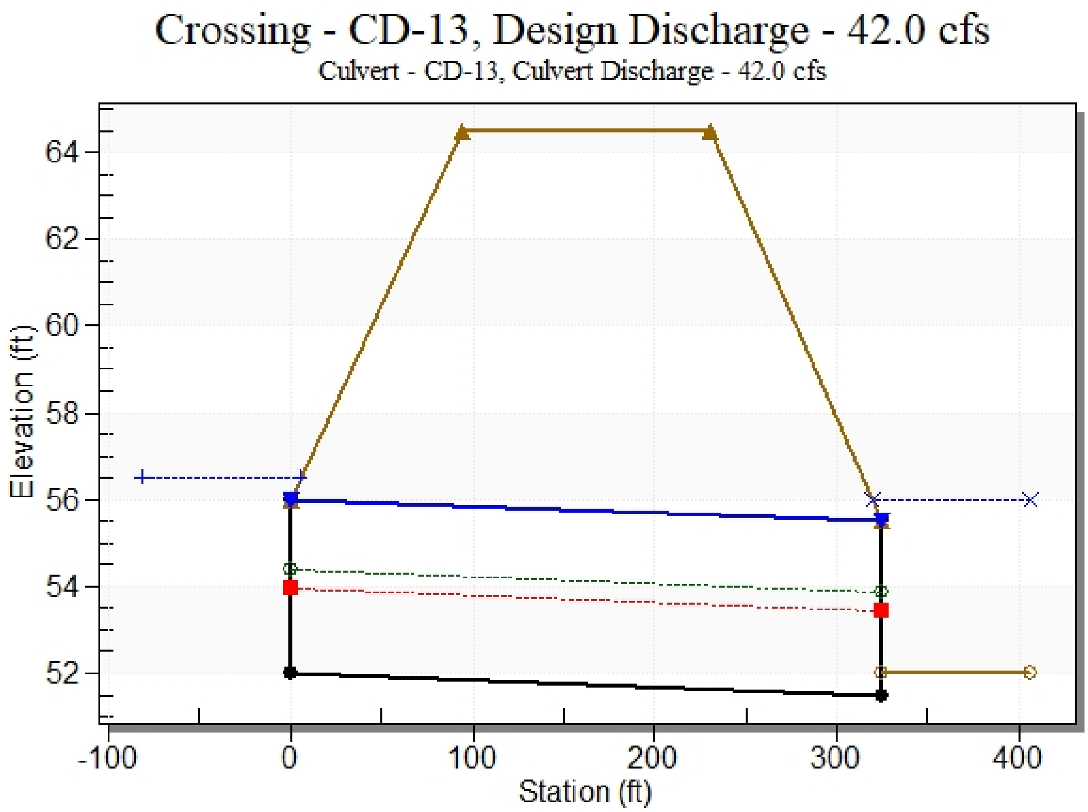
Culvert Length: 325.00 ft, Culvert Slope: 0.0015

****

Culvert Performance Curve Plot: CD-13



Water Surface Profile Plot for Culvert: CD-13



Site Data - CD-13

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 52.00 ft

Outlet Station: 325.00 ft

Outlet Elevation: 51.50 ft

Number of Barrels: 1

Culvert Data Summary - CD-13

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CD-13)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
26.00	56.00	4.00
28.50	56.00	4.00
31.00	56.00	4.00
33.50	56.00	4.00
36.00	56.00	4.00
38.50	56.00	4.00
41.00	56.00	4.00
42.00	56.00	4.00
46.00	56.00	4.00
48.50	56.00	4.00
51.00	56.00	4.00

Tailwater Channel Data - CD-13

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 56.00 ft

Roadway Data for Crossing: CD-13

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 100.00 ft

Crest Elevation: 64.50 ft

Roadway Surface: Paved

Roadway Top Width: 136.00 ft

Appendix: H

Design Aids

FDOT Drainage Manual

4.3 DESIGN FREQUENCY

4.3.1 Permanent Facilities

Standard design frequencies for permanent culverts, bridge-culverts, and bridges are as follows:

Table 4.1: Design Storm Frequencies of Permanent Facilities

FACILITY	FREQUENCY
Mainline Interstate	50 years
High Use or Essential: Projected 20-year AADT* > 1,500	50 years
Other: Projected 20-year AADT* < 1,500	25 years
• Roadside ditch culverts • Pedestrian and trail bridges	10 years

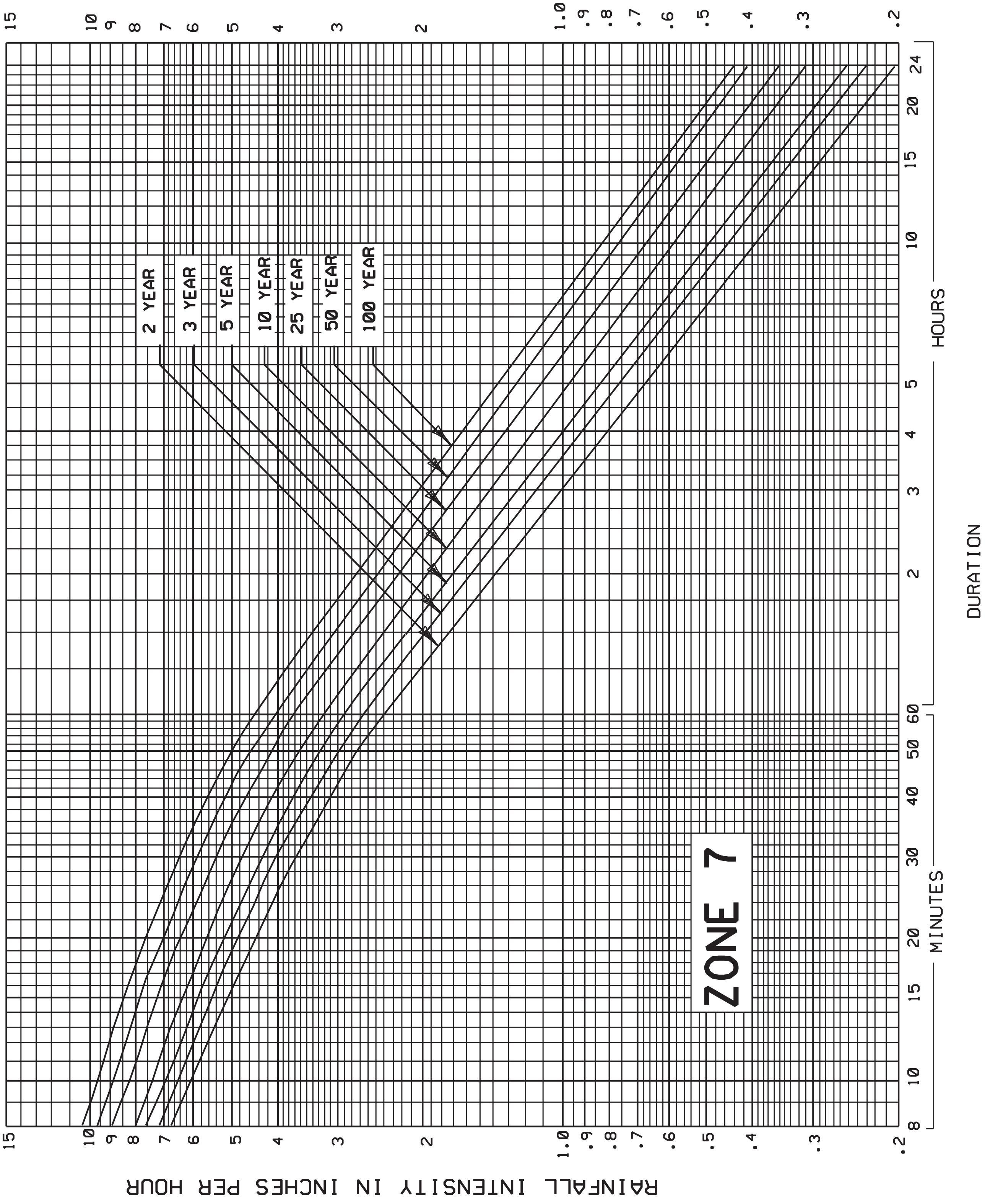
* AADT preferred but if not available ADT may be used.

Note: The flood frequencies used for scour analysis differ. See ***Section 4.9.2***.

4.3.2 Temporary Facilities

Design temporary traversing works accounting for the permitted duration of the work. Temporary traversing work will cause no more than a one-foot increase in the Design Storm Frequency (DSF) flood elevation immediately upstream and no more than one tenth of a foot increase in the DSF flood elevation 500 feet upstream.

Minimum standard design frequencies for temporary culverts, bridge-culverts, and bridges are as follows:



RAINFALL INTENSITY-DURATION-FREQUENCY CURVES
ZONE 7

FDOT Drainage Design Guide

4.7.2 Small Cross Drains

This information applies to cross drains having an area of opening up through a 48-inch-diameter round culvert or the equivalent.

- **Conduct hydrologic analysis**
  Estimate discharges for design year frequency, base flood, and greatest flood. Use one of the following procedures as appropriate (see Section 4.7 of the *Drainage Manual*):

  - Rational Equation (up to 600 acres)
  - Regional or Local Regression Equation

- **Select trial culvert size** based on the following:

$$A = Q/V$$

Where:
A = Culvert area (square feet)
Q = Design discharge (e.g., 50 year)
V = Average velocity (feet per second); use an average velocity of four feet per second

- **Estimate tailwater.** If the outlet is in a free-flowing condition, the crown of the pipe at the outlet may be assumed.

- **Conduct hydraulic analysis** using techniques provided in FHWA HDS 5. Compute headwater conditions for the selected size for the design flood, base flood, and greatest flood or overtopping flood as appropriate.

- **Check hydraulic results** against design standards for backwater, minimum size, and scour. If these standards are satisfied, the trial culvert size is acceptable.

- **Determine the most economical culvert size** that satisfies all standards. If the trial selected size does not satisfy all design standards, obtain a variance.

- **Document** as required in the *Drainage Manual.*

Example 4.7-3 illustrates this procedure.

Example 4.7-3—Design of Small Cross Drain

Referring back to Example 4.7-2, you determined that the two-foot x two-foot concrete box culvert should be replaced. A design frequency of 50 years was determined as the minimum for this roadway. The existing length of the two-foot x two-foot concrete box culvert was 50 feet. However, since the structure will have to be extended four feet on each side, the design length of the proposed structure will be 58 feet.

Proposed Elevations are as follows:
Allowable headwater (edge of travel lane) = 104.6 ft
Flow line (upstream) = 100.1 ft
Flow line (downstream) = 99.7 ft

- **Conduct hydrologic analysis**
  Estimate discharges for design-year frequency, base flood, and greatest flood. Use one of following procedures as appropriate (see Section 4.7 of the *Drainage Manual*):

  - Rational Equation (up to 600 acres)
  - Regional or Local Regression Equation

  Use the same discharges from Example 4.7-2:

  Q(50) = 35 ft^3/sec
  Q(100) = 52 ft^3/sec
  Q(500) = 88 ft^3/sec

- **Select trial culvert size**

$$A = \frac{Q}{V} = \frac{35\ ft^3/s}{4\ ft/s} = 8.8\,ft^2$$

  D = 3.3 ft., so try D = 36-inch pipe and 42-inch pipe

- **Conduct hydraulic analysis** using FHWA HDS 5 procedures.

  The hydraulic analysis would be similar to what was done in Example 4.7-1 and Example 4.7-2. A worksheet of the calculations for the 50-year frequency is shown in Figure 4.7-3. The other frequencies also would need to be analyzed for an actual project. The analysis shown in Figure 4.7-3 is for the proposed conditions.

- **Check hydraulic results** against design standards.

  Review of the worksheet in Figure 4.7-3 indicates that the roadway will not overtop for the 50-year frequency for either culvert size. There is very little difference between the 36-inch and 42 inch pipe as far as controlling headwater. Therefore, either pipe size would be adequate. However, it is recommended that the 36-inch pipe be installed since it would be slightly less in cost than the 42-inch pipe. In addition, it would be recommended that a rubble ditch lining design be installed at the outlet end due to velocities exceeding six feet per second.

- If design does not meet standards or if you can use more economical culvert size that satisfies the standards, then perform new computations for that design.

Document as required in the *Drainage Manual*.

4.7.3 Large Cross Drains

This information applies to cross drains having an area of opening greater than a 48-inch diameter pipe and less than a 20-foot bridge. The procedure for large cross drains is similar to that for small cross drains except that a greater level of effort and detail is expected in developing the hydrologic estimates and the determination of tailwater conditions.

- **Conduct hydrologic analysis**
  Estimate discharges for design-year frequency, base flood, and greatest flood. Use one of following procedures as appropriate (see Section 4.7 of the *Drainage Manual*):

  - Frequency analysis of observed conditions
  - Regional or Local Regression Equation
  - Rational Equation (up to 600 acres)

The remaining steps are the same as those identified in Section 4.7.2 for small cross drains.

Table B-1: Overland Flow Manning's n Values

	Value	Recommended Range of Values
Concrete	0.011	0.010 - 0.013
Asphalt	0.012	0.010 - 0.015
Bare sand [a]	0.010	0.010 - 0.016
Graveled surface [a]	0.012	0.012 - 0.030
Bare clay-loam (eroded) [a]	0.012	0.012 - 0.033
Fallow (no residue) [b]	0.05	0.006 - 0.16
Chisel plow (<1/4 tons/acre residue)	0.07	0.006 - 0.17
Chisel plow (1/4 - 1 tons/acre residue)	0.18	0.070 - 0.34
Chisel plow (1 - 3 tons/acre residue)	0.30	0.190 - 0.47
Chisel plow (>3 tons/acre residue)	0.40	0.340 - 0.46
Disk/Harrow (<1/4 tons/acre residue)	0.08	0.008 - 0.41
Disk/Harrow (1/4 - 1 tons/acre residue)	0.16	0.100 - 0.25
Disk/Harrow (1 - 3 tons/acre residue)	0.25	0.140 - 0.53
Disk/Harrow (>3 tons/acre residue)	0.30	-- --
No till (</4 tons/acre residue)	0.04	0.030 - 0.07
No till (1/4 - 1 tons/acre residue)	0.07	0.010 - 0.13
No till (1 - 3 tons/acre residue)	0.30	0.160 - 0.47
Plow (Fall)	0.06	0.020 - 0.10
Coulter	0.10	0.050 - 0.13
Range (natural)	0.13	0.010 - 0.32
Range (clipped)	0.08	0.020 - 0.24
Grass (bluegrass sod)	0.45	0.390 - 0.63
Short grass prairie [a]	0.15	0.100 - 0.20
Dense grass [c]	0.24	0.170 - 0.30
Bermuda grass [c]	0.41	0.300 - 0.48
Woods	0.45	-- --

All values are from Engman (1983), unless noted otherwise.

[a]Woolhiser (1975).

[b]Fallow has been idle for one year and is fairly smooth.

[c]Palmer (1946). Weeping love grass, bluegrass, buffalo grass, blue gamma grass, native grass mix (OK), alfalfa, lespedeza.

Note: These values were determined specifically for overland flow conditions and are not appropriate for conventional open channel flow calculations. See Chapter 3, for open channel flow procedures.

Table B-5: Design Storm Frequency Factors for Pervious Area Runoff Coefficients*

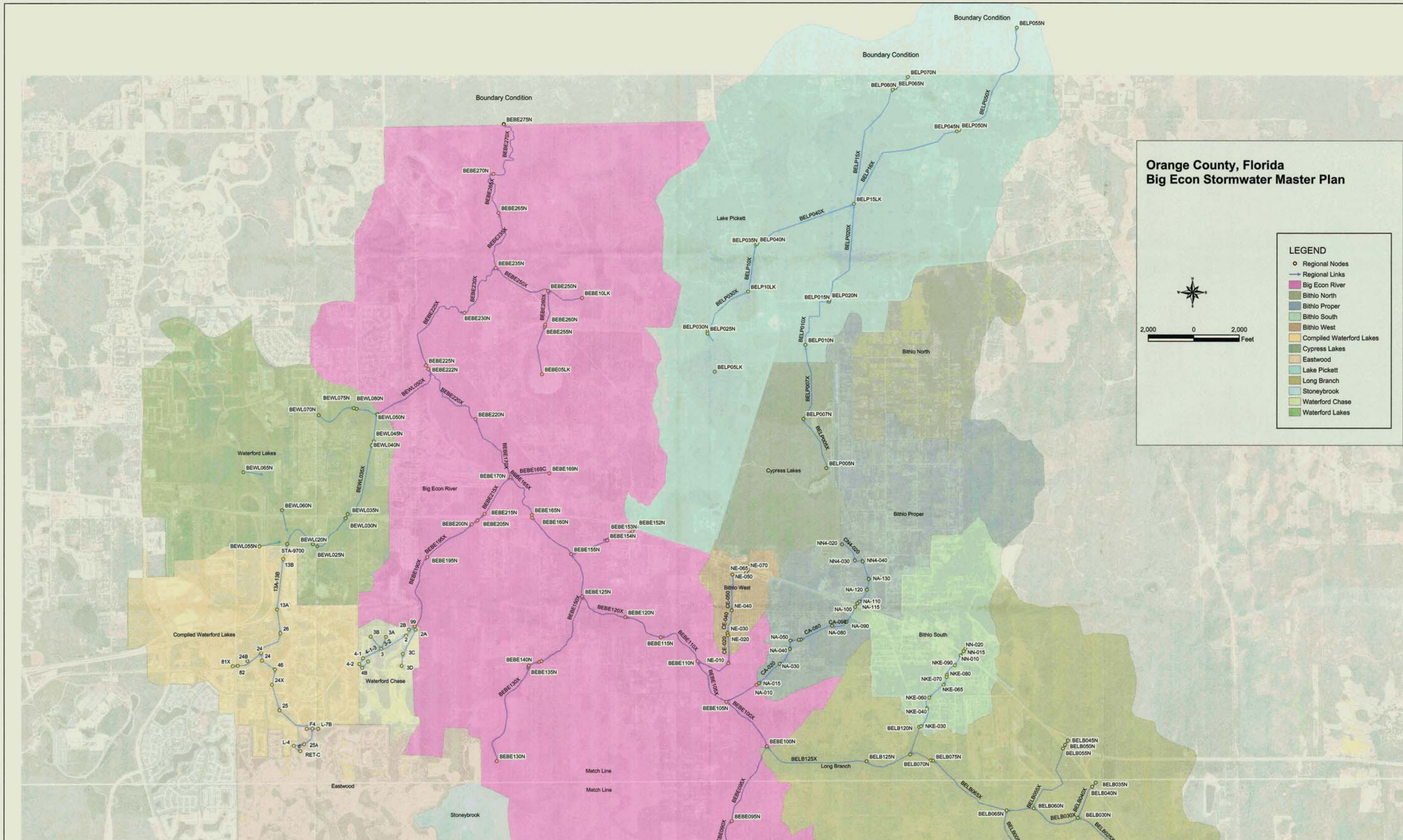
Return Period (years)	Design Storm Frequency Factor, X_T
2 to 10	1.0
25	1.1
50	1.2
100	1.25

Reference: Wright-McLaughlin Engineers (1969).

***** DUE TO THE INCREASE IN THE DURATION TIME THAT THE PEAK OR NEAR PEAK DISCHARGE RATE IS RELEASED FROM STORMWATER MANAGEMENT SYSTEMS, THE USE OF THESE SHORT DURATION PEAK RATE DISCHARGE ADJUSTMENT FACTORS IS NOT APPROPRIATE FOR FLOOD ROUTING COMPUTATIONS.

Appendix: I

Big Econ River Basin Stormwater Management Master Plan



CDM

GIS Source: Orange County, USGS, SJRWMD & CDM

Appendix F - 1 of 3
Model Schematic

Table 5-1
Big Econ Stormwater Management Master Plan
Orange County, Florida
Existing Conditions Results

Model ID	U/S Node	D/S Node	Critical Elevation[1]	Location	Mean Annual U/S Stage[3]	Mean Annual D/S Stage[3]	Mean Annual Flooding	Mean Annual Flow[2]	10 Year - 24 Hour U/S Stage[3]	10 Year - 24 Hour D/S Stage[3]	10 Year - 24 Hour Flooding	10 Year - 24 Hour Flow[2]	25 Year - 24 Hour U/S Stage[3]	25 Year - 24 Hour D/S Stage[3]	25 Year - 24 Hour Flooding	25 Year - 24 Hour Flow[2]	100 Year - 24 Hour U/S Stage[3]	100 Year - 24 Hour D/S Stage[3]	100 Year - 24 Hour Flooding	100 Year - 24 Hour Flow[2]	Comments
BEBE010C	BEBE010N	BEBE015N	65.8	Wewahootee Road	62.4	61.8	-	89	63.9	62.3	-	170	64.5	62.4	-	197	65.2	62.5	-	224	
BEBE011C	BEBE010N	BEBE015N	65.8	Wewahootee Road	62.4	61.8	-	172	63.9	62.3	-	347	64.5	62.4	-	416	65.2	62.5	-	498	
BEBE010W	BEBE010N	BEBE015N	65.8	Wewahootee Road - Overflow	62.4	61.8	-	0	63.9	62.3	-	0	64.5	62.4	-	0	65.2	62.5	-	0	
BEBE015X	BEBE015N	BEBE020N	57.6		61.8	55.2	-	393	62.3	56.8	-	732	62.4	57.3	-	863	62.5	58.1	0.5	1011	
BEBE020X	BEBE020N	BEBE025N	62.1	Beeline Bridge Equivalent	55.2	55.2	-	998	56.8	56.8	-	1967	57.3	57.3	-	2338	58.1	58.1	-	3067	
BEBE020W	BEBE020N	BEBE025N	62.15	Beeline - Overflow	55.2	55.2	-	0	56.8	56.8	-	0	57.3	57.3	-	0	58.1	58.1	-	0	
BEBE025X	BEBE025N	BEBE030N	56.6		55.2	53.8	-	992	56.8	55.8	-	1931	57.3	56.4	-	2291	58.1	57.2	0.5	3023	
BEBE030X	BEBE030N	BEBE035N	57.4		53.8	53.6	-	971	55.8	55.7	-	1861	56.4	56.3	-	2186	57.2	57.0	-	2961	
BEBE035X	BEBE035N	BEBE040N	50.2		53.6	52.5	2.3	2300	55.7	54.8	4.6	4418	56.3	55.4	5.2	5169	57.0	56.1	5.9	6007	Hal Scott - flooding not a problem
BEBE040X	BEBE040N	BEBE045N	49.8		52.5	52.1	2.3	2371	54.8	54.2	4.4	4758	55.4	54.8	5.0	5638	56.1	55.5	5.7	6735	Hal Scott - flooding not a problem
BEBE045X	BEBE045N	BEBE050N	48.3		52.1	45.5	-	2519	54.2	48.1	-	5187	54.8	48.8	0.5	6181	55.5	49.8	1.5	7516	Hal Scott - flooding not a problem
BEBE050X	BEBE050N	BEBE055N	47		45.5	44.7	-	2529	48.1	47.4	0.4	5310	48.8	48.1	1.1	6360	49.8	49.2	2.2	7843	Hal Scott - flooding not a problem
BEBE055X	BEBE055N	BEBE060N	43.1		44.7	44.6	1.5	2813	47.4	47.2	4.1	5700	48.1	47.9	4.8	6883	49.2	49.0	5.9	8642	Hal Scott - flooding not a problem
BEBE05X	BEBE05LK	BEBE255N	49.2		47.6	46.3	-	18	48.4	47.5	-	48	48.7	47.8	-	60	49.2	48.5	-	83	Hal Scott - flooding not a problem
BEBE060X	BEBE060N	BEBE065N	37.4		44.6	44.6	7.2	2967	47.2	47.2	9.8	6150	47.9	47.9	10.5	7360	49.0	49.0	11.6	9211	Hal Scott - flooding not a problem
BEBE065C	BEBE065N	BEBE070N	44.7	Powerline Bridge Equivalent	44.6	44.5	-	178	47.2	47.2	2.5	186	47.9	47.9	3.2	188	49.0	49.0	4.3	159	Hal Scott - flooding not a problem
BEBE065W	BEBE065N	BEBE070N	44.7	Powerline Overflow	44.6	44.5	-	0	47.2	47.2	2.5	419	47.9	47.9	3.2	492	49.0	49.0	4.3	542	Hal Scott - flooding not a problem
BEBE065X	BEBE065N	BEBE070N	44.7		44.6	44.5	-	2779	47.2	47.2	2.5	5606	47.9	47.9	3.2	6766	49.0	49.0	4.3	8661	Hal Scott - flooding not a problem
BEBE070X	BEBE070N	BEBE075N	44.8		44.5	44.4	-	2900	47.2	47.0	2.2	6086	47.9	47.8	3.0	7302	49.0	48.8	4.0	9145	Hal Scott - flooding not a problem
BEBE075X	BEBE075N	BEBE080N	43.4		44.4	44.1	0.7	3025	47.0	46.6	3.2	6435	47.8	47.3	3.9	7783	48.8	48.4	5.0	9697	Floodplain of Big Econ
BEBE080X	BEBE080N	BEBE085N	42.9		44.1	43.9	1.0	2957	46.6	46.4	3.5	6390	47.3	47.1	4.2	7736	48.4	48.2	5.3	9579	Floodplain of Big Econ
BEBE085X	BEBE085N	BEBE090N	42.8		43.9	43.6	0.8	2904	46.4	46.1	3.3	6358	47.1	46.8	4.0	7719	48.2	47.9	5.1	9566	Floodplain of Big Econ
BEBE090X	BEBE090N	BEBE095N	40.6		43.6	43.3	2.7	2862	46.1	45.6	5.0	6437	46.8	46.3	5.7	7852	47.9	47.4	6.8	9855	Floodplain of Big Econ
BEBE095X	BEBE095N	BEBE100N	40.7		43.3	41.1	0.4	2824	45.6	43.7	3.0	6355	46.3	44.6	3.9	7724	47.4	46.1	5.3	9761	Floodplain of Big Econ
BEBE100X	BEBE100N	BEBE105N	38.4		41.1	40.5	2.1	2852	43.7	43.1	4.7	6497	44.6	43.9	5.5	7943	46.1	45.5	7.1	10316	Floodplain of Big Econ
BEBE105X	BEBE105N	BEBE110N	39.3		40.5	39.6	0.3	2879	43.1	42.2	2.9	6567	43.9	43.2	3.9	8029	45.5	44.9	5.6	10462	Floodplain of Big Econ
BEBE10X	BEBE10LK	BEBE250N	41.7		45.3	39.7	-	35	46.3	40.5	-	93	46.6	40.8	-	118	47.1	41.6	-	173	
BEBE110X	BEBE110N	BEBE115N	37.8		39.6	39.1	1.3	2866	42.2	41.7	3.9	6510	43.2	42.8	5.0	7969	44.9	44.6	6.8	10388	Floodplain of Big Econ
BEBE115X	BEBE115N	BEBE120N	38		39.1	37.9	-	2855	41.7	41.1	3.1	6453	42.8	42.2	4.2	7909	44.6	44.2	6.2	10322	Floodplain of Big Econ
BEBE120X	BEBE120N	BEBE125N	37.9		37.9	37.7	-	2832	41.1	40.9	3.0	6379	42.2	42.0	4.1	7840	44.2	44.0	6.1	10295	Floodplain of Big Econ
BEBE125X	BEBE125N	BEBE155N	35.1		37.7	36.6	1.5	2812	40.9	40.3	5.2	6312	42.0	41.5	6.4	7792	44.0	43.6	8.5	10364	Floodplain of Big Econ
BEBE130X	BEBE130N	BEBE135N	61.8		72.4	51.9	-	117	72.7	53.8	-	233	72.8	54.2	-	277	72.9	55.2	-	360	
BEBE135C	BEBE135N	BEBE145N	53.4	Sunflower Trail Extension	51.9	51.5	-	109	53.8	53.0	0.4	207	54.2	53.8	0.8	209	55.2	55.2	1.8	208	Problem Area 12 - Sunflower Trail
BEBE135W	BEBE135N	BEBE145N	53.4	Sunflower Trail - Overflow	51.9	51.5	-	0	53.8	53.0	0.4	59	54.2	53.8	0.8	154	55.2	55.2	1.8	301	Problem Area 12 - Sunflower Trail
BEBE145C	BEBE145N	BEBE150N	55.8	Sunflower Trail	51.5	50.5	-	140	53.0	51.2	-	284	53.8	51.3	-	343	55.2	51.5	-	420	
BEBE145W	BEBE145N	BEBE150N	55.8	Sunflower Trail - Overflow	51.5	50.5	-	0	53.0	51.2	-	0	53.8	51.3	-	0	55.2	51.5	-	0	
BEBE150X	BEBE150N	BEBE125N	37.9		50.5	37.7	-	139	51.2	40.9	3.0	283	51.3	42.0	4.1	342	51.5	44.0	6.1	420	Floodplain of Big Econ
BEBE152C	BEBE152N	BEBE153N	62	State Road 50	59.6	57.4	-	84	60.6	58.3	-	200	61.1	58.4	-	200	61.9	58.6	-	201	
BEBE152W	BEBE152N	BEBE153N	62	State Road 50 - Overflow	59.6	57.4	-	0	60.6	58.3	-	0	61.1	58.4	-	0	61.9	58.6	-	0	
BEBE153X	BEBE153N	BEBE154N	52		57.4	50.8	-	128	58.3	53.6	1.6	171	58.4	53.7	1.7	180	58.6	53.7	1.7	200	Floodplain of Big Econ Tributary
BEBE154C	BEBE154N	BEBE155N	54	Old Cheney Highway	50.8	36.6	-	84	53.6	40.3	-	152	53.7	41.5	-	153	53.7	43.6	-	154	
BEBE154W	BEBE154N	BEBE155N	54	Old Cheney - Overflow	50.8	36.6	-	0	53.6	40.3	-	19	53.7	41.5	-	27	53.7	43.6	-	45	
BEBE155X	BEBE155N	BEBE160N	32.7		36.6	36.5	3.8	2780	40.3	40.1	7.4	6250	41.5	41.3	8.6	7742	43.6	43.3	10.6	10366	Floodplain of Big Econ
BEBE160X	BEBE160N	BEBE165N	44.7	SR 50 Bridge Equivalent	36.5	36.4	-	2763	40.1	40.1	-	6220	41.3	41.3	-	7716	43.3	43.3	-	10360	
BEBE160W	BEBE160N	BEBE165N	44.6	SR 50 Bridge - Overflow	36.5	36.4	-	0	40.1	40.1	-	0	41.3	41.3	-	0	43.3	43.3	-	0	
BEBE165X	BEBE165N	BEBE170N	36.5		36.4	35.7	-	2752	40.1	39.6	3.1	6194	41.3	40.8	4.3	7693	43.3	42.9	6.4	10356	Floodplain of Big Econ
BEBE169C	BEBE169N	BEBE170N	41.3	South Tanner Road	35.7	35.7	-	167	40.3	39.6	-	291	41.6	40.8	0.3	266	42.9	42.9	1.6	171	Overtopping due largely to tailwater in BE
BEBE169W	BEBE169N	BEBE170N	41.3	South Tanner - Overflow	35.7	35.7	-	0	40.3	39.6	-	0	41.6	40.8	0.3	49	42.9	42.9	1.6	299	Overtopping due largely to tailwater in BE
BEBE170X	BEBE170N	BEBE220N	31.7		35.7	35.4	3.7	2711	39.6	39.3	7.6	6121	40.8	40.5	8.8	7620	42.9	42.7	11.0	10338	Floodplain of Big Econ
4A-4B	4A	4B	65.4	Waterford Chase Parkway - d/s of pond 4A	64.9	64.9	-	4	65.5	65.3	0.1	9	65.7	65.4	0.3	12	66.1	65.5	0.7	17	Problem Area 10 - Maple Creek Drive
4B-4-2	4B	4-2	66.5	Control structure out of pond 4-B	64.9	63.6	-	0	65.3	64.3	-	11	65.4	64.7	-	16	65.5	65.4	-	24	
4-1-4-2	4-1	4-2	66.5	Waterford Chase Parkway - d/s wetland 4-2	63.6	63.6	-	0	64.3	64.3	-	0	64.6	64.7	-	0	65.2	65.4	-	0	
4-1-3	4-1	3	66	Drop structure - Maple Creek Drive	63.6	63.6	-	2	64.3	64.1	-	8	64.6	64.3	-	10	65.2	64.6	-	12	
3-2	3	2	66.5	Oak Chase Drive	63.6	63.6	-	20	64.1	64.0	-	42	64.3	64.2	-	61	64.6	64.4	-	96	
2-99	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	10	64.0	59.9	-	16	64.2	60.1	-	17	64.4	60.4	-	19	
2-99A	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	2	64.0	59.9	-	27	64.2	60.1	-	38	64.4	60.4	-	48	
2-99B	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	0	64.0	59.9	-	0	64.2	60.1	-	7	64.4	60.4	-	30	
BEBE190X	BEBE190N	BEBE195N	52.5		59.4	54.6	2.1	108	59.9	54.7	2.2	252	60.1	54.8	2.3	311	60.4	54.8	2.3	419	Floodplain of Big Econ Tributary
BEBE195X	BEBE195N	BEBE200N	47.8		54.6	46.5	-	169	54.7	47.8	0.0	301	54.8	48.3	0.5	370	54.8	49.3	1.5	496	Floodplain of Big Econ Tributary
BEBE200C	BEBE200N	BEBE205N	49.5	Old Cheney Highway Bridge Equivalent	46.5	44.7	-	258	47.8	45.2	-	513	48.3	45.7	-	621	49.3	47.5	-	817	
BEBE200W	BEBE200N	BEBE205N	49.5	Old Cheney - Overflow	46.5	44.7	-	0	47.8	45.2	-	0	48.3	45.7	-	0	49.3	47.5	-	0	
BEBE210C	BEBE205N	BEBE215N	49.9	SR 50	44.7	44.6	-	353	45.2	45.0	-	512	45.7	45.4	-	621	47.5	47.1	-	807	
BEBE210W	BEBE205N	BEBE215N	49.9	SR 50 - Overflow	44.7	44.6	-	0	45.2	45.0	-	0	45.7	45.4	-	0	47.5	47.1	-	0	
BEBE215X	BEBE215N	BEBE170N	36.5		44.6	35.7	-	403	45.0	39.6	3.1	512	45.4	40.8	4.3	621	47.1	42.9	6.4	805	Floodplain of Big Econ Tributary
BEBE220X	BEBE220N	BEBE222N	34.6		35.4	34.8	0.2	2676	39.3	38.9	4.3	6051	40.5	40.1	5.5	7568	42.7	42.3	7.7	10318	Floodplain of Big Econ
BEBE222X	BEBE222N	BEBE225N	44.7	Lake Pickett Bridge Equivalent	34.8	34.8	-	2724	38.9	38.9	-	6137	40.1	40.1	-	7792	42.3	42.3	-	10408	
BEBE222W	BEBE222N	BEBE225N	41.4	Lake Pickett - Overflow	34.8	34.8	-	0	38.9	38.9	-	0	40.1	40.1	-	0	42.3	42.3	0.9	194	Floodplain of Big Econ
BEBE225X	BEBE225N	BEBE230N	38.3		34.8	32.5	-	2723	38.9	35.9	-	6135	40.1	37.6	-	7700	42.3	40.5	2.2	10601	Floodplain of Big Econ
BEBE230X	BEBE230N	BEBE235N	41.7		32.5	32.2	-	2719	35.9	35.6	-	6129	37.6	37.3	-	7696	40.5	40.3	-	10600	

Notes:
1) Critical Elevation refers to road overtopping elevation for culverts and top of bank for open channels.
2) Flow taken from Link Maximum Conditions Report (cfs)
3) Stages taken from Node Maximum Conditions Report (ft NGVD)

Table 5-1
Big Econ Stormwater Management Master Plan
Orange County, Florida
Existing Conditions Results

					Mean Annual				10 Year - 24 Hour				25 Year - 24 Hour				100 Year - 24 Hour				
Model ID	U/S Node	D/S Node	Critical Elevation[1]	Location	U/S Stage[3]	D/S Stage[3]	Flooding	Flow[2]	U/S Stage[3]	D/S Stage[3]	Flooding	Flow[2]	U/S Stage[3]	D/S Stage[3]	Flooding	Flow[2]	U/S Stage[3]	D/S Stage[3]	Flooding	Flow[2]	Comments
BEBE010C	BEBE010N	BEBE015N	65.8	Wewahootee Road	62.4	61.8	-	89	63.9	62.3	-	170	64.5	62.4	-	197	65.2	62.5	-	224	
BEBE011C	BEBE010N	BEBE015N	65.8	Wewahootee Road	62.4	61.8	-	172	63.9	62.3	-	347	64.5	62.4	-	416	65.2	62.5	-	498	
BEBE010W	BEBE010N	BEBE015N	65.8	Wewahootee Road - Overflow	62.4	61.8	-	0	63.9	62.3	-	0	64.5	62.4	-	0	65.2	62.5	-	0	
BEBE015X	BEBE015N	BEBE020N	57.6		61.8	55.2	-	393	62.3	56.8	-	732	62.4	57.3	-	863	62.5	58.1	0.5	1011	
BEBE020X	BEBE020N	BEBE025N	62.1	Beeline Bridge Equivalent	55.2	55.2	-	998	56.8	56.8	-	1967	57.3	57.3	-	2338	58.1	58.1	-	3067	
BEBE020W	BEBE020N	BEBE025N	62.15	Beeline - Overflow	55.2	55.2	-	0	56.8	56.8	-	0	57.3	57.3	-	0	58.1	58.1	-	0	
BEBE025X	BEBE025N	BEBE030N	56.6		55.2	53.8	-	992	56.8	55.8	-	1931	57.3	56.4	-	2291	58.1	57.2	0.5	3023	
BEBE030X	BEBE030N	BEBE035N	57.4		53.8	53.6	-	971	55.8	55.7	-	1861	56.4	56.3	-	2186	57.2	57.0	-	2961	
BEBE035X	BEBE035N	BEBE040N	50.2		53.6	52.5	2.3	2300	55.7	54.8	4.6	4418	56.3	55.4	5.2	5169	57.0	56.1	5.9	6007	Hal Scott - flooding not a problem
BEBE040X	BEBE040N	BEBE045N	49.8		52.5	52.1	2.3	2371	54.8	54.2	4.4	4758	55.4	54.8	5.0	5638	56.1	55.5	5.7	6735	Hal Scott - flooding not a problem
BEBE045X	BEBE045N	BEBE050N	48.3		52.1	45.5	-	2519	54.2	48.1	-	5187	54.8	48.8	0.5	6181	55.5	49.8	1.5	7516	Hal Scott - flooding not a problem
BEBE050X	BEBE050N	BEBE055N	47		45.5	44.7	-	2529	48.1	47.4	0.4	5310	48.8	48.1	1.1	6360	49.8	49.2	2.2	7843	Hal Scott - flooding not a problem
BEBE055X	BEBE055N	BEBE060N	43.1		44.7	44.6	1.5	2813	47.4	47.2	4.1	5700	48.1	47.9	4.8	6883	49.2	49.0	5.9	8642	Hal Scott - flooding not a problem
BEBE05X	BEBE05LK	BEBE255N	49.2		47.6	46.3	-	18	48.4	47.5	-	48	48.7	47.8	-	60	49.2	48.5	-	83	Hal Scott - flooding not a problem
BEBE060X	BEBE060N	BEBE065N	37.4		44.6	44.6	7.2	2967	47.2	47.2	9.8	6150	47.9	47.9	10.5	7360	49.0	49.0	11.6	9211	Hal Scott - flooding not a problem
BEBE065C	BEBE065N	BEBE070N	44.7	Powerline Bridge Equivalent	44.6	44.5	-	178	47.2	47.2	2.5	186	47.9	47.9	3.2	188	49.0	49.0	4.3	159	Hal Scott - flooding not a problem
BEBE065W	BEBE065N	BEBE070N	44.7	Powerline Overflow	44.6	44.5	-	0	47.2	47.2	2.5	419	47.9	47.9	3.2	492	49.0	49.0	4.3	542	Hal Scott - flooding not a problem
BEBE065X	BEBE065N	BEBE070N	44.7		44.6	44.5	-	2779	47.2	47.2	2.5	5606	47.9	47.9	3.2	6766	49.0	49.0	4.3	8661	Hal Scott - flooding not a problem
BEBE070X	BEBE070N	BEBE075N	44.8		44.5	44.4	-	2900	47.2	47.0	2.2	6086	47.9	47.8	3.0	7302	49.0	48.8	4.0	9145	Hal Scott - flooding not a problem
BEBE075X	BEBE075N	BEBE080N	43.4		44.4	44.1	0.7	3025	47.0	46.6	3.2	6435	47.8	47.3	3.9	7783	48.8	48.4	5.0	9697	Floodplain of Big Econ
BEBE080X	BEBE080N	BEBE085N	42.9		44.1	43.9	1.0	2957	46.6	46.4	3.5	6390	47.3	47.1	4.2	7736	48.4	48.2	5.3	9579	Floodplain of Big Econ
BEBE085X	BEBE085N	BEBE090N	42.8		43.9	43.6	0.8	2904	46.4	46.1	3.3	6358	47.1	46.8	4.0	7719	48.2	47.9	5.1	9566	Floodplain of Big Econ
BEBE090X	BEBE090N	BEBE095N	40.6		43.6	43.3	2.7	2862	46.1	45.6	5.0	6437	46.8	46.3	5.7	7852	47.9	47.4	6.8	9855	Floodplain of Big Econ
BEBE095X	BEBE095N	BEBE100N	40.7		43.3	41.1	0.4	2824	45.6	43.7	3.0	6355	46.3	44.6	3.9	7724	47.4	46.1	5.3	9761	Floodplain of Big Econ
BEBE100X	BEBE100N	BEBE105N	38.4		41.1	40.5	2.1	2852	43.7	43.1	4.7	6497	44.6	43.9	5.5	7943	46.1	45.5	7.1	10316	Floodplain of Big Econ
BEBE105X	BEBE105N	BEBE110N	39.3		40.5	39.6	0.3	2879	43.1	42.2	2.9	6567	43.9	43.2	3.9	8029	45.5	44.9	5.6	10462	Floodplain of Big Econ
BEBE10X	BEBE10LK	BEBE250N	41.7		45.3	39.7	-	35	46.3	40.5	-	93	46.6	40.8	-	118	47.1	41.6	-	173	
BEBE110X	BEBE110N	BEBE115N	37.8		39.6	39.1	1.3	2866	42.2	41.7	3.9	6510	43.2	42.8	5.0	7969	44.9	44.6	6.8	10388	Floodplain of Big Econ
BEBE115X	BEBE115N	BEBE120N	38		39.1	37.9	-	2855	41.7	41.1	3.1	6453	42.8	42.2	4.2	7909	44.6	44.2	6.2	10322	Floodplain of Big Econ
BEBE120X	BEBE120N	BEBE125N	37.9		37.9	37.7	-	2832	41.1	40.9	3.0	6379	42.2	42.0	4.1	7840	44.2	44.0	6.1	10295	Floodplain of Big Econ
BEBE125X	BEBE125N	BEBE155N	35.1		37.7	36.6	1.5	2812	40.9	40.3	5.2	6312	42.0	41.5	6.4	7792	44.0	43.6	8.5	10364	Floodplain of Big Econ
BEBE130X	BEBE130N	BEBE135N	61.8		72.4	51.9	-	117	72.7	53.8	-	233	72.8	54.2	-	277	72.9	55.2	-	360	
BEBE135C	BEBE135N	BEBE145N	53.4	Sunflower Trail Extension	51.9	51.5	-	109	53.8	53.0	0.4	207	54.2	53.8	0.8	209	55.2	55.2	1.8	208	Problem Area 12 - Sunflower Trail
BEBE135W	BEBE135N	BEBE145N	53.4	Sunflower Trail - Overflow	51.9	51.5	-	0	53.8	53.0	0.4	59	54.2	53.8	0.8	154	55.2	55.2	1.8	301	Problem Area 12 - Sunflower Trail
BEBE145C	BEBE145N	BEBE150N	55.8	Sunflower Trail	51.5	50.5	-	140	53.0	51.2	-	284	53.8	51.3	-	343	55.2	51.5	-	420	
BEBE145W	BEBE145N	BEBE150N	55.8	Sunflower Trail - Overflow	51.5	50.5	-	0	53.0	51.2	-	0	53.8	51.3	-	0	55.2	51.5	-	0	
BEBE150X	BEBE150N	BEBE125N	37.9		50.5	37.7	-	139	51.2	40.9	3.0	283	51.3	42.0	4.1	342	51.5	44.0	6.1	420	Floodplain of Big Econ
BEBE152C	BEBE152N	BEBE153N	62	State Road 50	59.6	57.4	-	84	60.6	58.3	-	200	61.1	58.4	-	200	61.9	58.6	-	201	
BEBE152W	BEBE152N	BEBE153N	62	State Road 50 - Overflow	59.6	57.4	-	0	60.6	58.3	-	0	61.1	58.4	-	0	61.9	58.6	-	0	
BEBE153X	BEBE153N	BEBE154N	52		57.4	50.8	-	128	58.3	53.6	1.6	171	58.4	53.7	1.7	180	58.6	53.7	1.7	200	Floodplain of Big Econ Tributary
BEBE154C	BEBE154N	BEBE155N	54	Old Cheney Highway	50.8	36.6	-	84	53.6	40.3	-	152	53.7	41.5	-	153	53.7	43.6	-	154	
BEBE154W	BEBE154N	BEBE155N	54	Old Cheney - Overflow	50.8	36.6	-	0	53.6	40.3	-	19	53.7	41.5	-	27	53.7	43.6	-	45	
BEBE155X	BEBE155N	BEBE160N	32.7		36.6	36.5	3.8	2780	40.3	40.1	7.4	6250	41.5	41.3	8.6	7742	43.6	43.3	10.6	10366	Floodplain of Big Econ
BEBE160X	BEBE160N	BEBE165N	44.7	SR 50 Bridge Equivalent	36.5	36.4	-	2763	40.1	40.1	-	6220	41.3	41.3	-	7716	43.3	43.3	-	10360	
BEBE160W	BEBE160N	BEBE165N	44.6	SR 50 Bridge - Overflow	36.5	36.4	-	0	40.1	40.1	-	0	41.3	41.3	-	0	43.3	43.3	-	0	
BEBE165X	BEBE165N	BEBE170N	36.5		36.4	35.7	-	2752	40.1	39.6	3.1	6194	41.3	40.8	4.3	7693	43.3	42.9	6.4	10356	Floodplain of Big Econ
BEBE169C	BEBE169N	BEBE170N	41.3	South Tanner Road	35.7	35.7	-	167	40.3	39.6	-	291	41.6	40.8	0.3	266	42.9	42.9	1.6	171	Overtopping due largely to tailwater in BE
BEBE169W	BEBE169N	BEBE170N	41.3	South Tanner - Overflow	35.7	35.7	-	0	40.3	39.6	-	0	41.6	40.8	0.3	49	42.9	42.9	1.6	299	Overtopping due largely to tailwater in BE
BEBE170X	BEBE170N	BEBE220N	31.7		35.7	35.4	3.7	2711	39.6	39.3	7.6	6121	40.8	40.5	8.8	7620	42.9	42.7	11.0	10338	Floodplain of Big Econ
4A-4B	4A	4B	65.4	Waterford Chase Parkway - d/s of pond 4A	64.9	64.9	-	4	65.5	65.3	0.1	9	65.7	65.4	0.3	12	66.1	65.5	0.7	17	Problem Area 10 - Maple Creek Drive
4B-4-2	4B	4-2	66.5	Control structure out of pond 4-B	64.9	63.6	-	0	65.3	64.3	-	11	65.4	64.7	-	16	65.5	65.4	-	24	
4-1-4-2	4-1	4-2	66.5	Waterford Chase Parkway - d/s wetland 4-2	63.6	63.6	-	0	64.3	64.3	-	0	64.6	64.7	-	0	65.2	65.4	-	0	
4-1-3	4-1	3	66	Drop structure - Maple Creek Drive	63.6	63.6	-	2	64.3	64.1	-	8	64.6	64.3	-	10	65.2	64.6	-	12	
3-2	3	2	66.5	Oak Chase Drive	63.6	63.6	-	20	64.1	64.0	-	42	64.3	64.2	-	61	64.6	64.4	-	96	
2-99	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	10	64.0	59.9	-	16	64.2	60.1	-	17	64.4	60.4	-	19	
2-99A	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	2	64.0	59.9	-	27	64.2	60.1	-	38	64.4	60.4	-	48	
2-99B	2	BEBE190N	66	Waterford Chase outfall	63.6	59.4	-	0	64.0	59.9	-	0	64.2	60.1	-	7	64.4	60.4	-	30	
BEBE190X	BEBE190N	BEBE195N	52.5		59.4	54.6	2.1	108	59.9	54.7	2.2	252	60.1	54.8	2.3	311	60.4	54.8	2.3	419	Floodplain of Big Econ Tributary
BEBE195X	BEBE195N	BEBE200N	47.8		54.6	46.5	-	169	54.7	47.8	0.0	301	54.8	48.3	0.5	370	54.8	49.3	1.5	496	Floodplain of Big Econ Tributary
BEBE200C	BEBE200N	BEBE205N	49.5	Old Cheney Highway Bridge Equivalent	46.5	44.7	-	258	47.8	45.2	-	513	48.3	45.7	-	621	49.3	47.5	-	817	
BEBE200W	BEBE200N	BEBE205N	49.5	Old Cheney - Overflow	46.5	44.7	-	0	47.8	45.2	-	0	48.3	45.7	-	0	49.3	47.5	-	0	
BEBE210C	BEBE205N	BEBE215N	49.9	SR 50	44.7	44.6	-	353	45.2	45.0	-	512	45.7	45.4	-	621	47.5	47.1	-	807	
BEBE210W	BEBE205N	BEBE215N	49.9	SR 50 - Overflow	44.7	44.6	-	0	45.2	45.0	-	0	45.7	45.4	-	0	47.5	47.1	-	0	
BEBE215X	BEBE215N	BEBE170N	36.5		44.6	35.7	-	403	45.0	39.6	3.1	512	45.4	40.8	4.3	621	47.1	42.9	6.4	805	Floodplain of Big Econ Tributary
BEBE220X	BEBE220N	BEBE222N	34.6		35.4	34.8	0.2	2676	39.3	38.9	4.3	6051	40.5	40.1	5.5	7568	42.7	42.3	7.7	10318	Floodplain of Big Econ
BEBE222X	BEBE222N	BEBE225N	44.7	Lake Pickett Bridge Equivalent	34.8	34.8	-	2724	38.9	38.9	-	6137	40.1	40.1	-	7792	42.3	42.3	-	10408	
BEBE222W	BEBE222N	BEBE225N	41.4	Lake Pickett - Overflow	34.8	34.8	-	0	38.9	38.9	-	0	40.1	40.1	-	0	42.3	42.3	0.9	194	Floodplain of Big Econ
BEBE225X	BEBE225N	BEBE230N	38.3		34.8	32.5	-	2723	38.9	35.9	-	6135	40.1	37.6	-	7700	42.3	40.5	2.2	10601	Floodplain of Big Econ
BEBE230X	BEBE230N	BEBE235N	41.7		32.5	32.2	-	2719	35.9	35.6	-	6129	37.6	37.3	-	7696	40.5	40.3	-	10600	

Notes:
1) Critical Elevation refers to road overtopping elevation for culverts and top of bank for open channels.
2) Flow taken from Link Maximum Conditions Report (cfs)
3) Stages taken from Node Maximum Conditions Report (ft NGVD)

Table 5-1
Big Econ Stormwater Management Master Plan
Orange County, Florida
Existing Conditions Results

Model ID	U/S Node	D/S Node	Critical Elevation[1]	Location	Mean Annual U/S Stage[3]	Mean Annual D/S Stage[3]	Mean Annual Flooding	Mean Annual Flow[2]	10 Year - 24 Hour U/S Stage[3]	10 Year - 24 Hour D/S Stage[3]	10 Year - 24 Hour Flooding	10 Year - 24 Hour Flow[2]	25 Year - 24 Hour U/S Stage[3]	25 Year - 24 Hour D/S Stage[3]	25 Year - 24 Hour Flooding	25 Year - 24 Hour Flow[2]	100 Year - 24 Hour U/S Stage[3]	100 Year - 24 Hour D/S Stage[3]	100 Year - 24 Hour Flooding	100 Year - 24 Hour Flow[2]	Comments
CH-4B	CH-4A	CH-4B	51		47.7	47.0	-	816	49.0	48.2	-	1769	49.9	49.3	-	2117	50.0	49.1	-	2778	From Avalon Park FEMA floodplain study
CH-4C	CH-4B	CH-5	49		47.0	46.0	-	815	48.2	47.1	-	1768	49.3	48.8	-	2116	49.1	48.8	-	2779	From Avalon Park FEMA floodplain study
CH-5	CH-5	CH-6	50		46.0	44.4	-	820	47.1	47.0	-	1775	48.8	47.8	-	2114	48.8	48.8	-	2791	From Avalon Park FEMA floodplain study
CH-6	CH-6	CH-7	50		44.4	44.4	-	816	47.0	47.0	-	1736	47.8	47.8	-	2047	48.8	48.8	-	2671	From Avalon Park FEMA floodplain study
CH-7	CH-7	BEBE075N	44.8		44.4	44.4	-	784	47.0	47.0	2.2	1617	47.8	47.8	3.0	1886	48.8	48.8	4.0	2429	From Avalon Park FEMA floodplain study
CONS5-W	BESB050N	C1	78	Weir flow to Alafaya Trail Culverts	76.2	74.7	-	82	76.4	75.4	-	196	76.5	75.7	-	243	76.6	76.1	-	326	
BETC005X	BETC005N	BETC020N	55.4		55.6	53.9	-	498	56.2	55.9	0.5	989	56.7	56.5	1.1	1161	57.1	57.1	1.7	1866	Floodplain of Turkey Creek
BETC010X	BETC010N	BETC015N	62.6		73.0	64.8	2.2	1828	73.6	65.6	3.0	2762	73.8	65.9	3.3	3132	74.1	66.4	3.8	3864	Floodplain of Turkey Creek
BETC015X	BETC015N	BETC020N	48.8		64.8	53.9	5.1	802	65.6	55.9	7.1	1546	65.9	56.5	7.7	1816	66.4	57.1	8.3	2339	Floodplain of Turkey Creek
BETC020X	BETC020N	BEBE035N	57.4		53.9	53.6	-	1047	55.9	55.7	-	2018	56.5	56.3	-	2335	57.1	57.0	-	2505	
BEWF005X	BEWF005N	BEWF010N	65.1		65.5	65.4	0.3	448	66.7	66.6	1.5	771	67.0	66.8	1.7	912	67.4	67.2	2.1	1160	Floodplain of Wedgefield Canal
BEWF010P	BEWF010N	BEWF015N	65.3	Culvert Riser in Wedgefield Canal	65.4	61.0	0.1	408	66.6	63.5	1.3	431	66.8	63.7	1.5	433	67.2	64.1	1.9	435	Floodplain of Wedgefield Canal
BEWF010W	BEWF010N	BEWF015N	65.3		65.4	61.0	0.1	13	66.6	63.5	1.3	461	66.8	63.7	1.5	603	67.2	64.1	1.9	851	Floodplain of Wedgefield Canal
BEWF015X	BEWF015N	BEWF020N	61.1		61.0	61.0	-	667	63.5	63.5	2.4	771	63.7	63.7	2.6	912	64.1	64.1	3.0	1160	Floodplain of Wedgefield Canal
BEWF020P	BEWF020N	BEWF025N	62.3	Culvert Riser in Wedgefield Canal	61.0	57.4	-	401	63.5	59.0	1.2	482	63.7	59.2	1.4	488	64.1	59.6	1.8	494	Floodplain of Wedgefield Canal
BEWF020W	BEWF020N	BEWF025N	62.3		61.0	57.4	-	0	63.5	59.0	1.2	397	63.7	59.2	1.4	539	64.1	59.6	1.8	784	Floodplain of Wedgefield Canal
BEWF025X	BEWF025N	BEWF030N	57.8		57.4	57.4	-	379	59.0	59.0	1.2	764	59.2	59.2	1.4	909	59.6	59.6	1.8	1155	Floodplain of Wedgefield Canal
BEWF030P	BEWF030N	BEWF035N	57.5	Culvert Riser in Wedgefield Canal	57.4	54.6	-	348	59.0	57.9	1.5	413	59.2	58.1	1.7	421	59.6	58.6	2.1	430	Floodplain of Wedgefield Canal
BEWF030W	BEWF030N	BEWF035N	57.5		57.4	54.6	-	0	59.0	57.9	1.5	571	59.2	58.1	1.7	720	59.6	58.6	2.1	974	Floodplain of Wedgefield Canal
BEWF035X	BEWF035N	BEWF040N	54.8		54.6	54.6	-	348	57.9	57.9	3.1	761	58.1	58.1	3.3	906	58.6	58.6	3.8	1153	Floodplain of Wedgefield Canal
BEWF040P	BEWF040N	BEWF045N	56.8	Culvert Riser in Wedgefield Canal	54.6	52.1	-	330	57.9	54.2	1.1	465	58.1	54.8	1.3	482	58.6	55.5	1.8	501	Floodplain of Wedgefield Canal
BEWF040W	BEWF040N	BEWF045N	56.8		54.6	52.1	-	0	57.9	54.2	1.1	324	58.1	54.8	1.3	477	58.6	55.5	1.8	747	Floodplain of Wedgefield Canal
BEWF045X	BEWF045N	BEBE045N	54.6		52.1	52.1	-	322	54.2	54.2	-	717	54.8	54.8	0.2	858	55.5	55.5	0.9	1098	Floodplain of Wedgefield Canal
BEWF050X	BEWF050N	BEWF055N	55		65.3	51.9	-	414	66.7	52.7	-	809	67.1	52.8	-	1010	67.5	52.7	-	1501	
BEWF055X	BEWF055N	BEBE050N	48.3		51.9	45.5	-	668	52.7	48.1	-	1387	52.8	48.8	0.5	1624	52.7	49.8	1.5	2022	Floodplain of Wedgefield Canal
BEWF060X	BEWF060N	BEWF065N	63.7		60.9	60.3	-	379	63.4	63.1	-	510	64.2	64.0	0.3	546	65.5	65.3	1.6	651	Floodplain of Wedgefield Canal
BEWF065P	BEWF065N	BEWF070N	64.9	Culvert Riser in Wedgefield Canal	60.3	58.0	-	379	63.1	59.7	-	505	64.0	60.3	-	536	65.3	61.1	0.4	569	Floodplain of Wedgefield Canal
BEWF065W	BEWF065N	BEWF070N	64.9		60.3	58.0	-	0	63.1	59.7	-	0	64.0	60.3	-	0	65.3	61.1	0.4	78	Floodplain of Wedgefield Canal
BEWF070X	BEWF070N	BEWF075N	60.3		58.0	58.0	-	727	59.7	59.7	-	711	60.3	60.3	-	729	61.1	61.1	0.8	713	Floodplain of Wedgefield Canal
BEWF075P	BEWF075N	BEWF080N	60.7	Culvert Riser in Wedgefield Canal	58.0	56.2	-	378	59.7	56.5	-	502	60.3	56.6	-	533	61.1	56.9	0.4	570	Floodplain of Wedgefield Canal
BEWF075W	BEWF075N	BEWF080N	60.7		58.0	56.2	-	0	59.7	56.5	-	0	60.3	56.6	-	0	61.1	56.9	0.4	74	Floodplain of Wedgefield Canal
BEWF080X	BEWF080N	BEWF085N	56		56.2	56.1	0.1	378	56.5	56.4	0.4	502	56.6	56.5	0.5	532	56.9	56.7	0.7	643	Floodplain of Wedgefield Canal
BEWF085P	BEWF085N	BEWF090N	55.4	Culvert Riser in Wedgefield Canal	56.1	49.2	0.7	210	56.4	50.7	1.0	215	56.5	51.8	1.1	216	56.7	53.5	1.3	216	Floodplain of Wedgefield Canal
BEWF085W	BEWF085N	BEWF090N	55.4		56.1	49.2	0.7	168	56.4	50.7	1.0	286	56.5	51.8	1.1	332	56.7	53.5	1.3	480	Floodplain of Wedgefield Canal
BEWF090X	BEWF090N	BEWF095N	52.6		49.2	48.6	-	378	50.7	50.3	-	500	51.8	51.5	-	530	53.5	53.4	0.8	643	Floodplain of Wedgefield Canal
BEWF095P	BEWF095N	BEWF100N	53	Culvert Riser in Wedgefield Canal	48.6	44.6	-	378	50.3	47.2	-	497	51.5	47.9	-	528	53.4	49.0	0.4	591	Floodplain of Wedgefield Canal
BEWF095W	BEWF095N	BEWF100N	53		48.6	44.6	-	0	50.3	47.2	-	0	51.5	47.9	-	0	53.4	49.0	0.4	60	Floodplain of Wedgefield Canal
BEWF100X	BEWF100N	BEBE060N	43.1		44.6	44.6	1.5	378	47.2	47.2	4.1	497	47.9	47.9	4.8	528	49.0	49.0	5.9	642	Floodplain of Wedgefield Canal
BEWF105X	BEWF105N	BEWF110N	69.3		63.3	61.7	-	53	64.1	62.2	-	155	64.4	62.3	-	167	65.0	62.4	-	194	
BEWF110P	BEWF110N	BEWF115N	64.6	Culvert Riser in Wedgefield Canal	61.7	58.4	-	53	62.2	59.1	-	155	62.3	59.2	-	167	62.4	59.3	-	194	
BEWF110W	BEWF110N	BEWF115N	64.6		61.7	58.4	-	0	62.2	59.1	-	0	62.3	59.2	-	0	62.4	59.3	-	0	
BEWF115X	BEWF115N	BEWF120N	61.5		58.4	58.4	-	53	59.1	58.9	-	155	59.2	58.9	-	167	59.3	59.0	-	194	
BEWF120P	BEWF120N	BEWF125N	60.5	Culvert Riser in Wedgefield Canal	58.4	53.8	-	53	58.9	54.4	-	155	58.9	54.4	-	167	59.0	54.6	-	194	
BEWF120W	BEWF120N	BEWF125N	60.5		58.4	53.8	-	0	58.9	54.4	-	0	58.9	54.4	-	0	59.0	54.6	-	0	
BEWF125X	BEWF125N	BEWF130N	56.4		53.8	53.8	-	221	54.4	54.3	-	246	54.4	54.4	-	249	54.6	54.5	-	250	
BEWF130P	BEWF130N	BEWF135N	54.9	Culvert Riser in Wedgefield Canal	53.8	50.0	-	53	54.3	50.6	-	155	54.4	50.7	-	167	54.5	52.4	-	194	
BEWF130W	BEWF130N	BEWF135N	54.9		53.8	50.0	-	0	54.3	50.6	-	0	54.4	50.7	-	0	54.5	52.4	-	0	
BEWF135X	BEWF135N	BEWF140N	57		50.0	50.0	-	53	50.6	50.6	-	405	50.7	50.7	-	426	52.4	52.4	-	421	
BEWF140P	BEWF140N	BEWF145N	53.7	Culvert Riser in Wedgefield Canal	50.0	46.5	-	52	50.6	48.3	-	155	50.7	48.8	-	166	52.4	50.2	-	194	
BEWF140W	BEWF140N	BEWF145N	53.7		50.0	46.5	-	0	50.6	48.3	-	0	50.7	48.8	-	0	52.4	50.2	-	0	
BEWF145X	BEWF145N	BEWF150N	53.3		46.5	46.4	-	52	48.3	48.3	-	808	48.8	48.8	-	808	50.2	50.2	-	799	
BEWF150P	BEWF150N	BEWF155N	50.2	Culvert Riser in Wedgefield Canal	46.4	43.8	-	52	48.3	46.9	-	153	48.8	47.1	-	165	50.2	48.0	-	191	
BEWF150W	BEWF150N	BEWF155N	50.2		46.4	43.8	-	0	48.3	46.9	-	0	48.8	47.1	-	0	50.2	48.0	-	0	
BEWF155X	BEWF155N	BEWF160N	49		43.8	43.8	-	52	46.9	46.9	-	153	47.1	47.1	-	164	48.0	47.9	-	191	
BEWF160P	BEWF160N	BEWF165N	46.6	Culvert Riser in Wedgefield Canal	43.8	43.6	-	52	46.9	46.1	0.3	149	47.1	46.8	0.5	149	47.9	47.9	1.3	129	Floodplain of Wedgefield Canal
BEWF160W	BEWF160N	BEWF165N	46.6		43.8	43.6	-	0	46.9	46.1	0.3	37	47.1	46.8	0.5	92	47.9	47.9	1.3	172	Floodplain of Wedgefield Canal
BEWF165X	BEWF165N	BEBE090N	48.9		43.6	43.6	-	52	46.1	46.1	-	153	46.8	46.8	-	164	47.9	47.9	-	190	Floodplain of Wedgefield Canal
CULV-2	81X	82	74	Woodbury Road	69.9	69.3	-	170	71.2	69.9	-	350	71.6	70.1	-	416	72.6	70.6	-	526	
CHANL-5	82	24	65		69.3	62.8	-	171	69.9	63.6	-	352	70.1	63.8	-	416	70.6	63.9	-	526	
CHANL-6	24	26	65		62.8	59.7	-	200	63.6	61.2	-	414	63.8	61.6	-	467	63.9	62.3	-	545	
CULV-10	26	13A	60		59.7	55.4	-	268	61.2	55.7	1.2	560	61.6	55.9	1.6	656	62.3	56.2	2.3	795	Floodplain of Big Econ Tributary
13A-13B	13A	13B	55		55.4	53.7	0.4	63	55.7	55.0	0.7	72	55.9	55.3	0.9	74	56.2	55.8	1.2	76	Floodplain of Big Econ Tributary
B13A-13B	13A	13B	55		55.4	53.7	0.5	240	55.7	55.0	0.5	570	55.9	55.3	0.5	675	56.2	55.8	0.5	834	Floodplain of Big Econ Tributary
CHN-12-O	13B	STA-9700	57		53.7	52.0	-	342	55.0	53.2	-	873	55.3	53.3	-	1007	55.8	53.7	-	1312	
BEWL015X	STA-9700	BEWL020N	49		52.0	50.1	1.1	339	53.2	50.4	1.4	873	53.3	51.1	2.1	1013	53.7	52.1	3.1	1322	Floodplain of Big Econ Tributary
BEWL020C	BEWL020N	BEWL025N	57.8	Bridgeway Blvd - Bridge Equivalent	50.1	50.1	-	531	50.4	50.3	-	1136	51.1	51.0	-	1325	52.1	52.0	-	1690	
BEWL020W	BEWL020N	BEWL025N	57.8	Bridgeway Blvd Overflow	50.1	50.1	-	0	50.4	50.3	-	0	51.1	51.0	-	0	52.1	52.0	-	0	
BEWL025X	BEWL025N	BEWL030N	47.8		50.1	46.4	-	531	50.3	49.5	1.7	1136	51.0	50.2	2.4	1324	52.0	51.3	3.5	1695	Floodplain of Big Econ Tributary
BEWL030C	BEWL030N	BEWL035N	54.4	SR 50	46.4	44.4	-	612	49.5	45.0	-	1354	50.2	45.1	-	1549	51.3	45.4	-	2000	

Notes:
1) Critical Elevation refers to road overtopping elevation for culverts and top of bank for open channels.
2) Flow taken from Link Maximum Conditions Report (cfs)
3) Stages taken from Node Maximum Conditions Report (ft NGVD)

Appendix: J

Bithlo Area Stormwater Management Master Plan

Bithlo Area
Stormwater Management Master Plan Update

Final Report

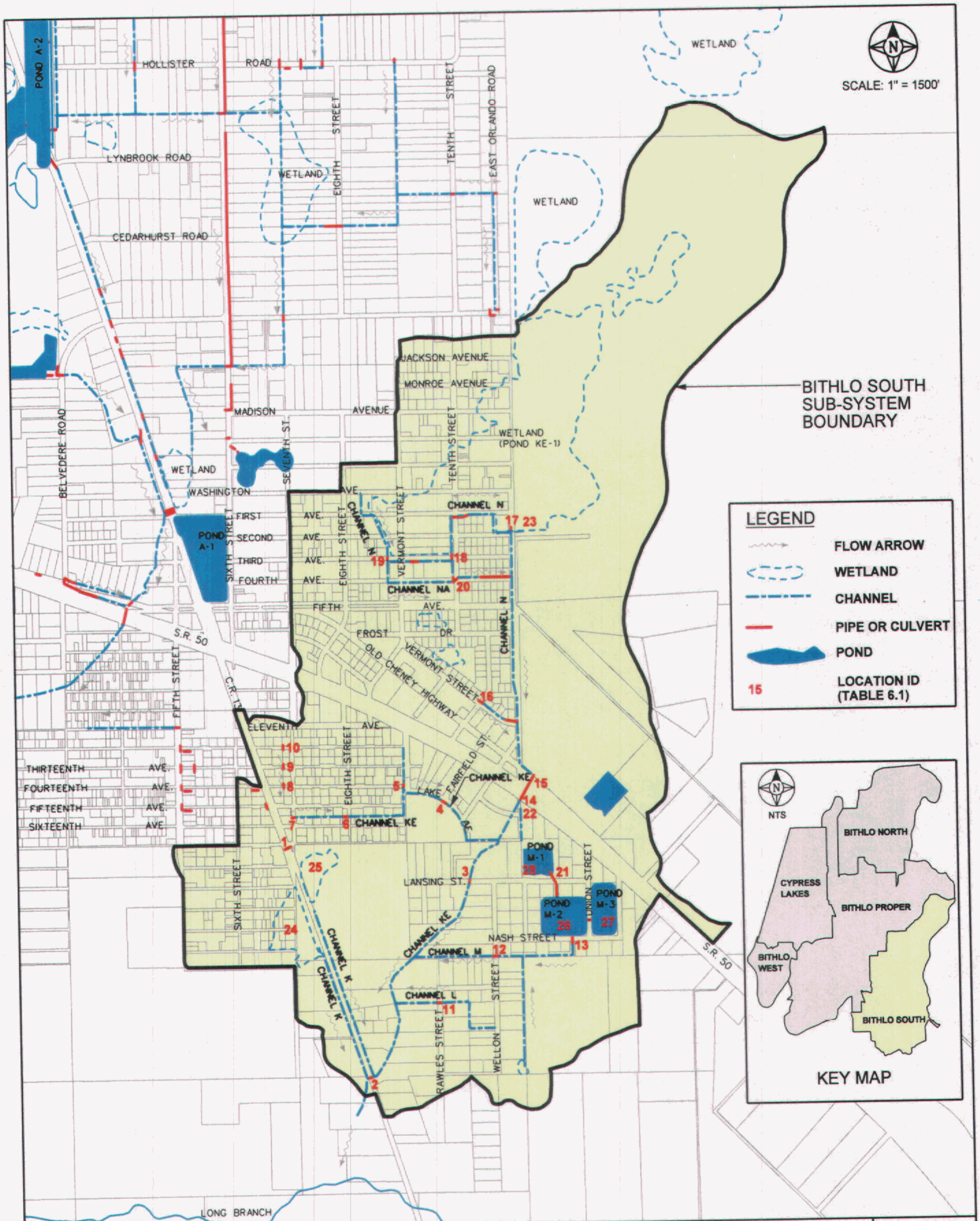
Prepared for

Board of County Commissioners
Orange County, Florida

Prepared by

Singhofen & Associates, Inc.
Stormwater Management and Civil Engineering

September 2002



SAI	BITHLO AREA STORMWATER MANAGEMENT MASTER PLAN	BITHLO SOUTH SUB-SYSTEM	FIGURE 6.1 Project No. 99001

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Table 6.1 Identification and Location Information for Structures at Major Crossings and/or Outfalls Bithlo South Sub-System

Location ID	Link Name	Upstream Node Name	SEC-TWN-RNG	Culvert Span (in)	Culvert Rise (in)	Location Description
Culverts						
1	PK-120	NK-120	27-22S-32E	24	24	C.R. 13 south of Seventeenth Avenue
2	PKE-030	NKE-030	34-22S-32E	96	84	C.R. 13, Roberts Branch
3	PKE-080A	NKE-080	27-22S-32E	72	72	Lansing St.
4	PKE-120	NKE-120	27-22S-32E	36	36	Fairfield St.
5	PKE-143	NKE-143	27-22S-32E	30	30	9th St. and 14th Ave.
6	PKE-165	NKE-165	27-22S-32E	24	24	8th St. between 15th and 16th Ave.
7	PKE-225	NKE-225	27-22S-32E	18	12	7th St. culvert
8	PKE-245	NKE-245	27-22S-32E	24	24	14th Ave.
9	PKE-255	NKE-255	27-22S-32E	24	24	13th Ave.
10	PKE-265	NKE-265	27-22S-32E	24	24	12th Ave.
11	PL-020	NL-020	27-22S-32E	30	30	Rawles St.
12	PM-030	NM-030	27-22S-32E	48	48	Wellon St.
13	PM-050	NM-050	26-22S-32E	42	42	South discharge from pond
14	PN-015	NN-015	27-22S-32E	120	48	S.R. 50
15	PN-020	NN-020	26-22S-32E	120	108	Old Cheney Hwy.
16	PN-033	NN-033	27-22S-32E	24	24	Vermont St. and Exeter St.
17	PN-060	NN-060	22-22S-32E	36	36	Containment berm
18	PN-115	NN-110	22-22S-32E	15	15	3rd Ave.
19	PN-150	NN-150	22-22S-32E	24	24	3rd Ave.
20	PNA-030	NNA-030	22-22S-32E	45	29	10th St.
Drop Structures						
21	DM-070	NM-070	26-22S-32E	42	42	Control structure from North pond to South pond (new)
Weirs						
22	WM-080	NN-010	26-22S-32E	-	-	Overflow spillway from Channel N to M
23	WN-060B	NN-060	22-22S-32E	-	-	High stage discharge from Wetland (Pond KE-1)
Other						
24	-	NK-110	27-22S-32E	-	-	Wetland west of C.R. 13
25	-	NK-130	27-22S-32E	-	-	Wetland eastof C.R.13
26	-	NM-050	26-22S-32E	-	-	Pond M-2
27	-	NM-060	26-22S-32E	-	-	Pond M-3
28	-	NM-070	26-22S-32E	-	-	Pond M-1

Notes:
1. The ID numbers associated with each structure are included for the purpose of correlating the structure locations with the system map. (See Fig. 6.1)
2. Detailed structure information for culverts, weirs and drop structures is included in the drainage inventory tables presented in Appendix A.

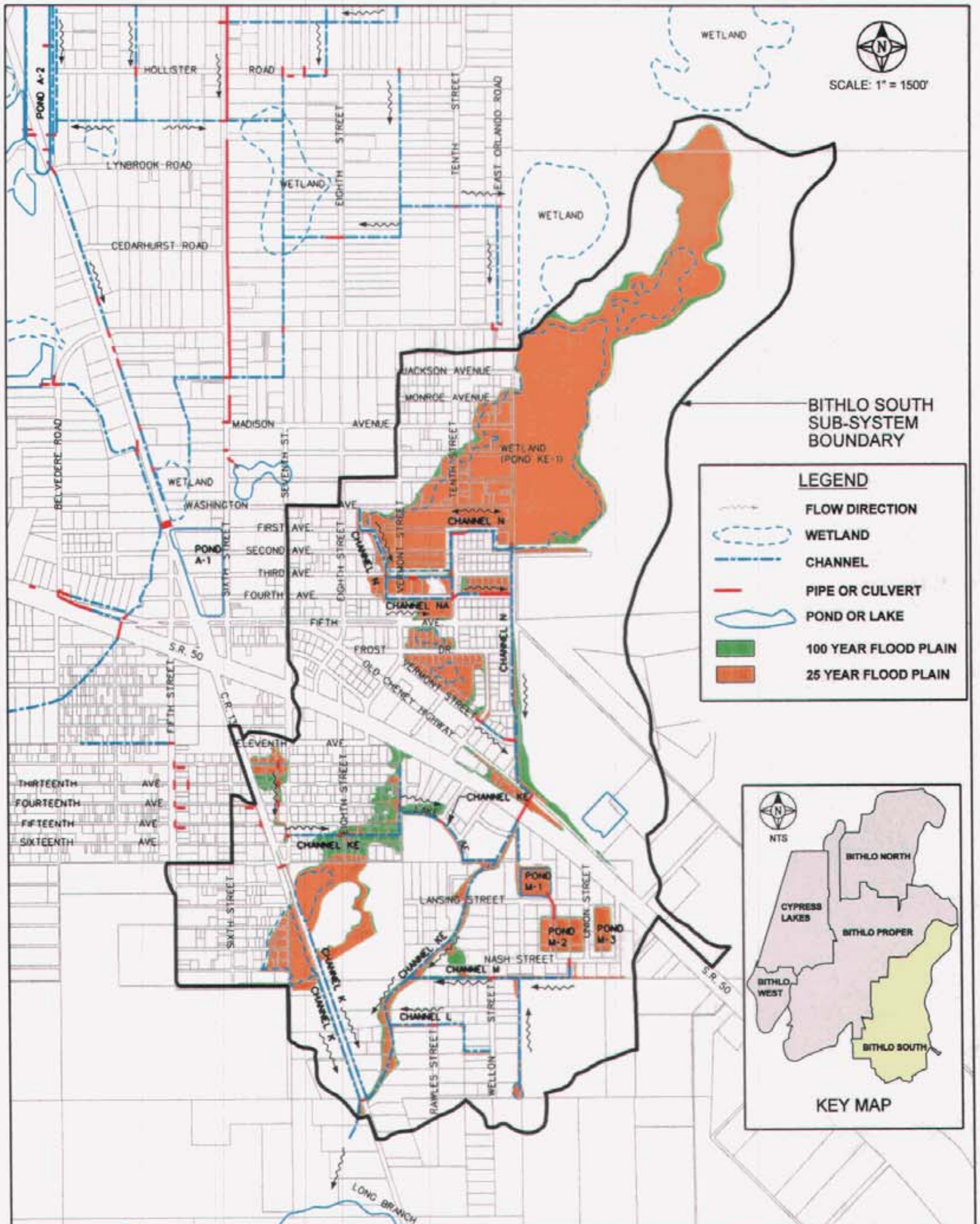
Table 6.2 Maximum Stages and Flows at Selected Locations in the Bithlo South Sub-System (Current and Project Conditions).

			Mean Annual Storm Event				5-Year Storm Event				10-Year Storm Event				25-Year Storm Event				100-Year Storm Event			
			Current		Project		Current		Project		Current		Project		Current		Project		Current		Project	
LOC ID	Node ID	Location	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)
Channel K																						
2	NKE-020	C.R. 13, S.	46.4	277	46.4	283	46.8	431	46.8	431	47.0	536	47.0	533	47.1	621	47.1	621	47.34	784	47.35	787
24	NK-110	Wetland, W. of CR13	59.5	28	59.5	32	59.6	46	59.6	54	59.7	59	59.7	71	59.7	71	59.7	84	59.8	97	59.8	110
25	NK-130	Wetland, E. of CR13	60.3	5	60.3	5	60.4	10	60.4	10	60.5	14	60.5	14	60.5	18	60.5	18	60.6	43	60.6	24
Channel KE																						
2	NKE-020	C.R. 13, S.	46.4	277	46.4	283	46.8	431	46.8	431	47.0	536	47.0	533	47.1	621	47.1	621	47.34	784	47.35	787
2	NKE-030	C.R. 13, N.	47.9	244	47.9	247	48.8	375	48.8	366	49.4	465	49.3	449	49.8	537	49.7	523	50.6	668	50.5	659
-	NKE-040	Confluence w/ Chan. L	51.1	236	51.2	239	51.8	361	51.7	353	52.2	447	52.1	432	52.5	516	52.5	502	52.8	642	52.8	633
-	NKE-060	Confluence w/ Chan. M	52.4	213	52.4	215	53.1	327	53.0	317	53.5	404	53.4	386	53.8	467	53.8	449	54.2	575	54.1	565
3	NKE-080	Lansing St., N.	54.4	169	54.4	173	55.3	256	55.2	250	55.8	311	55.7	299	56.1	353	56.0	340	56.6	410	56.6	409
-	NKE-090	Confluence w/ Chan. N	55.10	165	55.15	169	56.0	250	56.0	243	56.5	304	56.4	291	56.9	346	56.8	330	57.3	399	57.3	397
4	NKE-120	Fairfield St., W.	57.6	33	56.7	34	58.7	48	57.3	55	59.5	55	57.7	67	60.4	59	58.2	116	60.7	58	58.8	144
5	NKE-143	14th Ave., N.	58.7	10	58.7	10	59.2	16	59.1	16	59.8	20	59.4	20	60.9	21	59.6	24	61.5	24	60.0	31
6	NKE-165	8th St., W.	59.2	9	58.0	10	59.7	13	58.3	16	60.2	16	58.5	20	60.5	19	58.8	24	60.9	22	59.5	30
7	NKE-220	7th St., E.	61.8	8	60.6	8	61.9	12	60.9	13	62.0	15	61.0	17	62.1	17	61.2	20	62.2	20	61.4	25
7	NKE-225	7th St., W.	63.7	8	-	-	63.8	11	-	-	63.8	14	-	-	63.8	15	-	-	63.9	18	-	-
7	NKE-225Z	7th St., W.	-	-	61.5	8	-	-	61.9	12	-	-	62.1	16	-	-	62.3	19	-	-	62.6	24
-	NKE-235	Between 14th & 15th	65.2	7	62.8	8	65.2	10	63.1	17	65.2	12	63.3	18	65.3	14	63.5	19	65.3	16	63.8	24
8	NKE-245	Between 13th & 14th	65.3	6	63.5	7	65.5	9	63.8	11	65.6	11	64.0	14	65.7	12	64.1	16	65.9	14	64.4	21
9	NKE-255	Between 12th & 13th	65.4	5	64.2	6	65.6	7	64.5	9	65.8	9	64.7	12	66.0	10	64.9	14	66.3	12	65.2	17
10	NKE-265	Between 11th & 12th	65.4	4	64.6	4	65.7	7	64.9	7	66.0	8	65.1	9	66.2	9	65.3	10	66.6	11	65.5	17
Channel L																						
11	NL-020	Rawles St., E.	52.3	13	52.3	13	52.9	21	52.9	21	53.2	30	53.1	29	53.3	33	53.3	33	54.0	42	54.1	42
-	NL-030	Wellon St., W.	55.5	11	55.5	11	55.7	20	55.7	20	55.8	24	55.8	23	55.9	27	55.9	27	56.0	37	56.0	38

Table 6.2 Maximum Stages and Flows at Selected Locations in the Bithlo South Sub-System (Current and Project Conditions).

			Mean Annual Storm Event				5-Year Storm Event				10-Year Storm Event				25-Year Storm Event				100-Year Storm Event			
			Current		Project		Current		Project		Current		Project		Current		Project		Current		Project	
LOC ID	Node ID	Location	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)
Channel M																						
12	NM-030	Wellon St., E.	53.9	26	53.8	23	54.3	43	54.2	38	54.7	58	54.7	59	55.0	71	55.1	76	55.5	95	55.7	107
26	NM-050	Pond M-2	53.9	8	53.6	5	54.4	14	54.3	12	54.8	19	54.8	24	55.0	23	55.2	35	55.5	30	55.9	53
27	NM-060	Pond M-3	53.9	3	53.6	2	54.4	5	54.3	5	54.8	6	54.8	8	55.0	7	55.2	9	55.5	10	55.9	11
28	NM-070	Pond M-1	57.7	10	57.4	0	57.8	15	57.8	13	57.8	19	57.9	26	57.9	22	58.0	35	57.9	28	58.2	51
22	NM-080	Overflow spillway, S.	57.7	0	57.4	0	57.8	0	57.8	6	57.8	0	57.9	15	57.9	0	58.0	24	57.9	0	58.2	36
Channel N																						
14	NN-010	S.R. 50, S.	57.3	126	57.4	131	57.9	192	57.8	186	58.2	232	58.1	217	58.4	266	58.2	243	58.7	319	58.5	284
15	NN-015	S.R. 50, N.	61.1	117	61.1	117	61.8	178	61.8	178	62.3	214	62.3	214	62.6	246	62.6	246	63.1	294	63.1	294
15	NN-020	Old Cheney Hwy., N.	61.1	93	61.1	93	61.9	143	61.9	143	62.3	171	62.3	171	62.6	195	62.6	195	63.2	236	63.2	236
17	NN-050	Struct from wetland, N.	61.5	20	61.5	20	62.3	38	62.3	38	62.7	52	62.7	52	63.1	63	63.1	63	63.6	84	63.6	84
18	NN-110	Third Ave., N.	62.0	1	62.0	1	62.9	1	62.9	1	63.4	1	63.4	1	63.9	1	63.9	1	64.5	1	64.5	1
19	NN-150	Third Ave., N.	62.0	10	62.0	10	63.3	15	63.3	15	64.0	21	64.0	21	64.4	25	64.4	25	65.0	33	65.0	33
Channel NA																						
20	NNA-030	Intersect 4th & 10th, W.	61.9	19	61.9	19	63.2	24	63.2	24	63.8	34	63.8	34	64.1	38	64.1	38	64.5	49	64.5	49
-	NNA-070	4th St., N.	61.6	21	61.6	21	62.5	25	62.5	25	63.0	27	63.0	27	63.3	27	63.3	27	63.8	28	63.8	28

Notes:
1. Flow represents the peak outflow at the referenced node.
2. Results are from the Bithlo Current Conditions model <EXIST> and the Bithlo Project Conditions model <B-PROJ1>.
3. The simulated storms are all 24-hr duration storms.
4. The LOC ID numbers associated with each location are included for the purpose of cross referencing to the system map (refer to Figure 6.1)



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BITHLO AREA STORMWATER MANAGEMENT MASTER PLAN

BITHLO SOUTH SUB-SYSTEM CURRENT CONDITIONS FLOOD PLAIN MAP

FIGURE 6.3

Project No. 99001

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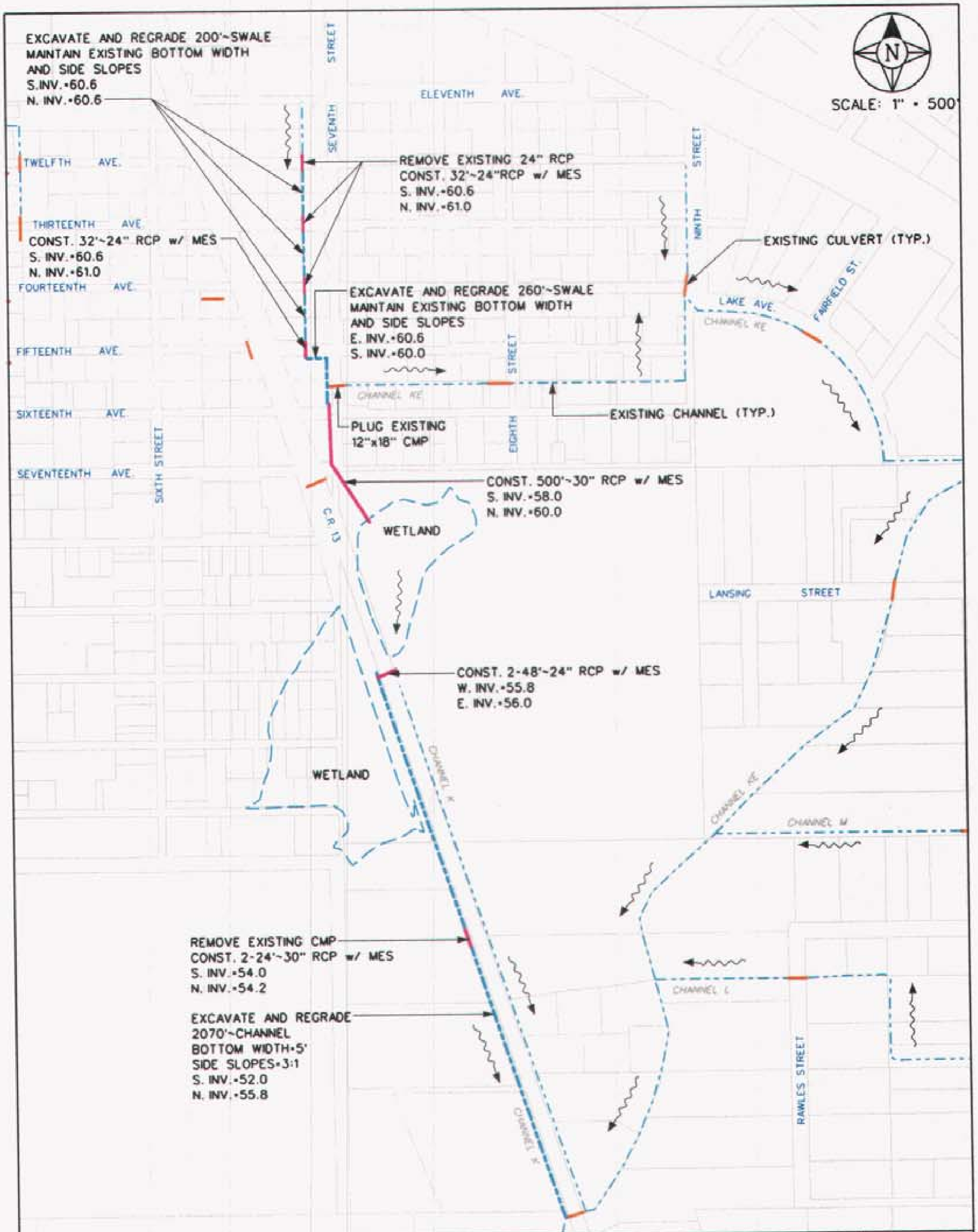

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BITHLO AREA
STORMWATER MANAGEMENT
MASTER PLAN

CHANNEL KE DRAINAGE SYSTEM
1987 REMAINING ELEMENTS
(ALTERNATIVE KE-2)

FIGURE
6.6

Project No.
99001

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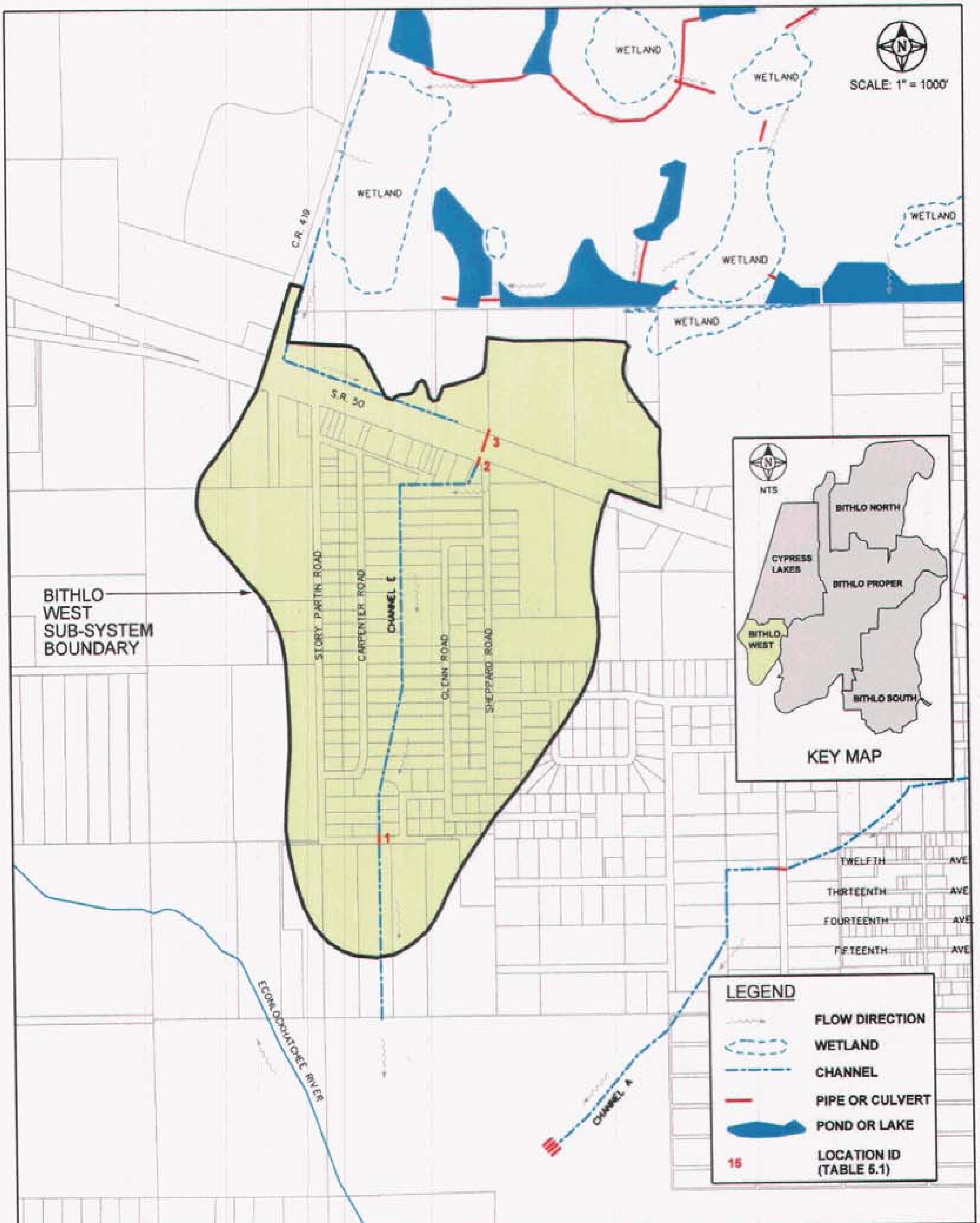


BITHLO AREA STORMWATER MANAGEMENT MASTER PLAN	BITHLO WEST SUB-SYSTEM	FIGURE 5.1 Project No. 99001

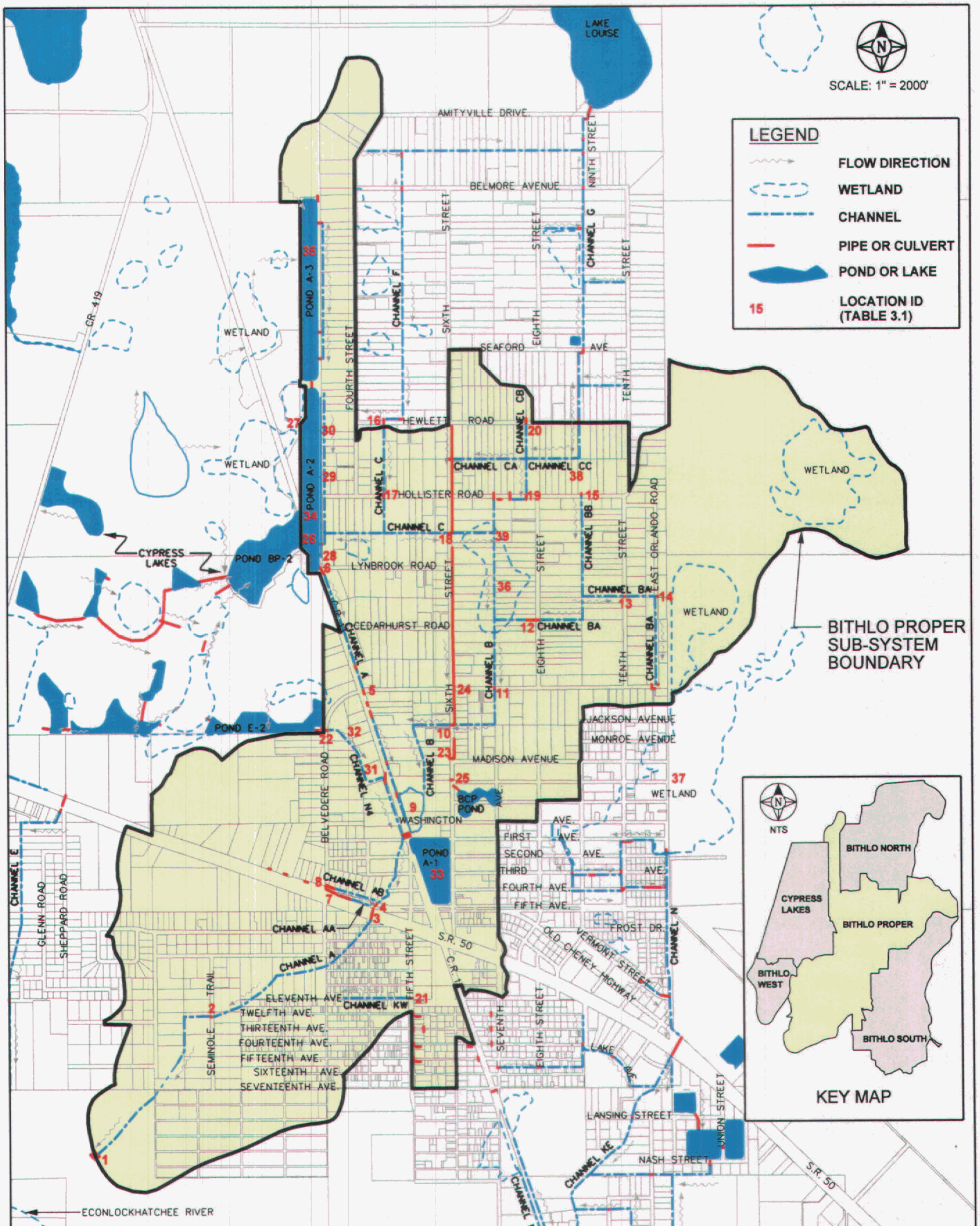
Table 5.1 Identification and Location Information for Structures at Major Crossings and/or Outfalls Bithlo West Sub-System

Location ID	Link Name	Upstream Node Name	SEC-TWN-RNG	Culvert Span (in)	Culvert Rise (in)	Location Description
Culverts						
1	PE-030A	NE-030	28-22S-32E	72	72	Story Partin Road
2	PE-070A	NE-070	21-22S-32E	48	48	Old Cheney Hwy, S. of S.R. 50
3	PE-080	NE-080	21-22S-32E	48	51	S.R. 50 (western most crossing)

Notes:
1. The ID numbers associated with each structure are included for the purpose of correlating the structure locations with the system map. (See Fig. 5.1)
2. Detailed structure information for culverts, weirs and drop structures is included in the drainage inventory tables presented in Appendix A.

Table 5.2 Maximum Stages and Flows at Selected Locations in the Bithlo West Sub-System (Current and Project Conditions).

			Mean Annual Storm Event				5-Year Storm Event				10-Year Storm Event				25-Year Storm Event				100-Year Storm Event			
			Current		Project		Current		Project		Current		Project		Current		Project		Current		Project	
LOC ID	Node ID	Location	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)
Channel E																						
3	NE-080	S.R. 50, N.	62.1	35	62.1	35	62.8	52	62.8	52	63.3	65	63.3	65	63.8	78	63.8	78	65.0	106	65.0	106
2	NE-070	Old Cheney Hwy., N.	59.9	38	59.9	38	60.2	57	60.2	57	60.4	72	60.4	72	60.6	86	60.6	86	61.4	132	61.4	131
-	NE-050	Southern turn in chan.	52.9	68	52.9	68	53.3	104	53.3	104	53.6	155	53.6	156	53.8	165	53.8	165	54.2	295	54.2	295
1	NE-030	Story Partin Rd., N.	44.7	121	44.7	121	45.5	189	45.5	189	46.0	242	46.0	242	46.5	291	46.5	291	47.4	364	47.4	364
1	NE-020	Story Partin Rd., S.	44.6	134	44.6	134	45.3	208	45.3	208	45.7	265	45.7	265	46.0	312	46.0	312	46.5	398	46.5	398



BITHLO AREA
STORMWATER MANAGEMENT
MASTER PLAN

BITHLO PROPER SUB-SYSTEM

FIGURE
3.1

Project No.
99001

z:\bithlo\dgn\system drawings\proper3.1.dgn

Table 3.1 Identification and Location Information for Structures at Major Crossings and/or Outfalls Bithlo Proper Sub-System

Location ID	Link Name	Upstream Node Name	SEC-TWN-RNG	Culvert Span (in)	Culvert Rise (in)	Location Description
Culverts						
1	PA-015A	NA-015	28-22S-32E	48	48	Utility (power) Easement at south end of Channel A u/s of the Econ River
2	PA-070	NA-070	28-22S-32E	72	72	Seminole Trail
3	PA-110	NA-110	27-22S-32E	96	84	S.R. 50
4	PA-115	NA-115	22-22S-32E	192	72	Old Cheney Highway
5	PA-220	NA-220	22-22S-32E	36	36	Belvedere Rd. at C.R. 13
6	PA-240	NA-240	21-22S-32E	60	38	Access road to Pond A-2
7	PAA-020	NAA-020	22-22S-32E	18	18	North side of S.R. 50 near Belvedere Rd.
8	PAB-030B	NAB-030	22-22S-32E	23	14	Belvedere Rd. at Old Cheney Hwy.
9	PB-010A	NB-010	22-22S-32E	54	54	C.R. 13
10	PB-040	NB-040	22-22S-32E	36	36	Channel B crossing 6th St.
11	PB-070	NB-070	22-22S-32E	30	30	Channel B crossing at Belvedere Rd.
12	PBA-020	NBA-020	22-22S-32E	36	36	8th St.
13	PBA-050	NBA-040	22-22S-32E	24	24	10th St.
14	PBA-060	NBA-060	22-22S-32E	38	24	East Orlando Rd.
15	PBB-030	NBB-030	15-22S-32E	23	14	Hollister Rd.
16	PF-130	NF-130	15-22S-32E	45	29	Hewlett Rd.
17	PC-025	NC-025	15-22S-32E	30	19	Hollister Rd.
18	PC-040	NC-030	15-22S-32E	30	19	6th St.
19	PC-080	NC-080	15-22S-32E	30	19	Hollister Rd.
20	PCB-020	NCB-020	15-22S-32E	24	24	Hewlett Rd.
21	PKW-110	NKW-110	27-22S-32E	30	30	5th St.
22	PN4-010	NN4-010	21-22S-32E	60	38	Under Belvedere Rd. (N-4 channel system)
23	P6-020	N6-020	22-22S-32E	30	19	6th St.
24	P6-050	N6-050	22-22S-32E	30	19	Belvedere Rd.
25	P6A-010	N6A-010	22-22S-32E	38	24	6thSt. culvert (near BCC pond)
Drop Structures						
26	DA-241A	NA-241	16-22S-32E	24	24	From perimeter ditch SW of Pond A-2
27	DA-241B	NA-241	16-22S-32E	15	15	From perimeter ditch NW of Pond A-2
28	DA-243A	NA-243	16-22S-32E	15	15	From perimeter ditch SE of Pond A-2
29	DA-243B	NA-243	16-22S-32E	15	15	From perimeter ditch east of Pond A-2
30	DA-243C	NA-243	16-22S-32E	15	15	From perimeter ditch NE of Pond A-2
31	DN4-035A	NN4-035	22-22S-32E	24	24	From depression west of C.R. 13 into Channel N4
32	DN4-035B	NN4-035	22-22S-32E	24	24	From depression west of C.R. 13 into Channel N4
Other						
33	-	NA-140	22-22S-32E	-	-	Pond A-1
34	-	NA-240	16-22S-32E	-	-	Pond A-2
35	-	NA-250	16-22S-32E	-	-	Pond A-3
36	-	NB-080	22-22S-32E	-	-	Wetland at Channel B/BA confluence
37	-	NN-060	22-22S-32E	-	-	Wetland (Pond KE-1)
38	-	NBB-030	15-22S-32E	-	-	Wetland north of Hollister Rd.
39	-	NC-050	15-22S-32E	-	-	Wetland south of Hollister Rd.

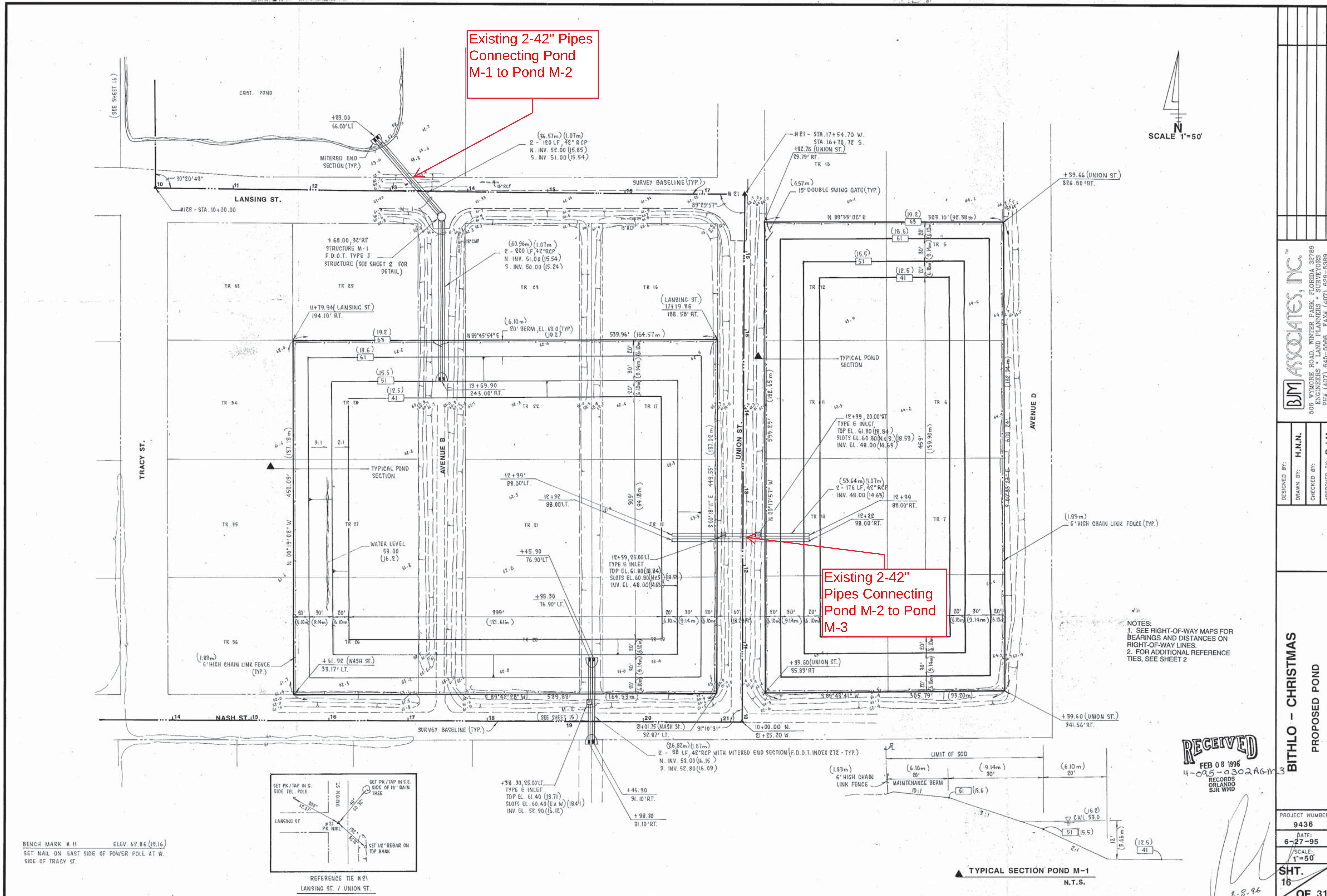
Notes:
1. The ID numbers associated with each structure are included for the purpose of correlating the structure locations with the system map. (See Fig. 3.1)
2. Detailed structure information for culverts, weirs and drop structures is included in the drainage inventory tables presented in Appendix A.

Table 3.2 Maximum Stages and Flows at Selected Locations in the Bithlo Proper Sub-System (Current and Project Conditions).

			Mean Annual Storm Event				5-Year Storm Event				10-Year Storm Event				25-Year Storm Event				100-Year Storm Event			
			Current		Project		Current		Project		Current		Project		Current		Project		Current		Project	
LOC ID	Node ID	Location	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)	Stage (ft)	Flow (cfs)
Channel A																						
1	NA-015	Power Easement, N.	40.2	325	40.2	322	40.5	492	40.5	489	40.7	620	40.7	615	41.5	762	41.5	744	42.8	1027	42.8	1005
2	NA-060	Seminole Trl., W.	48.2	256	48.2	253	48.6	377	48.6	372	48.8	465	48.8	458	49.1	564	49.1	549	49.5	719	49.4	697
2	NA-070	Seminole Trl., E.	48.4	253	48.4	250	49.6	373	49.6	369	50.5	461	50.4	454	50.7	556	50.7	541	50.9	703	50.9	682
3	NA-110	SR 50, N.	57.0	204	57.0	204	58.3	310	58.3	310	59.04	379	59.05	380	59.5	425	59.5	425	60.3	499	60.3	499
4	NA-115	Old Cheney Hwy., N.	57.1	192	57.1	191	58.4	295	58.4	290	59.2	373	59.2	369	60.0	395	60.0	393	61.0	446	61.0	447
-	NA-130	CR 13, W.	60.1	182	60.1	182	60.4	280	60.4	280	60.6	345	60.6	345	60.9	386	60.9	387	61.5	446	61.5	447
33	NA-140	Pond A-1	60.3	10	60.3	10	60.8	15	60.8	15	61.1	22	61.1	22	61.4	27	61.4	27	62.0	34	62.0	34
5	NA-220	Belvedere Rd., N.	65.6	58	65.6	58	66.6	80	66.6	80	66.9	81	66.9	81	67.3	83	67.3	83	68.4	91	68.4	91
6	NA-230	Just S. of Pond A-2	67.1	56	67.1	56	67.9	87	67.9	87	68.2	93	68.2	93	68.4	90	68.4	90	68.8	106	68.8	106
34	NA-240	Pond A-2	67.6	56	67.6	56	68.7	86	68.7	86	69.2	91	69.2	91	69.6	86	69.6	86	69.9	74	69.9	74
35	NA-250	Pond A-3	68.6	11	68.6	11	69.3	29	69.3	29	69.8	34	69.8	34	70.4	38	70.4	38	71.3	42	71.3	42
Channel AA																						
7	NAA-020	Belvedere Rd., W.	63.2	12	60.9	14	64.1	14	61.6	22	64.3	22	62.0	25	64.5	31	63.0	35	64.6	52	64.3	53
Channel AB																						
8	NAB-030	Belvedere Rd., W.	63.5	9	63.3	20	64.5	14	63.3	20	64.6	20	63.8	20	64.6	24	64.4	22	64.7	31	64.6	31
Channel B																						
9	NB-010	Wetland, E. of CR 13	60.3	142	60.3	142	60.8	206	60.8	206	61.1	249	61.1	249	61.3	270	61.3	271	62.0	296	62.0	297
10	NB-040	Sixth St., E.	64.9	76	64.9	76	65.3	79	65.3	79	65.7	82	65.7	82	66.2	91	66.2	91	66.7	98	66.7	98
11	NB-070	Belvedere Rd., N.	66.6	59	66.6	59	67.3	64	67.3	64	68.2	71	68.2	71	68.8	79	68.8	79	69.3	85	69.3	85
-	NB-080	Channel B/BA confluence	67.5	50	67.5	50	68.0	62	68.0	62	68.6	73	68.6	73	69.0	84	69.0	84	69.4	98	69.4	98
Channel BA																						
12	NBA-010	Eighth St., W.	68.3	12	68.3	12	68.8	13	68.8	13	69.0	11	69.0	11	69.1	10	69.1	10	69.4	10	69.4	10
12	NBA-020	Eighth St., E.	68.5	29	68.5	29	69.1	32	69.1	32	69.2	49	69.2	49	69.2	71	69.2	71	69.4	105	69.4	105
13	NBA-040	Tenth St., W.	68.5	16	68.5	16	69.1	23	69.1	23	69.2	24	69.2	24	69.3	25	69.3	25	69.5	26	69.5	26
14	NBA-060	East Orlando Rd., W.	66.2	2	66.2	2	66.3	3	66.3	3	66.4	4	66.4	4	66.4	4	66.4	4	66.5	5	66.5	5

Appendix: K

Excerpt from BJM Associates, Inc.

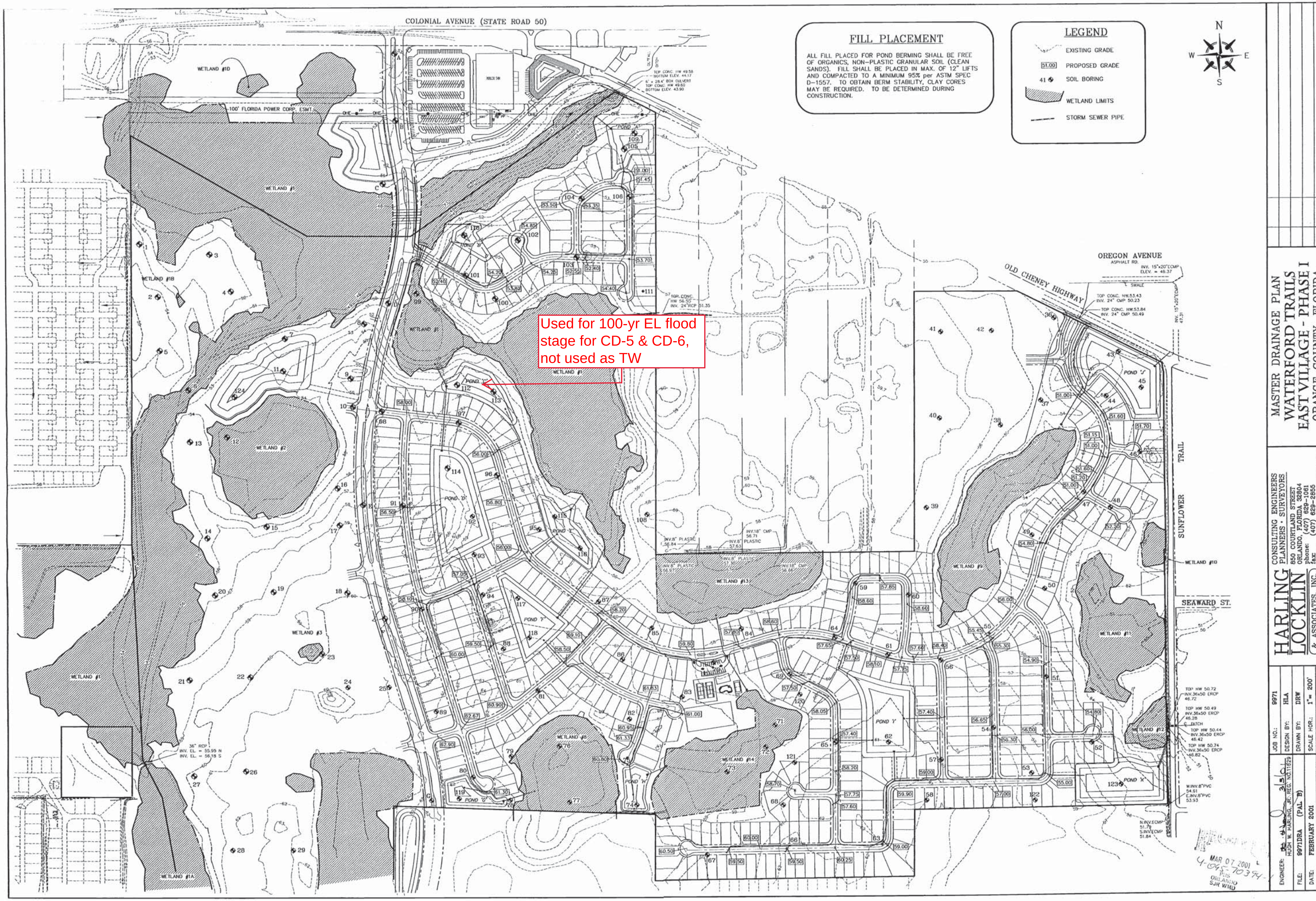


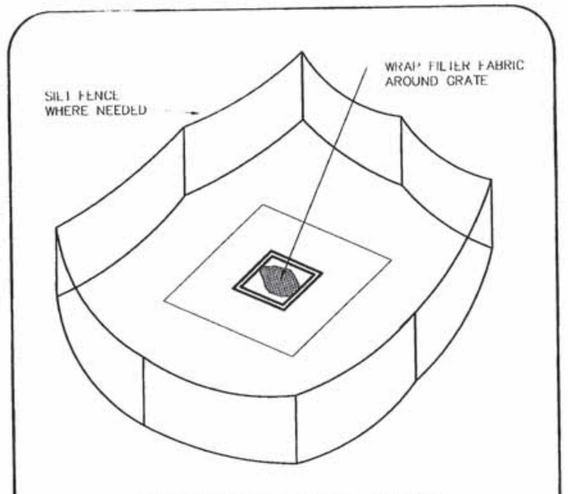
Existing 2-42" Pipes Connecting Pond M-1 to Pond M-2
Existing 2-42" Pipes Connecting Pond M-2 to Pond M-3
EXIST. POND
(SEE SHEET 16)
MITERED END SECTION (TYP.)
(36.57m) (1.07m) 2 - 120 LF, 42" RCP N. INV. 52.00 (15.85) S. INV. 51.00 (15.54)
LANSING ST.
SURVEY BASELINE (TYP.)
+68.00, 32' RT STRUCTURE M-1 F.D.O.T. TYPE J STRUCTURE (SEE SHEET 2 FOR DETAIL)
(60.96m) (1.07m) 2 - 200 LF, 42" RCP N. INV. 51.00 (15.54) S. INV. 50.00 (15.24)
TYPICAL POND SECTION
WATER LEVEL 53.00 (16.2)
AVENUE B
UNION ST.
AVENUE D
TRACY ST.
NASH ST.
(1.83m) 6' HIGH CHAIN LINK FENCE (TYP.)
(26.82m) (1.07m) 2 - 88 LF, 42" RCP WITH MITERED END SECTION (F.D.O.T. INDEX 272 - TYP.) N. INV. 53.00 (16.15) S. INV. 52.80 (16.09)
(53.64m) (1.07m) 2 - 176 LF, 42" RCP INV. 48.00 (14.63)
SCALE 1"=50'
NOTES:
1. SEE RIGHT-OF-WAY MAPS FOR BEARINGS AND DISTANCES ON RIGHT-OF-WAY LINES.
2. FOR ADDITIONAL REFERENCE TIES, SEE SHEET 2
LIMIT OF SOD
MAINTENANCE BERM
CWL 53.0
TYPICAL SECTION POND M-1
N.T.S.
REFERENCE TIE #21
LANSING ST. / UNION ST.
BENCH MARK # 11 ELEV. 62.86 (19.16)
SET NAIL ON EAST SIDE OF POWER POLE AT W. SIDE OF TRACY ST.
RECEIVED FEB 08 1996 4-095-0302AG-M3 RECORDS ORLANDO SJR WMD
BJM ASSOCIATES, INC.
506 WYMORE ROAD, WINTER PARK, FLORIDA 32789
ENGINEERS * LAND PLANNERS * SURVEYORS
PH# (407) 645-5566 FAX# (407) 629-5389
DESIGNED BY: H.N.N.
DRAWN BY:
CHECKED BY:
APPROVED BY: B.J.M.
BITHLO - CHRISTMAS
PROPOSED POND
PROJECT NUMBER 9436
DATE: 6-27-95
SCALE: 1"=50'
SHT. 16 OF 31

K-1

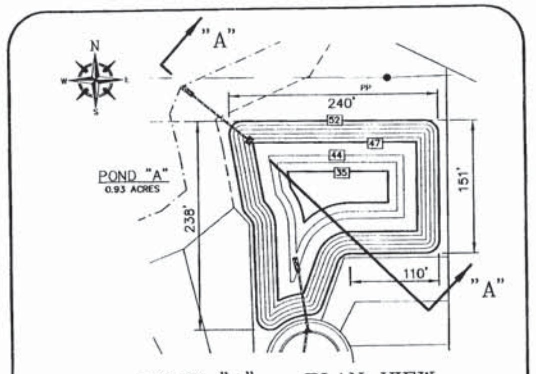
Appendix: L

Excerpt from Harling Locklin & Associates, Inc.
Waterford Trails Plans & Avalon Park Blvd

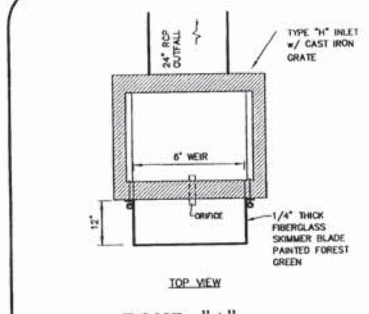

COLONIAL AVENUE (STATE ROAD 50)
FILL PLACEMENT
ALL FILL PLACED FOR POND BERMING SHALL BE FREE OF ORGANICS, NON-PLASTIC GRANULAR SOIL (CLEAN SANDS). FILL SHALL BE PLACED IN MAX. OF 12" LIFTS AND COMPACTED TO A MINIMUM 95% per ASTM SPEC D-1557. TO OBTAIN BERM STABILITY, CLAY CORES MAY BE REQUIRED. TO BE DETERMINED DURING CONSTRUCTION.
LEGEND
EXISTING GRADE
PROPOSED GRADE
SOIL BORING
WETLAND LIMITS
STORM SEWER PIPE
N
S
E
W
100' FLORIDA POWER CORP. ESMT.
WETLAND #1D
WETLAND #1
WETLAND #1B
WETLAND #2
WETLAND #3
WETLAND #1A
WETLAND #8
WETLAND #13
WETLAND #14
WETLAND #9
WETLAND #10
WETLAND #11
WETLAND #12
Used for 100-yr EL flood stage for CD-5 & CD-6, not used as TW
OREGON AVENUE
OLD CHENEY HIGHWAY
SUNFLOWER TRAIL
SEAWARD ST.
POND 'J'
POND 'K'
POND 'G'
POND 'H'
POND 'I'
POND 'D'
POND 'E'
POND 'F'
MASTER DRAINAGE PLAN
WATERFORD TRAILS
EAST VILLAGE - PHASE I
ORANGE COUNTY, FLORIDA
HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS PLANNERS • SURVEYORS
850 COURTLAND STREET
ORLANDO, FLORIDA 32804
phone: (407) 629-1061
fax: (407) 629-2865
JOB NO.: 9971
DESIGN BY: HLA
DRAWN BY: DRW
SCALE HOR.: 1"= 200'
SCALE VER.: N.T.S.
FILE: 9971DRA (PAL B)
DATE: FEBRUARY 2001
SHEET 8 OF 39
REVISIONS
NO.
DATE
MAR 07 2001
ORLANDO SJR WMD



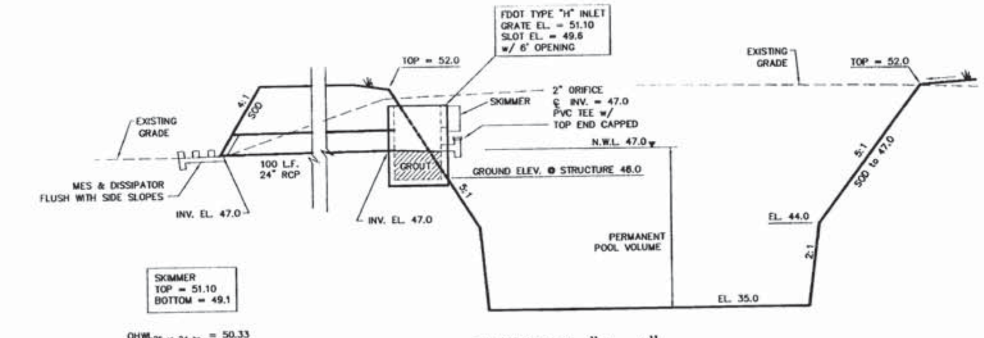
INLET PROTECTION DETAIL
N.T.S.



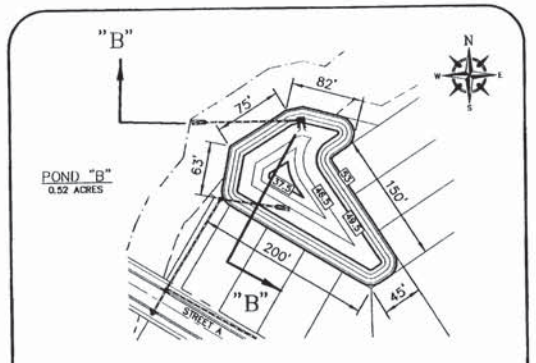
POND "A" – PLAN VIEW
SCALE: 1" = 100'



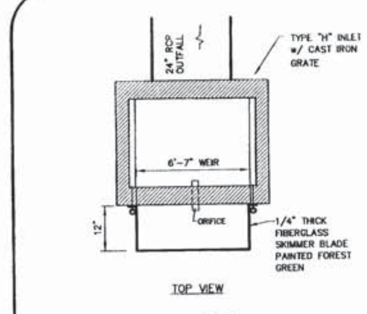
POND "A"
MODIFIED TYPE "H" INLET
N.T.S.



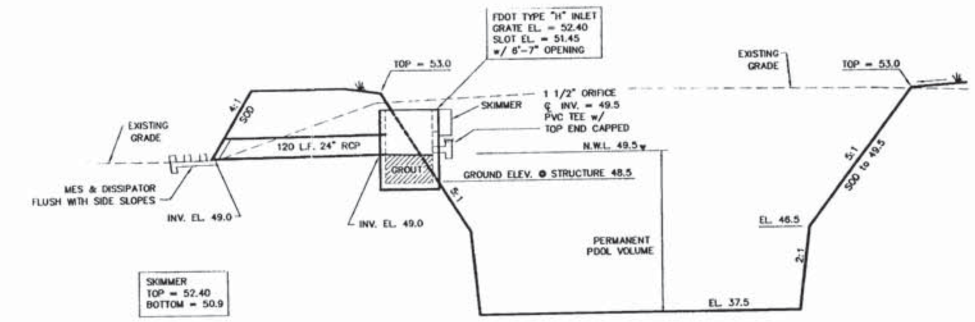
SECTION "A–A"
N.T.S.



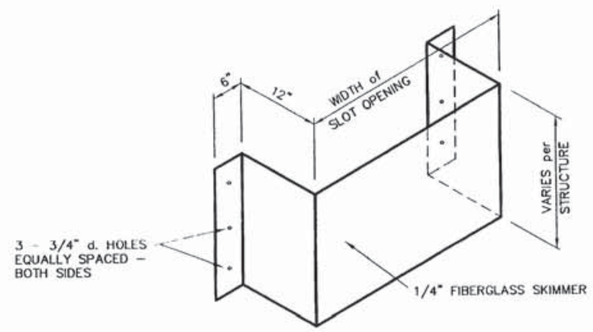
POND "B" – PLAN VIEW
SCALE: 1" = 100'



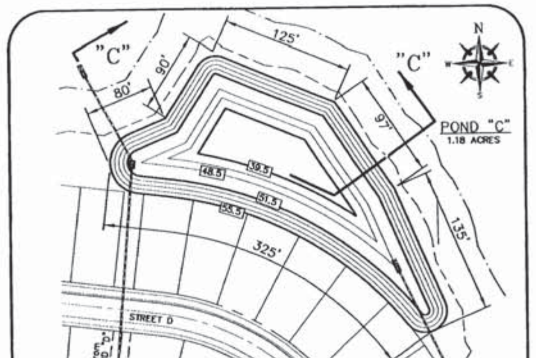
POND "B"
MODIFIED TYPE "H" INLET
N.T.S.



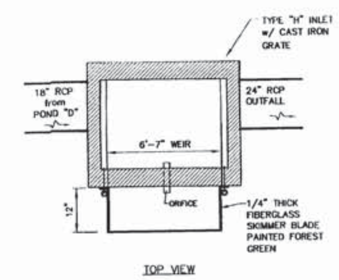
SECTION "B–B"
N.T.S.



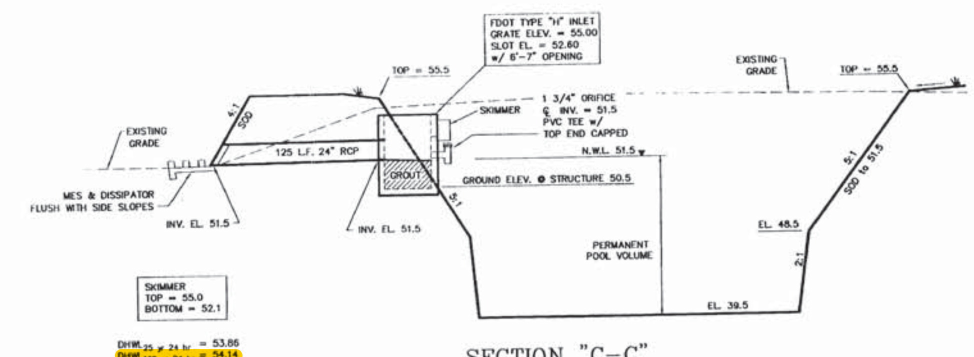
SKIMMER DETAIL
N.T.S.



POND "C" – PLAN VIEW
SCALE: 1" = 100'

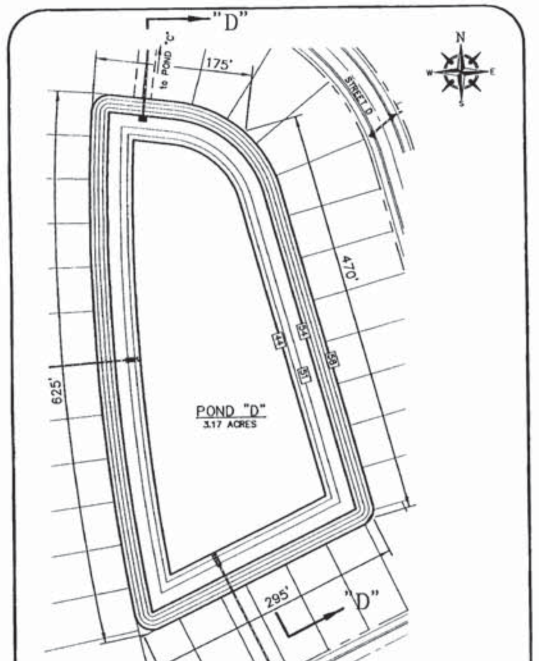


POND "C"
MODIFIED TYPE "H" INLET
N.T.S.

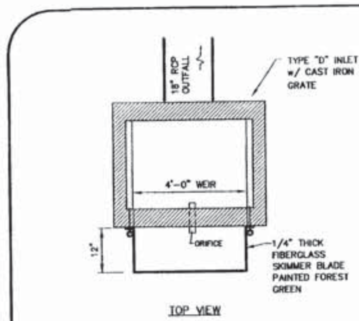


SECTION "C–C"

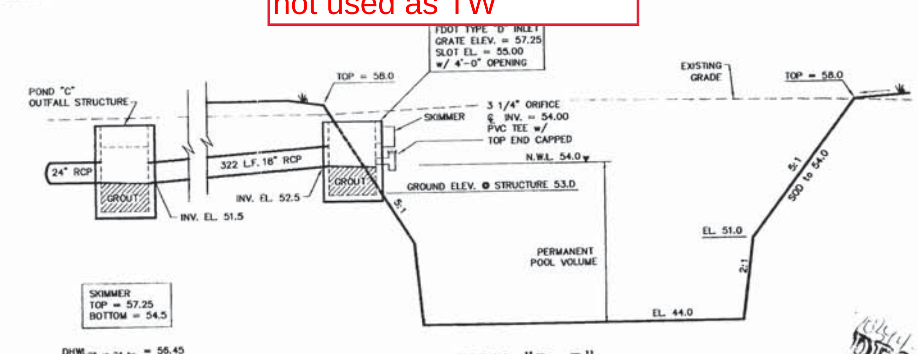
Used for 100-yr EL flood stage for CD-5 & CD-6, not used as TW



POND "D" – PLAN VIEW
SCALE: 1" = 100'



POND "D"
MODIFIED TYPE "D" INLET
N.T.S.



SECTION "D–D"
N.T.S.

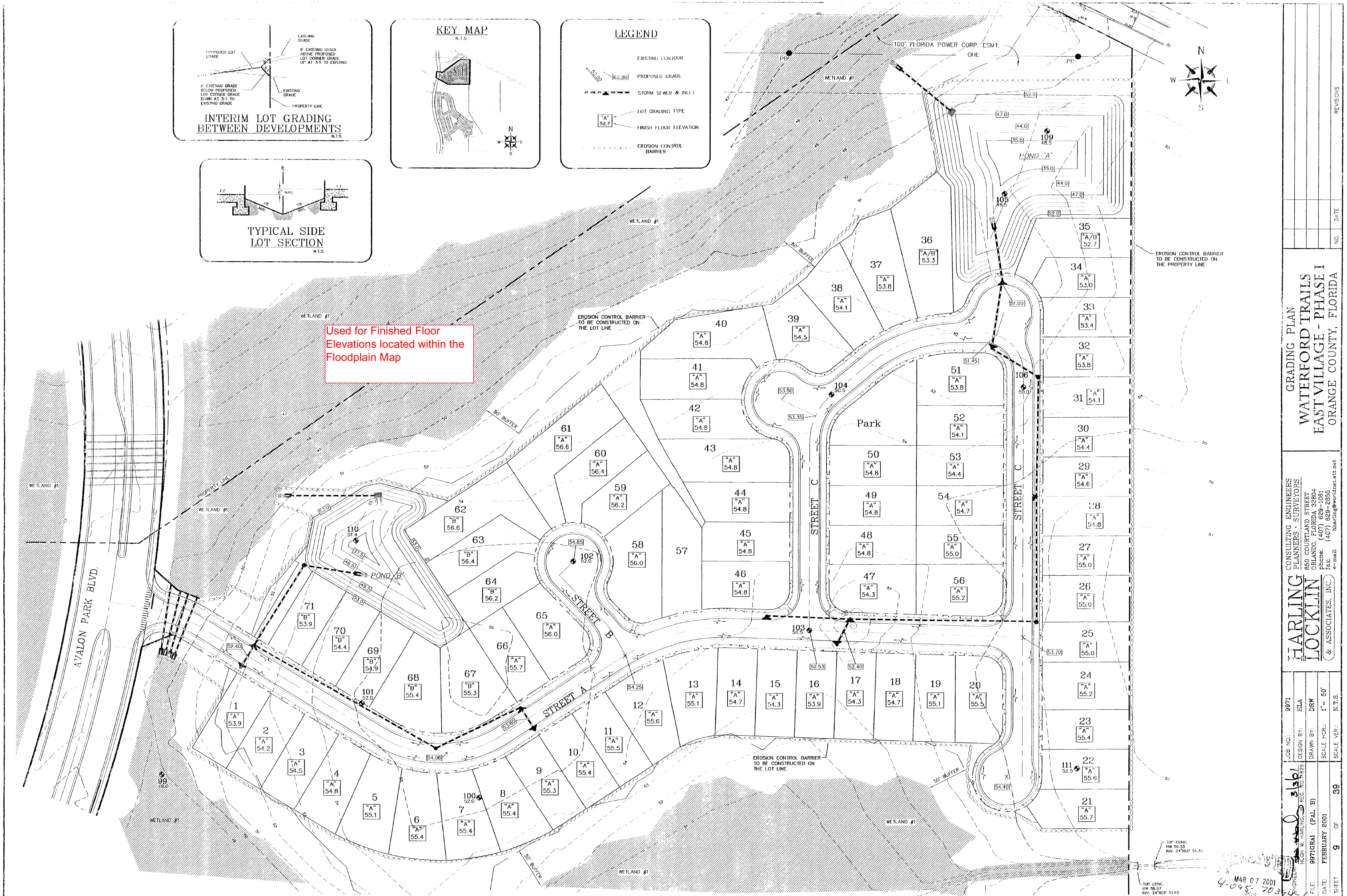
STORMWATER DETAIL SHEET
WATERFORD TRAILS
EAST VILLAGE – PHASE I
ORANGE COUNTY, FLORIDA

NO.	DATE	REVISIONS
1	5-1-01	REVISED PER SJRWMD COMMENTS (4-4-01)

HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS
PLANNERS • SURVEYORS
850 COURTLAND STREET
ORLANDO, FLORIDA 32804
phone: (407) 629-1061
fax: (407) 629-2855
e-mail: hharling@worldnet.att.net

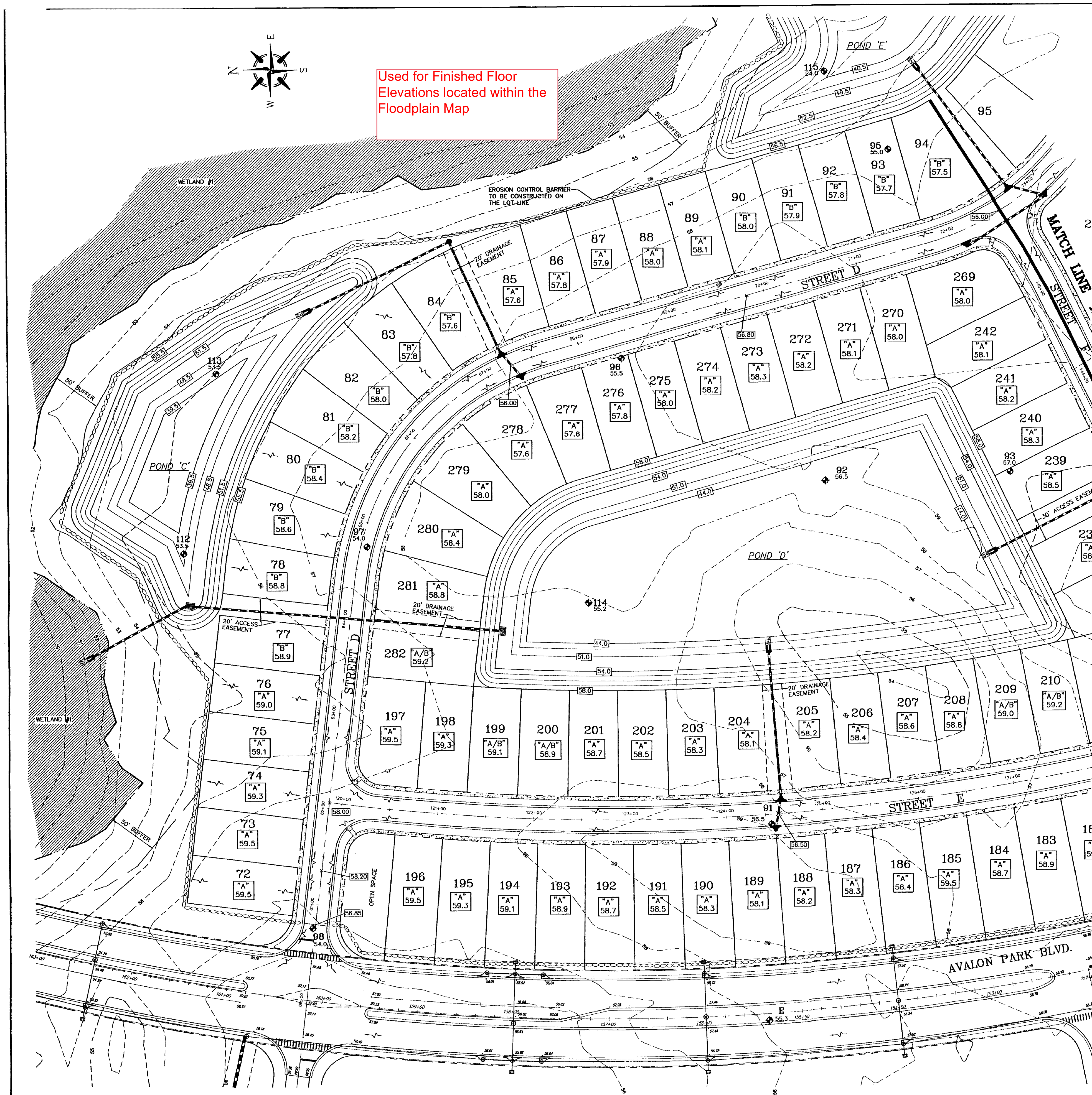
JOB NO.:	9971
DESIGN BY:	HLA
DRAWN BY:	DRW
SCALE HOR.:	N.T.S.
SCALE VER.:	N.T.S.
ENGINEER:	HUGH W. HARLING, JR. REG. NO. 11629
FILE:	9971DET1
DATE:	JANUARY 2001
SHEET:	34 OF 44

RECEIVED
2001
SJRWMD



Used for Finished Floor Elevations located within the Floodplain Map
INTERIM LOT GRADING BETWEEN DEVELOPMENTS
N.T.S.
KEY MAP
N.T.S.
LEGEND
EXISTING CONTOUR
PROPOSED GRADE
STORM SEWER & INLET
LOT GRADING TYPE
FINISH FLOOR ELEVATION
EROSION CONTROL BARRIER
TYPICAL SIDE LOT SECTION
N.T.S.
100' FLORIDA POWER CORP. ESMT.
OHE
WETLAND #1
POND "A"
POND "B"
50' BUFFER
PROPERTY LINE
EROSION CONTROL BARRIER TO BE CONSTRUCTED ON THE LOT LINE
EROSION CONTROL BARRIER TO BE CONSTRUCTED ON THE PROPERTY LINE
AVALON PARK BLVD.
STREET A
STREET B
STREET C
Park
GRADING PLAN
WATERFORD TRAILS EAST VILLAGE - PHASE I
ORANGE COUNTY, FLORIDA
HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS PLANNERS · SURVEYORS
850 COURTLAND STREET
ORLANDO, FLORIDA 32804
phone: (407) 629-1061
fax: (407) 629-2855
JOB NO.: 9971
DESIGN BY: HLA
DRAWN BY: DRW
SCALE HOR.: 1" = 50'
SCALE VER.: N.T.S.
FILE: 9971GRA1 (PAL B)
DATE: FEBRUARY 2001
SHEET 9 OF 39
REVISIONS
NO. DATE
MAR 07 2001

Used for Finished Floor Elevations located within the Floodplain Map



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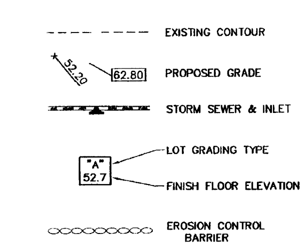
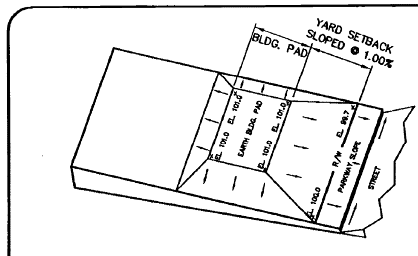
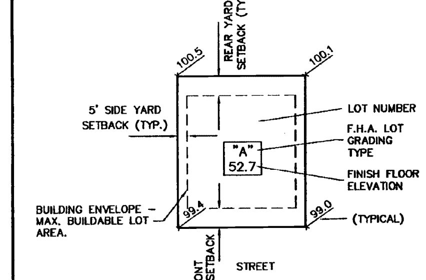


TYPICAL MASS LOT GRADING





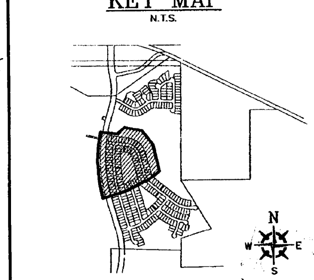
TYPICAL LOT GRADING

GENERAL NOTES:

1. ALL FINISH FLOOR ELEVATIONS SHALL BE A MINIMUM OF 6" ABOVE THE HIGHEST GRADE ADJACENT TO BUILDING PAD. FLOOR ELEVATIONS SHOWN ARE BASED ON THE MINIMUM FRONT SETBACK. ALL GRADING TYPE A & B LOT FINISH FLOORS SHALL BE AT LEAST 1.5 FT. ABOVE THE LOWEST ROAD CROWN ALONG LOT FRONTAGE.
2. DRIVEWAYS SHALL NOT EXCEED A SLOPE OF ±14%.
3. MEANDER SWALES AROUND SPECIMEN TREES AND LIMIT DISTURBANCE OF WETLAND VEGETATION TO A MINIMUM.
4. FINISHED FLOOR ELEVATION FOR GRADING TYPE C LOTS IS BASED ON A TWO PERCENT (2%) MINIMUM SLOPE ALONG SEWER SERVICE LATERALS AND AN ADDITIONAL ONE AND ONE HALF FOOT (1.5') FOR FOUNDATION THICKNESS AND PLUMBING STUBOUT.
5. IT WILL BE THE RESPONSIBILITY OF THE BUILDING CONTRACTOR TO INSURE THAT THE CONSTRUCTED SEWER SERVICE LATERAL STUBS CAN BE CONTINUED AT A MINIMUM TWO PERCENT (2%) SLOPE TO MEET THE FINISHED FLOOR ELEVATION CRITERIA FOR GRADING TYPE C LOTS AS DESCRIBED ABOVE. BEFORE ANY BUILDING CONSTRUCTION TAKES PLACE WITHIN A GRADING TYPE C LOT, THE CONTRACTOR MUST VERIFY THE AS-BUILT ELEVATION OF THE CONSTRUCTED SEWER SERVICE LATERAL.
6. THE BUILDING ENVELOPE SHOWN IS THE MAXIMUM AREA ON WHICH A BUILDING CAN COVER FOR EACH LOT. THE BUILDER SHOULD BE SURE TO CHECK LOT SETBACKS FOR EACH BUILDING PRIOR TO CONSTRUCTION.

KEY MAP

N.T.S.



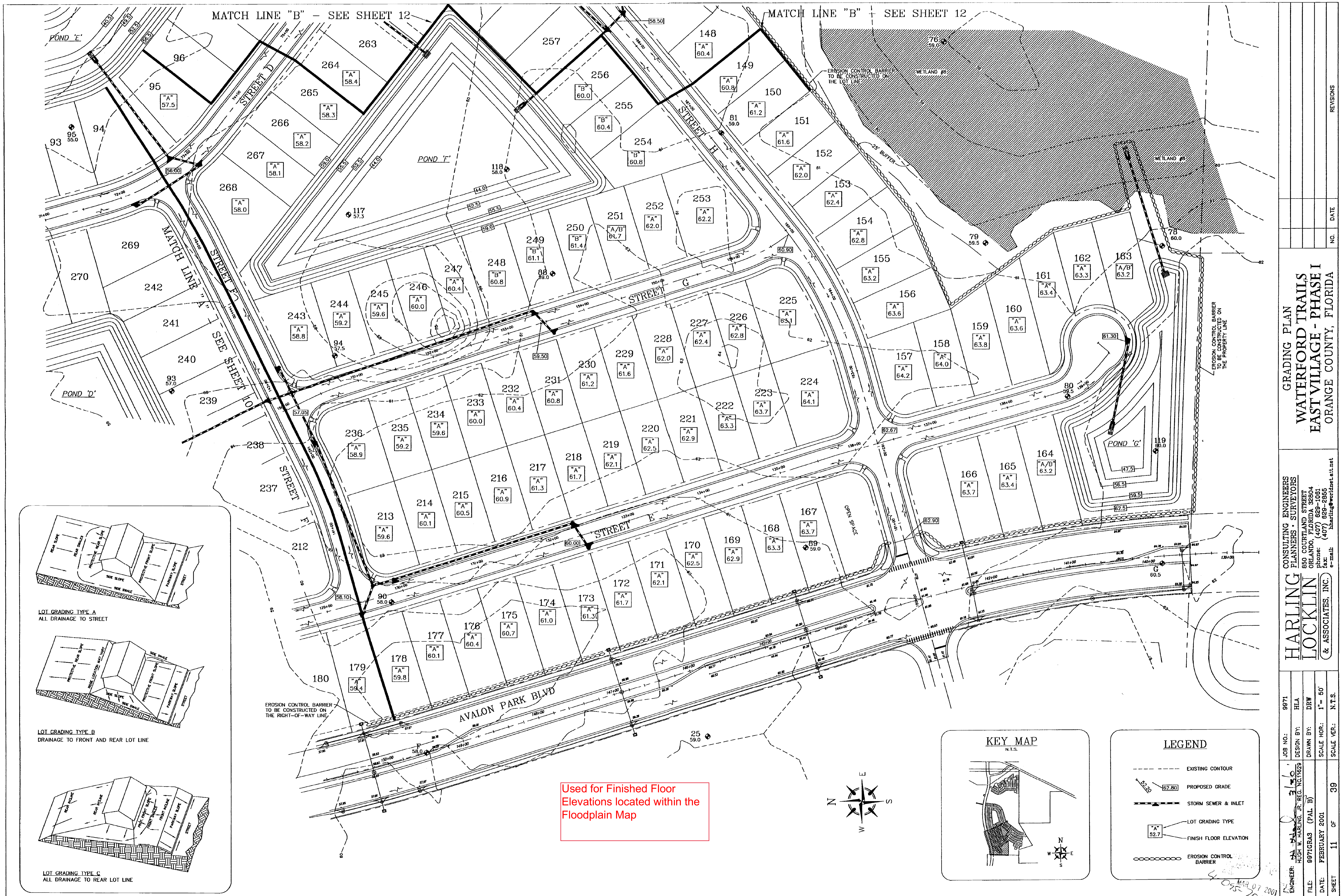
NO.	DATE
REVISIONS	

GRADING PLAN
WATERFORD TRAILS
EAST VILLAGE - PHASE I
ORANGE COUNTY, FLORIDA

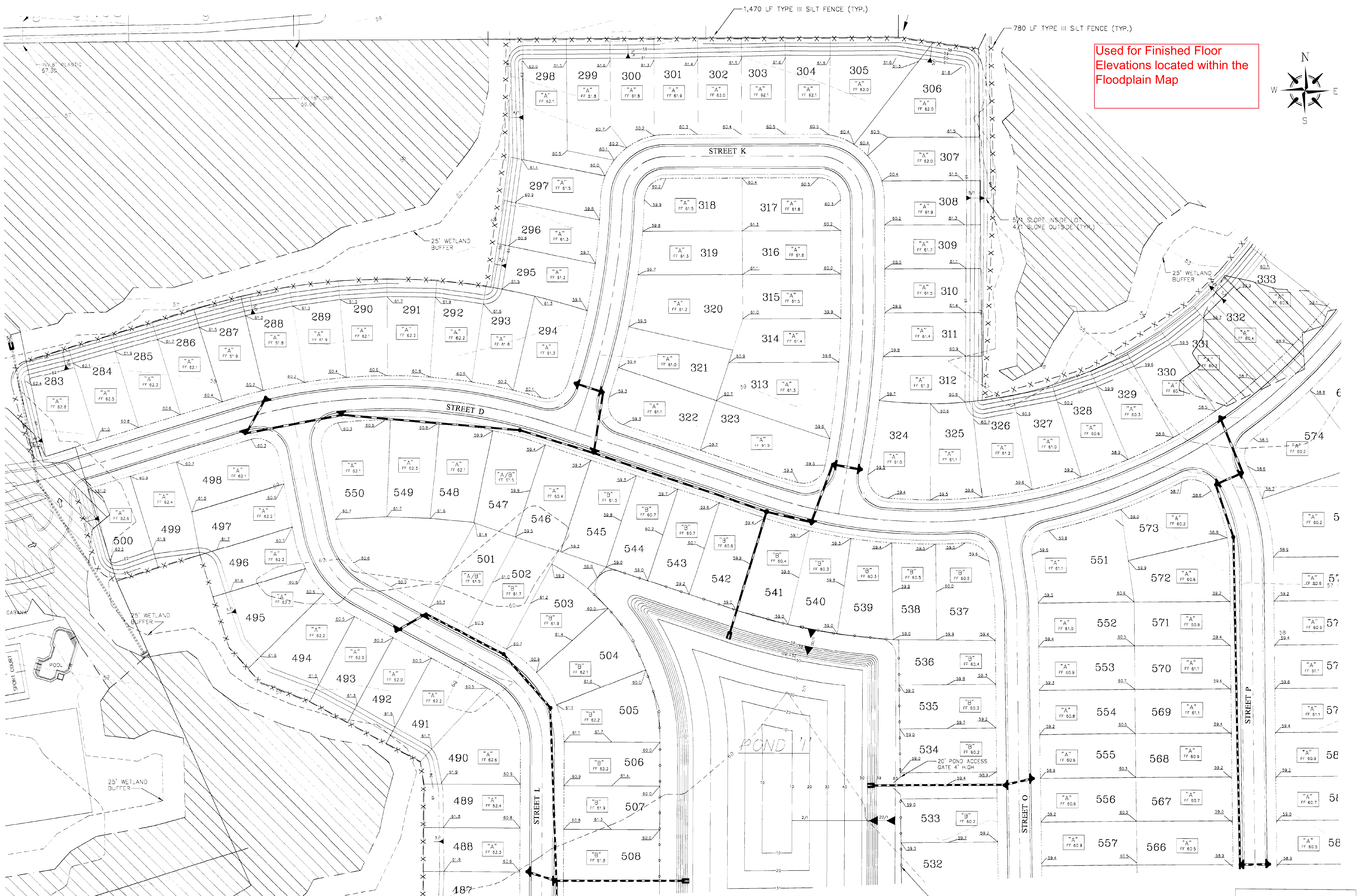
HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS
PLANNERS · SURVEYORS
850 COURTLAND STREET
ORLANDO, FLORIDA 32804
phone: (407) 629-1061
fax: (407) 629-2855
e-mail: hharling@worldnet.att.net

JOB NO.:	9971
DESIGN BY:	HLA
DRAWN BY:	DRW
SCALE HOR.:	1" = 50'
SCALE VER.:	N.T.S.

ENGINEER: 3/5/01 HUGH W. HARLING, JR. REG. NO. 11629
FILE: 9971GRA2 (PAL B)
DATE: FEBRUARY 2001
SHEET 10 OF 39



MATCH LINE "B" - SEE SHEET 12
MATCH LINE "A" - SEE SHEET 10
POND 'E'
POND 'F'
POND 'D'
POND 'G'
STREET D
STREET E
STREET F
STREET G
STREET H
AVALON PARK BLVD
OPEN SPACE
WETLAND #8
25' BUFFER
EROSION CONTROL BARRIER TO BE CONSTRUCTED ON THE LOT LINE
EROSION CONTROL BARRIER TO BE CONSTRUCTED ON THE PROPERTY LINE
EROSION CONTROL BARRIER TO BE CONSTRUCTED ON THE RIGHT-OF-WAY LINE
LOT GRADING TYPE A
ALL DRAINAGE TO STREET
LOT GRADING TYPE B
DRAINAGE TO FRONT AND REAR LOT LINE
LOT GRADING TYPE C
ALL DRAINAGE TO REAR LOT LINE
KEY MAP
N.T.S.
LEGEND
EXISTING CONTOUR
PROPOSED GRADE
STORM SEWER & INLET
LOT GRADING TYPE
FINISH FLOOR ELEVATION
EROSION CONTROL BARRIER
Used for Finished Floor Elevations located within the Floodplain Map
GRADING PLAN
WATERFORD TRAILS
EAST VILLAGE - PHASE I
ORANGE COUNTY, FLORIDA
HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS
PLANNERS • SURVEYORS
850 COURTLAND STREET
ORLANDO, FLORIDA 32804
phone: (407) 629-1061
fax: (407) 629-2865
e-mail: harling@worldnet.att.net
JOB NO.: 9971
DESIGN BY: HLA
DRAWN BY: DRW
SCALE HOR.: 1"= 50'
SCALE VER.: N.T.S.
ENGINEER: HUGH W. HARLING, JR. REG. NO.19829
FILE: 9971GRA3 (PAL B)
DATE: FEBRUARY 2001
SHEET 11 OF 39
REVISIONS
NO. DATE



SILT FENCE NOTES:

1. ALL SILT FENCING TO BE INSTALLED IMMEDIATELY AFTER LAND CLEARING OPERATION AND PRIOR TO RETENTION POND EXCAVATION.
2. CONTRACTOR TO DEVELOP POND DE-WATERING PLANS SUFFICIENT TO MEET STATE WATER QUALITY STANDARDS AT ALL DISCHARGE POINTS FROM SITE. DE-WATERING PLANS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO ANY DE-WATERING ACTIVITIES.

NOTE:
ALL LOTS DESIGNED FOR A MINIMUM 1% SIDE LOT SWALE GRADE

70394-2

RECEIVED
OCT 25 2002
PDS
ALTAMONTE SVC. CTR

Lot Grading Plan

Waterford Trails - Phase II
Orange County, Florida

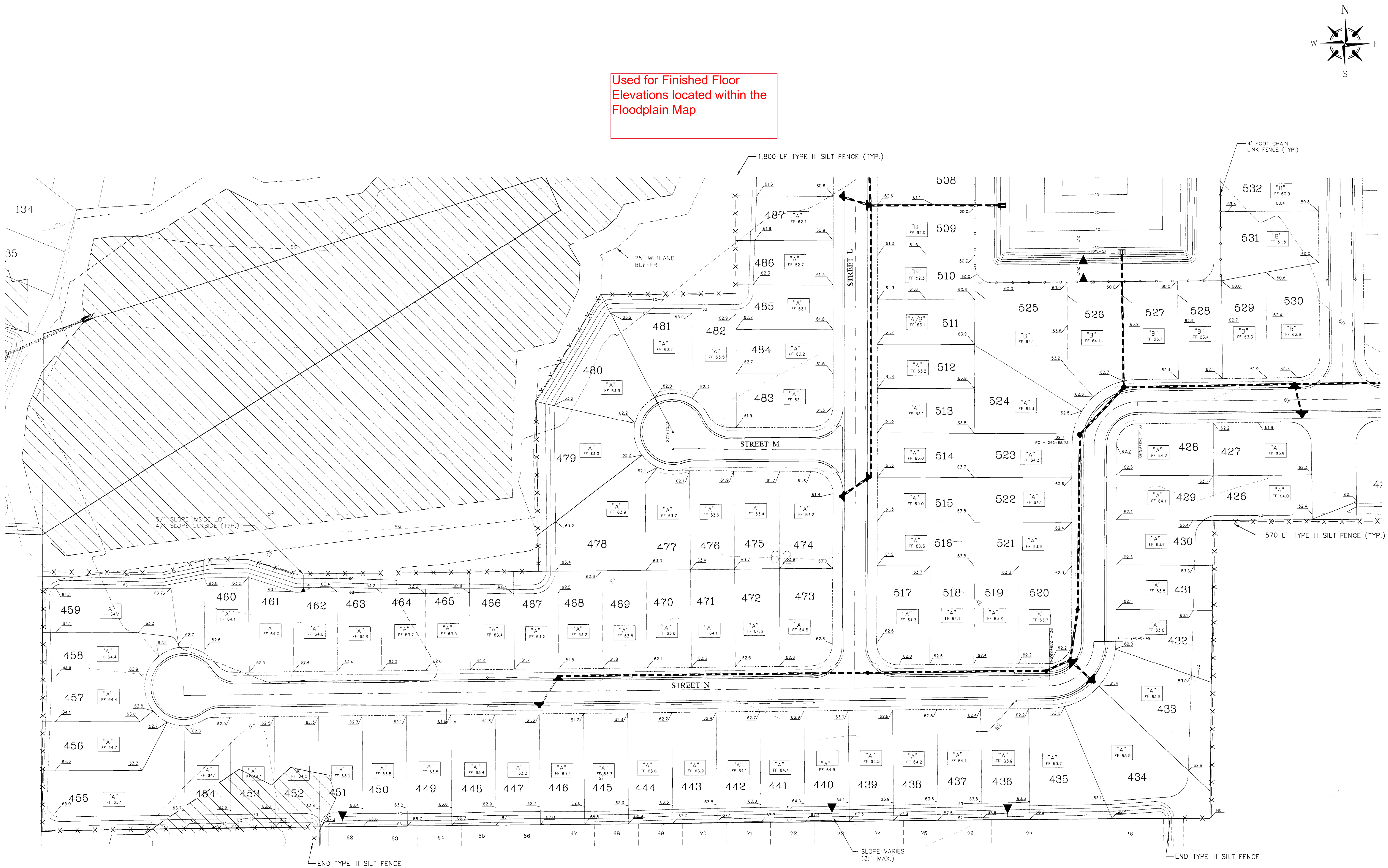
HARLING LOCKLIN (& ASSOCIATES, INC.)
Consulting Engineers • Planners • Surveyors
850 Courtland Street Orlando, Florida 32804
Phone: 407-629-1061
Fax: 407-629-2855
E-mail: hharling@worldnet.att.net

Drawn by:	AJR
Designed by:	WF
Filename:	9971BaseP2
xrefs:	
Engineer:	Hugh W. Harling, Jr. P.E. No.11629
Job Number:	9971
Scale:	1"=50'
Date:	August 06, 2002

No.	Date	Revisions	Rev. by

10/25/02

Used for Finished Floor Elevations located within the Floodplain Map



NOTE:
ALL LOTS DESIGNED FOR A MINIMUM 1% SIDE LOT SWALE GRADE

70394-2

RECEIVED
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Rev. by
Date
No.
Revisions

HARLING LOCKLIN & ASSOCIATES, INC.
Consulting Engineers - Planners - Surveyors
850 Courtland Street Orlando, Florida 32804
Phone: 407-629-1061
Fax: 407-629-2855
E-mail: hlastaff@worldnet.att.net

Lot Grading Plan

Waterford Trails - Phase II

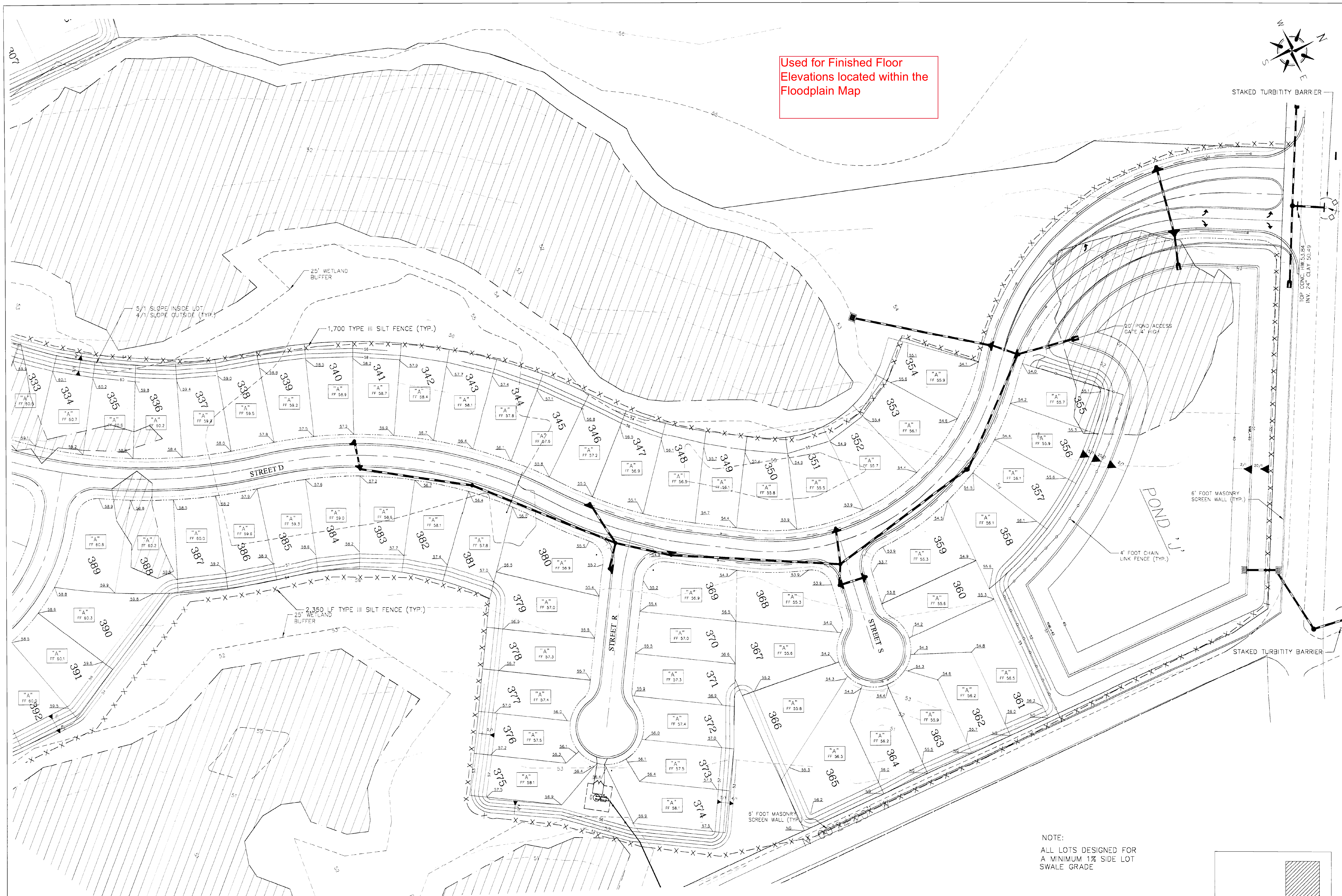
Orange County, Florida

Drawn by: AJR
Designed by: WF
Filename: 9971BaseP2
xref's:

Engineer: Hugh W. Harling, Jr. P.E. No.11629
Job Number: 9971
Scale: 1"=50'
Date: August 06, 2002

Sheet 10 of 34

Used for Finished Floor Elevations located within the Floodplain Map



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ALTAMONTE SVC. CTR.

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Lot Grading Plan

Waterford Trails - Phase II

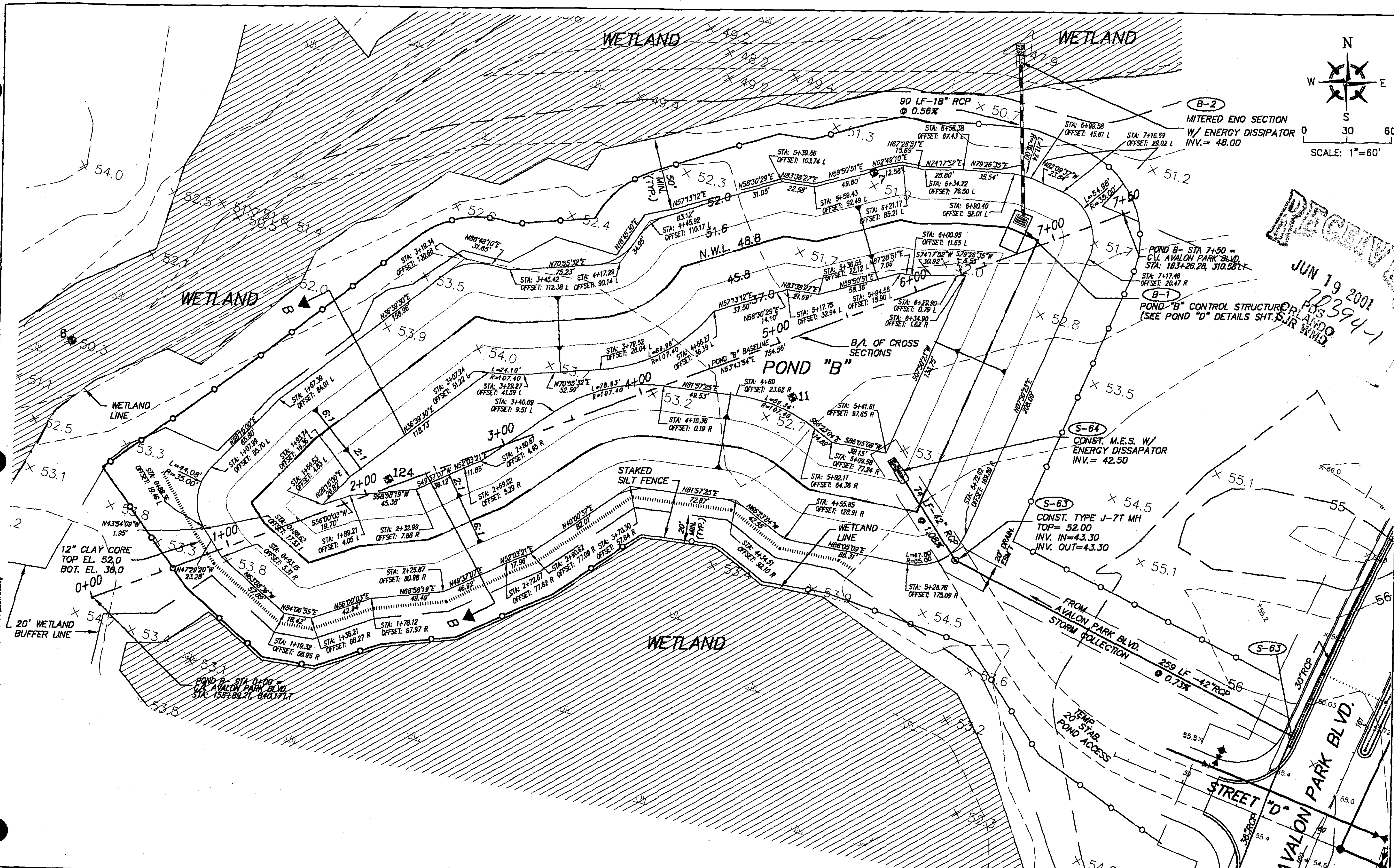
Orange County, Florida

HARLING LOCKLIN
& ASSOCIATES, INC.
Consulting Engineers-Planners-Surveyors
850 Courtland Street Orlando, Florida 32804
Phone: 407-629-1061
Fax: 407-629-2855
E-mail: hlarling@worldnet.att.net

Engineer: Hugh W. Harling, Jr. P.E. No. 11629
Job Number: 9971
Scale: 1"=50'
Date: August 06, 2002
Drawn by: AJR
Designed by: WF
Filename: 9971Base02
xref's:

No. | Date | Revisions | Rev by

Sheet: 11 of 34



DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

Plotted: Jun 07, 2001 - 10:48am

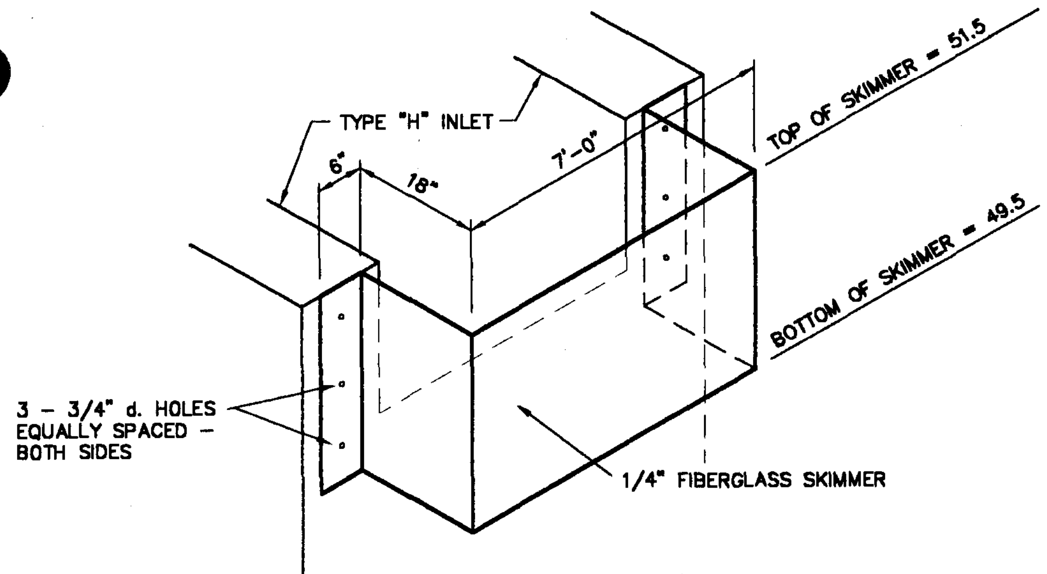
	NAME	DATE		NAME	DATE
DESIGNED BY	ADD	2/01	DESIGNED BY		
CHECKED BY	PC	2/01	CHECKED BY		
SUPERVISED BY:	HLH				

HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS · PLANNERS · SURVEYORS
850 COURTLAND STREET ORLANDO, FLORIDA 32804 PHONE: (407) 629-1061

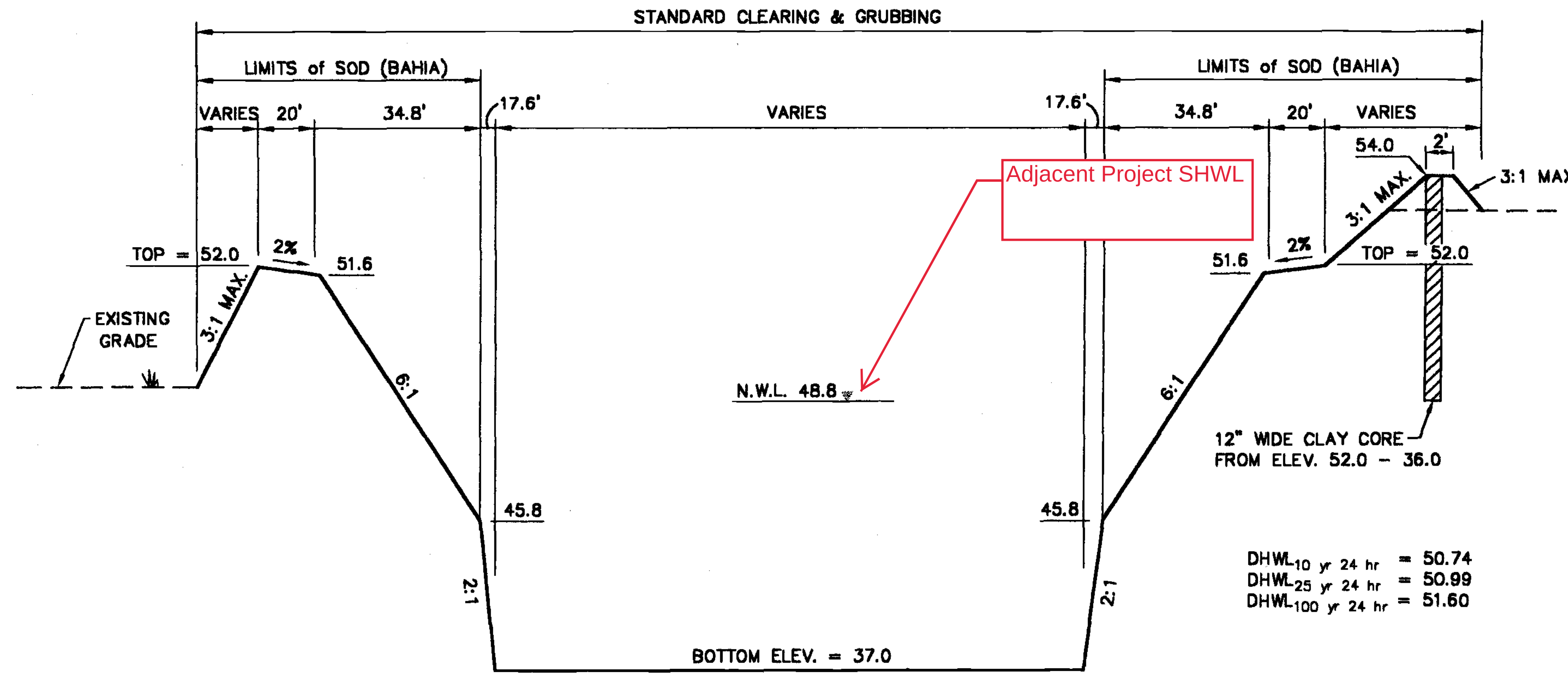
ORANGE COUNTY, FLORIDA
AVALON PARK BOULEVARD
POND "B" PLAN

SHEET 39 OF 133

90% SUBMITTAL 5-29-01

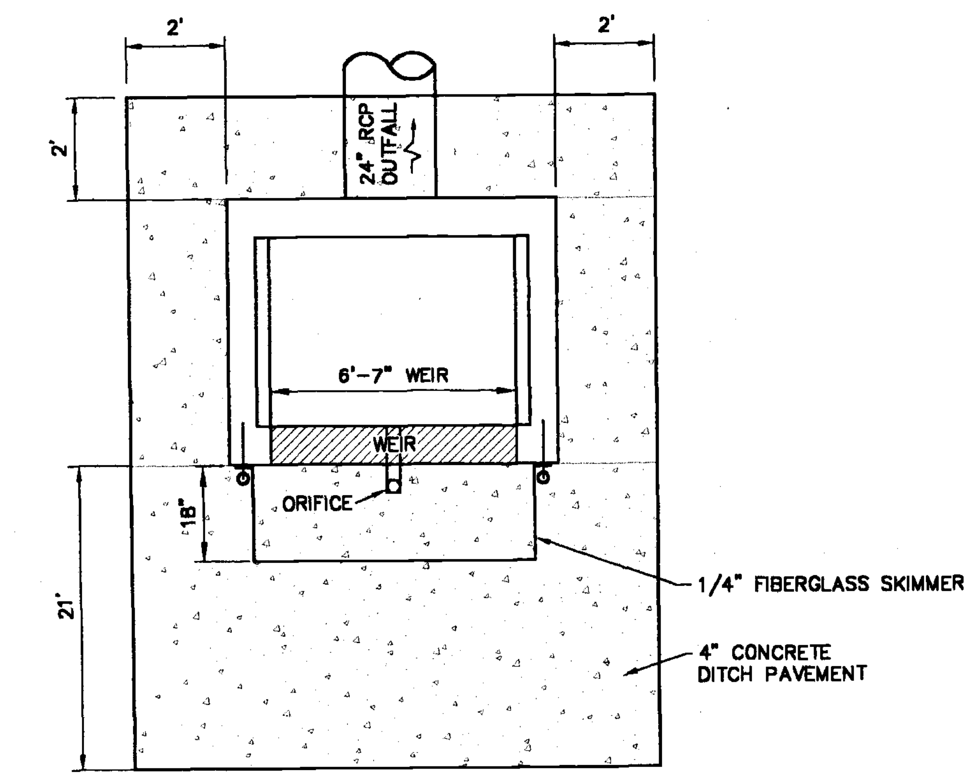


SKIMMER DETAIL

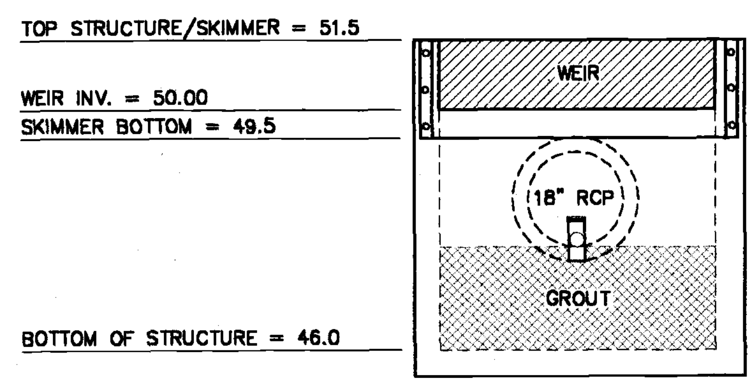


TYPICAL POND SECTION

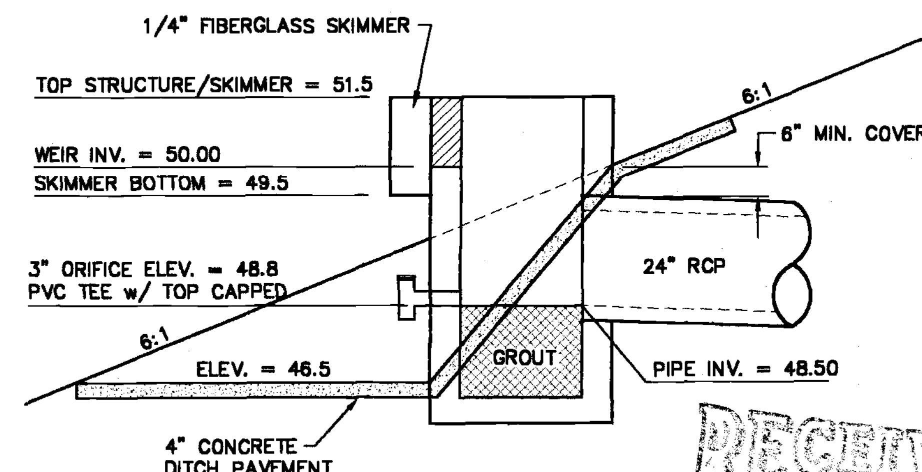
SECTION "B-B"



TOP VIEW



FRONT VIEW



SIDE VIEW

MODIFIED TYPE "H" INLET OUTFALL STRUCTURE

POND "B" (B-1)

RECEIVED
70394-1
JUN 19 2001
PDS
ORLANDO
SJR WMD

Plotted: May 23, 2001 - 7:46pm

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

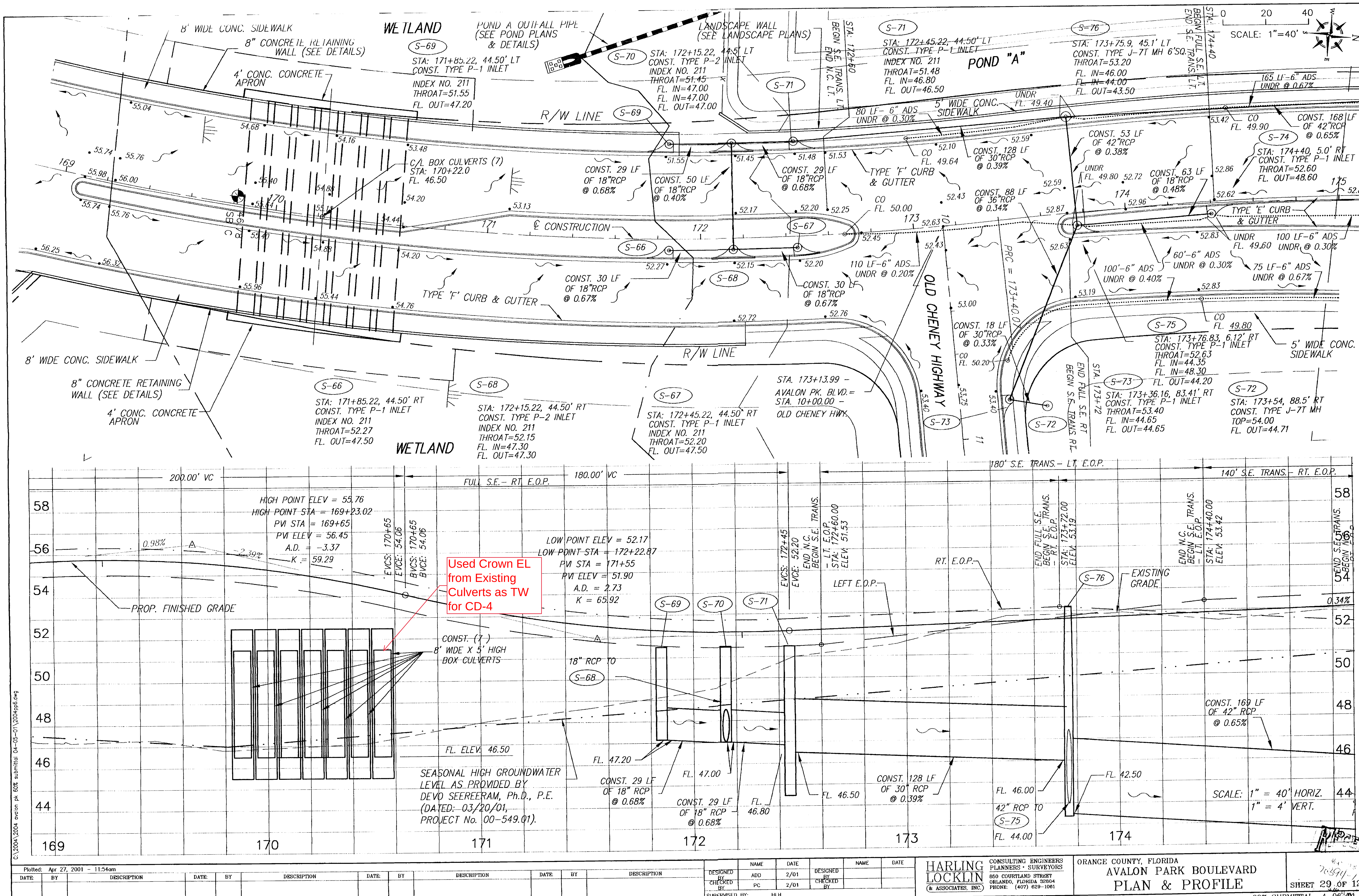
	NAME	DATE		NAME	DATE
DESIGNED BY	ADD	2/01	DESIGNED BY		
CHECKED BY	PC	2/01	CHECKED BY		
SUPERVISED BY:	HLH				

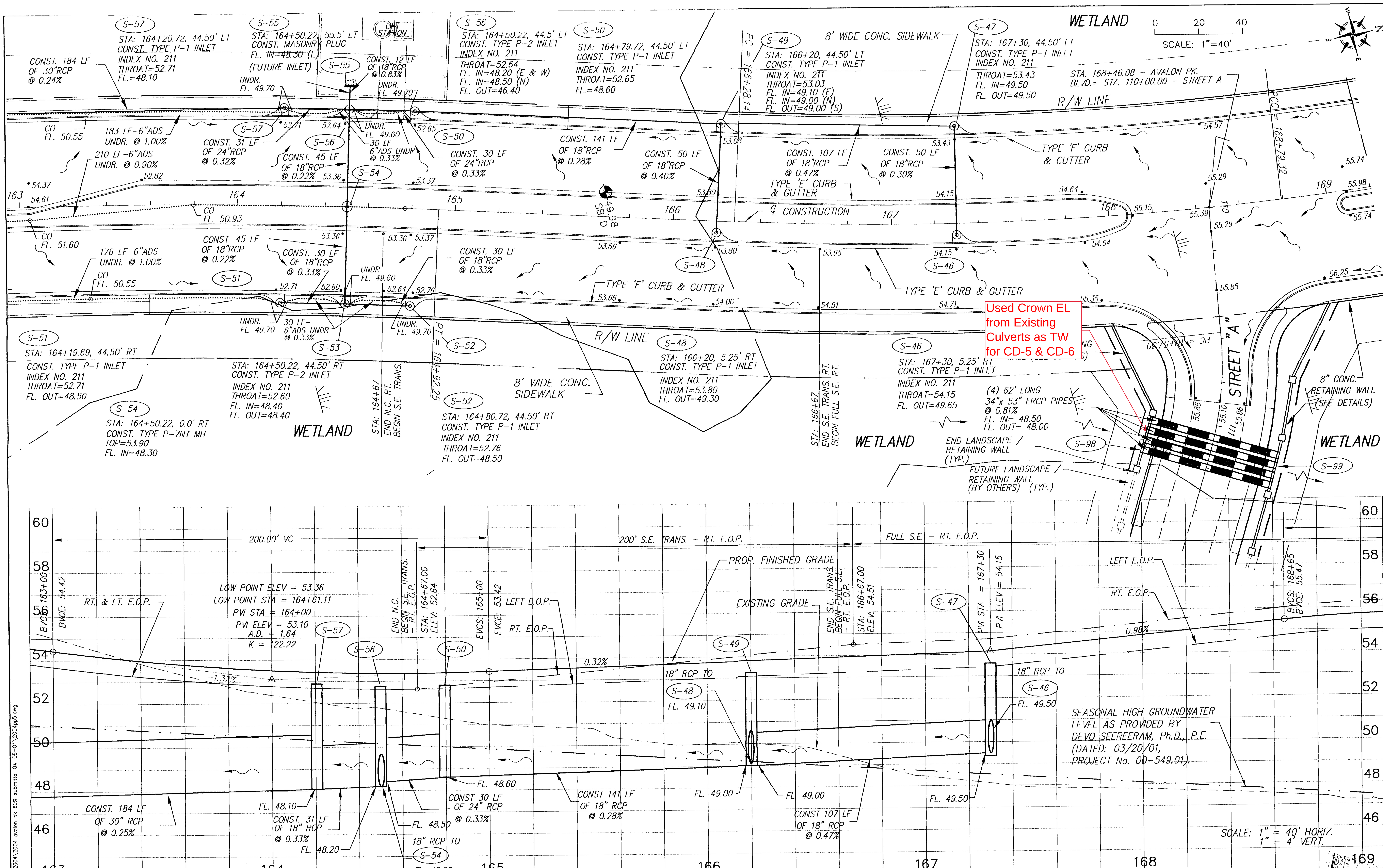
HARLING LOCKLIN & ASSOCIATES, INC. CONSULTING ENGINEERS PLANNERS - SURVEYORS 850 COURTLAND STREET ORLANDO, FLORIDA 32804 PHONE: (407) 629-1061

ORANGE COUNTY, FLORIDA
AVALON PARK BOULEVARD
POND "B" DETAILS

SHEET 40 OF 121

60% SUBMITTAL 4-06-01


WETLAND
8' WIDE CONC. SIDEWALK
8" CONCRETE RETAINING WALL (SEE DETAILS)
4' CONC. CONCRETE APRON
POND A OUTFALL PIPE (SEE POND PLANS & DETAILS)
LANDSCAPE WALL (SEE LANDSCAPE PLANS)
POND "A"
R/W LINE
C/L BOX CULVERTS (7)
STA: 170+22.0
FL. 46.50
℄ CONSTRUCTION
TYPE 'F' CURB & GUTTER
TYPE 'E' CURB & GUTTER
5' WIDE CONC. SIDEWALK
OLD CHENEY HIGHWAY
S-66
STA: 171+85.22, 44.50' RT
CONST. TYPE P-1 INLET
INDEX NO. 211
THROAT=52.27
FL. OUT=47.50
S-67
STA: 172+45.22, 44.50' RT
CONST. TYPE P-1 INLET
INDEX NO. 211
THROAT=52.20
FL. OUT=47.50
S-68
STA: 172+15.22, 44.50' RT
CONST. TYPE P-2 INLET
INDEX NO. 211
THROAT=52.15
FL. IN=47.30
FL. OUT=47.30
S-69
STA: 171+85.22, 44.50' LT
CONST. TYPE P-1 INLET
INDEX NO. 211
THROAT=51.55
FL. OUT=47.20
S-70
STA: 172+15.22, 44.5' LT
CONST. TYPE P-2 INLET
INDEX NO. 211
THROAT=51.45
FL. IN=47.00
FL. IN=47.00
FL. OUT=47.00
S-71
STA: 172+45.22, 44.50' LT
CONST. TYPE P-1 INLET
INDEX NO. 211
THROAT=51.48
FL. IN=46.80
FL. OUT=46.50
S-72
STA: 173+54, 88.5' RT
CONST. TYPE J-7T MH
TOP=54.00
FL. OUT=44.71
S-73
STA: 173+36.16, 83.41' RT
CONST. TYPE P-1 INLET
THROAT=53.40
FL. IN=44.65
FL. OUT=44.65
S-74
STA: 174+40, 5.0' RT
CONST. TYPE P-1 INLET
THROAT=52.60
FL. OUT=48.60
S-75
STA: 173+76.83, 6.12' RT
CONST. TYPE P-1 INLET
THROAT=52.63
FL. IN=44.35
FL. IN=48.30
FL. OUT=44.20
S-76
STA: 173+75.9, 45.1' LT
CONST. TYPE J-7T MH 6'SQ.
THROAT=53.20
FL. IN=46.00
FL. IN=44.00
FL. OUT=43.50
STA. 173+13.99 - AVALON PK. BLVD. = STA. 10+00.00 - OLD CHENEY HWY.
SCALE: 1"=40'
200.00' VC
180.00' VC
FULL S.E. - RT. E.O.P.
180' S.E. TRANS.- LT. E.O.P.
140' S.E. TRANS.- RT. E.O.P.
HIGH POINT ELEV = 55.76
HIGH POINT STA = 169+23.02
PVI STA = 169+65
PVI ELEV = 56.45
A.D. = -3.37
K = 59.29
LOW POINT ELEV = 52.17
LOW POINT STA = 172+22.87
PVI STA = 171+55
PVI ELEV = 51.90
A.D. = 2.73
K = 65.92
PROP. FINISHED GRADE
EXISTING GRADE
Used Crown EL from Existing Culverts as TW for CD-4
CONST. (7) 8' WIDE X 5' HIGH BOX CULVERTS
FL. ELEV. 46.50
SEASONAL HIGH GROUNDWATER LEVEL AS PROVIDED BY DEVO SEEREERAM, Ph.D., P.E. (DATED: 03/20/01, PROJECT No. 00-549.01).
CONST. 169 LF OF 42" RCP @ 0.65%
CONST. 128 LF OF 30" RCP @ 0.39%
SCALE: 1" = 40' HORIZ. 1" = 4' VERT.
HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS PLANNERS · SURVEYORS
850 COURTLAND STREET ORLANDO, FLORIDA 32804 PHONE: (407) 629-1061
ORANGE COUNTY, FLORIDA
AVALON PARK BOULEVARD
PLAN & PROFILE
SHEET 29 OF 121
60% SUBMITTAL 4-06-01
Plotted: Apr 27, 2001 - 11:54am



DESIGNED BY	ADD	2/01
CHECKED BY	PC	2/01
SUPERVISED BY:	HLH	

HARLING LOCKLIN & ASSOCIATES, INC.
CONSULTING ENGINEERS PLANNERS • SURVEYORS
850 COURTLAND STREET ORLANDO, FLORIDA 32804 PHONE: (407) 629-1061

ORANGE COUNTY, FLORIDA
AVALON PARK BOULEVARD
PLAN & PROFILE

SHEET 28 OF 121

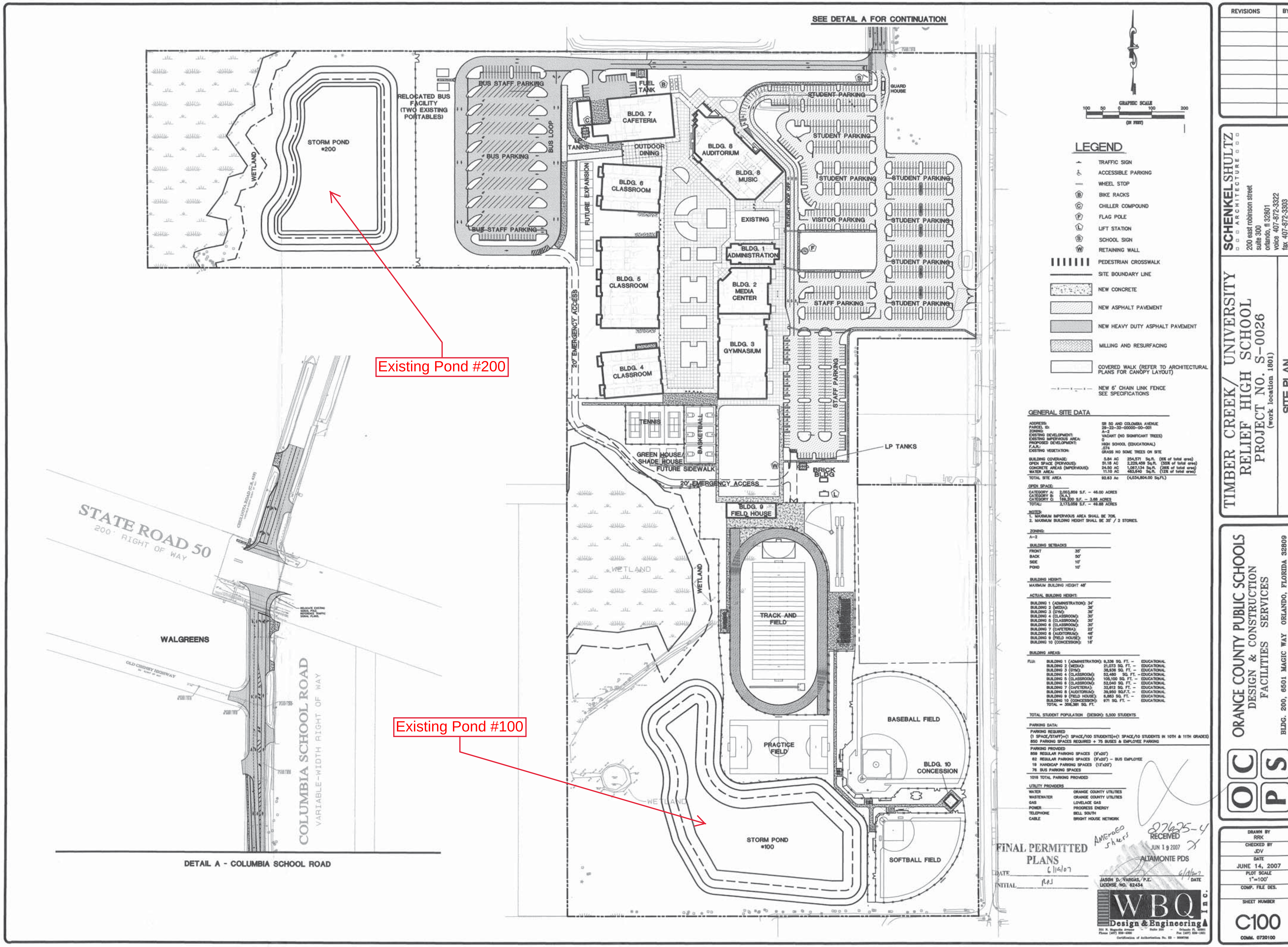
60% SUBMITTAL 4-06-01

Plotted: Apr 27, 2001 11:57am

Appendix: M

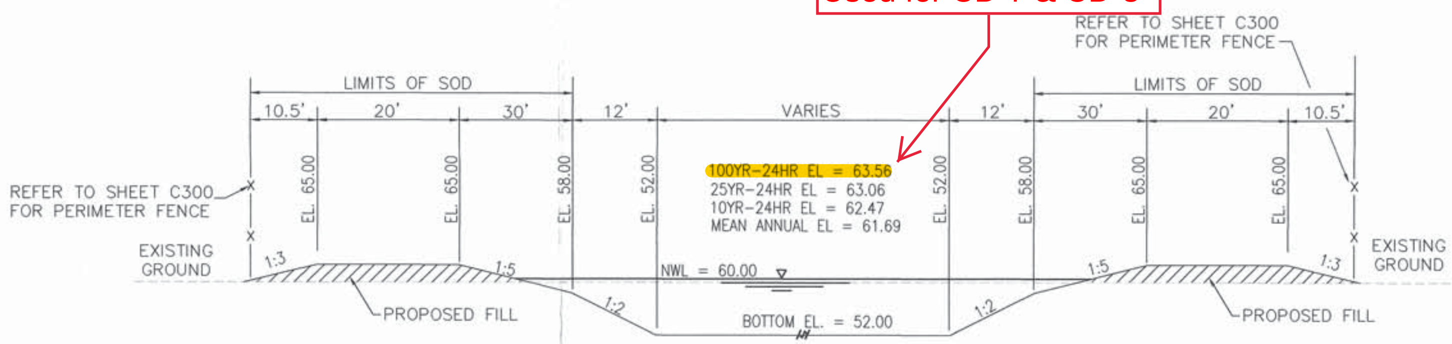
Excerpt from Orange County Public Schools

Timber Creek High School Construction Plans

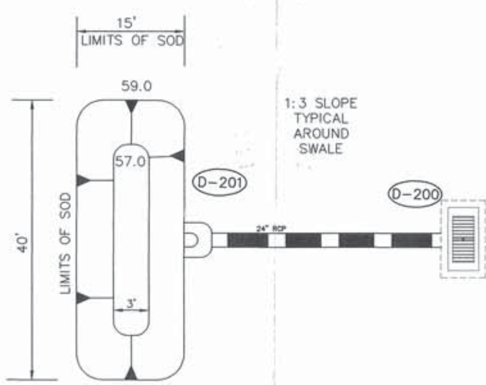

SEE DETAIL A FOR CONTINUATION
STORM POND #200
WETLAND
RELOCATED BUS FACILITY (TWO EXISTING PORTABLES)
BUS STAFF PARKING
BUS PARKING
BUS LOOP
LP TANKS
FUEL TANK
BLDG. 7 CAFETERIA
OUTDOOR DINING
BLDG. 8 AUDITORIUM
BLDG. 8 MUSIC
GUARD HOUSE
STUDENT PARKING
VISITOR PARKING
STAFF PARKING
BLDG. 6 CLASSROOM
BLDG. 5 CLASSROOM
BLDG. 4 CLASSROOM
FUTURE EXPANSION
EXISTING
BLDG. 1 ADMINISTRATION
BLDG. 2 MEDIA CENTER
BLDG. 3 GYMNASIUM
20' EMERGENCY ACCESS
TENNIS
BASKETBALL
GREEN HOUSE/ SHADE HOUSE
FUTURE SIDEWALK
LP TANKS
BRICK BLDG
BLDG. 9 FIELD HOUSE
WETLAND
TRACK AND FIELD
PRACTICE FIELD
BASEBALL FIELD
BLDG. 10 CONCESSION
SOFTBALL FIELD
STORM POND #100
Existing Pond #200
Existing Pond #100
STATE ROAD 50
200' RIGHT OF WAY
WALGREENS
COLUMBIA SCHOOL ROAD
VARIABLE-WIDTH RIGHT OF WAY
DETAIL A - COLUMBIA SCHOOL ROAD
GRAPHIC SCALE
LEGEND
TRAFFIC SIGN
ACCESSIBLE PARKING
WHEEL STOP
BIKE RACKS
CHILLER COMPOUND
FLAG POLE
LIFT STATION
SCHOOL SIGN
RETAINING WALL
PEDESTRIAN CROSSWALK
SITE BOUNDARY LINE
NEW CONCRETE
NEW ASPHALT PAVEMENT
NEW HEAVY DUTY ASPHALT PAVEMENT
MILLING AND RESURFACING
COVERED WALK (REFER TO ARCHITECTURAL PLANS FOR CANOPY LAYOUT)
NEW 6' CHAIN LINK FENCE SEE SPECIFICATIONS
GENERAL SITE DATA
FINAL PERMITTED PLANS
RECEIVED JUN 1 9 2007 ALTAMONTE PDS
WBQ Design & Engineering Inc.
REVISIONS
BY
SCHENKELSHULTZ ARCHITECTURE
200 east robinson street suite 300 orlando, fl 32801 voice 407-872-3322 fax 407-872-3303 schenkelshultz.com
TIMBER CREEK/ UNIVERSITY RELIEF HIGH SCHOOL PROJECT NO. S-0026 (work location 1801)
SITE PLAN
ORANGE COUNTY PUBLIC SCHOOLS DESIGN & CONSTRUCTION FACILITIES SERVICES
BLDG. 200, 6501 MAGIC WAY ORLANDO, FLORIDA 32809
OCPS
DRAWN BY RRK
CHECKED BY JDV
DATE JUNE 14, 2007
PLOT SCALE 1"=100'
COMP. FILE DES.
SHEET NUMBER C100

M-1

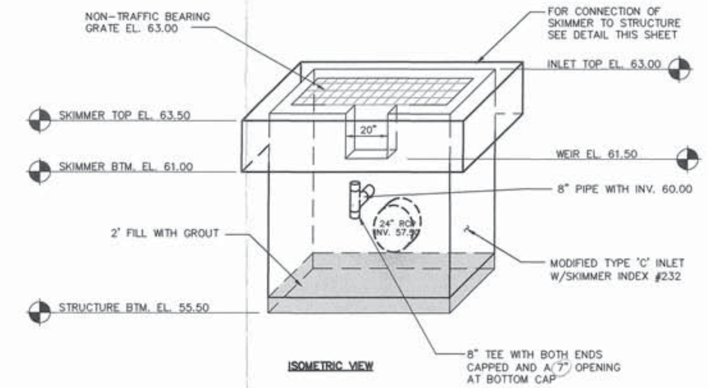
Used for CD-7 & CD-8



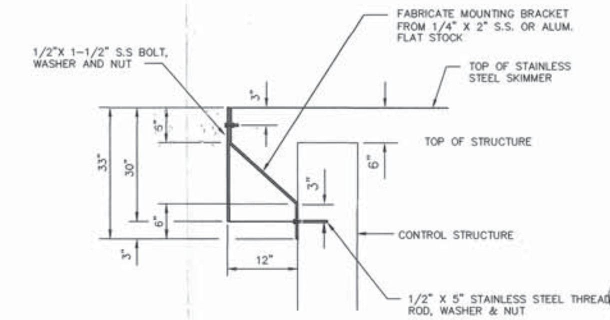
200 C400 WEST POND
N.T.S.



SPREADER SWALE
SCALE: 1"=10'

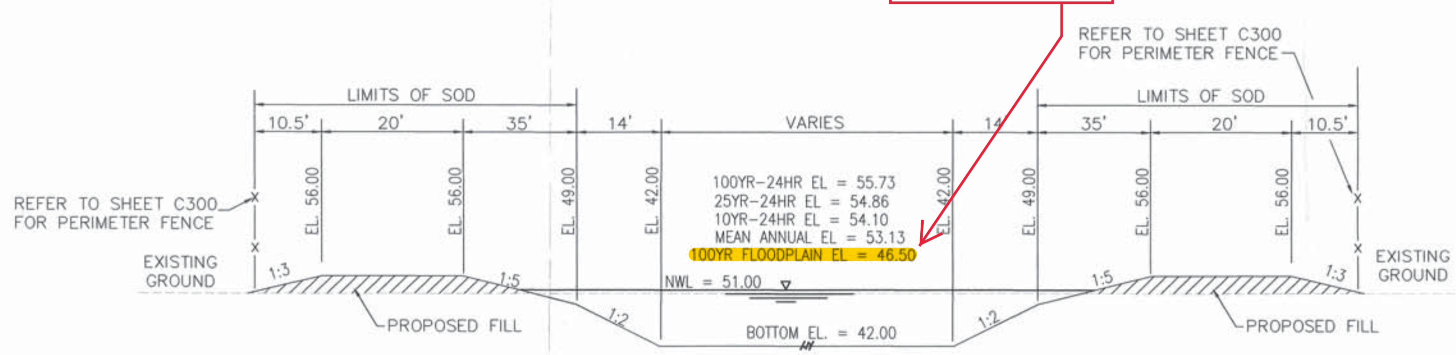


CONTROL STRUCTURE - WEST POND, D-200
NTS

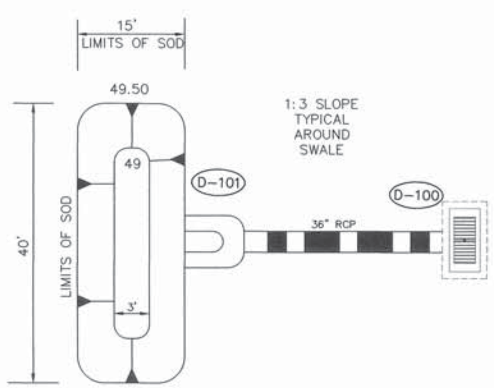


SKIMMER MOUNTING BRACKET FOR POND 200
SCALE: NTS

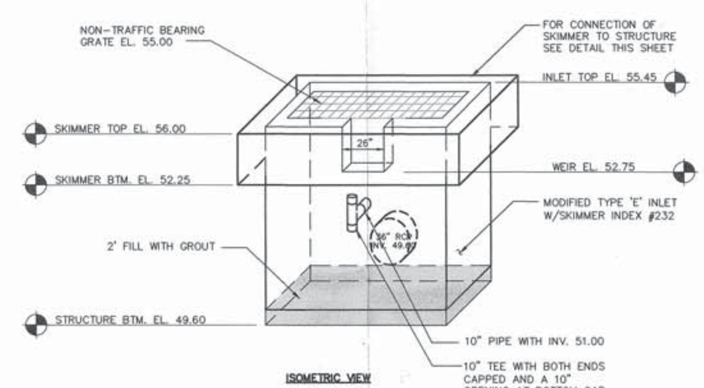
Used for CD-8



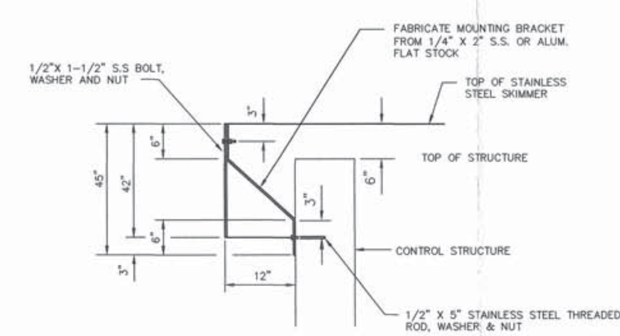
100 C400 SOUTH POND
N.T.S.



SPREADER SWALE
SCALE: 1"=10'



CONTROL STRUCTURE - SOUTH POND, D-100
NTS



SKIMMER MOUNTING BRACKET FOR SOUTH POND
SCALE: NTS

Superseded

27825-4-

RECEIVED
JUN 15 2007
PDS
ALTAMONTE SVC. CTR.

JASON D. VARGAS, P.E.
LICENSE NO. 62434
DATE

WBQ Design & Engineering Inc.

REVISIONS	BY

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voice 407-872-3322
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schenkelshultz.com

TIMBER CREEK/ UNIVERSITY
RELIEF HIGH SCHOOL
PROJECT NO. S-0026
(work location 1801)

DRAINAGE DETAILS

ORANGE COUNTY PUBLIC SCHOOLS
DESIGN & CONSTRUCTION
FACILITIES SERVICES
BLDG. 200, 6501 MAGIC WAY ORLANDO, FLORIDA 32809

OCPS

DRAWN BY
RLR
CHECKED BY
JDV
DATE
JUNE 14, 2007
PLOT SCALE
NTS
COMP. FILE DES.
C701 (DRAINAGE-DET).dwg
SHEET NUMBER
C701
COMM. 0720100

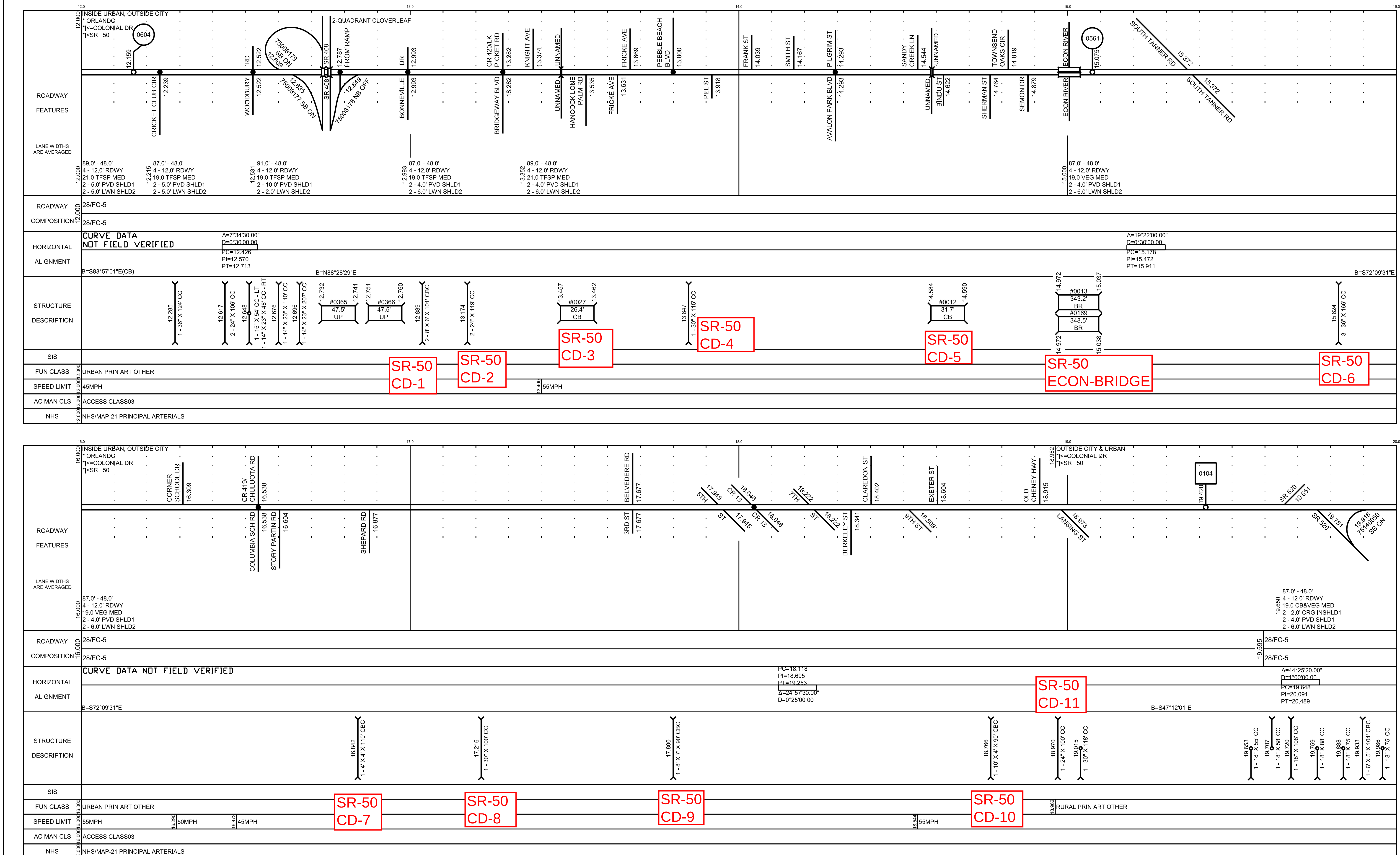
Appendix: N

SR-50 Straight Line Diagram

	5 YR INV	SLD REV	BMP	EMP	INV	SLD REV	
DATE	07/23/2014	08/18/2014	000.000	029.005		12/23/2014	MR
BY	Kim Auerbach	Michael Register					

FLORIDA DEPARTMENT OF TRANSPORTATION
STRAIGHT LINE DIAGRAM OF ROAD INVENTORY

SECTION STATUS	INT. or US ROUTE NO.	STATE ROAD NO.	COUNTY	DISTRICT	ROADWAY ID	SHEET NO:
02	US 92/US 17	SR 50/SR 600	ORANGE	05	75060000	3 OF 4

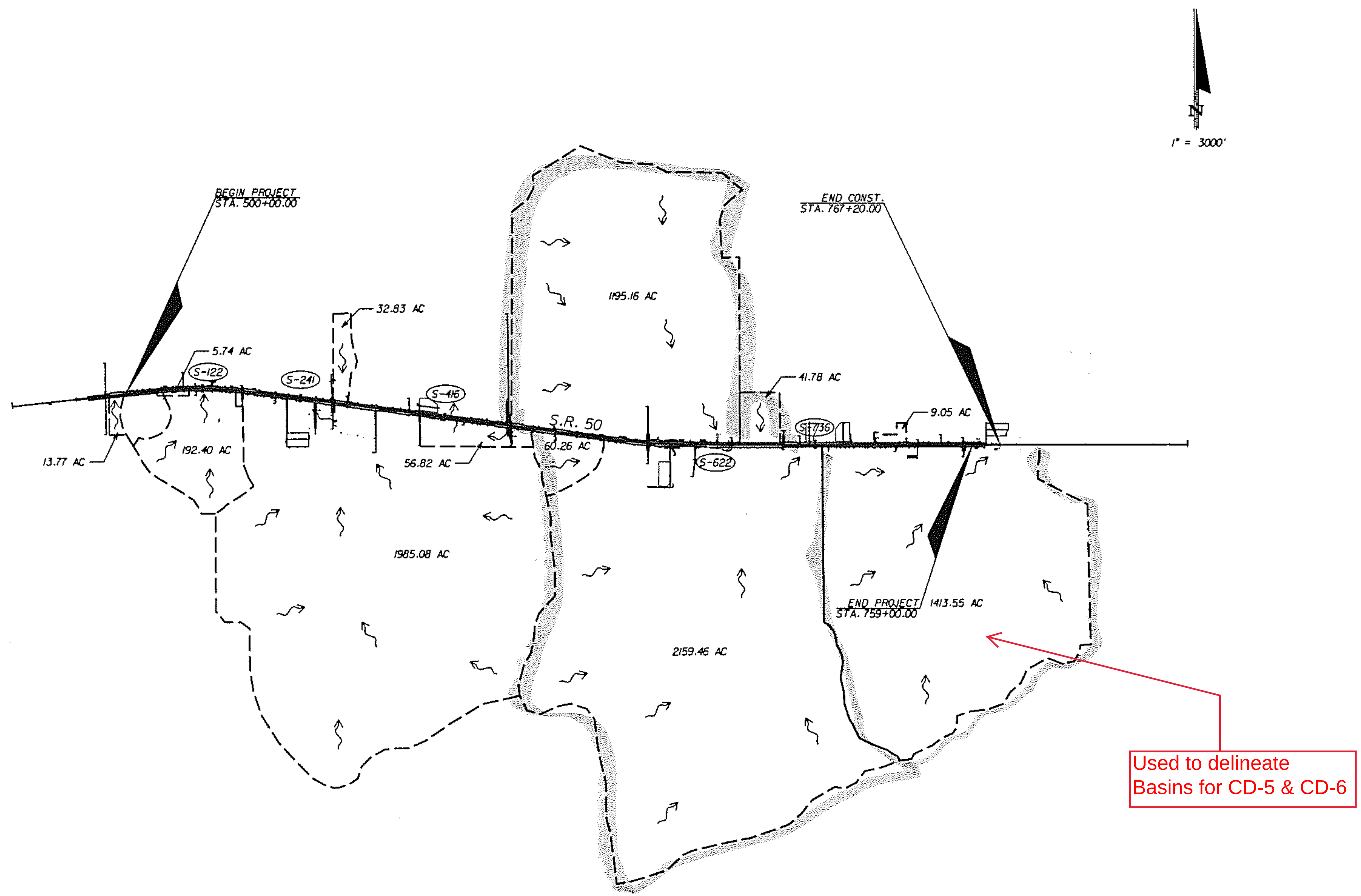


Version: 1.4.2.24 11/22/2014

Appendix: O

Excerpt from Lochner

Regional Drainage Map



REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
4350 W. CYPRESS STREET, SUITE 800
TAMPA, FLORIDA 33607
FBPR CERTIFICATE OF AUTH. # 894
THERESA D. ELLISON, P.E. # 53916

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

REGIONAL DRAINAGE MAP

SHEET NO.
14

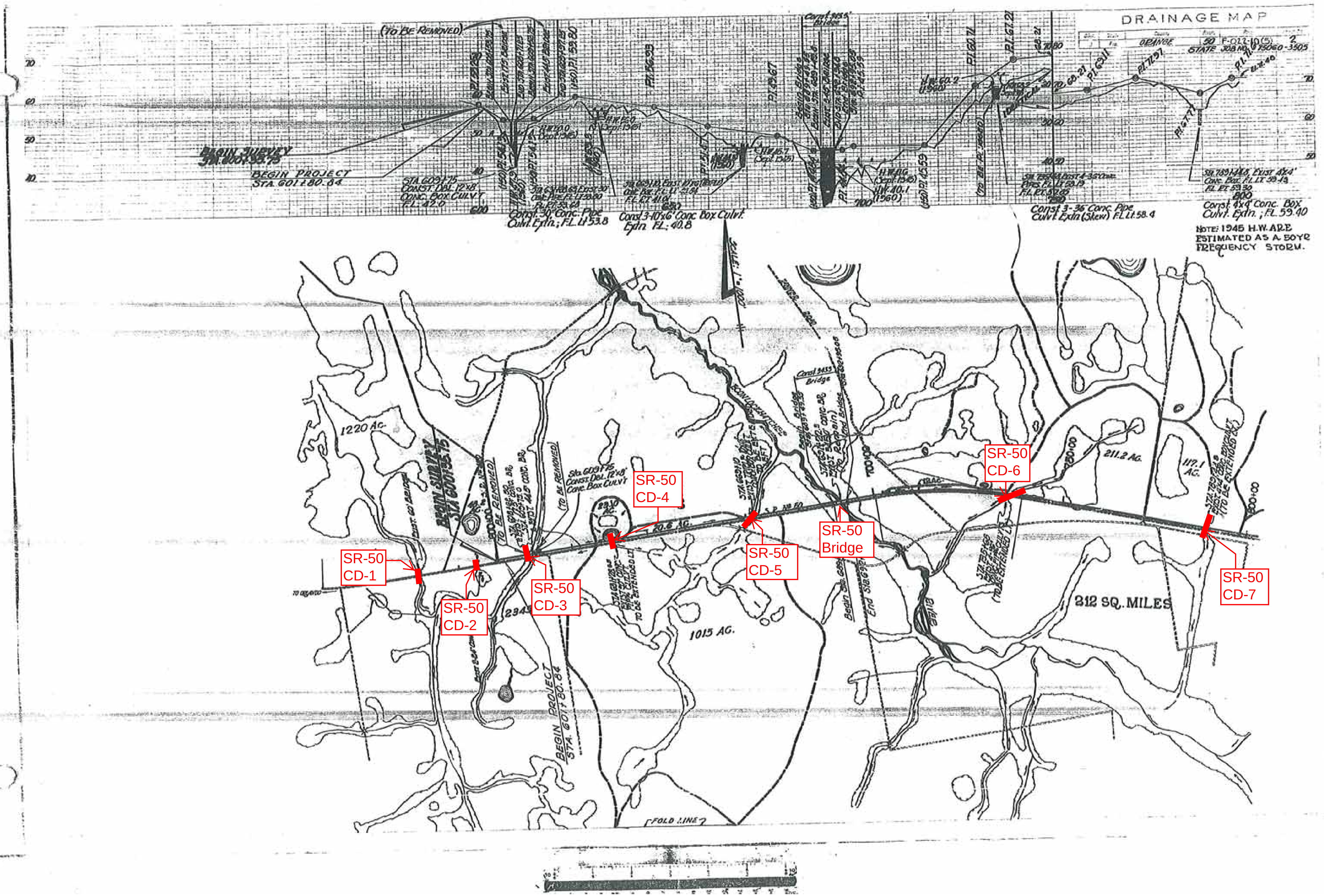
USER: jcoffey 2/6/2013 2:53:11 PM

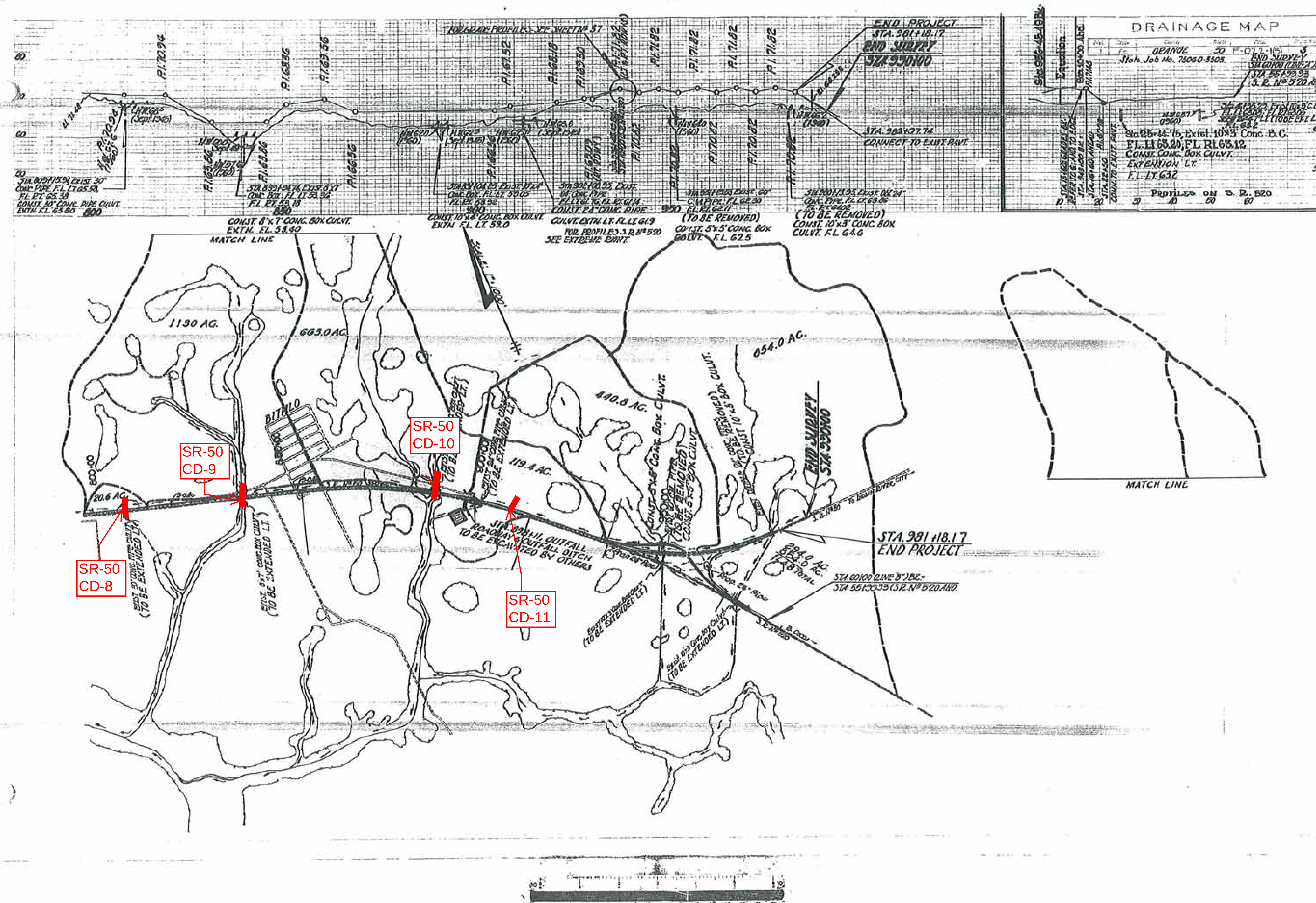
NOTICE: THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE SIGNED AND SEALED UNDER RULE 61G15-23.003, F.A.C.

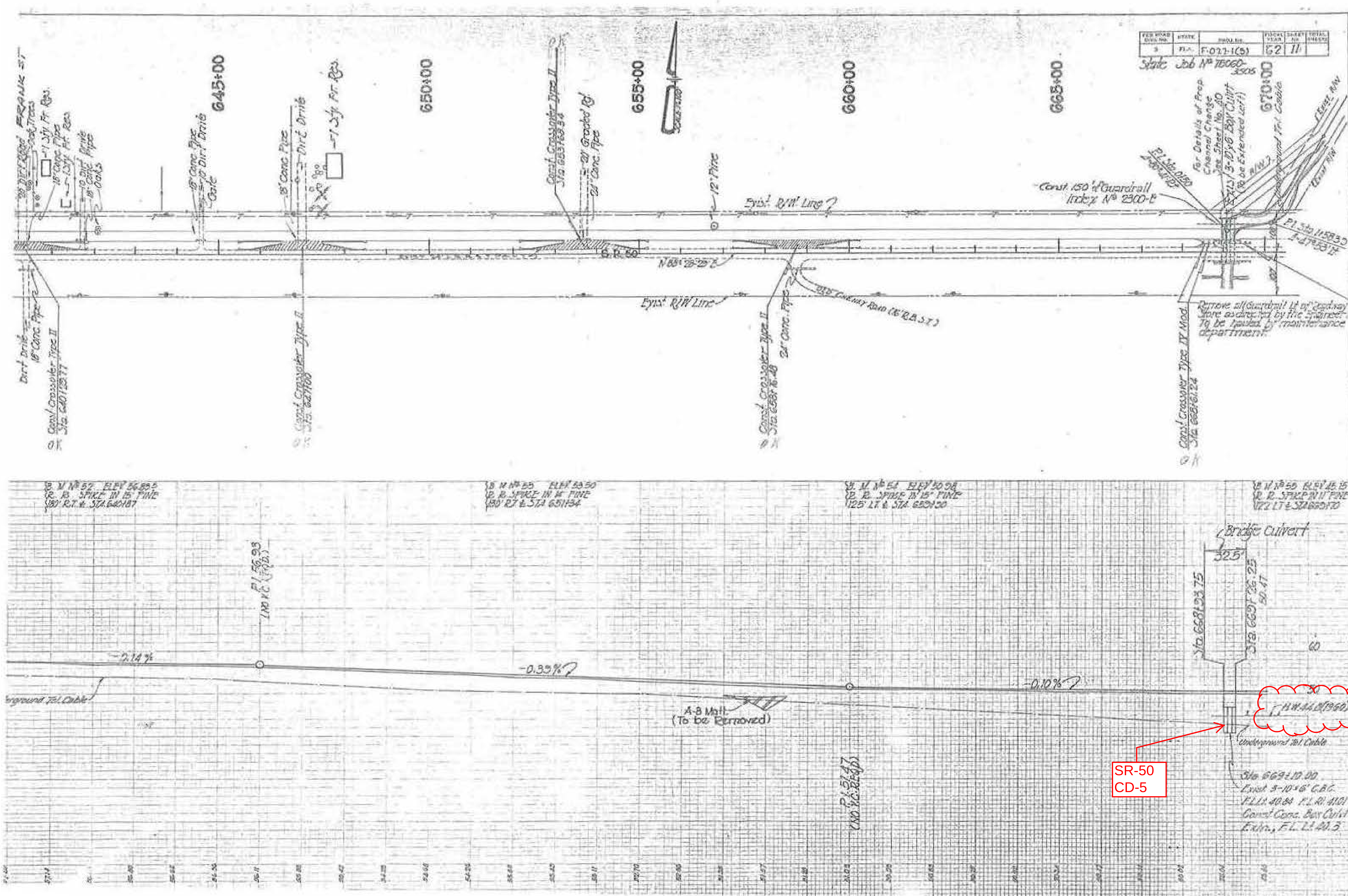
Appendix: P

Excerpt from SR-50

Original Construction Plans

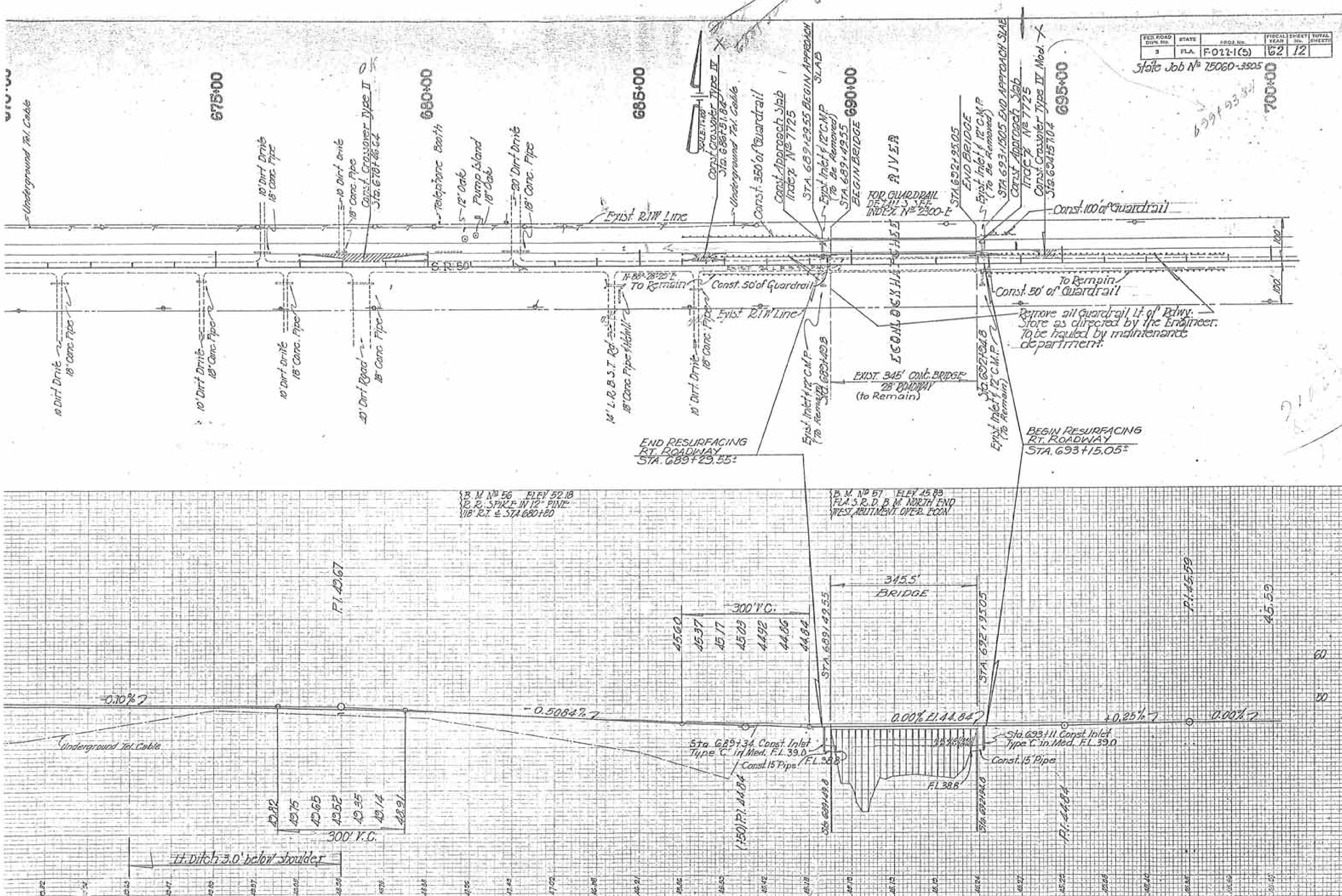

DRAINAGE MAP
ORANGE
50 F-022-10(5)
STATE JOB NO. 75060-3505
BEGIN SURVEY
BEGIN PROJECT
STA. 601+80.84
Const. 3-10'x6' Conc. Box Culvt. Exdn. FL 40.8
Const. 30" Conc. Pipe Culvt. Extn.; F.L. Lt. 53.8
Const. 3-36 Conc. Pipe Culvt. Extn (Skew) F.L. Lt. 58.4
Const. 4'x4' Conc. Box Culvt. Extn.; F.L. 59.40
NOTE: 1945 H.W. ARE ESTIMATED AS A 50YR FREQUENCY STORM.
1220 AC.
1015 AC.
211.2 AC.
117.1 AC.
212 SQ. MILES
SR-50 CD-1
SR-50 CD-2
SR-50 CD-3
SR-50 CD-4
SR-50 CD-5
SR-50 Bridge
SR-50 CD-6
SR-50 CD-7
FOLD LINE


DRAINAGE MAP
ORANGE
State Job No. 75060-3505
END PROJECT
STA. 981+18.17
END SURVEY
STA. 990+00
STA. 986+07.74
CONNECT TO EXIST. PAVT.
PROFILES ON S. R. 520
MATCH LINE
1130 AC.
663.0 AC.
440.8 AC.
854.0 AC.
119.4 AC.
20.6 AC.
BITHLO
STA. 981+18.17
END PROJECT
SR-50
CD-8
SR-50
CD-9
SR-50
CD-10
SR-50
CD-11



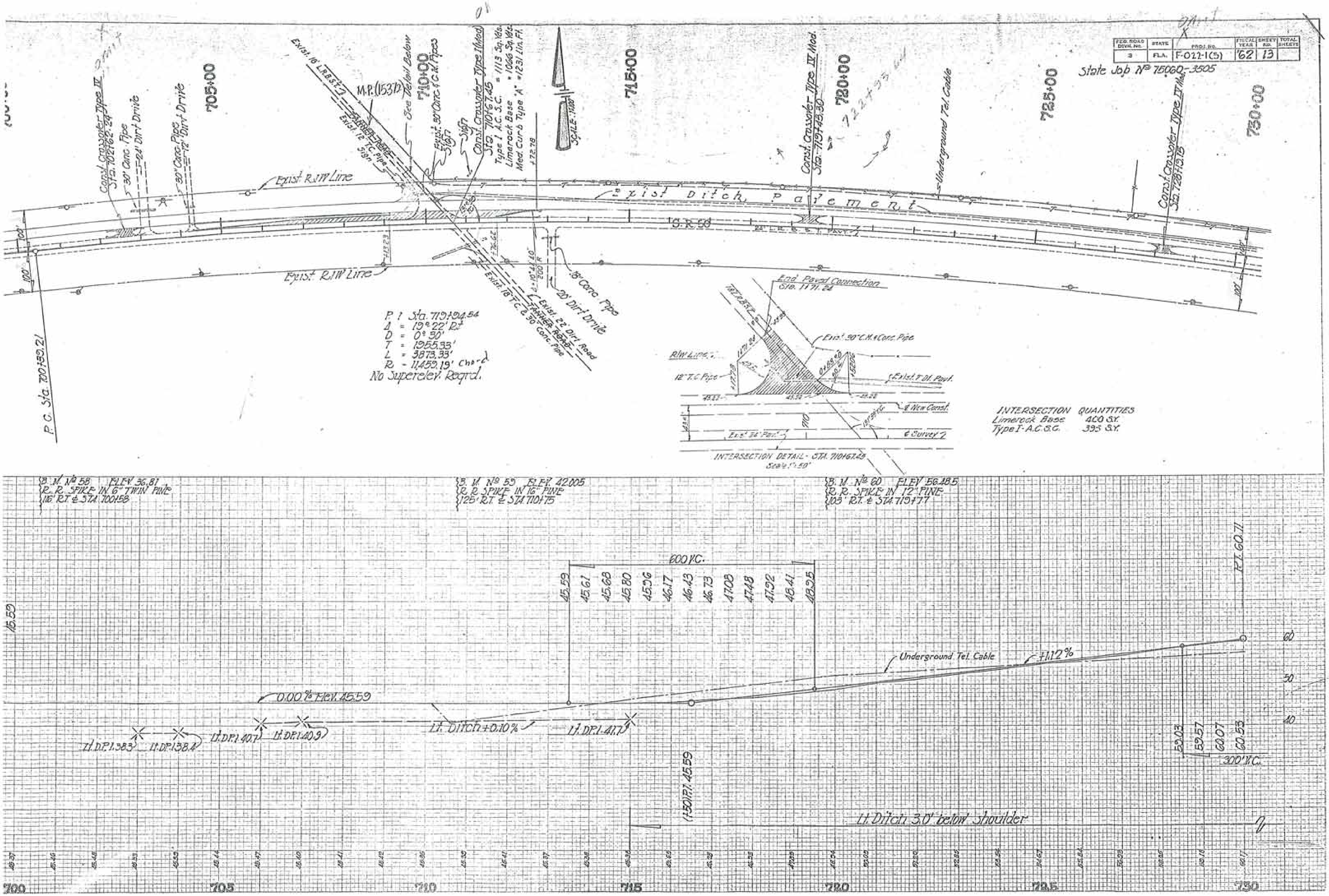
State Job No 78060-3506
645+00
650+00
655+00
660+00
665+00
670+00
Exist. R/W Line
Const. 150' of Guardrail
Index No 2300-E
Bridge Culvert
32.5'
-0.33%
-0.10%
A-8 Matl.
(To be Removed)
Underground Tel. Cable
SR-50
CD-5

P-3



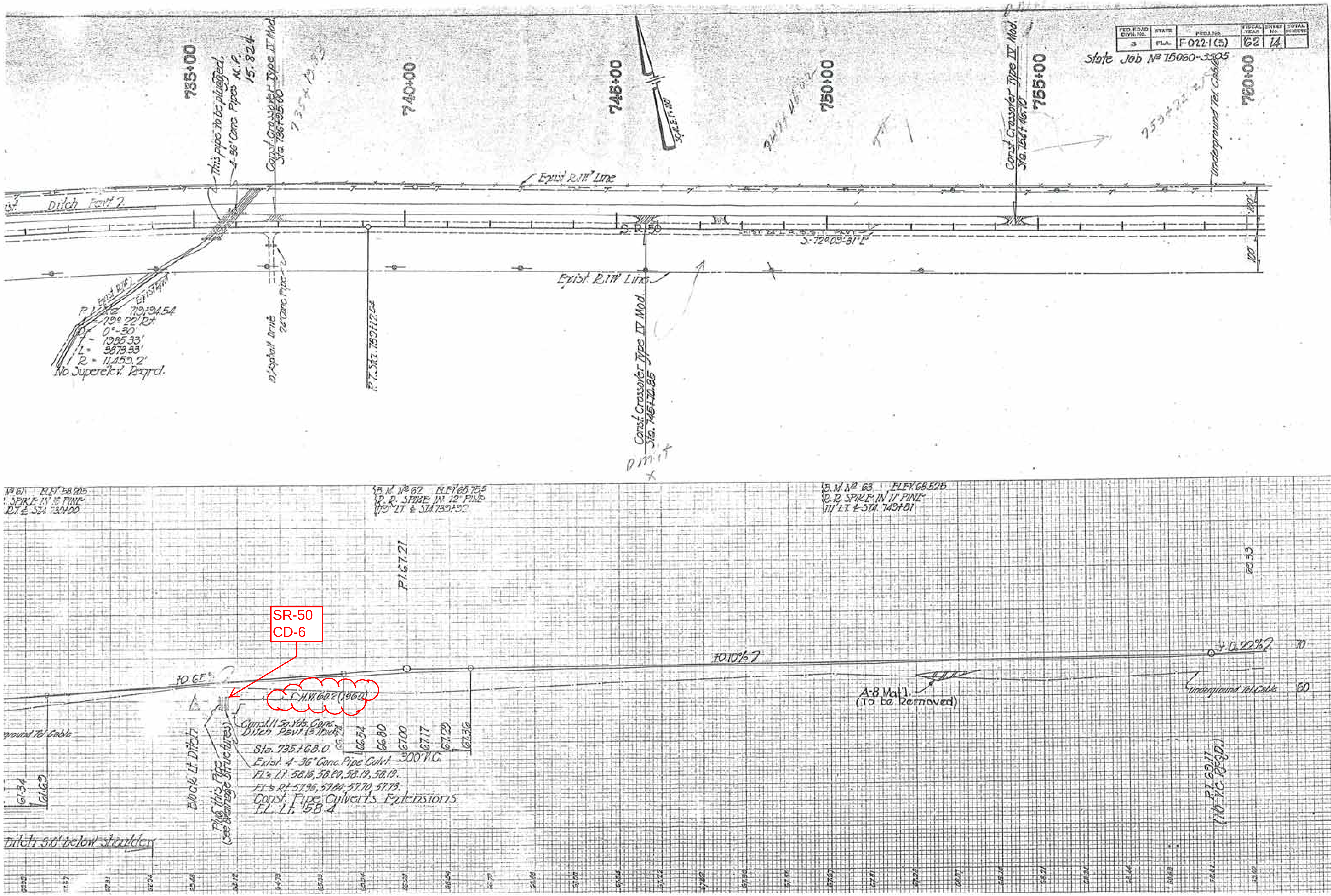
FED. ROAD DIV. NO. 3
STATE FLA.
PROJ. NO. F-022-1(5)
FISCAL YEAR 62
SHEET NO. 12
State Job Nº 75060-3505
675+00
680+00
685+00
690+00
695+00
700+00
Underground Tel. Cable
10' Dirt Drive 18" Conc. Pipe
Const. Crossover Type II Sta. 678+46.64
Telephone Booth
12" Oak
Pump Island
18" Oak
20' Dirt Drive 18" Conc. Pipe
Exist. R/W Line
S.R. 50
Const. Crossover Type IV Sta. 686+51.84
Underground Tel. Cable
Const. 350' of Guardrail
Const. Approach Slab Index Nº 7725
STA. 689+29.55 BEGIN APPROACH SLAB
Exist. Inlet & 12" C.M.P. (To Be Removed)
STA. 689+49.55 BEGIN BRIDGE
FOR GUARDRAIL DETAILS SEE INDEX Nº 2300-E
ECONLOCKHATCHEE RIVER
STA. 692+95.05 END BRIDGE
Exist. Inlet & 12" C.M.P. (To Be Removed)
STA. 693+15.05 END APPROACH SLAB
Const. Approach Slab Index Nº 7725
Const. Crossover Type IV Mod. Sta. 694+51.04
Const. 100' of Guardrail
To Remain
Const. 50' of Guardrail
Remove all Guardrail Lt. of Rdwy. Store as directed by the Engineer. To be hauled by maintenance department.
10' Dirt Drive 18" Conc. Pipe
10' Dirt Drive 18" Conc. Pipe
10' Dirt Drive 18" Conc. Pipe
20' Dirt Road 18" Conc. Pipe
N 88°28'25" E To Remain
14' L.R.B.S.T. Rd. 18" Conc. Pipe Sidehill
10' Dirt Drive 18" Conc. Pipe
Exist. R/W Line
Exist. Inlet & 12" C.M.P. (To Remain) Sta. 689+40.8
EXIST. 345' CONC. BRIDGE 28' ROADWAY (to Remain)
Exist. Inlet & 12" C.M.P. (To Remain) Sta. 692+94.8
END RESURFACING RT. ROADWAY STA. 689+29.55±
BEGIN RESURFACING RT. ROADWAY STA. 693+15.05±
B. M. Nº 56 ELEV. 52.18 R. R. SPIKE IN 12" PINE 118' RT. ℄ STA. 680+80
B. M. Nº 57 ELEV. 45.83 FLA. S.R.D. B. M. NORTH END WEST ABUTMENT OVER ECON
P.I. 49.67
300' V.C.
45.60
45.37
45.17
45.03
44.92
44.86
44.84
STA. 689+49.55
345.5' BRIDGE
STA. 692+95.05
P.I. 45.59
45.59
60
50
-0.10%
-0.5084%
0.00% El. 44.84
+0.25%
0.00%
Underground Tel. Cable
Sta. 689+34 Const. Inlet Type 'C' in Med. F.L. 39.0
Const. 15" Pipe
F.L. 38.8
Sta. 693+11 Const. Inlet Type 'C' in Med. F.L. 39.0
Const. 15" Pipe
F.L. 38.8
49.82
49.75
49.65
49.52
49.35
49.14
48.91
300' V.C.
(150) P.I. 44.84
Sta. 689+49.8
Sta. 692+94.8
P.I. 44.84
Lt. Ditch 3.0' below shoulder

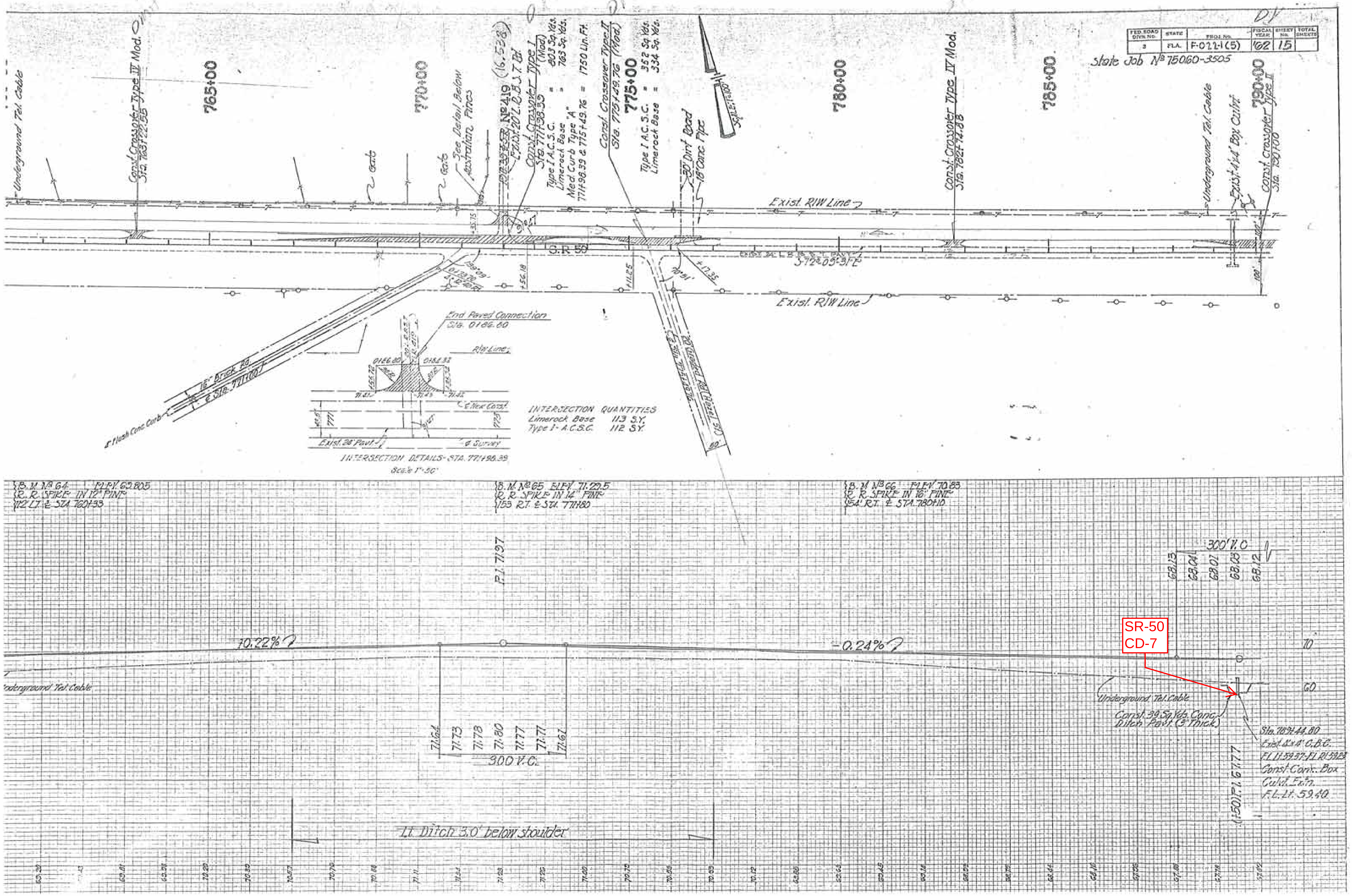
P-4

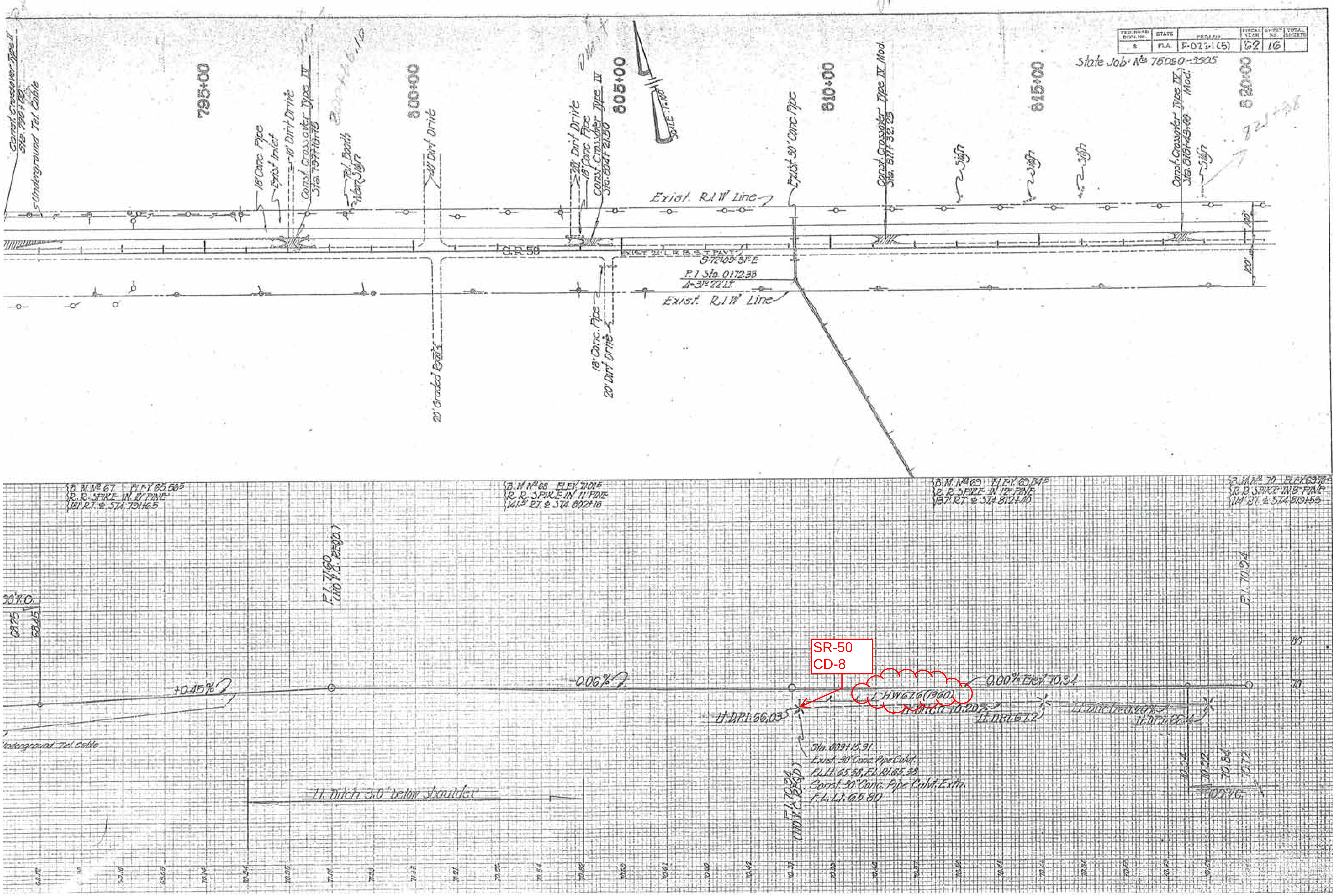


FED. ROAD DIVN. No. | STATE | PROJ. No. | FISCAL YEAR | SHEET No. | TOTAL SHEETS
3 | FLA. | F-022-1(5) | '62 | 13
State Job Nº 75060-3505
705+00
710+00
715+00
720+00
725+00
730+00
Const. Crossover Type III Sta. 702+62.24
30" Conc. Pipe
24' Dirt Drive
30" Conc. Pipe 12' Dirt Drive
M.P. (1537)
See Detail Below
Exist. 30" Conc. & C.M. Pipes
Sign
Const. Crossover Type I (Mod.) Sta. 710+67.45
Type I A.C.S.C. = 1113 Sq. Yds.
Limerock Base = 1066 Sq. Yds.
Med. Curb Type "A" = 1231 Lin. Ft.
SCALE: 1"=100'
Exist. 16' L.R.B.S.T.
Exist. 12" T.C. Pipe
Const. Crossover Type III Mod. Sta. 719+45.30
Underground Tel. Cable
Const. Crossover Type III Mod. Sta. 728+13.15
Exist. R/W Line
Exist. Ditch Pavement
S.R. 50
24' L.R. & S.T. Pavt.
Exist. R/W Line
18" Conc. Pipe
20' Dirt Drive
Exist. 18" T.C. & 30" Conc. Pipe
Exist. 22' Dirt Road
P.C. Sta. 700+39.21
P.I. Sta. 719+94.54
Δ = 19° 22' Rt.
D = 0° 30'
T = 1955.33'
L = 3873.33'
R = 11,459.19' Chord
No Superelev. Reqrd.
End Paved Connection Sta. 11+71.24
Exist. 30" C.M. & Conc. Pipe
R/W Line
12" T.C. Pipe
Exist. T.D. Pavt.
¢ New Const.
Exist. 24' Pavt.
¢ Survey 7
INTERSECTION DETAIL - STA. 710+67.45
Scale 1"=50'
INTERSECTION QUANTITIES
Limerock Base 400 S.Y.
Type I - A.C.S.C. 395 S.Y.
B.M. Nº 58 ELEV. 36.81
R.R. SPIKE IN 6" TWIN PINE
116' RT. ¢ STA. 700+58
B.M. Nº 59 ELEV. 42.005
R.R. SPIKE IN 16" PINE
125' RT. ¢ STA. 710+75
B.M. Nº 60 ELEV. 56.485
R.R. SPIKE IN 12" PINE
105' RT. ¢ STA. 719+77
800' V.C.
45.59 45.61 45.68 45.80 45.96 46.17 46.43 46.73 47.08 47.48 47.92 48.41 48.95
P.I. 60.71
45.59
0.00% Elev. 45.59
Underground Tel. Cable
+1.12%
Lt. Ditch +0.10%
Lt. D.P. 138.3
Lt. D.P. 138.4
Lt. D.P. 140.7
Lt. D.P. 140.9
Lt. D.P. 141.7
(150) P.I. 45.59
59.03 59.57 60.07 60.53
300' V.C.
60
50
40
Lt. Ditch 3.0' below Shoulder
700
705
710
715
720
725
730

P-5

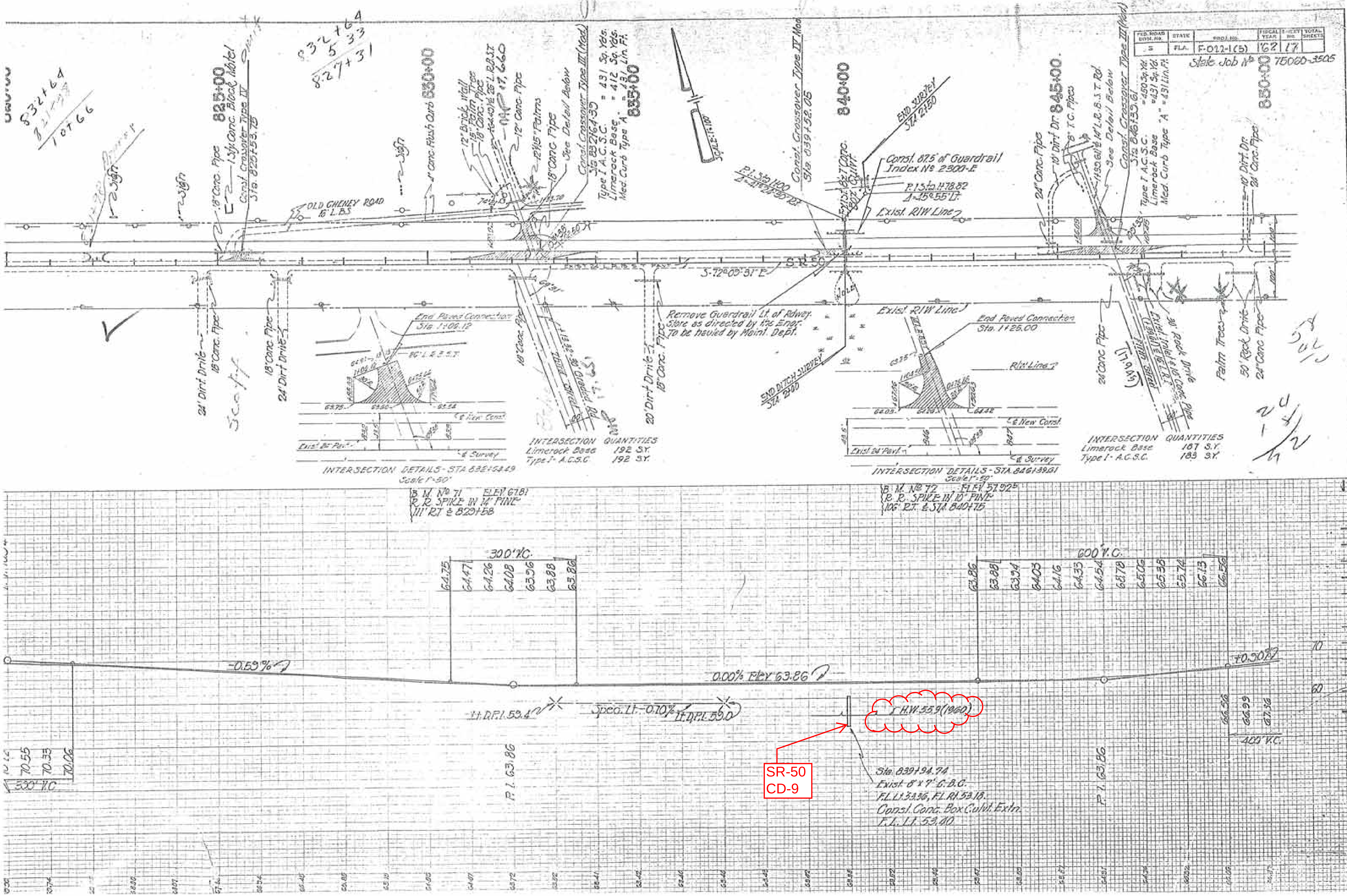

FED. ROAD DIVN. No. 3 STATE FLA. PROJ. No. F-022-1(5) FISCAL YEAR 62 SHEET No. 14
State Job Nº 75060-3505
735+00
740+00
745+00
750+00
755+00
760+00
This pipe to be plugged, 4-36" Conc. Pipes M.P. 15.824
Const. Crossover Type IV Mod. Sta. 736+05.00
Const. Crossover Type IV Mod. Sta. 754+46.70
Const. Crossover Type IV Mod. Sta. 745+70.85
Underground Tel. Cable
Exist. R/W Line
Ditch Pavt.
S.R. 50
S-72°09'-31"E
P.T. Sta. 739+12.54
10' Asphalt Drive
24" Conc. Pipe
P.I. Sta. 719+34.54
Δ = 15° 22' Rt.
D = 0°-30'
T = 1935.33'
L = 3873.33'
R = 11,459.2'
No Superelev. Reqrd.
Scale 1" = 100'
B.M. Nº 62 ELEV. 65.755 R.R. SPIKE IN 12" PINE 175' LT. ℄ STA. 739+32
B.M. Nº 63 ELEV. 68.525 R.R. SPIKE IN 11" PINE 111' LT. ℄ STA. 749+81
ELEV. 58.205 SPIKE IN 16" PINE RT. ℄ STA. 730+00
P.I. 67.21
+0.65%
+0.10%
+0.22%
SR-50
CD-6
D.H.W. 60.2 (1960)
66.54
66.80
67.00
67.17
67.29
67.36
300' V.C.
Const. 11 Sq. Yds. Conc. Ditch Pavt. (3" Thick)
Sta. 735+68.0
Exist. 4-36" Conc. Pipe Culvt.
FL's Lt. 58.16, 58.20, 58.19, 58.19.
FL's Rt. 57.96, 57.84, 57.70, 57.73.
Const. Pipe Culverts Extensions
FL. Lt. 58.4
Block Lt. Ditch
Plug this Pipe (See Drainage Structures)
A-8 Mat'l. (To be Removed)
Underground Tel. Cable
P.T. 69.11 (10' V.C. Reqd.)
69.33
Ditch 5.0' below shoulder
70
60


FED. ROAD DIVN. NO. 3
STATE FLA.
PROJ. NO. F-022-1(5)
FISCAL YEAR '62
SHEET NO. 15
State Job № 75060-3505
765+00
770+00
775+00
780+00
785+00
790+00
Underground Tel. Cable
Const. Crossover Type IV Mod. Sta. 763+22.55
Gate
See Detail Below
Australian Pines
Const. Crossover Type I (Mod.) Sta. 771+38.39
Type I A.C.S.C. 803 Sq. Yds.
Limerock Base 763 Sq. Yds.
Med. Curb Type "A" 771+98.39 & 775+49.76 = 1750 Lin. Ft.
Const. Crossover Type II (Mod.) Sta. 775+29.76
Type I A.C.S.C. 352 Sq. Yds.
Limerock Base 334 Sq. Yds.
30' Dirt Road
18" Conc. Pipe
Const. Crossover Type IV Mod. Sta. 782+72.18
Underground Tel. Cable
Exist. 4x4 Box Culvt.
Const. Crossover Type II Sta. 790+00
Exist. R/W Line
S.R. 50
S 72° 05' 31" E
Exist. R/W Line
16" Brick Rd.
End Paved Connection Sta. 0+66.80
R/W Line
Exist. 28' Pavt.
Survey
INTERSECTION QUANTITIES
Limerock Base 113 S.Y.
Type I - A.C.S.C. 112 S.Y.
INTERSECTION DETAILS - STA. 771+98.39
Scale 1" = 50'
B.M. № 64 ELEV. 62.805 R.R. SPIKE IN 12" PINE 112 LT. Sta. 760+33
B.M. № 65 ELEV. 71.225 R.R. SPIKE IN 14" PINE 155 RT. Sta. 771+80
B.M. № 66 ELEV. 70.83 R.R. SPIKE IN 16" PINE 54' RT. Sta. 780+10
P.I. 71.97
+0.72%
-0.24%
300' V.C.
71.64 71.73 71.78 71.80 71.77 71.71 71.61
300' V.C.
68.13 68.04 68.01 68.03 68.12
P.I. 67.77
SR-50 CD-7
Underground Tel. Cable
Const. 39 Sq. Yds. Conc. Ditch Pavt. (3" Thick)
Sta. 789+44.80
Exist. 4x4' C.B.C.
Const. Conc. Box Culvt. Extn.
F.L. Lt. 59.40
Lt. Ditch 3.0' below shoulder
70
60

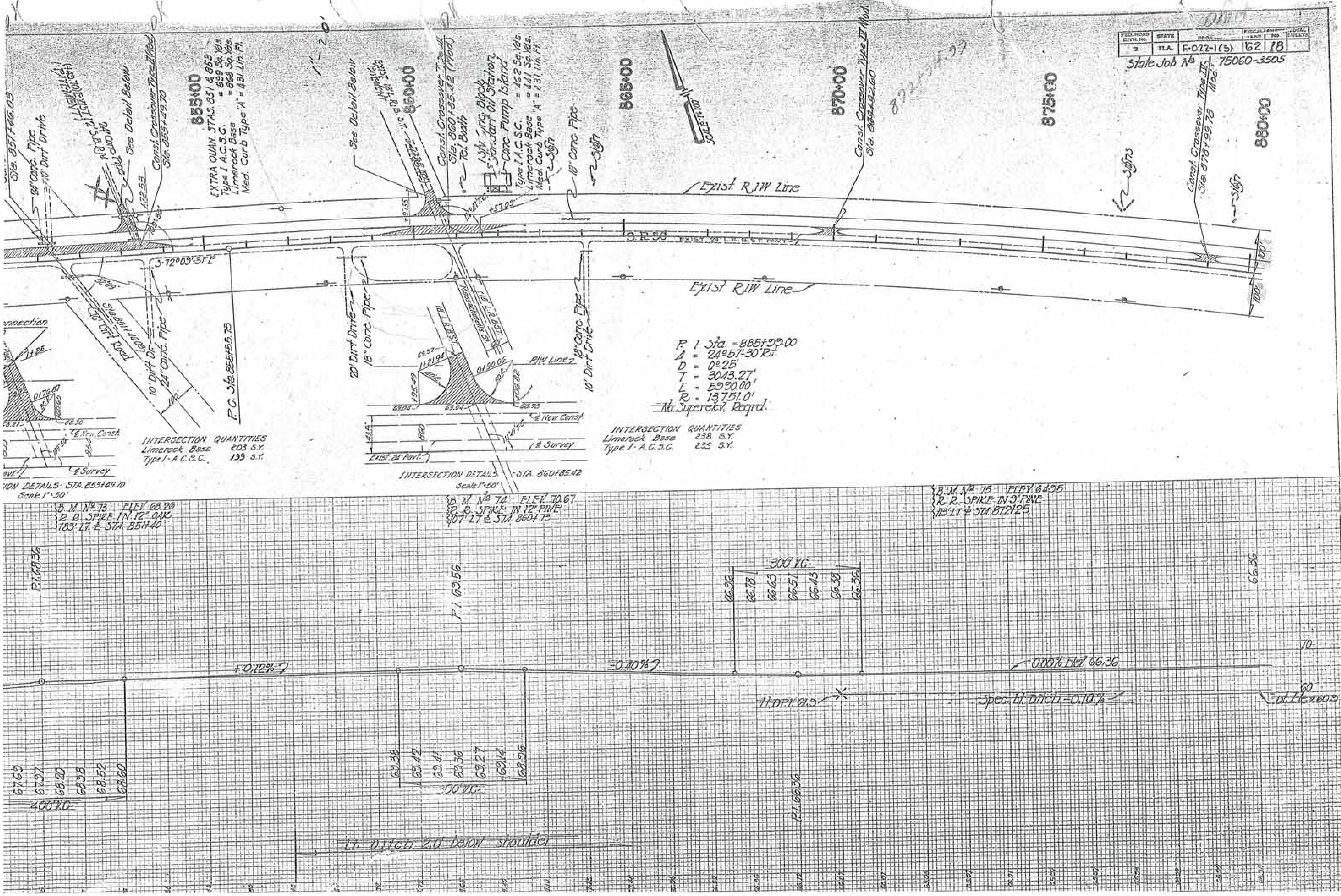


FED. ROAD DIVN. NO. 3
STATE FLA.
PROJ. NO. F-023-1(5)
FISCAL YEAR 62
SHEET NO. 16
State Job No 75080-3505
795+00
800+00
805+00
810+00
815+00
820+00
Const. Crossover Type II Sta. 790+10
Underground Tel. Cable
18" Conc. Pipe
Exist. Inlet
10' Dirt Drive
Const. Crossover Type IV Sta. 797+07.75
Tel. Booth
Sign
20' Dirt Drive
20' Dirt Drive
18" Conc. Pipe
Const. Crossover Type IV Sta. 804+81.50
Exist. 30" Conc. Pipe
Const. Crossover Type IV Mod. Sta. 811+32.75
Sign
Const. Crossover Type IV Mod. Sta. 818+43.00
Exist. R/W Line
S.R. 50
P.I. Sta. 0172.38
Exist. R/W Line
20' Graded Road
18" Conc. Pipe
20' Dirt Drive
100'
100'
B.M. No 67 ELEV. 65.565 R.R. SPIKE IN 10" PINE 181' RT. ℄ STA. 791+65
B.M. No 68 ELEV. 71.015 R.R. SPIKE IN 11" PINE 141.5' RT. ℄ STA. 802+16
B.M. No 69 ELEV. 69.845 R.R. SPIKE IN 12" PINE 137' RT. ℄ STA. 812+40
B.M. No 70 ELEV. 69.78 R.R. SPIKE IN 8" PINE 114' RT. ℄ STA. 818+58
300' V.C.
P.I. 71.60 (NO V.C. REQD.)
+0.45%
-0.06%
0.00% Elev. 70.94
P.I. 70.94
80
70
SR-50
CD-8
Lt. D.P.I. 66.03
I. H.W. 67.6 (1960)
Lt. Ditch +0.20%
Lt. D.P.I. 67.2
Lt. Ditch 0.00%
Underground Tel. Cable
Sta. 809+15.91
Exist. 30" Conc. Pipe Culvt.
F.L. Lt. 65.58, F.L. Rt. 65.38
Const. 30" Conc. Pipe Culvt. Extn.
F.L. Lt. 65.80
P.I. 70.94 (NO V.C. REQD.)
Lt. Ditch 3.0' below shoulder
300' V.C.

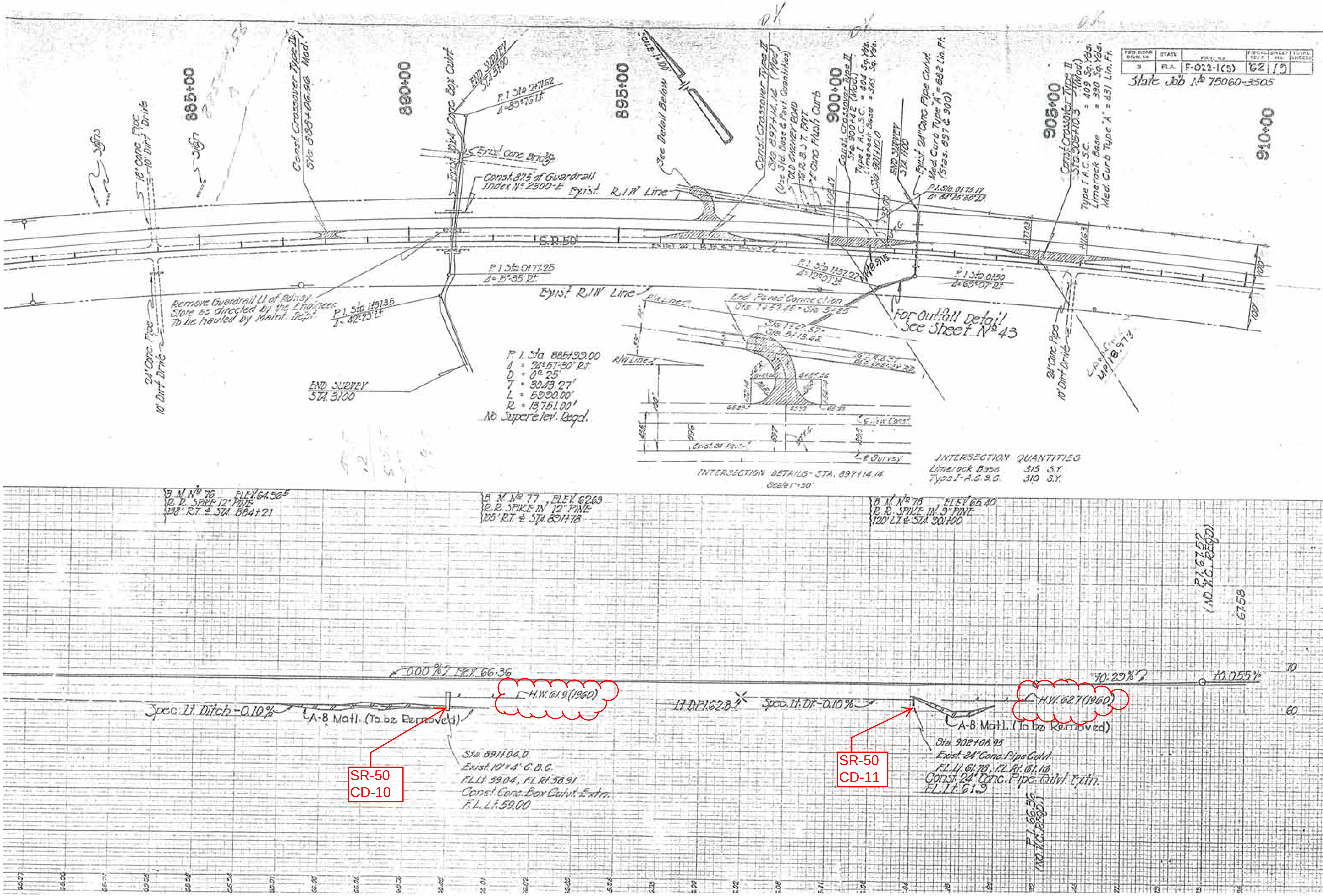
P-8



FED. ROAD DIVN. No. 3
STATE FLA.
PROJ. No. F-022-1(5)
FISCAL YEAR '62
SHEET No. 17
TOTAL SHEETS
State Job No 75060-3505
825+00
830+00
835+00
840+00
845+00
850+00
OLD CHENEY ROAD 16' L.B.S.
18" Conc. Pipe
Const. Crossover Type IV Sta. 825+53.75
1 Sty. Conc. Block Motel
4" Conc. Flush Curb
12" Brick Wall
15" Palm Tree
18" Conc. Pipe
12" Conc. Pipe
18" Conc. Pipe
See Detail Below
Const. Crossover Type III (Mod.) Sta. 832+64.35
Type I A.C.S.C. = 431 Sq. Yds.
Limerock Base = 412 Sq. Yds.
Med. Curb Type "A" = 131 Lin. Ft.
Const. Crossover Type IV Mod. Sta. 839+52.05
Const. 87.5' of Guardrail Index No 2300-E
END SURVEY STA. 21+50
Exist. R/W Line
S-72°09'31" E
S.R. 50
Remove Guardrail Lt. of Rdwy. Store as directed by the Engr. To be hauled by Maint. Dept.
END DITCH SURVEY STA. 21+00
Exist. R/W Line
End Paved Connection Sta. 1+25.00
R/W Line
24" Conc. Pipe
10' Dirt Dr.
8" T.C. Pipes
See Detail Below
Const. Crossover Type III (Mod.) Sta. 846+33.61
Type I A.C.S.C. = 450 Sq. Yd.
Limerock Base = 431 Sq. Yd.
Med. Curb Type "A" = 131 Lin. Ft.
10' Dirt Dr.
24" Conc. Pipe
24' Dirt Drive
18" Conc. Pipe
18" Conc. Pipe
24' Dirt Drive
18" Conc. Pipe
20' Dirt Drive
18" Conc. Pipe
24" Conc. Pipe
Palm Trees
50' Rock Drive
24" Conc. Pipe
End Paved Connection Sta. 1+06.12
Exist. 20' Pav't.
℄ New Const.
℄ Survey
INTERSECTION DETAILS - STA. 832+64.49
Scale 1"=50'
INTERSECTION QUANTITIES
Limerock Base 192 S.Y.
Type I - A.C.S.C. 192 S.Y.
Exist. 24' Pav't.
℄ New Const.
℄ Survey
INTERSECTION DETAILS - STA. 846+39.81
Scale 1"=50'
INTERSECTION QUANTITIES
Limerock Base 187 S.Y.
Type I - A.C.S.C. 183 S.Y.
B.M. No 71 ELEV. 67.81
R.R. SPIKE IN 14" PINE
111' Rt. ℄ 829+58
B.M. No 72 ELEV. 57.92
R.R. SPIKE IN 10" PINE
106' Rt. ℄ STA. 840+75
300' V.C.
64.75 64.47 64.26 64.08 63.96 63.88 63.86
600' V.C.
63.86 63.88 63.94 64.03 64.16 64.33 64.54 64.78 65.06 65.38 65.74 66.13 66.56
-0.59%
0.00% Elev. 63.86
+0.50%
Lt. D.P.I. 53.4
Spec. Lt. -0.10%
Lt. D.P.I. 53.0
H.W. 55.9 (1960)
P.I. 63.86
P.I. 63.86
70.55 70.33 70.06
330' V.C.
66.56 66.99 67.36
400' V.C.
70
60
SR-50
CD-9
Sta. 839+94.74
Exist. 6' x 7' C.B.C.
F.L. Lt. 53.36, F.L. Rt. 53.18.
Const. Conc. Box Culvt. Extn.
F.L. Lt. 53.40

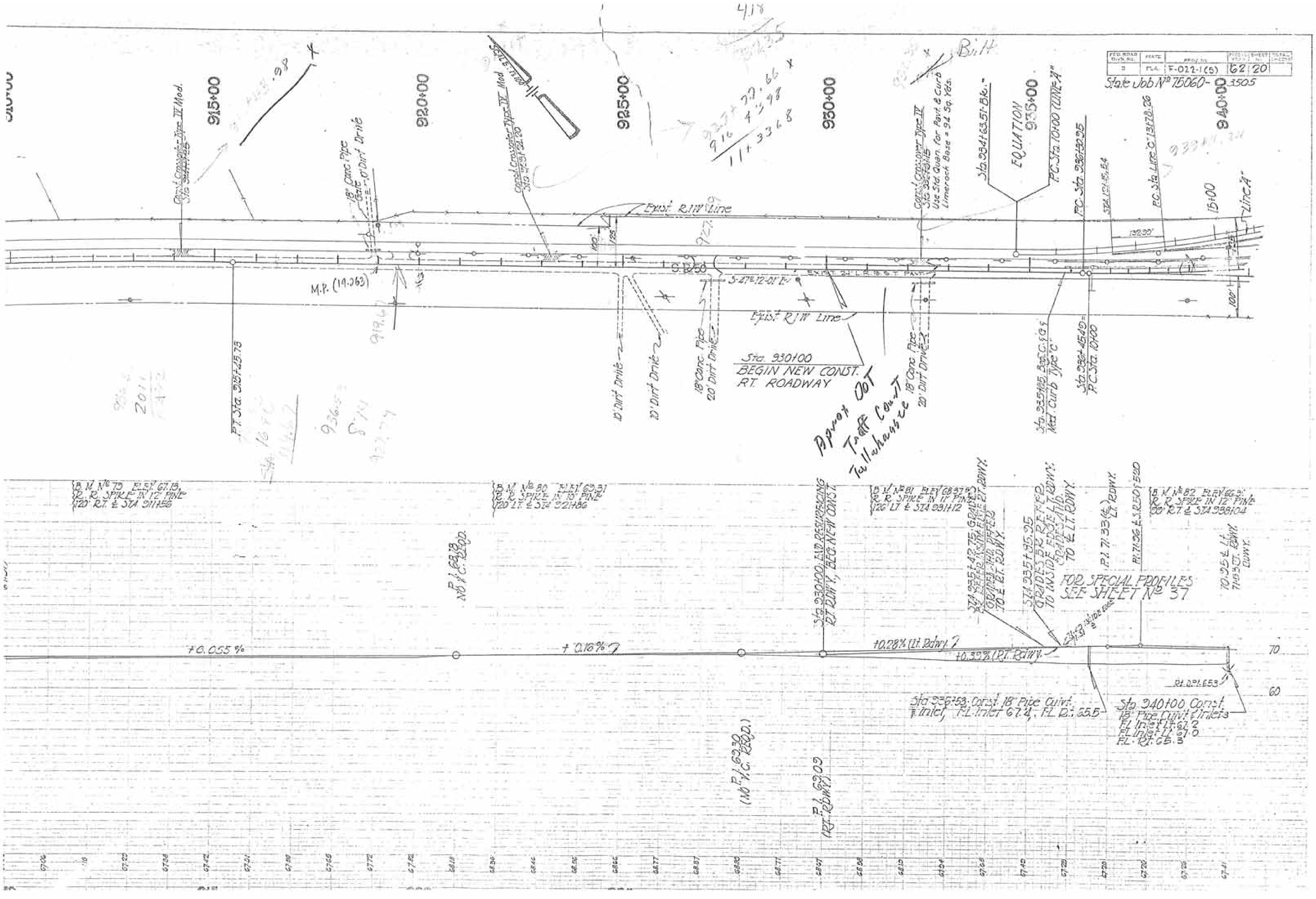


FED. ROAD DIV. No. 3 | STATE FLA. | PROJECT F-022-1(5) | 62 | 18
State Job No 75060-3505
855+00
860+00
865+00
870+00
875+00
880+00
Exist R/W Line
EXTRA QUAN. STAS. 851 & 853
Type I A.C.S.C. = 899 Sq. Yds.
Limerock Base = 968 Sq. Yds.
Med. Curb Type "A" = 431 Lin. Ft.
Const. Crossover Type II Mod. Sta. 851+49.70
See Detail Below
Const. Crossover Type II Mod. Sta. 860+85.42
Tel. Booth
15th Sing Block
Standard Oil Station
Conc. Pump Island
Type I A.C.S.C. = 462 Sq. Yds.
Limerock Base = 441 Sq. Yds.
Med. Curb Type "A" = 431 Lin. Ft.
18" Conc. Pipe
Const. Crossover Type II Mod. Sta. 869+92.60
Const. Crossover Type II Mod. Sta. 878+99.78
S-72°09'31"E
P.C. Sta. 855+55.73
10' Dirt Dr.
24" Conc. Pipe
20' Dirt Drive
18" Conc. Pipe
18" Conc. Pipe
10' Dirt Drive
P.I. Sta. = 885+32.00
Δ = 24°57'30" Rt.
D = 0°25'
T = 3043.27'
L = 5990.00'
R = 13751.0'
No Superelev. Reqrd.
INTERSECTION QUANTITIES
Limerock Base 203 S.Y.
Type I - A.C.S.C. 193 S.Y.
INTERSECTION DETAILS - STA. 851+49.70
Scale 1" = 50'
INTERSECTION DETAILS - STA. 860+85.42
Scale 1" = 50'
INTERSECTION QUANTITIES
Limerock Base 238 S.Y.
Type I - A.C.S.C. 235 S.Y.
℄ New Const.
℄ Survey
Exist. 24' Pavt.
R/W Line
B.M. No 73 ELEV. 68.26
R.R. SPIKE IN 12" OAK
183' Lt. ℄ STA. 851+40
B.M. No 74 ELEV. 70.67
R.R. SPIKE IN 12" PINE
107' Lt. ℄ STA. 860+73
B.M. No 75 ELEV. 64.95
R.R. SPIKE IN 9" PINE
113' Lt. ℄ STA. 872+25
P.I. 68.36
P.I. 69.56
P.I. 66.36
300' V.C.
66.36
66.78
66.63
66.51
66.43
66.38
66.36
66.36
+0.12%
-0.40%
0.00% Elev. 66.36
Lt. Ditch 61.5
Spec. Lt. Ditch -0.10%
400' V.C.
67.69
67.97
68.20
68.38
68.52
68.60
300' V.C.
69.38
69.42
69.41
69.36
69.27
69.14
68.96
Lt. Ditch 2.0' below shoulder
70
60



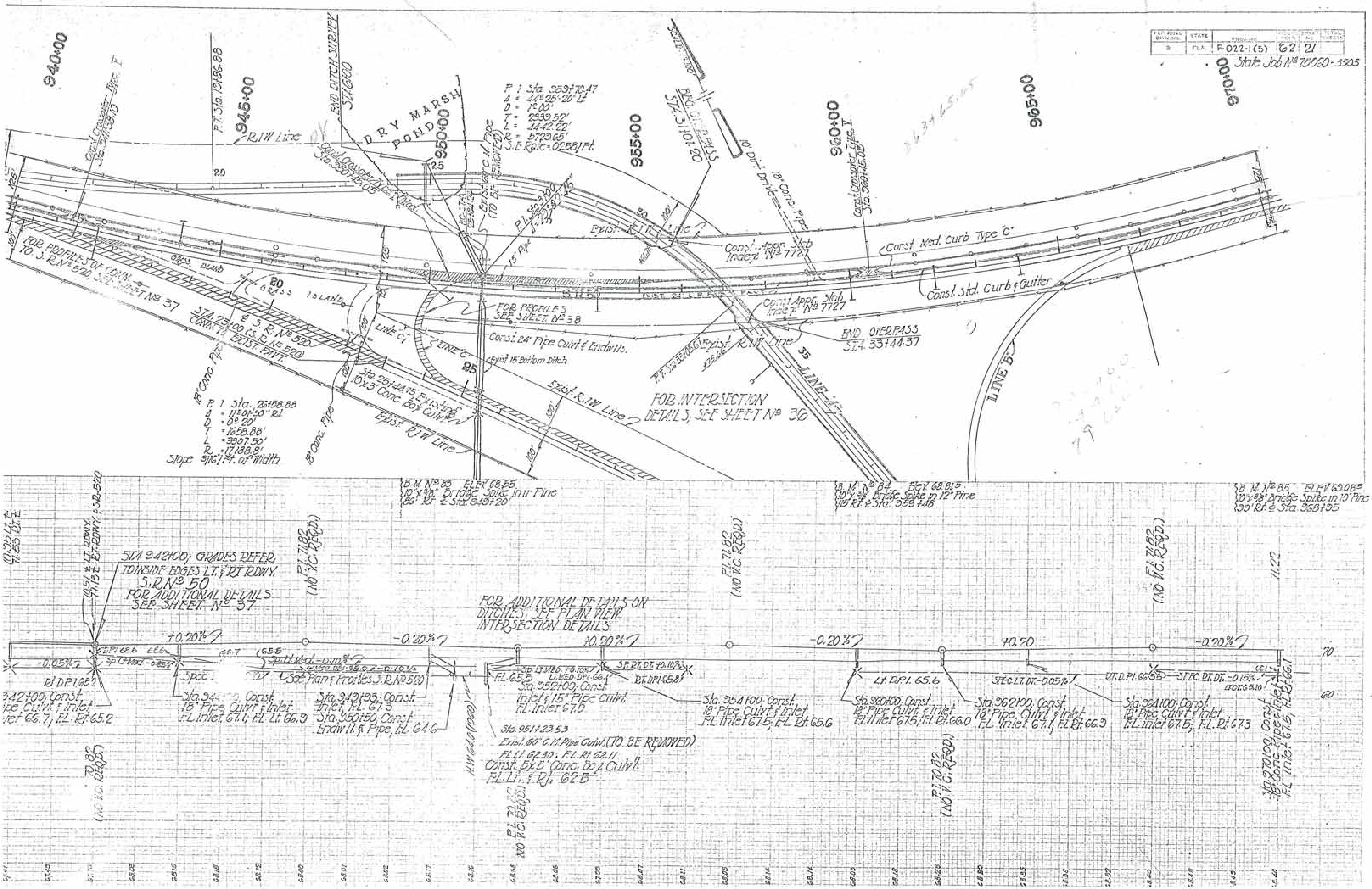
F-022-1(5)
State Job No 75060-3505
885+00
890+00
895+00
900+00
905+00
910+00
S.R. 50
Exist. R/W Line
Const. Crossover Type IV (Mod.) Sta. 886+06.96
Const. 87.5 of Guardrail Index No 2300-E
Exist. Conc. Bridge
END SURVEY STA. 3100
Remove Guardrail Lt. of Rdwy. Store as directed by the Engineer. To be hauled by Maint. Dept.
P.I. Sta. 885+33.00
Δ = 24°57'30" Rt.
D = 0°25'
T = 3043.27'
L = 5990.00'
R = 13,751.00'
No Superelev. Reqd.
For Outfall Detail See Sheet No 43
Const. Crossover Type II Sta. 897+14.14 (Mod.)
Const. Crossover Type II Sta. 905+10.5 (Mod.)
Type I A.C.S.C. = 409 Sq. Yds.
Limerock Base = 390 Sq. Yds.
Med. Curb Type "A" = 131 Lin. Ft.
Exist. 24" Conc. Pipe Culvt.
INTERSECTION DETAILS - STA. 897+14.14
Scale 1" = 50'
INTERSECTION QUANTITIES
Limerock Base 315 S.Y.
Type I-A.C.S.C. 310 S.Y.
B.M. No 76 ELEV. 64.36
R.R. SPIKE 12" PINE
138' RT. ℄ STA. 884+21
B.M. No 77 ELEV. 62.63
R.R. SPIKE IN 12" PINE
105' RT. ℄ STA. 891+78
B.M. No 78 ELEV. 65.40
R.R. SPIKE IN 3" PINE
120' LT. ℄ STA. 901+00
0.00% ELEV. 66.36
H.W. 61.9 (1960)
H.W. 62.7 (1960)
Spec. Lt. Ditch -0.10%
A-8 Matl. (To be Removed)
Lt. DP 62.8
Spec. Lt. Dt. -0.10%
+0.29%
+0.055%
Sta. 891+04.0
Exist. 10'x4' C.B.C.
F.L. Lt. 59.04, F.L. Rt. 58.91
Const. Conc. Box Culvt. Extn.
F.L. Lt. 59.00
Sta. 902+08.95
Exist. 24" Conc. Pipe Culvt.
F.L. Lt. 61.70, F.L. Rt. 61.16
Const. 24" Conc. Pipe Culvt. Extn.
F.L. Lt. 61.3
SR-50 CD-10
SR-50 CD-11

P-11



FED. ROAD DIVN. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
3	FLA.	F-022-1(5)	62	20	

State Job Nº 75060-3505
915+00
920+00
925+00
930+00
935+00
940+00
EQUATION
Sta. 934+63.51 Bk.=
P.C. Sta. 10+00 (LINE "A")
P.C. Sta. 936+30.95
P.C. Sta. Line "C" 13+78.26
15+00
Line "A"
Exist. R/W Line
M.P. (19.263)
18" Conc. Pipe
20' Dirt Drive
10' Dirt Drive
P.T. Sta. 915+25.73
Sta. 930+00
BEGIN NEW CONST.
RT. ROADWAY
Sta. 935+85 Beg. C.&G.
Med. Curb Type "C"
Sta. 936+45.49 =
P.C. Sta. 10+00
Use Std. Quan. for Pavt. & Curb
Limerock Base = 94 Sq. Yds.
Approx DOT
Traff Count
Tallahassee
B.M. Nº 79 ELEV. 67.13
R.R. SPIKE IN 12" PINE
120' RT. ℄ STA. 911+56
B.M. Nº 80 ELEV. 69.31
R.R. SPIKE IN 10" PINE
120' LT. ℄ STA. 921+86
B.M. Nº 81 ELEV. 68.37
R.R. SPIKE IN 11" PINE
126' LT. ℄ STA. 931+12
B.M. Nº 82 ELEV. 66.91
R.R. SPIKE IN 12" PINE
90' RT. ℄ STA. 938+04
P.I. 68.18
NO V.C. REQD.
P.I. 69.30
(NO V.C. REQD.)
P.I. 69.09
(RT. RDWY.)
Sta. 930+00 END RESURFACING
LT. RDWY., BEG. NEW CONST.
RT. RDWY.
FOR SPECIAL PROFILES
SEE SHEET Nº 37
+0.055 %
+0.16 %
+0.28 % (Lt. Rdwy.)
+0.39 % (Rt. Rdwy.)
Sta. 936+53 Const. 18" Pipe Culvt. & Inlet, F.L. Inlet 67.4, F.L. Rt. 65.5
Sta. 940+00 Const. 18" Pipe Culvt. & Inlets
F.L. Inlet Lt. 67.2
F.L. Inlet Lt. 67.0
F.L. Rt. 65.3
70
60


F-022-1(5)
62
21
FLA.
State Job No 79060-3505
940+00
945+00
950+00
955+00
960+00
965+00
970+00
P.T. Sta. 19186.88
END DITCH SURVEY
DRY MARSH POND
R/W Line
Const Crossover Type V
P.I. Sta. 963+70.47
Δ = 44° 25' 20" Lt.
D = 1° 00'
T = 2383.52'
L = 4442.22'
R = 5729.65'
S.E Rate = 0.0581/Ft.
BEG. OVERPASS
STA. 31+01.20
10' Dirt Drive
18" Conc. Pipe
Const. Appr. Slab Index No 7727
Const Med. Curb Type "C"
Const. Std. Curb & Gutter
END OVERPASS
STA. 33+44.37
FOR PROFILES OF CONN. TO S.R. No 520, SEE SHEET No 37
GRASS ISLAND
S.R. No 520
STA. 25+00 (S.R. No 520) CONN. TO EXIST. PAVT.
FOR PROFILES SEE SHEET No 38
Const. 24" Pipe Culvt & Endwlls.
LINE "C"
Exist 15" Bottom Ditch
Sta. 25+44.75 Existing 10'x3' Conc. Box Culvt.
Exist. R/W Line
FOR INTERSECTION DETAILS, SEE SHEET No 36
LINE "A"
LINE "B"
18" Conc. Pipe
P.I. Sta. 26+58.88
Δ = 11° 01' 30" Rt.
D = 0° 20'
T = 1658.88'
L = 3307.50'
R = 17188.8'
Slope 3/16"/Ft. of Width
B.M. No 83 ELEV. 68.55 10"x3/8" Bridge Spike in 11" Pine 86' Rt. ℄ Sta. 949+20'
B.M. No 84 Elev. 68.815 10"x3/8" Bridge Spike in 12" Pine 115' Rt. ℄ Sta. 959+48
B.M. No 85 ELEV. 69.085 10"x3/8" Bridge Spike in 10" Pine 135' Rt. ℄ Sta. 968+35
STA. 942+00; GRADES REFER TO INSIDE EDGES LT. & RT. RDWY. S.R. No 50
FOR ADDITIONAL DETAILS SEE SHEET No 37
FOR ADDITIONAL DETAILS ON DITCHES, SEE PLAN VIEW INTERSECTION DETAILS.
P.I. 71.82 (NO V.C. REQD.)
P.I. 70.82 (NO V.C. REQD.)
+0.20%
-0.20%
+0.20
-0.05%
See Plan & Profiles S.R. No 520
Sta. 944+00, Const. 18" Pipe Culvt & Inlet F.L. Inlet 67.1, F.L. Lt. 66.3
Sta. 949+93, Const. Inlet, F.L. 67.3
Sta. 950+50, Const. Endwll. & Pipe, F.L. 64.6
Sta. 952+00, Const. Inlet & 15" Pipe Culvt. F.L. Inlet 67.0
Sta. 951+23.53 Exist. 60" C.M. Pipe Culvt. (TO BE REMOVED) F.L. Lt. 62.30, F.L. Rt. 62.11
Const. 8'x5' Conc. Box Culvt. F.L. Lt. & Rt. 62.5
H.W. 62.0 (1960)
Sta. 954+00, Const. 18" Pipe Culvt & Inlet F.L. Inlet 67.5, F.L. Rt. 65.6
Sta. 960+00, Const. 18" Pipe Culvt & Inlet F.L. Inlet 67.5, F.L. Rt. 66.0
Sta. 962+00, Const. 18" Pipe Culvt & Inlet F.L. Inlet 67.1, F.L. Rt. 66.3
Sta. 964+00, Const. 18" Pipe Culvt & Inlet F.L. Inlet 67.5, F.L. Rt. 67.3
Sta. 970+00, Const. 18" Conc. Pipe & Inlet F.L. Inlet 67.6, F.L. Rt. 66.1
Lt. D.P.I. 65.6
SPEC. LT. DT. -0.05%
SPEC. RT. DT. -0.15%
70
60

Appendix: Q

Excerpt from Lochner

SR-50 Widening Construction Plans

COMPONENTS OF CONTRACT PLANS SET

ROADWAY PLANS
SIGNING AND PAVEMENT MARKING PLANS
SIGNALIZATION PLANS
ITS PLANS

A DETAILED INDEX APPEARS ON THE KEY SHEET OF EACH COMPONENT

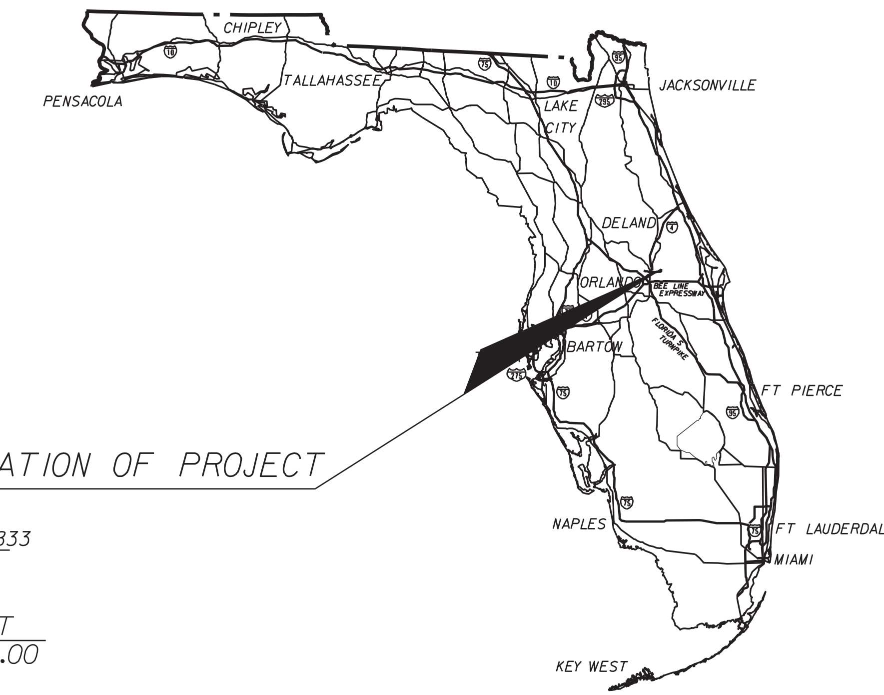
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

CONTRACT PLANS

FINANCIAL PROJECT ID 239203-4-52-01

ORANGE COUNTY (75060)

STATE ROAD NO. 50



LOCATION OF PROJECT

SHEET NO.	SHEET DESCRIPTION
1	KEY SHEET
~~2~~	~~NOTES TO REVIEWER~~
~~3-7~~	~~SUMMARY OF PAY ITEMS~~
11 - 12	DRAINAGE MAP
~~15 - 33~~	~~TYPICAL SECTIONS~~
~~34 - 48~~	~~SUMMARY OF QUANTITIES~~
~~49 - 52~~	~~BRIDGE CULVERT DETAILS~~
~~53 - 63~~	~~REPORT OF BORINGS~~
~~64 - 78~~	~~SUMMARY OF DRAINAGE STRUCTURES~~
~~79~~	~~OPTIONAL MATERIAL TABULATION~~
~~80~~	~~GENERAL NOTES~~
~~81 - 82~~	~~PROJECT LAYOUT~~
~~83 - 85~~	~~REFERENCE TIES~~
120 - 125	ROADWAY PLAN-PROFILES
~~126 - 150~~	~~SIDE STREET PROFILES~~
~~151 - 154~~	~~RAMP TERMINAL DETAILS~~
~~155 - 158~~	~~INTERSECTION DETAILS~~
~~159 - 330~~	~~DRAINAGE STRUCTURES~~
337	POND DETAILS
338 - 340	DRAINAGE DETAILS
~~341~~	~~SPECIAL DETAILS~~
~~343~~	~~INTERCHANGE CROSS SECTION PATTERN SHEET~~
~~344~~	~~ROADWAY SOIL SURVEY~~
602 - 605	CROSS SECTIONS
~~629 - 630~~	~~DRIVEWAY SECTIONS~~
~~631 - 664~~	~~STORMWATER POLLUTION PREVENTION PLAN~~
~~665 - 772~~	~~TRAFFIC CONTROL PLANS~~
~~773 - 818~~	~~UTILITY ADJUSTMENTS~~
~~819 - 828~~	~~CRITICAL TEMPORARY SHEET PILE WALL DETAILS~~
~~829 - 830~~	~~CONCRETE ENDWALL DETAILS~~

BRIDGE CULVERT 750832
BEGIN STA. 556+57.26
END STA. 556+90.61

BEGIN PROJECT
STA. 500+00.00
MP 9.467

BRIDGE CULVERT 750833
BEGIN STA. 710+00.05
END STA. 710+26.55

END PROJECT
STA. 759+00.00

TO SANFORD

TO OVIEDO

R-30-E | R-31-E

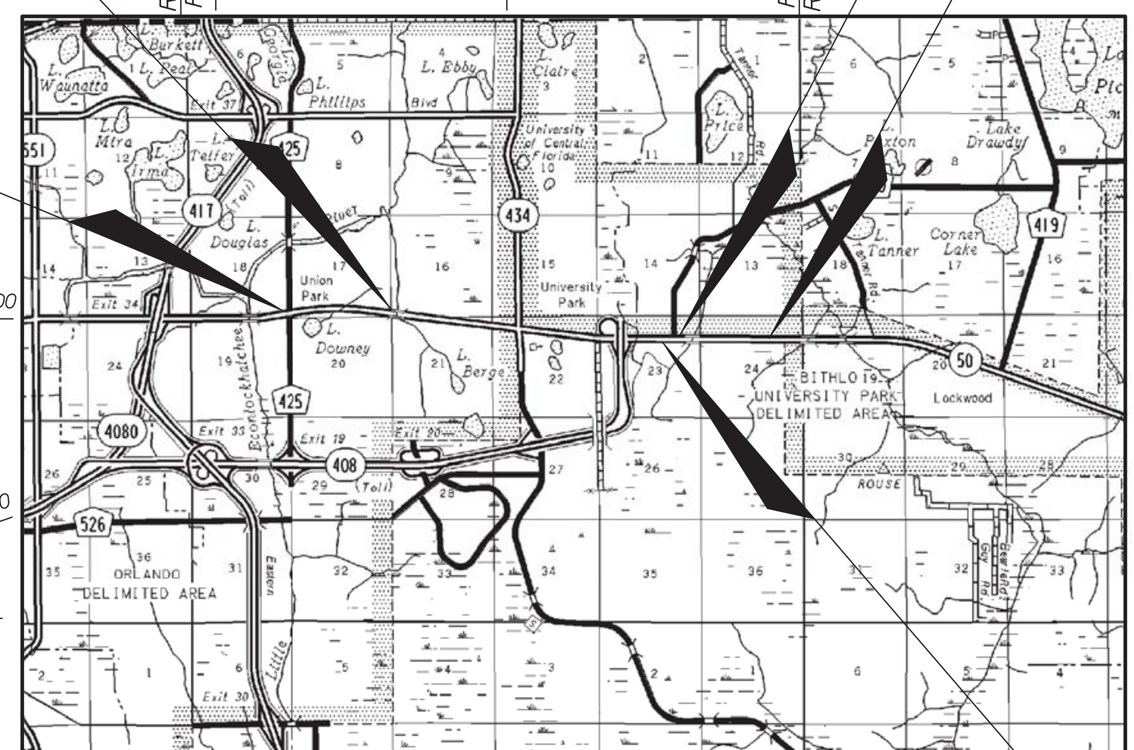
R-31-E | R-32-E

TO ORLANDO

TO ORLANDO

TO TITUSVILLE

T-22-S | T-23-S



N

0 1 2
Miles

R-30-E | R-31-E

R-31-E | R-32-E

TO KISSIMMEE

EQUATION:
STA. 684+57.21 ℄ CONST. (BK.) =
STA. 684+58.35 ℄ CONST. (AH.) =
STA. 684+58.35 ℄ SURVEY (AH.)

ROADWAY SHOP DRAWINGS TO BE SUBMITTED TO:
JOHN N. BOX P.E. NO. 41832
H.W. LOCHNER INC.
13577 FEATHER SOUND DR., SUITE 600
CLEARWATER, FLORIDA 33762

PLANS PREPARED BY:

LOCHNER

H. W. LOCHNER, INC.
CONSULTING ENGINEERS AND PLANNERS
13577 FEATHER SOUND DR., SUITE 600
CLEARWATER, FLORIDA 33762
VENDOR NO. 36-2338811
CONTRACT NO. C-7461
C.A. 894

NOTE: THE SCALE OF THESE PLANS MAY HAVE CHANGED DUE TO REPRODUCTION.

PLANS UPDATE
PERMIT SUBMITTAL
SEPTEMBER 2012

GOVERNING STANDARDS AND SPECIFICATIONS:
FLORIDA DEPARTMENT OF TRANSPORTATION, DESIGN STANDARDS DATED 2010, AND SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION DATED 2010, AS AMENDED BY CONTRACT DOCUMENTS.

APPLICABLE DESIGN STANDARDS MODIFICATIONS: 7-1-2013

FOR DESIGN STANDARDS MODIFICATIONS CLICK ON "DESIGN STANDARDS" AT THE FOLLOWING WEB SITE: http://www.dot.state.fl.us/rddesign/

REVISIONS

PROJECT LENGTH IS BASED ON ℄ CONSTRUCTION

LENGTH OF PROJECT		
	LINEAR FEET	MILES
ROADWAY	25,898.86	4.905
BRIDGES	NA	NA
NET LENGTH OF PROJECT	25,898.86	4.905
EXCEPTIONS	NA	NA
GROSS LENGTH OF PROJECT	25,898.86	4.905

FDOT PROJECT MANAGER: CHRISTOPHER L. DABSON, P.E.

KEY SHEET REVISIONS

DATE	BY	DESCRIPTION

ROADWAY PLANS
ENGINEER OF RECORD (E.O.R.): JOHN N. BOX, P.E.

P.E. NO.: 41832

FISCAL YEAR	SHEET NO.
14	1

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Q-1

$DATE$ $TIME$ $FILE$

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER C.A. 894
H. W. LOCHNER, INC.
CONSULTING ENGINEERS AND PLANNERS
13577 FEATHER SOUND DRIVE, SUITE 600
CLEARWATER, FLORIDA 33762
THERESA D. ELLISON, P.E. NO. 53918

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

DRAINAGE MAP

SHEET NO.
10

Q-2

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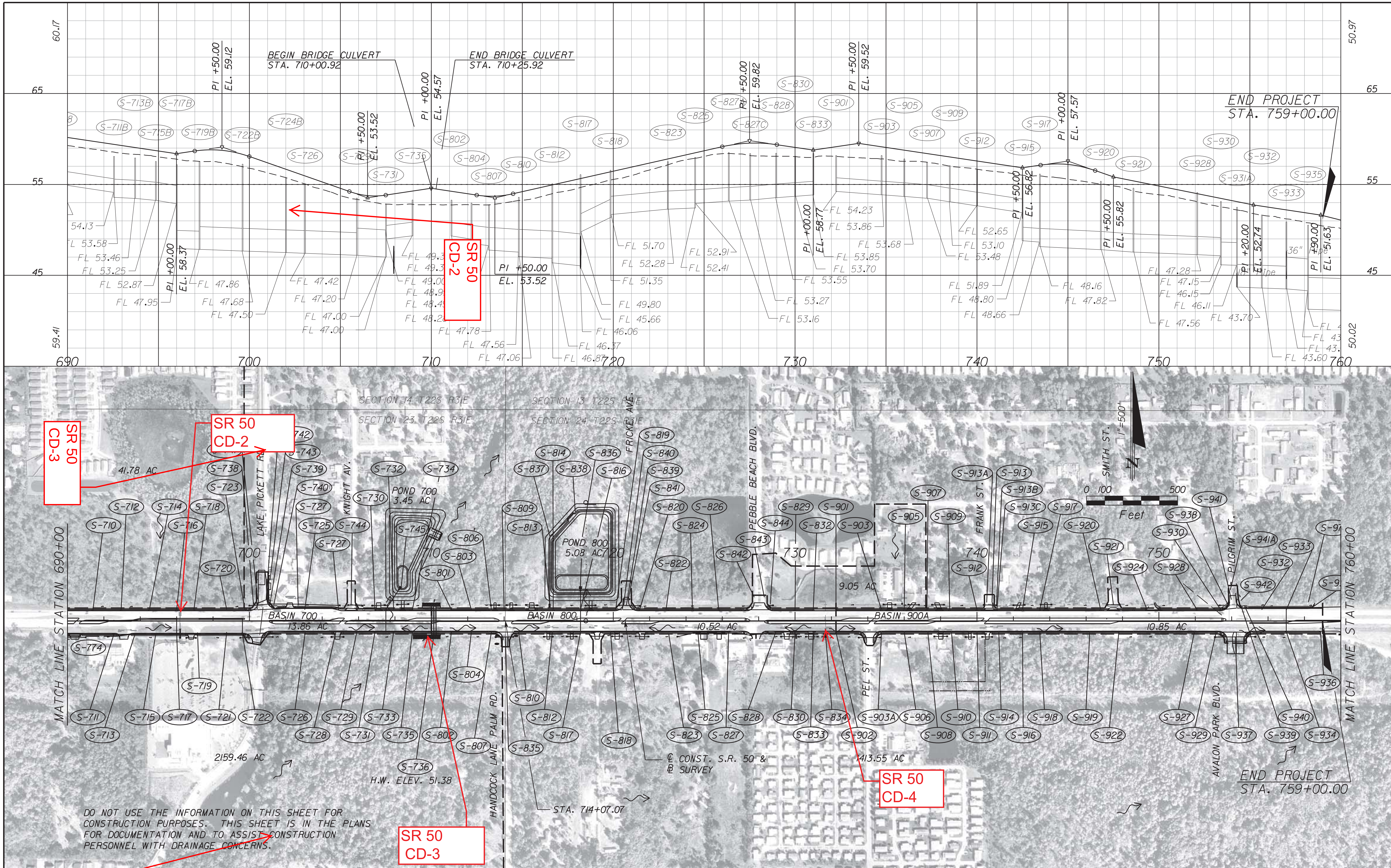

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER C.A. 894
H. W. LOCHNER, INC.
CONSULTING ENGINEERS AND PLANNERS
13577 FEATHER SOUND DRIVE, SUITE 600
CLEARWATER, FLORIDA 33762
MICHAEL D. FINCH, P.E. NO. 40118

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

DRAINAGE MAP

SHEET NO.
11

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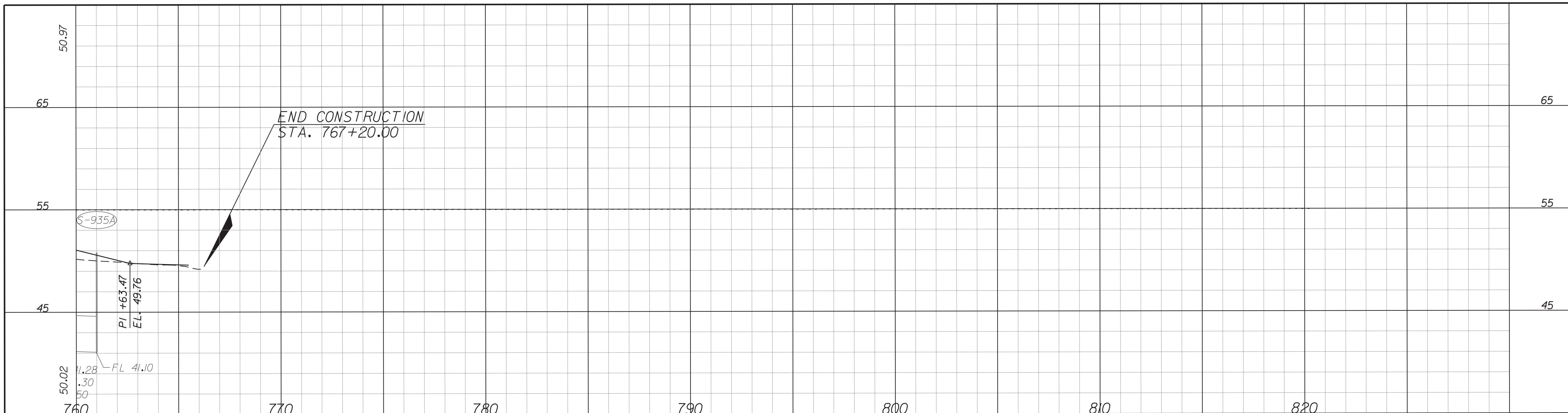

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER C.A. 894
H. W. LOCHNER, INC.
CONSULTING ENGINEERS AND PLANNERS
13577 FEATHER SOUND DRIVE, SUITE. 600
CLEARWATER, FLORIDA 33762
MICHAEL D. FINCH, P.E. NO. 40118

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

DRAINAGE MAP

SHEET NO. 12

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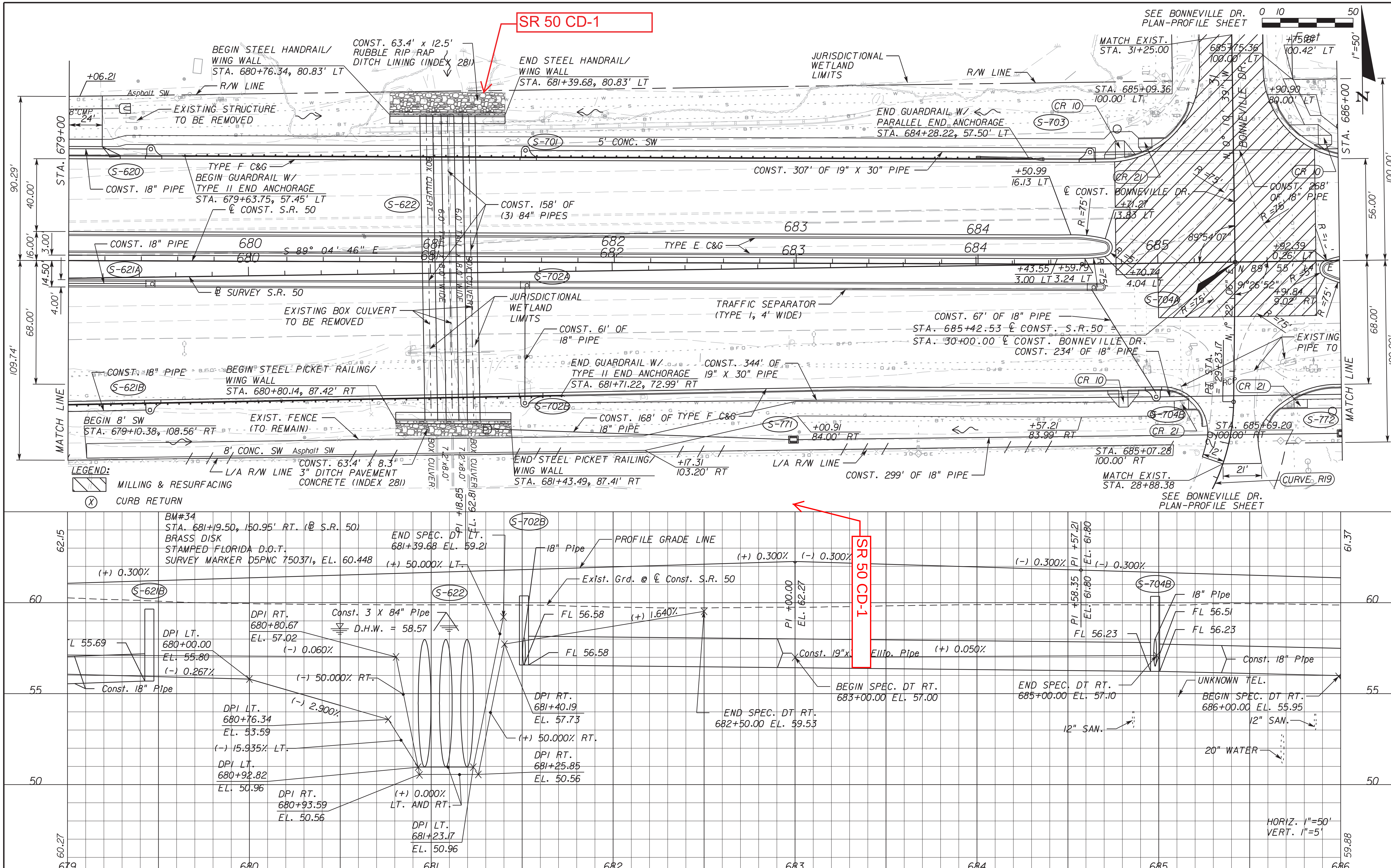

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (28)
STA. 679+00 TO STA. 686+00

SHEET NO. 113

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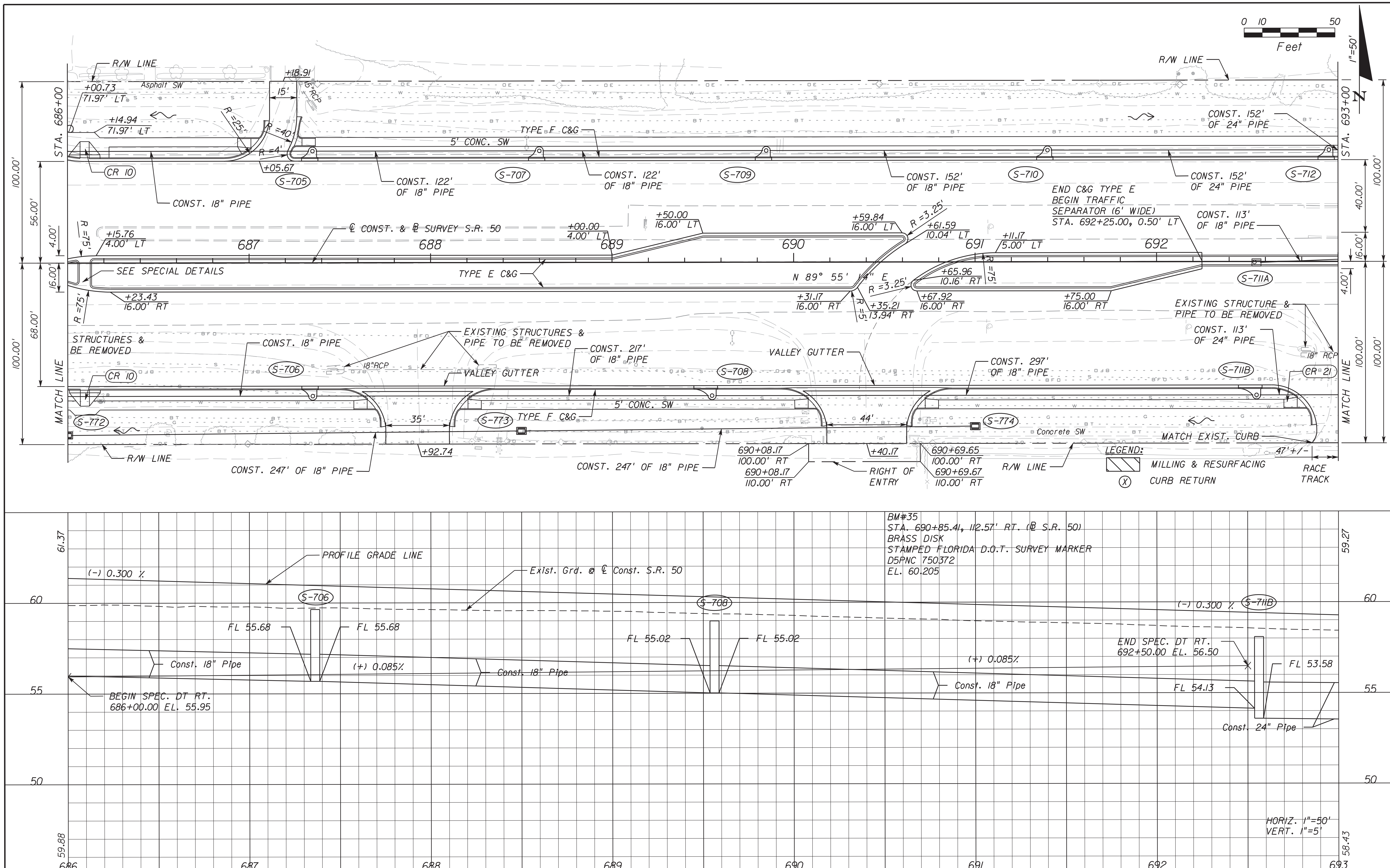

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (29)
STA. 686+00 TO STA. 693+00

SHEET NO.
114

Q-6

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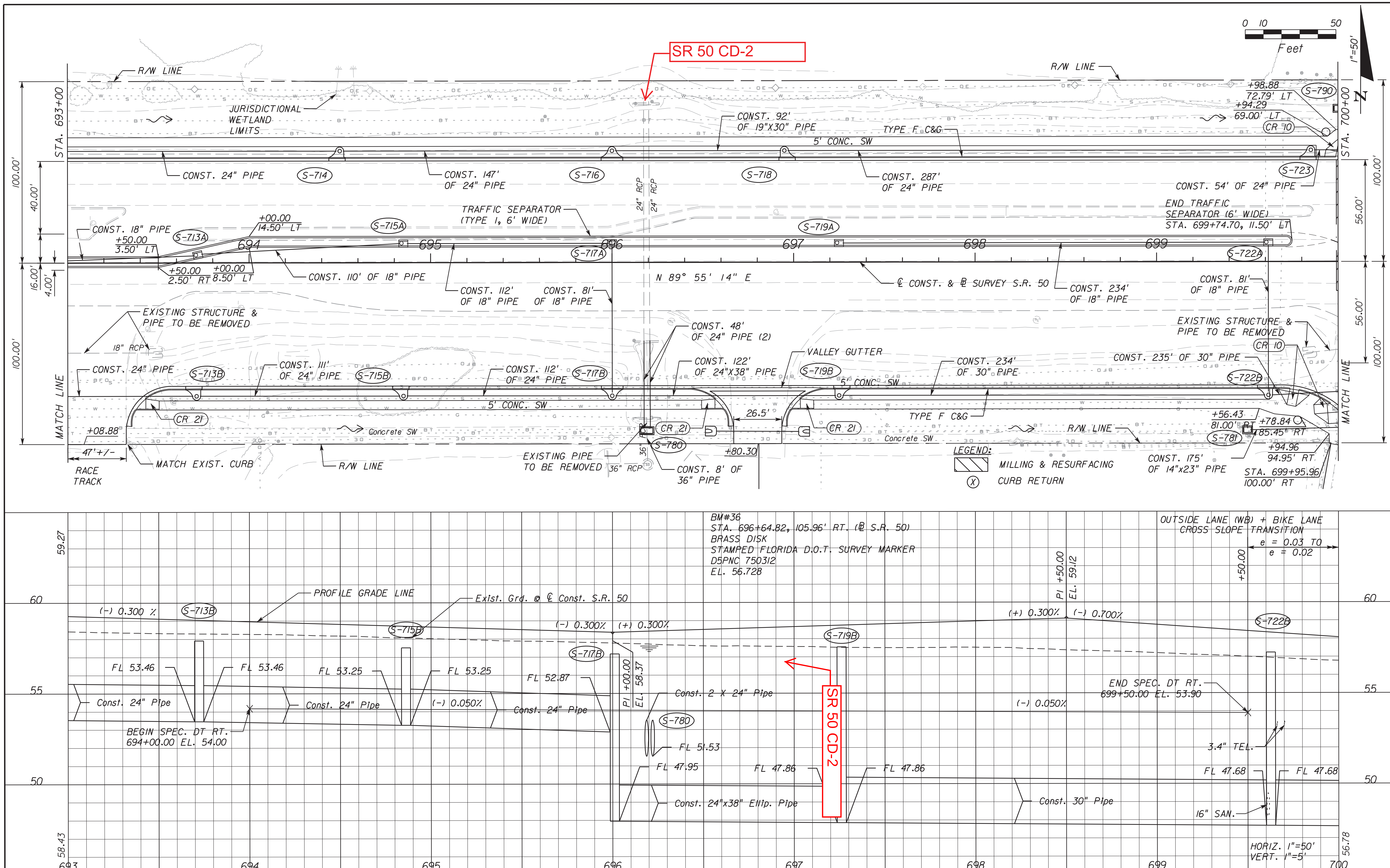

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (30)
STA. 693+00 TO STA. 700+00

SHEET NO.
115

Q-7

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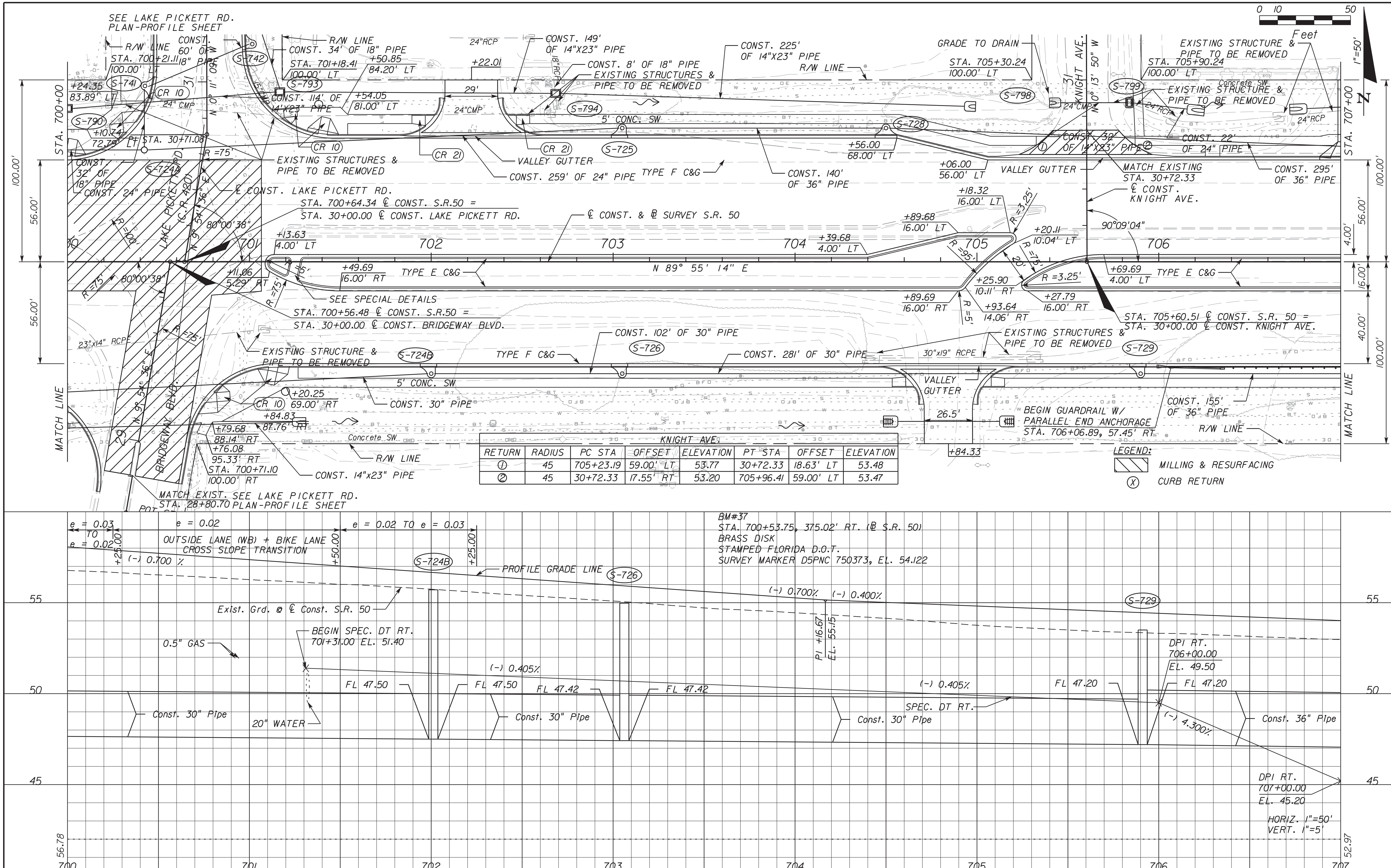

KNIGHT AVE.

RETURN	RADIUS	PC STA	OFFSET	ELEVATION	PT STA	OFFSET	ELEVATION
1	45	705+23.19	59.00' LT	53.77	30+72.33	18.63' LT	53.48
2	45	30+72.33	17.55' RT	53.20	705+96.41	59.00' LT	53.47

LEGEND:

MILLING & RESURFACING

X CURB RETURN

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REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER

13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (31)

STA. 700+00 TO STA. 707+00

SHEET NO. 116

Q-8

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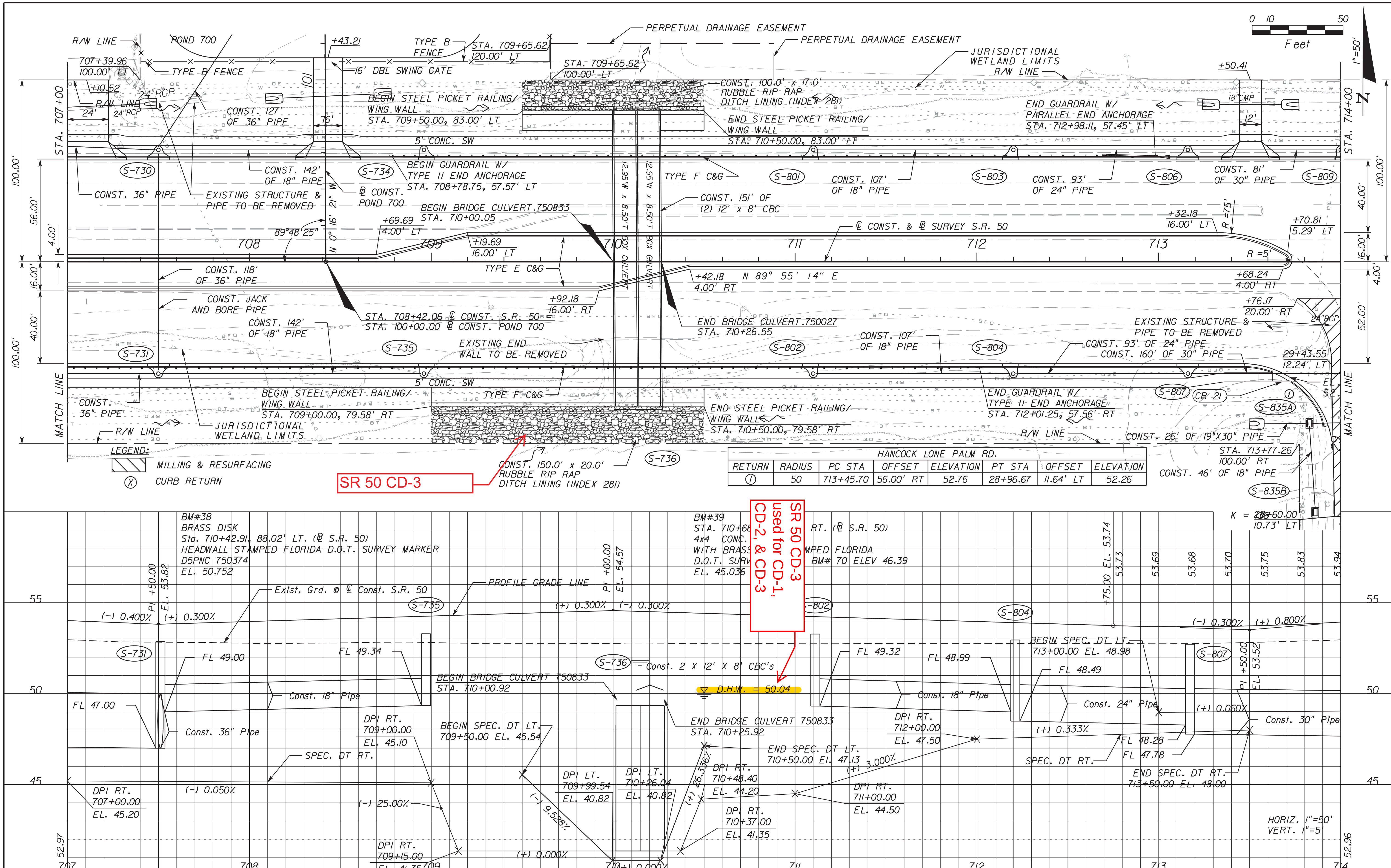

HANCOCK LONE PALM RD.

RETURN	RADIUS	PC STA	OFFSET	ELEVATION	PT STA	OFFSET	ELEVATION
1	50	713+45.70	56.00' RT	52.76	28+96.67	11.64' LT	52.26

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (32)
STA. 707+00 TO STA. 714+00

SHEET NO. 117

Q-9

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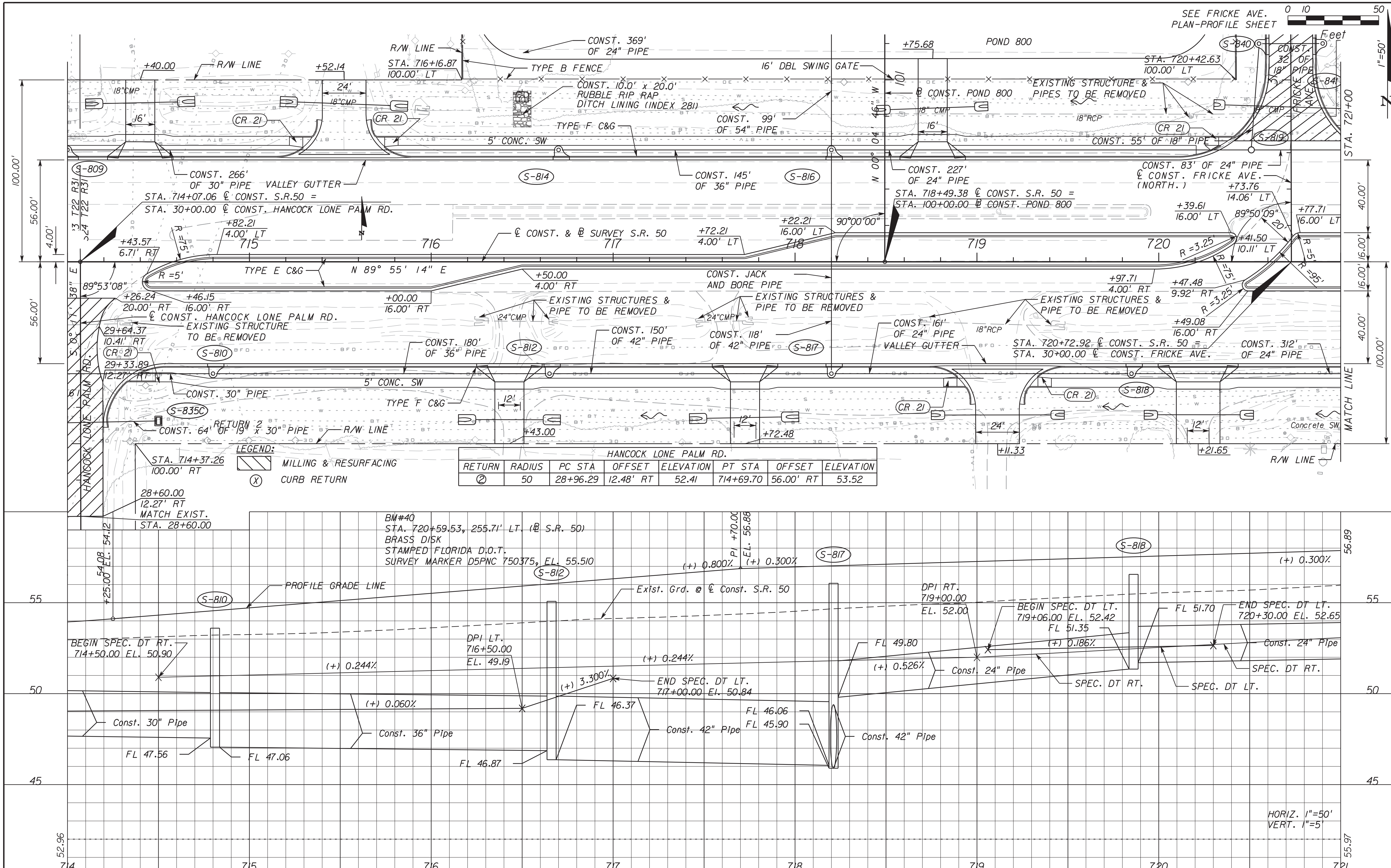

HANCOCK LONE PALM RD.							
RETURN	RADIUS	PC STA	OFFSET	ELEVATION	PT STA	OFFSET	ELEVATION
2	50	28+96.29	12.48' RT	52.41	714+69.70	56.00' RT	53.52

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (33)
STA. 714+00 TO STA. 721+00

SHEET NO. 118

Q-10

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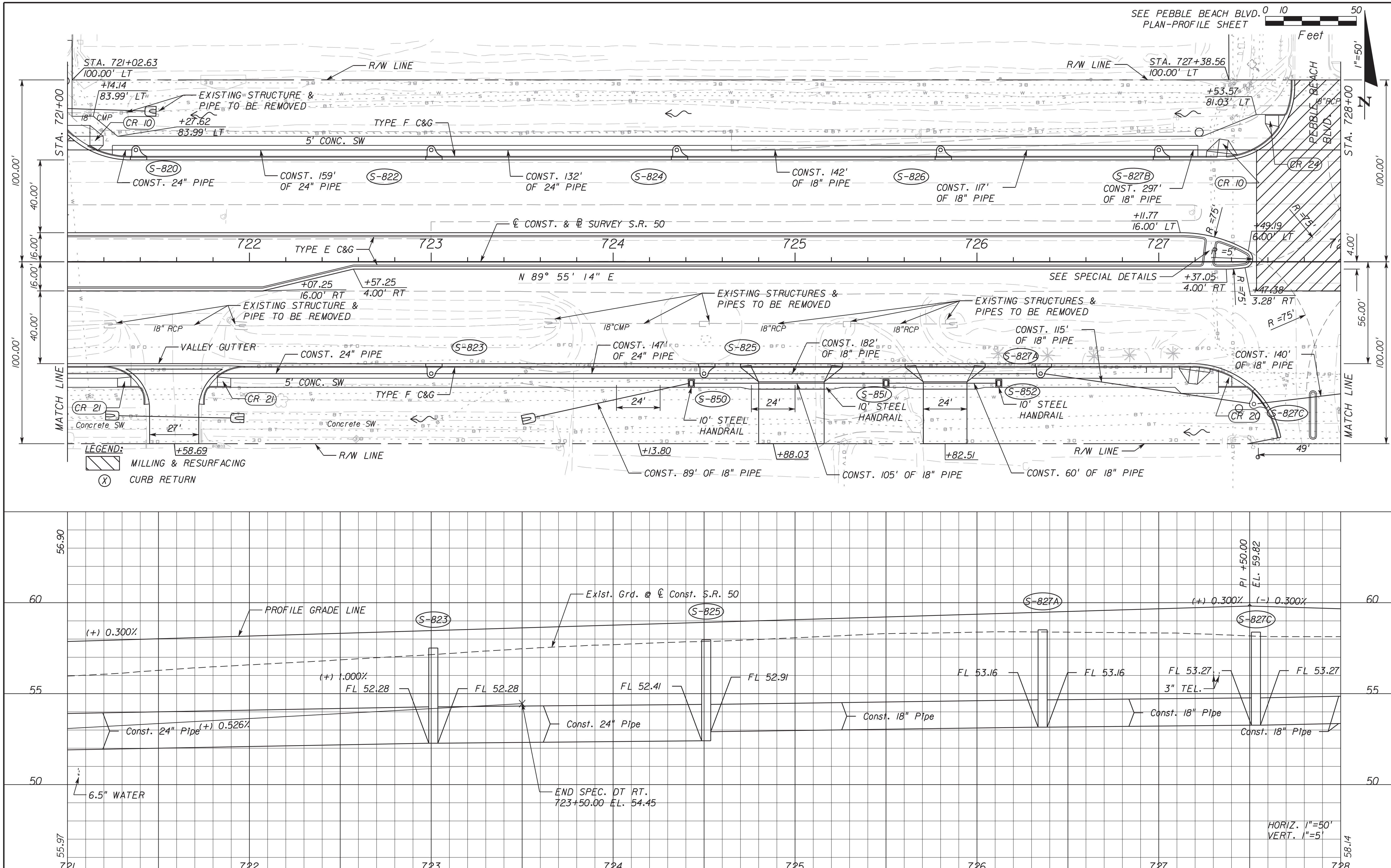

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (34)
STA. 721+00 TO STA. 728+00

SHEET NO. 119

Q-11

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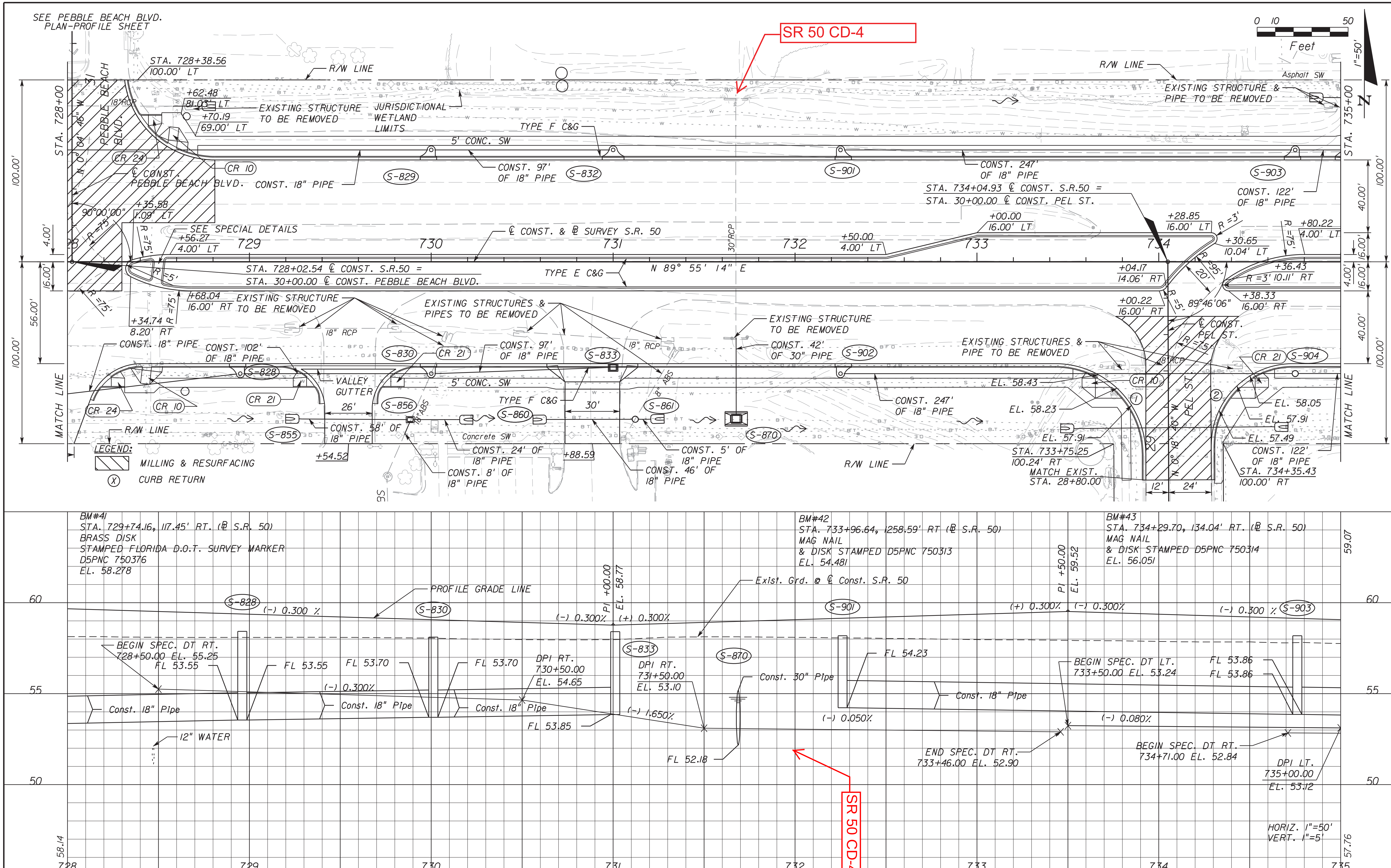

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REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (35)
STA. 728+00 TO STA. 735+00

SHEET NO. 120

Q-12

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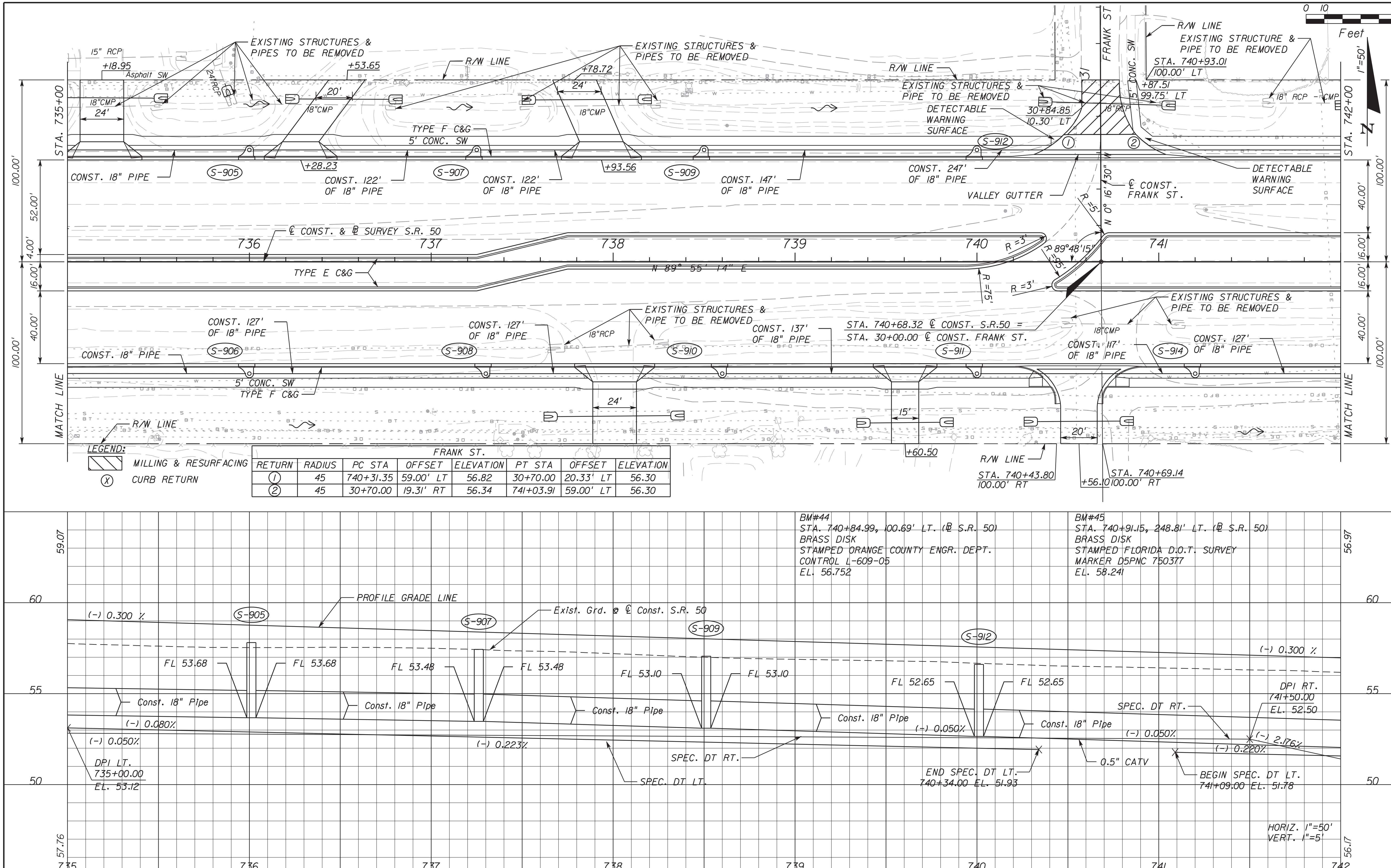

FRANK ST.

RETURN	RADIUS	PC STA	OFFSET	ELEVATION	PT STA	OFFSET	ELEVATION
1	45	740+31.35	59.00' LT	56.82	30+70.00	20.33' LT	56.30
2	45	30+70.00	19.31' RT	56.34	741+03.91	59.00' LT	56.30

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
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CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (36)
STA. 735+00 TO STA. 742+00

SHEET NO. 121

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Q-13

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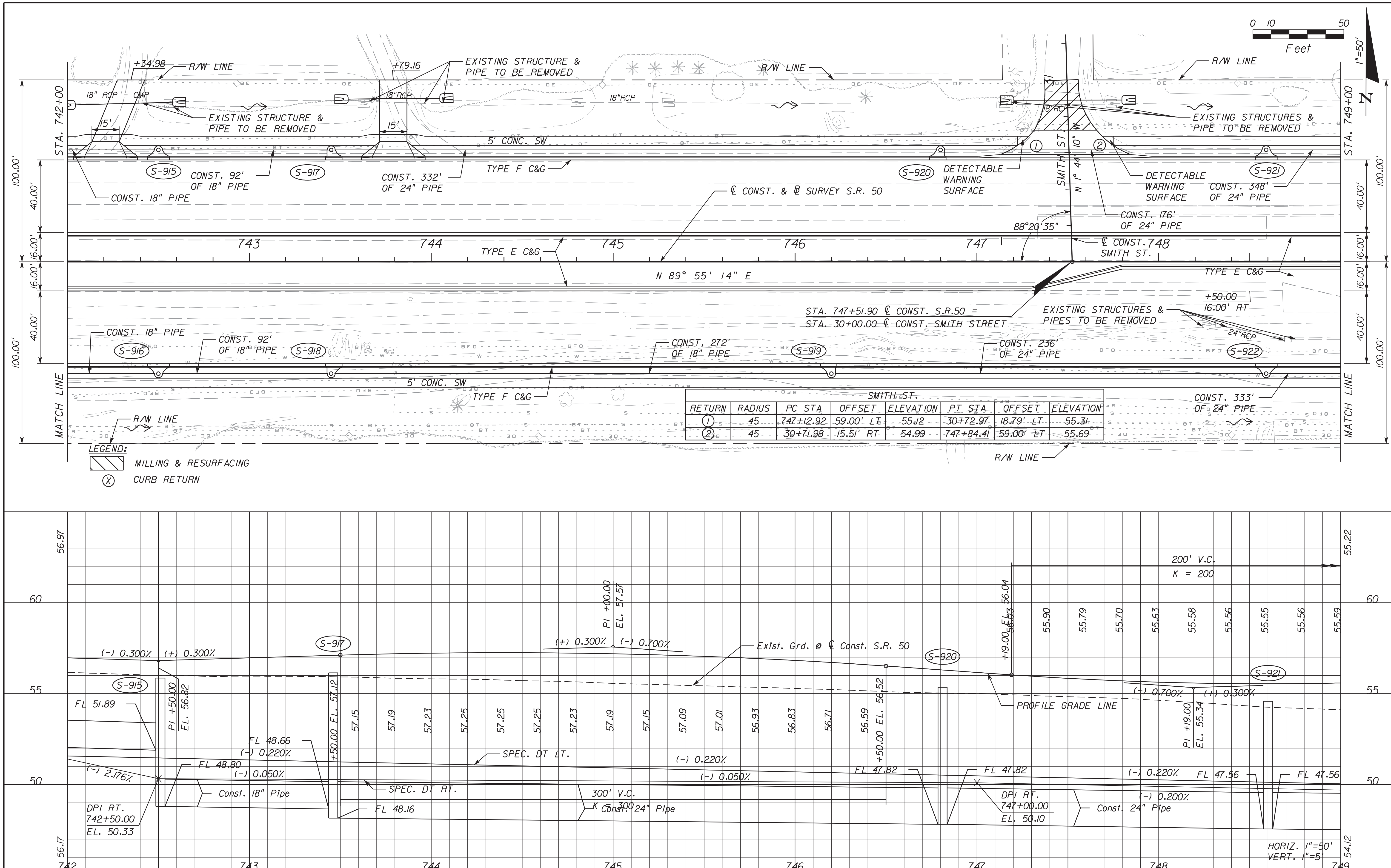

SMITH ST.

RETURN	RADIUS	PC STA	OFFSET	ELEVATION	PT STA	OFFSET	ELEVATION
1	45	747+12.92	59.00' LT	55.12	30+72.97	18.79' LT	55.31
2	45	30+71.98	15.51' RT	54.99	747+84.41	59.00' LT	55.69

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REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (37)
STA. 742+00 TO STA. 749+00

SHEET NO. 122

Q-14

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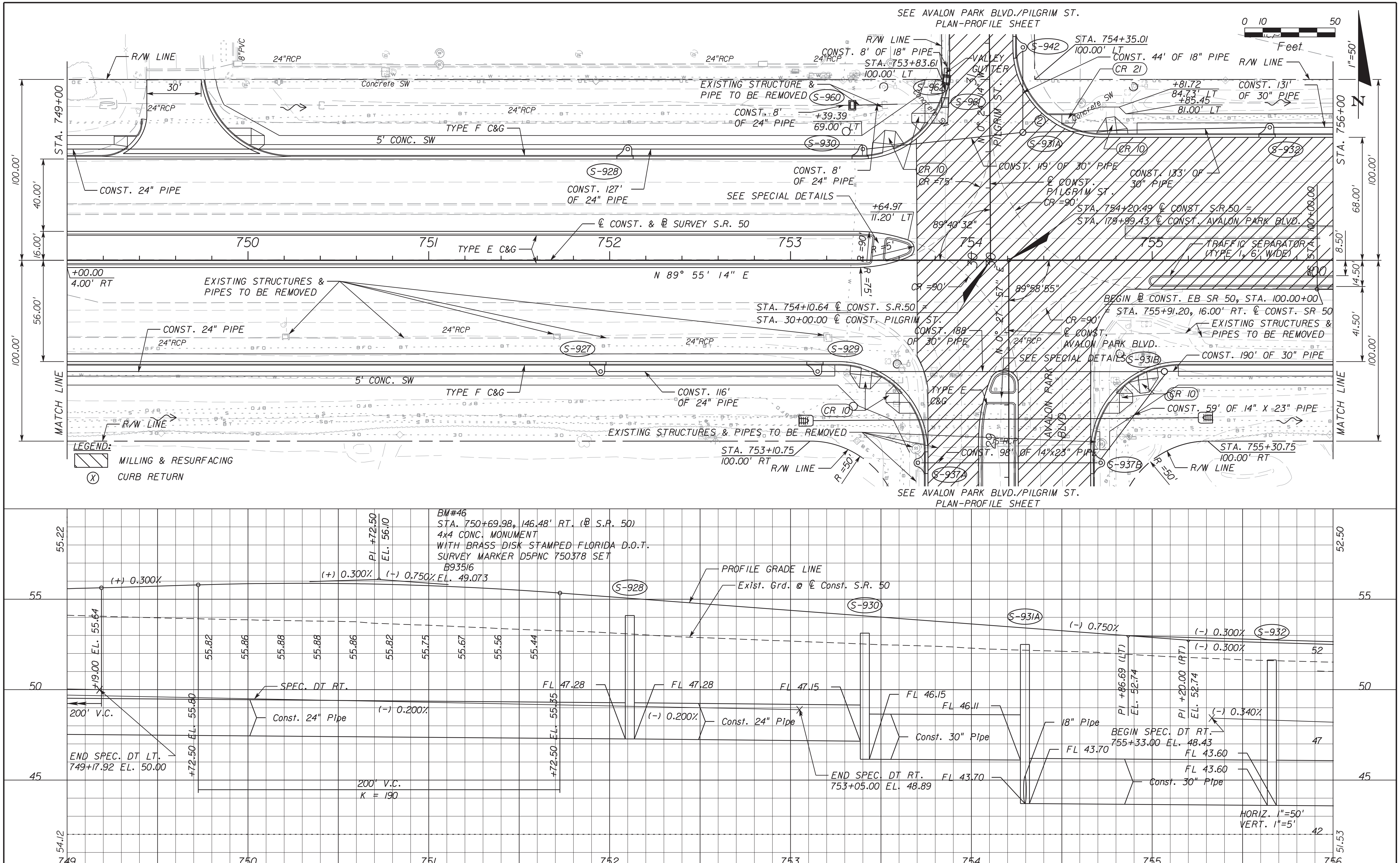

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (38)
STA. 749+00 TO STA. 756+00

SHEET NO. 123

Q-15

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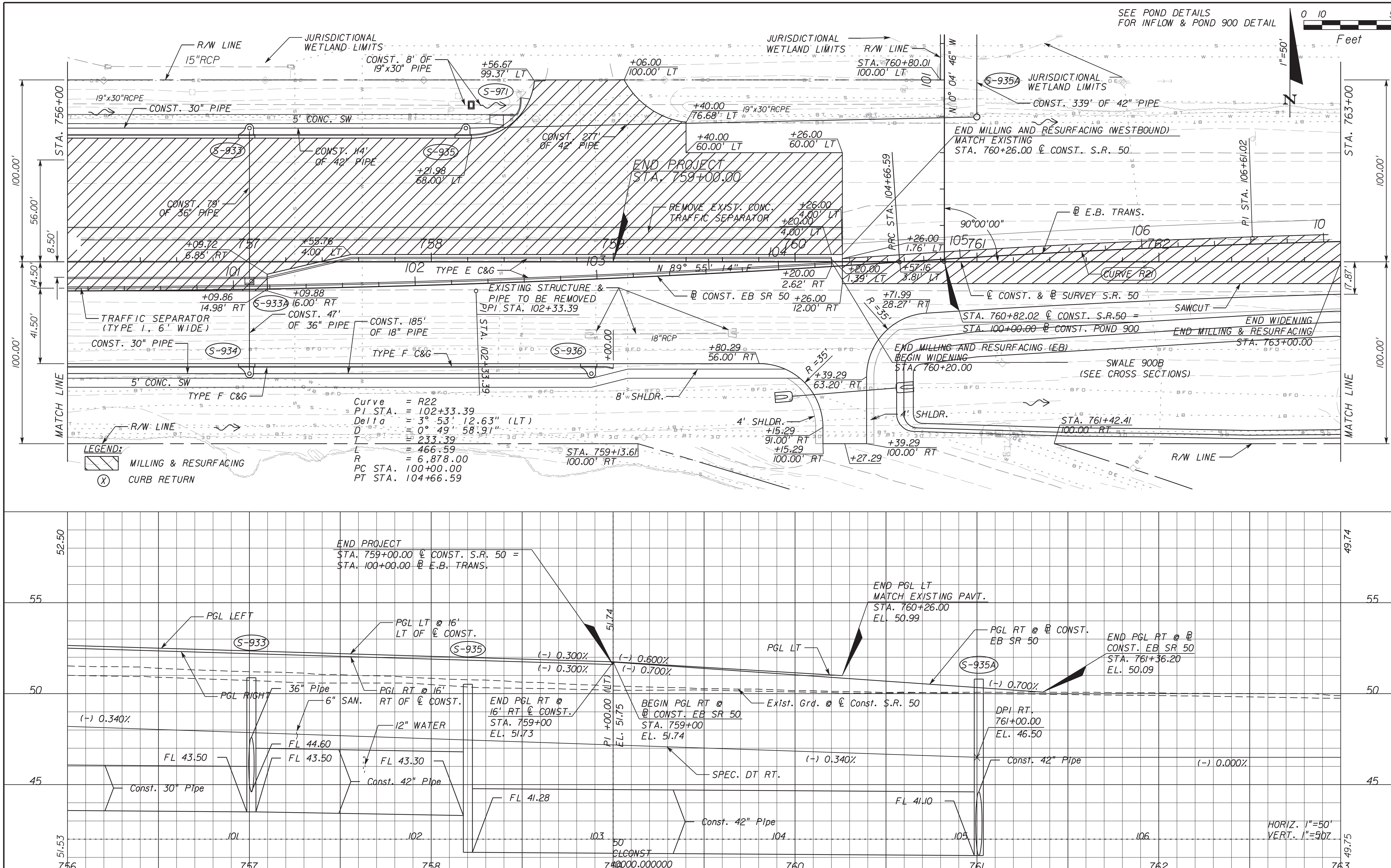

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (39)
STA. 756+00 TO STA. 763+00

SHEET NO.
124

Q-16

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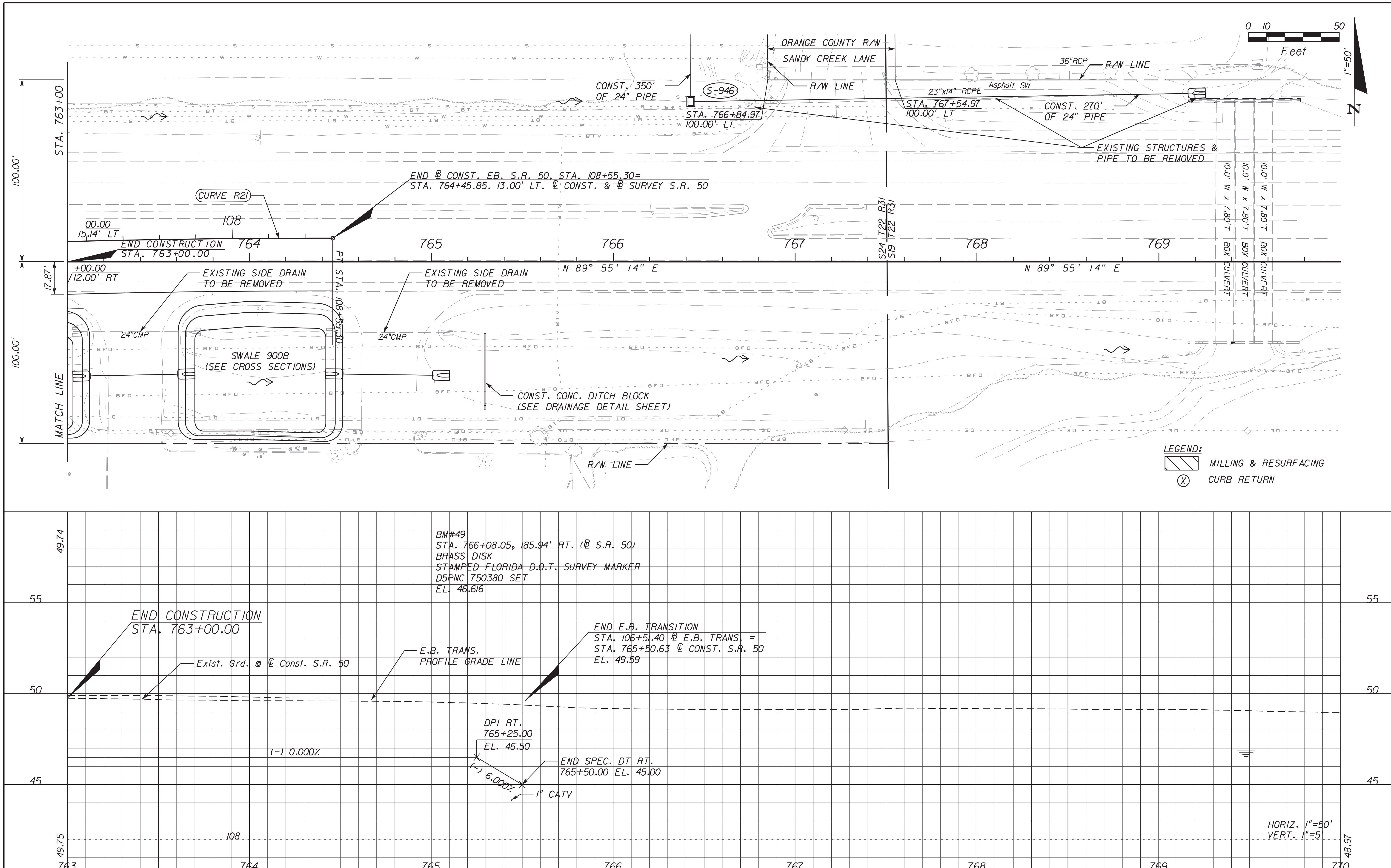

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

LOCHNER
13577 FEATHER SOUND DR. SUITE 600
CLEARWATER, FLORIDA 33762
FBPR CERTIFICATE OF AUTH. # 894
JOHN N. BOX, P.E. # 41832

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
S.R. 50	ORANGE	239203-4-52-01

PLAN-PROFILE (40)
STA. 763+00 TO STA. 770+00

SHEET NO. 125

Q-17

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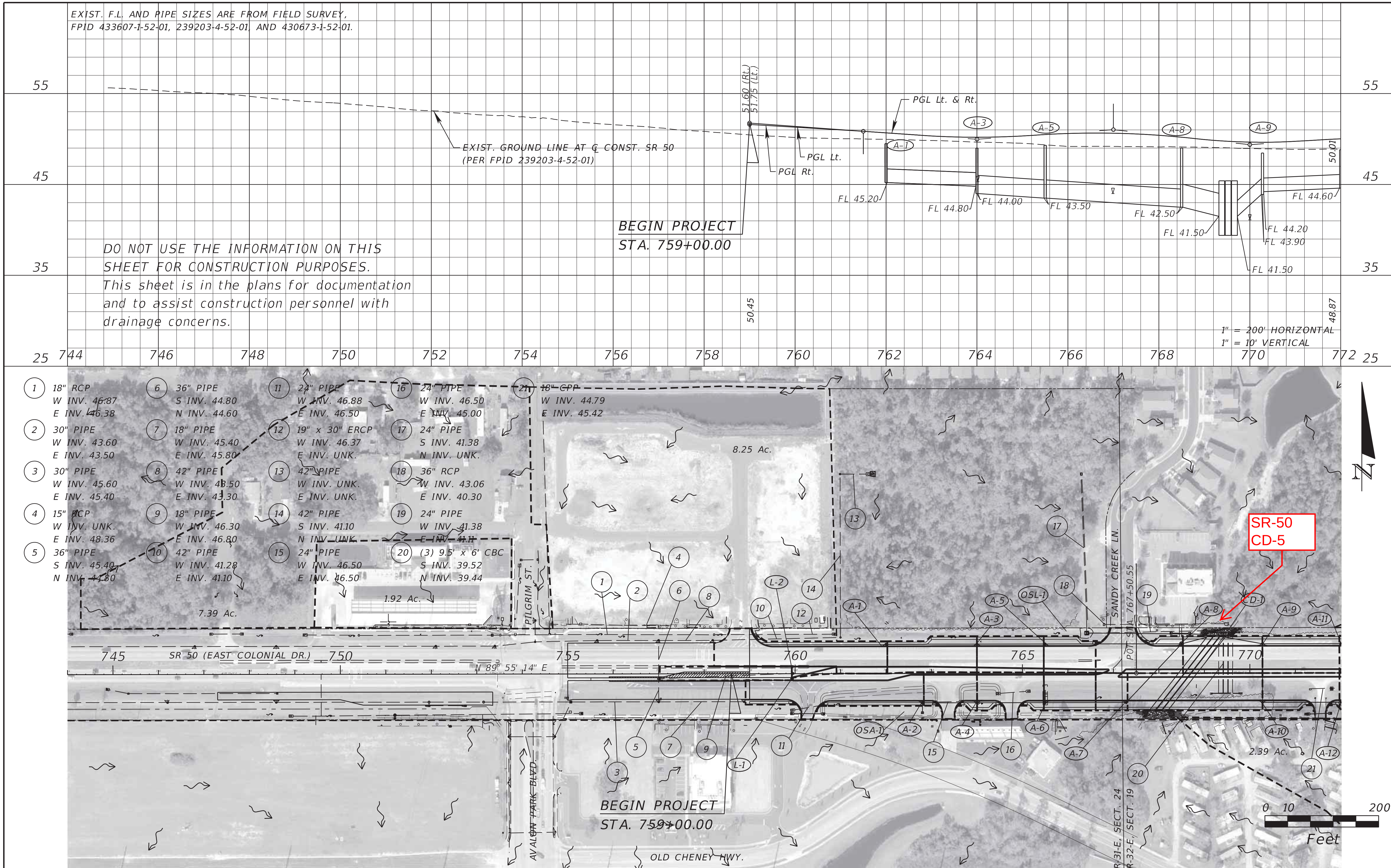
Appendix: R

Excerpt from Comprehensive Engineering Services, Inc.

SR-50 Widening Construction Plans



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Comprehensive Engineering Services, Inc.
201 S Orange Ave, Suite 1300
Orlando, FL 32801-3442
Certificate of Authorization No: 7862
Eric Arp, P.E., License No. 53971

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 5

R-1

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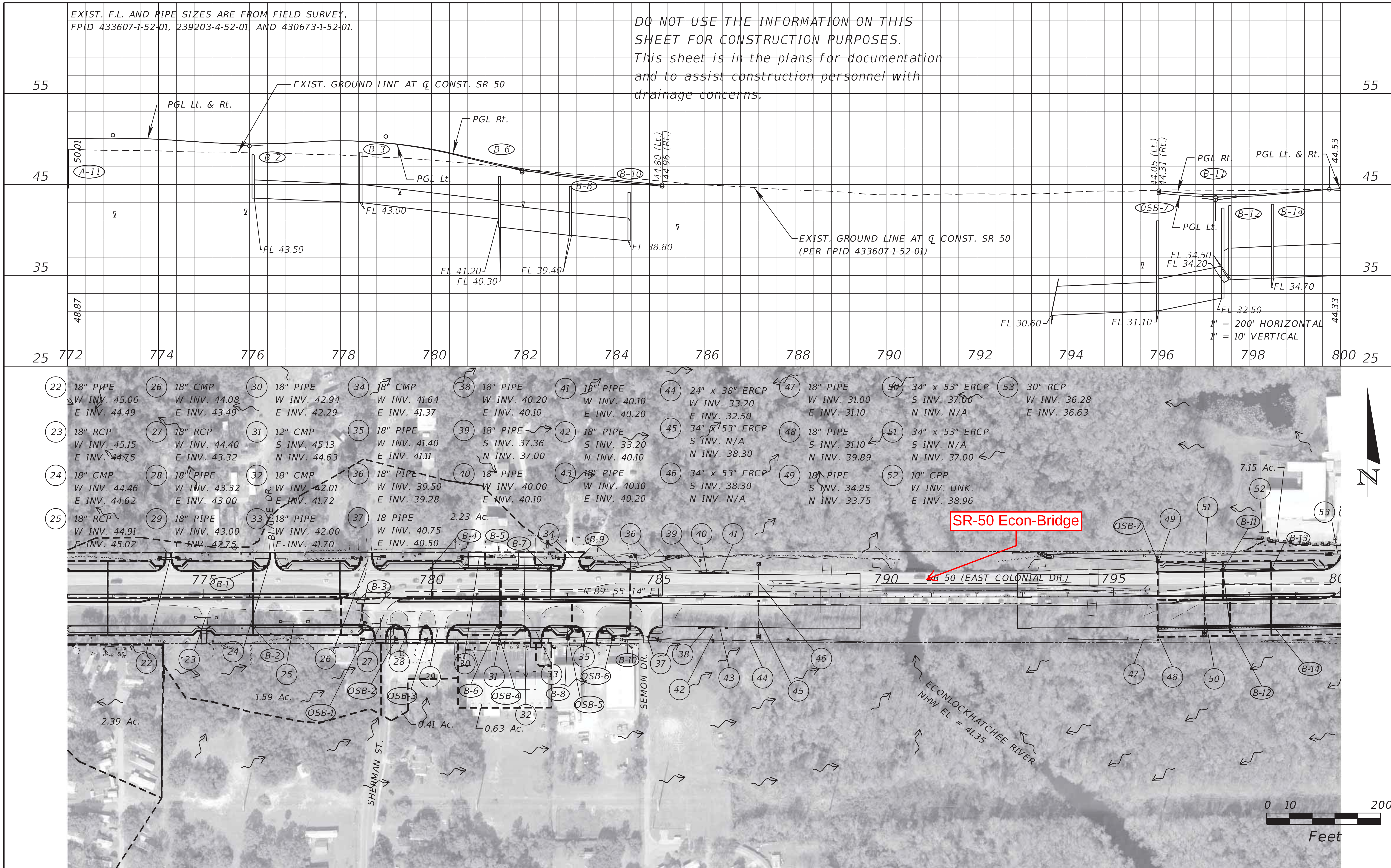

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DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO.
6

cwence 1/11/2016 12:11:11 PM T:\Projects\1500300\23920375201\drainage\DRMPRD02.DGN

EXIST. F.L. AND PIPE SIZES ARE FROM FIELD SURVEY,
FPID 433607-1-52-01, 239203-4-52-01, AND 430673-1-52-01.

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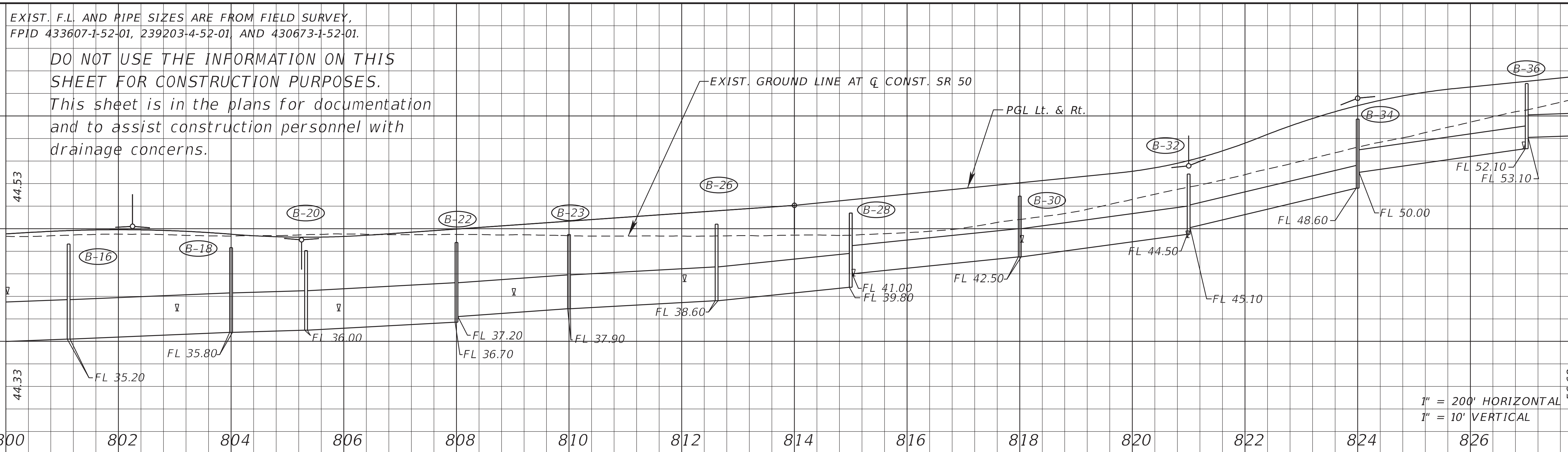
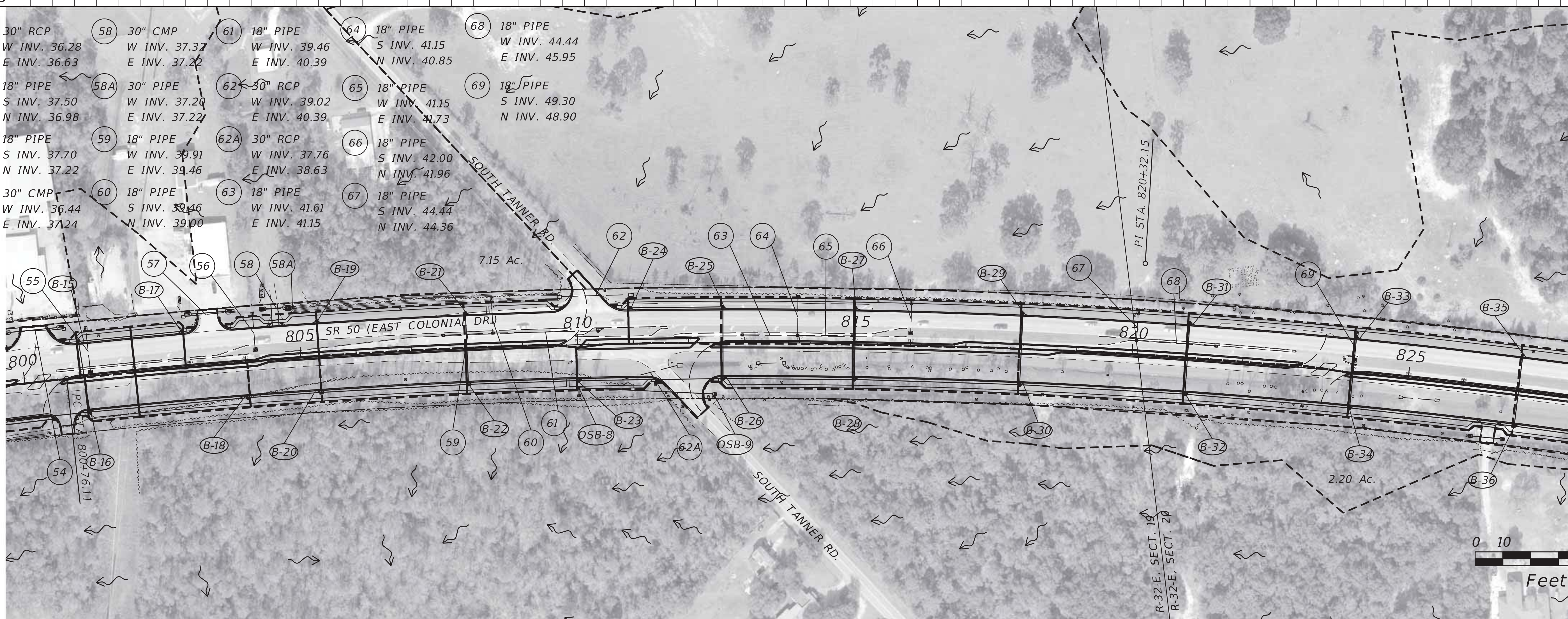


54	30" RCP	W INV. 36.28	E INV. 36.63
55	18" PIPE	S INV. 37.50	N INV. 36.98
56	18" PIPE	S INV. 37.70	N INV. 37.22
57	30" CMP	W INV. 36.44	E INV. 37.24
58	30" CMP	W INV. 37.32	E INV. 37.22
58A	30" PIPE	W INV. 37.20	E INV. 37.22
59	18" PIPE	W INV. 39.91	E INV. 39.46
60	18" PIPE	S INV. 39.46	N INV. 39.00
61	18" PIPE	W INV. 39.46	E INV. 40.39
62	30" RCP	W INV. 39.02	E INV. 40.39
62A	30" RCP	W INV. 37.76	E INV. 38.63
63	18" PIPE	W INV. 41.61	E INV. 41.15
64	18" PIPE	S INV. 41.15	N INV. 40.85
65	18" PIPE	W INV. 41.15	E INV. 41.73
66	18" PIPE	S INV. 42.00	N INV. 41.96
67	18" PIPE	S INV. 44.44	N INV. 44.36
68	18" PIPE	W INV. 44.44	E INV. 45.95
69	18" PIPE	S INV. 49.30	N INV. 48.90



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DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 7

R-3

cwence 1/11/2016 12:11:33 PM T:\Projects\1500300\23920375201\drainage\DRMPRD03.DGN

EXIST. F.L. AND PIPE SIZES ARE FROM FIELD SURVEY,
FPID 433607-1-52-01, 239203-4-52-01, AND 430673-1-52-01.

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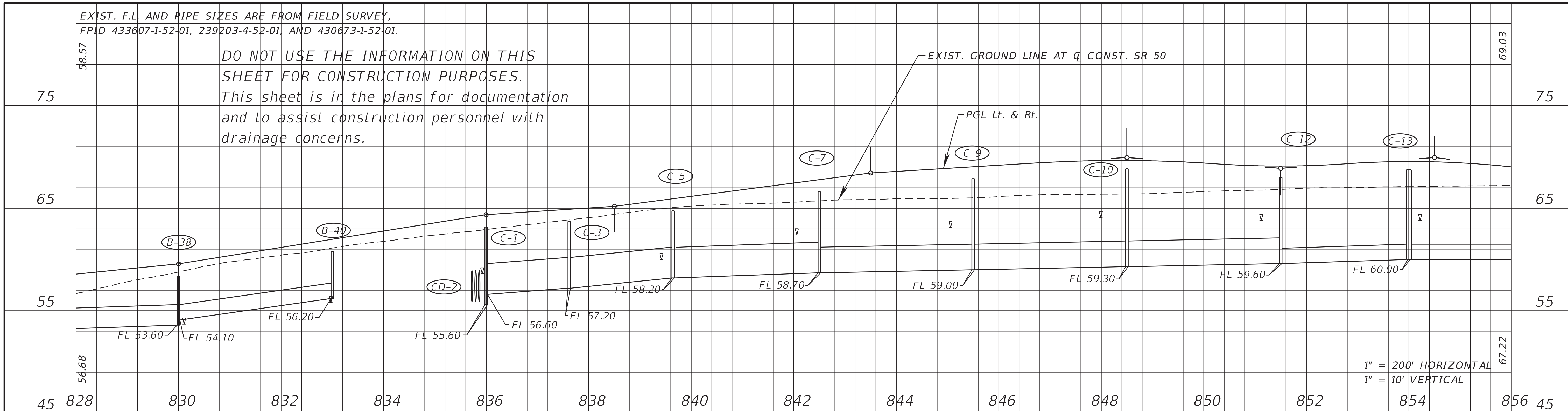


70 18" PIPE
S INV. 55.83
N INV. 54.98

71 14" x 23" ERCP
S INV. 60.21
N INV. 59.96

72 36" RCP
S INV. 56.11
N INV. 57.07

73 18" RCP
W INV. 60.14
E INV. 60.76

74 36" RCP
S INV. 56.10
N INV. 57.15

75 36" RCP
S INV. 56.07
N INV. 57.01

76 24" CMP
W INV. 50.38
E INV. 59.69

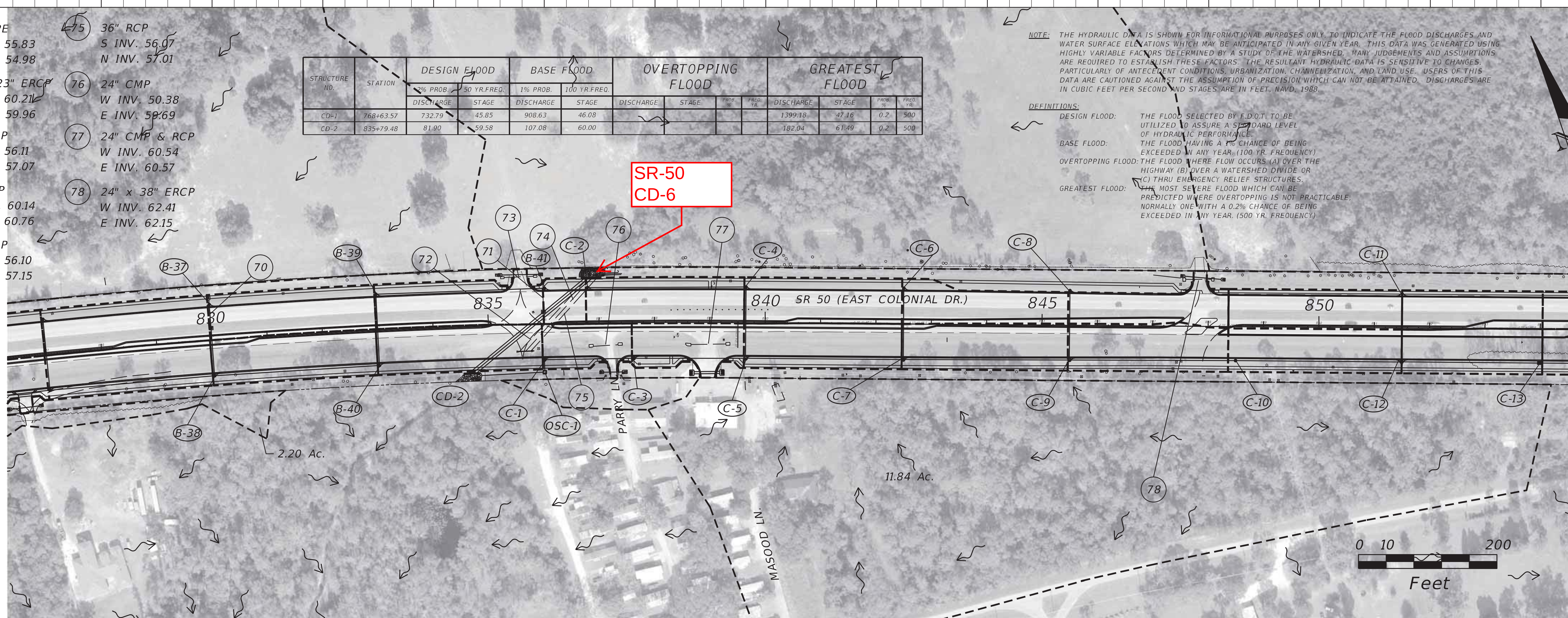
77 24" CMP & RCP
W INV. 60.54
E INV. 60.57

78 24" x 38" ERCP
W INV. 62.41
E INV. 62.15

STRUCTURE NO.	STATION	DESIGN FLOOD		BASE FLOOD		OVERTOPPING FLOOD				GREATEST FLOOD			
		2% PROB.	50 YR.FREQ.	1% PROB.	100 YR.FREQ.								
		DISCHARGE	STAGE	DISCHARGE	STAGE	DISCHARGE	STAGE	PROB. %	FREQ. YR.	DISCHARGE	STAGE	PROB. %	FREQ. YR.
CD-1	768+63.57	732.79	45.85	908.63	46.08					1399.18	47.16	0.2	500
CD-2	835+79.48	81.90	59.58	107.08	60.00					182.04	61.49	0.2	500

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)



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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO.
8

R-4

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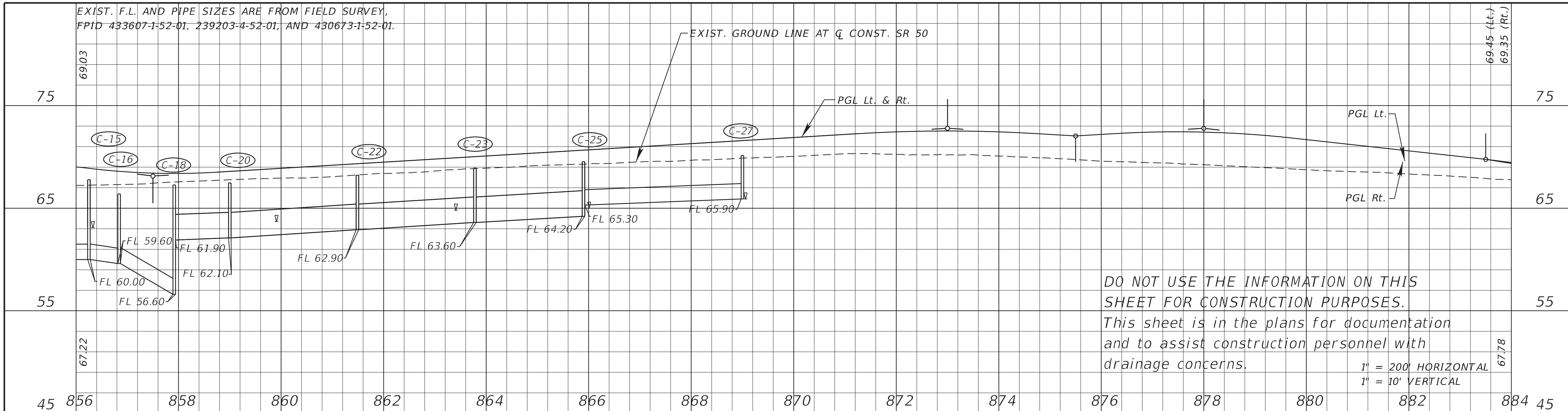

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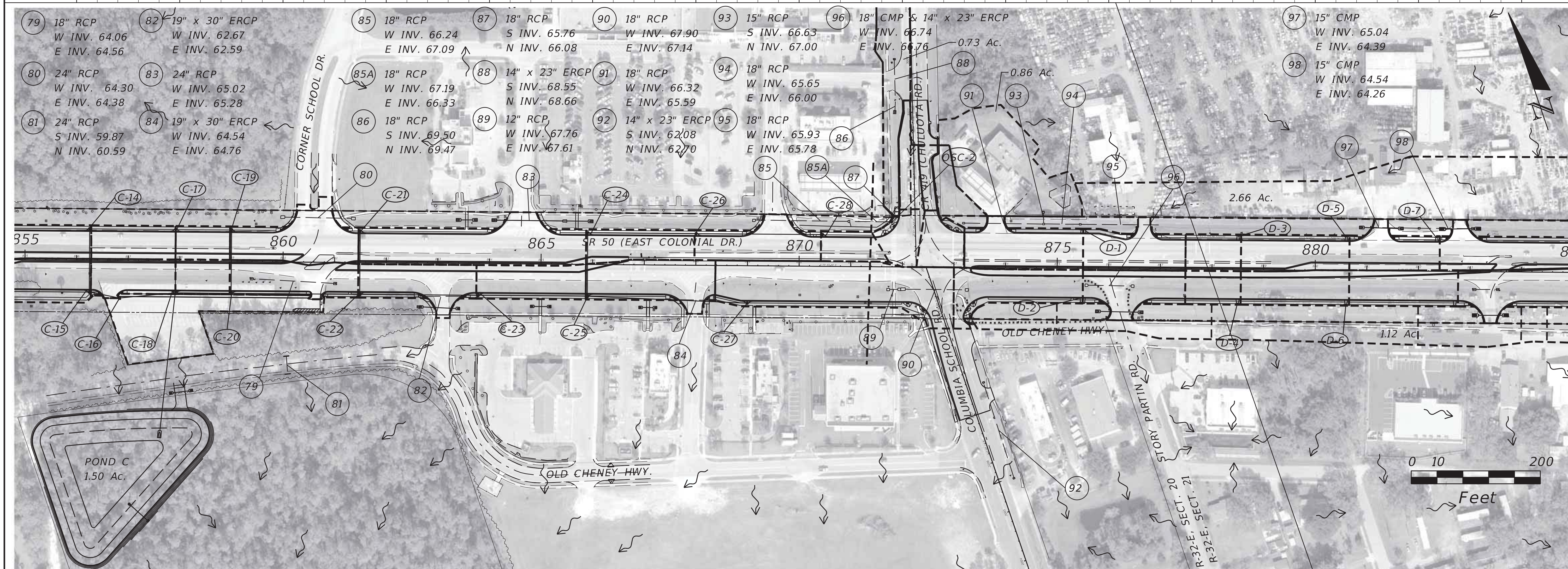

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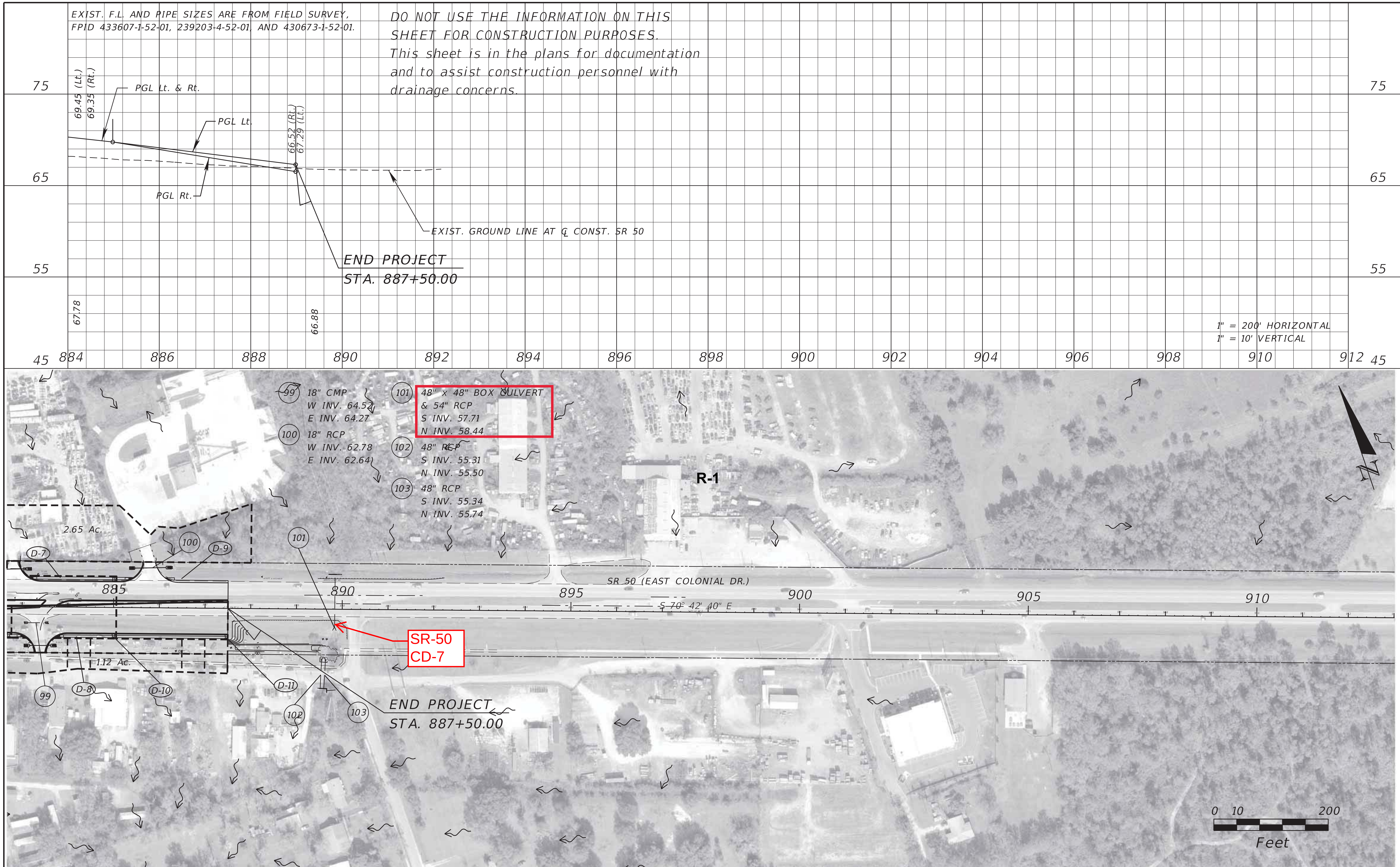
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 9

R-5



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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 10

R-6

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 11

R-7

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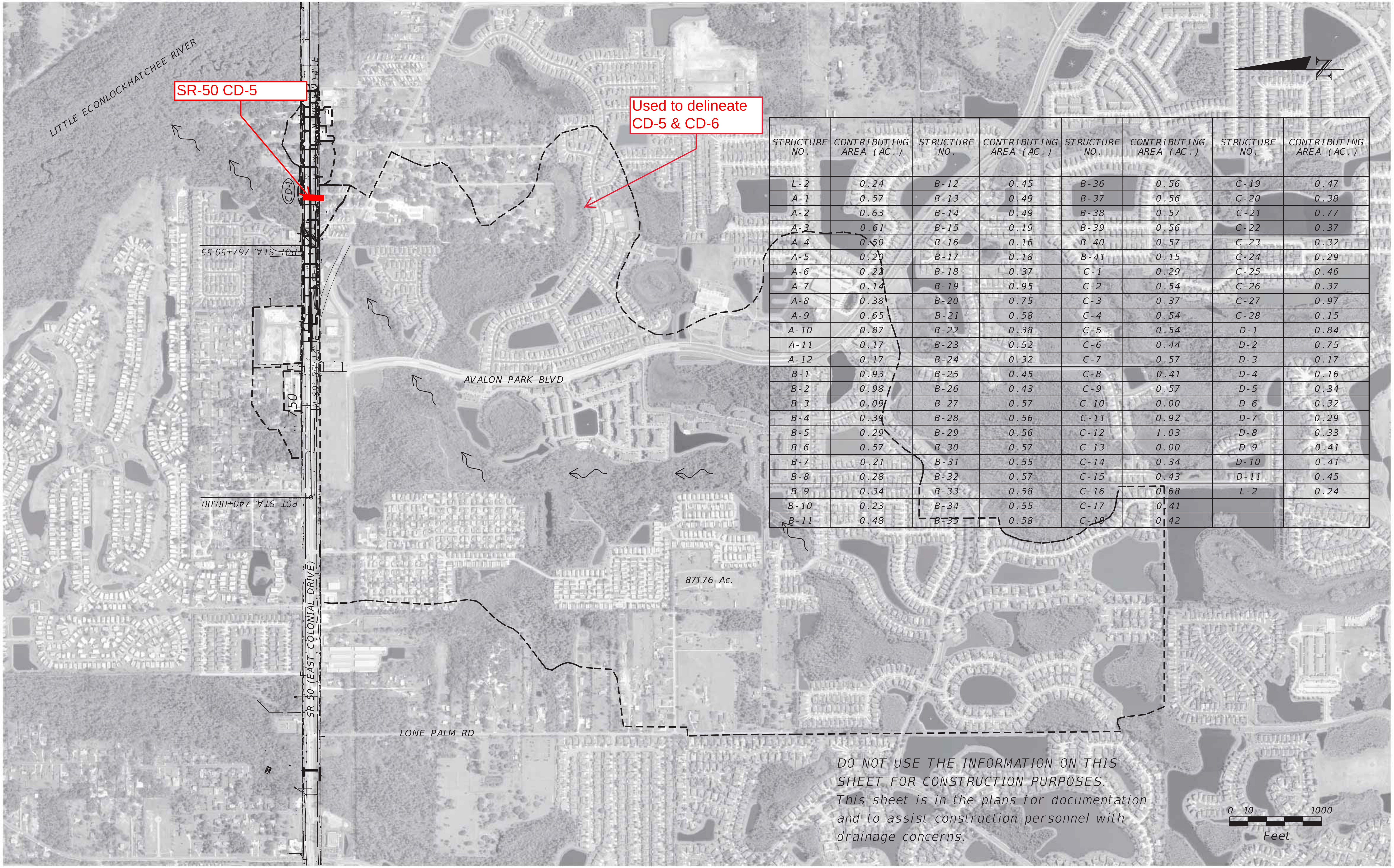

STRUCTURE NO.	CONTRIBUTING AREA (AC.)	STRUCTURE NO.	CONTRIBUTING AREA (AC.)	STRUCTURE NO.	CONTRIBUTING AREA (AC.)	STRUCTURE NO.	CONTRIBUTING AREA (AC.)
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A-1	0.57	B-13	0.49	B-37	0.56	C-20	0.38
A-2	0.63	B-14	0.49	B-38	0.57	C-21	0.77
A-3	0.61	B-15	0.19	B-39	0.56	C-22	0.37
A-4	0.50	B-16	0.16	B-40	0.57	C-23	0.32
A-5	0.20	B-17	0.18	B-41	0.15	C-24	0.29
A-6	0.22	B-18	0.37	C-1	0.29	C-25	0.46
A-7	0.14	B-19	0.95	C-2	0.54	C-26	0.37
A-8	0.38	B-20	0.75	C-3	0.37	C-27	0.97
A-9	0.65	B-21	0.58	C-4	0.54	C-28	0.15
A-10	0.87	B-22	0.38	C-5	0.54	D-1	0.84
A-11	0.17	B-23	0.52	C-6	0.44	D-2	0.75
A-12	0.17	B-24	0.32	C-7	0.57	D-3	0.17
B-1	0.93	B-25	0.45	C-8	0.41	D-4	0.16
B-2	0.98	B-26	0.43	C-9	0.57	D-5	0.34
B-3	0.09	B-27	0.57	C-10	0.00	D-6	0.32
B-4	0.39	B-28	0.56	C-11	0.92	D-7	0.29
B-5	0.29	B-29	0.56	C-12	1.03	D-8	0.33
B-6	0.57	B-30	0.57	C-13	0.00	D-9	0.41
B-7	0.21	B-31	0.55	C-14	0.34	D-10	0.41
B-8	0.28	B-32	0.57	C-15	0.43	D-11	0.45
B-9	0.34	B-33	0.58	C-16	0.68	L-2	0.24
B-10	0.23	B-34	0.55	C-17	0.41		
B-11	0.48	B-35	0.58	C-18	0.42		

DO NOT USE THE INFORMATION ON THIS SHEET FOR CONSTRUCTION PURPOSES.
This sheet is in the plans for documentation and to assist construction personnel with drainage concerns.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
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Comprehensive Engineering Services, Inc.
201 S Orange Ave, Suite 1300
Orlando, FL 32801-3442
Certificate of Authorization No: 7862
Eric Arp, P.E., License No. 53971

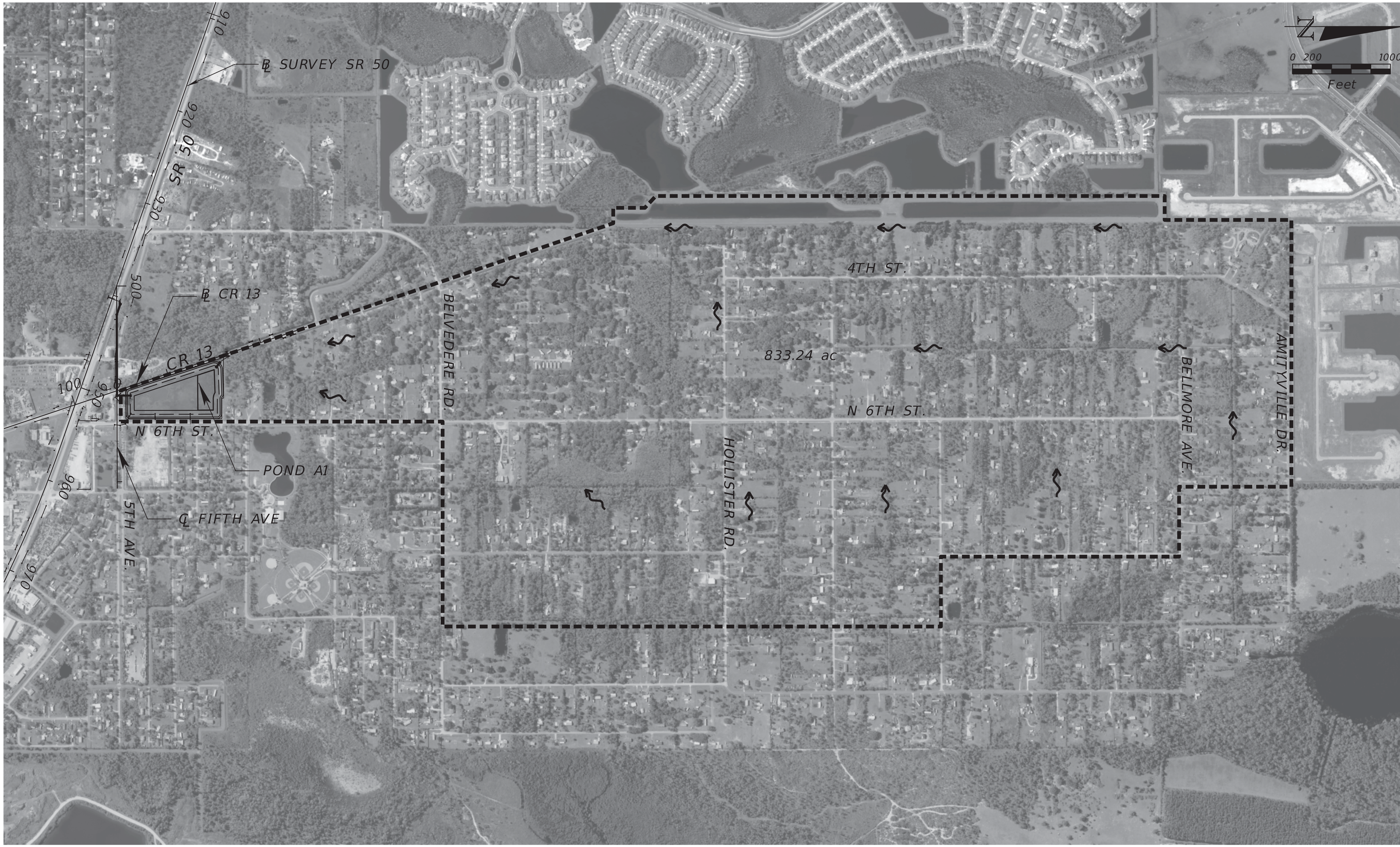
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 12

R-8



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION
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ARCADIS
1650 Prudential Drive, Suite 400
Jacksonville, Florida 32207
T: 904 721 2991 | F: 904 861 2450
Certificate of Authorization No. 7917
Walter J. Nemecek, III, PE | No. 58122

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE MAP

SHEET NO. 13

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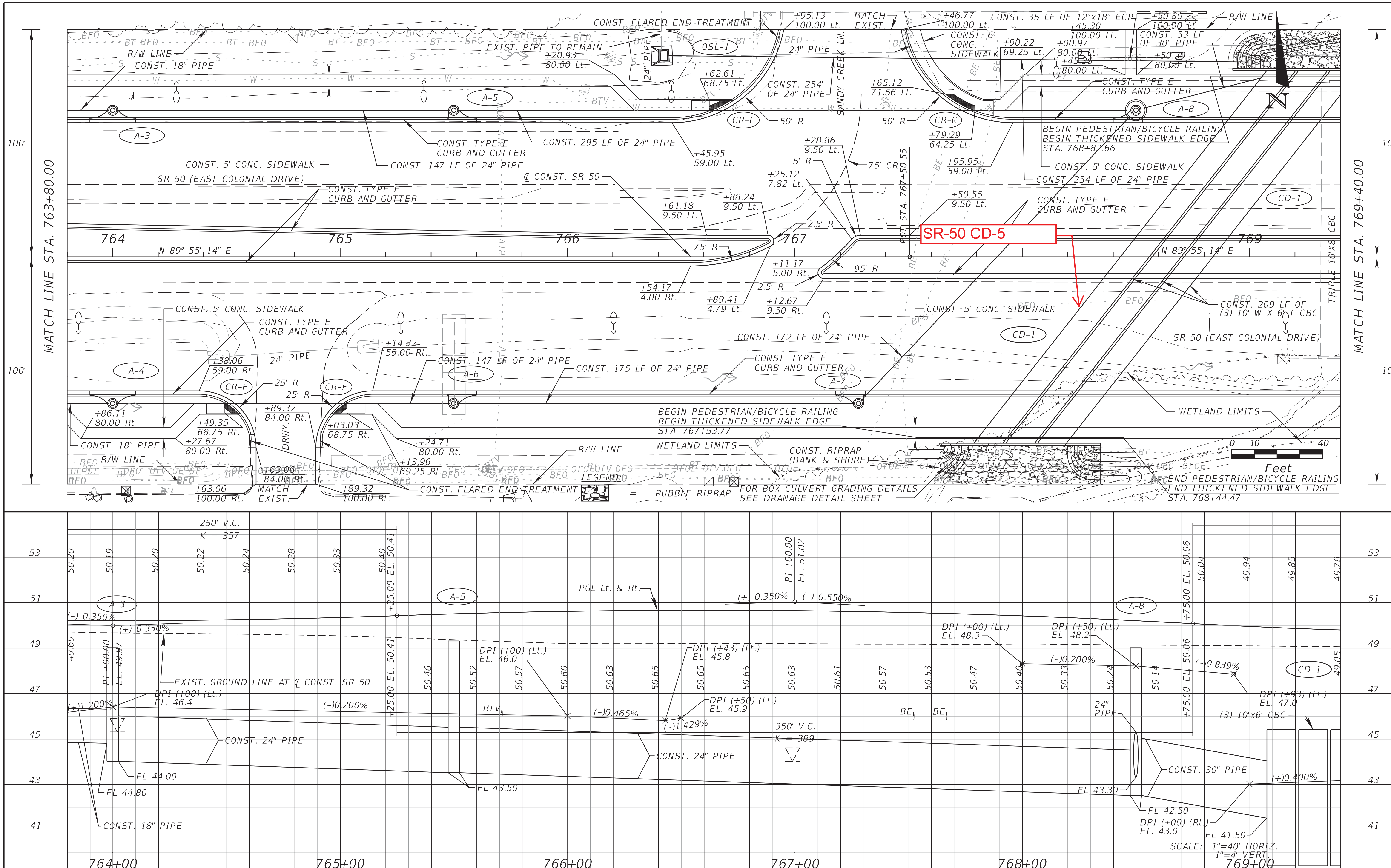

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

ROADWAY PLAN-PROFILE

SHEET NO.
36

R-10

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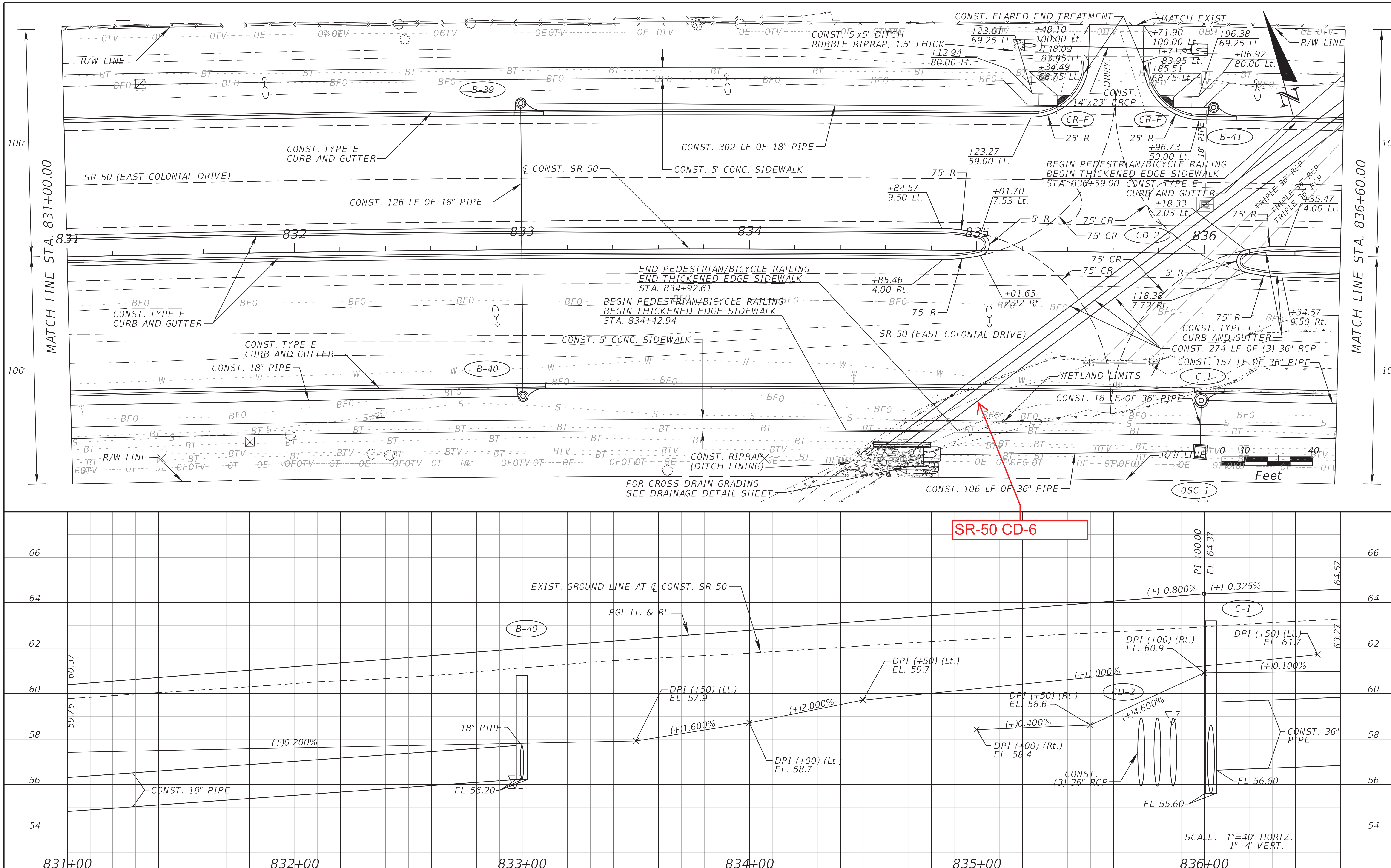

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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

ROADWAY PLAN-PROFILE

SHEET NO. 48

R-11

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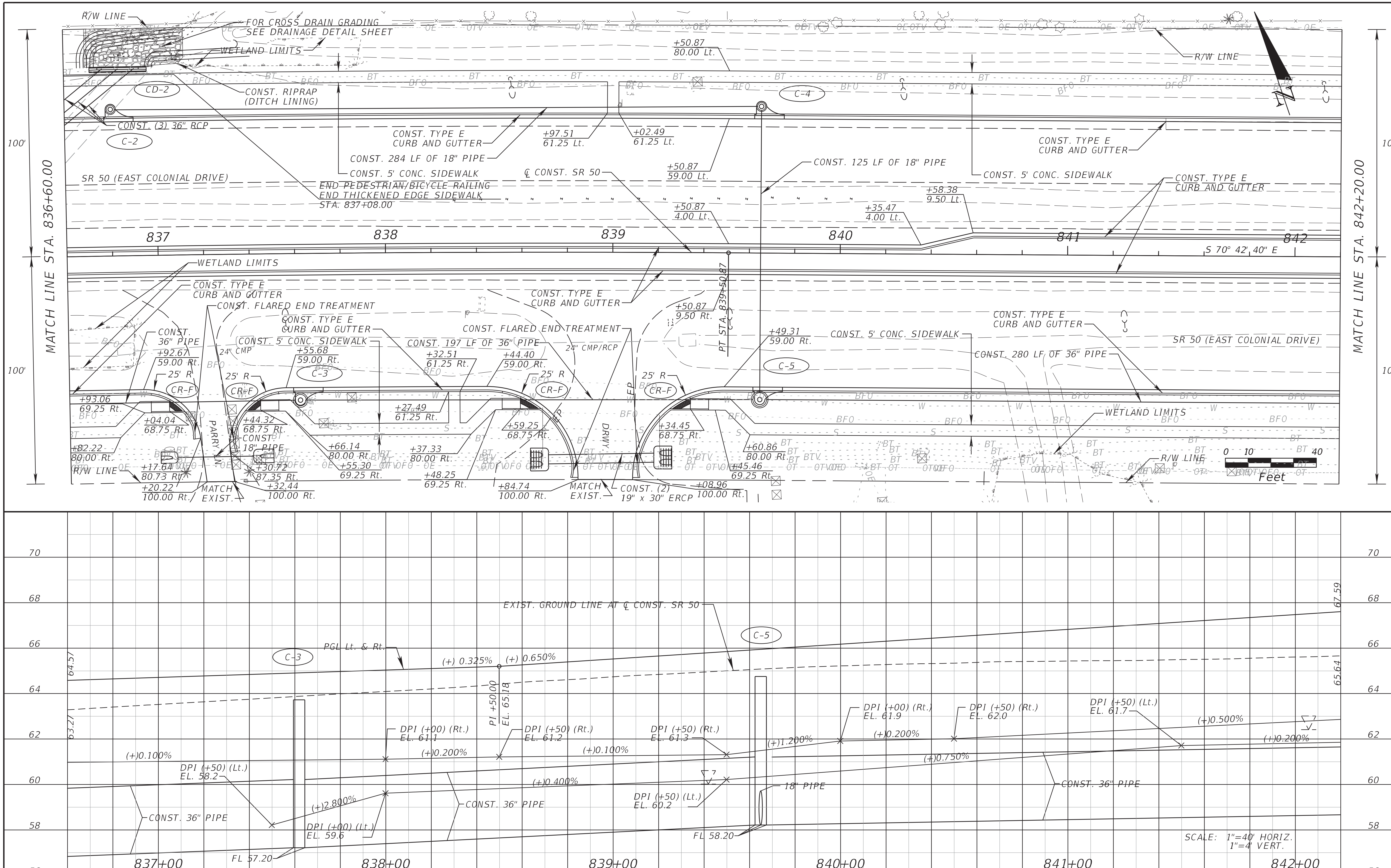

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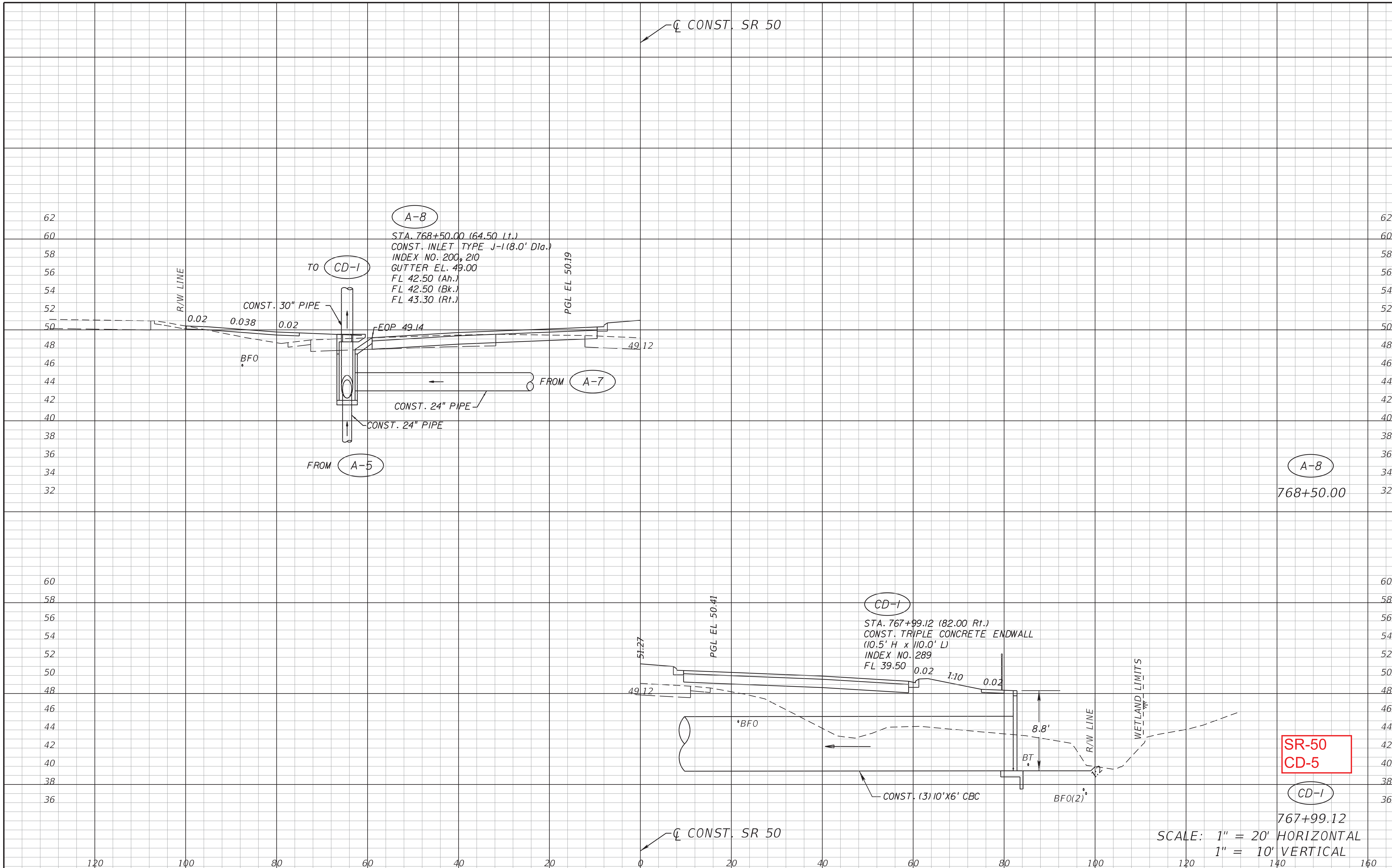
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

ROADWAY PLAN-PROFILE

SHEET NO. 49

R-12



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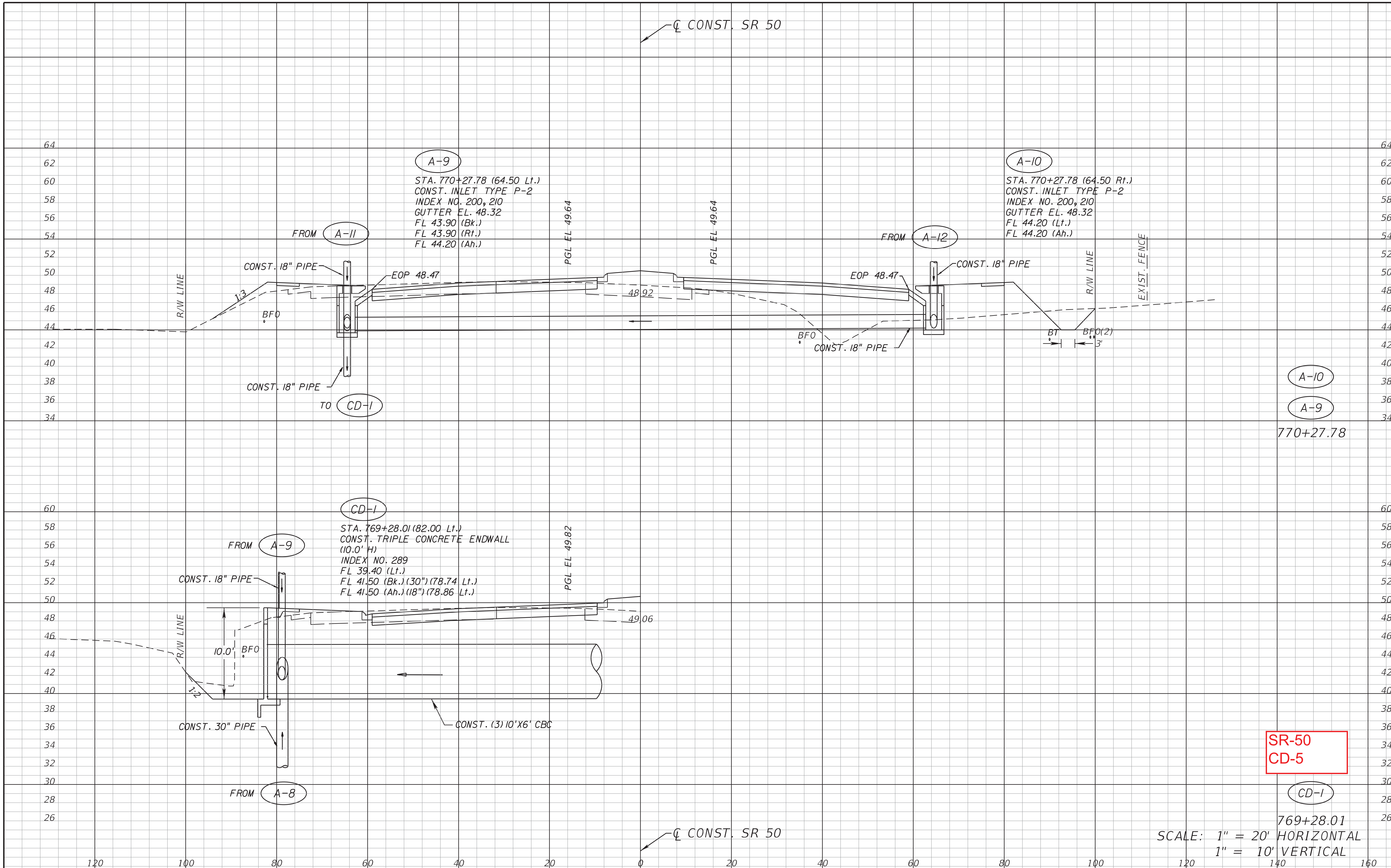
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE STRUCTURES

SHEET NO. 87

R-13



REVISIONS			
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SR 50	ORANGE	239203-7-52-01

DRAINAGE STRUCTURES

SHEET NO.
88

R-14

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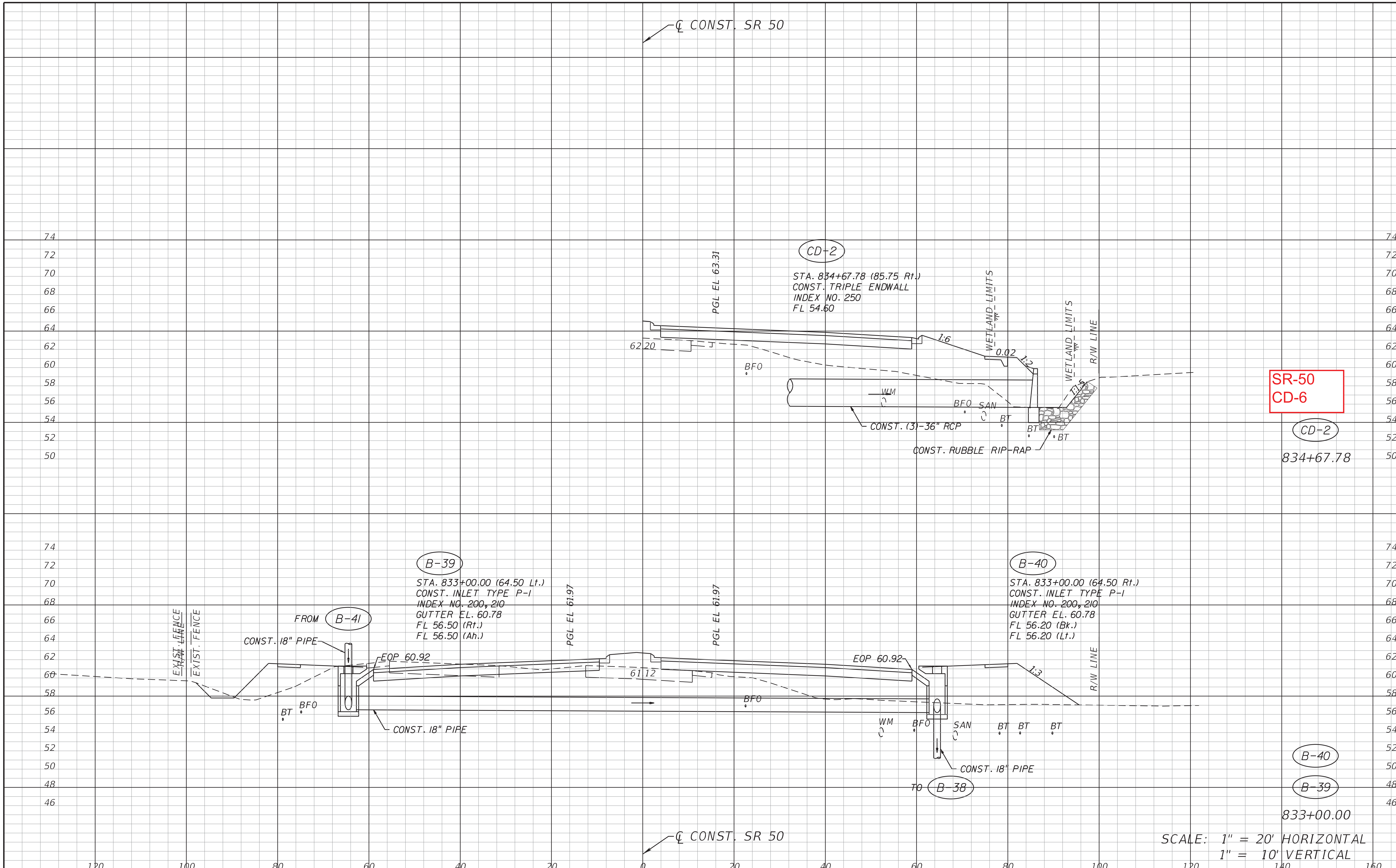

SR-50
CD-6

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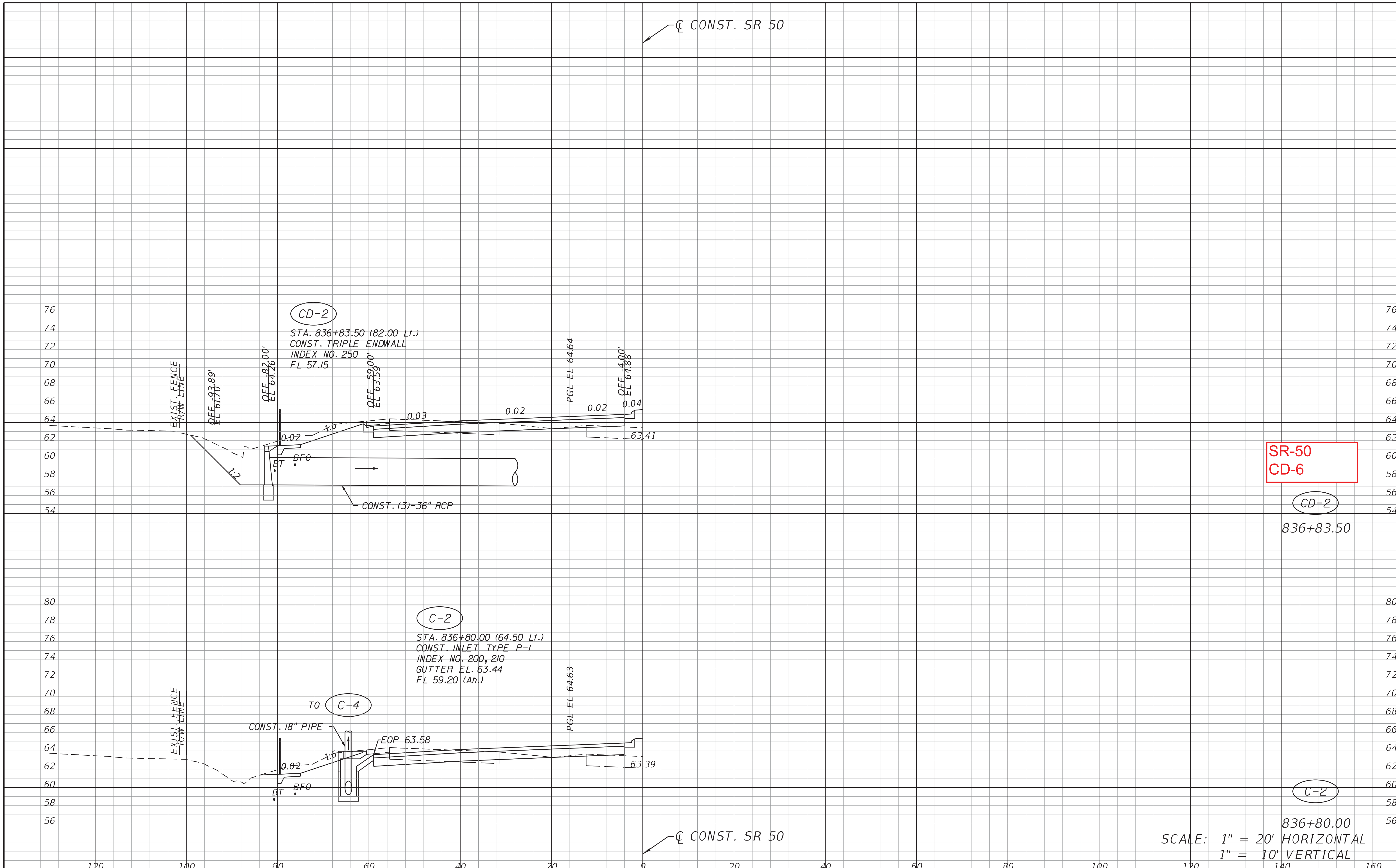
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE STRUCTURES

SHEET NO. 106

R-15



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DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 50	ORANGE	239203-7-52-01

DRAINAGE STRUCTURES

SHEET NO. 108

R-16

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Appendix: S

SR-50 Field Visit Photos (May 2016)

SR 50- CD1 (2-8’ x 6’ CBC)

(Looking North Side of the Culvert)

SR 50- CD2 (2-24” RCP)

(North side of the Culvert)

SR 50-CD3 (2-12.95’ x 8.5’ CBC)

(South Side of the Culvert)

SR 50-CD4 (1-30” RCP)

(South Side of the Culvert)

SR 50-CD5(3-10’x6’ CBC)

(South Side of the Culvert)

SR 50-CD6 (3-36” RCP)

(South side of the Culvert)

SR 50-CD7 (4’ x 4’ CBC & 1-54" RCP Jointed)

(South Side of the Culvert)

SR 50- CD8 (1-30” RCP)

(South side of the culvert)

SR 50- CD9 (1-8’x7’ CBC)

(South Side of the Culvert)

SR 50-CD10 (1-10’x4’ CBC)

(South Side of the Culvert)

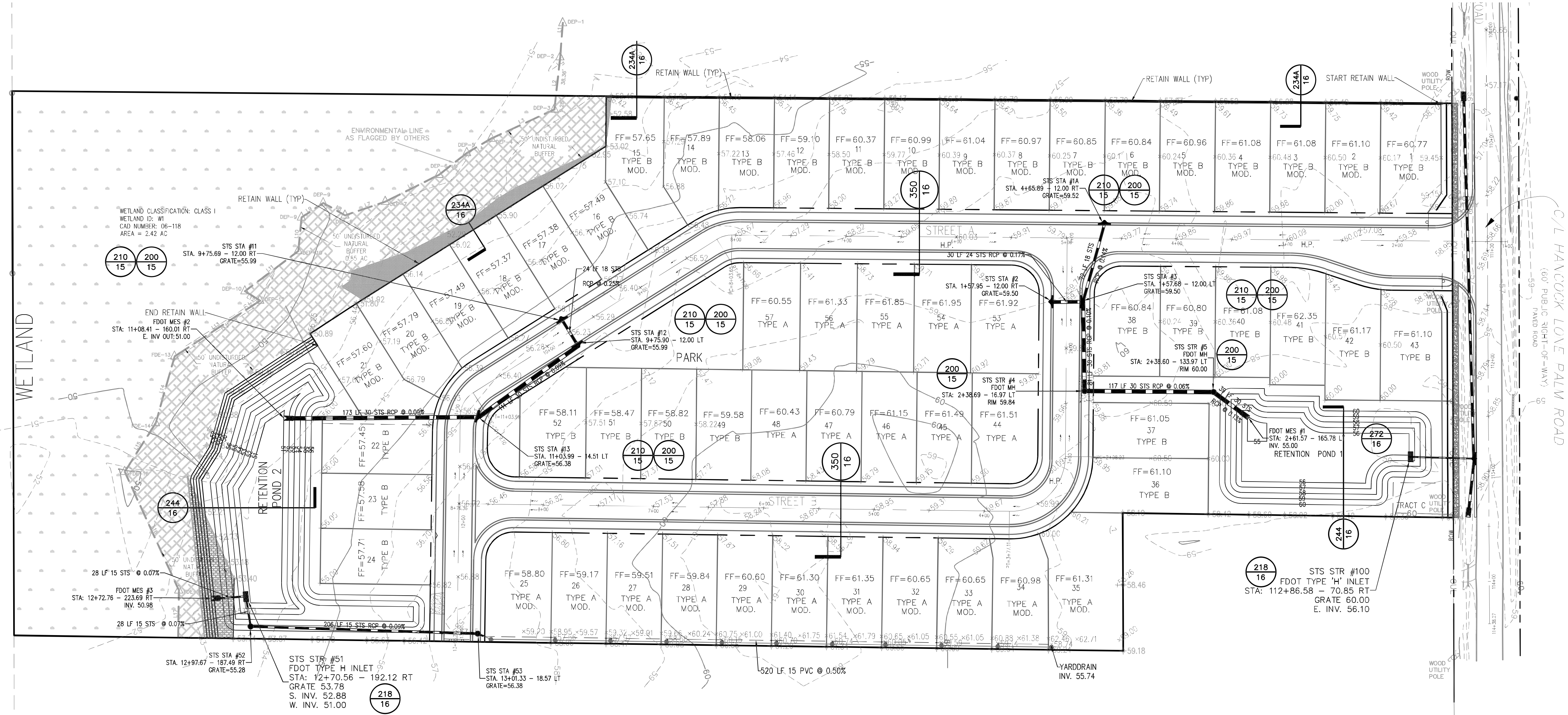
SR 50-CD11 (1-24” RCP)

(South Side of the Culvert)

Appendix: T

Excerpt from CAD Engineering and Design, Inc

Waterford Creek



100 50 0 100 200 300

SCALE IN FEET
1" = 100'

STORMWATER MANAGEMENT SYSTEM

1. THE ENTITY THAT WILL OWN, OPERATE, AND MAINTAIN THE STORM SEWER SHOWN ON THESE PLANS IS MATTAMY-JACKSONVILLE PARTNERSHIP. THE CONTRACTOR SHALL BE EXPECTED TO MEET ALL THE REQUIREMENTS OF THE PERMITS OBTAINED.

2. THE CONTRACTOR SHALL PERFORM HIS OWN INVESTIGATIONS AND CALCULATIONS AS NECESSARY TO ASSURE HIMSELF OF EARTHWORK QUANTITIES. THERE IS NO IMPLICATION THAT EARTHWORK BALANCES AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY IMPORT FILL NEEDED, OR FOR REMOVAL AND DISPOSAL OF EXCESS MATERIALS.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE NECESSARY TESTING TO ASSURE THAT THE PROPER COMPACTION HAS BEEN ACHIEVED ON THE SUBGRADE, BASE, AND ALL OTHER PERTINENT AREAS THAT HAVE BEEN COMPLETED. THE CONTRACTOR SHALL BEAR ALL COSTS ASSOCIATED WITH TESTING AND SHALL PROVIDE THE OWNER AND THE ENGINEER WITH COPIES OF THE CERTIFICATION OF COMPACTION FROM THE TESTING COMPANY.

4. PRIOR TO BID PREPARATION, THE CONTRACTOR MUST BECOME FAMILIAR WITH THE OVERALL SITE CONDITIONS AND PERFORM ADDITIONAL INVESTIGATIONS AS DETERMINED NECESSARY TO UNDERSTAND THE LIMIT AND DEPTH OF EXPECTED ORGANIC SILT PEAT AREAS, ADEQUACY OF EXISTING MATERIALS AS FILL, DEWATERING REQUIREMENTS, CLEAN FILL REQUIRED FROM OFF-SITE AND MATERIALS TO BE DISPOSED OF OFF-SITE, ALL OF WHICH WILL AFFECT HIS PRICING. ANY DELAY, INCONVENIENCE, OR EXPENSE CAUSED TO THE CONTRACTOR DUE TO INADEQUATE INVESTIGATION OF EXISTING CONDITIONS SHALL BE INCIDENTAL TO THE CONTRACT, AND NO EXTRA COMPENSATION WILL BE ALLOWED. THE MATERIALS ANTICIPATED TO BE ENCOUNTERED DURING CONSTRUCTION MAY REQUIRE DRYING PRIOR TO USE AS BACKFILL, AND THE CONTRACTOR MAY HAVE TO IMPORT MATERIALS, AT NO EXTRA COST, FROM OFF-SITE TO MEET THE REQUIREMENTS FOR COMPACTION AND PROPER FILL.

5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE EXISTING SITE CONDITIONS OF SOIL PRIOR TO N.T.P. TO DETERMINE IF ANY OFF-SITE MATERIALS WILL NEED TO BE IMPORTED TO ACHIEVE THE GRADES SPECIFIED ON THE PLANS.

6. THE CONTRACTOR SHALL NOTIFY THE OWNER AND ENGINEER WHEN ALL WORK IS LAID OUT (SURVEY STAKED), SO THAT A DETERMINATION MAY BE MADE OF SPECIFIC TREES TO BE REMOVED. A TREE REMOVAL PERMIT IS REQUIRED TO BE OBTAINED BY THE CONTRACTOR.

7. ALL FILL MATERIALS SHALL BE FREE OF MUCK, STUMPS, ROOTS, BRUSH, VEGETATIVE MATTER, RUBBISH, OR OTHER UNSUITABLE MATTER.

8. ALL MATERIALS EXCAVATED SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE STOCKPILED AT ON-SITE LOCATIONS AS SPECIFIED BY THE OWNER. MATERIALS SHALL BE STOCKPILED SEPARATELY AS TO USEABLE (NONORGANIC) FILL STOCKPILES AND ORGANIC (MUCK) STOCKPILES IF MUCK IS ENCOUNTERED. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL UNSUITABLE FILL MATERIALS FROM THE SITE.

9. FILL MATERIALS PLACED UNDER ROADWAYS SHALL BE COMPACTED TO AT LEAST 98% MAXIMUM DENSITY AS SPECIFIED IN AASHTO T-180. ALL OTHER AREAS ARE TO BE COMPACTED TO AT LEAST 95% MAXIMUM DENSITY AS SPECIFIED IN AASHTO T-180. FILL MATERIALS SHALL BE PLACED AND COMPACTED IN A MAXIMUM OF 12" LIFTS. REFER TO SOILS REPORT FOR ADDITIONAL INFORMATION. THE CONTRACTOR SHALL PROVIDE THE ENGINEER AND THE OWNER WITH ALL (PASSING AND FAILING) TESTING RESULTS. RESULTS SHALL BE PROVIDED ON A TIMELY AND REGULAR BASIS PRIOR TO CONTRACTOR'S PAY REQUEST SUBMITTAL.

10. GRADING SHOWN ON THESE PLANS IS PROVIDED TO THE CONTRACTOR TO EXPRESS THE GENERAL GRADING INTENT OF THE PROJECT. THE CONTRACTOR SHALL GRADE THE ENTIRE SITE TO PROVIDE POSITIVE DRAINAGE IN ALL AREAS. SMOOTH TRANSITIONS SHALL BE PROVIDED BETWEEN CONTOURS OR SPOT ELEVATIONS AS SHOWN ON THE PLANS TO ACCOMPLISH THE GRADING INTENT. ALL SLOPES SHALL BE STABILIZED IMMEDIATELY AFTER FINAL GRADING HAS BEEN COMPLETED. CONTRACTOR SHALL NOTIFY OWNER AND ENGINEER A MINIMUM OF FORTY-EIGHT(48) HOURS PRIOR TO DEMOBILIZATION OF GRADING EQUIPMENT TO DETERMINE THAT THE GRADING INTENT HAS BEEN ACHIEVED.

11. REINFORCED CONCRETE PIPE (RCP) SHALL BE CLASS III WITH RUBBER GASKET JOINTS. RCP SHALL CONFORM TO FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (LATEST EDITION) SECTION 941. RUBBER GASKETS SHALL CONFORM TO SECTION 942.

12. ALL OTHER RELATED ITEMS REQUIRED FOR THE CONSTRUCTION OF THE STORM SEWER (OUTFALL PROTECTION, POLLUTION CONTROL, ETC.) ARE TO BE IN ACCORDANCE WITH DETAILS SHOWN ON THE CONSTRUCTION PLANS, FDOT ROADWAY AND TRAFFIC DESIGN STANDARDS, AND FDOT STANDARD SPECIFICATIONS FOR ROADWAY AND BRIDGE CONSTRUCTION (LATEST EDITION).

13. ALL PIPE CALL OUTS ARE MEASURED CENTERLINE TO CENTERLINE FOR MANHOLES AND INLETS.

14. ALL ON-SITE AREAS DISTURBED BY THE CONSTRUCTION SHALL BE STABILIZED WITH A SEED AND MULCH MIXTURE UNLESS OTHERWISE NOTED.

15. ALL OFF-SITE AREAS DISTURBED BY CONSTRUCTION SHALL BE SODDED WITH BAHIA.

16. FINISHED FLOOR ELEVATIONS ARE 6" ABOVE SOD AT SLAB ON ALL SIDES.

17. MINIMUM GRADE OF SODDED AREA TO BE 1%.

18. COORDINATE WITH LANDSCAPE CONTRACTOR TO ASSURE POND(S) ARE SODDED TO PREVENT SCOURING.

19. F.D.O.T. INDEX NO. 102 AND 103 SHALL BE USED FOR EROSION AND SEDIMENT CONTROL.

20. BOUNDARY AND TOPOGRAPHIC DATA IS BASED ON SURVEY PREPARED BY W.C. ELLIOTT SURVEYING DATED JUNE 29, 2011.

21. FOR SOILS DATA, REFER TO REPORT PREPARED BY NODARSE & ASSOCIATES, INC. DATED JUNE 29, 2011.

22. SITE GRADING, PAVING, AND DRAINAGE MATERIALS AND CONSTRUCTION SHALL CONFORM TO ORANGE COUNTY AND SJRWMD DEVELOPMENT STANDARDS AND SPECIFICATIONS.

23. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR(S) TO INSURE THAT ALL REQUIRED PERMITS ARE OBTAINED AND ARE IN HAND PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

24. THE STORMWATER POND SIDE SLOPES SHALL BE CONSTRUCTED DURING THE EARLY STAGES OF CONSTRUCTION; SIDE SLOPES SHALL BE SODDED AND THE BOTTOM SEEDED. THESE AREAS SHOULD HAVE VEGETATION ADDED AS SOON AS FEASIBLE.

PAVING & DRAINAGE NOTES:

25. SIDEWALKS ARE TO BE CONSTRUCTED THE LENGTH OF FRONTAGE FOR TRACTS A & B AND ALONG HANCOCK LONE PALM ROAD AS PART OF THE INFRASTRUCTURE.

26. THE MINIMUM GRADE FOR THE SUBDIVISION STREETS WITH MIAMI CURB SHALL BE TWENTY-FOUR HUNDREDTHS (.24%) PERCENT.

27. WHERE BERMS ARE PROPOSED, THE DESIGN SHALL BE CERTIFIED BY THE GEOTECHNICAL ENGINEER.

28. ALL ENVIRONMENTAL SWALES WILL BE OWNED AND MAINTAINED BY THE INDIVIDUAL LOT OWNER AND WILL BE CONSTRUCTED WITH THE INFRASTRUCTURE.

29. AN EROSION CONTROL PLAN IS BEING SUBMITTED AND WILL BE APPROVED BY THE COUNTY ENGINEER.

30. THE SIDEWALK AND APRON IN FRONT OF THE DETENTION PONDS & LIFTSTATION ARE 6" THICK AS SHOWN ON PLANS.

T-1

Dec 18,2011 - 1:42pm
X:\CAD PROJECTS\105 Mattamy Homes\105001 Waterford Creek\Eng\Final\105001 C03 PGD.dwg

CAD Engineering Design, Inc.
Andrew E. Wright, P.E.
FL. Reg. # 59554
Date
FL. Cert. of Auth. #29191

REV.	DATE	BY	COMMENTS
1			

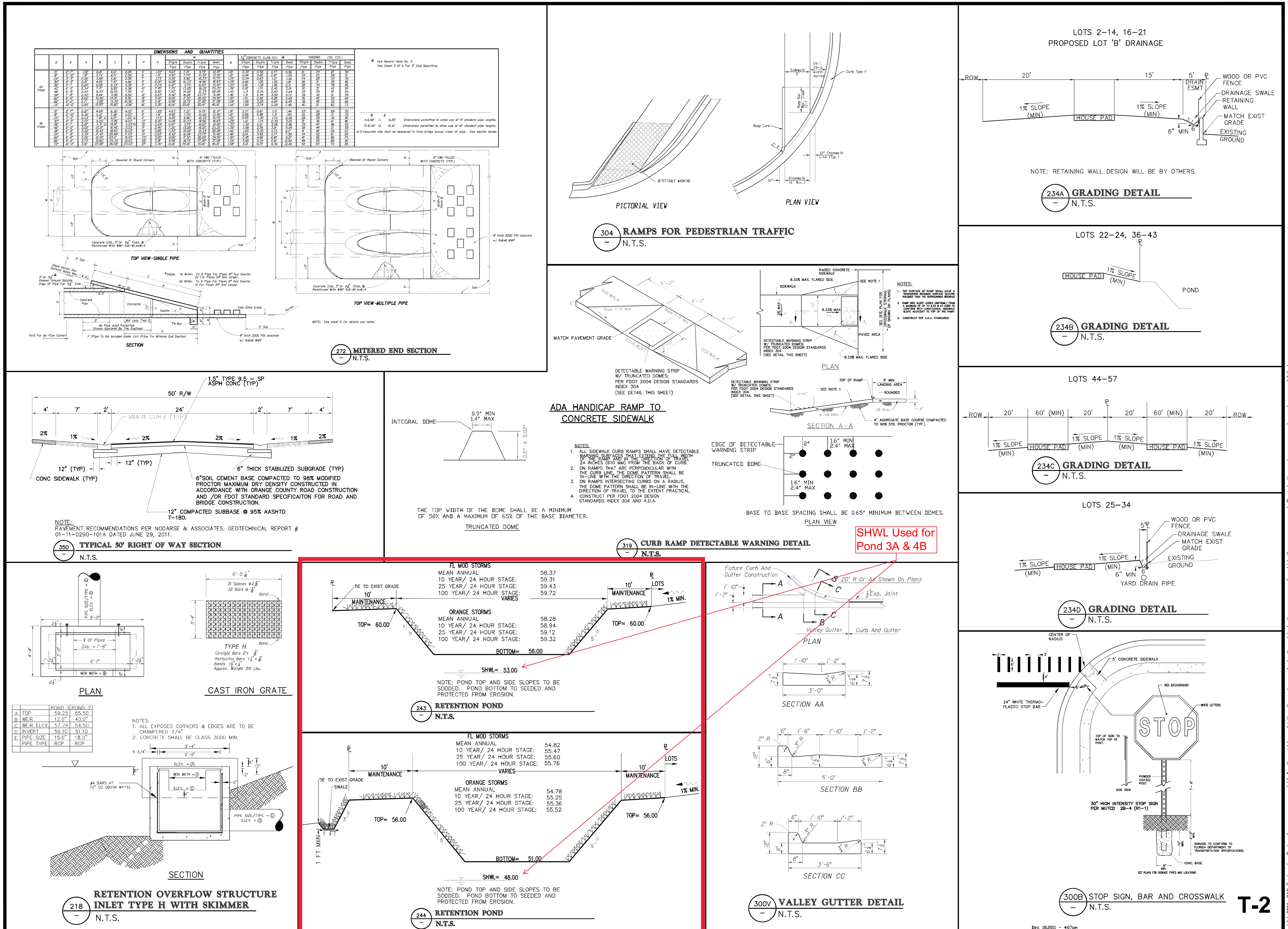
PREPARED FOR:
MATTAMY HOMES
400 PARK AVENUE SOUTH, SUITE 220
WINTER PARK, FLORIDA 32789
PHONE: (407) 599-9994
FAX: (407) 599-9998

PAVING GRADING AND DRAINAGE DETAILS

WATERFORD CREEK
1548, 1566 HANCOCK LONE PALM RD
ORLANDO, ORANGE COUNTY, FLORIDA 32828

CAD ENGINEERING DESIGN, INC.
1656 Stefan Cole Lane
Apopka, Florida 32703
Phone: (407) 495-6719
Fax: (407) 814-0158

PROJECT #: 105-001
DRAWN: JDD
APPROVED: AEW
DATE: DECEMBER 5, 2011
SHEET NAME: C03
SHEET: 6



		POND 1	POND 2
A	TOP	59.25	55.50
B	WEIR	12.0"	40.0"
C	WEIR ELEV.	57.74	54.50
D	INVERT	56.10	51.10
E	PIPE SIZE	15.0"	18.0"
	PIPE TYPE	RCP	RCP

Dec 16,2011 - 4:07pm

CAD Engineering Design, Inc.
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FL. Cert. of Auth. #29191
CAD ENGINEERING DESIGN, INC.
1656 Stefan Cole Lane
Apopka, Florida 32703
Phone: (407) 495-6719
Fax: (407) 814-0158

REV.	DATE	BY	COMMENTS
1			

PREPARED FOR:
MATTAMY HOMES
400 PARK AVENUE SOUTH, SUITE 220
WINTER PARK, FLORIDA 32789

PAVING GRADING AND DRAINAGE DETAILS

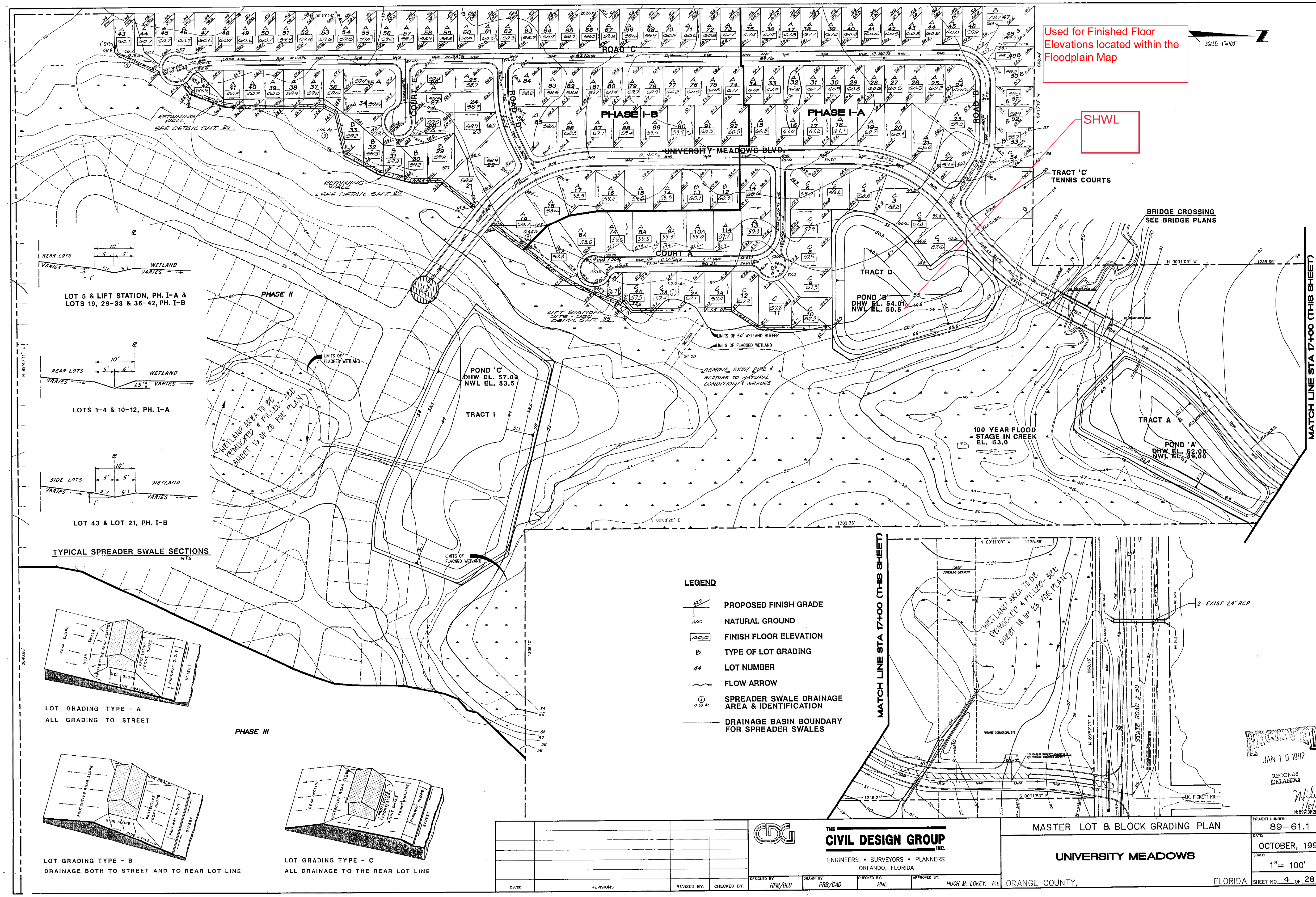
WATERFORD CREEK
1548, 1566 HANCOCK LONE PALM RD
ORLANDO, ORANGE COUNTY, FLORIDA 32828

PROJECT #105-001
DRAWN: JDD
APPROVED: AEW
DATE: DECEMBER 5, 2011
SHEET NAME: C13
SHEET: 16

Appendix: U

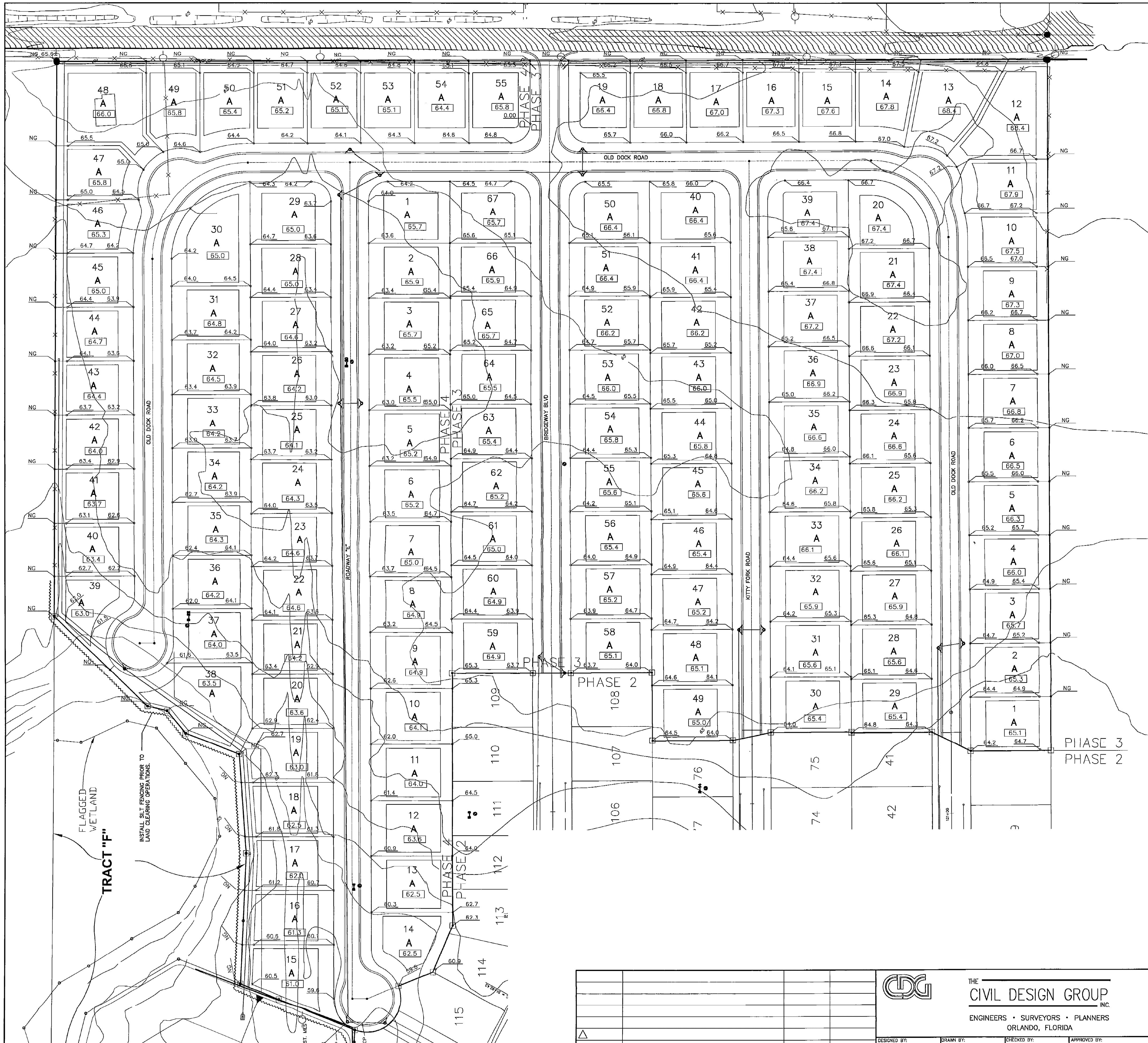
Excerpt from The Civil Design Group

University Meadows & Bridgewater Plans



Used for Finished Floor Elevations located within the Floodplain Map
SHWL
SCALE: 1"=100'
ROAD 'C'
PHASE I-B
PHASE I-A
UNIVERSITY MEADOWS BLVD.
COURT A
RETAINING WALL SEE DETAIL SHT. 20
TRACT 'C' TENNIS COURTS
BRIDGE CROSSING SEE BRIDGE PLANS
TRACT D
POND 'B' DHW EL. 54.0 NWL EL. 50.5
POND 'C' DHW EL. 57.02 NWL EL. 53.5
TRACT I
PHASE II
PHASE III
LIFT STATION SITE - SEE DETAIL SHT. 25
LIMITS OF 50' WETLAND BUFFER
LIMITS OF FLAGGED WETLAND
REMOVE EXIST. PIPE & RESTORE TO NATURAL CONDITION & GRADES
WETLAND AREA TO BE DEMUCKED & FILLED - SEE SHEET 16 OF 28 FOR PLAN
100 YEAR FLOOD STAGE IN CREEK EL. 53.0
TRACT A
POND 'A' DHW EL. 52.00 NWL EL. 49.00
MATCH LINE STA 17+00 (THIS SHEET)
LOT 5 & LIFT STATION, PH. I-A & LOTS 19, 29-33 & 36-42, PH. I-B
LOTS 1-4 & 10-12, PH. I-A
LOT 43 & LOT 21, PH. I-B
TYPICAL SPREADER SWALE SECTIONS
NTS
LEGEND
PROPOSED FINISH GRADE
NATURAL GROUND
FINISH FLOOR ELEVATION
TYPE OF LOT GRADING
LOT NUMBER
FLOW ARROW
SPREADER SWALE DRAINAGE AREA & IDENTIFICATION
DRAINAGE BASIN BOUNDARY FOR SPREADER SWALES
LOT GRADING TYPE - A
ALL GRADING TO STREET
LOT GRADING TYPE - B
DRAINAGE BOTH TO STREET AND TO REAR LOT LINE
LOT GRADING TYPE - C
ALL DRAINAGE TO THE REAR LOT LINE
2 - EXIST. 24" RCP
STATE ROAD # 50
RECEIVED JAN 10 1992 RECORDS ORLANDO
THE CIVIL DESIGN GROUP INC.
ENGINEERS • SURVEYORS • PLANNERS
ORLANDO, FLORIDA
MASTER LOT & BLOCK GRADING PLAN
UNIVERSITY MEADOWS
ORANGE COUNTY, FLORIDA
PROJECT NUMBER: 89-61.1
DATE: OCTOBER, 1991
SCALE: 1"= 100'
SHEET NO. 4 OF 28
DESIGNED BY: HFM/DLB
DRAWN BY: PRB/CAD
CHECKED BY: HML
APPROVED BY: HUGH M. LOKEY, P.E.
DATE
REVISIONS
REVISED BY:
CHECKED BY:

U-1



NOTE:
ALL LOTS TO BE GRADED AS SHOWN ON THIS LOT GRADING PLAN. FINISHED LOT GRADE FOR BUILDING PADS SHALL BE 6" BELOW THE FINISHED FLOOR ELEVATIONS SHOWN ON THE PLANS BELOW.

Used for Finished Floor Elevations located within the Floodplain Map

LEGEND:

62.4	FINISHED GRADE ELEVATION
64.3	FINISHED FLOOR ELEVATION
	EXIST. GROUND SURFACE CONTOURS
× 62.4	GROUND SHOTS FROM ACTUAL FEILD SURVEY

DATE	REVISIONS	REVISED BY:	CHECKED BY:

THE CIVIL DESIGN GROUP INC.
ENGINEERS · SURVEYORS · PLANNERS
ORLANDO, FLORIDA

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
WCF	RTS	WCF	WILLIAM C. FOGLE P.E.

MASTER GRADING PLAN

BRIDGEWATER PHASE III

ORANGE COUNTY FLORIDA

PROJECT NUMBER:	215700
DATE:	OCTOBER, 2001
SCALE:	1" = 60'
SHEET NO.	4 OF 20

4-095 00988-4
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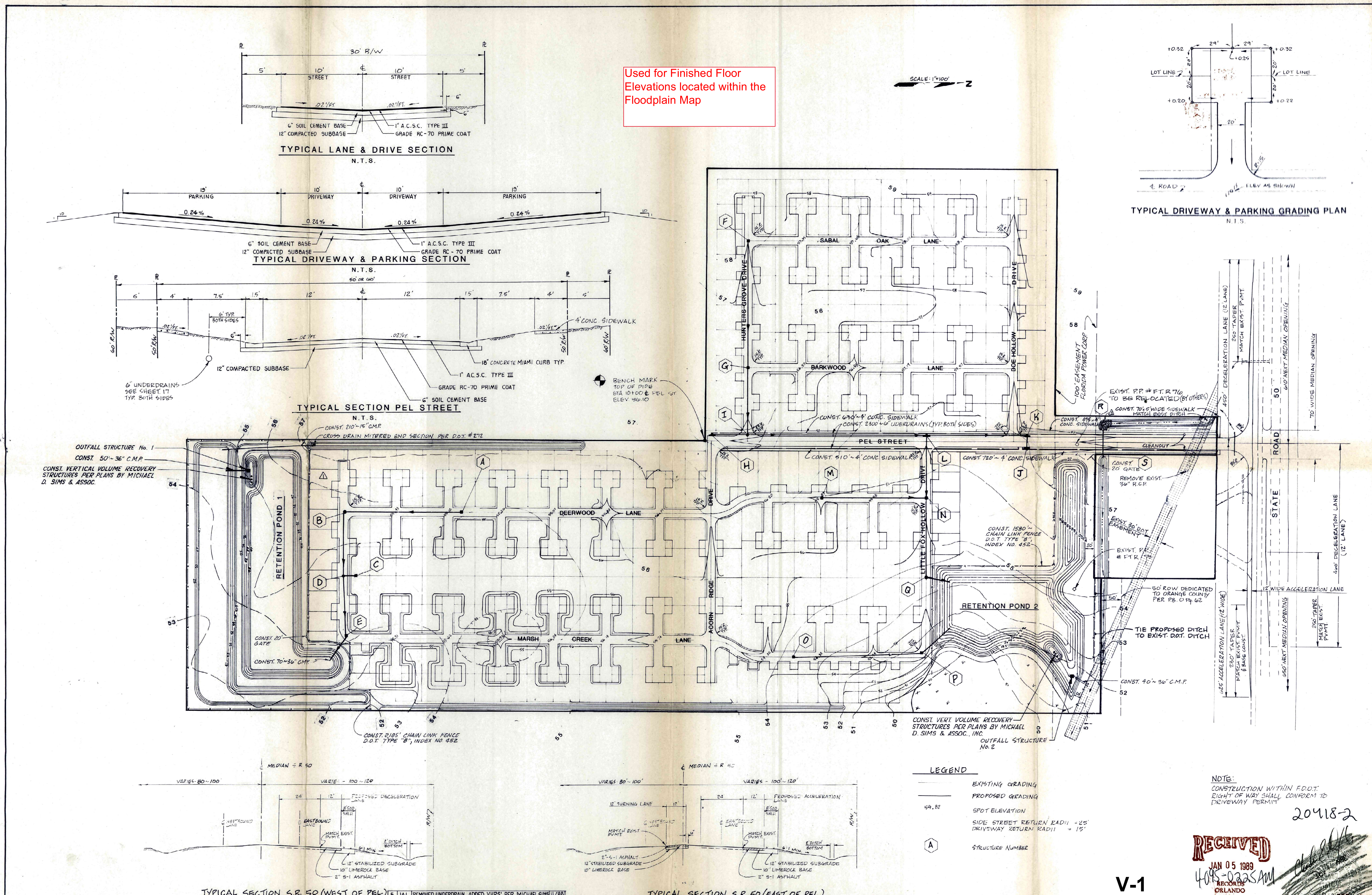
11-5-01

U-2

Appendix: V

Excerpt from Glace and Radcliffe, Inc.

Deerwood Plans



NO.	BY	REVISIONS	DATE
5	JAL	REMOVED UNDERDRAIN ADDED VVRS PER MICHAEL SIMS	11/88
4	J.J.A.	ADDED FENCE & UNDERDRAIN RET. POND #1	8/87
3	B.M.M.	ADDED RIP-RAP AT CULVERT	7/87
2	J.J.A.	RELOCATED DRAINAGE DITCH	7/87
1	B.M.M.	South End - Lot Layout	5/87

DESIGNED	G.R.I.	DATE	2-87
DRAWN	B.M.M.	DATE	2-87
CHECKED	C.E.G.	DATE	2-87
APPROVED	R B K	DATE	2-87

GLACE & RADCLIFFE, INC.
CONSULTING ENGINEERS
ST. PETERSBURG & WINTER PARK, FLORIDA

DEERWOOD
MOBILE HOME PARK

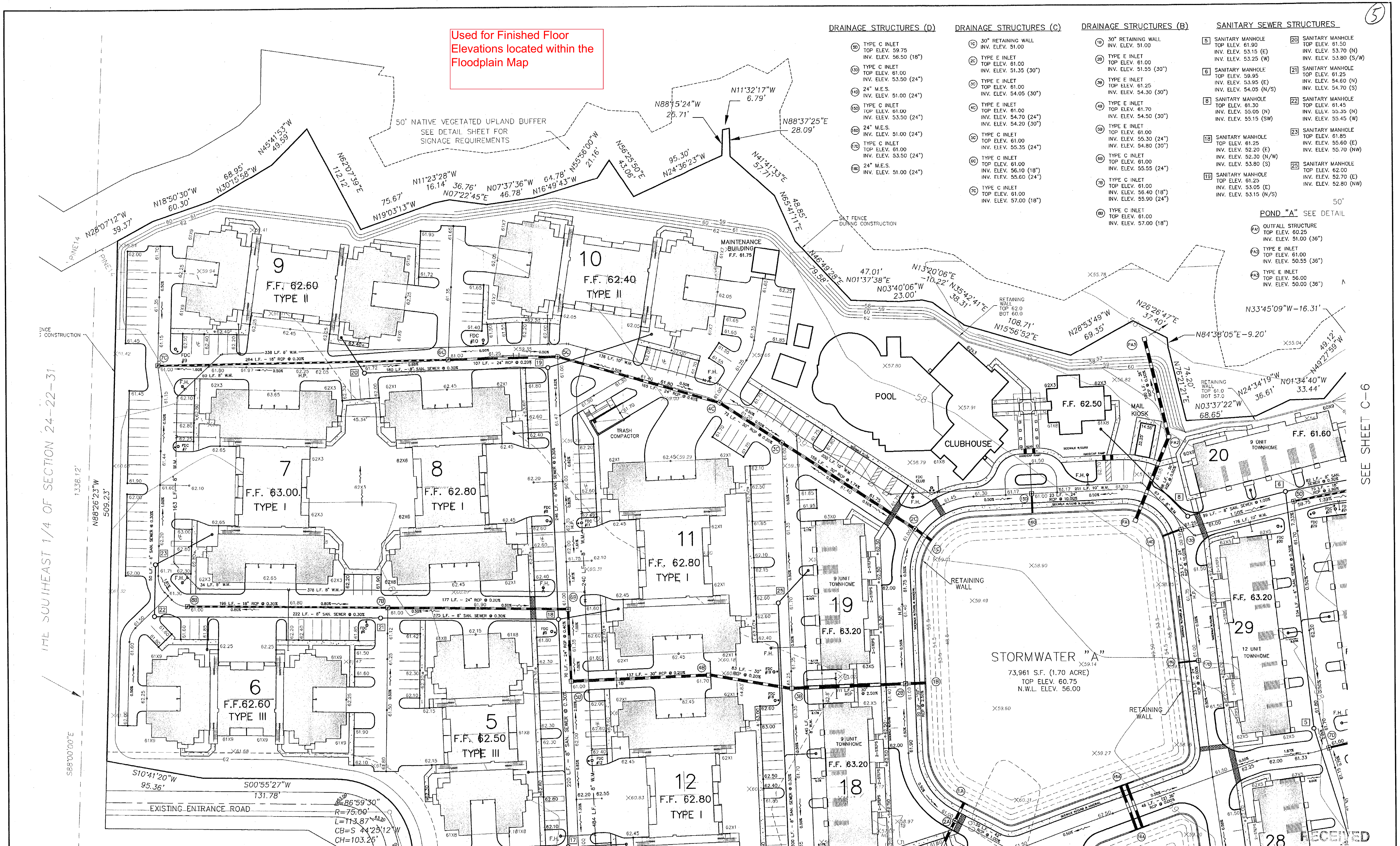
SITE PLAN
PAVING . GRADING & DRAINAGE

SCALE 1"=100'
JOB NO. 86538
SHEET NO. 4 OF 21

Appendix: W

Excerpt from George Garrett, P.E.

Avalon II Plans



70394 5

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NO.	DATE	REVISION	APP'D. BY
0			

GEORGE GARRETT, P.E.
P.O. BOX 531085
ORLANDO, FLORIDA 32853
407-256-5852 FAX: 321-636-1035

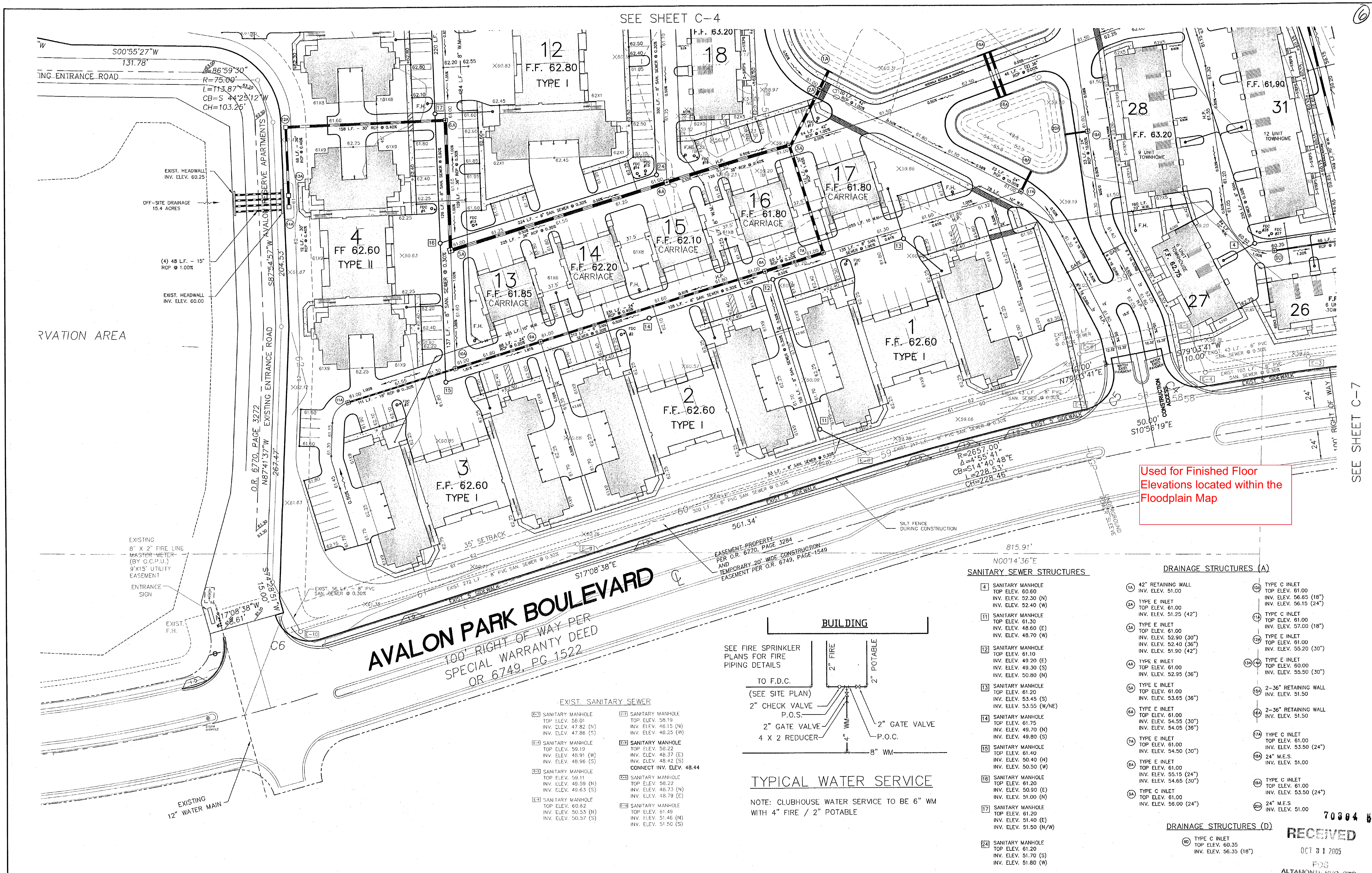
AVALON II
ORANGE COUNTY, FLORIDA

SITE PLAN

GEORGE GARRETT FLORIDA

SCALE	1" = 40'
JOB NO.	24-017
FILE	SITEPLAN
DRAWN BY	GG
DATE	8-05
SHT.	C-4

W-1



NO.	DATE	REVISION	APP'D. BY
0			

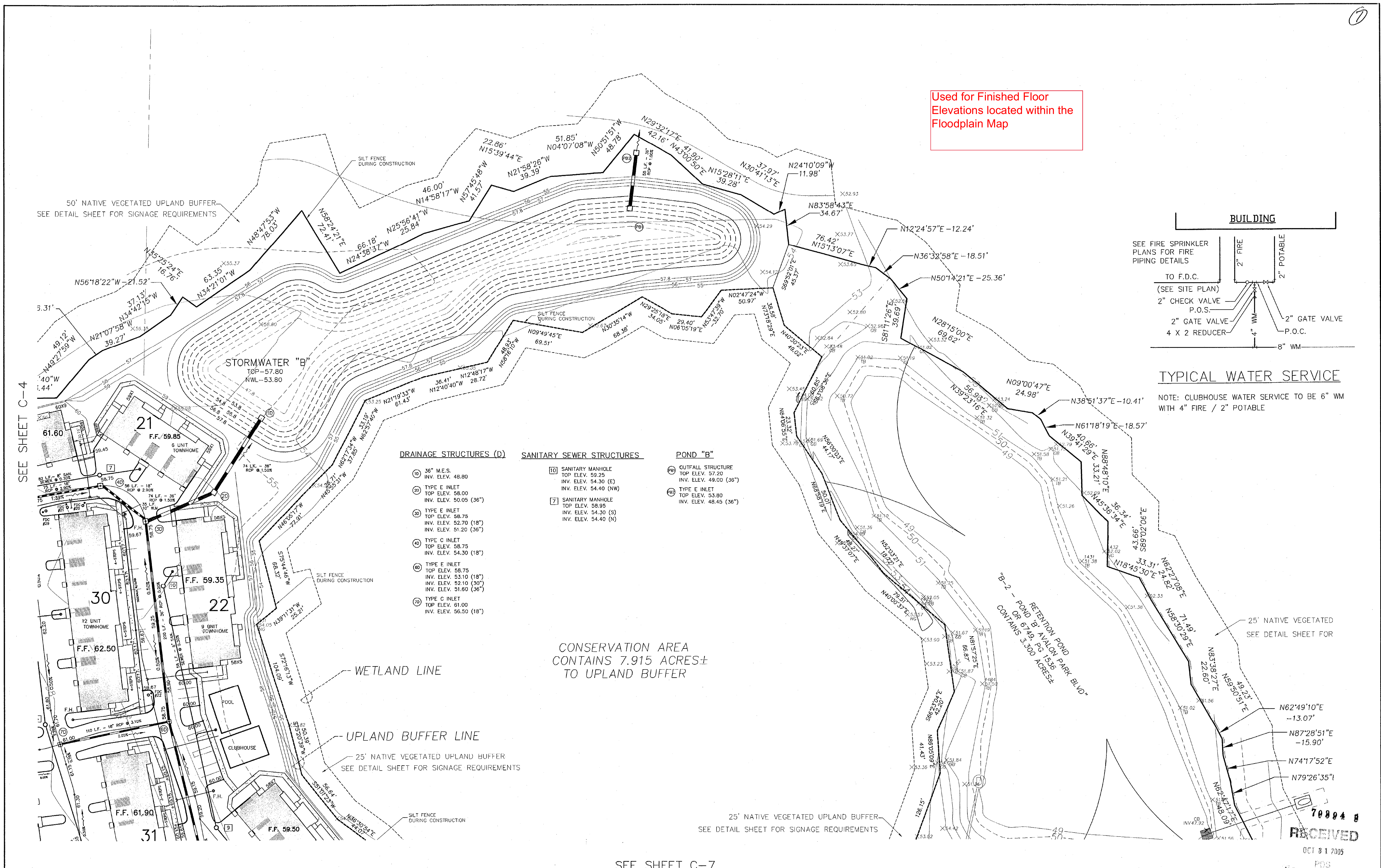
GEORGE GARRETT, P.E.
P.O. BOX 531085
ORLANDO, FLORIDA 32853
407-256-5852 FAX: 321-636-1035

AVALON II
ORANGE COUNTY, FLORIDA

SITE PLAN

SCALE: 1" = 40'
JOB NO. 24-017
FILE: SITEPLAN
DRAWN BY: GG
DATE: 8-05
SHT. C-5

Used for Finished Floor Elevations located within the Floodplain Map



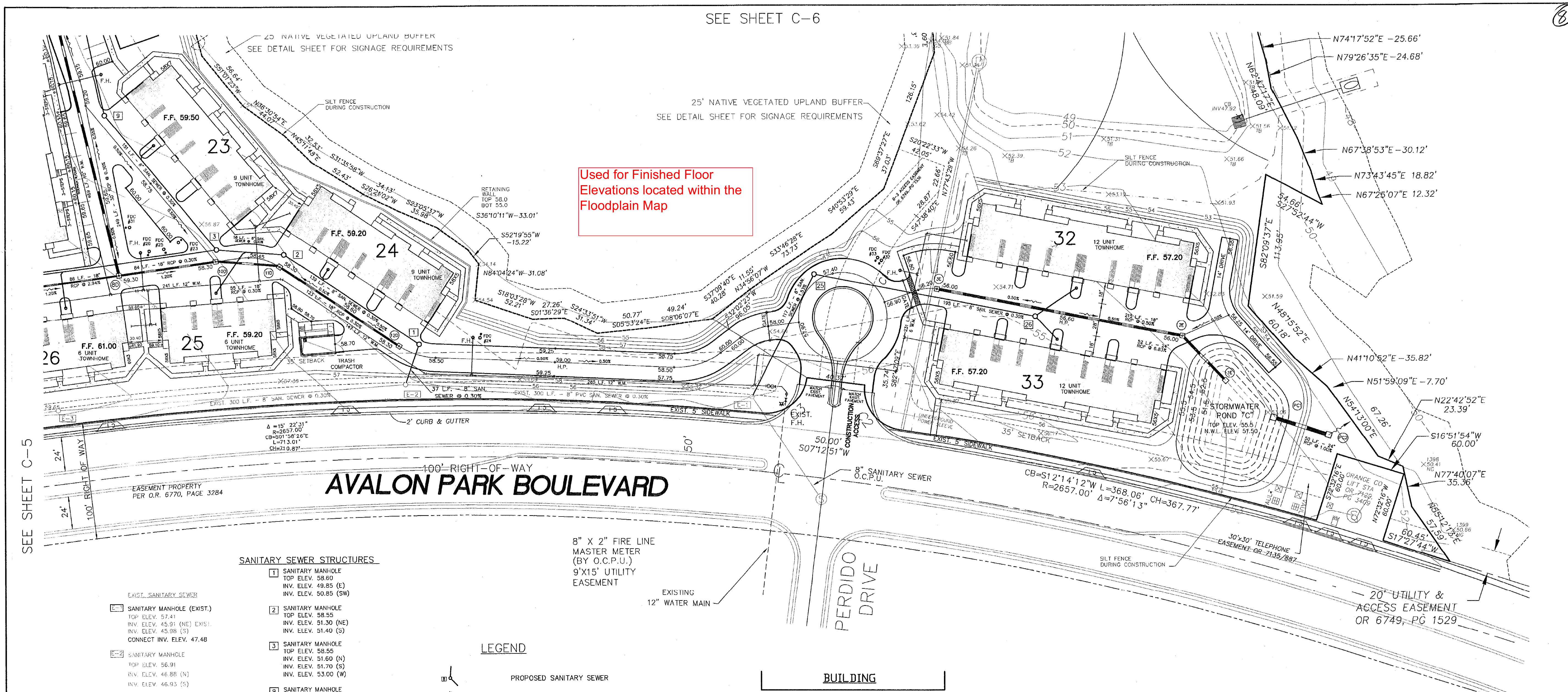
NO.	DATE	REVISION	APP'D. BY
0			

GEORGE GARRETT, P.E.
P.O. BOX 531085
ORLANDO, FLORIDA 32853
407-256-5852 FAX: 321-636-1035

AVALON II
ORANGE COUNTY, FLORIDA

SITE PLAN

SCALE: 1" = 40'
JOB NO. 24-017
FILE: SITEPLAN
DRAWN BY: GG
DATE: 8-05
SHT. C-6



SANITARY SEWER STRUCTURES

1 SANITARY MANHOLE
TOP ELEV. 58.60
INV. ELEV. 49.85 (E)
INV. ELEV. 50.85 (SW)

2 SANITARY MANHOLE
TOP ELEV. 58.55
INV. ELEV. 51.30 (NE)
INV. ELEV. 51.40 (S)

3 SANITARY MANHOLE
TOP ELEV. 58.55
INV. ELEV. 51.60 (N)
INV. ELEV. 51.70 (S)
INV. ELEV. 53.00 (W)

9 SANITARY MANHOLE
TOP ELEV. 59.30
INV. ELEV. 53.45 (E)
INV. ELEV. 53.55 (W)

25 SANITARY MANHOLE
TOP ELEV. 57.50
INV. ELEV. 49.32 (E)
INV. ELEV. 49.42 (W)

26 SANITARY MANHOLE
TOP ELEV. 56.55
INV. ELEV. 50.00 (S)
INV. ELEV. 50.10 (NW/NE)

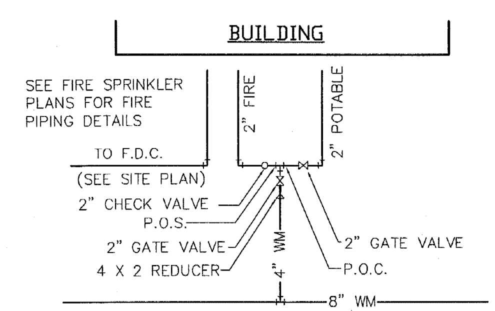
EXIST. SANITARY SEWER

E-1 SANITARY MANHOLE (EXIST.)
TOP ELEV. 57.41
INV. ELEV. 45.91 (NE) EXIST.
INV. ELEV. 45.98 (S)
CONNECT INV. ELEV. 47.48

E-2 SANITARY MANHOLE
TOP ELEV. 56.91
INV. ELEV. 46.88 (N)
INV. ELEV. 46.93 (S)

LEGEND

PROPOSED SANITARY SEWER
PROPOSED INLET
PROPOSED WATER MAIN W/ VALVE
PROPOSED FIRE HYDRANT
PROPOSED CONTOUR
PROPOSED PAVERS/STAMPED CONCRETE
F.F. 98.00 PROPOSED FINISH FLOOR ELEVATION
PROPOSED PAVEMENT ELEVATION
PROPOSED SLOPE / DIRECTION OF FLOW



TYPICAL WATER SERVICE

NOTE: CLUBHOUSE WATER SERVICE TO BE 6" WM WITH 4" FIRE / 2" POTABLE

DRAINAGE STRUCTURES (D)

80 TYPE E INLET
TOP ELEV. 59.30
INV. ELEV. 53.85 (18")
INV. ELEV. 52.85 (30")

100 TYPE C INLET
TOP ELEV. 58.30
INV. ELEV. 54.20 (18")

110 TYPE C INLET
TOP ELEV. 58.30
INV. ELEV. 54.40 (18")

120 TYPE C INLET
TOP ELEV. 58.30
INV. ELEV. 54.80 (18")

DRAINAGE STRUCTURES (E)

1E 24" M.E.S.
INV. ELEV. 47.50

2E TYPE C INLET
TOP ELEV. 56.00
INV. ELEV. 51.55 (18")
INV. ELEV. 51.05 (24")

3E TYPE C INLET
TOP ELEV. 56.00
INV. ELEV. 52.50 (18")

POND "C"

PC1 OUTFALL STRUCTURE
TOP ELEV. 54.60
INV. ELEV. 47.50 (24")

PC2 TYPE C INLET
TOP ELEV. 51.50
INV. ELEV. 47.00 (24")

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NO.	DATE	REVISION	APP'D. BY
0			

GEORGE GARRETT, P.E.
P.O. BOX 531085
ORLANDO, FLORIDA 32853
407-256-5852 FAX: 321-636-1035

AVALON II
ORANGE COUNTY, FLORIDA

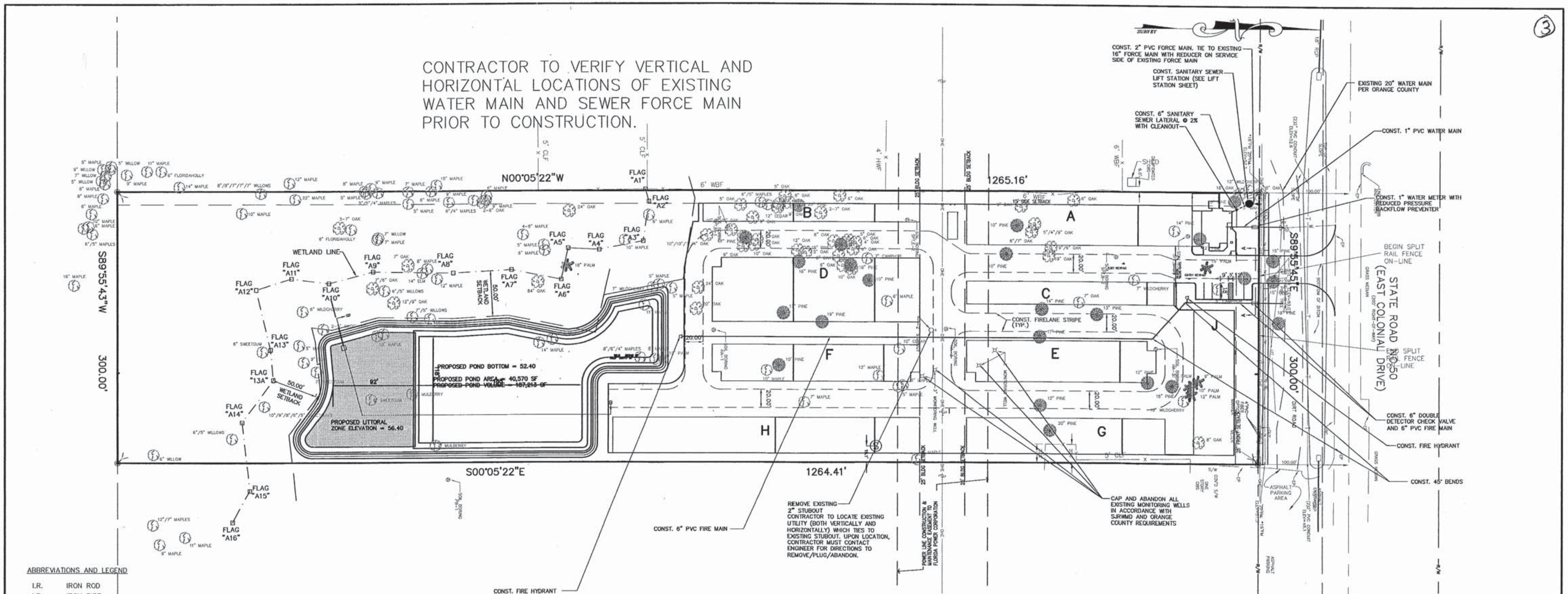
SITE PLAN

SCALE: 1" = 40'
JOB NO. 24-017
FILE: SITEPLAN
DRAWN BY: GG
DATE: 8-05
SHT. C-7

Appendix: X

Excerpt from Kisinger Campo & Associates Corp.

The Fairways – Self Storage



ABBREVIATIONS AND LEGEND

I.R.	IRON ROD
I.P.	IRON PIPE
℄	CENTERLINE
SEC.	SECTION
RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE
O.R.	OFFICIAL RECORDS (BOOK)
P.B.	PLAT BOOK
PG.	PAGE
	FENCE, AS NOTED
	SIGN
	WATER VALVE
	WATER METER
	UNDERGROUND WATER LINE
	DRAIN PIPE, SIZE NOTED
	GUY ANCHOR
	POWER POLE
	OVERHEAD POWER LINES
	UNDERGROUND TELEPHONE LINES
	SANITARY MANHOLE
E/P	EDGE OF PAVEMENT
R/W	RIGHT-OF-WAY (LINE)
LS	LAND SURVEYOR
LB	CERTIFICATE OF AUTHORIZATION
CCR	CERTIFIED CORNER RECORD
WBF	WOOD BOARD FENCE
CLF	CHAIN LINK FENCE
D.B.	DEED BOOK
REC	RECOVERED
	PROPOSED LIFT STATION
	PROPOSED CLEANOUT
	PROPOSED WATER LINE
	PROPOSED SEWER LINE
	PROPOSED FIRE HYDRANT
	PROPOSED REDUCER

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

SURVEYOR'S NOTES:

1. THE BEARINGS SHOWN HEREON ARE ASSUMED, BASED ON THE NORTH LINE OF THE NORTHWEST 1/4 OF SECTION 24, TOWNSHIP 22 SOUTH, RANGE 31 EAST, BEING N88°21'23"E.

2. SUB-SURFACE INSTALLATIONS OR IMPROVEMENTS SUCH AS UNDERGROUND UTILITIES AND FOUNDATIONS HAVE NOT BEEN LOCATED, UNLESS OTHERWISE SHOWN.

3. DATE OF FIELD SURVEY: MAY 18, 2005

4. THIS PROPERTY IS SUBJECT TO THE FOLLOWING EASEMENTS, ENCUMBERANCES, EXCEPTIONS, RESERVATIONS, RESTRICTIONS, COVENANTS, CONDITIONS, ASSIGNMENTS, ASSESSMENTS, OR AGREEMENTS AS LISTED IN SCHEDULE B, SECTION 2 OF THE FIRST AMERICAN TITLE INSURANCE COMPANY'S COMMITMENT NO. 2037-701759, DATED DECEMBER 17, 2004 AT 8:00 AM, PROVIDED TO THIS SURVEYOR BY THE CLIENT:

(A) EASEMENT TO FLORIDA POWER CORPORATION (DEED BOOK 984, PAGE 364, PUBLIC RECORDS, ORANGE COUNTY, FLORIDA) - POWER LINE IS SHOWN HEREON, HOWEVER, THE EASEMENT IS "BLANKET" IN NATURE AND ONLY LIMITS THE PROPERTY OWNER FROM BUILDING WITHIN 25 FEET OF SAID POWER LINE.

FLOOD NOTE:
BASED UPON MY REVIEW OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAPS FOR ORANGE COUNTY, FLORIDA, PANEL Nos. 285 AND 295 OF 700, COMMUNITY PANEL Nos. 12095C0285E AND 12095C0295E (RESPECTIVELY), BOTH WITH AN EFFECTIVE DATE OF DECEMBER 6, 2000, THE PROPERTY SHOWN HEREON LIES PARTIALLY WITHIN ZONE X (AREAS DETERMINED TO BE OUTSIDE 500-YEAR FLOOD PLAIN), AND ZONE A (AREAS WITHIN 100-YEAR FLOOD, NO BASE FLOOD ELEVATIONS DETERMINED).

LEGAL DESCRIPTION (From Title Commitment):

The West 300 feet of the East 1/2 of the Southwest 1/4 of the Northwest 1/4, lying south of highway in Section 24, Township 22 South, Range 31 East, Orange County, Florida.

OWNER/APPLICANT:
NOAH'S G.P.
30435 N. HIGHWAY 281
BULVERDE, TEXAS 78163

100527 1

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KISINGER CAMPO & ASSOCIATES CORP.
2203 NORTH LOIS AVENUE, SUITE 1200
TAMPA, FL 33607
(813) 871-5331
BOARD OF PROFESSIONAL ENGINEERS
CERTIFICATE OF AUTHORIZATION No.00002317

Kisinger Campo & Associates Corp.
engineering inspection planning

NO. DATE REVISIONS

THE FAIRWAYS - SELF STORAGE
WATER & SEWER PLAN

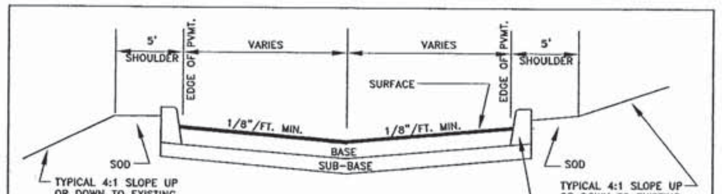
DESIGNED BY: ACM
DRAWN BY:
CHECKED BY: VST

DATE: 7/29/05
SCALE: 1"=50'
FILE NO. 2200504

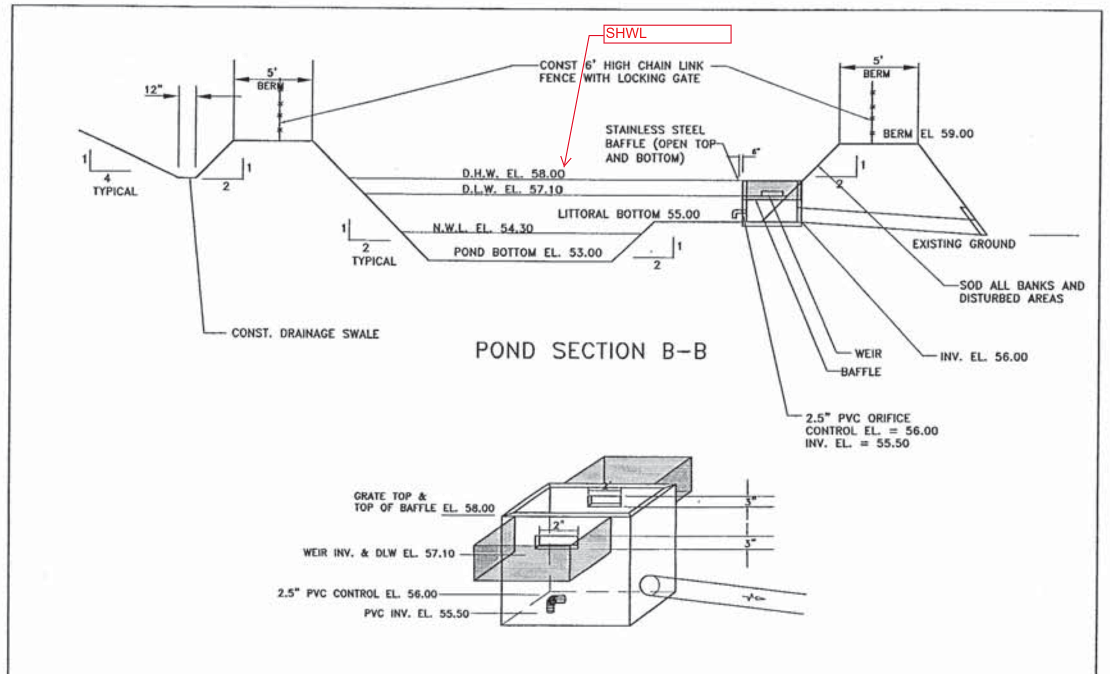
AARON CHRISTOPHER MEARES, P.E.
FLA. REGISTERED ENGINEER NO. 62955

SHEET C2
OF C6

X-1

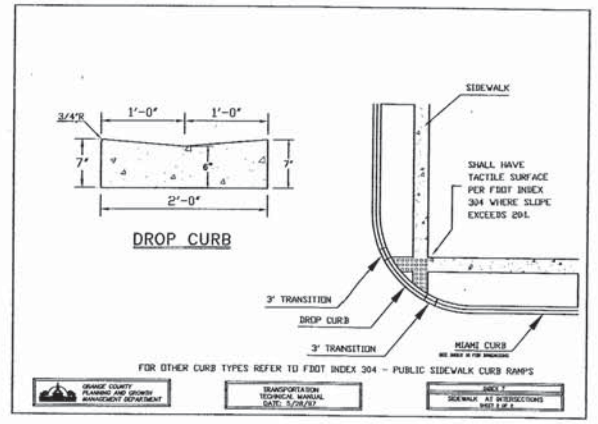


PAVEMENT SECTION

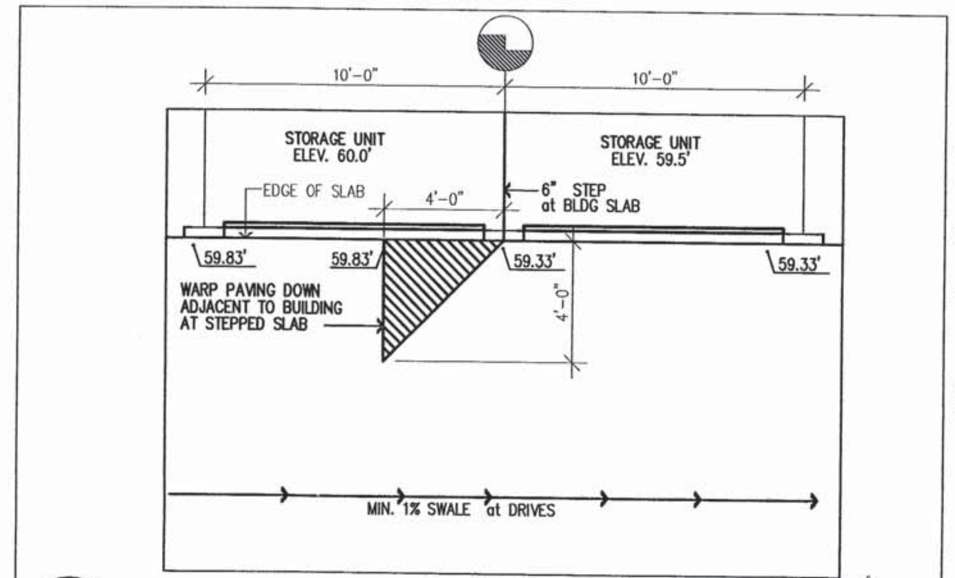


POND SECTION B-B

POND CONTROL STRUCTURE



DROP CURB



1 PAVING TRANSITION at BLDG STEP
1/4"=1'-0"

GENERAL NOTES

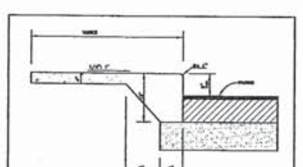
1. The dimensions and locations of the proposed buildings shown hereon are approximate only. Do not utilize said measurements for building layout. Refer to the Architectural drawings for exact building dimensions.
2. Land surveys, soils reports and legal descriptions were provided by others. The Engineer does not certify to the accuracy or completeness of same. The user of these plans shall verify the accuracy of all said information prior to any construction.
3. Prior to construction the Contractor and owner shall determine the locations of all drinking wells, septic tanks, waterways and other facilities to insure that all minimum setbacks between drainage facilities and all other utilities as required by law are met. All existing potable wells within minimum setback areas between any other utility shall be capped or plugged by a licensed water well contractor in accordance with Rules 40D-3 and 17-21.10(4). Florida Ad. Code. DO NOT UTILIZE THESE PLANS FOR CONSTRUCTION PRIOR TO THIS INVESTIGATION.
4. Prior to any construction the Contractor shall verify all aboveground and subsurface site conditions, facilities and utilities. The Contractor shall abide by Fl. Statute 93.240 (Sections 566.101 through 566.111 THE UNDERGROUND FACILITY DAMAGE PREVENTION AND SAFETY ACT (call 1-800-432-4770). The Contractor is responsible for the replacement to as-new condition of any existing facility and utility damaged by him whether or not shown hereon.
5. Prior to construction the Contractor shall obtain permits for all on-site and off-site work required by appropriate agencies.
6. Deviations from this drawing are not permitted without the written consent of Orange County and the Engineer. The Contractor shall notify the Engineer of any discrepancies in the drawings prior to proceeding.
7. No construction is permitted in any Conservation Area or setback.
8. All required fill shall meet the Architect's specifications.
9. The Contractor shall furnish and install all materials and labor required for the construction, testing, inspection and completion of the project.
10. The Contractor shall replace all survey stakes destroyed.
11. It is the intent of this design to conform to all applicable ADA codes and regulations, but the Engineer does not warrant or guarantee same to the user of these plans. The user of these plans shall become familiar with said ADA provisions and add same to this plan as necessary to conform to said codes.

ROAD AND DRAINAGE NOTES

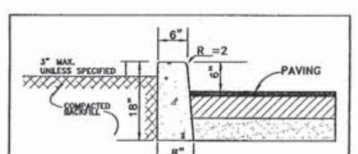
1. All workmanship and materials shall conform to Fla. D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2004 edition and all Orange County Technical Manuals.
2. This drawing shows drainage and grading design to within 5 feet of the building(s) only and specifically excludes designs for structures, retaining walls, waterproofing and ventilation. The Contractor shall coordinate with others to insure that support designs have been completed by other design professionals and that no conflicts exist with any other construction, particularly grading within 5 feet of the buildings.
3. Ponds shall be excavated prior to any other construction, with stormwater runoff directed to them. Over-excavation and burying any debris beneath the pond is prohibited. If dewatering is required the Contractor shall construct settling/percolation ponds on site. Following all other construction, the ponds shall be fine graded and sodded per the plan.
4. EROSION / SEDIMENTATION CONTROL: The Contractor shall supply all erosion / sedimentation barriers (hay bales, silt screens and so forth) to prevent siltation and excess quantities of earth from being transported either by natural drainage or vehicular traffic onto any adjacent properties, streets, storm sewers, waterways, conservation areas and so forth. The Contractor shall clean and restore any areas affected by erosion / sedimentation. Erosion control measures are to be in place at the start of construction and to remain in place until construction is completed. The Contractor is to inspect barriers for damage and maintain as needed.
5. The Contractor shall furnish the Engineer a complete as-built survey performed by a Registered Land Surveyor of all drainage and grading construction within 30 days of construction completion.
6. OPERATION & MAINTENANCE OF THE STORMWATER MANAGEMENT SYSTEM:
   (a) Regularly clean all pipes, weirs and inlets.
   (b) Maintain all design elevations and dimensions in the pond.
   (c) Repair all areas affected by erosion immediately.
   (d) Dry Pond: Mow, clean and power rake the pond bottom regularly.
   (e) Wet Pond: Removal of native vegetation, including cattails is prohibited. Removal includes dredging, the application of herbicides, introduction of grass corp and cutting. Maintenance of the ponds shall include keeping structures free of any obstructions. The maintenance entity should address any questions regarding authorized activities within the wet detention pond to SJRWMD.
7. The Contractor shall remove all existing asphalt, trees being designated as being removed and other debris and dispose of same off site at an approved dumping facility.
8. The Contractor shall stripe the parking lot and install concrete curb stops as indicated hereon.
9. All inlets and grate tops shall be designed and furnished as H-20 load bearing. Grate tops must be traversible by bicycles and pedestrians.
10. The Contractor shall obtain on site piping permits from the Orange County Building Dept. prior to any construction.

Traffic Control Plan:

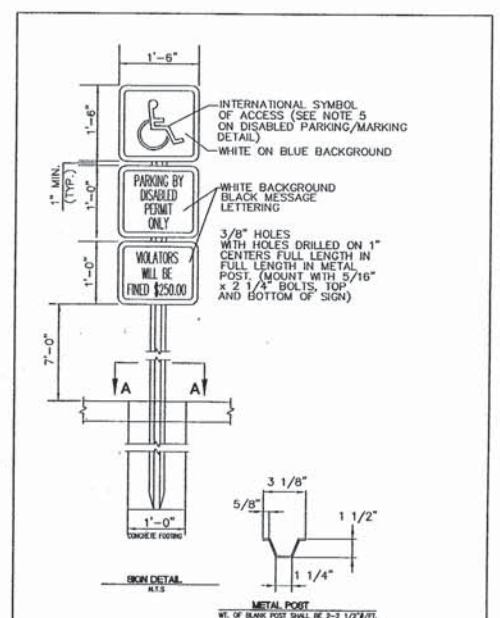
1. The Permittee shall conduct his operations such that there will be a minimum of interference with or interruption of traffic upon and along the roadway. This applies to both the initial installation and the continuing maintenance and operation of facilities except in emergencies There shall be no interference with or interruption of traffic upon and along the roadway until a maintenance of traffic plan approved by the county.
2. During the installation of the facilities authorized by the Use Permit, the Permittee shall at all times maintain flaggers, signs, lights, flares, barricades, and other safety devices as required by the applicable standards or as the County may reasonably deem necessary to properly protect traffic upon the roadway, and to warn and safeguard the public, work crews or County employees against injury or damage.
3. For work within County Right-of-way, submit a maintenance of traffic plan to Orange County Traffic Department.



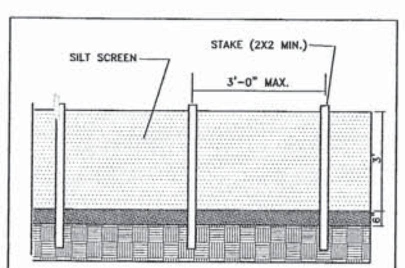
TYPICAL CROSS SECTION OF WALK @ PAVING/PARKING



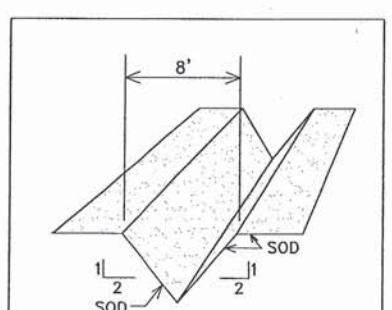
F.D.O.T. TYPE D VERTICAL CURB
(SEE F.D.O.T. INDEX FOR SPECIFIC DETAILS)



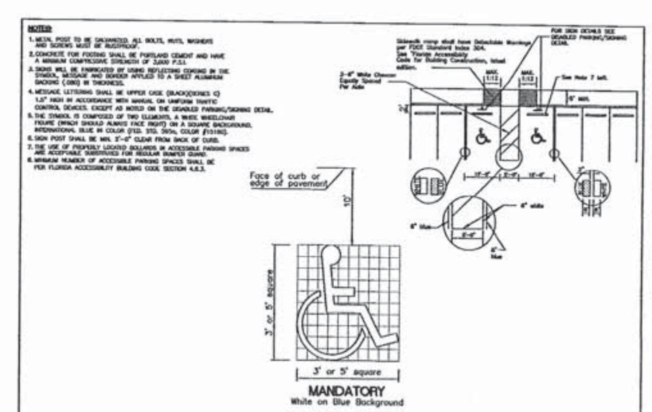
DISABLED PARKING / SIGNING
TYPICAL DETAILS



SILT SCREEN DETAIL



SWALE SECTION



DISABLED PARKING / MARKING
TYPICAL DETAILS

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ALTAMONTE SVC. CTR.

KISINGER CAMPO & ASSOCIATES CORP. 2203 NORTH LOIS AVENUE, SUITE 1200 TAMPA, FL 33607 (813) 871-5331 BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION No.00002317			
NO. DATE REVISIONS	THE FAIRWAYS - SELF STORAGE PAVING & DRAINAGE DETAILS		
	DESIGNED BY: / DRAWN BY: SBT / CHECKED BY:	DATE: 06/09/05 SCALE: N.T.S. FILE NO. 2200418	
	AARON CHRISTOPHER MEARES, P.E. FLA. REGISTERED ENGINEER NO. 62955		SHEET C3 OF C6

X-2